

Agenda Report

Subject: Spruce Street Outlet Drainage Improvements – Tower Road Relief Sewer

Prepared By: Steven M. Saunders, Director of Public Works/Village Engineer

Date: August 12, 2012

On March 8, 2012 the Village awarded a contract to Christopher B. Burke Engineering, Ltd. (CBBEL) to complete detailed plans and specifications suitable for permits and obtaining construction bids for two drainage improvements in the Spruce Street Outlet Study Area of northeast Winnetka. The contract awarded by the Village included a provision for a public review by interested citizens and the Village Council before proceeding to final design. Engineering is approximately 65% complete and input is being sought at this time before proceeding to final design. The specific improvements involved are as follows:

Lloyd Park Storm Sewer Outlet. The Spruce Street Outlet Area is a large drainage area east of the railroad grade separation bounded on the north by Tower Road, and on the south by approximately Spruce Street. All of the stormwater runoff generated in this area drains to Lake Michigan at a single outlet, located at the east end of Spruce Street. The size of this drainage area and change of topography contribute, along with insufficient storm sewer capacity for larger rain events, to significant flooding along Sheridan Road from Maple Street south, and along Spruce Street east to the lake. CBBEL has developed a proposed improvement for this area that consists of separating the large watershed into two outlet areas by constructing a new storm sewer outlet from Sheridan Road at the south end of Lloyd Park. This would divert stormwater from the north half of the watershed and allow the existing Spruce Street outlet to function much more effectively, reducing flooding along Sheridan Road.

The proposed storm sewer outlet would consist of a new 36-inch diameter storm sewer beneath the parking lot at Lloyd Park. The project would re-use an existing abandoned 20" ductile iron water main to transit the slope to reach lake level. While this section of water main is smaller in diameter than the incoming 36-inch storm sewer, the significantly steeper slope provides sufficient capacity to carry the necessary flow. The water would discharge to the lake via a new rubble-covered discharge structure constructed by the Park District last spring.

The initial cost estimate for this project was approximately \$500,000, however the current cost estimate is lower, at approximately \$309,000. This is because re-using the existing water main pipe and outlet to transit to lake level saves a significant amount of pipe construction and bluff restoration, reducing the project cost.

Issues Remaining to be Addressed: There are two issues needing further resolution at this time. First, a detailed evaluation needs to be made of the Park District's lake

discharge structure to assure that it can accommodate the additional flow from the proposed storm sewer. Second, although preliminary discussions are ongoing with Park District staff about the routing of the proposed storm sewer through the parking lot, the routing needs to be finalized, easements obtained, and agreements formalized about parking lot restoration.

Tower Road/Old Green Bay Relief Sewer. An additional area of flooding, including overland property damage flooding, is along Tower Road east of Old Green Bay Road. Flooding in this area is primarily caused by three factors – 1) insufficient capacity for larger storms in the storm sewer system along Tower Road; 2) insufficient inlet grate capacity to capture water draining north from Foxdale Avenue and Lincoln Avenue; and 3) topography issues wherein properties along the north side of Tower Road are lower than the roadway, so that any significant flooding that does occur in the roadway spills north into these properties. CBBEL has developed a proposed improvement that consists of increased inlet capacity at key locations, and a new storm sewer to convey stormwater west on Tower Road and north along Old Green Bay Road, to an existing storm sewer beneath the ravine that outlets to Lake Michigan. The existing storm sewer primarily drains the Union Pacific Railroad right of way, but also drains a small drainage area west of the railroad tracks. CBBEL has analyzed this storm sewer and has determined that sufficient excess capacity exists to accommodate the additional runoff tributary from the Tower Road area without causing backups into the railroad property.

The initial cost estimate for this project was approximately \$1,400,000, however the current cost estimate is lower, at approximately \$973,000. This is primarily due to further advancement of the engineering allowing more detailed cost estimates for pavement restoration, trench backfill, and other items.

