

Mr. Jason Craft, P.E.  
City Engineer  
City of Clinton  
611 South 3rd Street  
Clinton, Iowa 52733

**SUBJECT: CITY OF CLINTON, IOWA - 2024 OVERFLOW ACTIVATION MEMO**

Dear Mr. Craft

RJN Group, Inc. (RJN) is pleased to submit this memorandum documenting activation of the internal combined sewer overflow locations in Basin 6 for the calendar year 2024.

## **BACKGROUND**

Ultrasonic depth sensors were installed by RJN in 2015 to monitor flow levels at 16 known overflow locations in sewer system Basin 6. During high rain/flow events these locations are designed to allow flow to leave the combined sewer system and overflow by gravity into the storm sewer system. As further investigation of the Clinton sewer system continued, an additional 6 overflow locations were identified, resulting in a total of 22 internal overflow locations, most of which were installed during the 1989 sewer improvements. All of the overflows, with the exception of Overflow 53, have been monitored at various intervals since the start of the flow monitoring program in 2015. The exhibit in Appendix A shows the current status and location of each overflow.

Overflow 47 was removed in the summer of 2024. In previous years, the City has removed 12 of the original 22 overflow locations, leaving 10 remaining at the end of 2024. Table 1 indicates how each remaining overflow is currently monitored. The remaining overflows are being monitored either directly, with sensors at the overflow location, or indirectly (with sensors at a nearby location). The City currently has 10 depth sensors deployed at the locations shown in Table 1. In January of 2021, RJN replaced the old sensors and installed new APG sensors and Ayyeka telemetry at the 10 current monitoring sites.

Both OFCLINT-45 and OFCLINT-46 are monitored by the sensor labeled OFCLINT-46. These overflows split the flow exiting one sanitary manhole to two storm manholes. The flow volume attributed to OFCLINT-46 includes the flow volume at OFCLINT-45. As OFCLINT-45 and OFCLINT-46 are monitored by one sensor, and the two have a single initiation point, they are counted together as one overflow site out of the 22 locations.

It should be noted that multiple sensors were not functional throughout portions of the year. Telemetry, meter, and contract issues prevented data collection and maintenance in parts of the Spring of 2024. New equipment was purchased and installed in July. Table 2 details any other significant periods of malfunction.

Table 1 – Overflow Status

Overflow Site	Sanitary Manhole #	Storm Manhole #	Flapgate?	Location	Currently Monitored	Removed
OFCLINT-31	1829	5223	-	253-299 11th Ave N	N/A	2017
OFCLINT-32	1818	5222	-	320 10th Ave N	N/A	2017
OFCLINT-33	2759	5226	Y-rect	201-227 Lee Ct	Depth Sensor	
OFCLINT-34	2723	5218	Y-rect	300-316 7th Ave N	Depth Sensor	
OFCLINT-35	2725	5217	Y-rect	701 Park Pl	N/A	2018
OFCLINT-36	2727	5773	Y-rect	401 7th Ave N	N/A	2020
OFCLINT-37	1129	5214	Y-rect	399 6th Ave N	N/A	2020
OFCLINT-38	1125	5213	Y-circular	422 N 4th St	Depth Sensor	
OFCLINT-39	2728	5212	Y-rect, screw	408 4th Ave N	N/A	2020
OFCLINT-40	1121	5210	Y-circular	503 n 5th st	N/A	2020
OFCLINT-41	2174	5376	No	210 S Bluff Blvd	N/A	2021
OFCLINT-42	1242	5377	No	240 S Bluff Blvd	N/A	2021
OFCLINT-43	2733	5386	Y-rect	S 6th st 3rd Ave S	Depth Sensor	
OFCLINT-44	2736	5383	Y-rect	3rd Ave S and S 7th St	Depth Sensor	
OFCLINT-45	2738	5384	Y-rect	700-720 4th Ave S	*	
OFCLINT-46	2738	5385	Y-rect	700-720 4th Ave S	Depth Sensor	
OFCLINT-47	2719	5233	Y-rect	520 S 7th St	N/A	2024
OFCLINT-48	1285	5198	Y-rect	212-298 S 5th St	Depth Sensor	
OFCLINT-49	5200A	5200	Y-rect	303 S 3rd St	Depth Sensor	
OFCLINT-51	2067	5237	Y-rect	756 7th Ave S	Depth Sensor	
OFCLINT-52	1810	5564	-	8th Ave N & Pershing	N/A	2017
OFCLINT-53	137	5321	No	Glenwood Pl & Bluff Blvd	N/A	2018
OFCLINT-54	1977	5201	Y-rect	305 S 2nd St	Depth Sensor	

