Projects Committee Meeting
Thursday, July 29, 2021 7:30 AM
Lower Platte North NRD Office
P.O. Box 126
Wahoo, NE 68066

1. UNFINISHED BUSINESS
   No unfinished businees to address.
2. SWCP

   A. SWCP Application Approvals
   Below are the fall SWCP applications up for approval, the eight applications total $75,534.17:

	App	Loc (Watershed)	Name	Amt	Pracs
B.	21-B-1	C. SEC. 7-15-2 (BELL 6-F)*	D. ROBERT SCHMIT	E. $3,577.19	F. TOT
G.	21-B-3	H. SEC. 23-16-4 (SKULL)*	I. DWAYNE LANC	J. $1 2,500.00	K. TOT, WAS CB, TO
L.	21-B-4	M. SEC. 36-16-4 (SKULL)*	N. DAVID HANIS	O. $5,308.48	P. WAS CB TO
Q.	21-B-5	R. SEC. 36-16-4 (SKULL)*	S. CARL SOUSEK	T. $1 2,500.00	U. WAS CB TO
V.	21-S-6	W. SEC. 16-4-6 (WAHOO)*	X. ALLEN MEDUNA	Y. $1 2,500.00	Z. TOT, WAS CB, TO
AA.	1-S-7	BB. SEC. 26-15-6 (COTTONWOOD)*	CC. NORM LINDGREN	DD. $6,033.00	EE. WAS CB TO

FF.	21-S-8	GG.	SEC. 6-14-7 (COTTONWOOD)*	HH.	JOHN & CARL BERN	II.	$ 10,615.50	JJ.	WASCB TO
KK.	1-S-9	LL.	SEC. 29-17-6 (SAND)*	MM.	JERRY SOUKUP	NN.	$ 12,500.00	OO.	TO T

PP. SWCP Payments

A completed tree planting has been certified and ready to be paid:

QQ.	Jason Scott	RR.	$ 1,348.50	SS.	FIELD & WILDLIFE WINDBREAK

TT. SWCP Cancellations

None

UU. Wahoo Creek Cost Share Approvals

None

3. WATERSHEDS

A. Shell Creek

1. Shell Creek Environmental Enhancement Plan Implementation
Pruss Construction has completed tree removal on the Shell Creek South Channel Improvement/Benching Project and will finish the project work after fall harvest. U.P. Railroad is near completing their bridge replacement project near country road 15.

As part of the Shell Creek Watershed Water Quality Plan update, JEO has sent a draft analysis of pollution loads and concentrations (provided by Wright Water Engineers, Inc.) for review and comment (attachment). NDEE is assisting with the plan update narrative. As part of the Shell Creek Watershed Water Quality Plan Phase II, JEO continues to work with NDEE on the Plan update.JEO continues to work with NDEE to complete our Watershed Plan Update. Attached is JEO's $756.00 invoice and progress report. After this payment, $22,270.50 will remain under our $31,630 contract. We are requesting NDEE reimbursement for this expense.

a. Shell Creek Grant Funding Update
No new updates since last month. As previously mentioned, we have approximately $390,0000 EPA 319 funds and $14,000 of NET grant funding for various projects and other tasks for use by June 30, 2022.

b. Shell Creek Environmental Enhancement Plan Completed Practice Payment
Completed septic system upgrade:

c. JOHN SONDERMAN d. $4,800.00

B. Wahoo Creek Watershed

1. Wahoo Creek Dam Site Planning Update & FYRA Invoices
   Attached is FYRA's July 26th invoice totaling $5,160 for Wahoo Creek Planning contract work, primarily adjusting the draft plan without Dam Site 83. After this payment, $31,146.50 will remain under contract. This invoice will be submitted to NRCS for 100% reimbursement.
2. Wahoo Creek Watershed Water Quality Plan Phase II
   Saunders County has prepared the Railroad Avenue Road for fabric and rip-rap for the Czechland Lake Shoreline/Road Stabilization Project. The County took bids on the fabric & rip-rap and these materials will be delivered to the site and placed in August. Attached is our approved Interlocal Agreement with Saunders County for the Project.

   As part of the Wahoo Creek Watershed Water Quality Plan Phase II, JEO continues to work with NDEE on the Plan update.JEO continues to work with NDEE to complete our Watershed Plan Update. Attached is JEO's $634.50 invoice and progress report. After this payment, $16,270,50 will remain under our $31,630 contract. We are requesting NDEE reimbursement for this expense. Also attached is the draft report on sediment load estimates and water quality assessment that is being reviewed by NDEE.

3. Olsson Design Update and Invoice
   Olsson will start dam design after NRCS approves the Wahoo Creek Watershed Plan. It is anticipated that FYRA will submit the plan for NRCS review by September 1, 2021.

4. JOINT WATER MANAGEMENT ADVISORY BOARD
   A JWMAB Meeting was held on July 21, 2021, at the Fremont Municipal Building. Attached is the Agenda and minutes from the February 23 meeting.

   A. Rawhide Creek Work Plan-Environmental Assessment
      Dodge County, LPNNRD and Fremont representatives had a Zoom meeting with NRCS on July 2nd to discuss RFP proposals received for completing the Wateshed Plan Environmental Assessment for the Rawhide Creek Watershed. Three firms submitted proposals (FYRA, JEO & Burns & McDonnell). The review committee recommended Burns and McDonnell based primarily on the perceived lowest proposed cost to complete the work. During Dodge County's contract discussions, Burns and McDonnell provided an adjusted scope and amendments to their original project proposal. Following that discussion, the Dodge County's Attorney recommended not to accept the proposal and readvertise for new Requests for Proposals (RFP's), which will be received and reviewed in mid-August.

      NRCS has obligated funds for planning and conceptual design costs for surveys and investigations, environmental studies, evaluation of alternatives, and preparation of plans and design prior to the authorization of assistance for the installation of works of improvement. The assessment will evaluate feasible flood reduction projects that

can hopefully be eligible for future federal Watershed Flood Prevention Operations (WFPO) program. While LPNNRD is a participating partner, this planning effort is 100% funded by NRCS, so we have not obligated any funding at this point.

B. Platte River Camera Sensor Update
Partner representatives have been meeting to discuss possible camera/water sensor options to monitor ice conditions/flooding at strategic Platte River locations. There were some issues working with the first company we tried to work with, so the group decided to look for other possibilities. LPNNRD, PMRNRD, Dodge County and Fremont have entered into an interlocal agreement for this effort. However, this agreement might need to be updated depending on the direction the partners decide.

C. Elkhorn Township/East Fremont Drainage Improvement Project Update
A kick-off meeting with the selected consulting firm, JEO, was held on July 9th with Fremont, Dodge County and LPNNRD representatives (meeting minutes attached). JEO will be reviewing all available information about the area. Attached is a news release that was sent out for public input. LPNNRD will meet with JEO next week to share information on the failed project effort that occurred in the mid 1990's.

D. Platte River Breach Repair Project Update
This Breach Repair Project is nearly complete. LPNNRD has committed up to $50,000 toward the project.

5. HAZARD MITIGATION PLAN UPDATE
No new updates. Most participating entities in our HMP have submitted plan adoption resolutions. JEO last reported that they were still tracking down one or two entity resolutions.
6. EROSION AND SEDIMENT RULES AND REGULATIONS
No new issues.
7. OTHER

A. LPNNRD Projects FY2022 Draft Budget Review
General Manager Gottschalk reviewed the Projects protion of LPNNRD's draft FY22 budget with the committee.

8. ADJOURNMENT
The Projects Committee adjourned at 8:15 a.m.

WWE

MEMORANDUM

To: Adam Rupe, Natural Resources Specialist
JEO Consulting Group, Inc.
2700 Fletcher Avenue
Lincoln, Nebraska 68504-1113

DRAFT – For Review and Comment

From: Wright Water Engineers, Inc.
Hayes Lenhart, P.E. and Steven Crisp, E.I.T

Date: July 21, 2021

Re: Shell Creek Watershed Environmental Enhancement Plan Update – Analysis of Pollutant Loads and Concentrations Pre- and Post-Watershed Plan Implementation

Wright Water Engineers, Inc. (WWE) is pleased to provide JEO Consulting Group, Inc. (JEO) with this technical memorandum summarizing WWE's assessment of water quality trends and pollutant loads in the Shell Creek watershed basin located in the east-central part of Nebraska. The Shell Creek watershed spans five counties, including southeast Antelope County, northeast Boone County, southwest Madison County, northwest and central Platte County, and western and southern Colfax County. WWE understands EA Engineering Science and Technology, Inc. (EA), developed the Shell Creek Watershed Environmental Enhancement Plan for the Lower Platte North Natural Resources District (LPNNRD) in April 2016 (2016 Watershed Plan). After the LPNNRD adopted the 2016 Watershed Plan, the LPNNRD began implementing best management practices (BMPs) and conservation strategies outlined in the 2016 Watershed Plan and continued water quality monitoring in the watershed.

1.0 APPROACH

WWE's pre- and post-BMP implementation assessment for the Shell Creek Watershed focused on the following water quality parameters: 1) total nitrogen, 2) total phosphorus, 3) atrazine, 4) sediment, and 5) *E. coli*. To evaluate water quality trends, WWE compared pollutant concentrations and loads under pre- versus post-2016 Watershed Plan implementation conditions at a USGS gage station #06795500 Shell Creek near Columbus, NE (Shell 207) with both water quality samples and long-term flow monitoring data (see Figure 1). The analysis included these components:

- General review of flow conditions for pre- and post-BMP implementations where streamflow data is available.
- Generation of Load Duration Curves (LDC) using Colorado State University's eRAMs tool at locations where paired water quality and flow data are available. LDCs enable a visual assessment of how pre- and post-BMP loads compare over a range of hydrologic conditions.

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A target LDC can be generated based on a water quality standard or a non-regulatory benchmark used for general comparative purposes.

- Basic summary statistics for pre- and post-BMP implementation.
- Development of boxplots to graphically illustrate water quality results.
- Non-parametric hypothesis tests using the Mann-Whitney test to determine whether statistically significant differences in pollutant concentrations were present pre- and post-BMP implementation.

Findings for pollutant loads are presented first, followed by a discussion of pollutant concentrations.

2.0 COMPARISON OF PRE- VS. POST BMP POLLUTANT LOADS

LDCs are a commonly used tool in development of total maximum daily loads (TMDLs) or to better understand how loading varies under a range of flow conditions. LDCs plot a curve (line) that represents the pollutant load meeting the stream standard (or non-regulatory benchmark) under the range of flow conditions recorded at a representative stream gage on the stream. Thus, the curve shown is a stream flow multiplied by a pollutant concentration (along with some conversion factors). Water quality samples collected under various flow conditions are then plotted as pollutant loads on the graph. This depiction can then be used to develop a better understanding of whether pollutant loading issues are exceeding the standard under a range of flow conditions from high flow (storm) to low flow (dry) conditions. The LDCs are sometimes used quantitatively in TMDLs to assign percent load reductions targeted to various flow conditions. LDCs can also be used qualitatively in terms of likely general sources of pollution. For example, if standards are exceeded during high flow only, then the issue is most likely stormwater-driven. If the standards are exceeded mostly during baseflow conditions, then dry-weather sources (e.g., groundwater-dominated flow conditions, WWTF discharges) are likely causes. In the case of pollutants such as *E. coli*, standards are often exceeded under a wide-range of flow conditions. For purposes of this analysis, LDCs have been generated using a publicly available tool developed by Colorado State University as part of the https://erams.com/catena/ flow analysis tool suite. The LDCs used in this analysis are utilized in a primarily qualitative manner.

To provide a basis of comparison, several standards or benchmarks were used for comparison purposes:

- Total Nitrogen: Nebraska nitrate standard for drinking water, Maximum Contaminant Level (MCL) of 10 mg/L (benchmark only—based on a related Nebraska standard)
- Total Phosphorus: Kansas median water quality narrative standard of 0.2 mg/L (benchmark only—has no regulatory significance in Nebraska)
- Atrazine: Nebraska stream standard of four-day average concentration of 12 ug/L.
- Total Suspended Solids: Kansas median water quality narrative standard of 50 mg/L (benchmark only—has no regulatory significance in Nebraska)
- *E. coli*: Nebraska recreational season (May 1st and September 30th) geometric mean stream standard of 126 MPN/100 mL (NDEE, 2020).

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A summary of findings based on the LDCs is provided for each pollutant below.

2.1 Nitrogen

Figure 2 provides a LDC for nitrogen samples collected pre- and post-2016 Watershed Plan implementation for Shell 207. Nitrogen samples were available for a wide range of flow conditions both pre- and post-2016 Watershed Plan. The nitrogen concentration in most of the samples collected during both pre- and post- 2016 Watershed Plan are below the loading target based on a 10 mg/L nitrate water quality benchmark. Two samples collected pre-2016 Watershed Plan implementation were above the target water quality benchmark, and four samples collected post-2016 Watershed Plan implementation were above the target water quality benchmark. The LDC in Figure 2 indicates the water quality benchmark for nitrogen is typically exceeded during higher-than-average flow conditions.

2.2 Phosphorus

Figure 3 provides a LDC for phosphorus samples collected pre- and post-2016 Watershed Plan implementation for Shell 207. Phosphorus samples were available for a wide range of flows conditions both pre- and post-2016 Watershed Plan. The total phosphorus concentration in most of the samples collected during both pre- and post- 2016 Watershed Plan are above the loading target based on a 0.2 mg/L total phosphorus water quality benchmark. Five samples collected pre-2016 Watershed Plan implementation were below the target water quality benchmark, and one sample collected post-2016 Watershed Plan implementation was below the target water quality benchmark.

2.3 Atrazine

Figure 4 provides a LDC for atrazine samples collected pre- and post-2016 Watershed Plan implementation for Shell 207. Atrazine samples were available for a wide range of flows conditions both pre- and post-2016 Watershed Plan. Atrazine concentrations in the samples collected pre- 2016 Watershed Plan are above and below the loading target based on a NDEE atrazine water quality standard of 12 ug/L (NDEE, 2020). Water quality standard exceedances for atrazine tended to occur under higher flow conditions during the pre- 2016 Watershed Plan period.

Atrazine concentrations in the samples collected post- 2016 Watershed Plan are all below the loading target, including during high flow conditions. The results of this loading analysis suggest that efforts to reduce atrazine loading in the Shell Creek watershed are working.

2.4 Total Suspended Solids

Figure 5 provides a LDC for TSS samples collected pre- and post-2016 Watershed Plan implementation for Shell 207. TSS samples were available for a wide range of flow conditions both pre- and post-2016 Watershed Plan. The TSS concentration in most of the samples collected during both pre- and post- 2016 Watershed Plan are above the loading target based on a 50 mg/L TSS water

quality benchmark. Three samples collected pre-2016 Watershed Plan implementation were below the target water quality benchmark, and eleven samples collected post-2016 Watershed Plan implementation were at or below the target water quality benchmark.

It is worth noting that Figure 5 indicates TSS loading post-2016 Watershed Plan implementation is more frequently below the water quality benchmark when compared to samples collected pre-2016 Watershed Plan. Lower TSS concentrations are also present in the post-2016 Watershed Plan period during higher-than-average flow conditions, when TSS concentrations are typically higher due to more erosive streamflow velocity, and higher intensity rainfall conditions. The results of this loading analysis suggest that efforts to reduce sediment loading in the Shell Creek watershed are trending positively.

2.5 E. coli

Figure 6 provides a LDC for *E. coli* samples collected pre- and post-2016 Watershed Plan implementation for Shell 207. *E. coli* samples were available for a wide range of flow conditions both pre- and post-2016 Watershed Plan. The *E. coli* concentration in most of the samples collected during both pre- and post- 2016 Watershed Plan are above the loading target based on the NDEE *E. coli* water quality standard of 126 MPN/100 mL (NDEE, 2020). Two samples collected pre-2016 Watershed Plan implementation were below the target water quality standard, and sixteen samples collected post-2016 Watershed Plan implementation were below the target water quality standard.

It is worth noting that Figure 6 indicates *E. coli* loading post-2016 Watershed Plan implementation is more frequently below the water quality standard when compared to samples collected pre-2016 Watershed Plan, particularly during mid-range to high flow conditions, while samples collected during low flow conditions remain above the water quality standard. The results of this loading analysis suggest that efforts to reduce *E. coli* loading in the Shell Creek watershed are trending positively.

3.0 CONCENTRATION BASED WATER QUALITY TRENDS

To evaluate water quality changes pre- and post-Watershed Plan implementation, WWE prepared basic summary statistics box plots to help visually show central tendencies in water quality data and conducted hypothesis testing. A key to the box plots is provided Figure 7. WWE used The Mann-Whitney non-parametric hypothesis test to assess whether statistically significant differences ($p < 0.05$) were present pre- and post-Watershed Plan implementation (also referred to in the figures and tables as pre-BMP and post-BMP). WWE completed this analysis for total nitrogen, total phosphorus, atrazine, TSS, and *E. coli*, for Shell 207.

3.1 Data Summary

Table 1 provides basic water quality summary statistics for the pre- and post-BMP implementation (also referred to as pre- and post-Watershed Plan implementation) at Shell 207 along with flow conditions at the time of sampling. Sample results are graphically displayed in box plots (see Figure Set 8 through Figure Set 12), with a box plot legend provided in Figure 7. All figures are provided as

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attachments to this memorandum. Table 2 summarizes the results of the hypothesis tests for the following comparisons:

- Pre- versus post-BMP implementation relative to the 2016 Shell Creek Watershed Environmental Enhancement Plan.
- Pre- versus post-BMP implementation for samples collected during dry and wet conditions. A sample is considered under dry conditions when collected during a day with less than 0.1 inches of rainfall. A sample is considered under wet conditions when collected during a day with at least 0.1 inches of rainfall in the watershed, or immediately following a day with at least 0.1 inches of rainfall. WWE utilized daily precipitation data totals from the National Oceanic and Atmospheric Administration (NOAA) Columbus 3 NE weather station (see Figure 1) to group the water quality samples by dry or wet conditions. Grouping the data in this manner can help provide insight regarding whether in-stream water quality concentrations are influenced by rainfall and stormwater runoff.
- Pre- versus post-BMP implementation for samples collected during the non-irrigation season and during the irrigation season. WWE assumed an average irrigation season of May 7th through October 15th. Grouping the data in this manner can help provide insight regarding whether in-stream water quality concentrations are influenced by irrigation runoff or elevated seasonal groundwater return flows.

Table 1. Water Quality Summary Statistics at Shell 207

Sample Condition	Analyte	Nbr.	Minimum	Maximum	Median	Mean	Target
Pre-BMP	Nitrogen (mg/L)	53	1.10	10.59	5.10	5.04	
Post-BMP	Nitrogen (mg/L)	56	3.85	12.48	6.56	7.01	10.0
Pre-BMP	Phosphorus (mg/L)	69	0.10	8.70	0.42	0.84	
Post-BMP	Phosphorus (mg/L)	56	0.17	4.73	0.57	0.89	0.2
Pre-BMP	Atrazine (ug/L)	56	0.02	55.10	0.60	6.55	
Post-BMP	Atrazine (ug/L)	18	0.12	5.27	0.74	1.35	12.0
Pre-BMP	TSS (mg/L)	12	31	846	196	279	
Post-BMP	TSS (mg/L)	55	18	4110	136	322	50
Pre-BMP	*E. coli* (cfu/100 mL)	51	100	200,000	1,400	19,600 (2,476)*	
Post-BMP	*E. coli* (cfu/100 mL)	55	16	24,196	313	2,869 (509)*	126
Pre-BMP - Recreation Season	*E. coli* (cfu/100 mL)	39	110	200,000	1,600	24,646 (3,656)*	
Post-BMP - Recreation Season	*E. coli* (cfu/100 mL)	26	39	24,196	1,357	4,524 (1,263)*	126
Pre-BMP	Flow (cfs) During Sampling	108	9	1650	77	253	
Post-BMP	Flow (cfs) During Sampling	57	11	338	43	57	NA

*Geometric mean for *E. coli* is shown in parentheses.

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Table 2. Mann-Whitney Hypothesis Test Summary for Water Quality at Shell 207

Comparison	Shell Creek Post-Condition Relative to Pre-BMP Condition					
	Nitrogen	Phosphorus	Atrazine	TSS	E. coli	E. coli - Recreation Season
Post-BMP vs. Pre-BMP	Significantly Higher	No Significant Difference	No Significant Difference	No Significant Difference	Significantly Lower	No Significant Difference
Post-BMP-Dry vs. Pre-BMP Dry	Significantly Higher	Significantly Higher	No Significant Difference	No Significant Difference	Significantly Lower	No Significant Difference
Post-BMP-Wet vs. Pre-BMP Wet	Significantly Higher	No Significant Difference	No Significant Difference	Insufficient Data	Significantly Lower	Significantly Lower
Post-BMP-Irrigation Season vs. Pre-BMP-Irrigation Season	Significantly Higher	No Significant Difference	No Significant Difference	Insufficient Data	No Significant Difference	Insufficient Data
Post-BMP-Non-irrigation Season vs. Pre-BMP-Non-Irrigation Season	Significantly Higher	No Significant Difference	Insufficient Data	No Significant Difference	Significantly Lower	Insufficient Data

3.2 Discussion

3.2.1 *Total Nitrogen*

Shell 207 had a reasonably sized data set to compare pre- and post-BMP total nitrogen under varying hydrologic conditions. Figure Set 8 contains boxplots that graphically summarize total nitrogen data for Shell 207. The water quality samples indicate significantly higher total nitrogen concentrations for all five condition comparisons after 2016 Watershed Plan implementation.

Overall, median total nitrogen results at Shell 207 pre- and post-Watershed Plan implementation were in relatively similar ranges of 5.1 to 6.6 mg/L, respectively. Nebraska does not currently have a numeric stream standard for total nitrogen. For comparison purposes, WWE utilized Nebraska's nitrate standard for drinking water of 10 mg/L as a water quality benchmark. Median total nitrogen concentrations for both pre- and post-BMP implementation are below this benchmark.

3.2.2 *Total Phosphorus*

Shell 207 had a reasonably sized data set to compare pre- and post-BMP total phosphorus under varying hydrologic conditions. Figure Set 9 contains boxplots that graphically summarize total phosphorus data for Shell 207. The water quality samples indicate significantly higher total phosphorus concentration under dry weather conditions after 2016 Watershed Plan implementation. All other condition comparisons indicate no statistically significant difference between total phosphorus concentration pre- versus post- Watershed Plan implementation.

Overall, median total phosphorus results pre- and post-BMP implementation were in relatively similar ranges of 0.42 to 0.57 mg/L, respectively, which, is higher than the benchmark standard of 0.2 mg/L although this has no regulatory significance in Nebraska. It is worth noting that post-BMP concentrations during wet conditions display a much narrower interquartile range when compared with pre-BMP concentrations during wet conditions, suggesting a trend towards lower total phosphorus during storm events.

One hypothesis for higher total phosphorus concentrations at the Shell 207 gage during dry weather conditions is the possible addition of point source discharges post-2016 Watershed Plan implementation, such as a wastewater treatment plant, or an increase in the number of onsite septic systems or failing septic systems.

3.2.3 *Atrazine*

Shell 207 had a reasonably sized data set to compare pre- and post-BMP atrazine under varying hydrologic conditions, however the post-BMP data set was much smaller (eighteen data points) when compared to the pre-BMP data set (fifty-six data points). Figure Set 10 contains boxplots that graphically summarize atrazine data for Shell 207. The water quality samples indicate no statistically significant difference in atrazine concentrations for four out of the five condition comparisons after 2016 Watershed Plan implementation. There is insufficient data available to statistically compare pre- and post-BMP concentrations during the non-irrigation season.

Overall, median atrazine results pre- and post-BMP implementation were in relatively similar ranges of 0.6 ug/L to 0.74 ug/L, respectively. However, the pre-BMP implementation mean atrazine concentration of 6.55 ug/L was much higher when compared to the post-BMP implementation mean concentration of 1.35 ug/L. Based on review of the LDC for atrazine, loading in the Shell Creek watershed is generally less than it was pre- BMP implementation, and efforts to reduce atrazine in the Shell Creek watershed appear to be working. The median atrazine concentration post-BMP implementation (1.35 ug/L) is well below the NDEE water quality standard of 12 ug/L.

WWE understands that Shell Creek was delisted for its aquatic life impairment due to atrazine in 2018. Based on the analysis presented herein, efforts by the NDEE and LPNNRD to reduce atrazine concentrations in Shell Creek continue to maintain atrazine concentrations below the stream standard.

3.2.4 *Total Suspended Solids*

Shell 207 had a reasonably sized data set to compare pre- and post-BMP TSS under varying hydrologic conditions, however the post-BMP data set was much larger (fifty-five data points) when compared to the pre-BMP data set (twelve data points). Figure Set 11 contains boxplots that graphically summarize TSS data for Shell 207. The water quality samples indicate no statistically significant difference in TSS concentrations for three out of the five condition comparisons after 2016 Watershed Plan implementation. There is insufficient data available to statistically compare pre- and post-BMP concentrations during the irrigation season and under wet conditions.

Overall, median TSS results pre- and post-BMP implementation were in relatively similar ranges of 196 and 136 mg/L, respectively. Nebraska does not currently have an instream TSS numeric standard. For purposes of general comparison of criteria in an adjacent state—Kansas uses 50 mg/L as threshold in its narrative standard. Median TSS concentrations for both pre- and post-BMP implementation are above this benchmark.

Based on review of the LDC for TSS, loading post-2016 Watershed Plan implementation is more frequently below the water quality benchmark when compared to samples collected pre-2016 Watershed Plan. Lower TSS concentrations are also present in the post-2016 Watershed Plan period

during higher-than-average flow conditions, when TSS concentrations are typically higher due to more erosive streamflow velocity, and higher intensity rainfall conditions.

3.2.5 *E. coli*

Annual Based Analysis: Shell 207 had a reasonably sized data set to compare year-round pre- and post-BMP *E. coli* under varying conditions. Figure Set 12a contains boxplots that graphically summarize all the collected *E. coli* data for Shell 207 The water quality samples indicate significantly lower *E. coli* concentrations for four out of the five condition comparisons after 2016 Watershed Plan implementation; there was no significant difference between pre- and post-BMP implementation *E. coli* concentrations during the irrigation season.

The geometric mean *E. coli* concentration decreased an order of magnitude from 2,500 MPN/100 mL to 500 MPN/100 mL between pre- and post BMP implementation, respectively. Post-BMP implementation concentrations are still above the stream standard of 126 MPN/100 mL, but the comparison indicates that the 2016 Watershed Plan made a positive impact on (decreased) *E. coli* concentrations. While post-BMP concentrations still exceed the stream standard, they are not unusual values for agricultural areas where livestock are present and/or manure spreading occurs.

Recreation Season Based Analysis: Shell 207 had a reasonably sized data set to compare recreation season based pre- and post-BMP *E. coli* under varying conditions. Figure Set 12b contains boxplots that graphically summarize the portion of the *E. coli* data collected during the recreation season between May 1st and September 30th. The water quality samples indicate significantly lower *E. coli* concentrations for one out of the five condition comparisons after 2016 Watershed Plan implementation; concentrations during wet conditions are significantly lower after 2016 Watershed Plan implementation.

During the recreational season, the seasonal geometric mean *E. coli* concentration decreased from 3,600 to 1,200 MPN/100 mL. Under wet conditions, the seasonal geometric mean *E. coli* concentration significantly decreased from 10,000 to 1,300 MPN/100 mL, suggesting that BMP implementation is positively impacting (decreasing) *E. coli* concentrations during rain events.

4.0 CONCLUSIONS

Based on analysis of water quality data in the Shell Creek watershed pre- and post-BMP implementation, WWE's conclusions include:

- Water quality sampling for all five pollutants occurred over a wide range of flows at Shell 207 under both pre- and post-BMP implementation conditions. Most water quality data for both pre-and post-BMP implementation occurred within the 20th and 80th percentile flow range, providing a good foundation on which to assess changes in water quality in the watershed. Because pollutant fate and transport are significantly affected by hydrologic conditions, there is greater confidence in the pre- and post-BMP implementation analysis when data are available under a wider range of flow conditions.

- Water quality monitoring at Shell 207 suggests that BMP implementation has significantly improved (decreased) concentrations of *E. coli* within the watershed. While *E. coli* concentrations improved post-BMP implementation, concentrations remain elevated above the stream standard of 126 MPN/100 mL.

- Monitoring data indicate no significant changes in water quality for atrazine and TSS at Shell 207. However, the LDC for each of these pollutants indicate loading is trending lower (improving) in the Shell Creek watershed, suggesting that BMP implementation is positively impacting these pollutants.

- Monitoring data for total phosphorus indicate no significant change to concentrations except for concentrations during dry weather conditions. Dry weather total phosphorus concentrations significantly increased. One hypothesis to explain this increase is the possible addition of point source discharges post-2016 Watershed Plan implementation, such as a wastewater treatment plant, or an increase in the number of onsite septic systems or failing septic systems. WWE recommends this phenomenon be investigated further.

- Monitoring data for total nitrogen indicate a significant increase in concentrations under all conditions. While nitrogen concentrations post-BMP implementation remain below the water quality benchmark standard of 10 mg/L, it may be appropriate to refocus Shell Creek watershed planning and BMP installation efforts to target nitrogen in the future.

- In an effort to better asses how well the implementation of BMPs is impacting water quality in the Shell Creek Watershed, WWE recommends further refining the water quality monitoring program to focus on creek segments where pre- versus post-BMP implementation can be evaluated (i.e., upstream-downstream sampling). Additionally, trends over time may be more apparent as more post-implementation data become available.

5.0 REFERENCES

Kansas Department of Health and Environment Bureau of Water. 2018. Kansas Surface Water Quality Standards. April 11, 2018.

Nebraska Department of Environment and Energy (NDEE), 2020. 2020 Water Quality Integrated Report DRAFT. Nebraska Department of Environment and Energy. November 20, 2020.

Attachments:

Figure 1. Shell Creek Watershed and Monitoring Locations

Figure 2. Nitrogen Load Duration Curve - Shell Creek Gage

Figure 3. Phosphorus Load Duration Curve - Shell Creek Gage

Figure 4. Atrazine Load Duration Curve – Shell Creek Gage

Figure 5. TSS Load Duration Curve - Shell Creek Gage

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Figure 6. *E. coli* Load Duration Curve – Shell Creek Gage

Figure 7. Box Plot Key

Figure Set 8. TN Concentration Box Plots for Shell Creek Gage

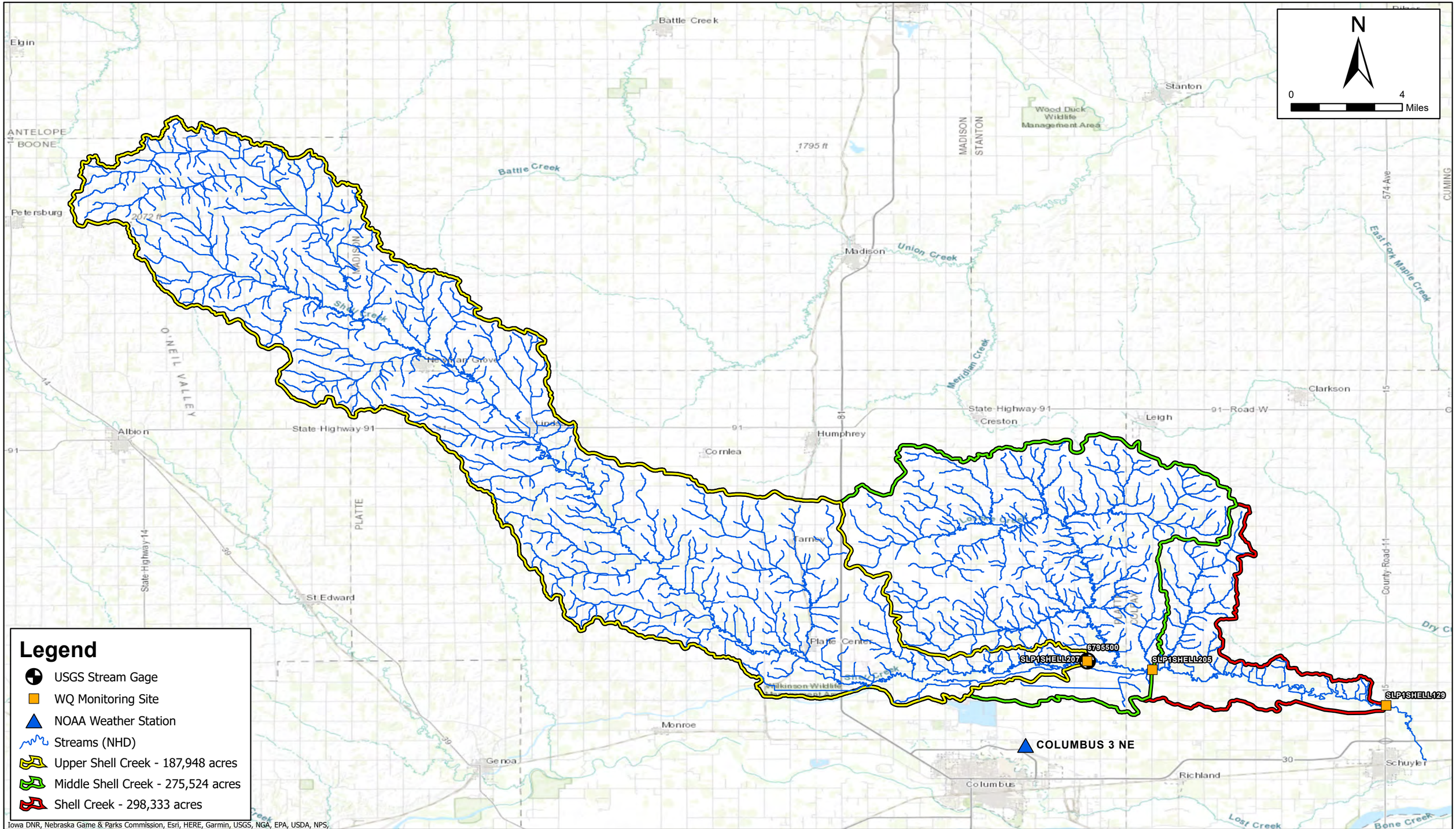
Figure Set 9. TP Concentration Box Plots for Shell Creek Gage

Figure Set 10. Atrazine Concentration Box Plots for Shell Creek Gage

Figure Set 11. TSS Concentration Box Plots for Shell Creek Gage

Figure Set 12a. *E. coli* Concentration Box Plots for Shell Creek Gage

Figure Set 132b. *E. coli* Concentration Box Plots for Shell Creek Gage During Recreation Season



Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

NEBRASKA

SHELL CREEK WATER QUALITY MONITORING LOCATIONS AND HUC12 DRAINAGE BASINS

JEO

PROJECT NO.
031-139.090

DRAFT
FIGURE
1

Figure 2
Nitrogen Load Duration Curve
Shell Creek 207, NE 06795500

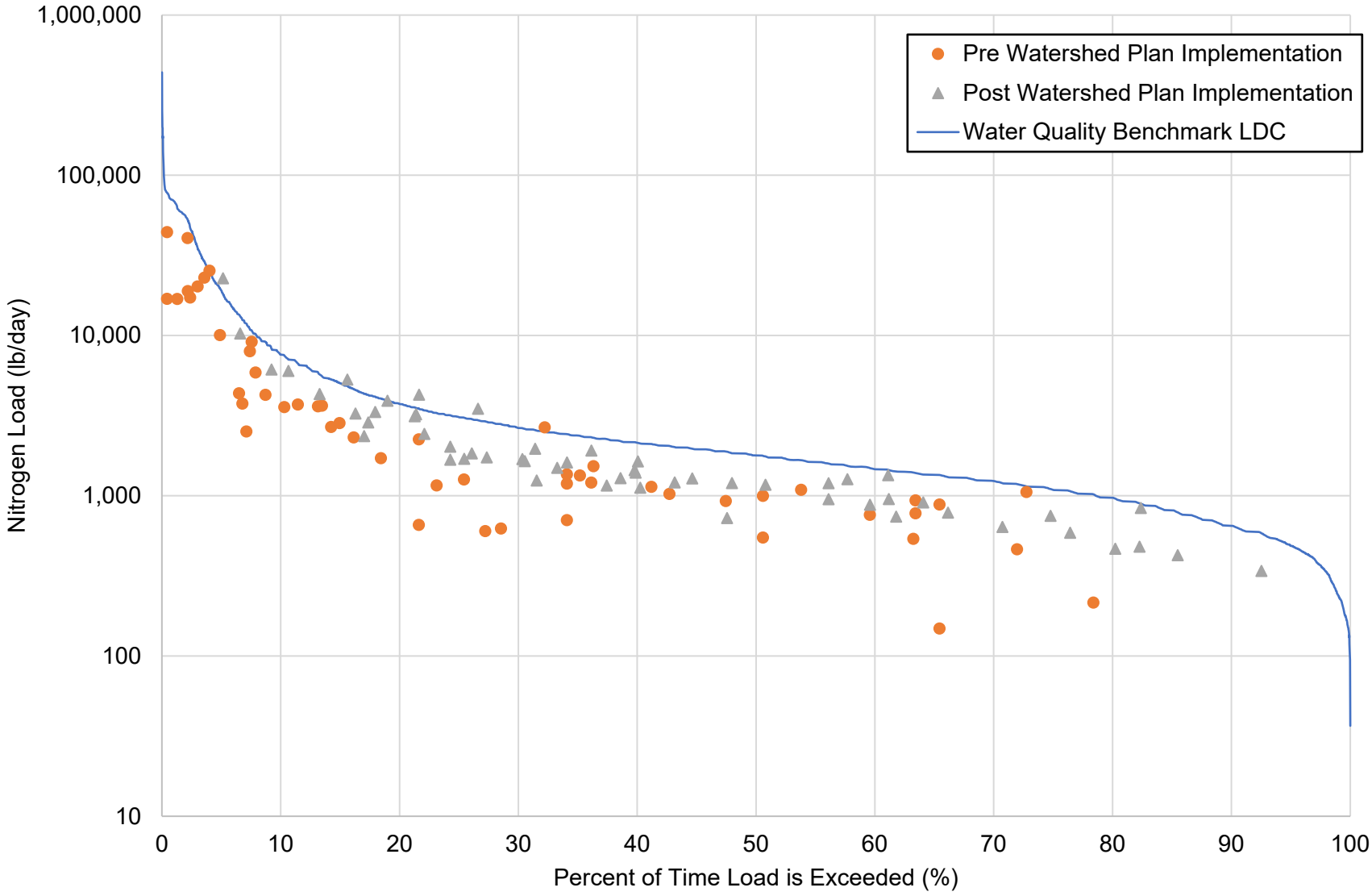


Figure 3
Phosphorus Load Duration Curve
Shell Creek 207, NE 06795500

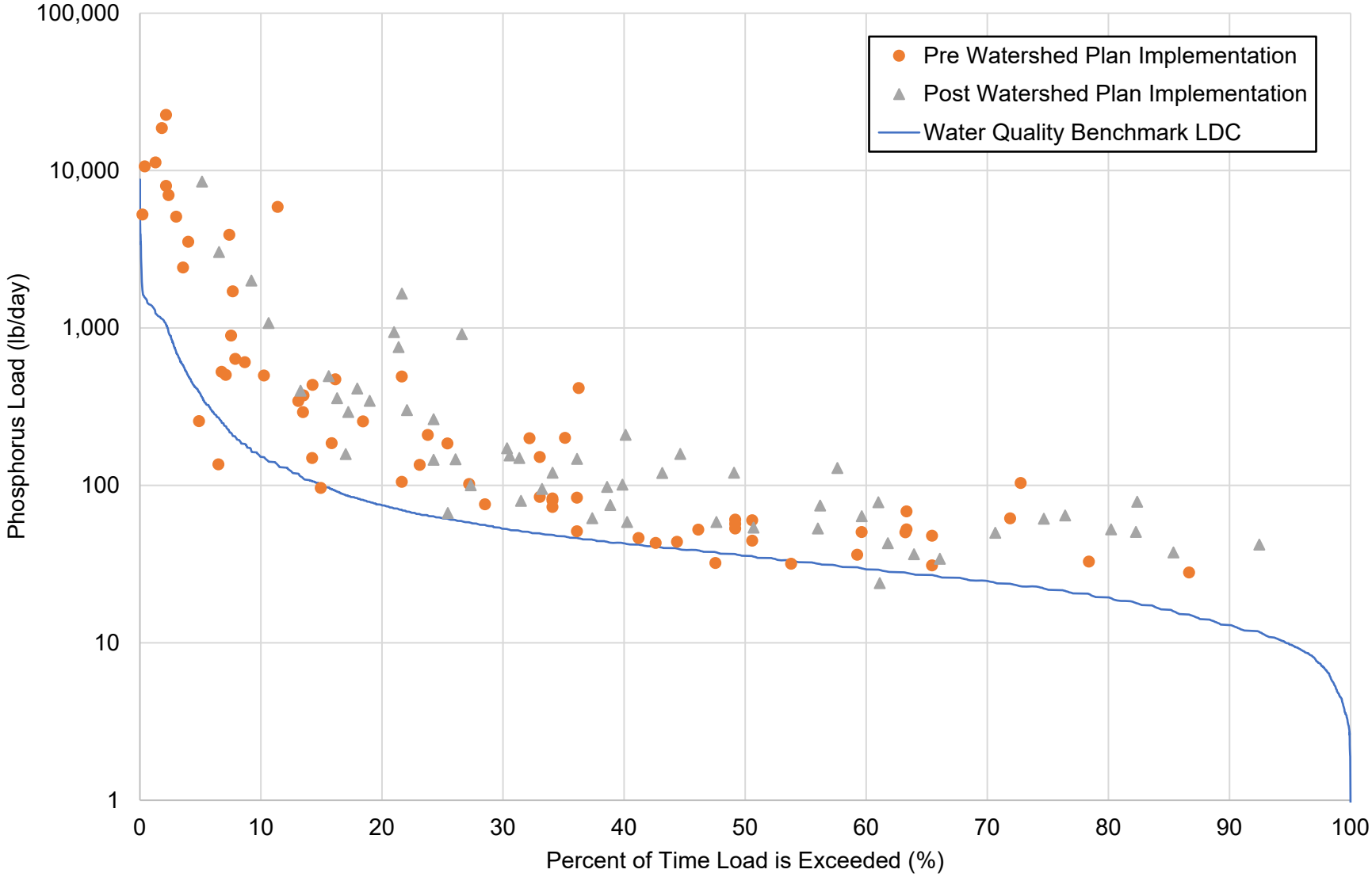


Figure 4
Atrazine Load Duration Curve
Shell Creek 207, NE 06795500

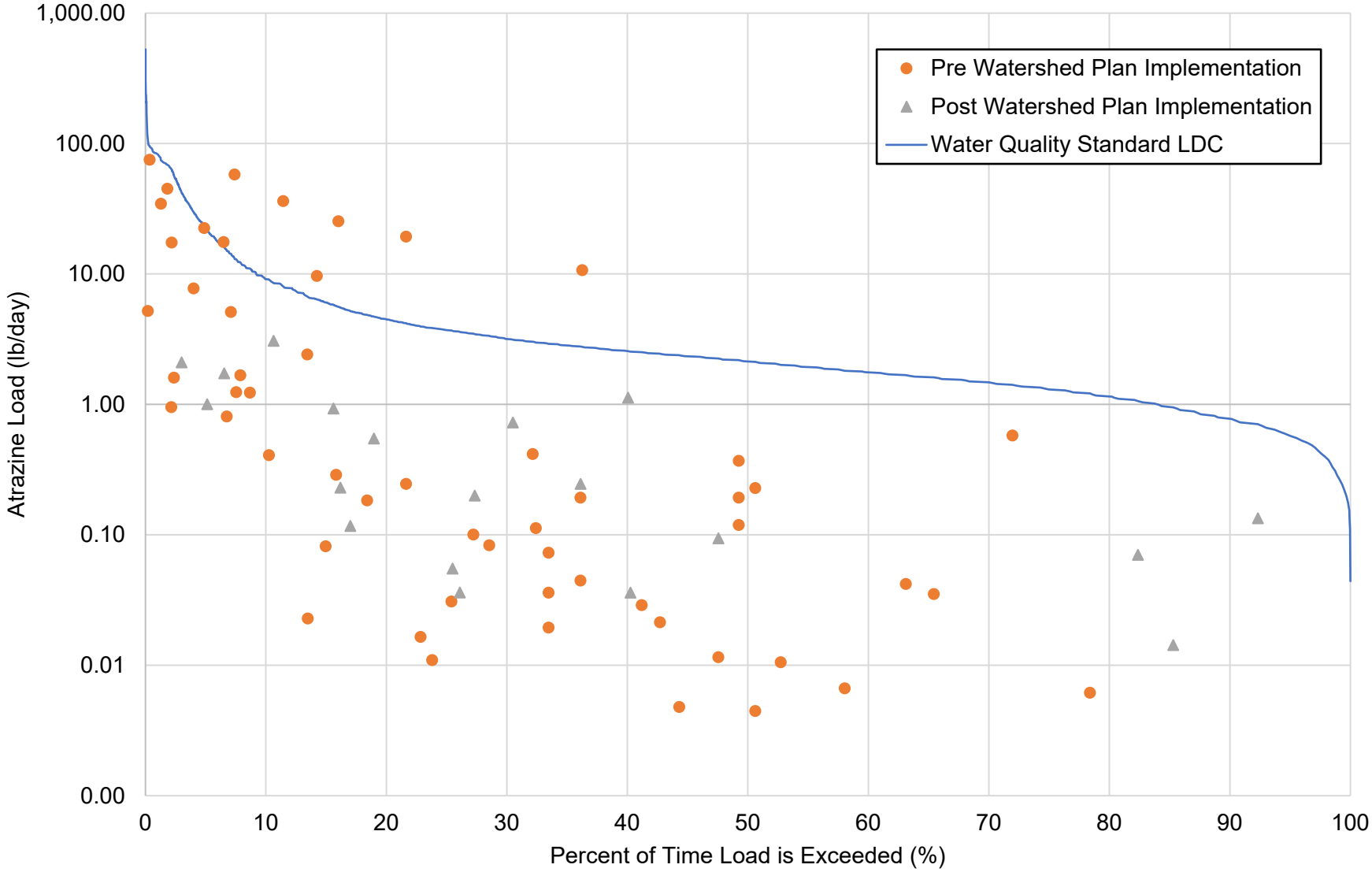


Figure 5
TSS Load Duration Curve
Shell Creek 207, NE 06795500

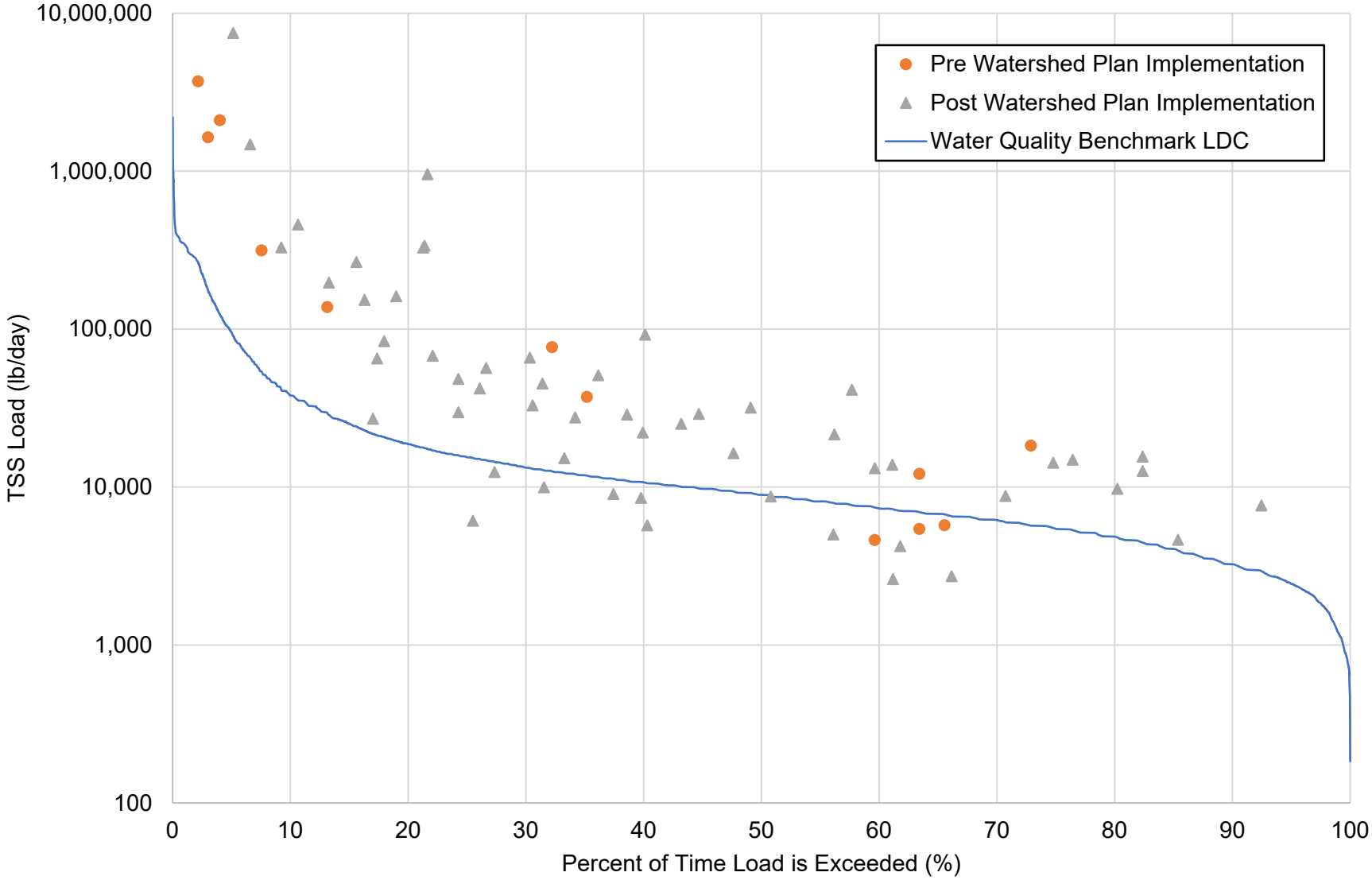


Figure 6
E. coli Load Duration Curve
Shell Creek 207, NE 06795500

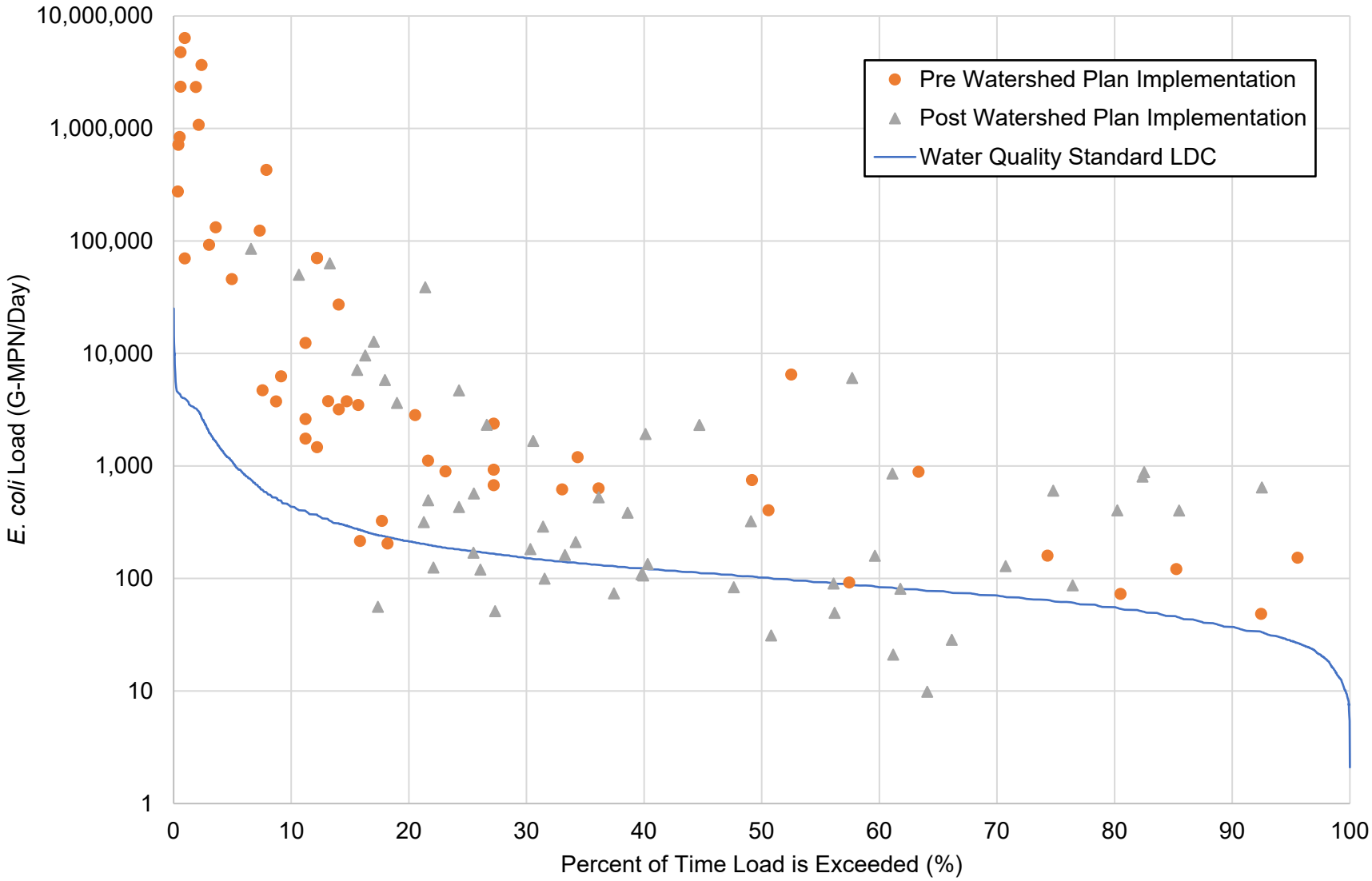
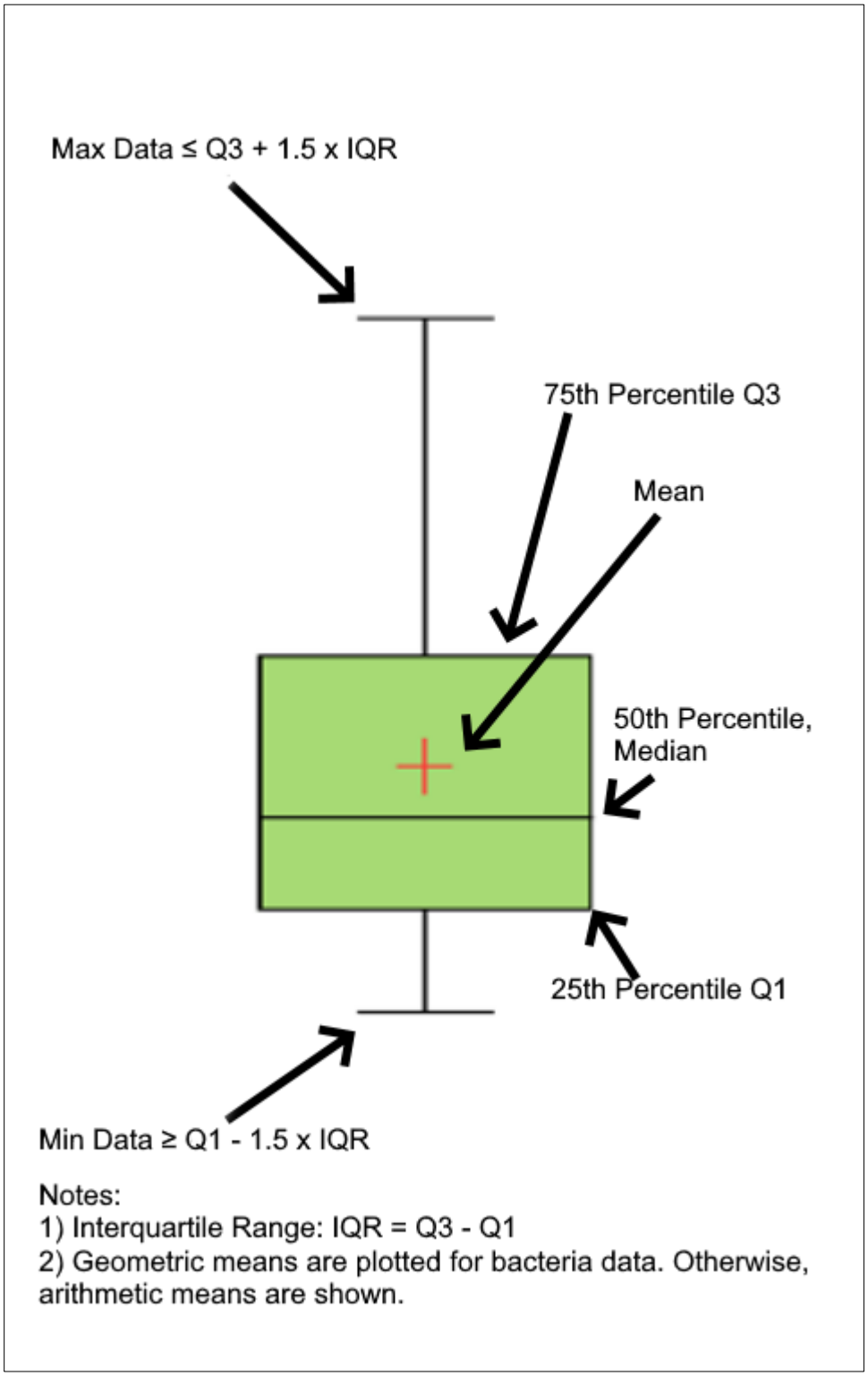


Figure 7. Box Plot Key



Notes:
1) Interquartile Range: IQR = Q3 - Q1
2) Geometric means are plotted for bacteria data. Otherwise, arithmetic means are shown.

Figure Set 8. TN Concentration Box Plots for Shell Creek Gage

Figure 8.1

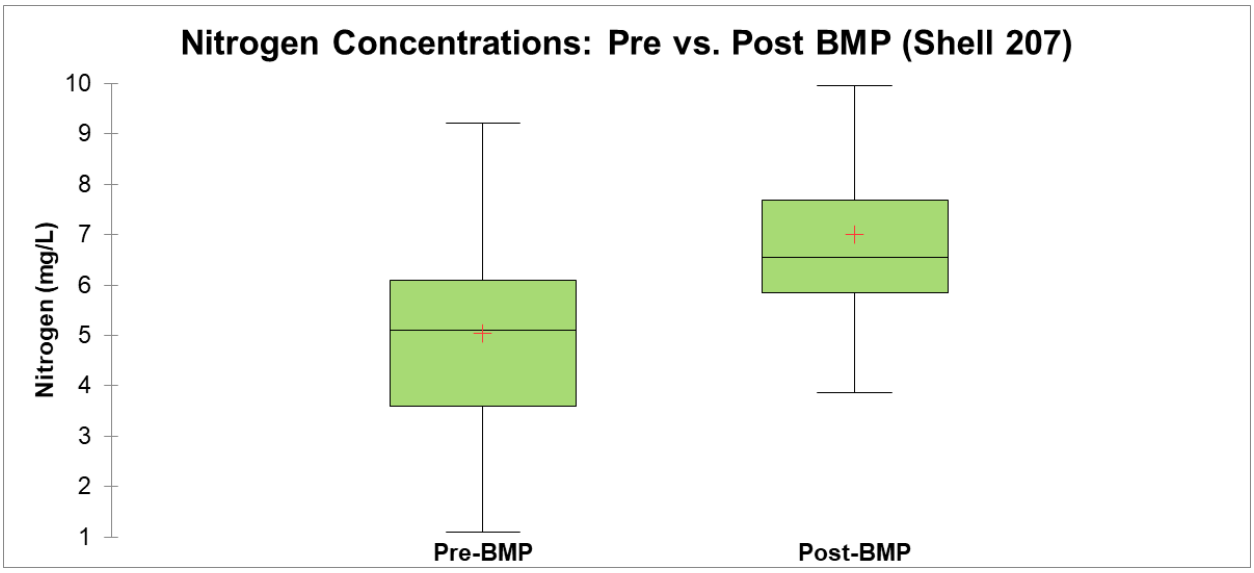


Figure 8.2

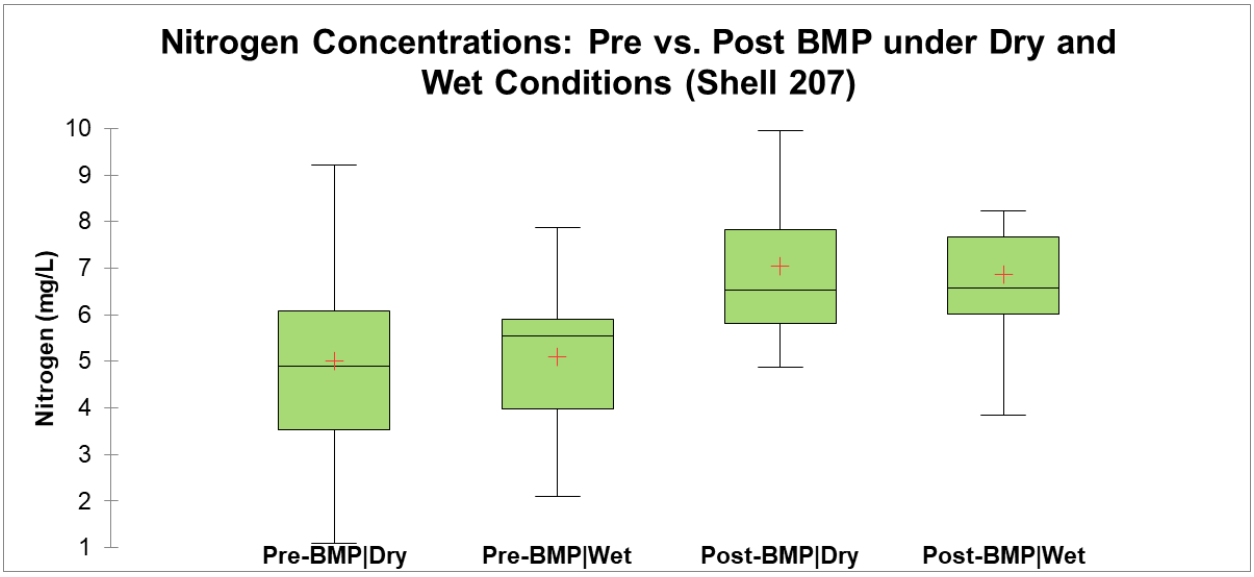


Figure 8.3

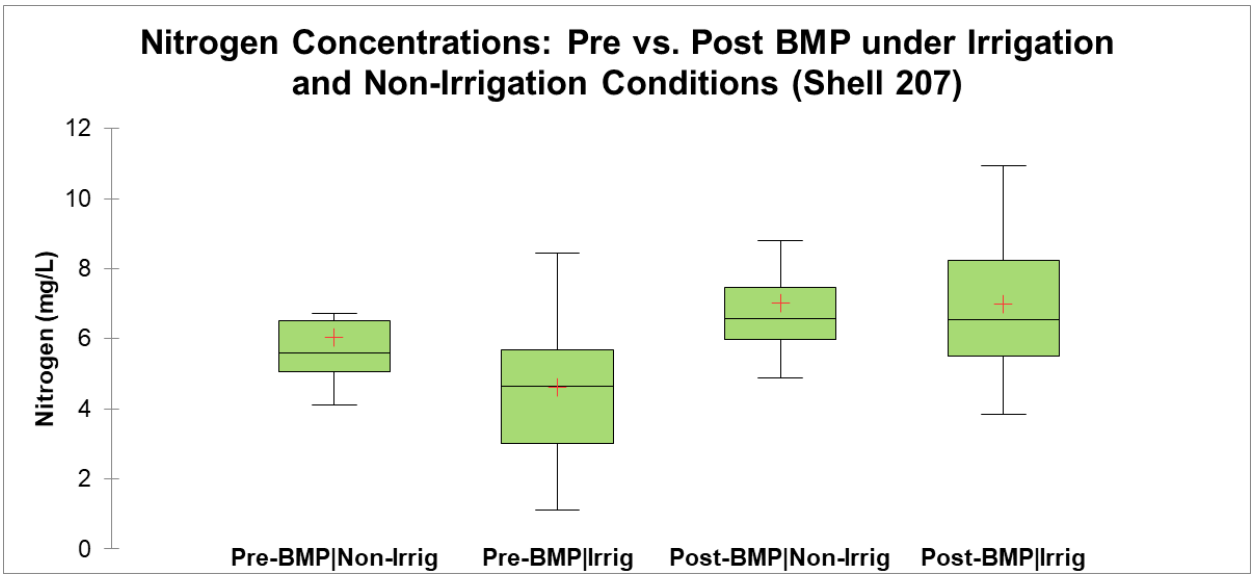

Nitrogen Concentrations: Pre vs. Post BMP under Irrigation and Non-Irrigation Conditions (Shell 207)
Nitrogen (mg/L)
12
10
8
6
4
2
0
Pre-BMP|Non-Irrig
Pre-BMP|Irrig
Post-BMP|Non-Irrig
Post-BMP|Irrig

Figure Set 9. TP Concentration Box Plots for Shell Creek Gage

Figure 9.1

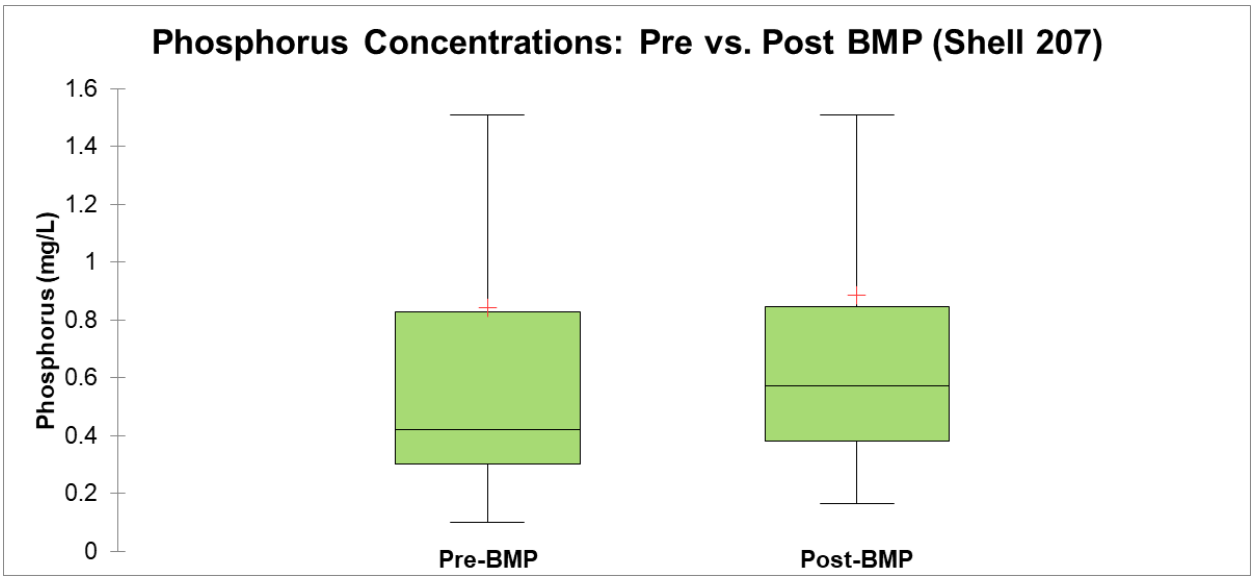


Figure 9.2

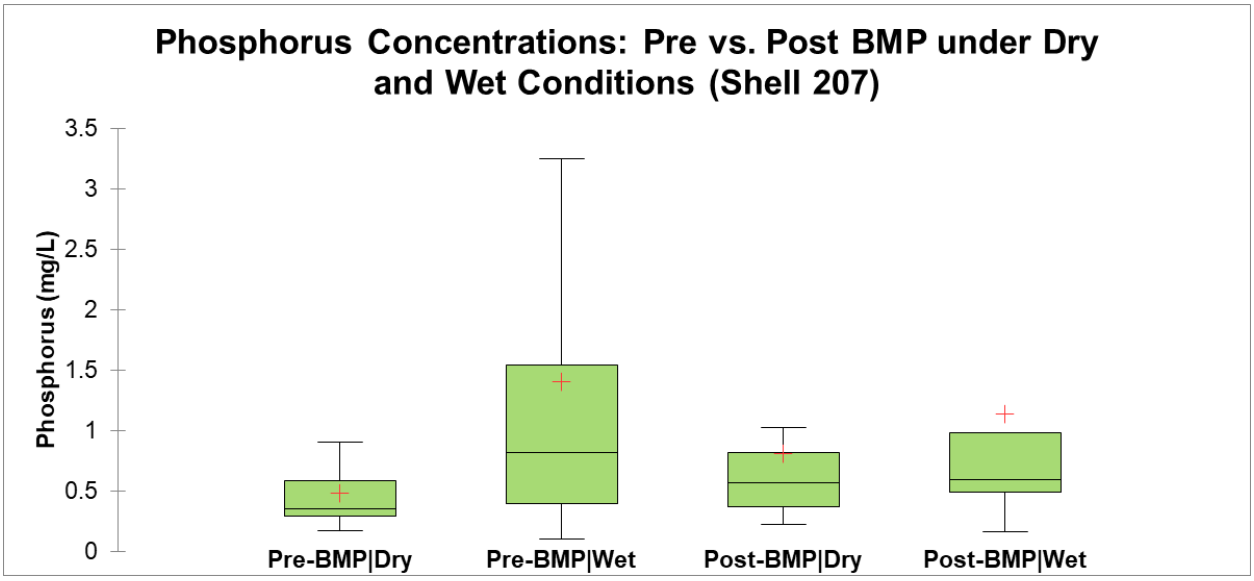


Figure 9.3

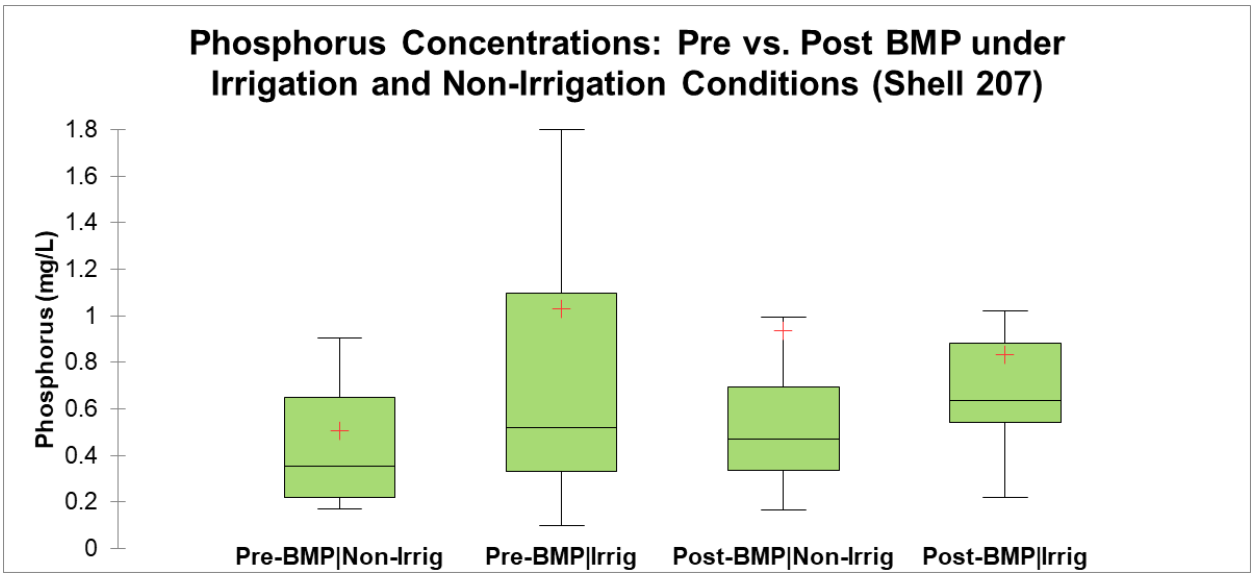

Phosphorus Concentrations: Pre vs. Post BMP under Irrigation and Non-Irrigation Conditions (Shell 207)
Phosphorus (mg/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Pre-BMP|Non-Irrig
Pre-BMP|Irrig
Post-BMP|Non-Irrig
Post-BMP|Irrig

Figure Set 10. Atrazine Concentration Box Plots for Shell Creek Gage

Figure 10.1

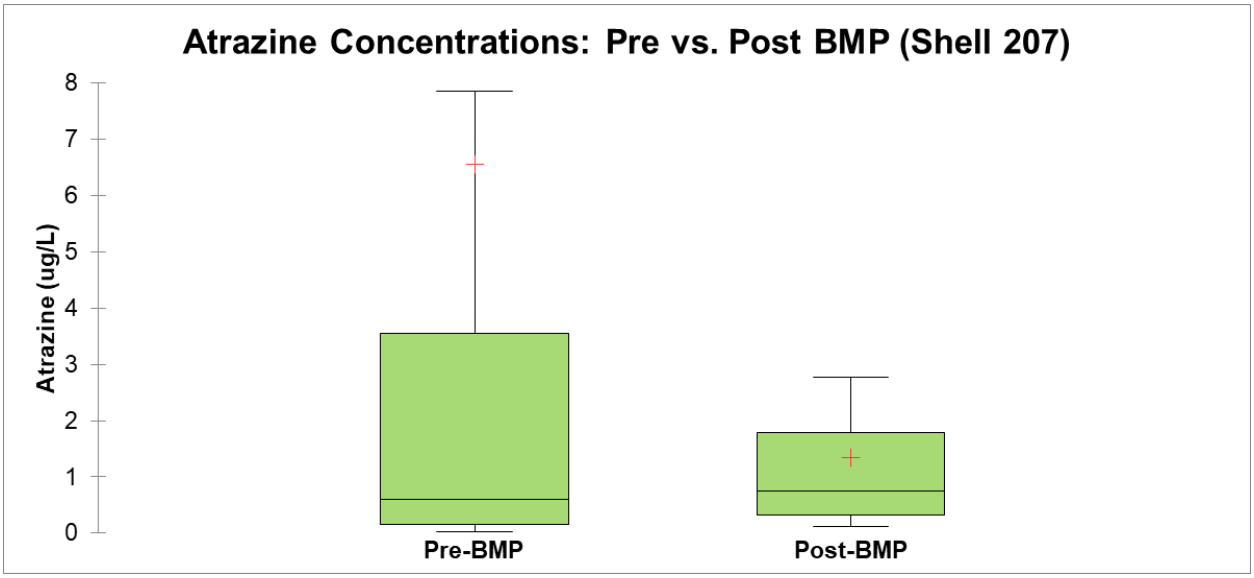


Figure 10.2

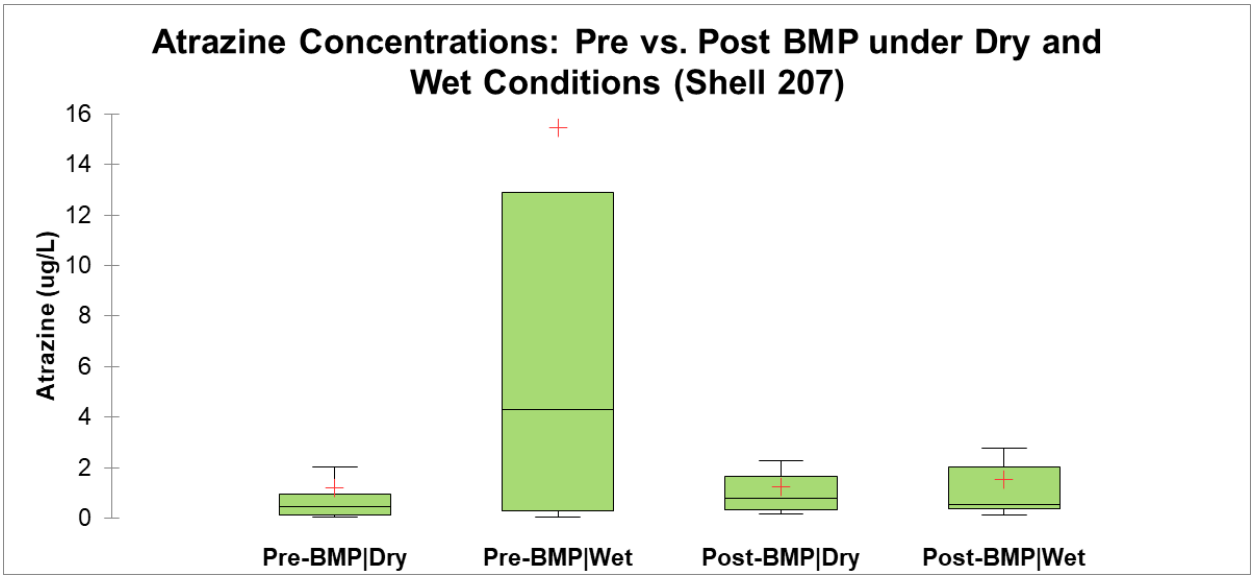


Figure 10.3

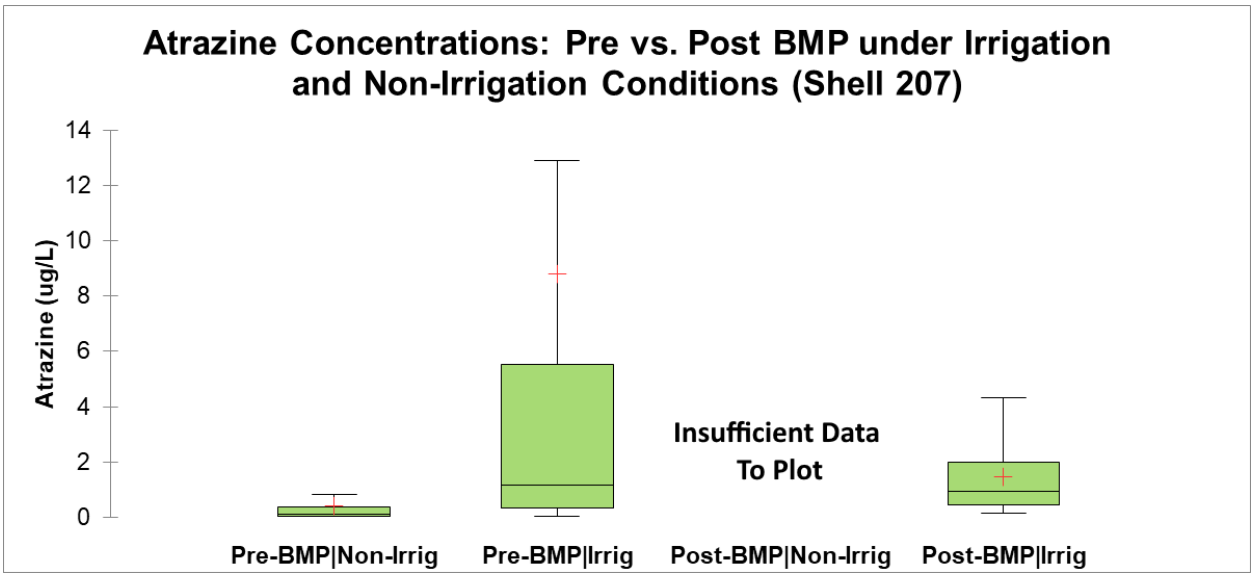

Atrazine Concentrations: Pre vs. Post BMP under Irrigation and Non-Irrigation Conditions (Shell 207)
Atrazine (ug/L)
14
12
10
8
6
4
2
0
Insufficient Data To Plot
Pre-BMP|Non-Irrig
Pre-BMP|Irrig
Post-BMP|Non-Irrig
Post-BMP|Irrig

Figure Set 11. TSS Concentration Box Plots for Shell Creek Gage

Figure 11.1

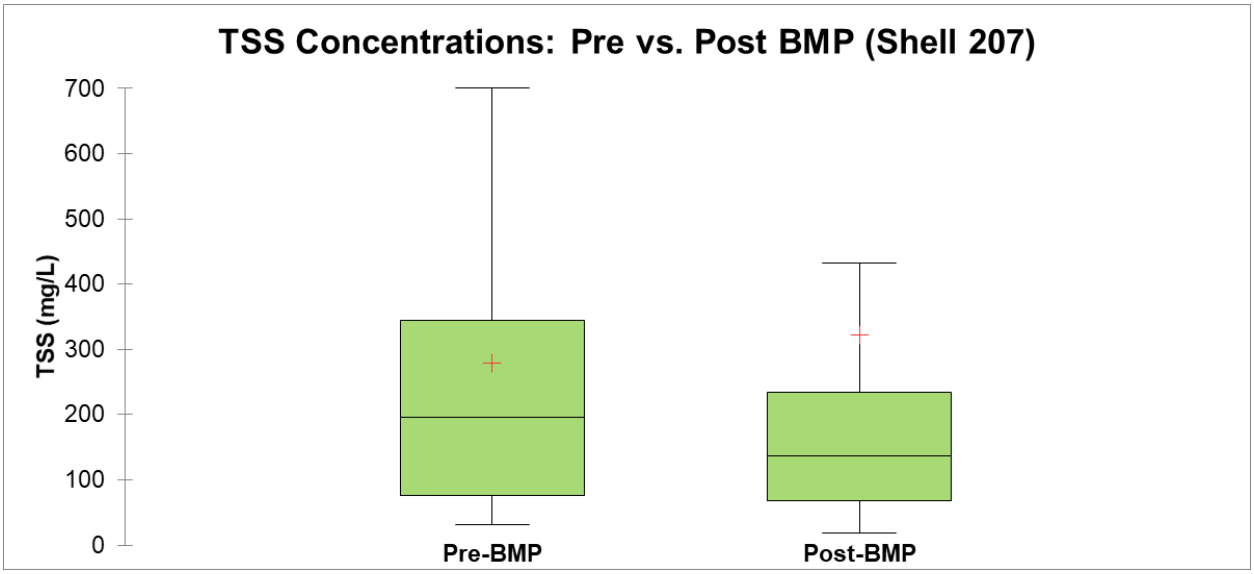


Figure 11.2

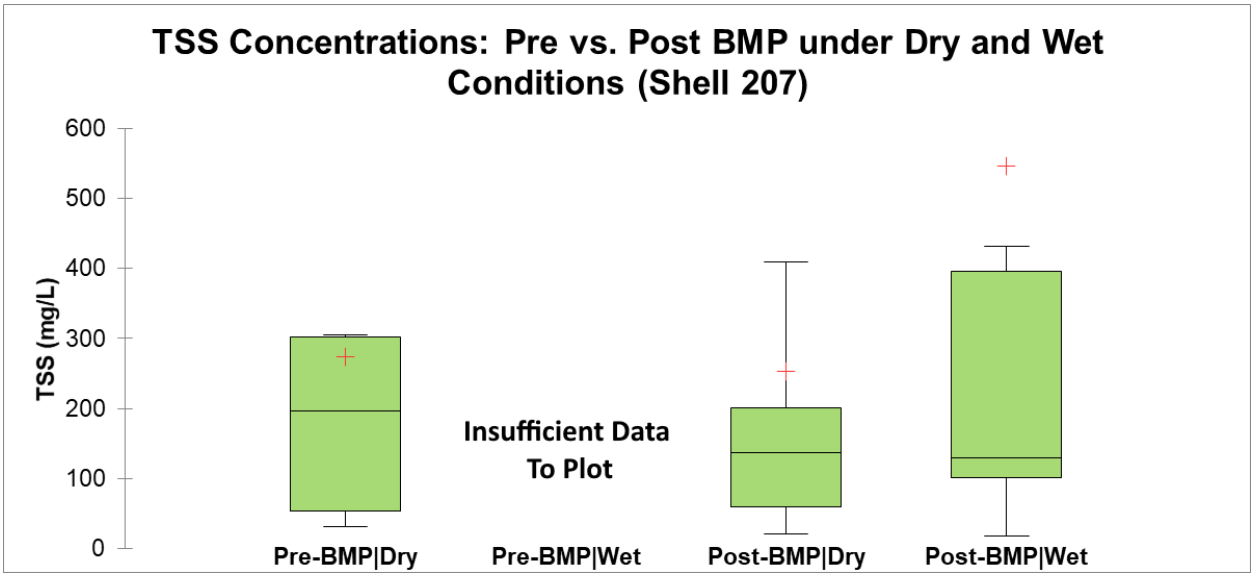


Figure 11.3

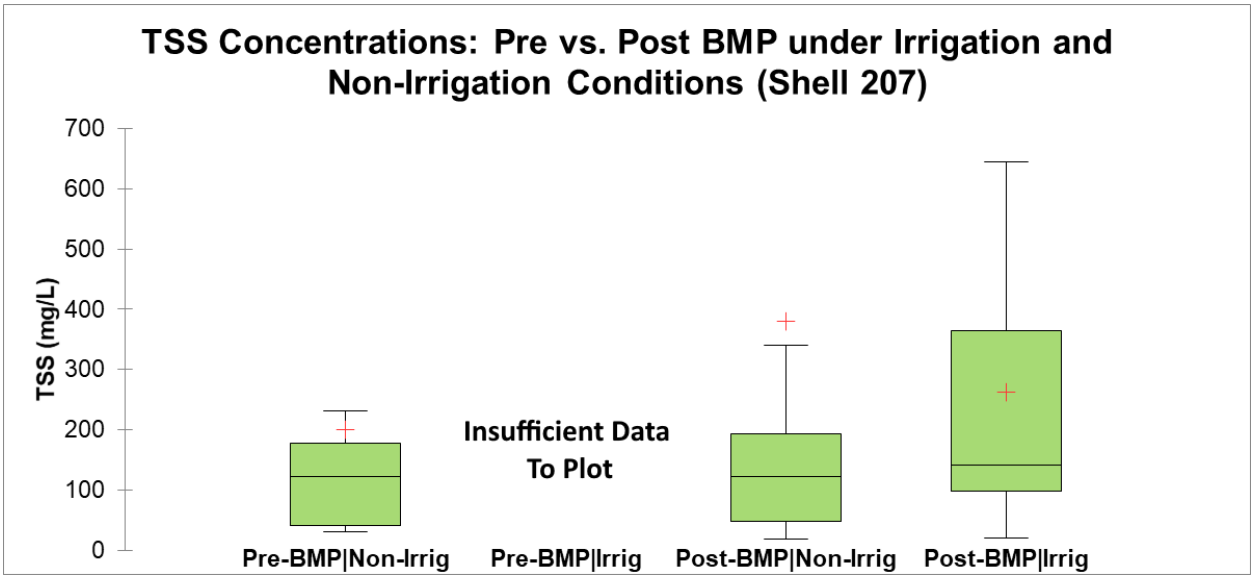

TSS Concentrations: Pre vs. Post BMP under Irrigation and Non-Irrigation Conditions (Shell 207)
TSS (mg/L)
700
600
500
400
300
200
100
0
Insufficient Data To Plot
Pre-BMP|Non-Irrig
Pre-BMP|Irrig
Post-BMP|Non-Irrig
Post-BMP|Irrig