Issues Remaining to be Addressed: There is a significant technical issue still to be addressed with the proposed project. The receiving storm sewer that runs beneath the ravine primarily serves as drainage for the railroad right-of-way, but also drains an area of Hubbard Woods centered on Merrill Street. After CBBEL was engaged to complete design work on this proposed improvement, the Village also engaged Baxter & Woodman, as part of the stormwater master planning process, to evaluate the Merrill Street area and develop potential improvements to reduce flood risk in that area. Baxter & Woodman has not yet completed this task, so it is not yet known whether the flow tributary to the ravine storm sewer will remain as it exists today. CBBEL's technical analysis of the existing storm sewer system does not include any potential improvements to the Merrill Street area. If Baxter & Woodman recommends stormwater capacity improvements along Merrill Street that would increase downstream flows, the combination of improvements might create surcharge conditions in the downstream pipe that do not currently exist. It is advisable at this time to wait for the completion of Baxter & Woodman's evaluation of the Merrill Street area before proceeding with final design on the Tower Road project, so that recommended improvements in the two areas can be evaluated in concert with one another.

A second technical issue involves addressing erosion at the head of the ravine caused by existing roadway drainage from Old Green Bay Road. While the Village's proposed improvements will not affect the amount of water discharging to the ravine, the existing erosion should be addressed while the Village is working in the area. Since the ravine bottom is classified as a wetland, improving the area to address erosion will require a permit from the US Army Corps of Engineers. It is not anticipated that there will be any significant difficulty associated with securing this permit.

Recommendation:

Review preliminary plans and provide comments.

Attachments:

1. Conceptual Plan
2. Preliminary Detailed Plan Sheets
3. CBBEL Technical Memo

**ATTACHMENT 1
CONCEPTUAL PLAN**



Connect to exiting storm sewer system beneath Ravine to Lake Michigan

Ravine to Lake Michigan

New 30" to 36" storm sewer to help move flood water away

Existing 18" to 24" storm sewer to remain

Area susceptible to flooding

Old Green Bay Rd

Tower Rd

Sheridan Rd

Foxdale Ave

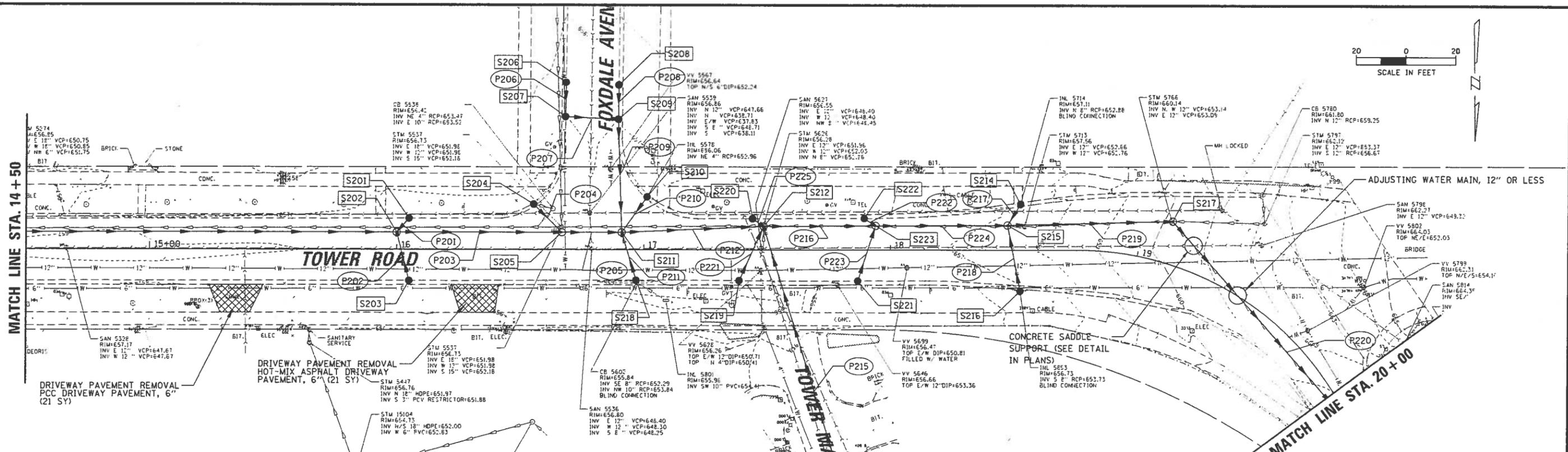
Lincoln Ave

Flow from south toward Tower Rd

Storm sewer to Lake Michigan

156

ATTACHMENT 2
PRELIMINARY DETAILED PLAN SHEETS

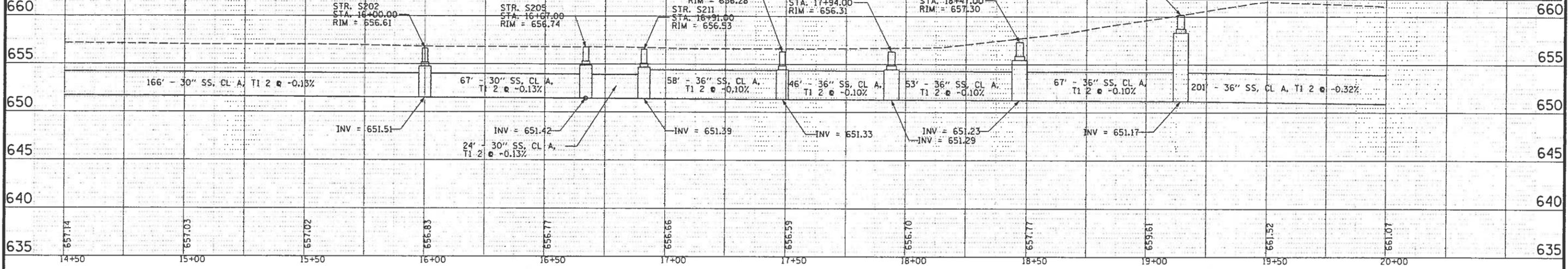


STRUCTURE TABLE STA. 14+50 TO STA. 20+00

STRUCTURE NO.	STRUCTURE TYPE	DIA.	STATION	OFFSET	RIM ELEV.	INV. NORTH	INV. SOUTH	INV. EAST	INV. WEST
S201	CB TY C, R-3015, TY L	2	16+05	12.6 LT	656.41	653.41 (NE)	X	X	X
S202	MH TY A, T1F CL	5	16+00	7 LT	656.61	653.33 (SW)	653.35	651.51	651.51
S203	CB TY C, R-3015, TY L	2	16+05	12.6 RT	656.35	X	X	X	X
S204	CB TY C, R-3015, TY R	2	16+56	18.4 LT	656.29	653.29 (NW)	X	X	X
S205	MH TY A, T1F CL	5	16+47	7 LT	656.74	X	653.13 (SE)	651.42	651.42
S206	CB TY C, R-3015, TY L	2	16+68	68 LT	657.32	653.80	X	X	X
S207	CB TY A, R-3015, TY L	4	16+68	54 LT	656.99	X	653.66	X	653.41
S208	CB TY C, R-3015, TY L	2	16+69	67 LT	657.32	653.59	X	X	X
S209	CB TY A, R-3015, TY L	4	16+89	53 LT	656.99	652.95	653.45	653.20	X
S210	CB TY C, R-3015, TY R	2	17+01	21.3 LT	656.06	653.06 (NE)	X	X	X
S211	MH TY A, T1F CL	5	16+91	7 LT	656.53	652.89	652.49	651.39 (E&W)	652.86 (SW)
S212	MH TY A, T1F CL	6	17+48.5	9.5 LT	656.26	651.39 (NW)	653.13 (SE)	652.86 (NE)	651.33 (E&W)
S213	CB TY A, T1F OL	4	17+90	125 RT	655.21	X	651.95	X	652.8 (EX)
S214	CB TY C, R-3015, TY L	2	18+52	18.5 LT	657.11	654.11 (NE)	X	X	X
S215	MH TY A, T1F CL	5	18+47	10 LT	657.30	654.04	654.01 (SW)	651.23	651.23
S216	CB TY C, R-3015, TY L	2	18+52	16.7 RT	657.31	X	654.31	X	X
S217	MH TY A, T1F CL	5	18+10	17 LT	660.16	X	X	651.17	651.17
S218	CB TY A, R-3015, TY R	4	16+97	12.4 RT	656.09	653.84 (EX)	653.09	X	X
S219	CB TY C, R-3015, TY R	2	17+39	12.5 RT	656.10	X	653.10 (SW)	X	X
S220	CB TY C, R-3015, TY R	2	17+44	12.6 LT	656.18	653.16 (NW)	X	X	X
S221	CB TY C, R-3015, TY L	2	17+87	12.8 RT	656.20	X	653.20 (SW)	X	X
S222	CB TY C, R-3015, TY L	2	17+89	12.7 LT	656.17	X	653.17 (NW)	X	X
S223	MH TY A, T1F CL	5	17+94	9.6 LT	656.31	652.97 (NE)	653.12 (SE)	651.29	651.29