\* Currently monitored by the depth sensor at OFCLINT-46

Table 2 – Equipment Malfunction

Overflow Site	Period 1	Period 2	Notes
OFCLINT-33-15	8/12 - 10/12	10/23-12/31	Erratic telemetry caused missing data. Low signal location. Service visit scheduled for early 2025.
OFCLINT-38-15	7/14 - 7/15	8/27 - 8/29	Erratic telemetry caused missing data during 7/15 and 8/28 storms.
OFCLINT-46-15	7/18 - 8/6		Spotty telemetry caused missing data.
OFCLINT-48-17	7/15		New equipment installed 7/16 after the storm.
OFCLINT-49-17	8/27 - 8/29		Erratic telemetry caused missing data during 8/28 storm.
OFCLINT-51-17	7/15		New equipment installed 7/16 after the storm.
OFCLINT-54-17	7/15		New equipment installed 7/16 after the storm.

## ANALYSIS

The overflow activation table was compiled by using ultrasonic depth data to determine when the flow depth exceeded the overflow height. The overflow height is the vertical distance from the invert of the primary outlet pipe at the overflow location to the level where the overflow initially occurs. Table 3 shows the assumptions used to calculate the volume that passed through the overflow during a rain event.

**Table 3 – Calculation Parameters for Monitored Overflow Volumes**

Overflow Site	Calculation Method	Pipe Shape	Dimension	Slope	Overflow Height (in)
OFCLINT-33-15	Manning's Formula	Rectangular	35 in x 26.5 in	0.2	20.5
OFCLINT-34-15	Manning's Formula	Rectangular	36 in x 24 in	0.2	24.5
OFCLINT-38-15	Manning's Formula	Round	24 in	0.3	13.0
OFCLINT-43-15	Weir Equation	Rectangular	48 in x 22.25 in	1	36.4
OFCLINT-44-15	Manning's Formula	Rectangular	50 in x 24 in	0.3	24.0
*OFCLINT-46-15	Weir Equation	Rectangular	26 in x 45.5 in	1	28.7
OFCLINT-48-17	Manning's Formula	Rectangular	36 in x 24 in	0.3	20.7
OFCLINT-49-17	Manning's Formula	Rectangular	36 in x 24 in	0.3	30.0
OFCLINT-51-17	Manning's Formula	Rectangular	48 in x 24 in	1	30.4
OFCLINT-54-17	Manning's Formula	Rectangular	36 in x 24 in	0.3	36.5

\* OFCLINT-46-15 measures the sum of flows at OFCLINT-45 and OFCLINT-46

The flow volumes were estimated using Manning's formula for most of the overflow sites and the weir equation for sites OFCLINT-43 and OFCLINT-46. Appendix B shows the overflow activation table from January 2024 to December 2024. The overflow activation table shows the results of monitoring, as well as the 1-hour and 24-hour rainfalls for each day an overflow occurred. Note that in some cases the 24-hour period overlaps consecutive calendar days. For the dates where sensors were functional, the table shows the estimated overflow volumes calculated during each rain event at each overflow.