Figure Set 12a. *E. coli* Concentration Box Plots for Shell Creek Gage

Figure 12a.1

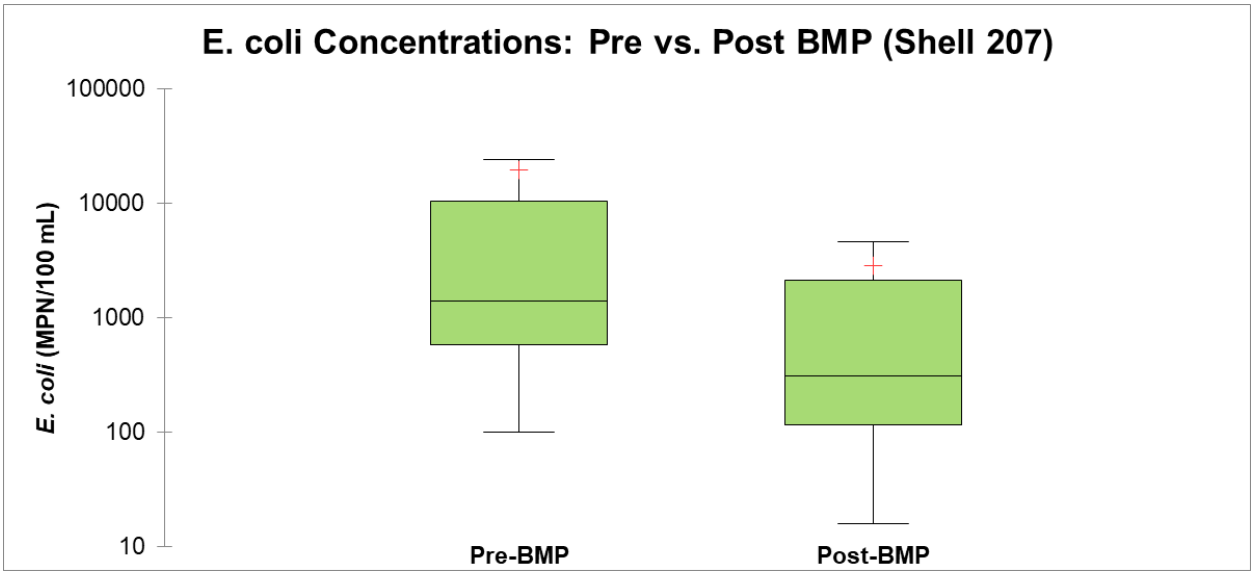


Figure 12a.2

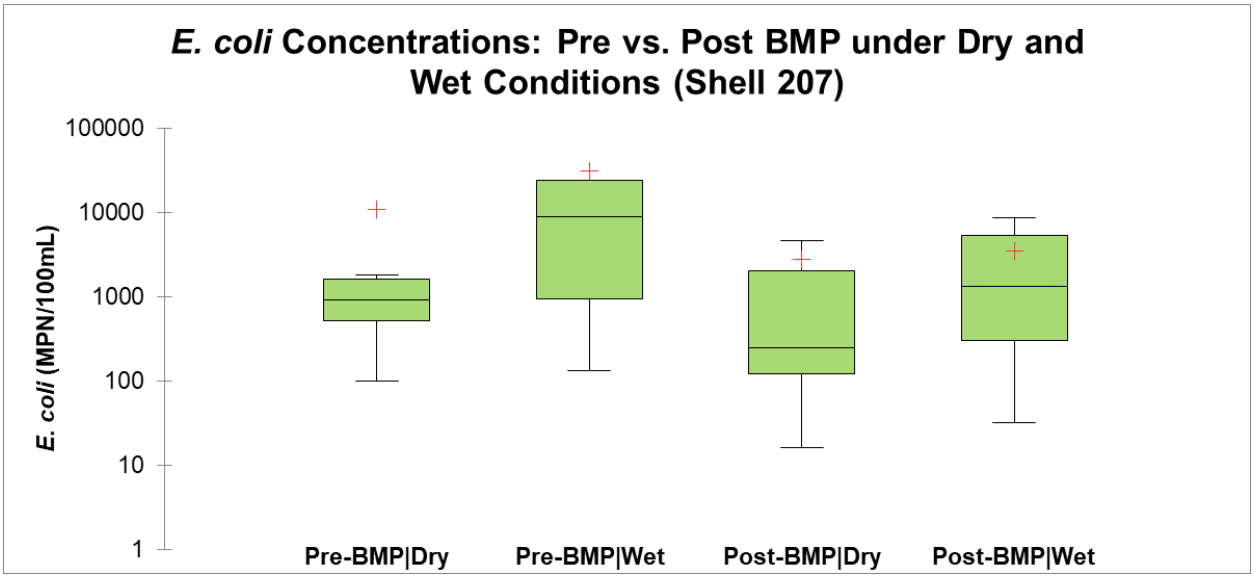


Figure 12a.3

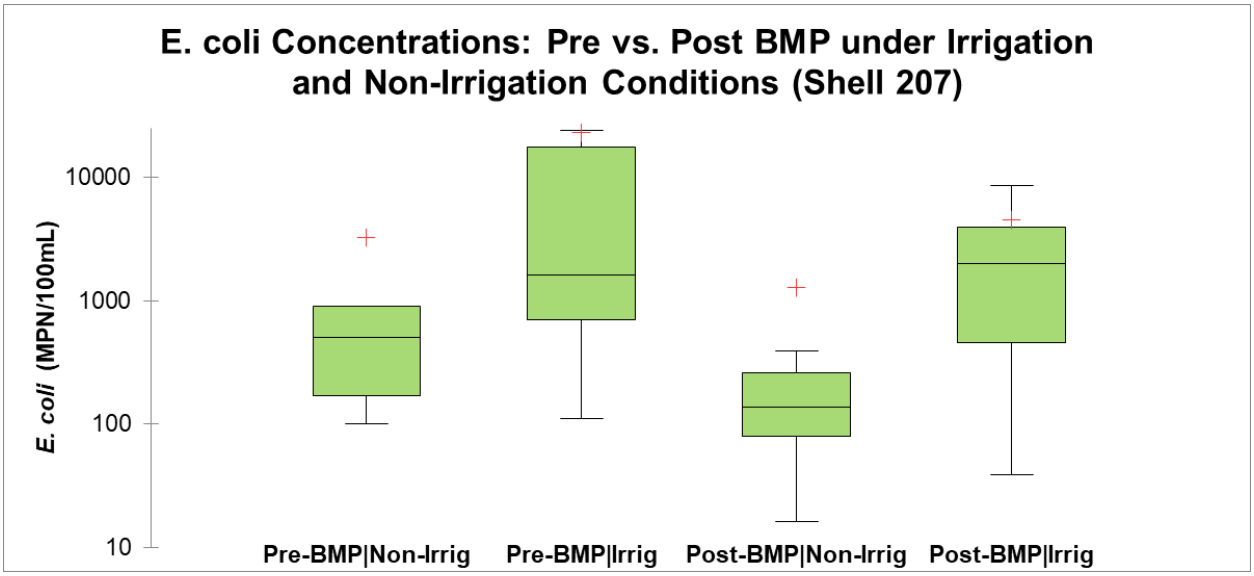

E. coli Concentrations: Pre vs. Post BMP under Irrigation and Non-Irrigation Conditions (Shell 207)
E. coli (MPN/100mL)
10000
1000
100
10
Pre-BMP|Non-Irrig
Pre-BMP|Irrig
Post-BMP|Non-Irrig
Post-BMP|Irrig

Figure Set 13b. *E. coli* Concentration Box Plots for Shell Creek Gage During Recreation Season

Figure 12b.1

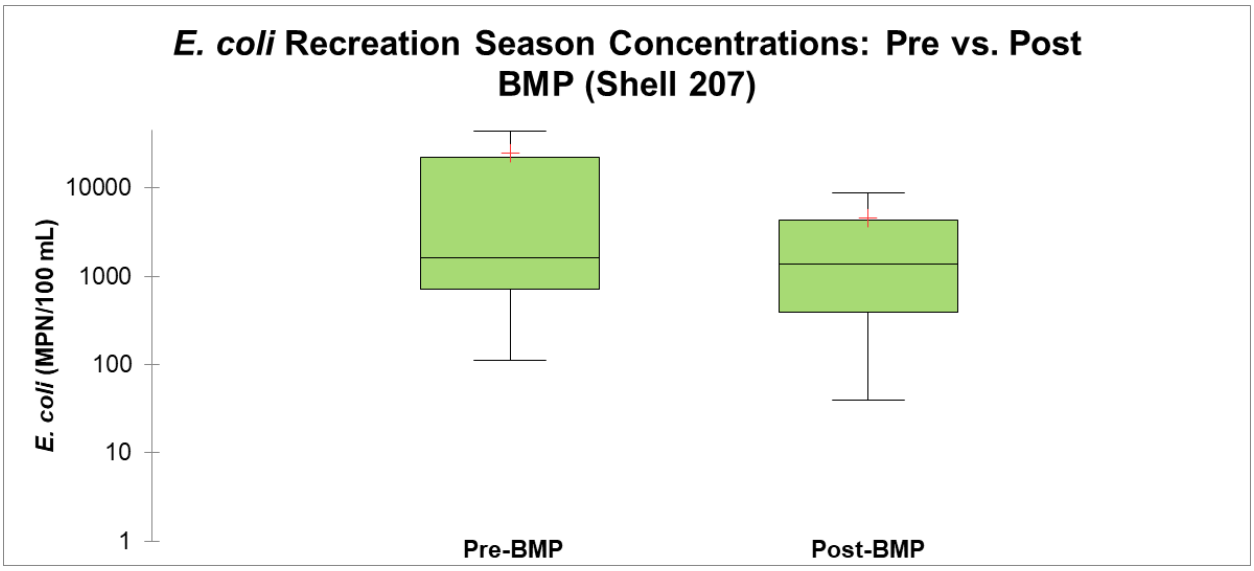


Figure 12b.2

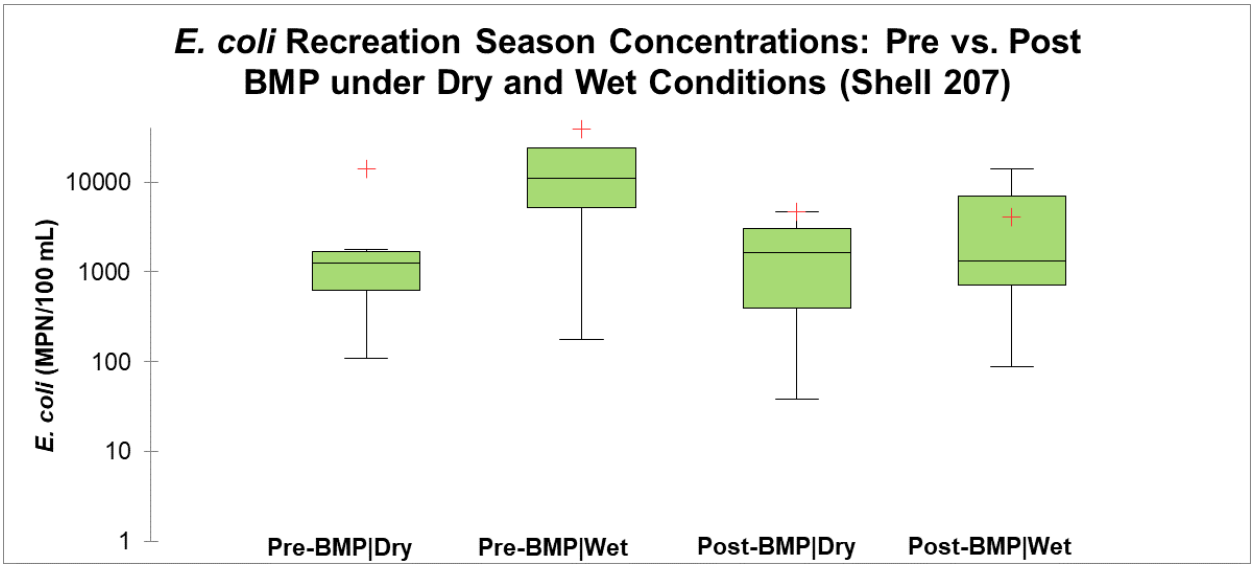
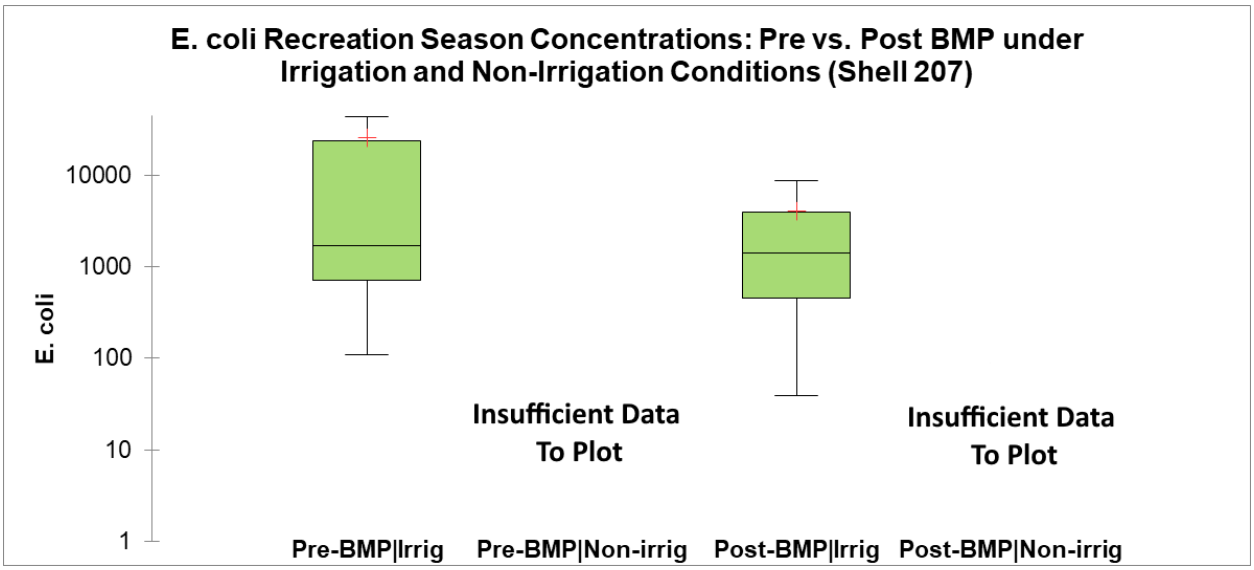


Figure 12b.3


E. coli Recreation Season Concentrations: Pre vs. Post BMP under Irrigation and Non-Irrigation Conditions (Shell 207)
E. coli
10000
1000
100
10
1
Insufficient Data To Plot
Insufficient Data To Plot
Pre-BMP|Irrig
Pre-BMP|Non-irrig
Post-BMP|Irrig
Post-BMP|Non-irrig

JEO CONSULTING GROUP

Engineering | Architecture | Surveying | Planning

Invoice

July 28, 2021
Project No: R210166.00
Invoice No: 126085
Invoice Amount: 756.00

Lower Platte North NRD
511 Commercial Park Road
PO Box 126
Wahoo, NE 68066

Project Manager Adam Rupe

Project R210166.00 Lower Platte North NRD: Shell Creek Watershed Plan Update

Professional Services through July 23, 2021

	Contract Amount	Percent Complete	Billed-to-Date	Previous Billing	Current Billing
Lump Sum Phase(s)					
Task 1: Evaluate Water Quality Data	$4,540.00	56 %	$2,540.00	$2,270.00	$270.00
Task 2: Quantify Pollutant Loads	$13,240.00	40 %	$5,240.00	$5,240.00	0.00
Task 3: Quantify Pollutant Reductions	$11,420.00	0 %	0.00	0.00	0.00
Task 4: Project Management	$2,430.00	65 %	$1,579.50	$1,093.50	$486.00
Additional Services	0.00		0.00	0.00	0.00
Total	**$31,630.00**		**$9,359.50**	**$8,603.50**	**$756.00**
		Total Amount Due Upon Receipt :			**$756.00**

Email Invoice to: tmountford@lpnnrd.org and jbreunig@lpnnrd.org

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

Monthly Progress Report
Shell Creek Watershed WQMP Update
Lower Platte North NRD

JEO Project #: 210166.00
Through: July 26, 2021

1. **Work completed during current period**
   - Ongoing coordination with LPNNRD and NDEE.
   - Internal project management.
   - Completion of water quality data review.
   - Provided water quality analysis memo.
   - Pulling together data on BMP implementation records.

2. **Planned accomplishments for next period**
   - Complete data gathering on BMPs.
   - Refine water quality model and existing loads.

3. **Project schedule**
   - Project is on schedule

4. **Information needed from the LPNNRD**
   - None at this time

5. **Next Meeting Date and Time**
   - None at this time

6. **Other Notes**
   - Project team will continue to monitor COVID-19 health directives and recommendations, as they may relate to any meetings

Please contact Adam Rupe at 402.322.0377 or at arupe@jeo.com for any questions or concerns regarding this progress report

FYRA ENGINEERING

FYRA Engineering, LLC
12702 Westport Parkway, Suite 300
Omaha, NE 68138
402-502-7131

Lower Platte North NRD
Tom Mountford
511 Commercial Park Road
Wahoo, NE 68066

Invoice number: 022-063
Date: 07/26/2021

Project: 022-17-02 WAHOO CREEK WATERSHED PLAN/EA

For Services Through July 23, 2021

MONTHLY INVOICING/SCHEDULE	Hours	Rate	Billed
Admin Executive Ann Stratton	0.50	$80.00	$40.00

ADDITIONAL SERVICES-ECONCOMICS-FLOOD DAMAGE REDUCTION ECONOMICS	Hours	Rate	Billed
Senior Environmental Engineer Janel Kaufman	14.00	$160.00	$2,240.00

SITE 83 REMOVAL	Hours	Rate	Billed
Engineer Intern Ryan Roenigk	15.75	$110.00	$1,732.50
Engineer Intern Anna Bakke	0.25	$110.00	$27.50
Senior Environmental Engineer Janel Kaufman	7.00	$160.00	$1,120.00
Phase subtotal			$2,880.00

Invoice total	$5,160.00

Make all checks payable to:
FYRA Engineering, LLC
12702 Westport Parkway, Suite 300
Omaha, NE 68138

FYRA
ENGINEERING

INVOICE SUMMARY

Description	Contracted Fee	Previously Billed	This Invoice	Total To Date	% Complete
Coord Meetings w/LPNNRD	$5,724.00	$16,175.49	$0.00	$16,175.49	282.59
Coord Meetings w/NRCS	$8,904.00	$11,366.25	$0.00	$11,366.25	127.65
Project Meetings	$49,372.00	$23,605.04	$0.00	$23,605.04	47.81
Monthly Invoicing/Schedule	$7,875.00	$13,510.50	$40.00	$13,550.50	172.07
Project Scoping	$7,170.00	$7,068.75	$0.00	$7,068.75	98.59
Plan Review	$6,740.00	$24,541.09	$0.00	$24,541.09	364.11
Develop, Write & Summarize Plan	$60,100.00	$83,011.48	$0.00	$83,011.48	138.12
Maintain Admin Record	$3,560.00	$859.25	$0.00	$859.25	24.14
Develop and Describe Purpose & Need	$2,320.00	$1,820.00	$0.00	$1,820.00	78.45
19239.2Formulate, Describe & Compare Alternatives	$27,270.00	$19,239.25	$0.00	$19,239.25	70.55
Collect & Analyze Social/Demographic Data	$1,435.00	$1,562.50	$0.00	$1,562.50	108.89
Historic & Cultural Resources	$675.00	$9,869.00	$0.00	$9,869.00	1,462.07
Prime & Unique Farmland	$675.00	$2,404.75	$0.00	$2,404.75	356.26
Identify Wetlands & Other Water Bodies	$117,145.00	$102,862.36	$0.00	$102,862.36	87.81
Collect Soils Data	$810.00	$0.00	$0.00	$0.00	0.00
Identify and Anlyze Soil Erosion	$810.00	$1,952.75	$0.00	$1,952.75	241.08
Collect & Analyze Floodplain Data	$3,900.00	$6,521.00	$0.00	$6,521.00	167.21
Collect & Analyze Data on Critical Areas	$6,300.00	$3,071.00	$0.00	$3,071.00	48.75
Identify Land Use and Crop Inventory	$810.00	$1,125.00	$0.00	$1,125.00	138.89
T&E Species & Migratory Birds	$11,500.00	$12,192.50	$0.00	$12,192.50	106.02
Consumptive Use Data	$1,840.00	$1,366.50	$0.00	$1,366.50	74.27
Effects on Public Health & Safety	$4,440.00	$1,936.00	$0.00	$1,936.00	43.60
Effects to Homes/Bus/Ag	$4,440.00	$4,124.75	$0.00	$4,124.75	92.90
Cummulative Impacts	$11,080.00	$2,821.25	$0.00	$2,821.25	25.46
Federal, State & Local Permits	$1,790.00	$1,775.00	$0.00	$1,775.00	99.16
38Relationship/Conflicts w/Other Plans	$4,460.00	$3,822.50	$0.00	$3,822.50	85.71
Interagency & Public Involvement	$2,940.00	$5,197.02	$0.00	$5,197.02	176.77
Risk & Uncertainty	$4,880.00	$4,292.00	$0.00	$4,292.00	87.95
Preferred Alternatives Discussion	$11,840.00	$14,006.00	$0.00	$14,006.00	118.29
Mitigation Features	$6,760.00	$4,486.00	$0.00	$4,486.00	66.36
Hydrologic Investigation	$26,460.00	$33,403.25	$0.00	$33,403.25	126.24
Economic Data & Discussion	$14,640.00	$51,211.00	$0.00	$51,211.00	349.80
Installation & Financing	$2,600.00	$775.00	$0.00	$775.00	29.81
Operations, Maintenance & Replacment	$3,240.00	$740.00	$0.00	$740.00	22.84
Project Maps	$24,850.00	$28,438.25	$0.00	$28,438.25	114.44
Utility Investigations	$5,200.00	$1,940.00	$0.00	$1,940.00	37.31
Recreation Site 77 Planning	$7,350.00	$0.00	$0.00	$0.00	0.00
Interagency Scoping Mtg	$10,720.00	$6,396.50	$0.00	$6,396.50	59.67

FYRA
ENGINEERING

INVOICE SUMMARY

Description	Contracted Fee	Previously Billed	This Invoice	Total To Date	% Complete
Agency Coord	$7,680.00	$6,181.00	$0.00	$6,181.00	80.48
Breach Analysis	$26,343.00	$36,054.50	$0.00	$36,054.50	136.87
Hydraulics/Structure Sizing	$19,244.00	$30,321.25	$0.00	$30,321.25	157.56
Develop Land Rights & Structure Costs	$29,784.00	$29,048.25	$0.00	$29,048.25	97.53
Land Rights Assessment	$4,534.00	$1,496.25	$0.00	$1,496.25	33.00
Site Survey	$14,779.00	$5,080.00	$0.00	$5,080.00	34.37
Additional Services Watershed Plan EA	$48,000.00	$6,033.02	$0.00	$6,033.02	12.57
Additional Services-Economic-Project Management	$8,329.00	$5,550.00	$0.00	$5,550.00	66.63
Additional Services-Econcomics-Flood Damage Reduction Economics	$64,690.00	$64,530.50	$2,240.00	$66,770.50	103.22
Additional Services-Economics-Revised Plan Economics	$22,450.00	$10,187.75	$0.00	$10,187.75	45.38
Site 83 Removal	$22,305.00	$485.00	$2,880.00	$3,365.00	15.09
Total	$740,763.00	$704,456.50	$5,160.00	$709,616.50	95.80

Aging Summary

Invoice Number	Invoice Date	Outstanding	Current	Over 30	Over 60	Over 90	Over 120
022-063	07/26/2021	5,160.00	5,160.00				
	Total	5,160.00	5,160.00	0.00	0.00	0.00	0.00

INTERLOCAL COOPERATION AGREEMENT
CZECHLAND LAKE SHORELINE/RAILROAD AVENUE ROAD
STABILIZATION PROJECT

THIS INTERLOCAL COOPERATION AGREEMENT is made and entered into this 20th day of July, 2021, by and between the Lower Platte North Natural Resources District, a political subdivision in the State of Nebraska, hereinafter referred to as "LPNNRD," and Saunders County, Nebraska, hereinafter referred to as "County", and jointly referred to as "Partners".

WHEREAS, a portion of the south shoreline of Czechland Lake and the Railroad Avenue Road has experienced excessive damaging erosion, located in Section 26, Township 16, Range 5 East, Saunders County.

WHEREAS, LPNNRD and the County desire to work together on a lake shoreline/road stabilization project, hereinafter referred to as "Project", (Project Plans attached as "Exhibit A") to protect the Railroad Avenue Road and a portion of the Czechland Lake south shoreline from further erosion damage.

WHEREAS, LPNNRD and County agree that the County will be responsible for taking the lead and provide the expense of engineering, designing, observation, and oversight of the Project as part of their in-kind contribution. The LPNNRD and County will share project construction costs as outlined in this Agreement.

WHEREAS, parties agree that the estimated total construction cost of the Project outside of and inside of the county right of way is estimated at $292,859 (attached as "Exhibit B") by Make Mainelli, Saunders County Engineer, of which a portion of the funds from LPNNRD will be coming from federal and/or state grant funding and those third-party dollars will be part of the LPNNRD financial commitment.

WHEREAS, the LPNNRD and County agree that the Project provides an opportunity to cooperate public funds, with the goal of decreasing risk to life and property and is a good use of taxpayer dollars.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, it is agreed between the parties as follows:

1. **Authority**:
The Partners desire to cooperate on completing the Project on a basis of mutual. Advantage under the auspices of the Interlocal Cooperation Act (Nebraska Revised Statute Section 13-801 to 13-827). In furtherance of this cooperative effort, each Partner desires to enter this Agreement for any powers, privileges or authorities exercised, or capable of exercise, individually by them as public entities under the Interlocal Cooperation Act.

2. **Project Description:**
The Partners desire to work together on the Project to stabilize erosion on a

portion of the south shoreline of Czechland Lake Reservoir and Railroad Avenue Road, located in Section 26, Township 16 North, Range 5 East, Saunders County, Nebraska.

3. **Partnership Contributions**:
The estimated Project construction cost of $292,859 will be provided as follows:

LPNNRD:
LPNNRD will reimburse the County the actual costs for Project rock riprap and riprap filter, up to a maximum of $231,955, as shown in "Exhibit B".

Saunders County:
The County will pay all contractor invoices and invoice LPNNRD for Project rock riprap and riprap filter, up to a maximum of $231,955, as shown in "Exhibit B".

The County will contribute the remainder of the Project construction costs (to include mobilization, site preparation, earth work & embankment, crushed rock road surface, cover crop and grass seeding) estimated at $60,904, as shown in "Exhibit B". The County will also provide all engineering, design, bidding, observation, and oversight services as additional in-kind contribution for the Project.

4. **Effective Date:**
This Agreement becomes effective upon execution by all Partners. The original copy of this Agreement will be maintained as part of the records of LPNNRD, with a copy being provided to the County. The Agreement may be signed in counterparts, as necessary.

5. **Duration of Agreement:**
This Agreement shall extend from the date of execution by both Partners and will remain in effect until Project completion, which is not to extend beyond September 1, 2021.

6. **Amendments and Addendums of Agreement:**
This Agreement may be amended subject to approval by both Partners.

7. **Indemnification:**
The Partners assume no liability under this Agreement unless expressly accepted herein. Each party agrees to defend the other from and against all liabilities, obligations, losses, damages, claims, and demands arising from the acts of its respective officers, agents, or employees.

IN WITNESS WHEREOF, each Partner has caused this Agreement to be executed by its duly authorized officer as of the date and year:

EXECUTED BY THE COUNTY this 20 day of July, 2021.

COUNTY OF SAUNDERS,

BY: _____
Doris Karloff, Chairperson
Saunders County Board of Supervisors

EXECUTED BY THE LOWER PLATTE NORTH RESOURCES DISTRICT this 12th day of July, 2021.

BY: _____
Frank Pollard, Chairperson
Lower Platte North Natural Resources District

ATTACHMENT "A"

PROJECT NUMBER	SHEET NO.
C-7818501	1

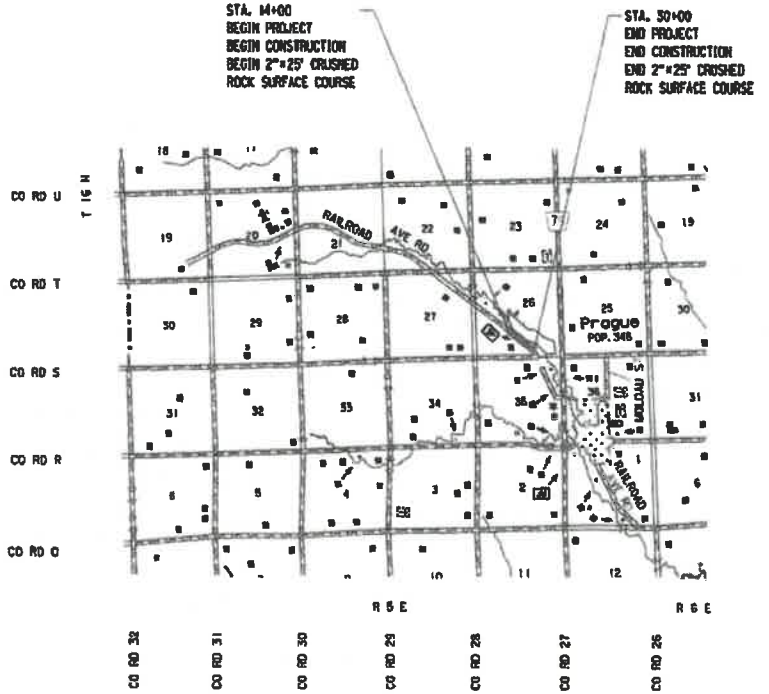
INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE PAGE
2-T	TYPICAL CROSS SECTIONS OF IMPROVEMENT
3 TO 4	PLAN AND PROFILES
X-1 TO X-4	CROSS SECTIONS

PLANS FOR CONSTRUCTION

PRAGUE NORTHWEST

SAUNDERS COUNTY



THE 2017 EDITION OF THE NEBRASKA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION AND THE SPECIAL PROVISIONS APPLY TO THIS PROJECT.

HALF SIZE PLANS

STANDARD PLANS

STANDARD PLAN NO.	DESCRIPTION
501-R7	(3 SHEETS) EROSION CONTROL
502-R2	(2 SHEETS) SILT FENCE DETAILS
920-R7	(5 SHEETS) TRAFFIC CONTROL, CONSTRUCTION AND MAINTENANCE
921-R8	(2 SHEETS) TRAFFIC CONTROL, CONSTRUCTION AND MAINTENANCE
923-R2	TRAFFIC CONTROL, ROAD CLOSURE

MEETS OR EXCEEDS MINIMUM DESIGN STANDARDS OF THE BOARD OF PUBLIC ROADS CLASSIFICATIONS AND STANDARDS FOR NEW AND RECONSTRUCTED ROADS IN RURAL AREAS.

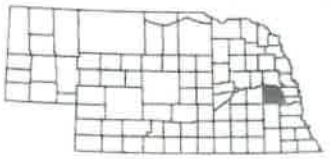
DESIGN DESIGNATION		
YEAR:	2020	-
ADT:	100	-
DHV:	-	-
N.F.C. =	LOCAL	
S.F.C. =	LOCAL	

CONVENTIONAL SIGNS

FENCE R.O.W. OR WIRE
GUARDRAIL
TRAVELED WAY
DIKE
CULVERT
POWER POLE
TELEPHONE POLE
MAILBOX
RAILROAD TRACKS
MARSH
TREE - CONIFEROUS
TREE - DECIDUOUS

R.O.W. LEGEND

NEW CONTROLLED ACCESS
PREVIOUS CONTROLLED ACCESS
LIMITS OF CONSTRUCTION
PREVIOUS R.O.W.
NEW R.O.W.
EXISTING PERMANENT EASEMENT
TEMPORARY EASEMENT
EXCESS TAKING
PERMANENT EASEMENT
EXISTING RAILROAD EASEMENT
NEW RAILROAD PERMANENT EASEMENT
NEW RAILROAD TEMPORARY EASEMENT



REFERENCE POST NO. N/A TO REFERENCE POST NO. N/A

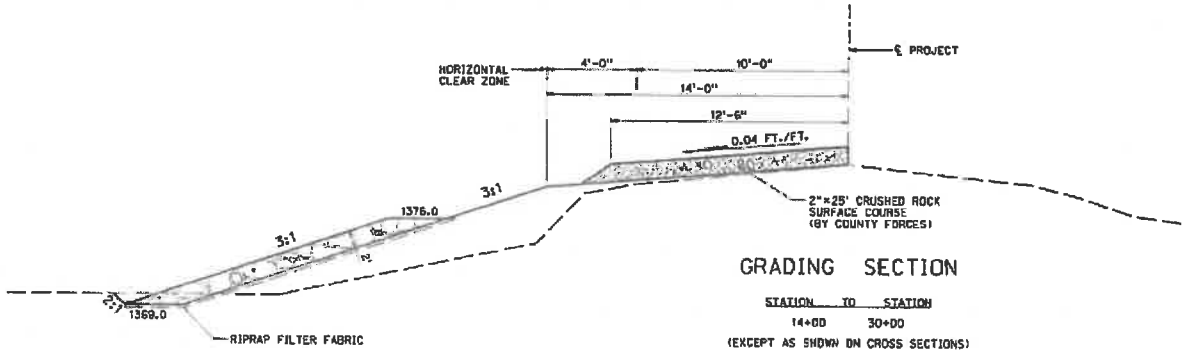
EXCEPTIONS: FROM STA. N/A TO STA. N/A

TOTAL NET LENGTH OF PROJECT: 0.303 MILES

Plans by:

Mainelli Wagner & Associates, Inc.

TYPICAL CROSS SECTION OF IMPROVEMENT



GRADING SECTION

STATION	TO	STATION
14+00		30+00

(EXCEPT AS SHOWN ON CROSS SECTIONS)

ANY UNSUITABLE MATERIAL ENCOUNTERED DURING CONSTRUCTION MUST BE EXCAVATED AND REMOVED FROM THE SITE. THE RESULTING VOID MAY BE FILLED WITH SUITABLE MATERIAL AS DIRECTED BY THE ENGINEER. ADDITIONAL EXCAVATION WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED SUBSIDIARY TO THE ITEM "SITE PREPARATION".

ANY EXCESS MATERIAL WILL BE DISPOSED OF BY THE COUNTY AS APPROVED BY THE ENGINEER. IF ADDITIONAL MATERIAL IS REQUIRED FOR FINAL GRADING, THE COUNTY WILL BE REQUIRED TO OBTAIN THE NECESSARY SUITABLE MATERIAL FROM A SITE APPROVED BY THE ENGINEER.

UPON COMPLETION OF THE GRADING OPERATIONS PERMANENT SEEDING OF THE DISTURBED AREAS CREATED BY THE GRADING OPERATIONS WILL BE PERFORMED BY THE COUNTY AS DIRECTED BY THE PROJECT MANAGER.

COMPACTION REQUIREMENTS

ROADWAY EMBANKMENT	CLASS II
EMBANKMENT FOR INTERSECTING PUBLIC ROADS	CLASS II
PRIVATE DRIVES	CLASS I

(SEE SEC. 205 IN THE 2017 EDITION OF THE NEBRASKA STANDARD SPECIFICATIONS)

THE LOCATIONS OF ALL AERIAL AND UNDERGROUND UTILITY FACILITIES MAY NOT BE INDICATED IN THESE PLANS. UNDERGROUND UTILITIES, WHETHER INDICATED OR NOT WILL BE LOCATED AND FLAGGED BY THE UTILITIES AT THE REQUEST OF THE COUNTY.

NO EXCAVATION WILL BE PERMITTED IN THE AREA OF THE UNDERGROUND UTILITY FACILITIES UNTIL ALL SUCH FACILITIES HAVE BEEN LOCATED AND IDENTIFIED TO THE SATISFACTION OF ALL PARTIES. THE EXCAVATION MUST BE ACCOMPLISHED WITH EXTREME CARE IN ORDER TO AVOID ANY POSSIBILITY OF DAMAGE TO THE UTILITY FACILITY.

THE COUNTY MAY CLOSE THE ROAD TO ALL BUT LOCAL TRAFFIC SUBJECT TO THE CONDITIONS PRESCRIBED IN THE 2017 EDITION OF THE NEBRASKA STANDARD SPECIFICATIONS.

THE COUNTY SHALL PROVIDE ROUTING THROUGH TRAFFIC AROUND THE PROJECT IF DEEMED NECESSARY.

ALL SIGNING AND PAVEMENT MARKING DURING CONSTRUCTION SHALL BE DONE BY THE COUNTY IN CONFORMANCE WITH THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

EARTHWORK QUANTITIES

DRIVES AND DIKES ARE NOT INCLUDED

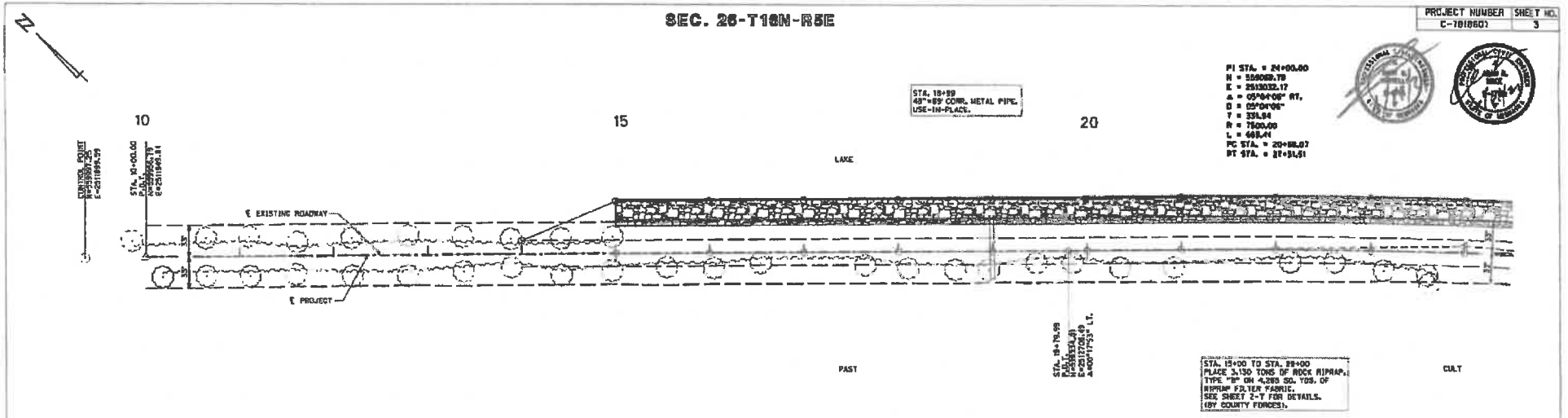
STATION	TO	STATION	DESCRIPTION	EXCAVATION AVAILABLE (Cu. yds.)	EMBANKMENT (cu. yds.)
14+00		30+00	ROADWAY	804	2,502
			TOTALS	804	2,502

SUMMARY OF QUANTITIES

ITEM	QUANTITY	UNIT
EARTHWORK MEASURED IN EMBANKMENT	2,502.000	CU. YDS.
CRUSHED ROCK SURFACE COURSE	167.000	TONS
ROCK RIPRAP, TYPE "B"	3,130.000	TONS
RIPRAP FILTER FABRIC	4,285.000	SQ. YDS.
COVERCROP SEEDING	0.800	ACRES
SEEDING, TYPE "A"	0.800	ACRES

PROJECT NUMBER	SHEET NO.
C-7818601	3

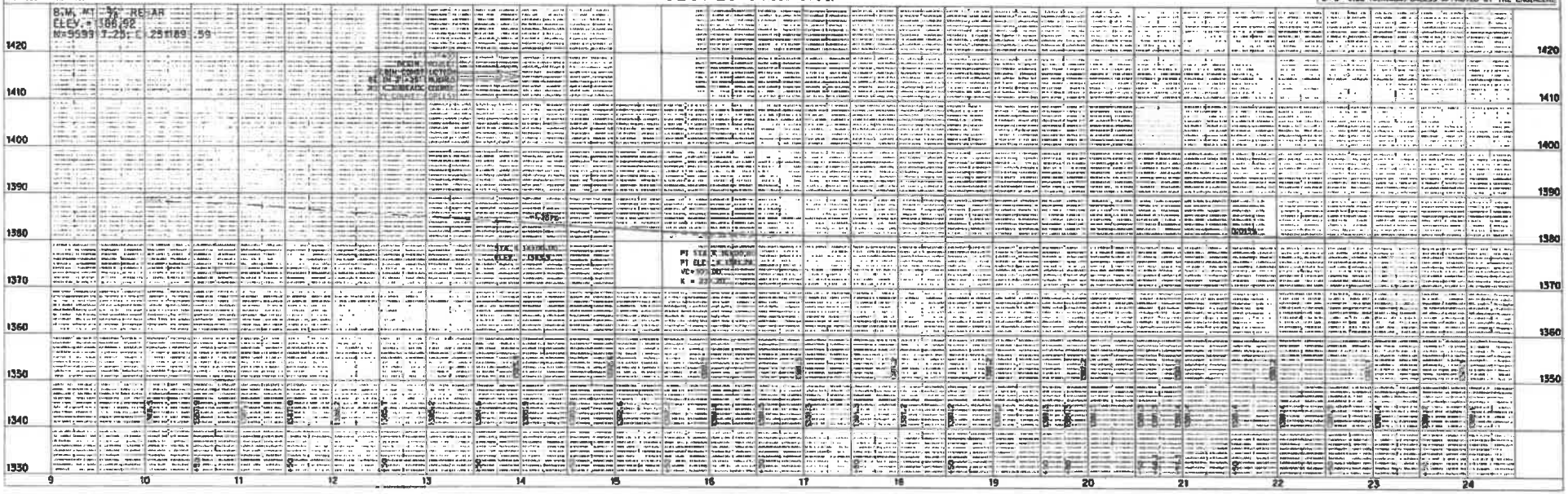
SEC. 26-T16N-R5E



NO TIES AVAILABLE.

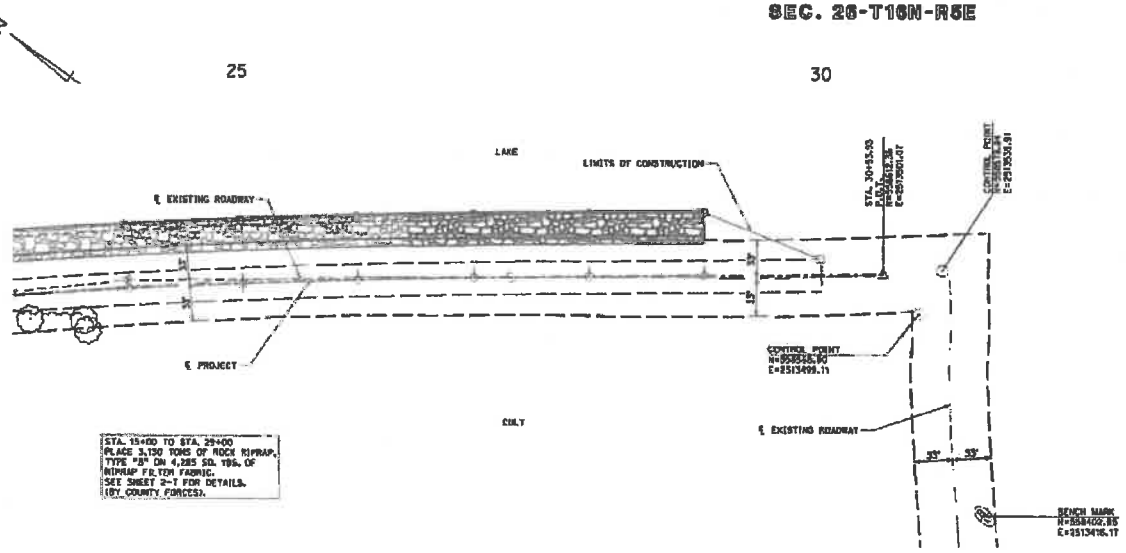
SEC. 26-T16N-R5E

ALL BANDS FOR CORRUGATED METAL PIPE SHALL BE 2'-0" WIDE (MINIMUM) UNLESS APPROVED BY THE ENGINEER.