PIPE TABLE STA. 14+50 TO STA. 20+00

PIPE NO.	FROM STR.	TO STR.	MATERIAL	TYPE	LENGTH	DIA.	UPPER INV.	LOWER INV.	SLOPE %	TRENCH B.F.
P201	S201	S202	RCCP	1	8	12"	653.41	653.33	-1.00	1.1
P202	S203	S204	WM QUAL	1	8	12"	653.35	653.15	-1.00	2.6
P203	S205	S206	RCCP	2	67	30"	651.51	651.42	-0.13	19.1
P204	S204	S205	RCCP	1	16	12"	653.29	653.13	-1.00	2.1
P205	S205	S211	RCCP	2	24	30"	651.42	651.39	-0.13	6.9
P206	S206	S207	WM QUAL	1	14	12"	653.80	653.66	-1.00	1.6
P207	S207	S209	WM QUAL	1	21	15"	653.41	653.20	-1.00	3.1
P208	S208	S209	WM QUAL	1	14	12"	653.59	653.45	-1.00	2.1
P209	S209	S211	WM QUAL	1	46	16"	652.95	652.49	-1.00	8.2
P210	S210	S211	RCCP	1	18	12"	653.06	652.86	-1.00	2.4
P211	S211	S211	WM QUAL	1	20	12"	653.09	652.89	-1.00	2.6
P212	S211	S212	RCCP	1	58	36"	651.39	651.33	-0.10	16.5
P215	S213	S212	WM QUAL	1	140	18"	651.95	651.39	-0.40	25.5
P216	S212	S223	RCCP	1	45	36"	651.33	651.29	-0.10	6.6
P217	S214	S215	RCCP	1	10	12"	654.11	654.01	-1.00	1.3
P218	S216	S215	WM QUAL	1	27	12"	654.31	654.04	-1.00	3.6
P219	S215	S217	RCCP	2	67	36"	651.23	651.17	-0.10	62.8
P220	S217	S201	RCCP	1	201	36"	651.17	650.52	-0.32	243.2
P221	S219	S223	WM QUAL	1	24	12"	653.10	652.86	-1.00	3.2
P222	S222	S223	RCCP	1	5	12"	653.17	653.12	-1.00	0.7
P223	S221	S223	WM QUAL	1	23	12"	653.20	652.97	-1.00	3.0
P224	S223	S215	RCCP	1	53	36"	651.29	651.17	-1.00	16.1
P225	S220	S212	RCCP	1	5	12"	653.16	653.13	-1.00	0.7