Due to City staff availability, rain data from the WWTP, 1<sup>st</sup> Ave LS, and 25<sup>th</sup> Ave LS rain gauges were not available for a few periods in 2024. Rain data was obtained from the National Oceanic and Atmospheric Administration (NOAA) Multi-Radar Multi-Sensor (MRMS) system at the centroid of Basin 6 for the entirety of 2024. Its Quantitative Precipitation Estimation (QPE) product is a 1km gridded national rainfall estimate using radar and satellite data to estimate rainfall rates, creating a good map of the spatial variation of rainfall. After correcting radar biases with 7,000 rain gauges, high-quality estimates of rainfall time series at any latitude and longitude can be obtained. Rjn has written a tool to fetch and process the MRMS QPE data from the publicly available map. This rain data was validated with the 2023 data from the City rain gauges; therefore, rain totals for 2024 were gathered from the NOAA MRMS data. Generally, less storms occurred in 2024, but those that did were of greater volume.

OFCLINT-54 shows the greatest response to rain events, as the overflow was recorded to have activated twice for a total volume of 2.67 million gallons (MG). It is difficult to compare total volume and activation frequency across years as many of the sensors were not operating in the Spring; regardless, the overflow volume and frequency when equipment is functional are similar to that of previous years.

## CONCLUSIONS

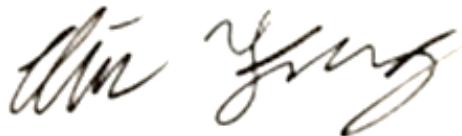
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In 2024, 12 million gallons (MG) was observed to discharge to 3<sup>rd</sup> Ave N and 3 MG to 9<sup>th</sup> Ave N. The overflow activation table for the 2024 monitoring data shows that the overflow site OFCLINT-34 activated the most frequently throughout 2024. Historically, OFCLINT-33 and OFCLINT-49 are the sites that tend to activate most frequently, but the meters were not functional for three of the large storms in 2024. While OFCLINT-51 and OFCLINT-54 did not frequently activate, they accounted for around 45% of the total recorded overflow volume from all sites. The storm that caused the most overflows to activate occurred on July 22 with nine recorded long-duration overflows. This storm was nearly a 5-Year, 1-Hour rain event and 9-Month, 24-Hour rain event. The storm produced a calculated overflow volume of 13.9 MG, 92% of the total recorded overflow volume in 2024.

Looking forward, the City plans to continue monitoring the 10 overflow sites in 2024. It has been our pleasure to provide flow monitoring services to the City of Clinton. We appreciate your cooperation on this project and look forward to continuing to work with the City through 2024 and in the future.

Sincerely,

RJN Group, Inc.



AJ Fernandez, P.E.