PROJECT NUMBER	SHEET NO.
C-78(860)	4

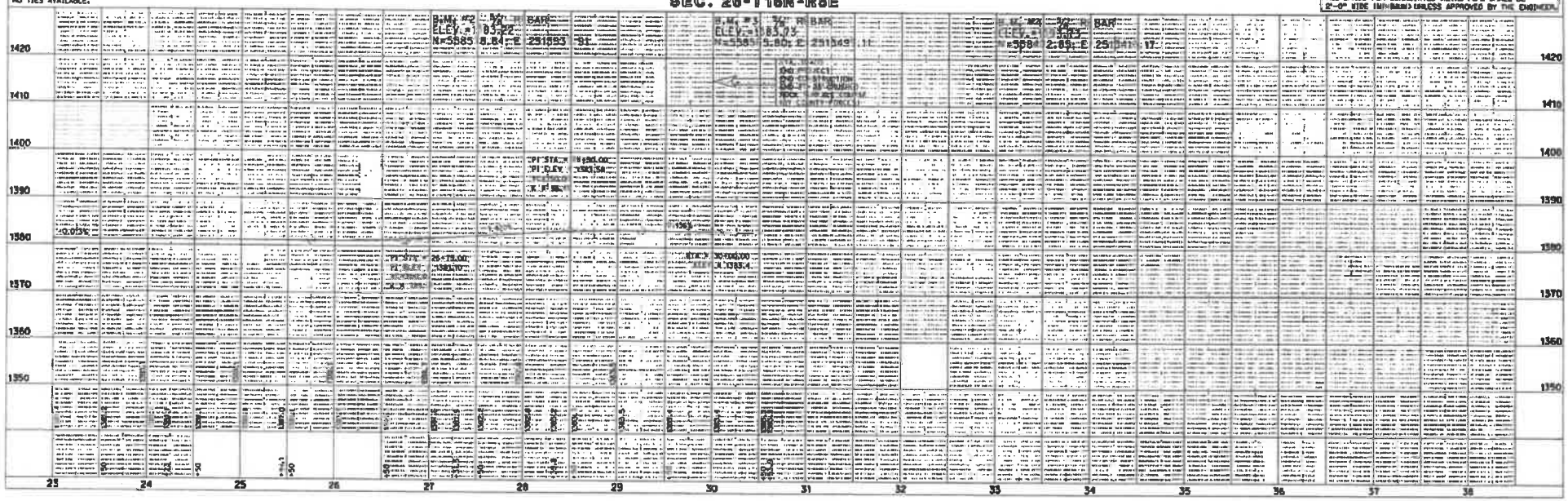
SEC. 26-T16N-R5E

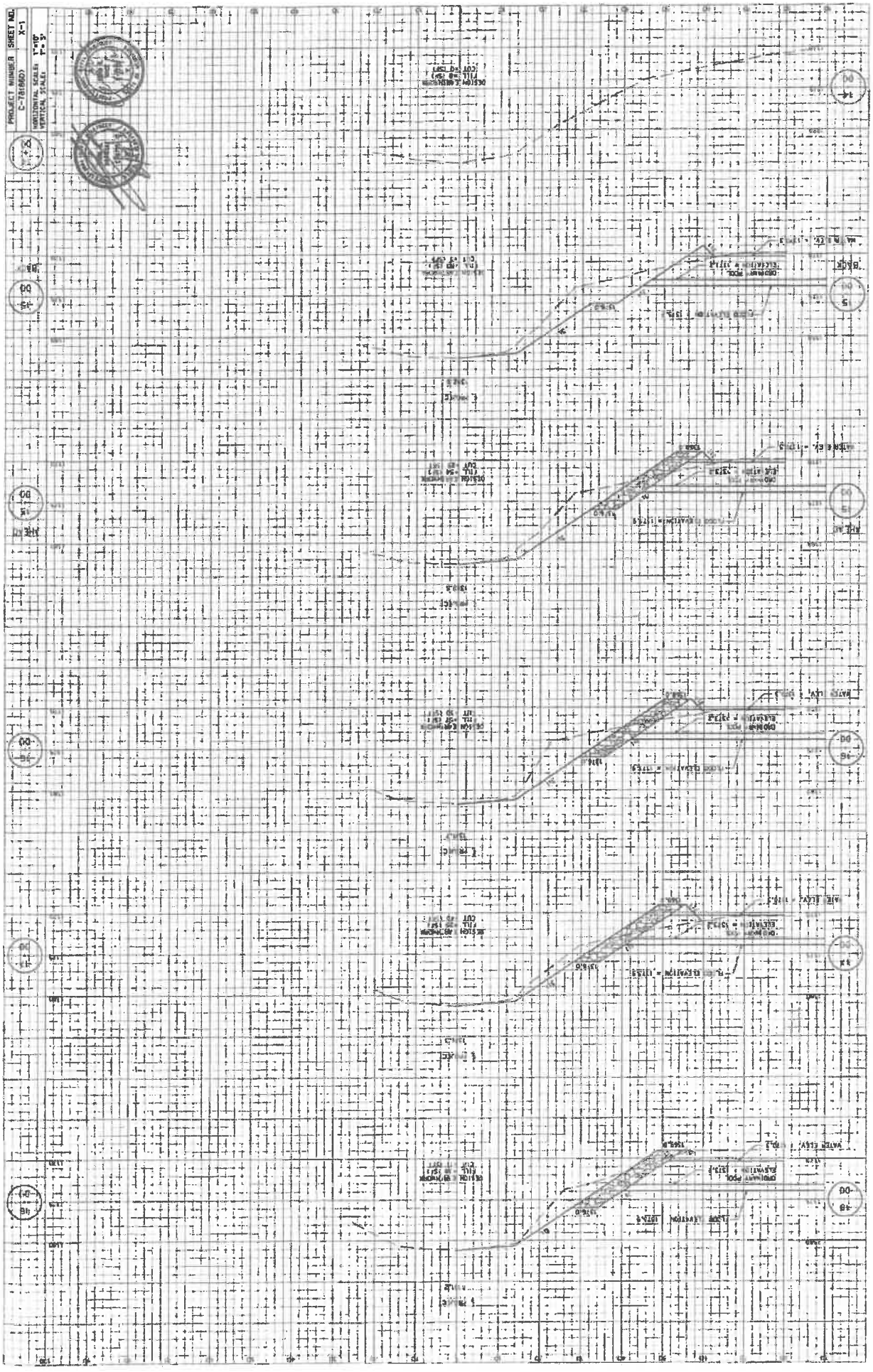


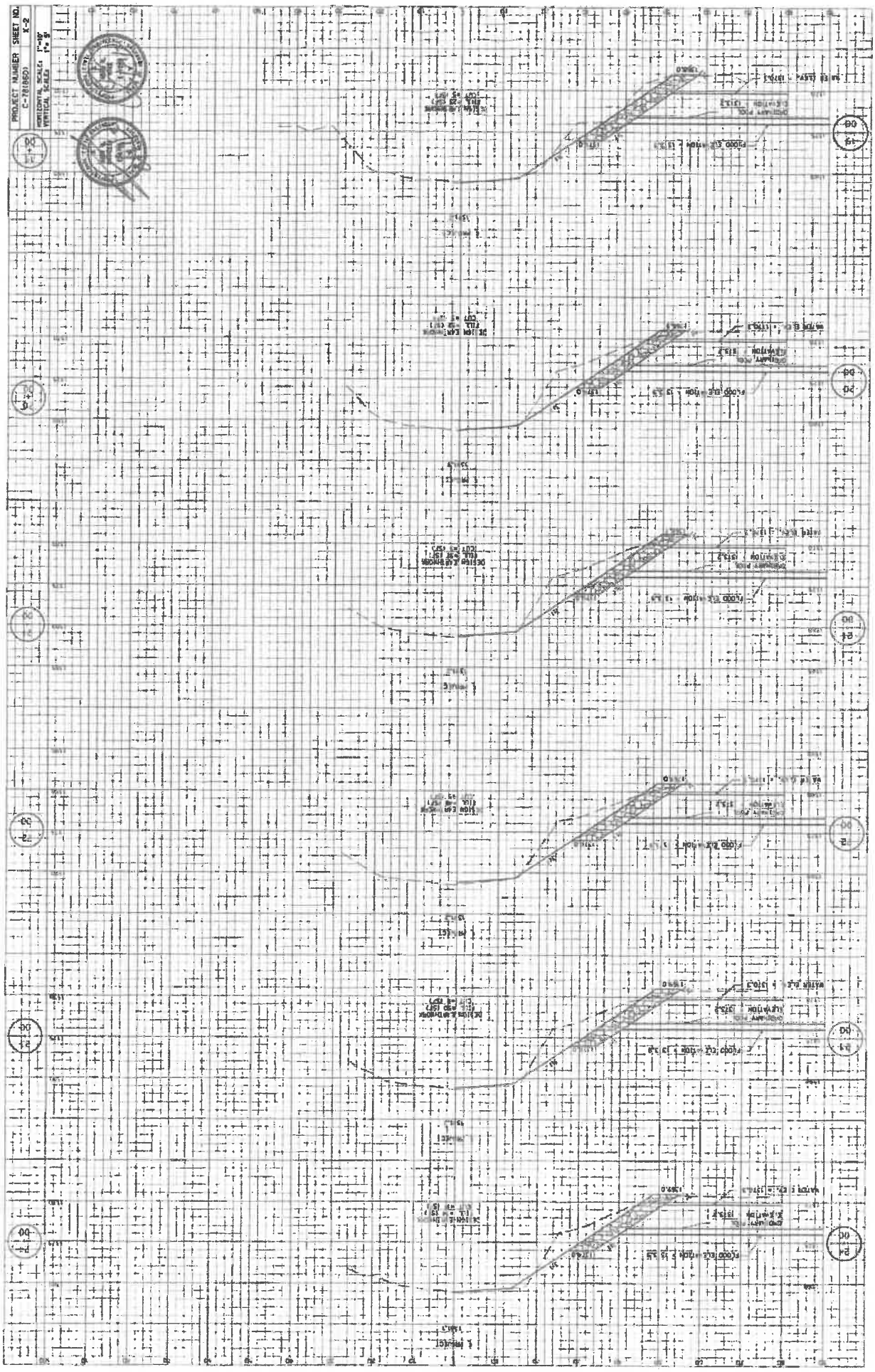
NO TIES AVAILABLE.

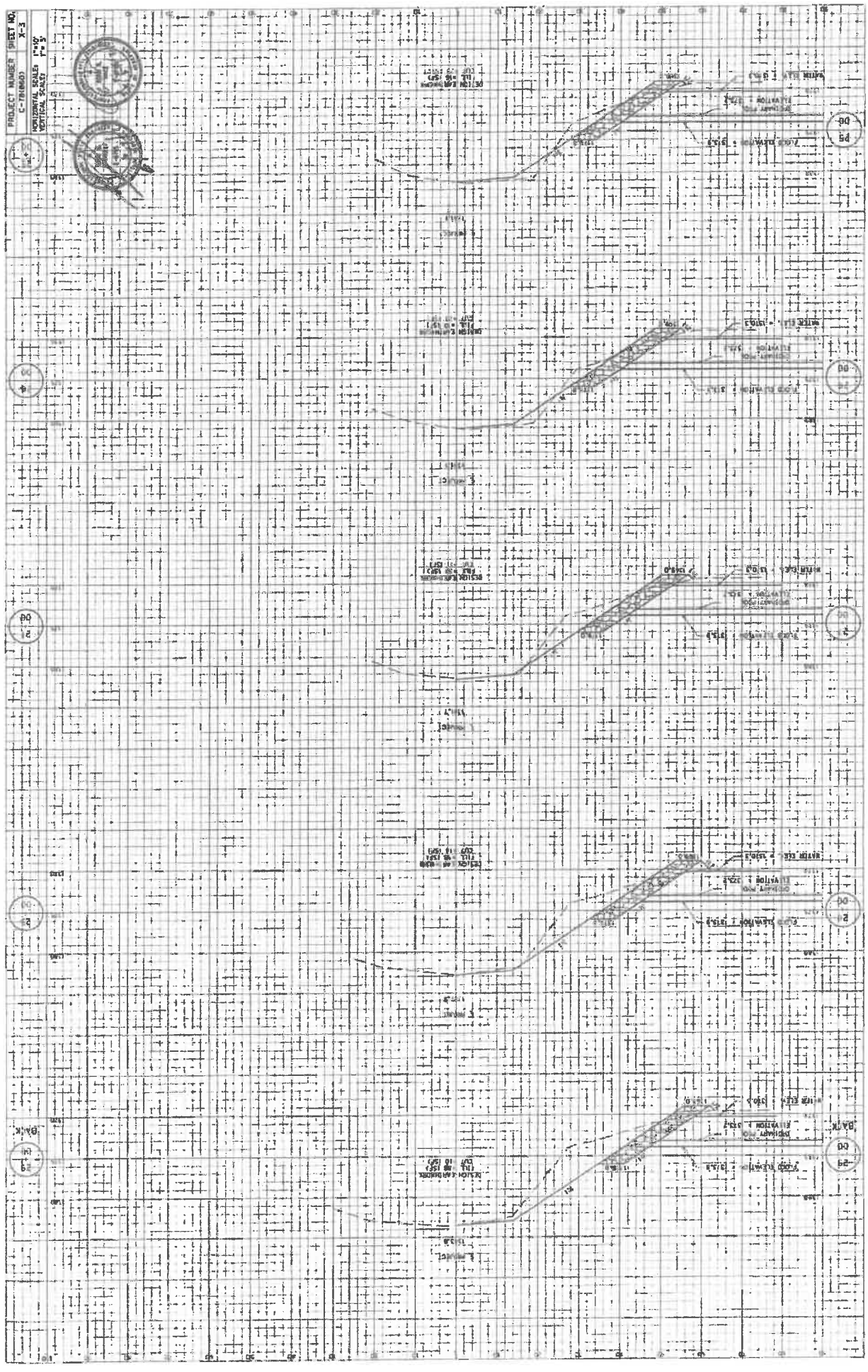
SEC. 26-T16N-R5E

ALL BANDS FOR CORRUGATED METAL PIPE SHALL BE 2'-0" WIDE UNLESS APPROVED BY THE ENGINEER.




PROJECT NUMBER
C-78(860)
SHEET NO.
X-1
HORIZONTAL SCALE 1"=10'
VERTICAL SCALE 1"=5'




PROJECT NUMBER
C-7818(60)
SHEET NO.
X-3
HORIZONTAL SCALE
1"=10'
VERTICAL SCALE
1"=5'

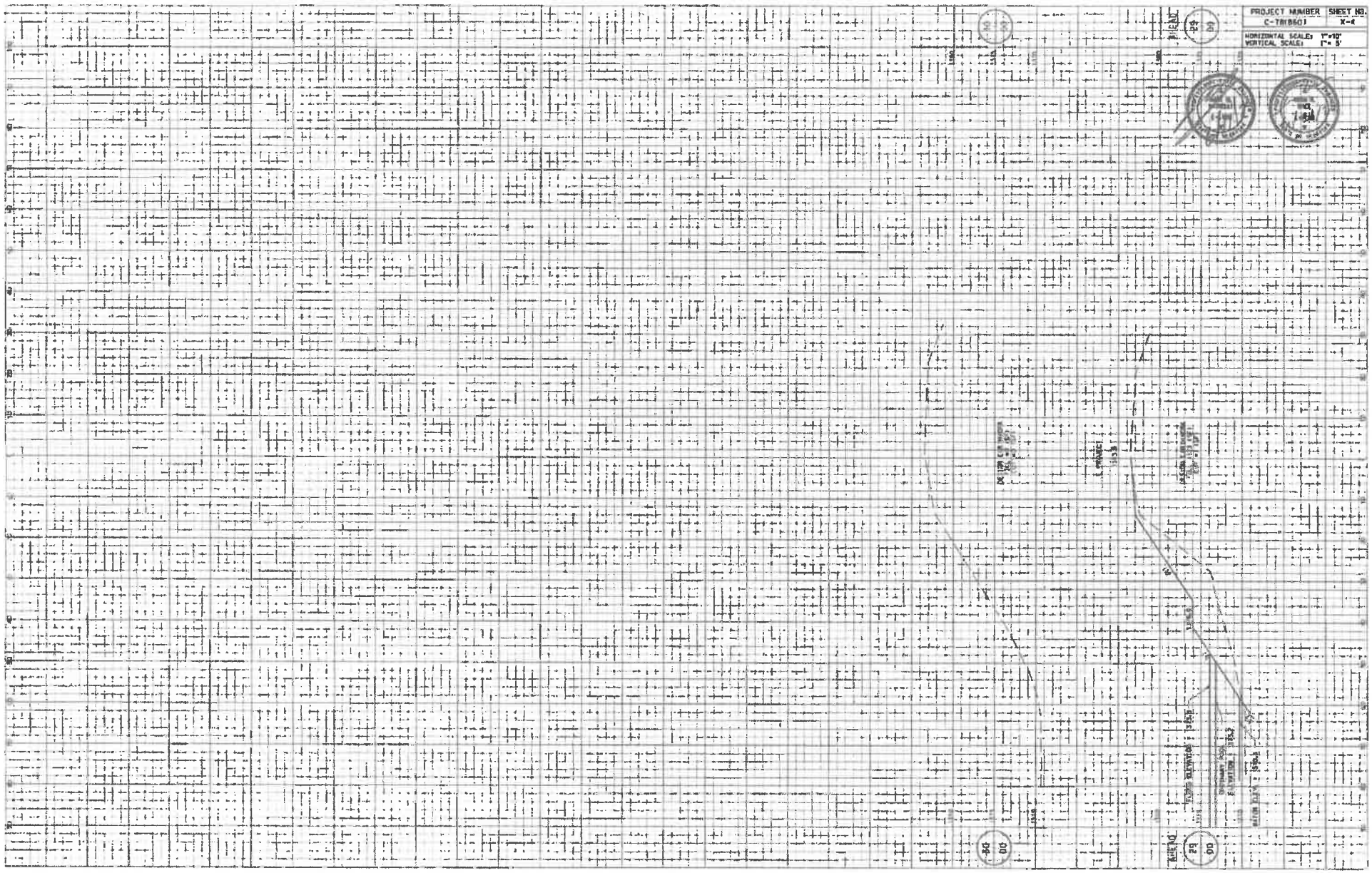

PROJECT NUMBER
C-7918601
SHEET NO.
X-4
HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"= 5'

EXHIBIT "B"

Engineer's Estimate

Project: Prague Northwest

County: Saunders

Project No.: Czech Lake

Description: Approximately 0.3 miles of grading.

Letting Date:

				Engineer's Estimate	
	Item Description	Plan Qty.	Units	Unit Price	Amount
1-1	Mobilization	1.000	Lump Sum	$10,000.00	$10,000.00
1-2	Site Preparation	1.000	Lump Sum	$10,000.00	$10,000.00
1-3	Earthwork Measured in Embankment	2,502.000	Cu. Yds.	$12.00	$30,024.00
1-4	Crushed Rock Surface Course	167.000	Tons	$40.00	$6,680.00
1-5	Rock Riprap, Type "B"	3,130.000	Tons	$70.00	$219,100.00
1-6	Riprap Filter Fabric	4,285.000	Sq. Yds.	$3.00	$12,855.00
1-7	Covercrop Seeding	2.100	Acres	$1,000.00	$2,100.00
1-8	Seeding, Type "A"	2.100	Acres	$1,000.00	$2,100.00
			Total for Project:		$292,859.00

PRELIMINARY

Not For Construction

WWE

MEMORANDUM

To: Adam Rupe, Natural Resources Specialist
JEO Consulting Group, Inc.
2700 Fletcher Avenue
Lincoln, Nebraska 68504-1113

DRAFT – For Review and Comment

From: Wright Water Engineers, Inc.
Hayes Lenhart, P.E. and Steven Crisp, E.I.T

Date: June 4, 2021

Re: Wahoo Creek Watershed Management Plan Update – Load Estimates and Water Quality Assessment

Wright Water Engineers, Inc. (WWE) is pleased to provide JEO Consulting Group, Inc. (JEO) with this technical memorandum summarizing WWE's assessment of water quality trends and pollutant loads in the Wahoo Creek watershed basin located in Saunders County, Nebraska. WWE understands JEO developed the Wahoo Creek Watershed Water Quality Management Plan for the Lower Platte North Natural Resources District (LPNNRD) in August 2013 (2013 Watershed Plan). After the LPNNRD adopted the 2013 Watershed Plan, the LPNNRD began implementing best management practices and conservation strategies outlined in the 2013 Watershed Plan and continued water quality monitoring in the watershed.

This technical memorandum is intended to provide JEO and the LPNNRD with a preliminary assessment of pollutant loads and water quality trends in the Wahoo Creek Watershed pre- versus post- 2013 Watershed Plan Implementation. WWE's assessment focused on the following water quality parameters: 1) total nitrogen (TN), 2) total phosphorus (TP), 3) sediment, 4) *E. coli*, and 5) atrazine.

1.0 PRE- VERSUS POST- 2013 WATERSHED PLAN IMPLEMENTATION LOADS

WWE utilized paired water quality and flow data collected in the Wahoo Creek watershed to compare pre- versus post- Watershed Plan implementation pollutant loads in Wahoo Creek. There are two United States Geological Survey (USGS) flow monitoring stations in Wahoo Creek with long-term flow monitoring data; 1) USGS Gauge #06804700 Wahoo Creek at Ashland, NE (Ashland Gage), and 2) USGS #06804000 Wahoo Creek at Ithaca, Nebr. (Ithaca Gage) (see Figure 1). Both pre- and post- 2013 Watershed Plan water quality data are also available at each of these USGS gages.

1.1 Nutrient and Sediment Loading

WWE developed annual load estimates for TN, TP, and sediment (total suspended solids (TSS)) by pairing their respective concentration data with average daily streamflow data for the Ashland Gage

and Ithaca Gage. WWE utilized the LOADEST program developed by the USGS (Runkel et al., 2004), which estimates annual constituent loadings based on paired water quality concentration and flow data. The LOADEST program is a publicly available program and is a well-accepted method for estimating constituent loads in streams and rivers across the United States. The user provides time series input of streamflow, watershed characteristics, and constituent concentrations into the program, which then assists the user in developing a regression model for estimating the constituent load (i.e. TN, TP, and TSS) over a specified time interval. Estimates are developed on a monthly, annual, or seasonal basis. Table 1 and Figure 2 though Figure 5 present the results of the LOADEST analysis for the Ashland and Ithaca Gages.

WWE's loading analysis suggests post- 2013 Watershed Plan implementation nutrient and sediment loads are on average generally equal to or greater than pre- 2013 Watershed Plan implementation. However, this is likely due to noticeable difference in gaged streamflow pre- versus post- 2013 Watershed Plan implementation. The average annual flow volume post- 2013 Watershed Plan implementation at both the Ashland and Ithaca Gages is approximately two times greater than the average annual flow volume pre- 2013 Watershed Plan conditions. Given the difference in hydrologic conditions, WWE does not recommend inferring nutrient and sediment water quality trends from the LOADEST analysis at this time. Continuing to collect water quality data over the long-term is recommended to help develop a more robust data set utilizing a wider range of hydrologic conditions.

1.2 *E. coli* Load Duration Curves

WWE developed pre- versus post- 2013 Watershed Plan implementation load duration curves for *E. coli* at the Ashland Gage and Ithaca Gage to help evaluate potential changes in *E. coli* loading since 2013 Watershed Plan implementation (see Figure 6 and Figure 7). The load duration curves are based on a Nebraska Department of Environment and Energy (NDEE) seasonal recreational *E. coli* water quality standard of 126 MPN/100 mL (NDEE, 2007).

Figure 6 and Figure 7 appear to indicate that *E. coli* loads at the Ashland and Ithaca Gages are trending lower since 2013 Watershed Plan implementation, respectively. Please note that only two samples were collected pre- 2013 Watershed Plan implementation at the Ithaca Gage, making meaningful pre- versus post- comparisons difficult for the Ithaca Gage.

It is also worth noting that post- 2013 Watershed Plan implementation *E. coli* sample collection at the Ashland and Ithaca Gages occurred when flows in Wahoo Creek were less than the 50% exceedance threshold. This suggests sample collection occurred during days of higher-than-average flow. WWE recommends trying to collect water quality sample during lower flow periods in the future to develop a better understanding of *E coli* loading under lower flow conditions.

1.3 Atrazine Load Duration Curves

WWE developed pre- versus post- 2013 Watershed Plan implementation load duration curves for atrazine at the Ashland Gage and Ithaca Gage to help evaluate potential changes in atrazine loading

since 2013 Watershed Plan implementation (see Figure 8 and Figure 9). The load duration curves are based on a NDEE water quality standard of 12 ug/L (NDEE, 2020).

Figure 8 appears to indicate that atrazine loads at the Ashland Gage are trending higher since 2013 Watershed Plan implementation, and that atrazine concentrations are more consistently at or higher than the NDEE Water Quality Standard of 12 ug/L.

Figure 9 appears to indicate that atrazine loads at the Ithaca Gage are generally similar to pre- 2013 Watershed Plan implementation loads. Atrazine concentrations for the water quality samples collected post- 2013 Watershed Plan implementation are all less than the NDEE atrazine Water Quality Standard of 12 ug/L.

It is also worth noting that post- 2013 Watershed Plan implementation, atrazine sample collection at the Ashland and Ithaca Gages occurred when flows in Wahoo Creek were less than the 50% exceedance threshold. This suggests sample collection occurred during days of higher-than-average flow. WWE recommends collecting water quality sample during lower flow periods in the future to develop a better understanding of atrazine loading under lower flow conditions.

2.0 CONCENTRATION BASED WATER QUALITY TRENDS

WWE also prepared side-by-side box plots to compare pre- versus post- 2013 Watershed Plan implementation concentrations for TN, TP, TSS, *E. coli*, and atrazine. Box plots are a useful comparison tool to help visually show central tendencies in water quality data, and whether there are observable differences between different data sets. A key to the box plots is provided in the Figure 10.

WWE developed side-by-side box plots for the following water quality sampling conditions:

- Pre- versus post- 2013 Watershed Plan implementation.
- Pre- versus post- 2013 Watershed Plan implementation for samples collected during wet and dry conditions. A sample is considered wet condition when collected during a day with at least 0.1 inches of rainfall in the watershed, or immediately following a day with at least 0.1 inches of rainfall. A sample is considered dry condition when collected during a day with no rainfall or rainfall of less than 0.1 inches. WWE utilized daily precipitation data totals from the National Oceanic and Atmospheric Administration (NOAA) Mead 6 S weather station (see Figure 1) to group the water quality samples by wet or dry conditions. Grouping the data in this manner can help provide insight regarding whether in-stream water quality concentrations are influenced by rainfall and stormwater runoff.
- Pre- versus post- 2013 Watershed Plan implementation for samples collected during the non-irrigation season and during the irrigation season. WWE assumed a regular irrigation season of May 7th through October 15th. Grouping the data in this manner can help provide insight regarding whether in-stream water quality concentrations are influenced by irrigation runoff or elevated seasonal groundwater return flows.

DRAFT – For Review and Comment

2.1 Total Nitrogen Water Quality Trends

2.1.1 *Ashland Gage*

Figure Set 11 presents the TN pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ashland gage. Key observations associated with these data suggest the following:

- It appears TN concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally higher when compared to TN concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TN concentrations in the water quality samples collected under both wet and dry conditions post- 2013 Watershed Plan implementation are generally higher when compared to TN concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TN concentrations in the water quality samples collected during the non-irrigation season and during the irrigation season are similar pre- 2013 Watershed Plan implementation.

2.1.2 *Ithaca Gage*

Figure Set 12 presents the TN pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ithaca gage. Key observations associated with these data suggest the following:

- It appears TN concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally similar when compared to TN concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TN concentrations in the water quality samples collected under both wet and dry conditions post- 2013 Watershed Plan implementation are generally similar when compared to TN concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TN concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally similar when compared to TN concentrations collected pre- 2013 Watershed Plan implementation.

2.2 Total Phosphorus Water Quality Trends

2.2.1 *Ashland Gage*

Figure Set 13 presents the TP pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ashland gage. Key observations associated with these data suggest the following:

- It appears TP concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally higher when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TP concentrations in the water quality samples collected under wet conditions post- 2013 Watershed Plan implementation are generally within the range of TP concentrations collected pre- 2013 Watershed Plan implementation. However, the range of TP concentrations in the samples collected during wet conditions post- 2013 Watershed Plan implementation appear less extreme and have a lower average when compared to the samples collected pre- 2013 Watershed Plan implementation. This suggests that TP concentrations are trending lower during storm events post- 2013 Watershed Plan implementation.

- It appears TP concentrations in the water quality samples collected under dry conditions post- 2013 Watershed Plan implementation are generally similar when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TP concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally similar when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

2.2.2 *Ithaca Gage*

Figure Set 14 presents the TP pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ithaca gage. Key observations associated with these data suggest the following:

- It appears TP concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally higher when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TP concentrations in the water quality samples collected under both wet and dry conditions post- 2013 Watershed Plan implementation are generally higher when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TP concentrations in the water quality samples collected under both wet and dry conditions post- 2013 Watershed Plan implementation are generally higher when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

- It appears TP concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally higher when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

2.3 Sediment Water Quality Trends

2.3.1 *Ashland Gage*

Figure Set 15 presents the total suspended solids (TSS) pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ashland gage. Key observations associated with these data suggest the following:

- It appears TSS concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally similar when compared to TSS concentrations collected pre- 2013 Watershed Plan implementation. It is worth noting that the overall average TSS concentration is noticeably lower for the samples collected post- 2013 Watershed Plan implementation.

- It appears TSS concentrations in the water quality samples collected under wet conditions post- 2013 Watershed Plan implementation are generally lower when compared to the concentrations collected pre- 2013 Watershed Plan implementation. This suggests that TSS concentrations are trending lower during storm events post- 2013 Watershed Plan implementation.

- It appears TSS concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally similar when compared to TSS concentrations collected pre- 2013 Watershed Plan implementation. It is worth noting that the overall average TSS concentration during the irrigation season is noticeably lower for the samples collected post- 2013 Watershed Plan implementation.

2.3.2 *Ithaca Gage*

Figure Set 16 presents the TSS pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ithaca gage. Due to the lack of TSS concentration data at this gage location prior to 2013, WWE cannot make any meaningful comparisons pre- versus post- 2013 Watershed Plan implementation.

2.4 *E. coli* Water Quality Trends

2.4.1 *Ashland Gage*

Figure Set 17 presents the *E. coli* pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ashland gage. Key observations associated with these data suggest the following:

- It appears *E. coli* concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally similar when compared to *E. coli* concentrations collected pre- 2013 Watershed Plan implementation.

- It appears *E. coli* concentrations in the water quality samples collected under wet conditions post- 2013 Watershed Plan implementation are generally within the range of *E. coli* concentrations collected pre- 2013 Watershed Plan implementation. However, the range of *E. coli* concentrations in the samples collected during wet conditions post- 2013 Watershed Plan implementation appear less extreme and have a slightly lower seasonal geometric mean when compared to the samples collected pre- 2013 Watershed Plan implementation. This suggests *E. coli* concentrations during wet conditions are trending lower post- 2013 Watershed Plan implementation.

- It appears *E. coli* concentrations in the water quality samples collected under dry conditions post- 2013 Watershed Plan implementation are generally higher when compared to *E. coli* concentrations collected pre- 2013 Watershed Plan implementation. This suggests that a contributor to *E. coli* in Wahoo Creek may be natural background sources, such as animals.

- It appears *E. coli* concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally similar when compared to *E. coli* concentrations collected pre- 2013 Watershed Plan implementation.

2.4.2 *Ithaca Gage*

Figure Set 18 presents the *E. coli* pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ithaca gage. Due to the lack of *E. coli* concentration data at this gage location prior to 2013, WWE cannot make any meaningful comparisons pre- versus post- 2013 Watershed Plan implementation.

2.5 Atrazine Water Quality Trends

2.5.1 *Ashland Gage*

Figure Set 19 presents the atrazine pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ashland gage. Key observations associated with these data suggest the following:

- It appears atrazine concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally higher when compared to TP concentrations collected pre- 2013 Watershed Plan implementation.

- It appears atrazine concentrations in the water quality samples collected under dry conditions post- 2013 Watershed Plan implementation are higher when compared to atrazine concentrations collected pre- 2013 Watershed Plan implementation.

- It appears Atrazine concentrations in the water quality samples collected under wet conditions post- 2013 Watershed Plan implementation are generally higher when compared to atrazine concentrations collected under dry conditions after 2013.

- It appears atrazine concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally higher when compared to atrazine concentrations collected pre- 2013 Watershed Plan implementation.

2.5.2 *Ithaca Gage*

Figure Set 20 presents the atrazine pre- versus post- 2013 Watershed Plan implementation box plots developed for the Ithaca gage. Key observations associated with these data suggest the following:

DRAFT – For Review and Comment

- It appears atrazine concentrations in the water quality samples collected post- 2013 Watershed Plan implementation are generally higher when compared to atrazine concentrations collected pre- 2013 Watershed Plan implementation. It is worth noting that the average concentration pre- 2013 Watershed Plan implementation is higher when compared to post- due to two outlying concentrations of 34 ug/L and 55 ug/L reported by the USGS in May and June of 2002, respectively.

- It appears atrazine concentrations in the water quality samples collected under dry conditions post- 2013 Watershed Plan implementation are higher when compared to atrazine concentrations collected pre- 2013 Watershed Plan implementation.

- It appears atrazine concentrations in the water quality samples collected during the irrigation season post- 2013 Watershed Plan implementation are generally higher when compared to atrazine concentrations collected pre- 2013 Watershed Plan implementation. It is worth noting that the average concentration pre- 2013 Watershed Plan implementation is higher when compared to post- due to two outlying concentrations of 34 ug/L and 55 ug/L reported by the USGS in May and June of 2002, respectively.

Attachment(s)/Enclosure(s)

Table 1. Estimated Annual Loads in the Wahoo Creek Watershed

Figure 1. Wahoo Creek Watershed and Monitoring Locations

Figure 2. Estimated Annual Nutrient Loading – Ashland Gage

Figure 3. Estimated Annual Sediment Loading – Ashland Gage

Figure 4. Estimated Annual Nutrient Loading – Ithaca Gage

Figure 5. Estimated Annual Sediment Loading – Ithaca Gage

Figure 6. *E. coli* Load Duration Curve – Ashland Gage

Figure 7. *E. coli* Load Duration Curve – Ithaca Gage

Figure 8. Atrazine Load Duration Curve – Ashland Gage

Figure 9. Atrazine Load Duration Curve – Ithaca Gage

Figure 10. Box Plot Key

Figure Set 11. TN Concentration Box Plots for Ashland Gage

Figure Set 12. TN Concentration Box Plots for Ithaca Gage

Figure Set 13. TP Concentration Box Plots for Ashland Gage

Figure Set 14. TP Concentration Box Plots for Ithaca Gage

DRAFT – For Review and Comment

Figure Set 15. TSS Concentration Box Plots for Ashland Gage

Figure Set 16. TSS Concentration Box Plots for Ithaca Gage

Figure Set 17. *E. coli* Concentration Box Plots for Ashland Gage

Figure Set 18. *E. coli* Concentration Box Plots for Ithaca Gage

Figure Set 19. Atrazine Concentration Box Plots for Ashland Gage

Figure Set 20. Atrazine Concentration Box Plots for Ithaca Gage

REFERENCES

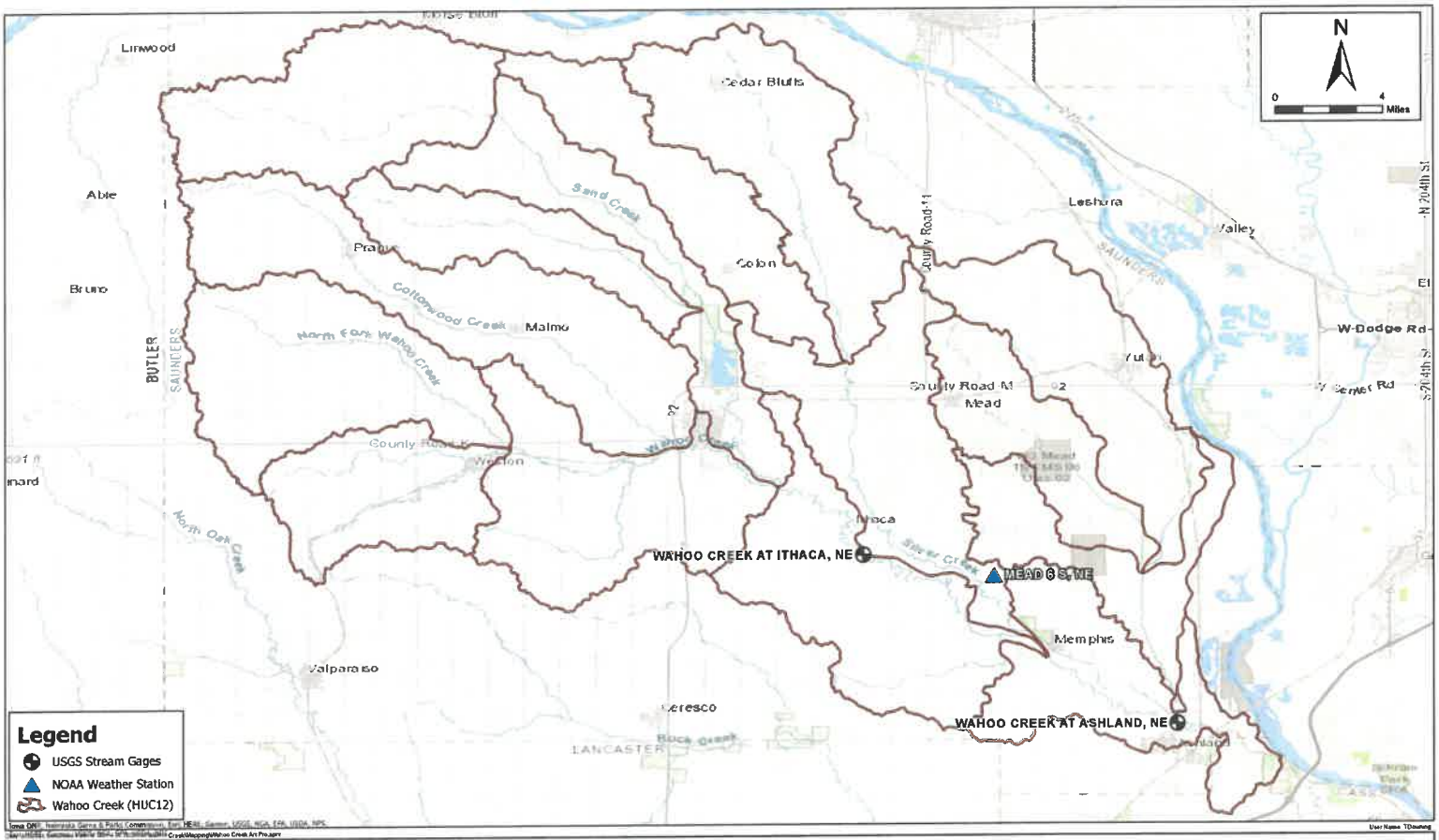
Runkel, Robert L., Charles G. Crawford, and Timothy A. Cohn, 2004. U.S. Department of the Interior, U.S. Geological Survey. Load Estimator (LOADEST): A FORTRAN Program for Estimating Constituent Loads in Streams and Rivers. Reston, Virginia: 2004.

NDEE, 2007. Total Maximum Daily Loads for the Lower Platte River Basin. Parameter of Concern: *E. coli* Bacteria. Nebraska Department of Environment and Energy. Planning Unit, Water Quality Division. June 2007.

NDEE, 2020. 2020 Water Quality Integrated Report DRAFT. Nebraska Department of Environment and Energy. November 20, 2020.