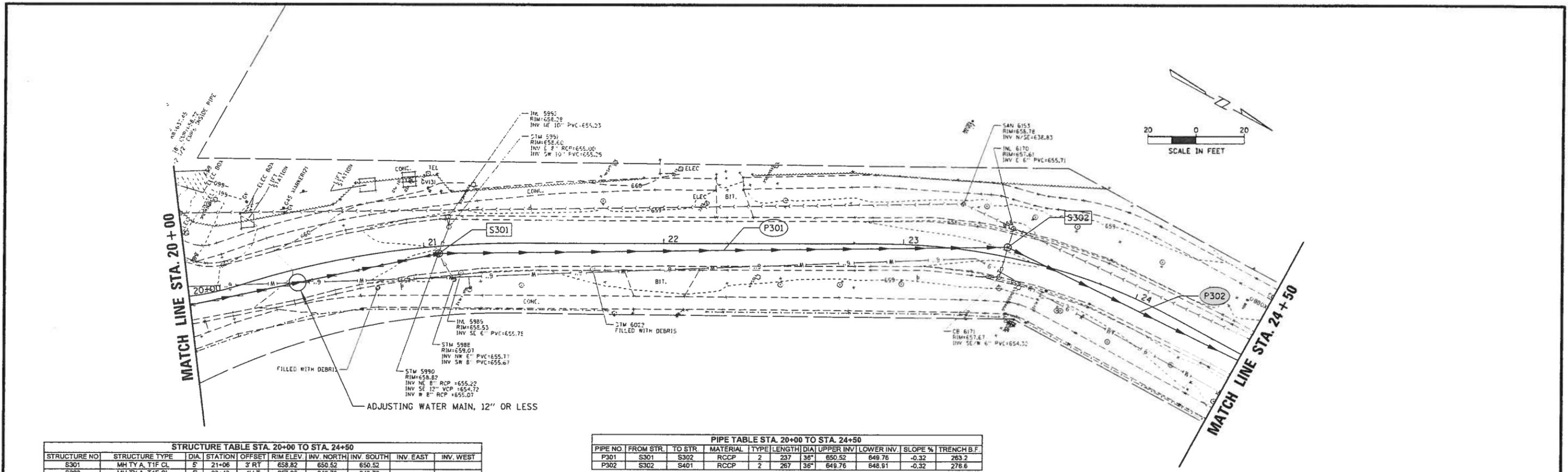
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 9575 W. Higgins Road, Suite 600
 Rosemont, Illinois 60018
 (847) 823-0500