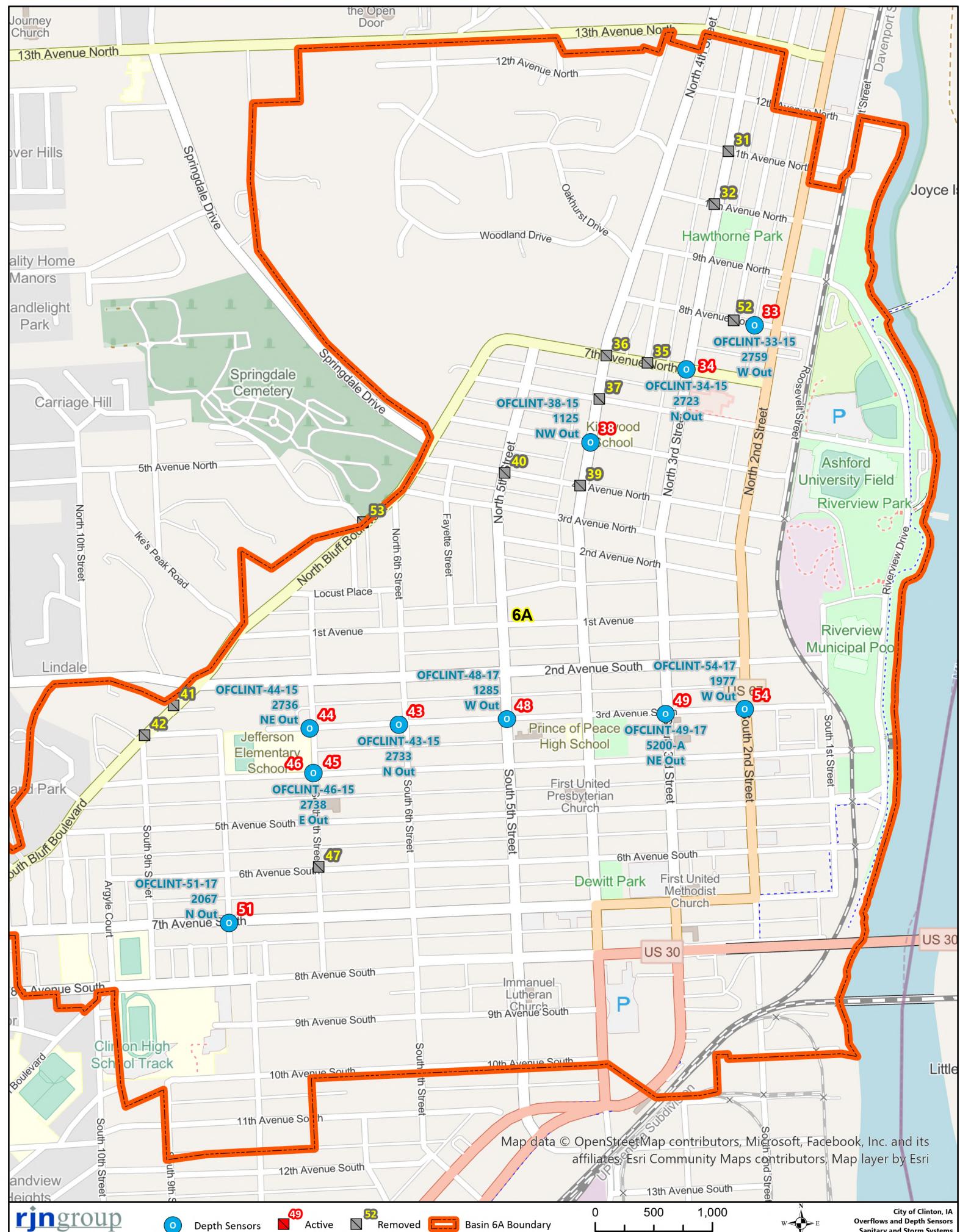
Project Engineer



Lewis Chellberg

Project Manager

**APPENDIX A – EXHIBIT**



## **APPENDIX B – Overflow Activation**

**City of Clinton**  
**Monitored Overflow Activation Events**

Date	Peak 1-Hour Rain (in.)	24-Hour Rain (in.)	Overflow Site												Storm Discharge Location	
			OFCLINT-33	OFCLINT-34	OFCLINT-38	OFCLINT-43	OFCLINT-44	OFCLINT-46	OFCLINT-47 <sup>+</sup>	OFCLINT-48	OFCLINT-49	OFCLINT-51	OFCLINT-54	3rd Ave N	9th Ave N	
4-Jun-24	0.57	1.46	*	*	0.01	*		*	*		*	*	*	0.00	0.01	
15-Jul-24	1.02	1.39		0.37	*	0.16	0.14	0.29		*	*	*	*	0.58	0.37	
22-Jul-24	1.79	2.38	0.64	1.47	0.57	1.70	1.90	*		0.93	1.49	2.67	2.48	11.17	2.69	
28-Aug-24	0.60	0.76	*	0.09	*					*		0.19	0.19	0.09		
30-Aug-24	0.38	1.23	*							0.02				0.02	0.00	
<b>Totals (Millions of Gallons):</b>			<b>0.64</b>	<b>1.94</b>	<b>0.58</b>	<b>1.86</b>	<b>2.03</b>	<b>0.29</b>	<b>0.00</b>	<b>0.93</b>	<b>1.51</b>	<b>2.67</b>	<b>2.67</b>	<b>11.96</b>	<b>3.16</b>	

24-Hour totals are inclusive of adjacent dates.

\*Meter malfunction. See report for maintenance dates.

+OFCLINT-47 was calculated based on OFCLINT-46 since Jan 18, 2023. Reporting discontinued June 30, 2024 due to overflow removal.