Table 1
Estimated Annual Loads in the Wahoo Creek Watershed

	Ashland				Ithaca			
Year	Nitrogen Tons per Year	Phosphorus Tons per Year	TSS Tons per Year	Total Flow Acre-Feet per Year	Nitrogen Tons per Year	Phosphorus Tons per Year	TSS Tons per Year	Total Flow Acre-Feet per Year
1990	41	1	5,879	9,550	Not Analyzed - Water Quality Data Not Available			
1991	999	473	7,906,474	110,895				
1992	259	21	334,260	46,303				
1993	1,488	815	8,161,453	169,527				
1994	667	157	1,638,498	93,903	314	1	259,489	65,713
1995	819	145	1,073,527	114,096	271	47	74,624	67,575
1996	871	463	2,672,527	106,588	378	835	423,780	78,186
1997	319	36	92,384	55,778	113	3	15,913	36,499
1998	979	568	2,079,052	124,560	382	154	342,622	92,120
1999	881	298	1,012,969	121,724	453	37	190,184	102,128
2000	322	47	109,946	56,819	128	1	12,572	36,049
2001	462	94	177,733	71,852	174	4	38,867	46,372
2002	233	36	45,509	43,265	97	1	12,349	26,565
2003	181	28	26,943	34,627	73	1	5,958	19,640
2004	197	28	23,679	37,780	85	1	6,418	23,330
2005	300	91	86,861	48,239	126	4	41,931	31,435
2006	342	212	160,972	53,387	130	8	111,350	39,545
2007	1,108	654	491,562	144,956	441	120	406,090	116,645
2008	1,478	916	683,674	183,778	539	125	298,905	128,981
2009	483	89	51,598	80,931	196	2	19,688	54,555
2010	1,498	914	604,531	186,784	546	99	213,777	125,524
2011	869	314	181,104	121,910	345	37	82,093	82,661
2012	300	36	10,161	54,512	118	3	5,124	34,109
2013	287	59	26,714	49,383	107	8	7,936	28,319
2014	1,014	653	288,959	125,703	827	2,737	305,467	98,758
2015	1,322	568	204,834	169,669	844	564	157,501	120,982
2016	1,751	555	229,687	221,889	1,330	970	266,104	177,098
2017	1,287	399	138,921	173,566	876	783	161,321	125,485
2018	1,072	258	90,862	151,963	690	345	86,577	108,502
2019	1,989	866	226,413	236,774	1,763	8,948	792,772	196,452
2020	619	47	10,865	99,550	329	35	15,518	65,423
Max	**1,989**	**916**	**8,161,453**	**236,774**	**1,763**	**8,948**	**792,772**	**196,452**
Min	**41**	**1**	**5,879**	**9,550**	**73**	**1**	**5,124**	**19,640**
Average	**788**	**317**	**930,598**	**106,460**	**432**	**588**	**161,294**	**78,839**
Pre-2013 Watershed Plan Implementation Average	**641**	**271**	**1,152,417**	**88,381**	**251**	**75**	**128,483**	**61,797**
Post-2013 Watershed Plan Implementation Average	**1,293**	**478**	**170,077**	**168,445**	**951**	**2,055**	**255,037**	**127,529**



NEBRASKA

WAHOO CREEK GAGES AND WEATHER STATION

PRIVILEGED AND CONFIDENTIAL INFORMATION

JEO

WWE
Wright Water Engineers, Inc.
1666 N. Main Ave., Ste.C
Durango, CO 81301
(970) 259-7411 ph 259-8758 fx

PROJECT NO. 031-139.100

DRAFT FIGURE 1

Figure 2
06804700 - Wahoo Creek at Ashland
Estimated Annual Nutrient Loading

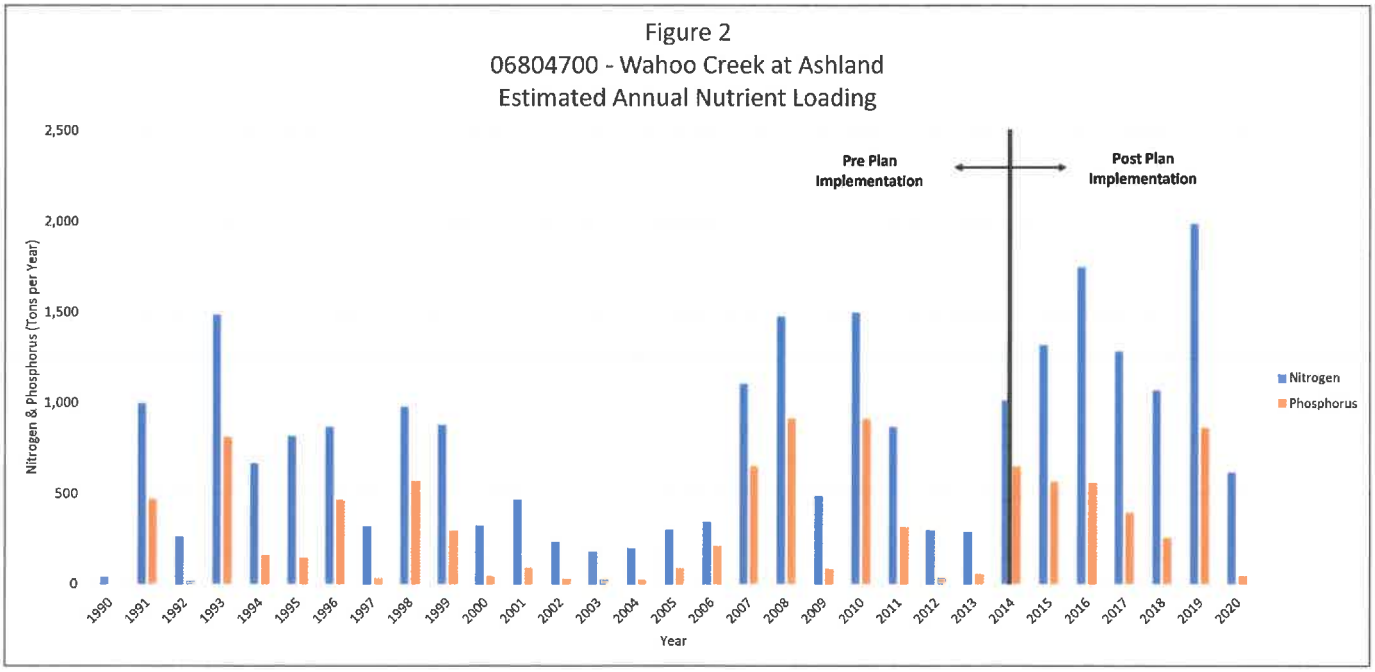


Figure 3
06804700 - Wahoo Creek at Ashland
Estimated Annual Sediment Loading

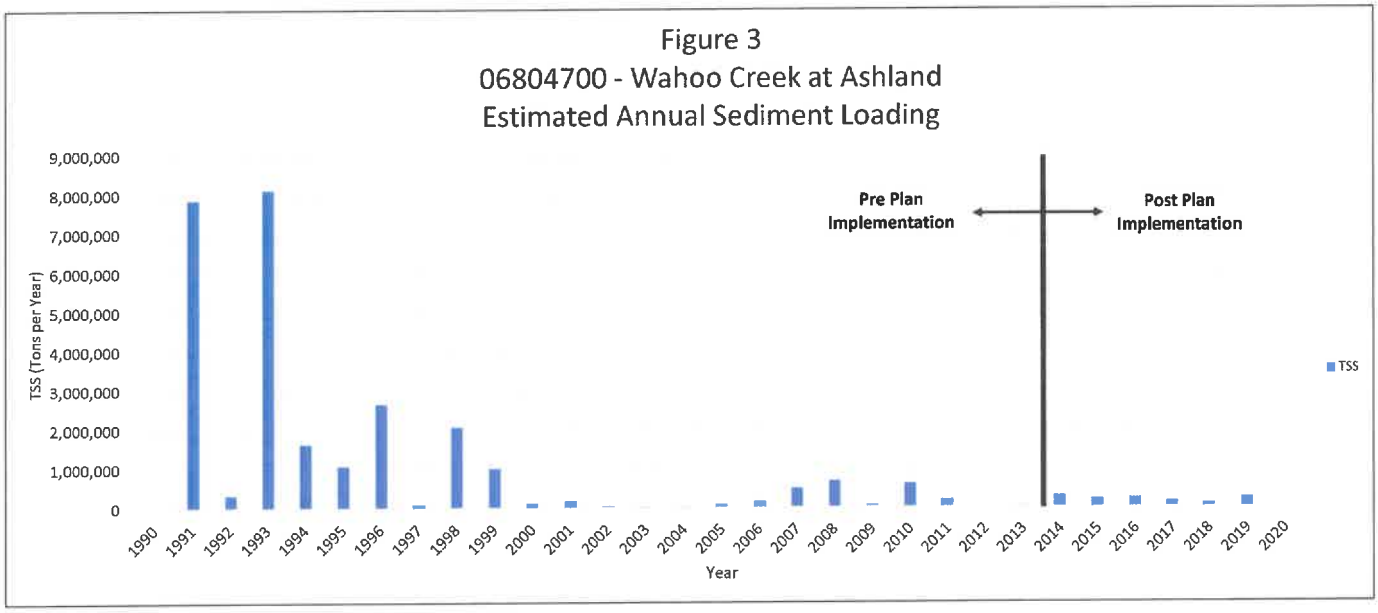


Figure 4
06804000 - Wahoo Creek at Ithaca
Estimated Annual Nutrient Loading

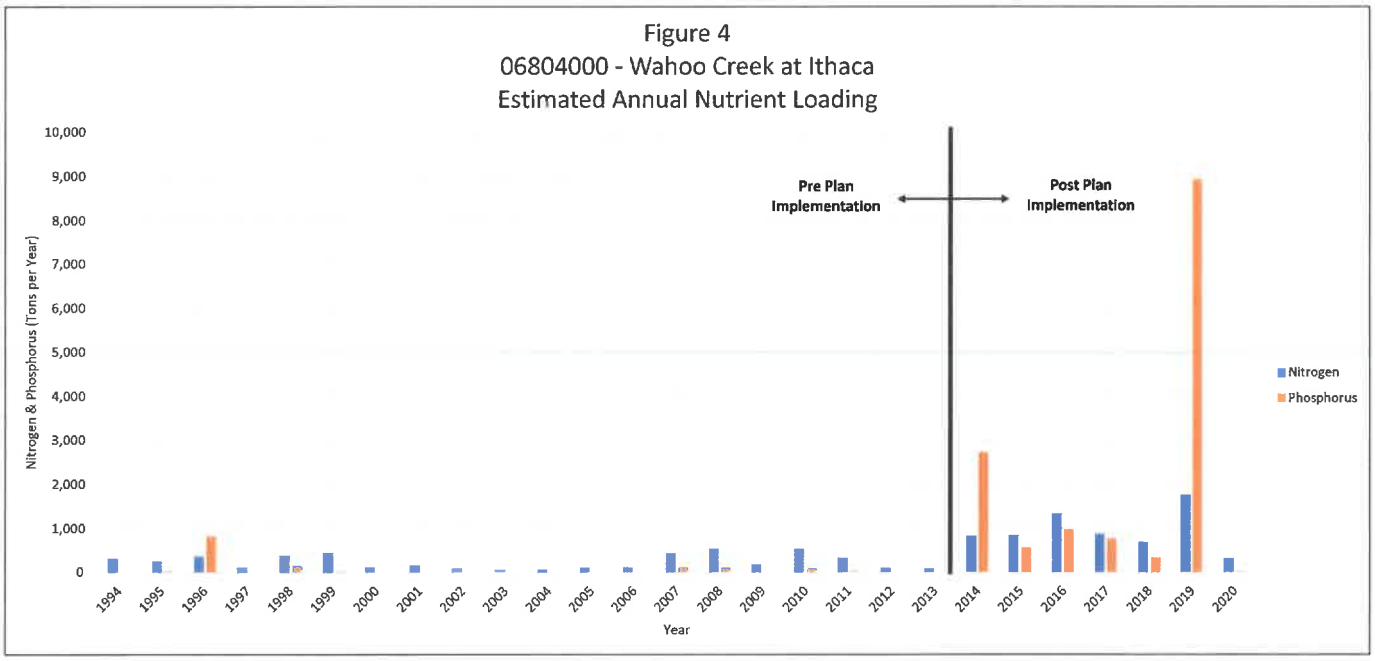


Figure 5
06804000 - Wahoo Creek at Ithaca
Estimated Annual Sediment Loading

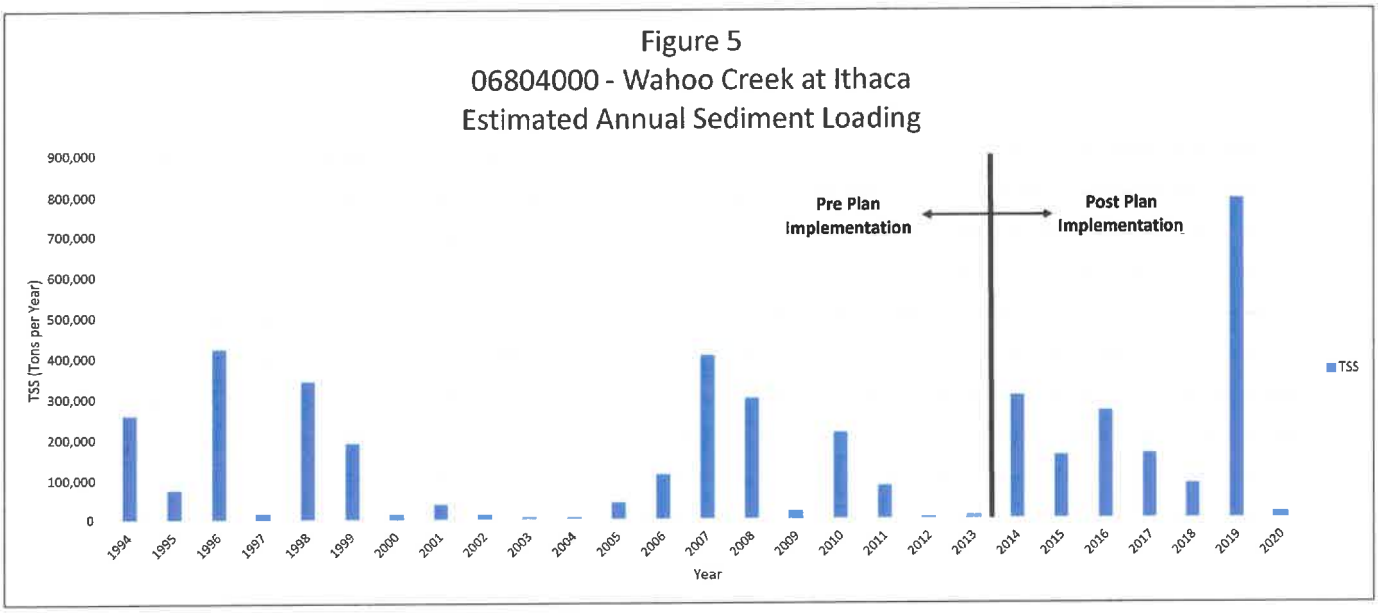


Figure 6
***E. coli* Load Duration Curve**
Wahoo Creek at Ashland, NE 06804700

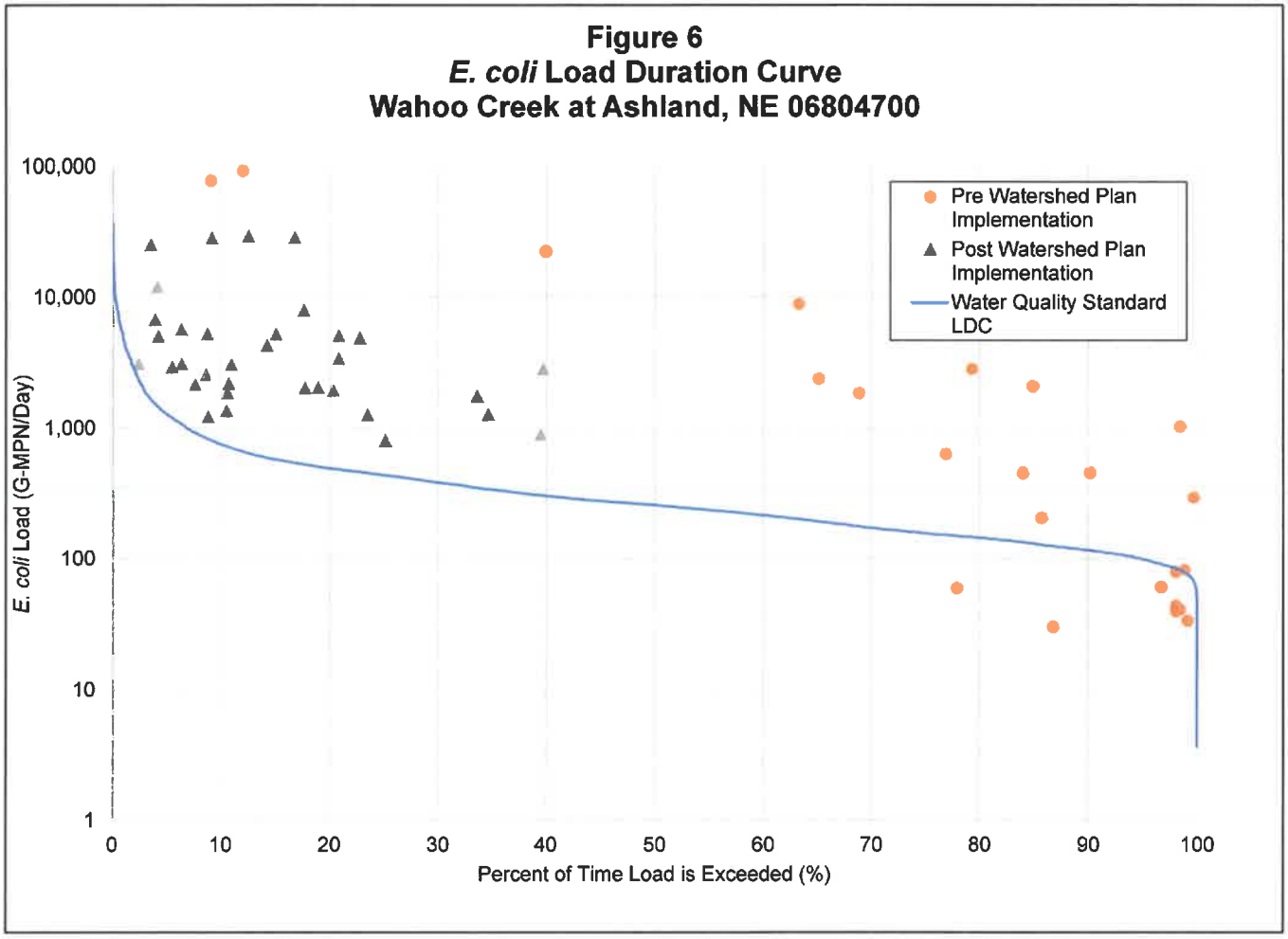


Figure 7
***E. coli* Load Duration Curve**
Wahoo Creek at Ithaca, NE 06804000

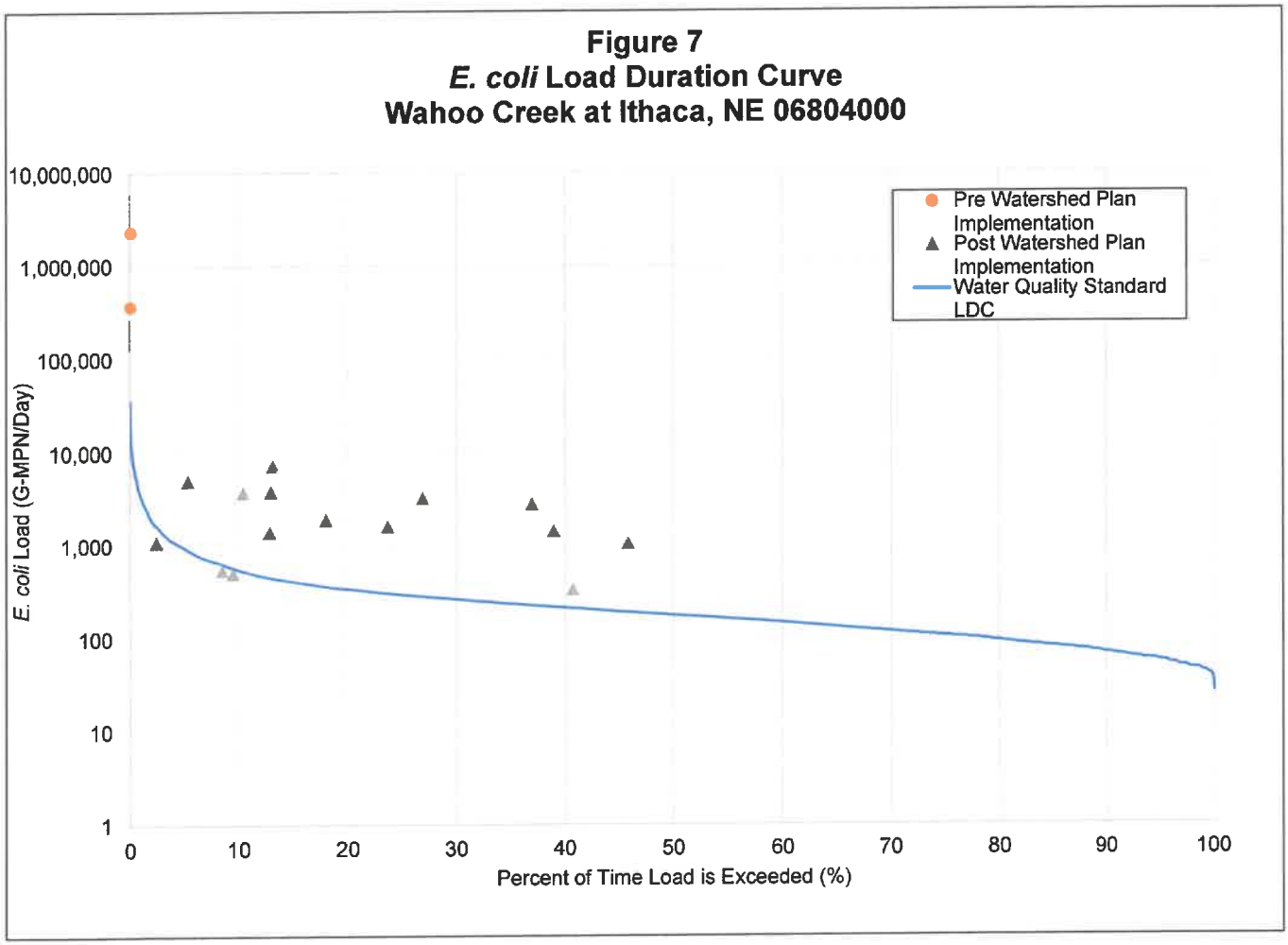


Figure 8
Atrazine Load Duration Curve
Wahoo Creek at Ashland, NE 06804700

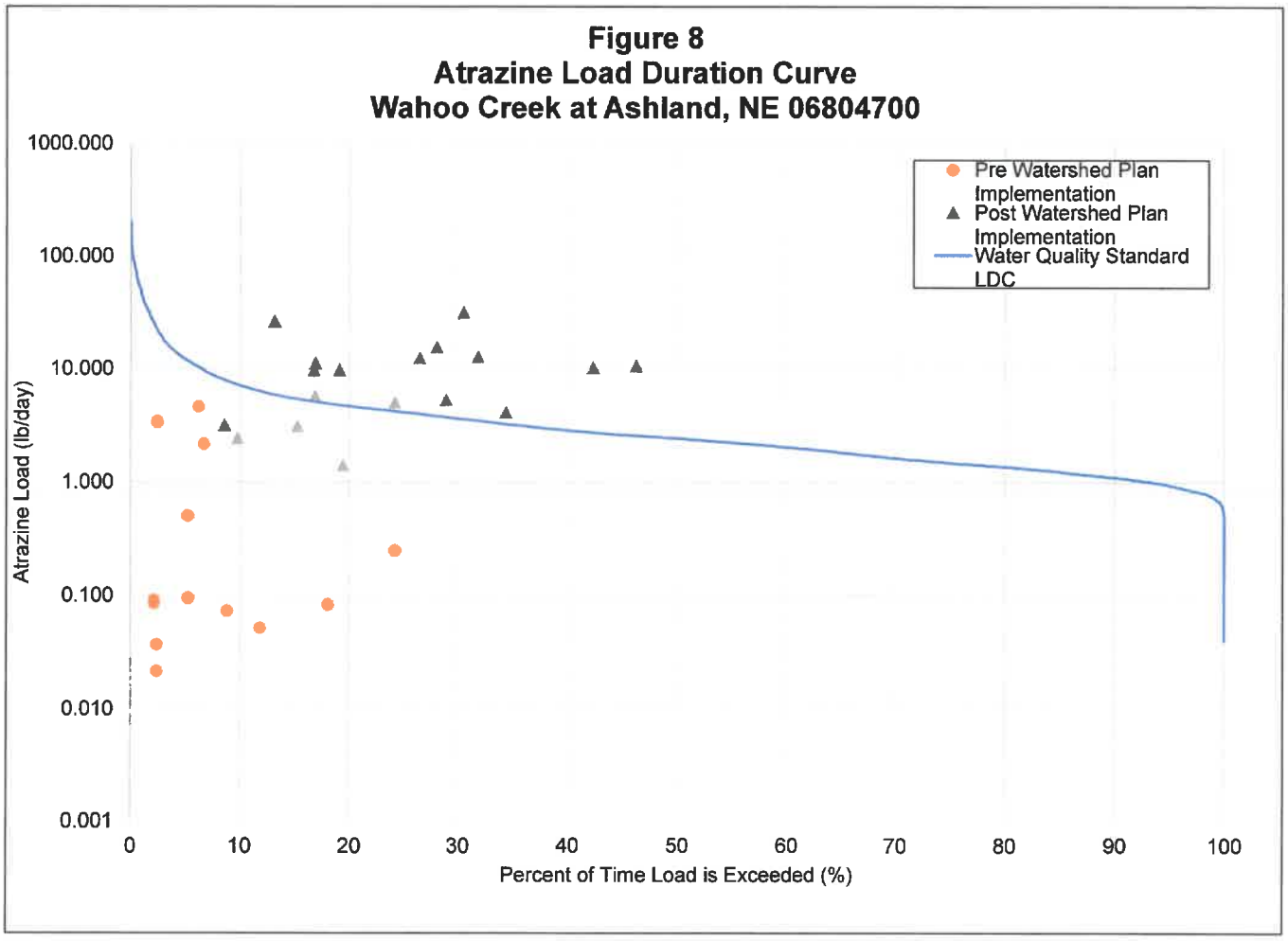


Figure 9
Atrazine Load Duration Curve
Wahoo Creek at Ithaca, NE 06804000

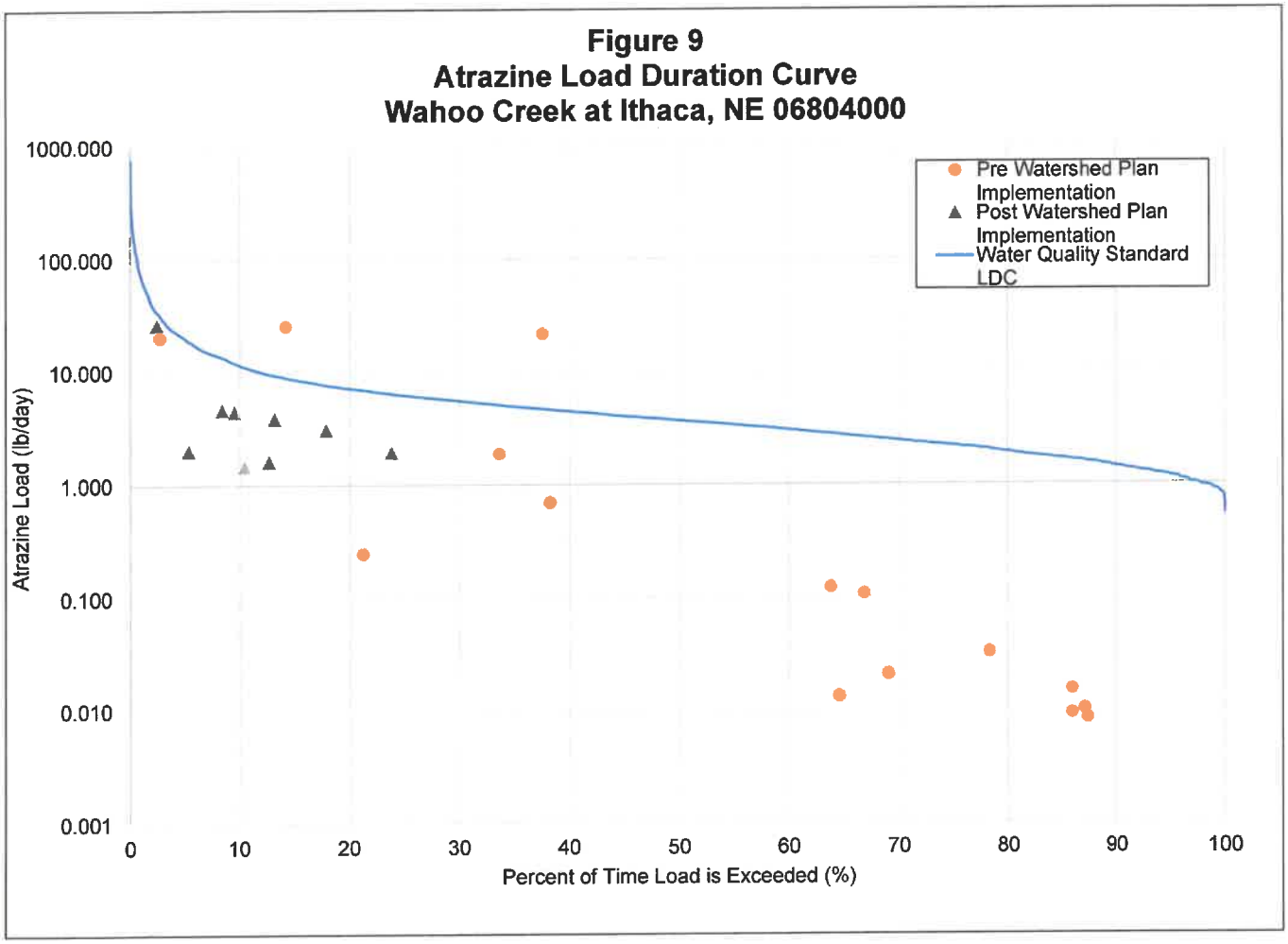
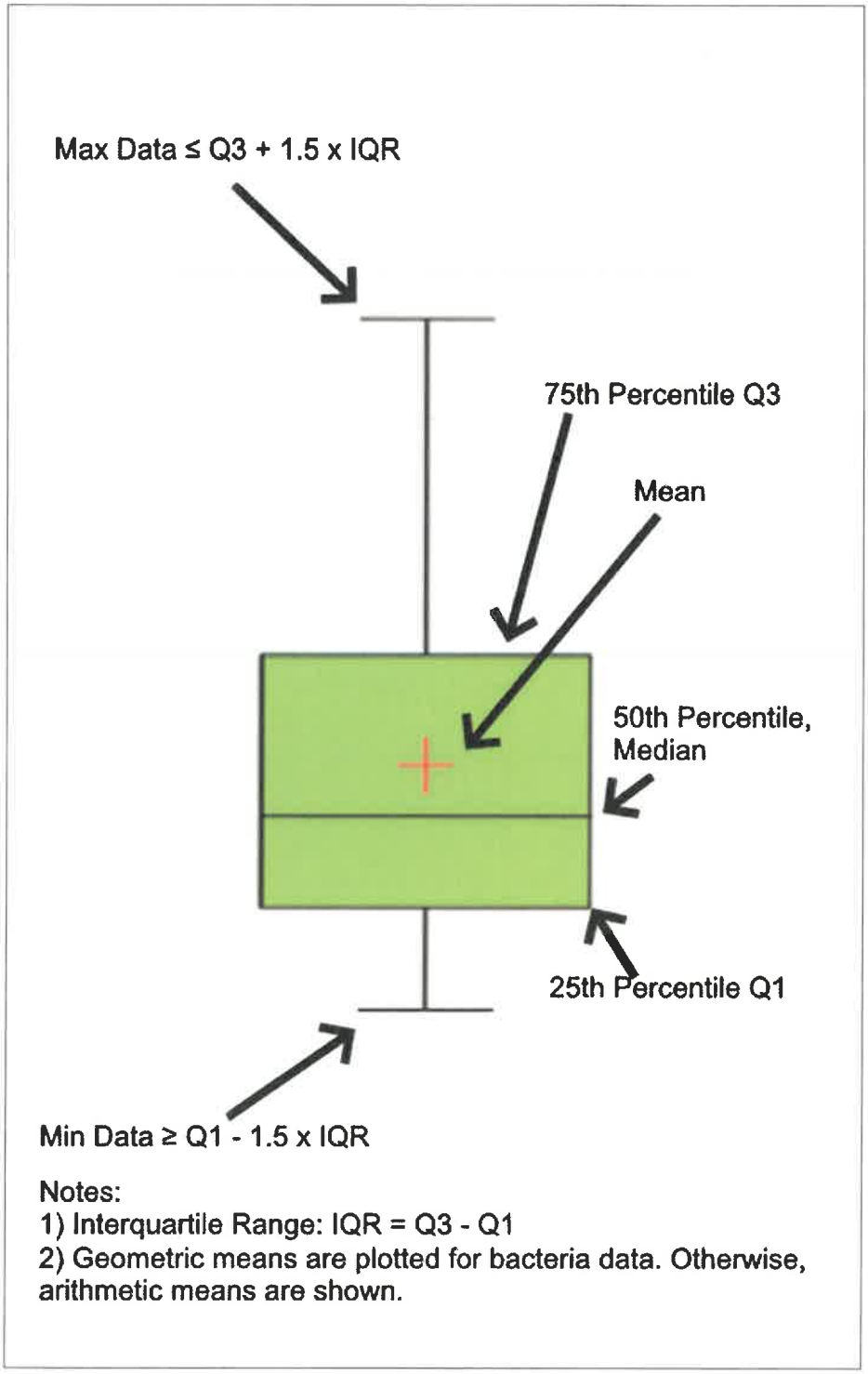


Figure 10 Box Plot Key



Notes:
1) Interquartile Range: IQR = Q3 - Q1
2) Geometric means are plotted for bacteria data. Otherwise, arithmetic means are shown.

Figure 11 TN Concentration Box Plots for Ashland Gage

Figure 11.1

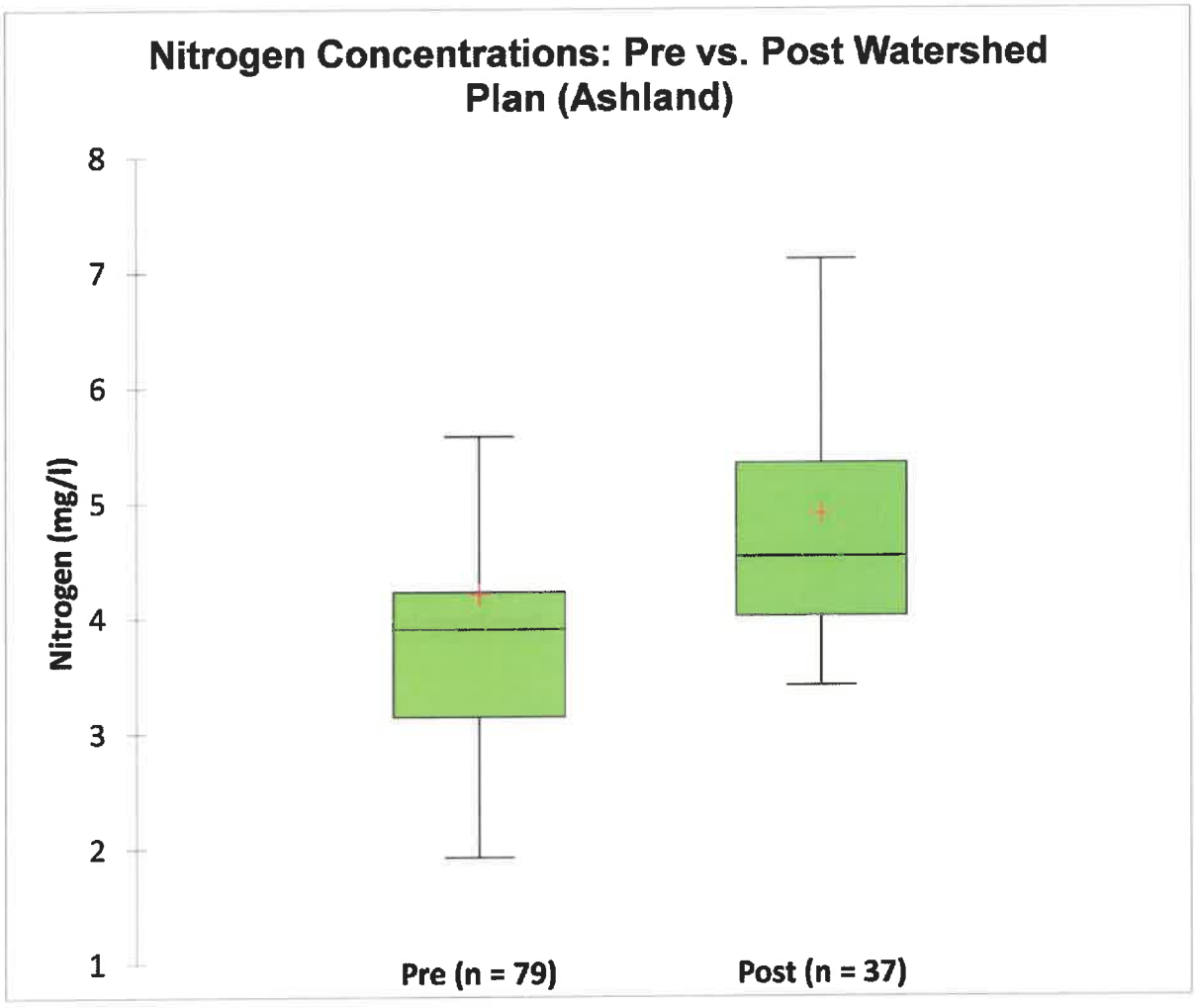


Figure 11.2

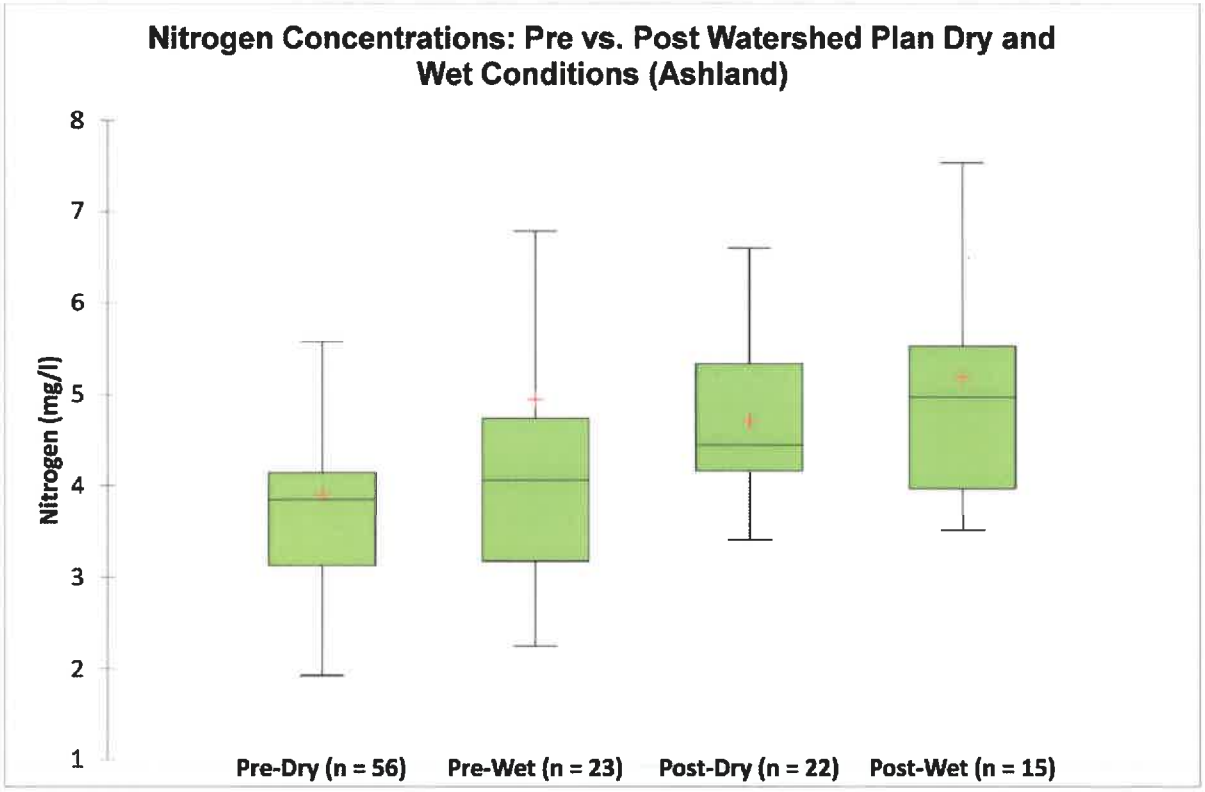

Nitrogen Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ashland)
Nitrogen (mg/l)
8
7
6
5
4
3
2
1
Pre-Dry (n = 56)
Pre-Wet (n = 23)
Post-Dry (n = 22)
Post-Wet (n = 15)

Figure 11.3

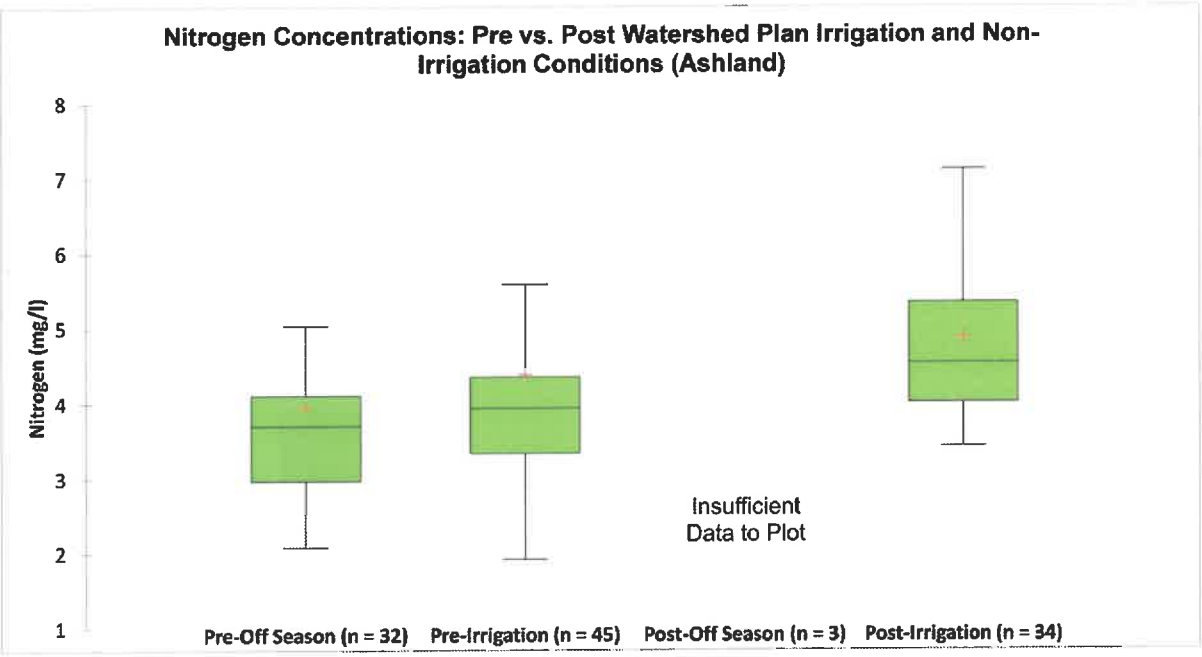

Nitrogen Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ashland)
Nitrogen (mg/l)
8
7
6
5
4
3
2
1
Insufficient Data to Plot
Pre-Off Season (n = 32)
Pre-Irrigation (n = 45)
Post-Off Season (n = 3)
Post-Irrigation (n = 34)

Figure Set 12. TN Concentration Box Plots for Ithaca Gage

Figure 12.1

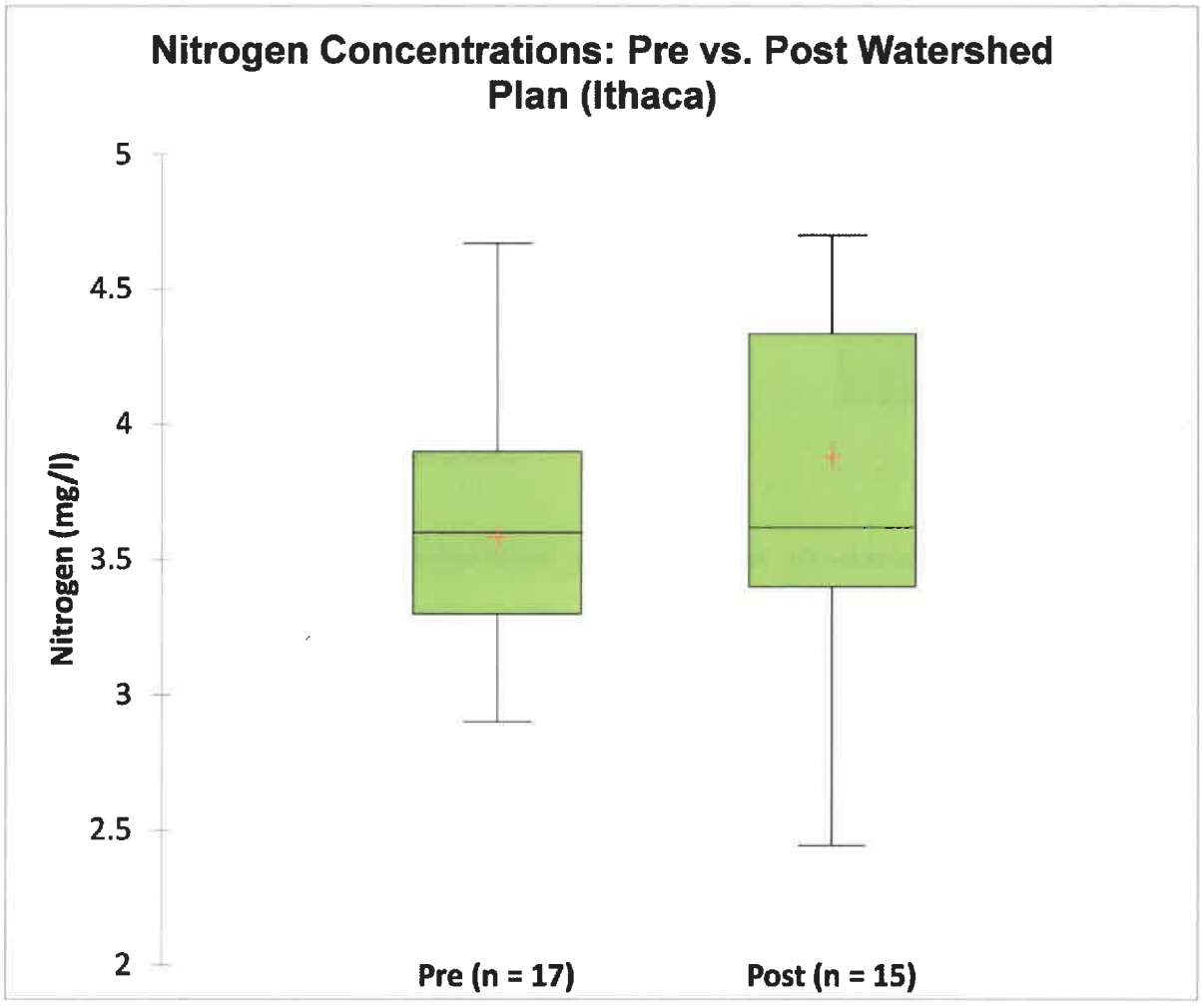


Figure 12.2

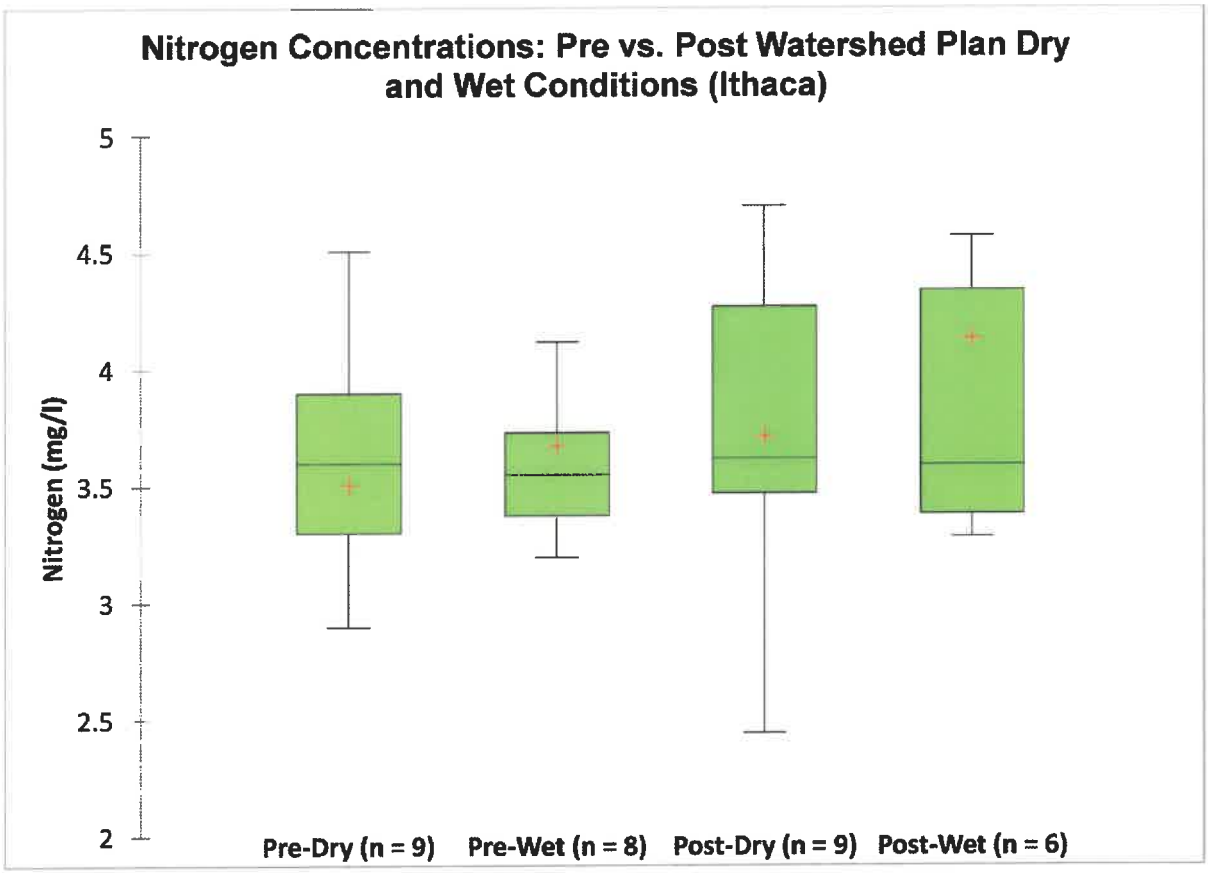

Nitrogen Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ithaca)
Nitrogen (mg/l)
5
4.5
4
3.5
3
2.5
2
Pre-Dry (n = 9)
Pre-Wet (n = 8)
Post-Dry (n = 9)
Post-Wet (n = 6)