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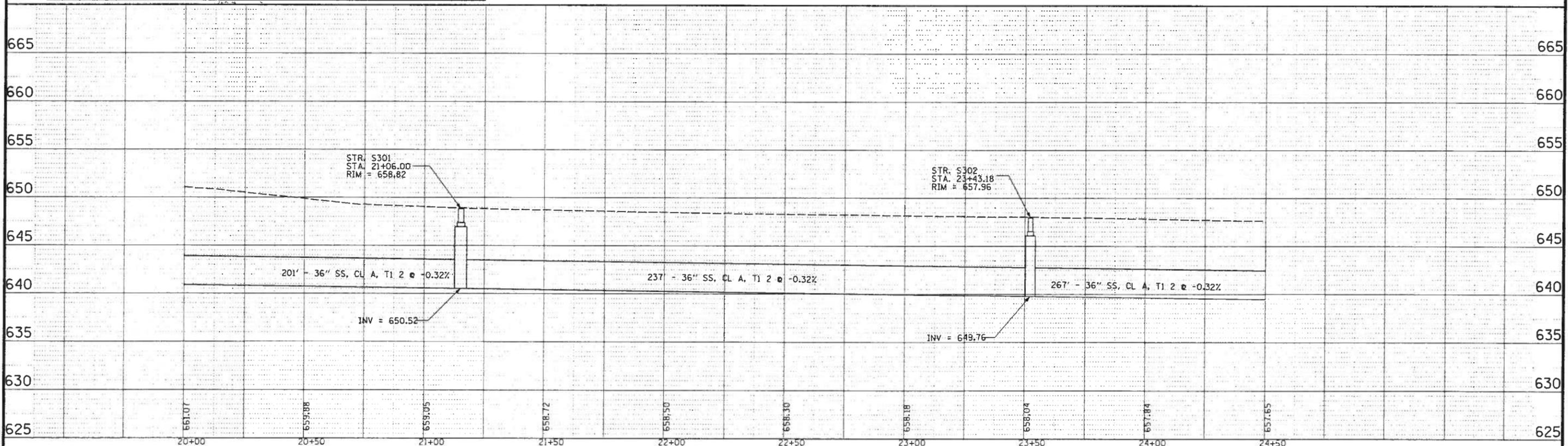
**TOWER ROAD/OLD GREEN BAY ROAD
 STORM SEWER IMPROVEMENTS**
DRAFT

PRD. NO. 120145
 DATE:
 SHEET 9 OF 12
 DRAWING NO.
 158PP2



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S301	MH TY A, T1F CL	5	21+06	3' RT	658.82	650.52	650.52		
S302	MH TY A, T1F CL	5	23+43	4' LT	657.96	649.76	649.76		

PIPE TABLE STA. 20+00 TO STA. 24+50										
PIPE NO.	FROM STR.	TO STR.	MATERIAL	TYPE	LENGTH	DIA.	UPPER INV.	LOWER INV.	SLOPE %	TRENCH B.F.
P301	S301	S302	RCCP	2	237	36"	650.52	649.76	-0.32	263.2
P302	S302	S401	RCCP	2	267	36"	649.76	648.81	-0.32	276.6



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CLIENT:
VILLAGE OF WINNETKA
Incorporated in 1869