Figure 12.3

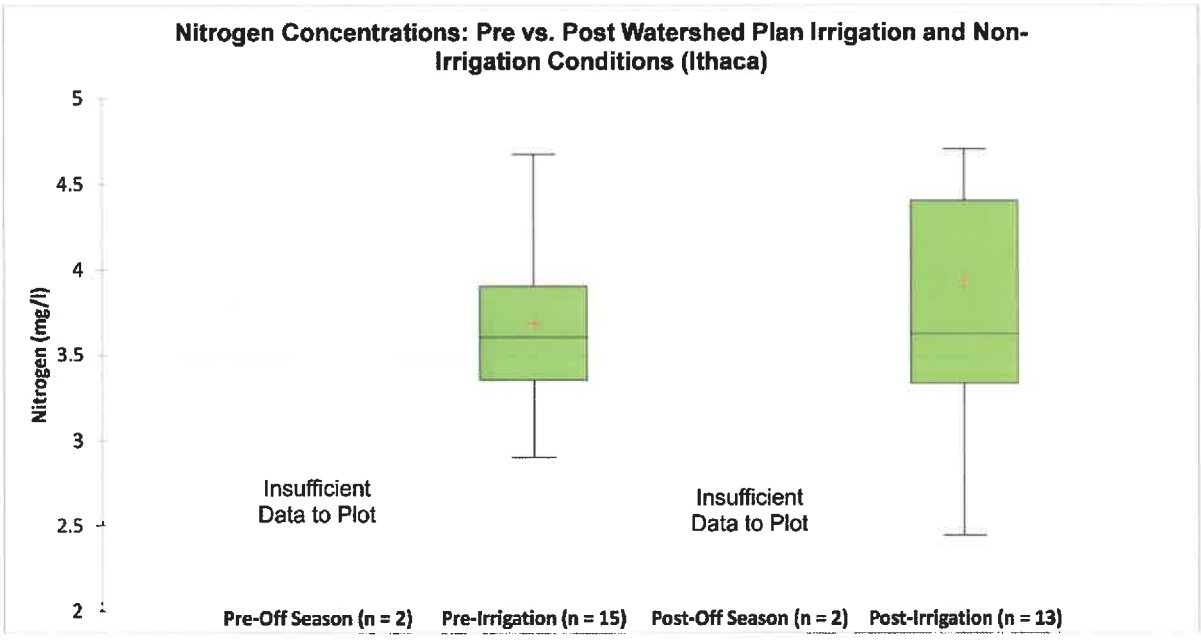

Nitrogen Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ithaca)
Nitrogen (mg/l)
5
4.5
4
3.5
3
2.5
2
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 2)
Pre-Irrigation (n = 15)
Post-Off Season (n = 2)
Post-Irrigation (n = 13)

Figure 13 TP Concentration Box Plots for Ashland Gage

Figure 13.1

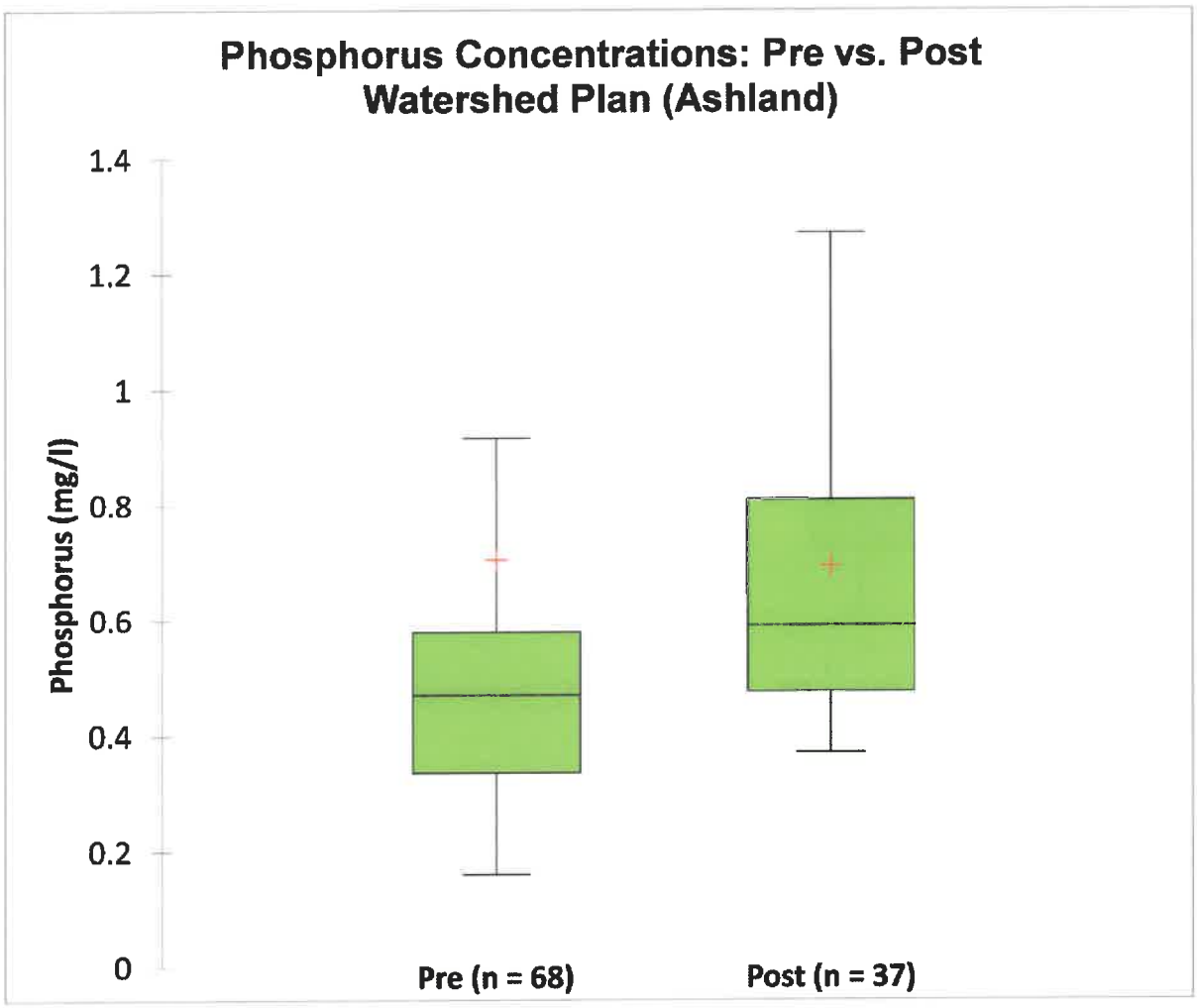


Figure 13.2

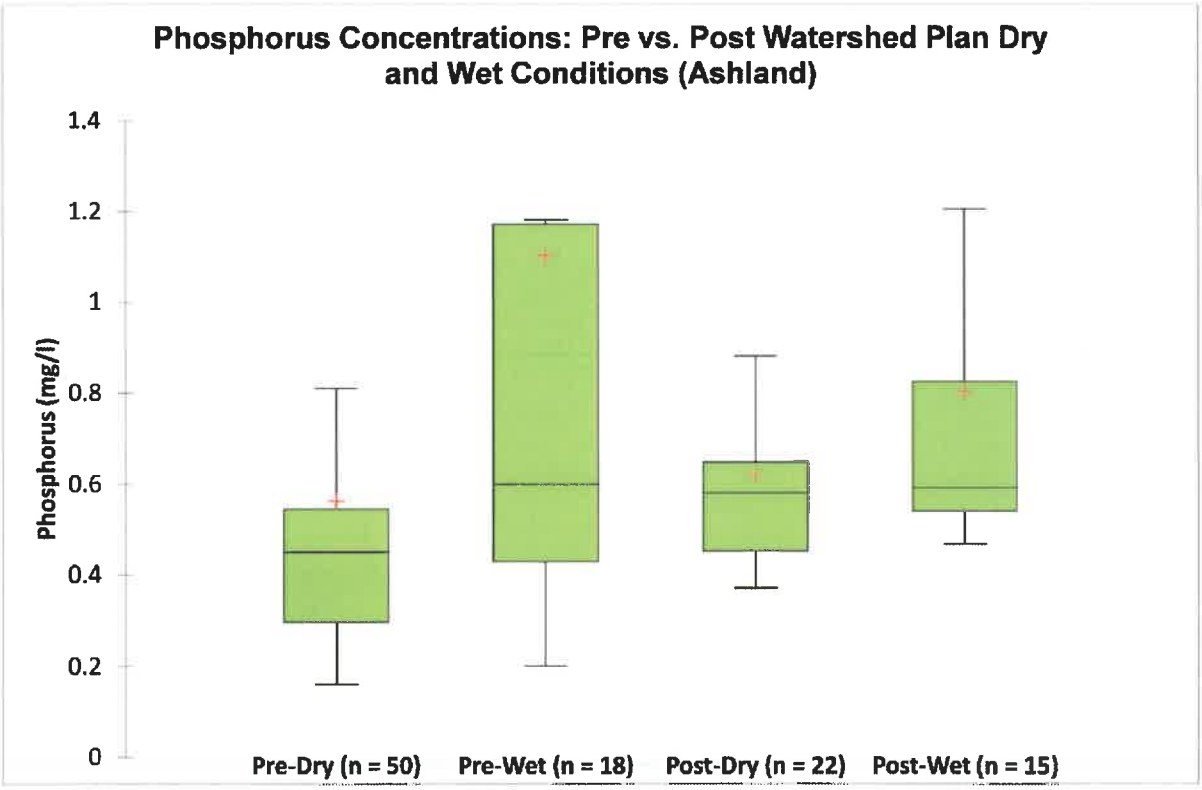

Phosphorus Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ashland)
Phosphorus (mg/l)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Pre-Dry (n = 50)
Pre-Wet (n = 18)
Post-Dry (n = 22)
Post-Wet (n = 15)

Figure 13.3

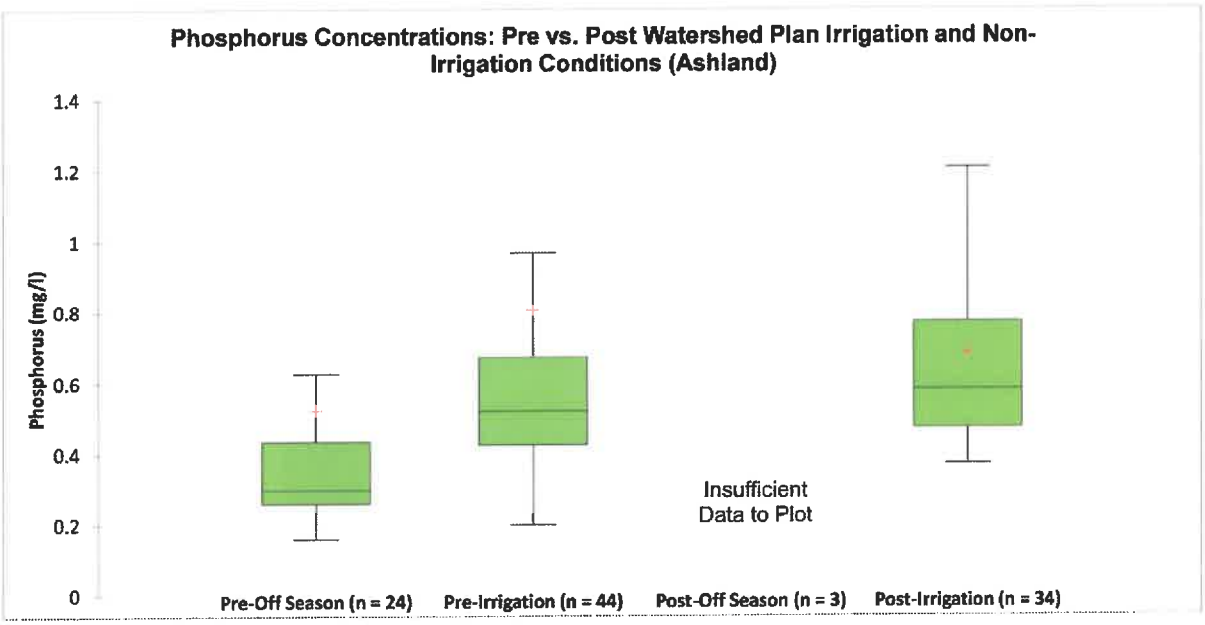

Phosphorus Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ashland)
Phosphorus (mg/l)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Insufficient Data to Plot
Pre-Off Season (n = 24)
Pre-Irrigation (n = 44)
Post-Off Season (n = 3)
Post-Irrigation (n = 34)

Figure 14 TP Concentration Box Plots for Ithaca Gage

Figure 14.1

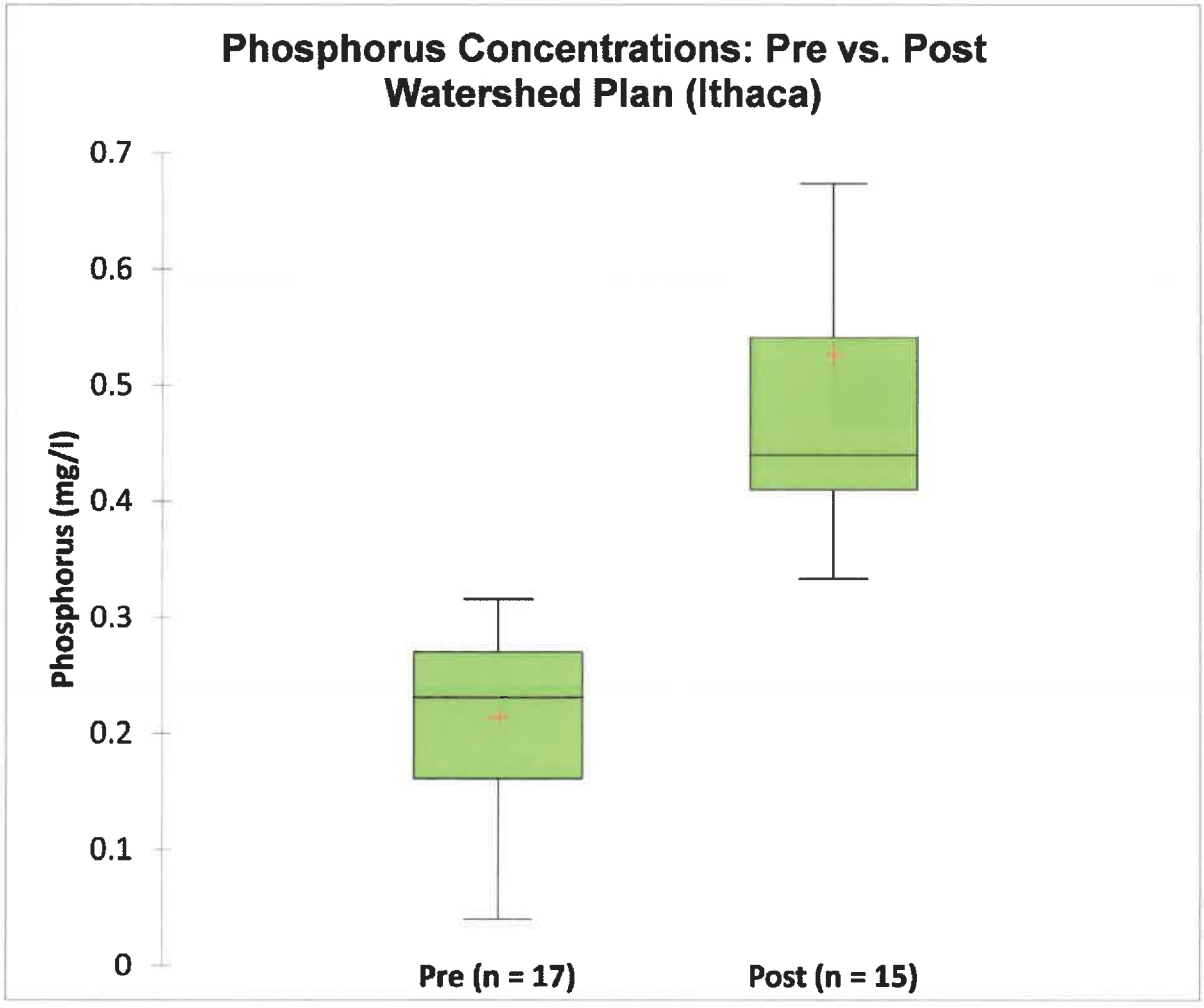


Figure 14.2

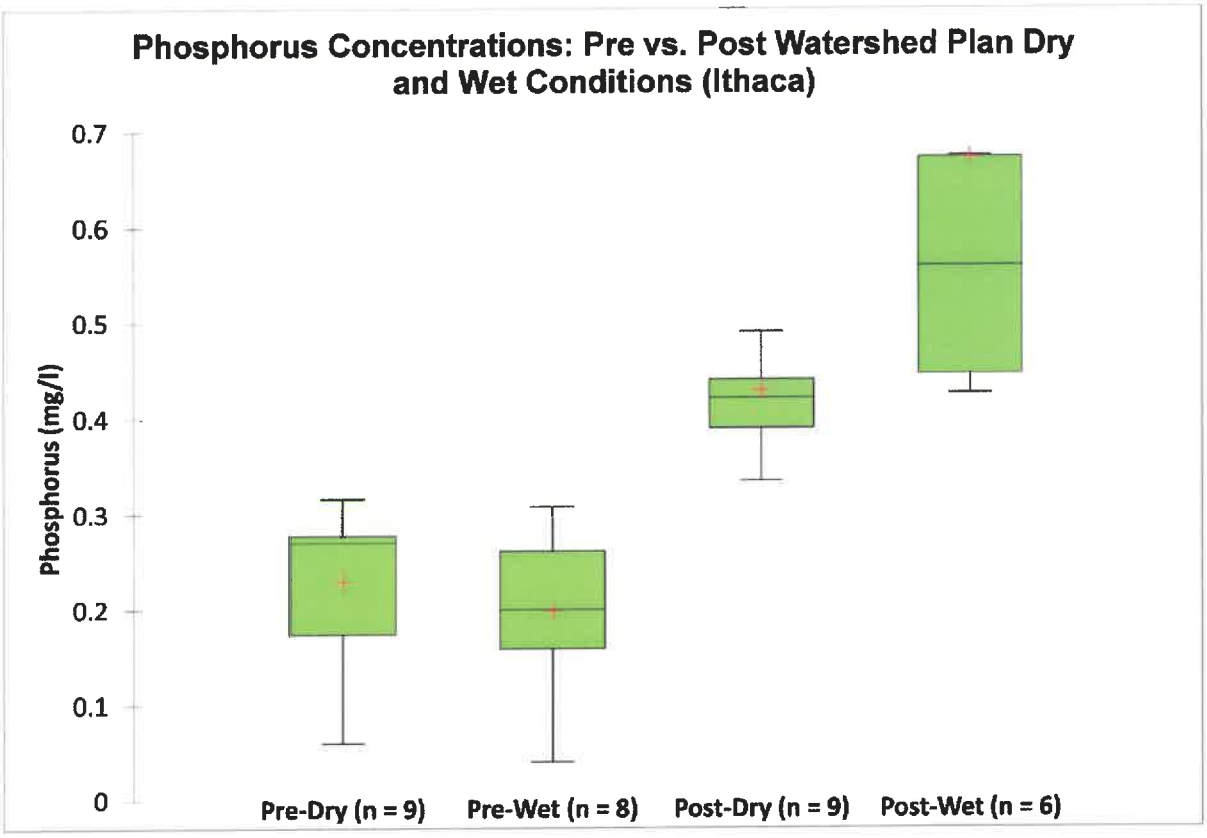

Phosphorus Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ithaca)
Phosphorus (mg/l)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Pre-Dry (n = 9)
Pre-Wet (n = 8)
Post-Dry (n = 9)
Post-Wet (n = 6)

Figure 14.3

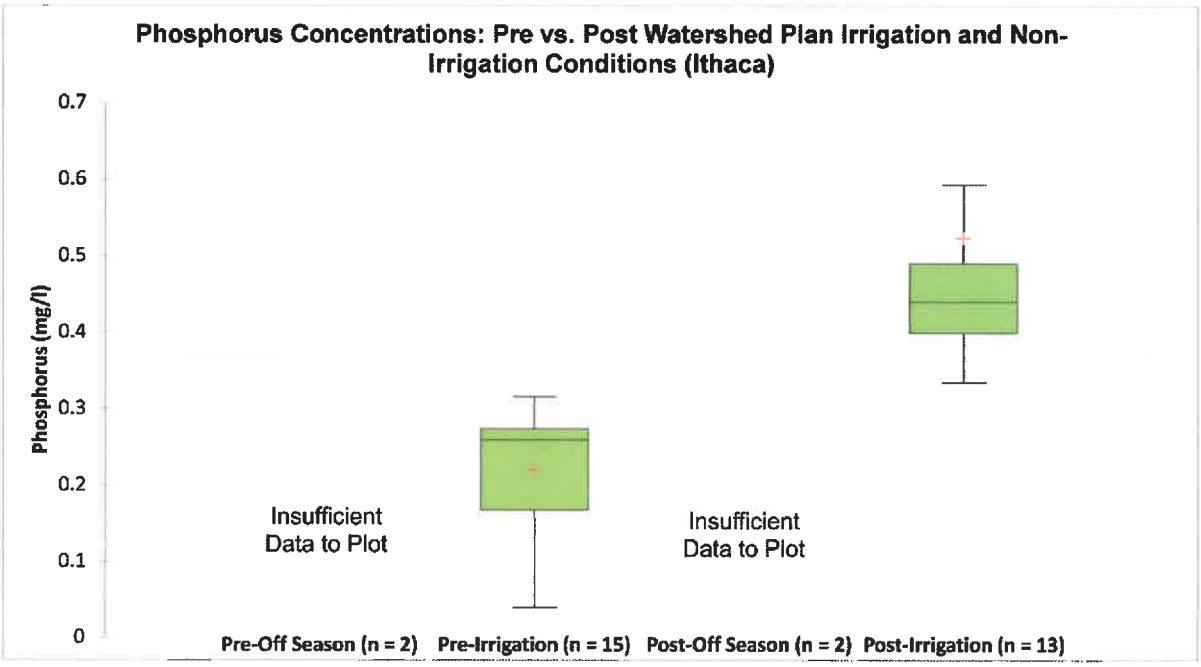

Phosphorus Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ithaca)
Phosphorus (mg/l)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 2)
Pre-Irrigation (n = 15)
Post-Off Season (n = 2)
Post-Irrigation (n = 13)

Figure 15 TSS Concentration Box Plots for Ashland Gage

Figure 15.1

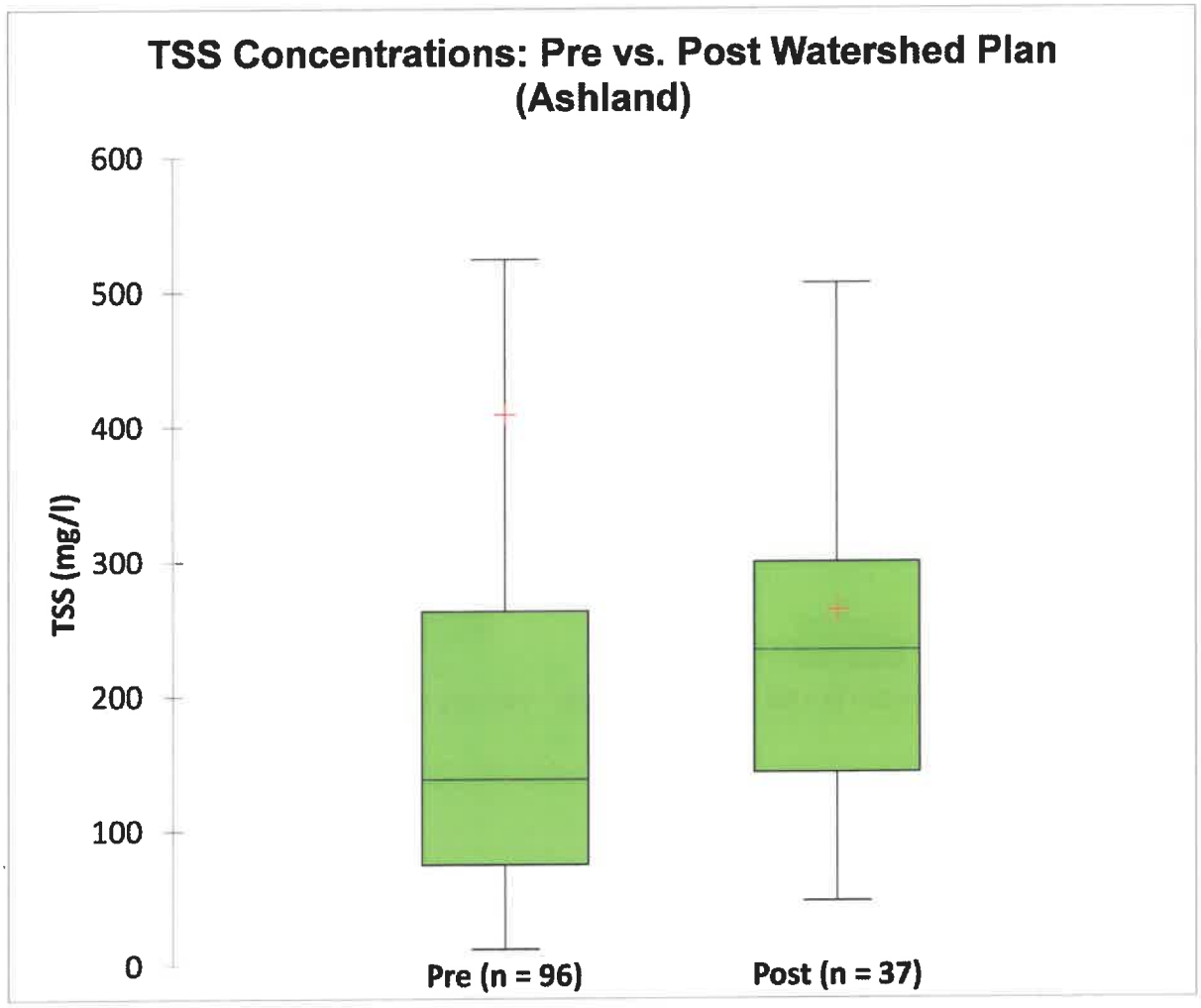


Figure 15.2

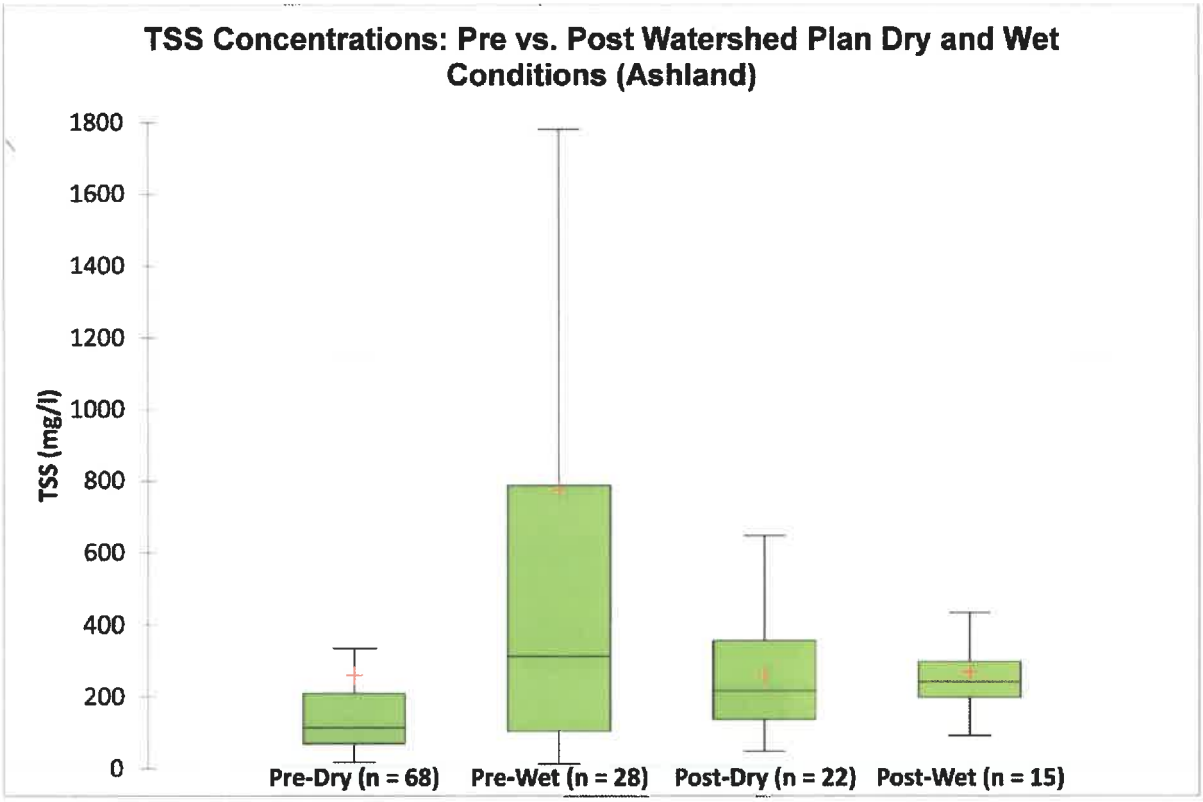

TSS Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ashland)
TSS (mg/l)
1800
1600
1400
1200
1000
800
600
400
200
0
Pre-Dry (n = 68)
Pre-Wet (n = 28)
Post-Dry (n = 22)
Post-Wet (n = 15)

Figure 15.3

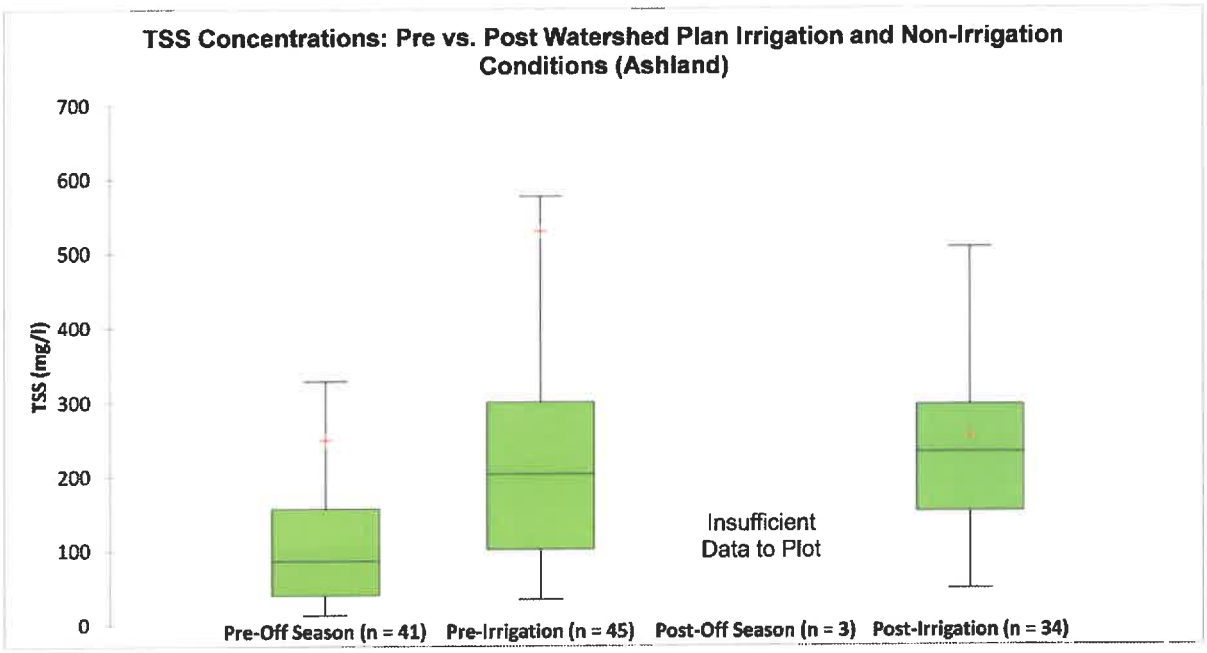

TSS Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ashland)
TSS (mg/l)
700
600
500
400
300
200
100
0
Insufficient Data to Plot
Pre-Off Season (n = 41)
Pre-Irrigation (n = 45)
Post-Off Season (n = 3)
Post-Irrigation (n = 34)

Figure 16 TSS Concentration Box Plots for Ithaca Gage

Figure 16.1

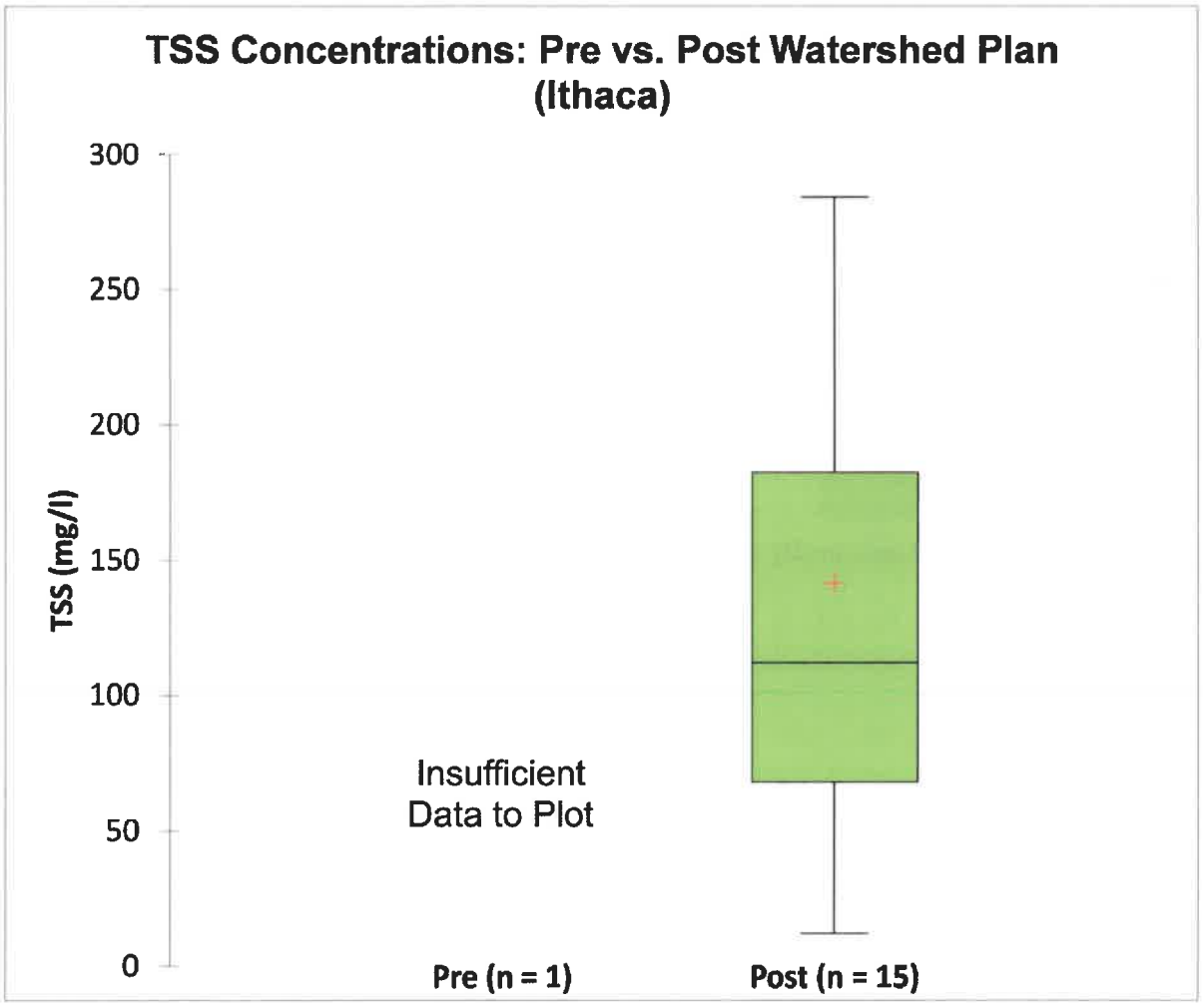


Figure 16.2

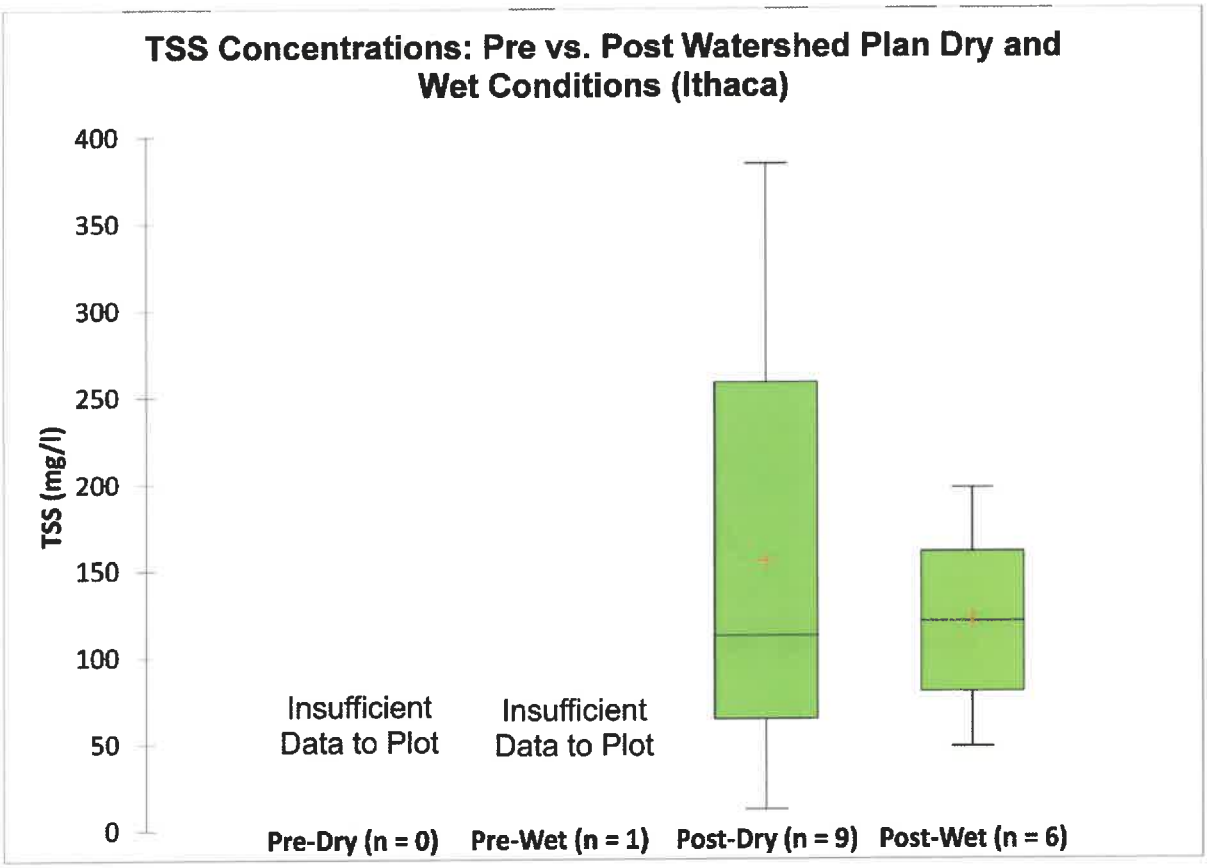

TSS Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ithaca)
TSS (mg/l)
400
350
300
250
200
150
100
50
0
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Dry (n = 0)
Pre-Wet (n = 1)
Post-Dry (n = 9)
Post-Wet (n = 6)

Figure 16.3

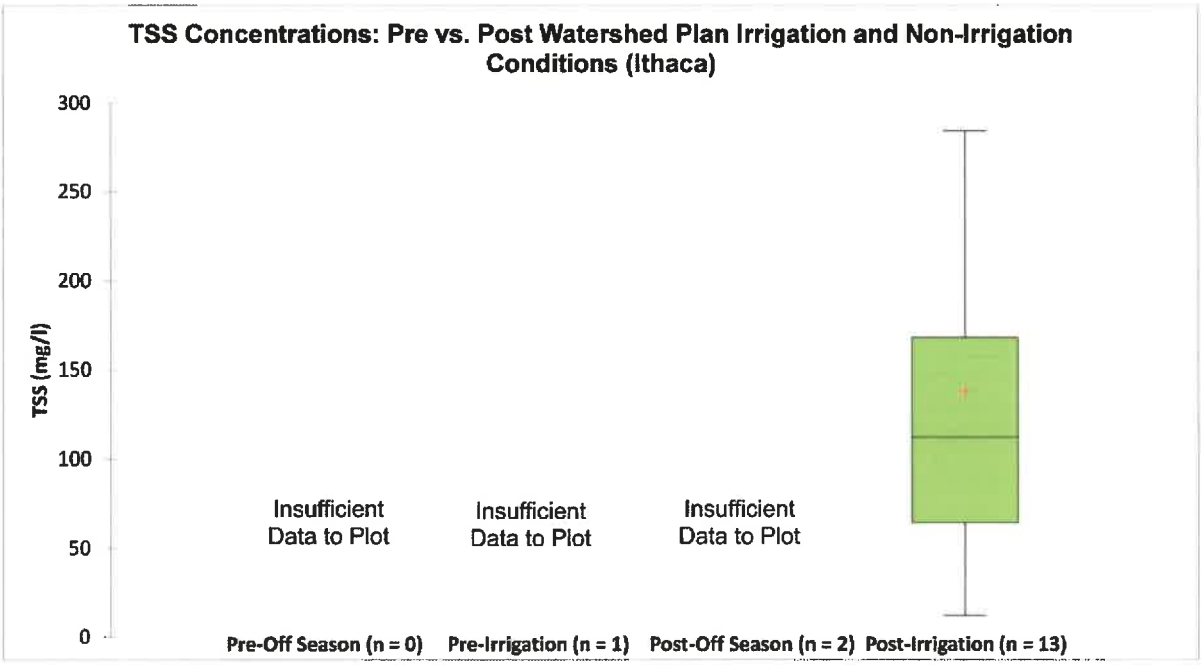

TSS Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ithaca)
TSS (mg/l)
300
250
200
150
100
50
0
Insufficient Data to Plot
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 0)
Pre-Irrigation (n = 1)
Post-Off Season (n = 2)
Post-Irrigation (n = 13)

Figure 17 *E. coli* Concentration Box Plots for Ashland Gage

Figure 17.1

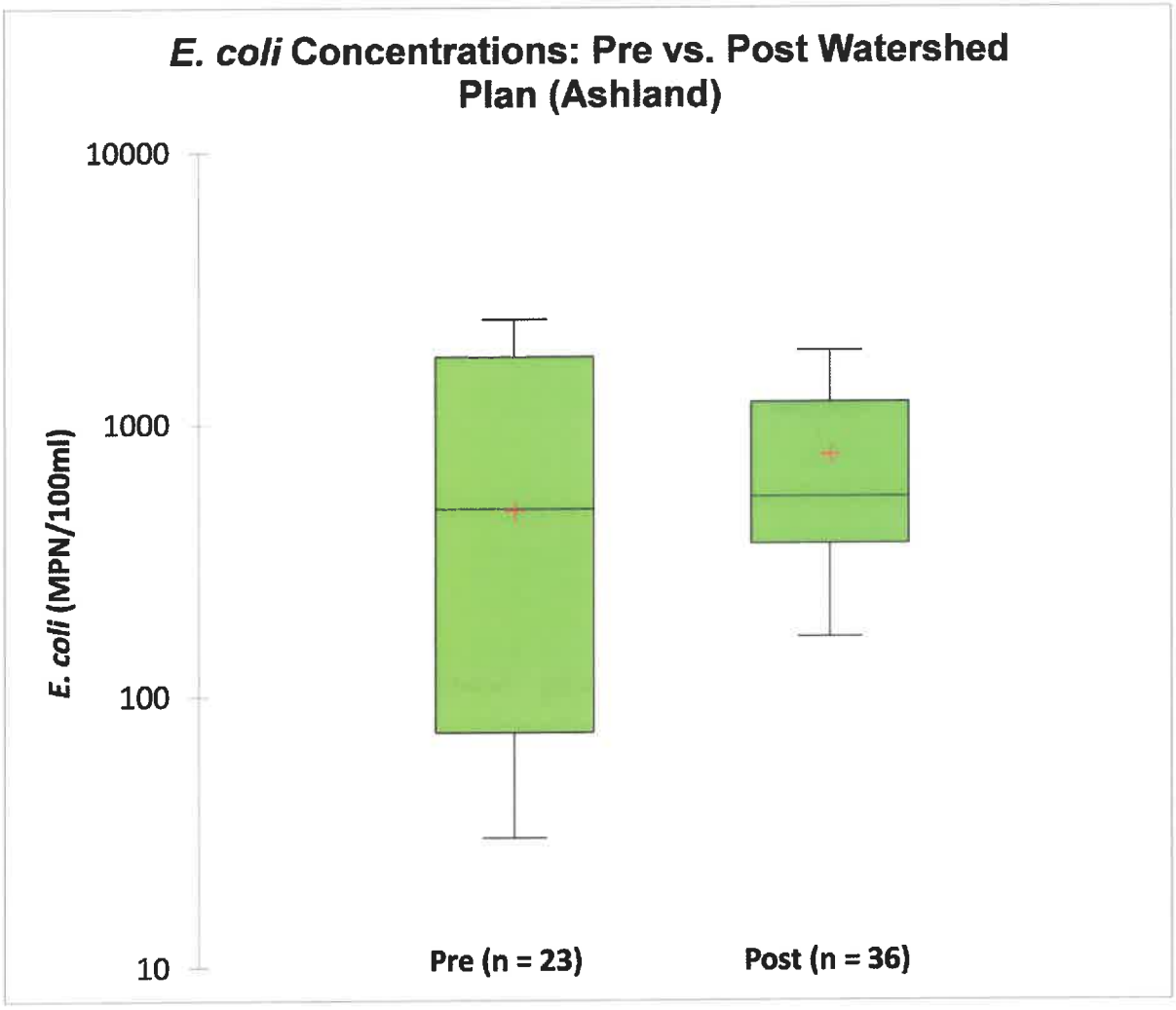


Figure 17.2

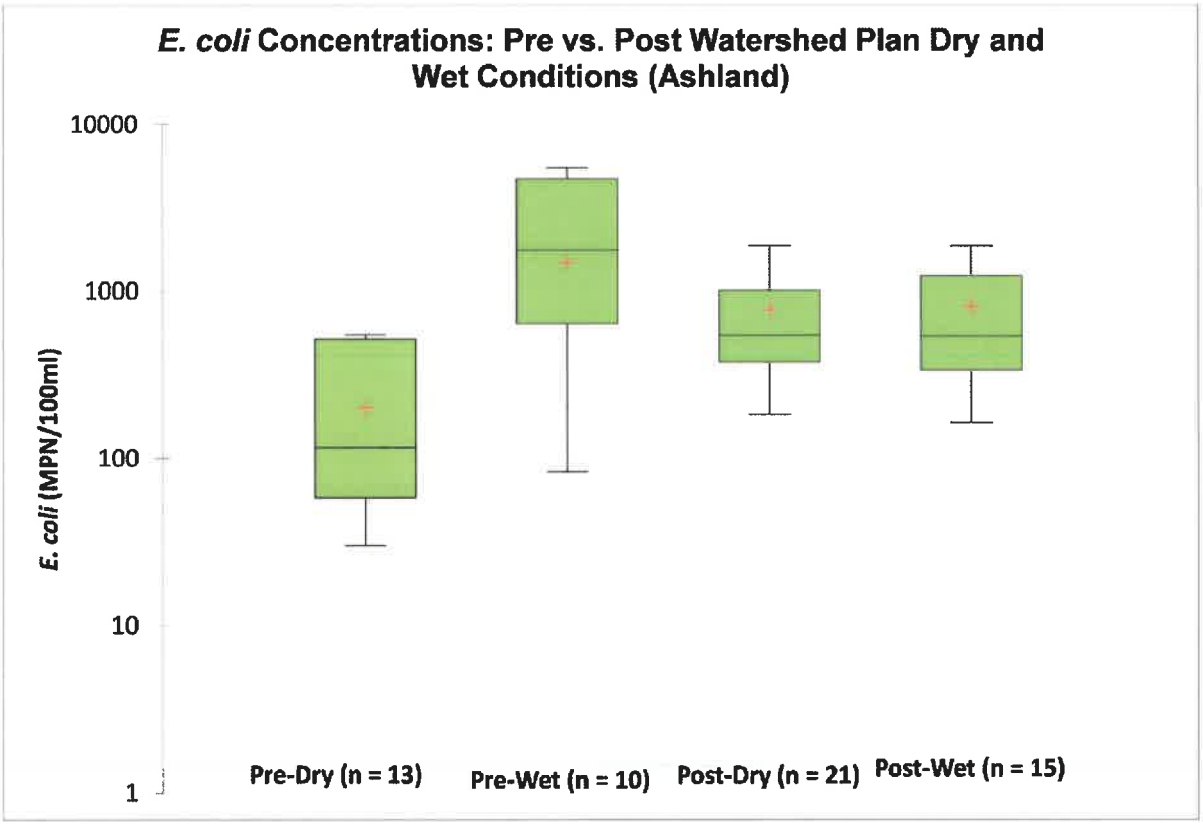

E. coli Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ashland)
E. coli (MPN/100ml)
10000
1000
100
10
1
Pre-Dry (n = 13)
Pre-Wet (n = 10)
Post-Dry (n = 21)
Post-Wet (n = 15)

Figure 17.3

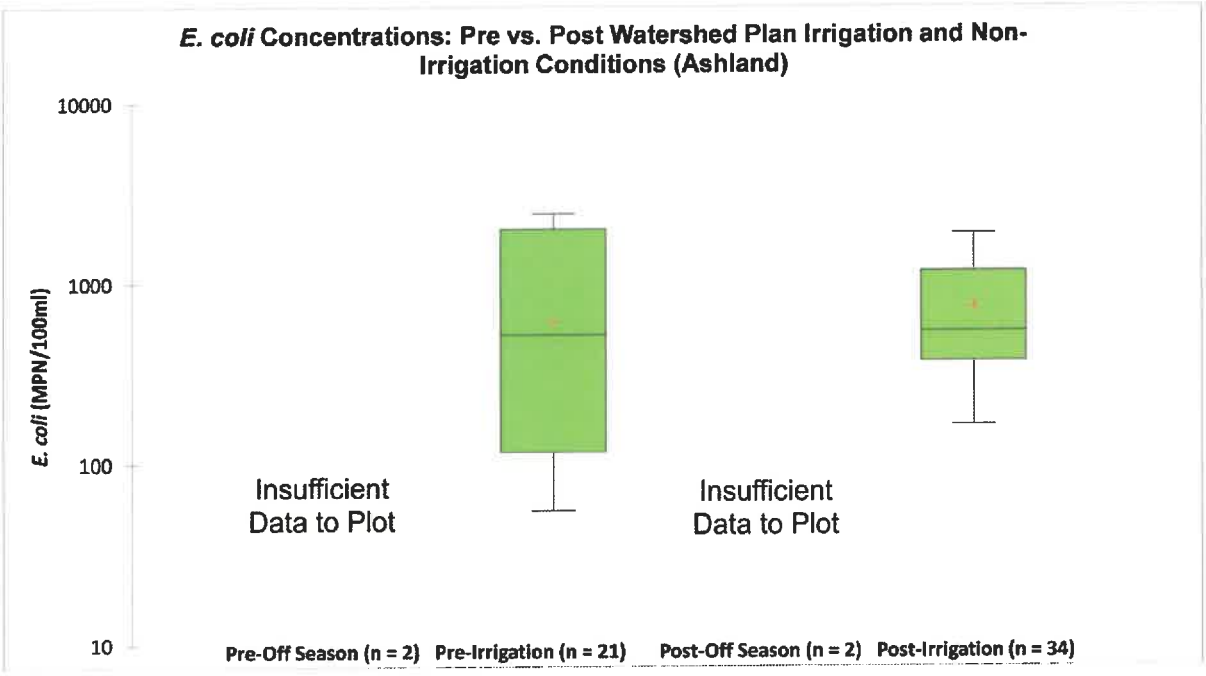

E. coli Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ashland)
10000
1000
100
10
E. coli (MPN/100ml)
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 2)
Pre-Irrigation (n = 21)
Post-Off Season (n = 2)
Post-Irrigation (n = 34)

Figure 18 *E. coli* Concentration Box Plots for Ithaca Gage

Figure 18.1

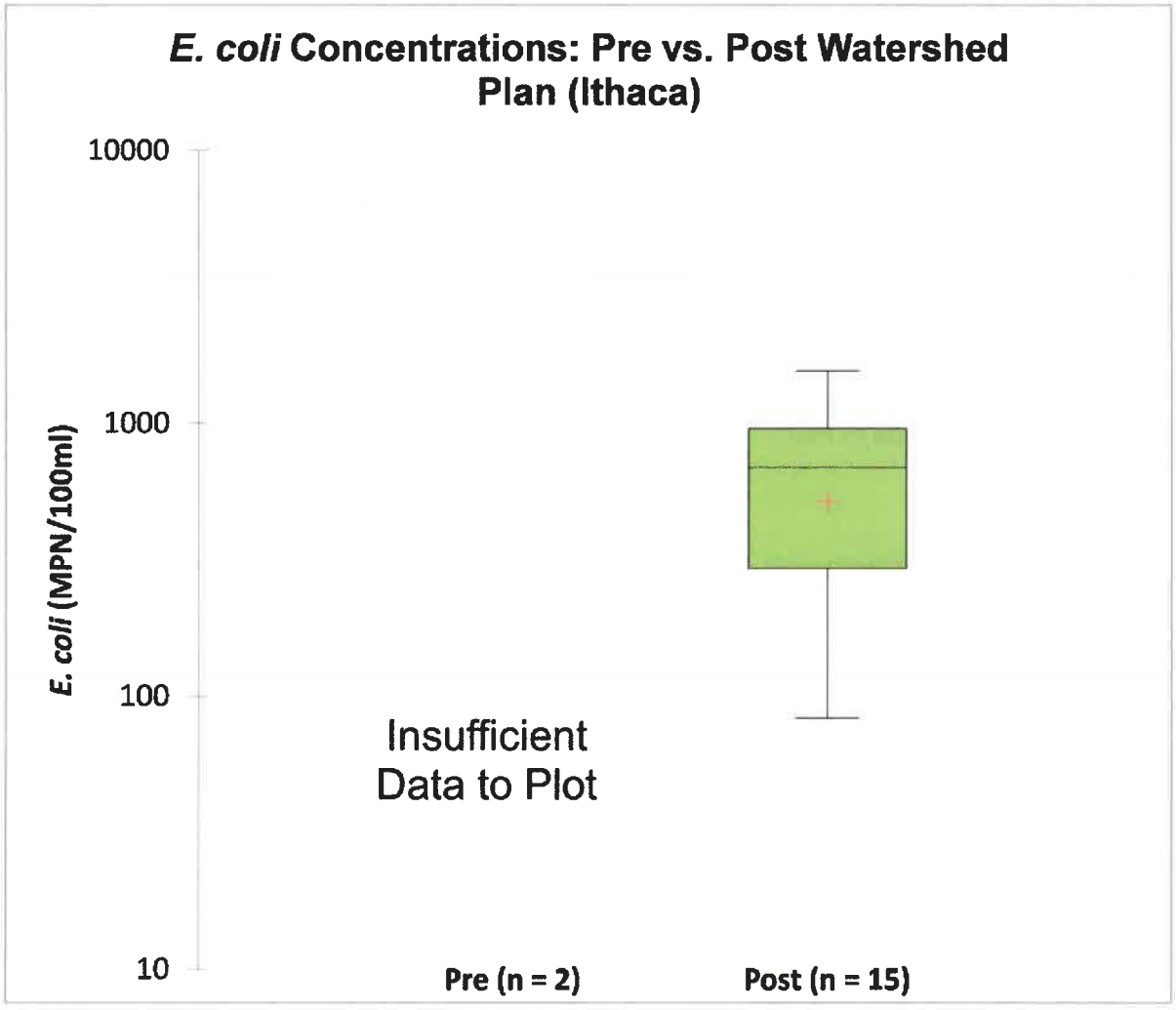


Figure 18.2

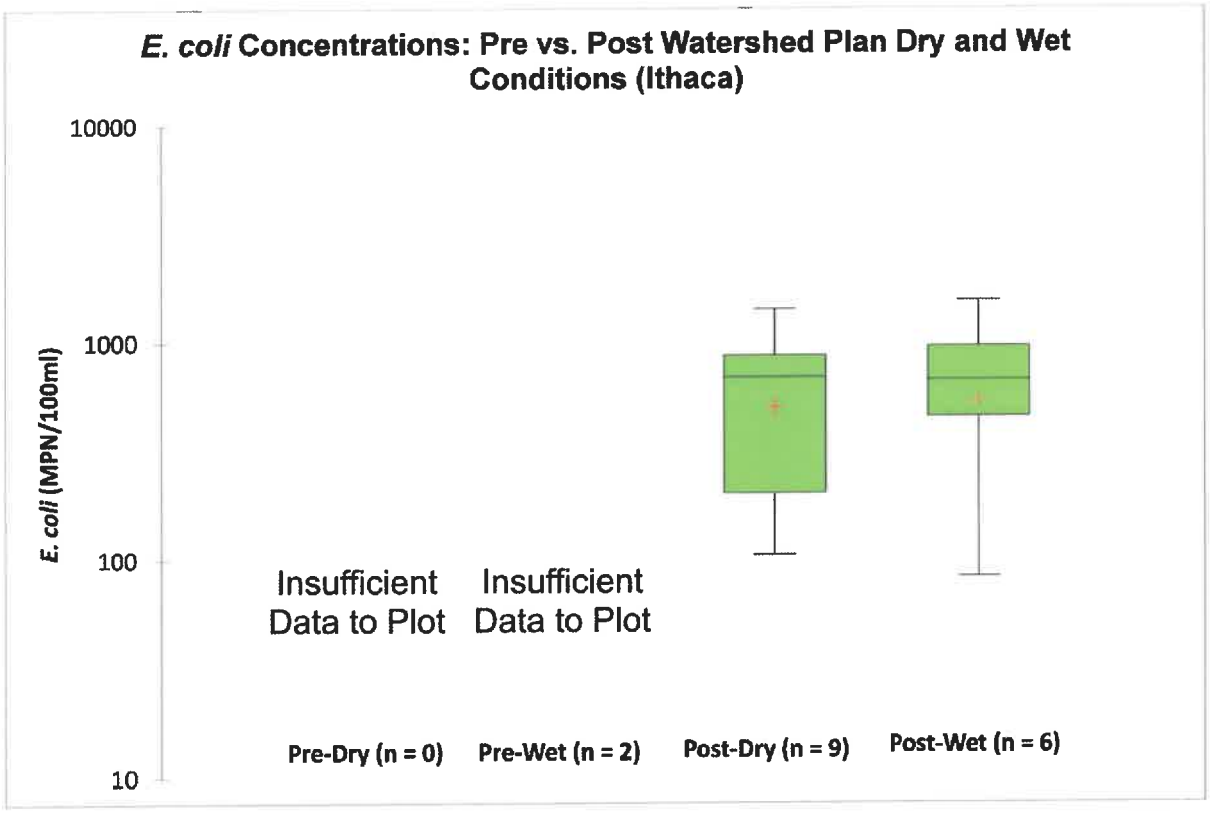

E. coli Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ithaca)
E. coli (MPN/100ml)
10000
1000
100
10
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Dry (n = 0)
Pre-Wet (n = 2)
Post-Dry (n = 9)
Post-Wet (n = 6)

Figure 18.3

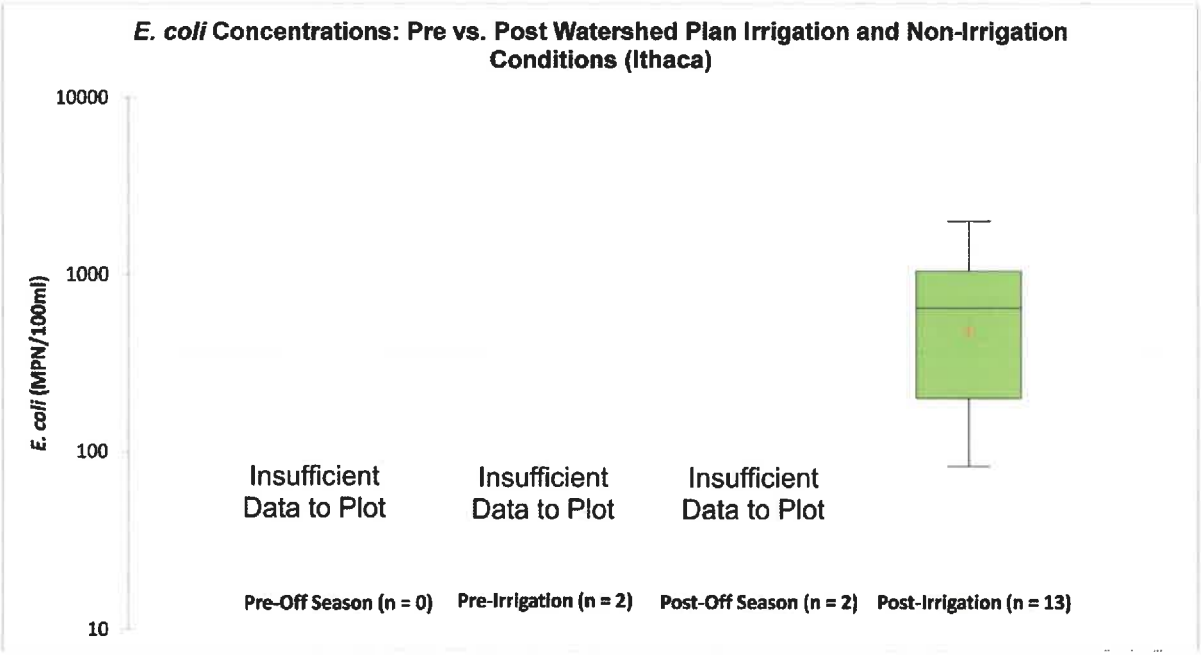

E. coli Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ithaca)
10000
1000
100
10
E. coli (MPN/100ml)
Insufficient Data to Plot
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 0)
Pre-Irrigation (n = 2)
Post-Off Season (n = 2)
Post-Irrigation (n = 13)

Figure 19 Atrazine Concentration Box Plots for Ashland Gage

Figure 19.1

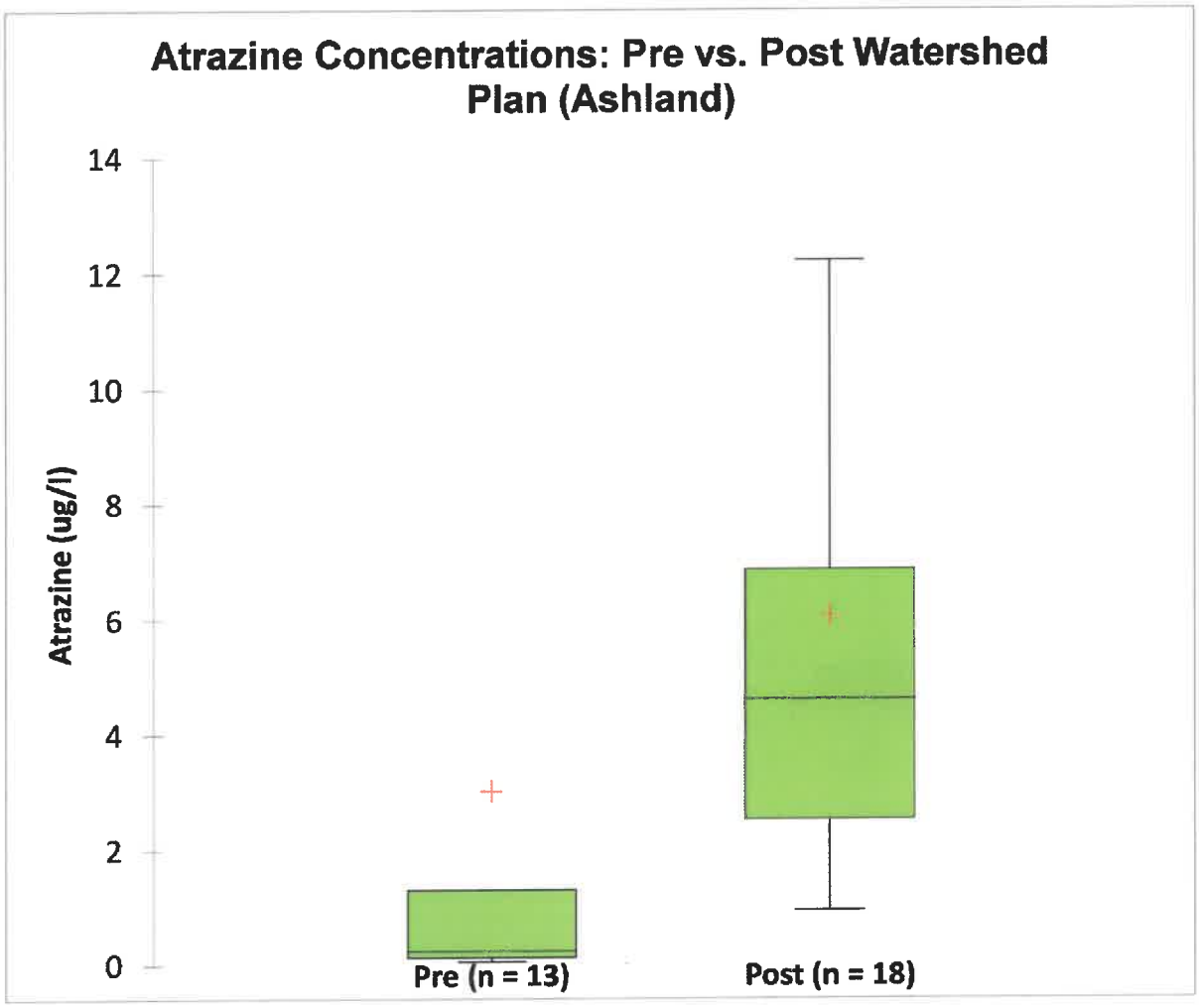


Figure 19.2

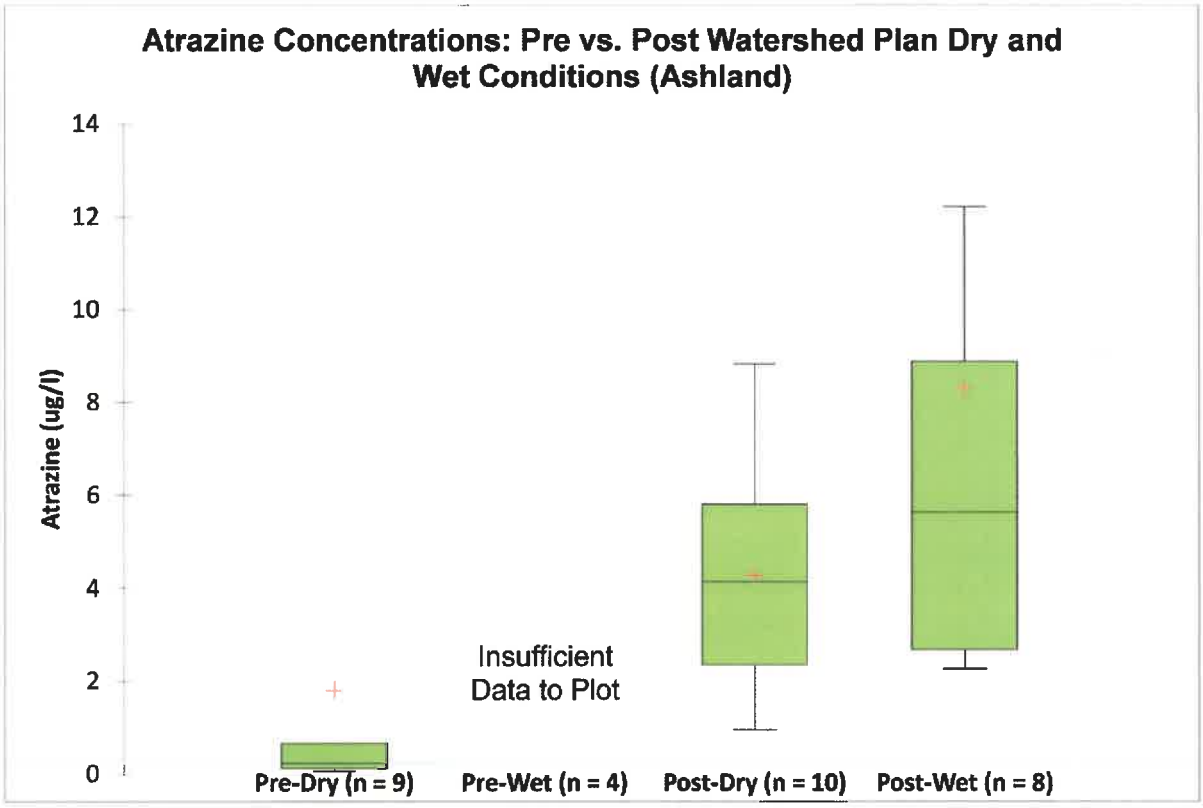

Atrazine Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ashland)
Atrazine (ug/l)
14
12
10
8
6
4
2
0
Insufficient Data to Plot
Pre-Dry (n = 9)
Pre-Wet (n = 4)
Post-Dry (n = 10)
Post-Wet (n = 8)

Figure 19.3

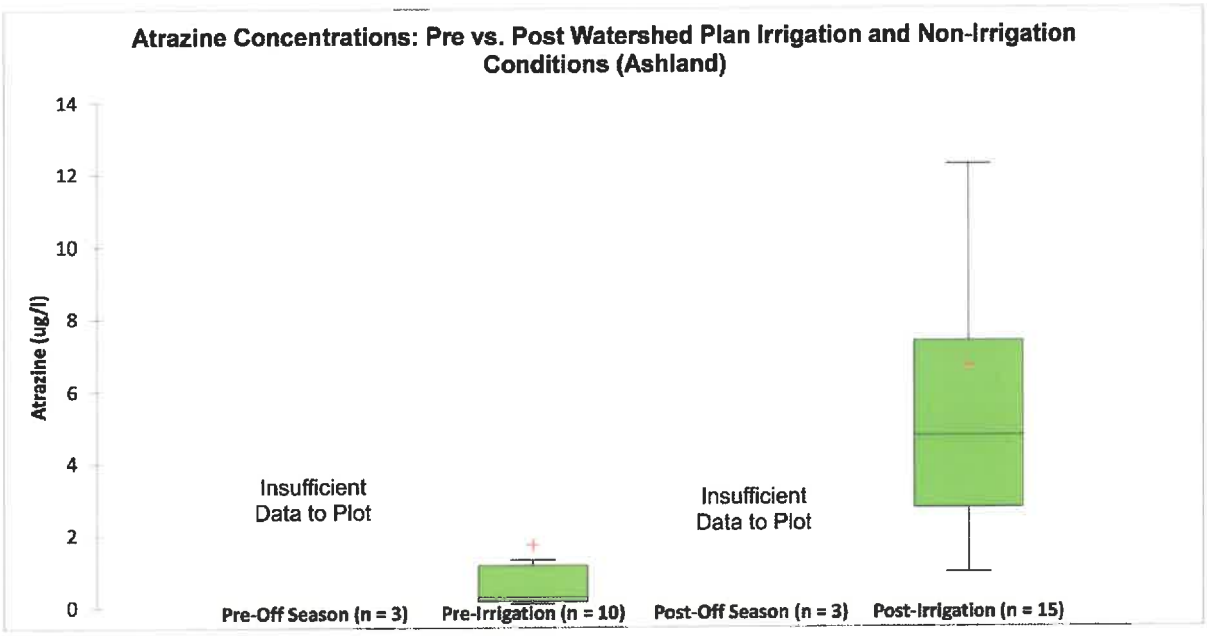

Atrazine Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ashland)
Atrazine (ug/l)
14
12
10
8
6
4
2
0
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 3)
Pre-Irrigation (n = 10)
Post-Off Season (n = 3)
Post-Irrigation (n = 15)

Figure 20 Atrazine Concentration Box Plots for Ithaca Gage

Figure 20.1

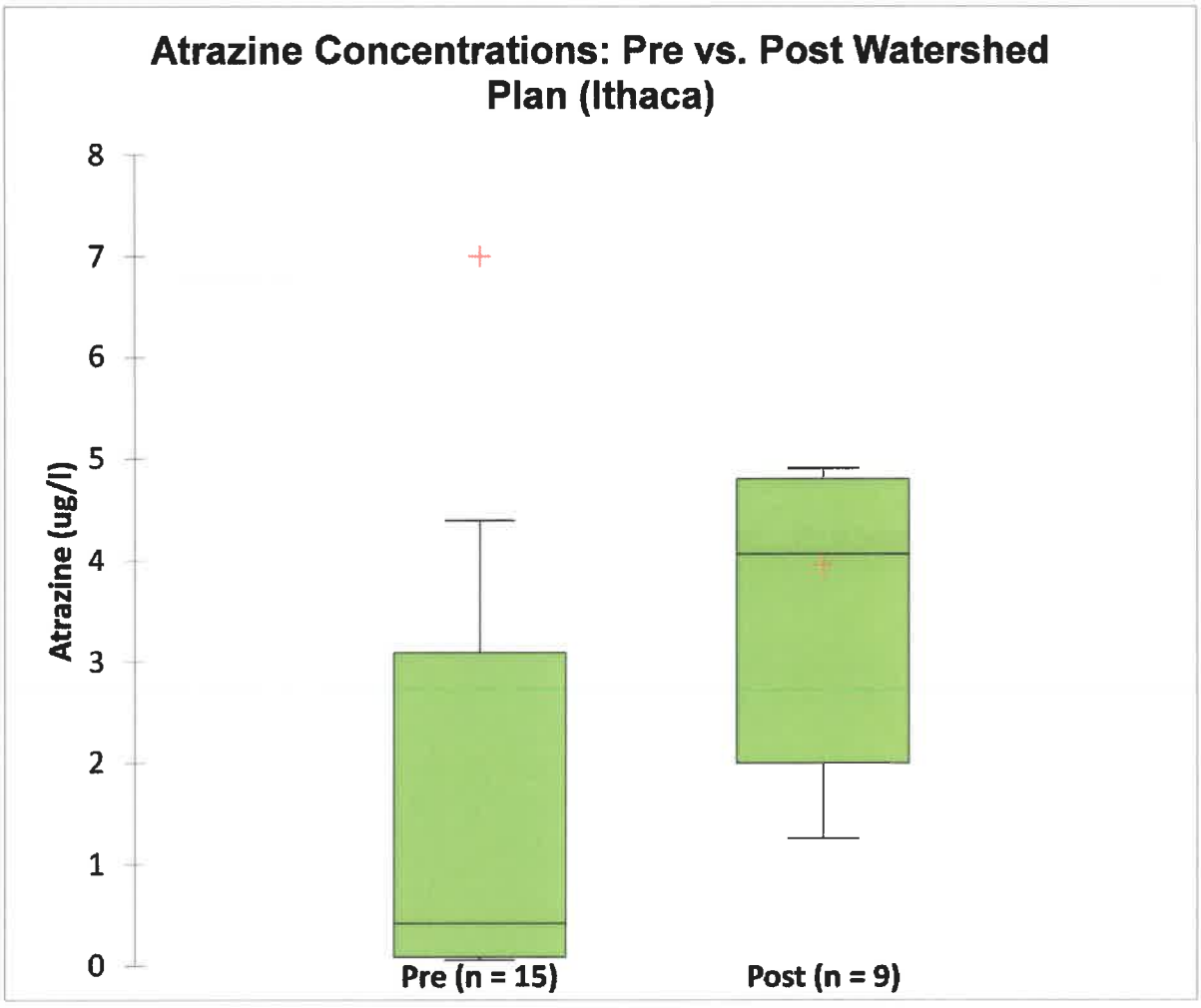


Figure 20.2

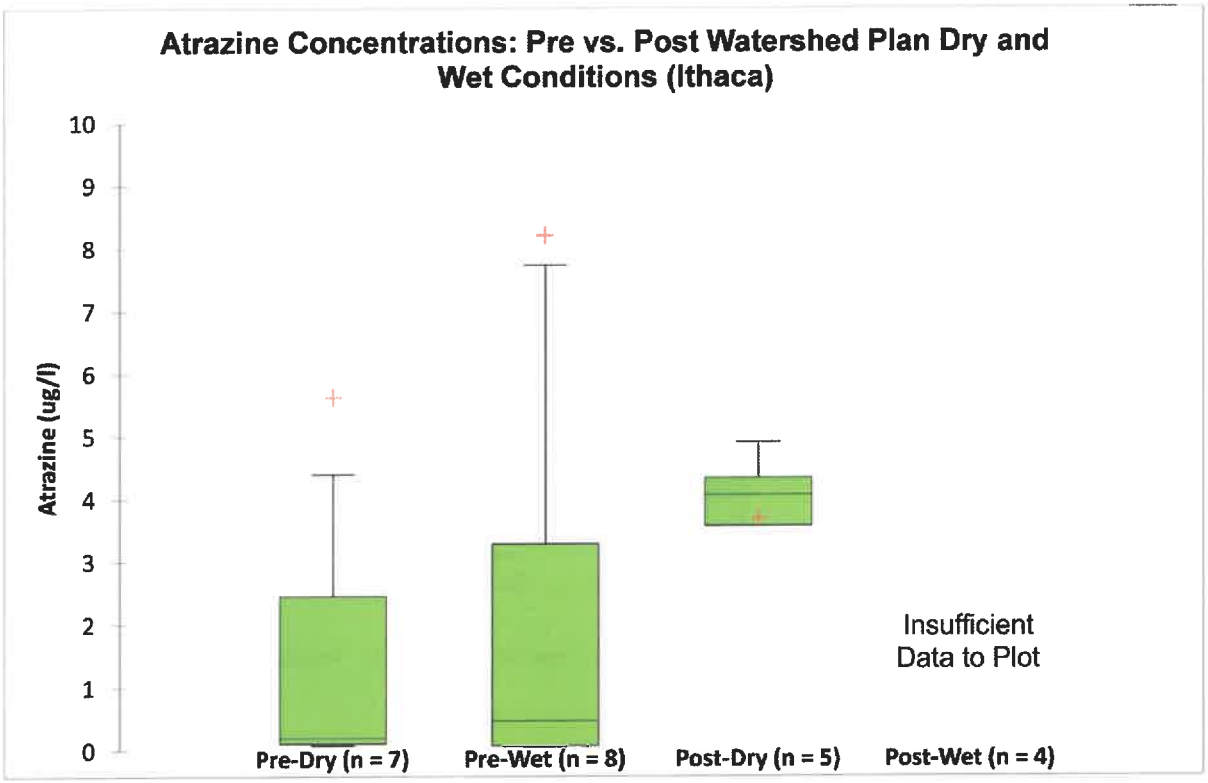
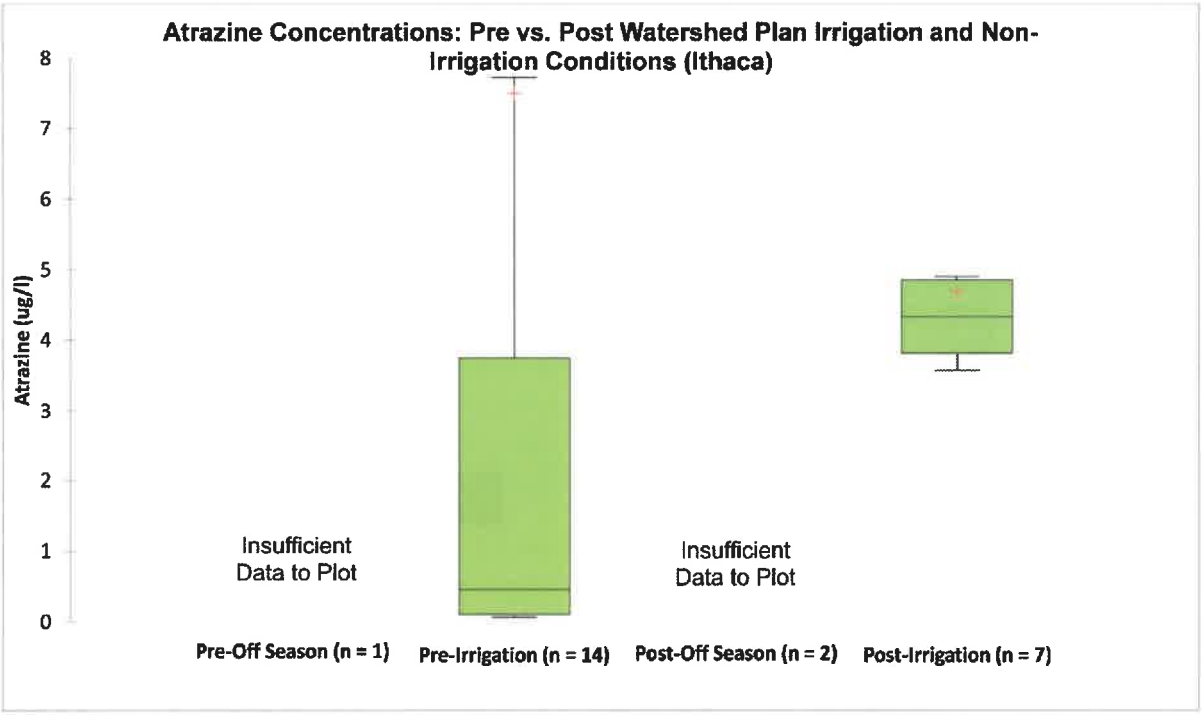

Atrazine Concentrations: Pre vs. Post Watershed Plan Dry and Wet Conditions (Ithaca)
Atrazine (ug/l)
10
9
8
7
6
5
4
3
2
1
0
Pre-Dry (n = 7)
Pre-Wet (n = 8)
Post-Dry (n = 5)
Insufficient Data to Plot
Post-Wet (n = 4)

Figure 20.3


Atrazine Concentrations: Pre vs. Post Watershed Plan Irrigation and Non-Irrigation Conditions (Ithaca)
Atrazine (ug/l)
8
7
6
5
4
3
2
1
0
Insufficient Data to Plot
Insufficient Data to Plot
Pre-Off Season (n = 1)
Pre-Irrigation (n = 14)
Post-Off Season (n = 2)
Post-Irrigation (n = 7)

Engineering | Architecture | Surveying | Planning

JEO CONSULTING GROUP

Invoice

July 28, 2021
Project No: R170124.00
Invoice No: 126084
Invoice Amount: 634.50

Lower Platte North NRD
511 Commercial Park Road
PO Box 126
Wahoo, NE 68066

Project Manager Adam Rupe

Project R170124.00 Lower Platte North NRD Wahoo Creek WQMP Update

Professional Services through July 23, 2021

	Contract Amount	Percent Complete	Billed-to-Date	Previous Billing	Current Billing
	0.00		0.00	0.00	0.00
Lump Sum Phase(s)					
Task 1: Evaluate Water Quality Data	$4,540.00	100 %	$4,540.00	$4,270.00	$270.00
Task 2: Quantify Pollutant Loads	$13,240.00	70 %	$9,240.00	$9,240.00	0.00
Task 3: Quantify Pollutant Reductions	$11,420.00	0 %	0.00	0.00	0.00
Task 4: Project Management	$2,430.00	65 %	$1,579.50	$1,215.00	$364.50
Total	**$31,630.00**		**$15,359.50**	**$14,725.00**	**$634.50**
		Total Amount Due Upon Receipt :			**$634.50**

Email Invoice to: tmountford@lpnnrd.org and jbreunig@lpnnrd.org

ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

Monthly Progress Report
Wahoo Creek Watershed WQMP Update
Lower Platte North NRD

JEO Project #: 170124.00
Through: July 26, 2021

1. **Work completed during current period**
   - Ongoing coordination with LPNNRD and NDEE.
   - Internal project management.
   - Delivered updated version of water quality analysis memo
   - Pulling together data on BMP implementation records.

2. **Planned accomplishments for next period**
   - Complete data gathering on BMPs.
   - Refine water quality model and existing loads.

3. **Project schedule**
   - Project is on schedule

4. **Information needed from the LPNNRD**
   - None at this time

5. **Next Meeting Date and Time**
   - None at this time

6. **Other Notes**
   - Project team will continue to monitor COVID-19 health directives and recommendations, as they may relate to any meetings

Please contact Adam Rupe at 402.322.0377 or at arupe@jeo.com for any questions or concerns regarding this progress report

Joint Water Management Advisory Board
July 21, 2021 - 9:00 A.M.
Fremont Municipal Building, 2nd Floor Meeting Room,
400 East Military, Fremont Nebraska

Videoconference Meeting Participation Notice
Representatives on the Joint Water Management Advisory Board may Zoom into the meeting or may call into the meeting by dialing one of the numbers listed below, **but they will not be permitted to vote**.
Join Zoom Meeting
https://us06web.zoom.us/j/86170968094?pwd=QkZsdEhFUVhxb1hYU1kzVzJFbGFYZz09

Meeting ID: 861 7096 8094; Passcode: 872253
One tap mobile
+17207072699,,86170968094# US (Denver)
+12532158782,,86170968094# US (Tacoma)

Dial by your location
+1 720 707 2699 US (Denver)
+1 253 215 8782 US (Tacoma)
Meeting ID: 861 7096 8094

Agenda:

1. Meeting called to order – Bob Missel
2. Roll call.
3. Approval of the minutes from the February 23, 2021 meeting.
4. Grant Updates
    a. NEMA/FEMA 90% funding, 5% state and local funding
    b. North Bend Cutoff Ditch
    c. Rawhide Creek Watershed Work Plan
    d. East Fremont & Elkhorn Township Drainage Improvement Project
    e. Platte Township/West Fremont flood mitigation
    f. Platte River Gauge Monitoring
    g. Other grants
5. Breach Repair Updates
    a. North Bend Levee
    b. Fremont Rod & Gun Club Levee Breach
    c. Fremont Railroad & Farmland Levee Breach
6. Member updates
7. Public comments
8. Adjournment.

A meeting notice was printed in the Fremont Tribune and the agenda was posted at the Municipal Building on July 16, 2021, and was distributed to the governing partners of the advisory board. The official current copy of the agenda is available at Municipal Building, 400 East Military, office of the City Clerk. A copy of the Open Meeting Law is posted in the 2nd floor meeting room for review by the public.

Joint Water Management Advisory Board
Meeting Minutes, February 23, 2021 - 9:00 A.M.
Fremont Municipal Building, City Council Chambers,
400 East Military, Fremont Nebraska

1. **Meeting called to order**. A meeting of the Joint Water Management Advisory Board (JWMAB) was called to order by Bob Missel. It was noted that a copy of the Open Meetings Act is posted continually for public inspection near the entrance door and a notice of the meeting was printed in the Fremont Tribune.
2. **Roll call.** Authorized representatives and guests attending in person and by Zoom were asked to identify themselves and are shown on the attached attendance sheet. A quorum was established by only those attending in person.
3. **Approval of the August 4, 2020 meeting minutes**. A motion was made by Pollard and seconded by Nielsen to approve the meeting minutes as submitted. Ayes: City of Fremont: Jensen; Ames Dike: Hansen; SID #3: Eckerman; SID #5: Getzschman; Lower Platte North Natural Resource District (LPNNRD): Olson and Pollard; Dodge County: Missel; Inglewood: Nielsen; and North Bend Drainage: Ruzicka and Taylor; North Bend: Busse. Nays: none. Motion carried 9-0.
4. **Grant Updates.**
    a. **Review of the Dodge County Flood Mitigation, Disaster 4420 Flood Mitigation Projects.** Smith reported on 1) a nonstructural and planning project for the Rawhide Creek Watershed estimated at $745,000; 2) a structural project to improve drainage in East Fremont/ Elkhorn Township estimated at $800,000, and a Platte Township/West Fremont flood mitigation and drainage projects estimated at $250,000 for BRIC funding; 3) an existing structural project to increase the 4.2-mile North Bend Cutoff Ditch's capacity estimated at $1.6 million; 4) an existing structural project to repair the Fremont Rod & Gun Club Levee breach estimated at $485,000; 5) an existing structural project to repair the levee south of North Bend estimated at $1 million; 6) an existing structural project to repair the Fremont Railroad & Farmland Levee (FEMA obligated $507,830 and Community Develop Block Grant funds of $485,000); 7) a modeling and an emergency action plan with the Silver Jackets; 8) several nonstructural projects to floodproof and elevate homes in the County and Fremont; 9) US Army Corps of Engineers 205 Study to floodproof and elevate homes in Fremont; 10) Winslow acquisitions; 11) a Platte River monitoring grant to add river monitoring on the Highway 77 Bridge; 12) a project to increase flood warning capabilities in Fremont; and 13) several opportunities to apply for federal funding for flood mitigation projects.
    b. **Other grants.** Nothing to report.
5. **2021 flood status.** Smith reported on low land flooding that occurred along the Platte River and said the January ice jam cleared recently. Newton reported on the rumor that an ice jam on the Loup River caused more Platte River flooding.
6. **Platte River ice jam removal agreement.** Missel reported that four Counties (excluding Dodge County) and three Natural Resource Districts signed an agreement in 1993 to dynamite ice jams. It was noted that the Platte River south of Fremont, where most of the ice jams occur, cannot be dynamited due to proximity

to Highway 77, Burlington Northern's Railroad Bridge, and the Northern Natural Gas Pipeline under the river.

7. **Member Updates.** Mountford reported that the Joint Water Management Advisory Board partners are working to respond to the 2019 flood through several mitigation projects including, repairs to Ditch #8, East Fremont & Elkhorn Ditch Drainage Improvement grant application, Rawhide Creek Watershed grant application, and other projects.
8. **Public Comments.** none
9. **Adjournment.** A motion was made by Jensen and seconded by Nielsen to adjourn the meeting at 10:00 am. By roll call vote, the motion was approved 9-0.

Minutes prepared by Brian Newton, Fremont City Administrator

Joint Water Management Advisory Board Meeting Roll Call/Attendance
February 23, 2021

Name	Representing/Guest	Are you the Authorized Representative?	Email Address
BRIAN NEWTON	CITY OF FREMONT	NO	BRIAN.NEWTON@FREMONTNE.GOV
BOB MISSEZ	DODGE COUNTY	YES	BOBC@SAMPTERS.COM
Albert Nielsen	Inglewood	Yes	bertyn39975@Gmail.com
Mark Jensen	City of Fremont	Yes	Mark.Jensen@Fremontne.gov
FRANK POLLARD	Lower Platte North NRD	YES	pollard.flj@gmail.com
PAT TAWNEY	Dodge County	No	ffd104@hotmail.com
Justin Taylor	North Bend Drainage Dist.	No	Justin.taylorNB@gmail.com
Grant Hansen	Amos Diking dist	yes	gchansen85@gmail.com
John Miyoshi	Fremont Rod & Gun Club	yes	~~[illegible]~~ johnmiyoshi@icloud.com
Lon Olson	LPNNRD board	No	Lon.olson@msn.com
JOEN SPELLERBERG	CITY OF FREMONT	NO	
MARLIN ECKERMAN	SID #3 VENTURA	Yes	
LARRY RUZICKA - NORTH BEND	DRAINAGE DITCH		
TERESA BUSSE - NORTH BEND			
SCOTT GOETSCHMAN - FREMONT	TIMBERWOOD		
TOM MONTFORD - LOWER PLATTE	NORTH NRD		
JULIE WINDMARSH - FREMONT			
~~[illegible]~~	~~[illegible]~~		
~~[illegible]~~			
LALIT JHA - JEO			
MARK BAKER - JEO			

ZOOM

INTERLOCAL COOPERATION ACT AGREEMENT
PLATTE RIVER CAMERAS/SENSORS
FOR
LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT
PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT
DODGE COUNTY
AND
CITY OF FREMONT

This Agreement (hereinafter named "Agreement") is made by and among the following Parties (all are political subdivisions of the State of Nebraska):

Lower Platte North Natural Resources District (LPNNRD)
Papio-Missouri River Natural Resources District (PMRNRD)
Dodge County (County)
City of Fremont (CITY)

The parties hereinafter being referred to individually as "Partner" and collectively as "Partners".

WHEREAS:

Flooding and resulting damages from winter ice jams and seasonal rainstorms frequently occur along the Lower Platte River corridor.

The Partners work closely with the National Weather Service, the Nebraska Emergency Management Agency and the Nebraska Department of Natural Resources to monitor winter ice/ice-out and flood stage conditions along the Lower Platte River corridor and take necessary actions to alert the public of resulting flood hazards.

The Partners desire to increase awareness of potential flood threats due to winter ice/ice-out conditions and other significant seasonal rainstorm events, by establishing cameras and additional water monitoring sensors at mutually agreed upon locations along the Lower Platte River corridor.

The Partners desire to enter into an Interlocal Agreement for purchasing cameras, additional water monitoring sensors and other supporting equipment, for placement along the Lower Platte River corridor and for the future operation and maintenance of that equipment.

Dodge County Emergency Management has applied for FEMA/NEMA Hazard Mitigation grant assistance, up to $20,250 (75%), to potentially assist the Partners with the purchase and placement of ten (10) cameras, three (3) additional water monitoring sensors and other supporting equipment, at an estimated total project cost of $27,000.

THEREFORE, in consideration of the foregoing recitals and their mutual covenants hereinafter expressed, the Partners agree as follows:

1. **Authority:**
   The Partners desire to work together for purchasing and establishing cameras and water monitoring sensors and supporting equipment, at mutually agreed upon Lower Platte River locations and to make the most efficient use of their respective powers by cooperating on a basis of mutual advantage under the auspices of the Interlocal Cooperation Act (Neb. Rev. Stat. §§ 13-801 to 13-827). In furtherance of this cooperative effort the Parties desire to enter into this Interlocal Agreement with one another for joint and cooperative action for any power or powers, privileges or authorities exercised or capable of exercise individually by them as public agencies under the Interlocal Cooperation Act.

2. **Funding for Cameras, Water Sensors & Supporting Equipment Purchase:**
   The Partners agree to equally share the maximum local costs estimated at $27,000 ($6,750 each), for purchasing/placing up to ten cameras and three water sensors and supporting equipment.

   It is anticipated that the Partners may receive NEMA/FEMA grant assistance, reimbursable up to $20,250 (75%), based on the total maximum estimated project costs. Should grant funds be approved, the Partners actual total local share will be adjusted accordingly, up to $6,750 ($1,687.50 each). The County will be the subgrantee and fiscal agent for the NEMA/FEMA grant.

   LPNNRD will purchase and take the lead for placing all cameras, sensors and supporting equipment and bill each Partner for their equal share. If the NEMA/FEMA grant is approved, LPNNRD will submit expenses to the County for 75% reimbursement and bill each Partner for their equal monetary share of the remaining 25%, minus contributed in-kind credit.

3. **Camera/Equipment Operation, Maintenance and Data Subscription Expense:**
   The Partners agree to equally share on-going annual camera/sensor equipment operation, maintenance, and data subscription expense at an annual total cost not to exceed $10,000, or $2,500 maximum annual cost for each Partner. On behalf of the Partners, LPNNRD will enter into a contract for operation, maintenance and subscription services and annually bill each Partner for their equal share.

4. **Effective Date:**
   This Agreement becomes effective upon execution by all Partners. The original copy of this Agreement will be maintained as part of the records of LPNNRD, with a copy being provided to each of the Partners. The Agreement may be signed in counterparts, as necessary.

5. **Duration of Agreement:**
   This Agreement shall extend from the date of execution by all Partners and will remain in effect, unless mutually or individually terminated by one or more of the Partners upon an advance 90 day written notice.

6. **Amendments and Addendums of Agreement:**
   This Agreement may be amended, or Addendums added, subject to approval by all Partners.

7. **Indemnification:**
   The Partners assume no liability under this Agreement unless expressly accepted herein. Each party agrees to defend the other from and against all liabilities, obligations, losses, damages, claims, and demands arising from the acts of its respective officers, agents, or employees.

IN WITNESS WHEREOF, each Partner has caused this Agreement to be executed by its duly authorized officer as of the date and year.

Lower Platte North Natural Resources District

By: Gene Rupicka
Board Chairperson

Date: July 13, 2020

Papio-Missouri River Natural Resources District

By: _____
Board Chairperson

Date: 07-09-20

Dodge County

By: _____
Chairman, Board of Supervisors

Date: 7/15/20

City of Fremont

By: _____
Scott Getzschman, Mayor

Date: 6/30/2020

PRESS RELEASE

Contact: Tom Smith
Dodge County Emergency Management Director
Tel. 402.727.2785
Email: dodgecoema@gmail.com
FOR IMMEDIATE RELEASE
Date: 07/22/2021

Drainage Improvement Project-July 10th, 2021

Dodge County, Neb.— Dodge County Emergency Management is requesting residents share information on private property damage from the July 10th, 2021 rainstorm. The information provided will be used to complete the East Fremont and Elkhorn Township Drainage Improvement Project Application. Residents and businesses having any damage, minor to severe, can submit photos and a brief damage narrative at the Dodge County Nebraska Emergency Management Office webpage, click on the radial button that says, “Report Disaster Damage to Property”. A link to the site will also be posted on the Dodge County, NE Emergency Management Facebook page.

The City of Fremont, Dodge County, and Lower Platte North Natural Resource District, as part of the Joint Water Management Advisory Board, partnered to develop a drainage project to be readily implemented in the Elkhorn Township area including East Fremont. A project study will be completed to assess Fremont's internal drainage needs and examine the out-letting drainage ditch system in the Elkhorn Township area east of Fremont. This project will assess the holistic situation and propose project alternatives to be pursued and a finalized design to submit with a hazard mitigation application to State and Federal partners.

State and Federal partners require a costs analysis prior to approval of project funding. “The information collected from the public will help the City and County provide the cost justification to complete the drainage improvement project”, said Tom Smith Dodge County Emergency Manager. Community Meetings about the project will also be held over the next several months.

For more information about the project, please contact the Dodge County Emergency Management Office at 402.727.2785 or email emergencymanagement@dodgecountyne.gov.

Meeting Minutes

DATE AND TIME | July 19, 2021 @ 10:00 AM
PROJECT | Dodge County – Elkhorn Township Drainage Improvement
JEO Project #181941.00
MEETING | Kick-off Meeting
LOCATION | City of Fremont Offices

1. **Introductions and Roles**
   a. JEO Consulting Group, Inc
      i. Kevin Kruse – Project Manager
      ii. Lalit Jha – Project Principal
      iii. Mary Baker – FEMA Coordination
   b. Dodge County
      i. Tom Smith – County Emergency Manager
      ii. Bob Missel -Dodge County Supervisor
   c. City of Fremont
      i. Brian Newton – City Administrator
      ii. Pete Geaghan – Engineering Associate
   d. Lower Platte North NRD
      i. Tom Mountford – Assistant Manager
      ii. Sean Elliot – Projects/Rural Water Manager
      iii. Lon Olson – LPN Board Member
      iv. Frank Pollard – LPN Board Member
      v. Bill Saeger – LPN Board Member

2. **Project Status and Administrative Details**
   a. County/JEO agreement received (7/14/2021)
   b. Draft Invoice and Progress Report
      i. Task breakdown matches agreement
      ii. Invoices processed 4th week of every month
      iii. Can be emailed directly to County with a cc to City, NRD
   c. A formal kick-off meeting will need to be held with NEMA/FEMA. Tom Smith is working on that and will update Kevin as necessary.

3. **Review of Major Scope Items (See attached for full scope)**
      i. Phase 1 – Evaluation and Project Screening
         1. Project Kick-Off & Data Gathering
         2. Stakeholder Engagement
         3. H&H Analysis
         4. Alternative Identification
         5. Project Screening & BCA
         6. Selection of Preferred Alternatives and Final Study Phase Deliverables
         7. Initial Review with NEMA/FEMA
      ii. Phase 2 – Design and Grant Application (Final Scope to be determined upon completion of Phase 1)
         1. Design of Preferred Alternative

2. Stakeholder Engagement
3. HMGP Grant Application for Construction

4. Schedule

a. Schedule (see attached)

5. Stakeholder Involvement

a. Any other agencies to involve at regular intervals?
   i. Kevin to contact Scott Huppert – Dodge Co. Highway Superintendent
b. Phase 1 - Evaluation and Project Screening
   i. 2 Update meetings to JWMAB
      1. Discussion of using the kick-off meeting attendees as the Stakeholder Group. Tom Smith and others can provide necessary updates to the JWMAB as necessary.
   ii. 2 Community Open Houses
      1. Anticipated for August 2021 and April 2022
      2. Final dates TBD. Kevin to work with Tom/Brian on a final date and location
   iii. 10 One-on-One meetings with property owners (Final list to be determined when conceptual improvements have been developed)
      1. Potential landowners to include
         a. Julia Hindmarsh
         b. Michael Steinbach
         c. Tom Delaney
   iv. Regular technical discussions with County/City/NRD staff
c. Phase 2 – Design and Grant Application
   i. TBD

6. Data Needs (Kevin to send separate emails as follow up)

a. City of Fremont
   i. Storm Sewer GIS or CADD data
   ii. Water and Sewer data
      1. Will be useful when developing projects later on
   iii. Previous flood damages
      1. FEMA Public Assistance records
      2. Known flooding/damage locations
      3. Utility Impacts/Outages
         a. Sewer Treatment Plan By-Pass Pumping 2017
b. Dodge County
   i. Previous flood damages
      1. FEMA Public Assistance records
      2. Known flooding/damage locations
      3. Utility Impacts/Outages
   ii. Culvert/Bridge data (Kevin to discuss with Scott Huppert)
      1. Type/Size if available
   iii. Any previous property/easement information on what was turned over to County by drainage district
   iv. Tom Smith may have drone footage following 2019 of major ditches

v. Prior to meeting Tom Smith provided update on July 10, 2021 rain event. Kevin provided hard copy of Tom'summary.

c. Lower Platte North NRD
   i. LPN Owned and Operated Ditch Network
      1. GIS or CADD data
      2. As-Builts/Maintenance Records
   ii. Previous flood damages
      1. FEMA Public Assistance records
      2. Known flooding/damage locations
   iii. Groundwater level information
   iv. Previous studies – Tom Mountford to track down

7. Next Steps

a. Review City/County/NRD information on known flooding locations
b. Field Visit to identify specific study level survey needs (coordinate with Tom as necessary)
   i. Week of July 26 or August 2
   ii. Kevin will contact Scott Huppert (County), Pete Geaghan (City) and Sean Elliot (NRD) to invite them for site visit. JEO staff will be doing a full day of site visit. City/County/NRD staff can participate as available. Field survey needs will be identified during site visit and will be collected August 2021.
c. H&H model development for existing conditions
d. Existing Conditions Review with City/County/NRD
   i. October/November 2021
e. Alternative Development and Screening to follow
f. As projects are developed will need to have detailed discussion of future O&M responsibilities. Each project may be unique.

JEO CONSULTING GROUP

Engineering | Architecture | Surveying | Planning

Invoice

July 15, 2021
Project No: R181941.00
Invoice No: <Draft>
Invoice Amount: 0.00

Dodge County
435 North Park Avenue
Fremont, NE 68025

DRAFT

Project Manager Kevin Kruse

Project R181941.00 Dodge County Elkhorn Township Drainage Improvement

Professional Services through July 31, 2021

	Contract Amount	Percent Complete	Billed-to-Date	Previous Billing	Current Billing
Lump Sum Phase(s)					
Project Kick-Off & Data Gathering	$30,600.00	0 %	0.00	0.00	0.00
Stakeholder Engagement	$32,610.00	0 %	0.00	0.00	0.00
Hydrologic and Hydraulic Analysis	$87,480.00	0 %	0.00	0.00	0.00
Alternative Identification	$88,060.00	0 %	0.00	0.00	0.00
Project Screening and Preliminary BCA	$71,520.00	0 %	0.00	0.00	0.00
Selection of Preferred Alternative and Final Deliverable	$47,380.00	0 %	0.00	0.00	0.00
Initial Review with NEMA/FEMA	$7,340.00	0 %	0.00	0.00	0.00
Total	**$364,990.00**		**0.00**	**0.00**	**0.00**

Total Amount Due Upon Receipt : 0.00

Exhibit A: Scope of Work

DODGE COUNTY, NEBRASKA
Dodge County – Elkhorn Township Drainage Evaluation
Project Number: 181941.00

PROJECT OVERVIEW

The original Elkhorn River Drainage District was formed in 1909 and was in place until 1929, with the intention to maintain a series of ditches east of Fremont to reduce flooding and enhance agricultural operations. Since that time, inconsistent maintenance has resulted in sediment and vegetation-filled channels, hindering the systems' ability to convey stormwater from Fremont to the Elkhorn River.

Recently Dodge County; in partnership with the City of Fremont and the Lower Platte North NRD; were awarded FEMA Hazard Mitigation Grant Program (HMGP) funds with an Advanced Assistance grant. These funds are intended to be utilized for evaluating the existing conditions, development and screening of improvement alternatives, selection of a preferred alternative, development of a design and final grant application package for construction funds through FEMA's HMGP.

To accomplish this task JEO has developed the following scope of work broken down into two phases. The work associated with the evaluation phase will be initiated immediately upon authorization. The scope of work for "Phase 2 – Final Design and HMGP Application" presented in this authorization is brief and it is anticipated that upon completion of "Phase 1 – Evaluation, Development of Alternatives and Screening" a detailed scope of work for the subsequent tasks will be completed.

TASK SUMMARY

Phase 1 – Evaluation and Project Screening

- Step 1: Project Kick-Off & Data Gathering
- Step 2: Stakeholder Engagement (Evaluation Phase)
- Step 3: Hydrologic and Hydraulic Analysis
- Step 4: Alternative Identification
- Step 5: Project Screening and Preliminary BCA
- Step 6: Selection of Preferred Alternatives and Final Study Phase Deliverables
- Step 7: Initial Review with NEMA/FEMA

Phase 2 – Design and Grant Application (Final scope to be determined upon completion of Phase 1)

- Step 8: Design of Preferred Alternative(s)
- Step 9: Stakeholder Engagement (Design Phase)
- Step 10: HMGP Grant Application

SCOPE OF WORK

Phase 1 – Evaluation and Project Screening

STEP 1: PROJECT KICK-OFF & DATA GATHERING

1.1: Project Management (Evaluation Phase)

JEO will provide a project manager (PM) who will be responsible for developing and monitoring a comprehensive plan of work defining the project goals and priorities. This project scope shall serve as

the plan of work. The PM will organize, manage, and coordinate the disciplines required to accomplish the scope of services. The PM will also be responsible for maintaining the project schedule, budget, and work quality. JEO will ensure all deliverables are professionally produced and receive proper quality assurance and quality control (QA/QC) from the QA/QC Manager.

1.2: Study Level Field Survey and Site Visits

The JEO evaluation team will perform a site visit during the course of the evaluation phase. The site visit will be attended by the Project Manager, Lead H&H Modeling Engineer and the Lead Design Engineer. The purpose of the site visit will be to review the existing site conditions for the purpose of developing a comprehensive existing conditions model and also reviewing potential alternative improvements. During the site visit the team will also identify specific areas requiring detailed field survey.

Following the site visits by the evaluation team, JEO will mobilize a survey crew to collect necessary data. This data may include locations and or sizes of existing culvert/storm sewer pipes and channels. This information will not constitute a complete topographic survey and it is anticipated that additional survey will be required once a final alternative is selected and proceeds toward a final design.

1.3: Existing Data Gathering and Review

JEO will work with various local, state and federal agencies to compile available data that may be useful for model development and evaluation. It is anticipated that this data may include:

Dodge County/City of Fremont

- Assessor's property information
- Storm Sewer database
- County road culverts and ditches
- Current and future land use

Lower Platte North NRD

- Seasonal groundwater levels
- O&M information on NRD operated ditch network

NeDNR/USGS

- Post 2019 flood LiDAR and imagery
- Groundwater well registrations
- Elkhorn and Platte River flow data and flood studies

1.4: Previous Flood Damage Documentation

JEO will request flood damage documentation on residential and agricultural properties in the study area. This information could include photographs, insurance claims, news reports etc from any and all high-water events (not only 2019). This information will be used to validate the findings of the existing conditions modeling as well as for the future benefit cost analysis.

Step 1: Key Responsibilities/Assumptions

- It is anticipated that Dodge County/City of Fremont/Lower Platte North NRD will assign a single point of contact (POC) for the project for day to day communications.
- It is anticipated that the POC will assist JEO with acquiring permission for access to private property if necessary.

- Full topographic survey of the project area is not included.
- Deliverables:
    - Monthly invoices and progress reports.
    - Meeting agendas, materials, and minutes for facilitated meetings.

STEP 2: STAKEHOLDER ENGAGEMENT (EVALUATION PHASE)

2.1: Stakeholder Meetings

During the evaluation phase, JEO will attend up to two meetings of the Joint Water Management Advisory Board (JWMAB) to provide updates as well as answer questions. During these meetings JEO will provide a written status report and present findings to date. It is anticipated that the first of these meetings will be scheduled to coincide with the existing conditions modeling effort. The second meeting will include a presentation of the alternative actions and the preferred alternative.

Additional stakeholder meetings are anticipated during Phase 2 and a specific scope for these meetings will be developed following the selection of a preferred alternate.

2.2: Community Open Houses

During the evaluation phase, JEO will facilitate and attend up to two Open House meetings. It is anticipated that these meetings will be held in Fremont and the POC will assist in arranging a suitable location. The JEO team will develop a meeting invite and provide to the POC for distribution. The Open Houses will provide information on the overall project intent as well as the findings to date and will coincide closely with the schedule of the JWMAB meetings. The Open Houses will be attended by select members of the evaluation team with specific technical understanding of the project that will be able to answer detailed questions if necessary.

Additional community meetings are anticipated during Phase 2 and a specific scope for these meetings will be developed following the selection of a preferred alternate.

2.3: One-on-One Property Owners Meetings

During the final development and selection of recommended projects it is anticipated that specific one-on-one meetings with individual property owners may be beneficial. These meetings may be used to vet the acceptance of projects and to preliminarily discuss any land acquisition that may be necessary for a particular improvement. These meetings are for information purposes for the development of the alternatives and should not be considered negotiation meetings for land acquisition. (up to 10 meetings)

Step 2: Key Responsibilities/Assumptions

- The POC will assist in selection of an Open House location and distribution of invitations/notices
- The POC will assist/attend One-on-One meetings with landowners
- Additional stakeholder engagement is anticipated during the design phase and a scope for those meetings will be developed upon selection of a preferred alternative.

STEP 3: HYDROLOGIC AND HYDRAULIC ANALYSIS

3.1: Hydrologic Evaluation

The JEO team will develop a Hydrologic analysis using the HEC-HMS modeling software. Rainfall depths for applicable storms will be obtained from NOAA Atlas 14. Contributing drainage areas will be

delineated using the most recent available LiDAR information and sized appropriately based upon potential alternatives. Land use will be obtained from the National Land Cover Dataset and City of Fremont Land Use plans. Soil information will be obtained from the Web Soil Survey. Time of concentrations for individual sub-basins will be developed using TR-55 methodology.

3.2: Hydraulic Evaluation
The hydraulic evaluation will include a 1D/2D approach to analyze the pipe/ditch network for smaller storm events but also the overland flow conditions. The analysis will focus on main stem or trunk line infrastructure that impact flow conveyance across the entire study area. The analysis is not anticipated to include specific modeling of small lateral infrastructure that does not impact the overall flood extents. The analysis will be performed for a variety of storm events and not just the 100-year event and will be used as the basis of the alternative development as well as the Benefic Cost Analysis.

3.3: Groundwater Sensitivity Analysis
Seasonal groundwater levels in the area may have an impact on the performance of the existing drainage system. The JEO team will review the existing well log and/or monitoring well (if available) data and preliminarily evaluate the impacts of groundwater levels on the surface water drainage system. The evaluation will also include a sensitivity analysis to determine what impact (if any) the fluctuations in groundwater may have on the performance of the system.

3.4: Deficiency Identification
With the H&H and Groundwater Sensitivity Analysis underway, the JEO team will review the preliminary results to identify key deficiencies/bottlenecks in the system. These deficiencies are infrastructure that is either undersized or non-existent that could be improved to improve the performance of the system and may reduce the risk of flooding in the future.

Step 3: Key Responsibilities/Assumptions

- The H&H modeling will focus on trunk line/main stem infrastructure.
- The H&H modeling will be completed for a variety of storm events and will serve as the basis for future design and BCA efforts.

STEP 4: ALTERNATIVE IDENTIFICATION

4.1: Develop and Evaluate Alternatives for Preliminary Screening
JEO will formulate a reasonable list of alternatives targeted to meet flood reduction goals and other purposes identified. Alternatives will be sited based on the H&H analysis, collected resource information, and stakeholder input received. GIS will be used to identify appropriate drainage areas and initial sizing. Alignments/locations of infrastructure will be shown on maps. Detailed cost opinions and estimation of benefits will not be done for all alternatives at this time.

4.2: Preliminary Screening for Unfeasible Alternatives
JEO will facilitate and attend a meeting with Dodge County, City of Fremont and the Lower Platte North NRD to review the alternatives. It is anticipated that alternatives will be screened for high-level practicality. It is anticipated that some alternatives will be eliminated from further consideration, leaving 2 to 3 alternatives to move forward to the final screening task.

Step 4: Key Responsibilities/Assumptions

- Alternatives for preliminary screening will be conceptual in nature and not include a cost

opinion or estimation of benefits at this time.
- Preliminary screening will not include a quantitative review for regulatory compliance

STEP 5: PROJECT SCREENING AND PRELIMINARY BCA

5.1: Development of Screening Criteria
JEO will facilitate a study session with Dodge County, City of Fremont and the Lower Platte North NRD to develop the screening criteria and process. Screening criteria may include but not be limited to: FEMA eligibility, Benefit Cost Analysis, property acquisition needs, impacts to other utilities/agencies, regulatory considerations, political acceptance. Following the meeting with the stakeholders, JEO will prepare a screening methodology and submit for review. The screening methodology will determine which project characteristics will be needed for each project.

Following the review and approval of the screening methodology, the JEO team will begin populating the screening data for the practical alternatives identified in Step 4.

5.2: Preliminary Real Estate Needs
For each of the practical alternatives identified in Step 5, real estate needs will be identified. This analysis will be based on the existing Dodge County assessor's GIS database and will be broken down by parcel for each alternative. Detailed title search or property research effort will not be completed for each alternative at this time but will likely be necessary for the preferred alternative during the final design tasks. Preliminary real estate needs for the preferred alternative will be refined during the final design phase and should only be used for screening purposes.

5.3: Preliminary Cost Opinions
Opinions of cost will be developed in two stages for the purposes of screening. For each of the practical alternatives identified in Step 4, a conceptual opinion of cost will be developed. This opinion of cost will be based on recent bid tabulations in the area and will include contingencies for unknown items.

Following the preliminary screening process, it is anticipated that 2-3 alternatives will be selected to move forward to the Preliminary BCA. For these projects, the opinion of cost will be reviewed in further detail and refined.

5.4: Screening Refinement and Application
Throughout the screening process, refinements in the screening methodology may be necessary. If necessary, JEO will update the process one time to account for new information. Following the refinements, the screening methodology will be applied to the alternatives identified in Step 4. It is anticipated that 2-3 alternatives will be selected to move forward to the Preliminary BCA evaluation.

5.5: Preliminary BCA for Select Alternatives
A preliminary BCA will be completed for 2-3 alternatives. The opinions of cost will be refined as described in Step 5.3 and benefits for each alternative will be preliminarily determined. Benefits will be preliminarily calculated as defined in the FEMA BCA Toolbox and anticipated to include potential items such as:
- Structural flood depth reduction
- Damage avoidance to utilities/infrastructure
- Residential displacement
- Social benefits

- Preservation of emergency services
- Environmental benefits

5.6: Regulatory Review of Feasible Alternatives
JEO will facilitate and attend a meeting with representatives from the USACE to review the top 2-3 alternatives. The purpose of these meetings is to understand the preliminary regulatory impacts so that they can be incorporated into the final screening and selection of preferred alternatives. For this screening level assessment, a detailed wetland delineation or field work will not be completed, however this effort may be necessary for the preferred alternative during the final design phase.

Step 5: Key Responsibilities/Assumptions

- Upon final approval of the screening methodology, the modifications to the methodology will be minor.
- Conceptual level cost opinions for 8-10 alternatives
- Preliminary level cost opinions for 2-3 alternatives
- Preliminary level BCA for 2-3 alternatives

STEP 6: SELECTION OF PREFERRED ALTERNATIVE AND FINAL EVALUATION DELIVERABLE

6.1: Selection of Preferred Alternative for HMGP Funding
JEO will facilitate and attend a study session with Dodge County, City of Fremont and the Lower Platte North NRD to review and finalize the screening process and make a final recommendation on the preferred alternative. This decision will be based on screening criteria determined and populated in Steps 4 and 5. It is anticipated that the preferred alternative will maximize benefits for an eventual HMGP application for construction funds.

6.3: Develop Funding Program for Non-HMGP Alternatives
It is anticipated that not all of the practical alternatives will be eligible for HMGP funding. For these alternates JEO will document a funding strategy for the various agencies to consider. Funding strategies may include local funds, state and/or federal programs.

6.4: Final Evaluation Deliverables
JEO will prepare a final deliverable to document the H&H analysis, alternatives development and screening process. The final deliverable will include necessary maps, figures and data as necessary to document the decision-making process.

Step 6: Key Responsibilities/Assumptions

- The final preferred alternative will be a FEMA HMGP eligible alternative that maximizes federal funding.

STEP 7: INITIAL REVIEW WITH NEMA/FEMA

7.1: Review Preferred Alternative and Draft BCA with NEMA/FEMA
During the development of the final deliverable, JEO will facilitate and attend a meeting with representatives of NEMA and FEMA to review the preferred alternative. It is anticipated that the preliminary project scope as well as the preliminary BCA will be reviewed, and NEMA/FEMA will provide input on the eligibility of the preferred alternative for HMGP construction funds.

Phase 2 – Final Design and HMGP Application

The purpose of Phase 1 – Evaluation, Development of Alternatives and Screening is to identify, screen and ultimately scope the effort required effort for all Phase 2 – Final Design and HMGP Application. While the specific project limits are not yet known, it is generally assumed that the preferred alternative will include ditch/channel improvements between 3.25 and 8.25 miles with construction costs between $4.5 Million to $6.0 Million. The final selection of the preferred alternative will have a direct impact on the specific scope and schedule of Phase 2 services. It is anticipated that a detailed scope for all Phase 2 services will be developed at the completion of Phase 1 prior to proceeding with any Phase 2 efforts.

Generally the Phase 2 services will include the following tasks, but may be modified pending the results of the Phase 1 evaluation.

STEP 8: DESIGN OF PREFERRED ALTERNATIVE(S)
JEO will develop a final design of the preferred alternative. It is anticipated that the final design will include construction plans, specifications and bid documents.

STEP 9: STAKEHOLDER ENGAGEMENT (DESIGN PHASE)
JEO will facilitate and attend a design phase community open house meeting. The final format and number of these meetings will be determined upon the selection of a preferred alternative.

STEP 10: FINAL BCA AND HMGP APPLICATION
JEO will develop an HMGP application for construction funds based on the final design of the alternative and cost opinion. The opinion of cost and the project benefits will be updated throughout the project. The HMGP application will include a final BCA based on the FEMA BCA Toolkit and project narratives.

Project Fee

JEO will provide the services described above in two phases. A final scope of service and associated fees for Phase 2 – Final Design and HMGP Application will be developed at the conclusion of Phase 1.

Owner will be billed monthly for services. A Task Series breakdown of the project fee is provided below. Additional services can be provided based upon current hourly rates as requested by the owner. JEO will begin work immediately following the receipt of Notice to Proceed. JEO reserves the right to redistribute budget among tasks so long as the total fee amount does not change.

Project Tasks		**Base Fee**
Step 1	Project Kick-Off & Data Gathering	$30,600.00
Step 2	Stakeholder Engagement (Evaluation Phase)	$ 32,610.00
Step 3	Hydrologic and Hydraulic Analysis	$87,480.00
Step 4	Alternative Identification	$88,060.00
Step 5	Project Screening and Preliminary BCA	$ 71,520.00
Step 6	Selection of Preferred Alternatives and Final Study Phase Deliverables	$47,380.00
Step 7	Initial Review with NEMA/FEMA	$7,340.00
	Total Phase 1 – Evaluation and Project Screening	**$364,990.00**

Step 8	* Design of Preferred Alternative(s)	$310,990.00
Step 9	* Stakeholder Engagement (Design Phase)	$ 14,050.00
Step 10	* Final BCA and HMGP Application	$49,640.00
Total Phase 2 – Final Design and HMGP Application		**$374,590.00****
Total Project		**$739,580.00**

*A final scope and associated fee will be developed for Phase 2 – Final Design and HMGP Application at the completion of Phase 1 and the selection of the preferred alternative.

** The cost provided is based upon assumptions for known inputs of the FEMA BCA process such as real estate acquisition, long term maintenance, construction engineering (all of which are FEMA eligible expenses). The design budget presented in that application would generally be consistent with a brick-and-mortar project having construction costs of between $2.75 and $4.25 Million. For the purposes of this estimate, it is generally conservative to assume that those construction costs would include ditch/channel improvements for between 3.25 and 8.25 miles and may include widening, culvert improvements, fencing, seeding/erosion control. A project of this scale would require documentation of FEMA eligible benefits of $4.5 to $6 Million in order to secure FEMA funding for construction.
For the detailed estimate please see attached fee breakdown.

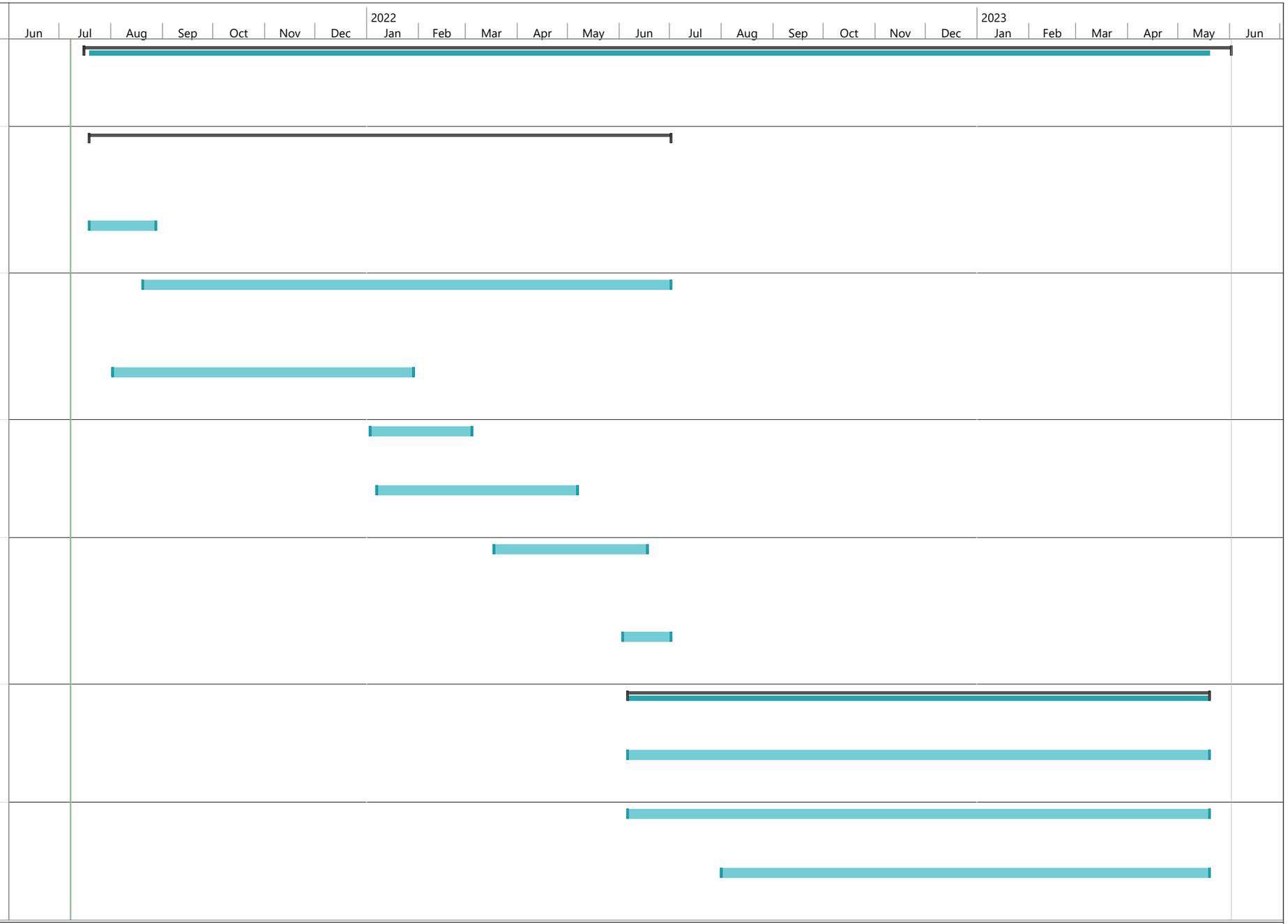
SERVICES NOT INCLUDED

- Additional meetings not mentioned in the above scope
- Regulatory permits
- Website hosting, maintenance, or other social media posts (beyond GIS Storyboard)
- Additional biological surveys or compliance with other agency requests not outlined in the scope of services
- Water quality sampling, stream gaging, analysis, or data acquisition
- Other data collection not outlined in the scope of services
- Design plans and cost estimates beyond conceptual/preliminary level
- Section 404, floodplain, or other permit applications
- Field investigation for wetlands or Waters of the US
- Field investigation for Nebraska Stream Condition Assessments Procedure (NeSCAP)
- Final design or construction engineering services
- Property, deed, or title searches
- Preparation of an Environmental Impact Statement (EIS)

PROJECT SCHEDULE

The anticipated project schedule is shown below. JEO will coordinate with Dodge County, City of Fremont and LPNNRD to ensure the schedules for project tasks are modified or maintained as needed. It is anticipated that Phase 1 of the project will be completed within 12 months of receiving notice to proceed.

ID	Task Name	Start	Finish
1	**Dodge County - Elkhorn Township Drainage Improvement**	**Fri 7/16/21**	**Thu 6/1/23**
2	**Phase 1 - Evaluation, Development of Alterntives and Screening**	**Mon 7/19/21**	**Fri 7/1/22**
3	Step 1: Project Kick-Off & Data Gathering	Mon 7/19/21	Fri 8/27/21
4	Step 2: Stakeholder Engagement (Evaluation Phase)	Fri 8/20/21	Fri 7/1/22
5	Step 3: Hydrologic & Hydraulic Analysis	Mon 8/2/21	Fri 1/28/22
6	Step 4: Alternative Identification	Mon 1/3/22	Fri 3/4/22
7	Step 5: Project Screening and Preliminary BCA	Fri 1/7/22	Fri 5/6/22
8	Step 6: Selection of Preferred Alternative and FinalEvaluation Deliverable	Fri 3/18/22	Fri 6/17/22
9	Step 7: Initial Review with NEMA/FEMA	Fri 6/3/22	Fri 7/1/22
10	**Phase 2 - Final Design and HMGP Application**	**Mon 6/6/22**	**Fri 5/19/23**
11	Step 8: Design of Preferred Alternative(s)	Mon 6/6/22	Fri 5/19/23
12	Step 9: Stakeholder Engagement (Design Phase)	Mon 6/6/22	Fri 5/19/23
13	Step 10: Final BCA and HMGP Application	Mon 8/1/22	Fri 5/19/23



Project: schedule
Date: Thu 7/8/21

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

Project Name	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY2029	FY2030	FY2031	Total	Fed $	State $	Local $
Wahoo Creek Flood Reduction														
Wahoo Creek Planning														
Wahoo Creek 3 Dam Designs/ Permitng	100,000	150,000									250,000		150,000	100,000
Wahoo Creek 3 Dam Construction		1,825,000	1,825,000								3,650,000	1,350,000	1,380,000	920,000
Wahoo Creek 8 Dam Designs/Permiting	600,000	450,000	450,000								1,500,000	1,300,000		200,000
Wahoo Creek 8 Dams Construction				5,000,000	3,500,000	3,000,000	3,000,000	3,500,000			18,000,000	11,700,000	3,800,000	2,500,000
JWMAB Projects														
Platte River Breach Repair (Rod & Gun Club)	50,000										50,000			
Platte River Sensors/Cameras	6,000										6,000	4,500		1,500
Fremont East/Elkhorn Township (Eval)	66,500										66,500			66,500
Fremont East/Elkhorn Township (Const)		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	450,000			900,000
Fremont West/ Platte Township (Eval)	20,000										20,000			20,000
Fremont West/ Platte Township (Const)		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	450,000			450,000
Rawhide WFPO Projects		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	450,000			450,000
North Bend Drainage Distrcit Project	50,000	50,000									100,000			
Other Projects														
Schuyler Gates/Channel Project	25,000										25,000			25,000
Woodcliff 406 Stabilization	40,000	25,000	25,000								90,000			90,000
Shell Creek 319 WQ	300,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	1,200,000	600,000	100,000	300,000
Wahoo Creek 319 WQ	245,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	1,145,000	570,000	95,000	280,000
Lashara Drainage	31,000	31,000									62,000			
North Bend Dike Stabilization	13,000	50,000	50,000	50,000	50,000	50,000	50,000				313,000			200,000
Potential Project Requests														
Platte Center Bank Stabilization Project	25,000										25,000			25,000
Platte River 319 WQ (Bone/Skull)		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	900,000	540,000	90,000	270,000
Misc. Projects		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	900,000			900,000
Total	1,571,500	3,131,000	2,900,000	5,600,000	4,100,000	3,600,000	3,600,000	4,050,000	550,000	550,000	29,652,500	16,064,500	5,615,000	7,698,000