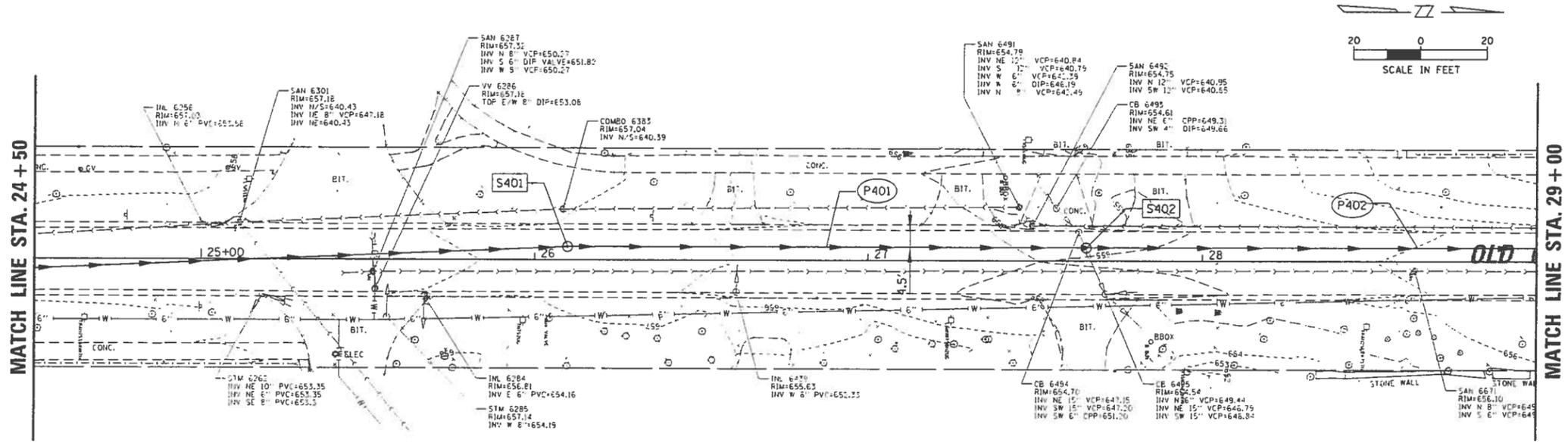
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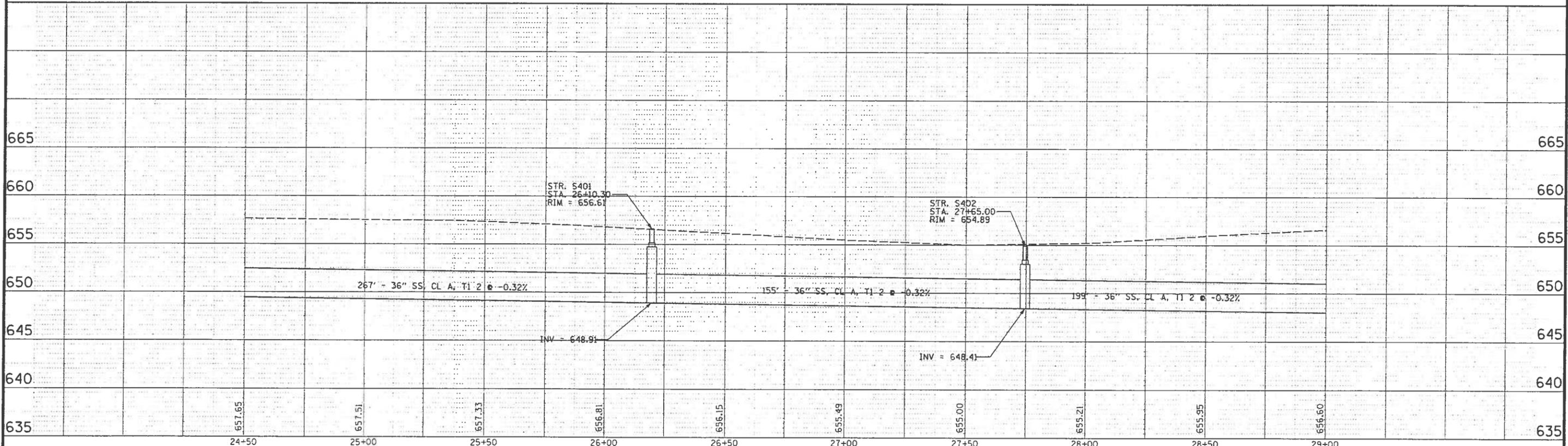
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**TOWER ROAD OLD GREEN BAY ROAD
STORM SEWER IMPROVEMENTS**
DRAFT

PROJ. NO. 120145
DATE: _____
SHEET 10 OF 12
DRAWING NO. _____
168PP3



STRUCTURE TABLE STA. 24+50 TO STA. 29+00									
STRUCTURE NO.	STRUCTURE TYPE	DIA.	STATION	OFFSET	RIM ELEV.	INV. NORTH	INV. SOUTH	INV. EAST	INV. WEST
S401	MH TY A, T1F CL	5'	26+10	4' LT	656.61	648.91	648.91		
S402	MH TY A, T1F CL	5'	27+65	4' LT	654.89	648.41	648.41		

PIPE TABLE STA. 24+50 TO STA. 29+00										
PIPE NO.	FROM STR.	TO STR.	MATERIAL	TYPE	LENGTH	DIA	UPPER INV.	LOWER INV.	SLOPE %	TRENCH B.F.
P401	S401	S402	RCCP	2	155	36"	648.91	648.41	-0.32	127.6
P402	S402	S501	RCCP	2	199	36"	648.41	647.78	-0.32	195.8



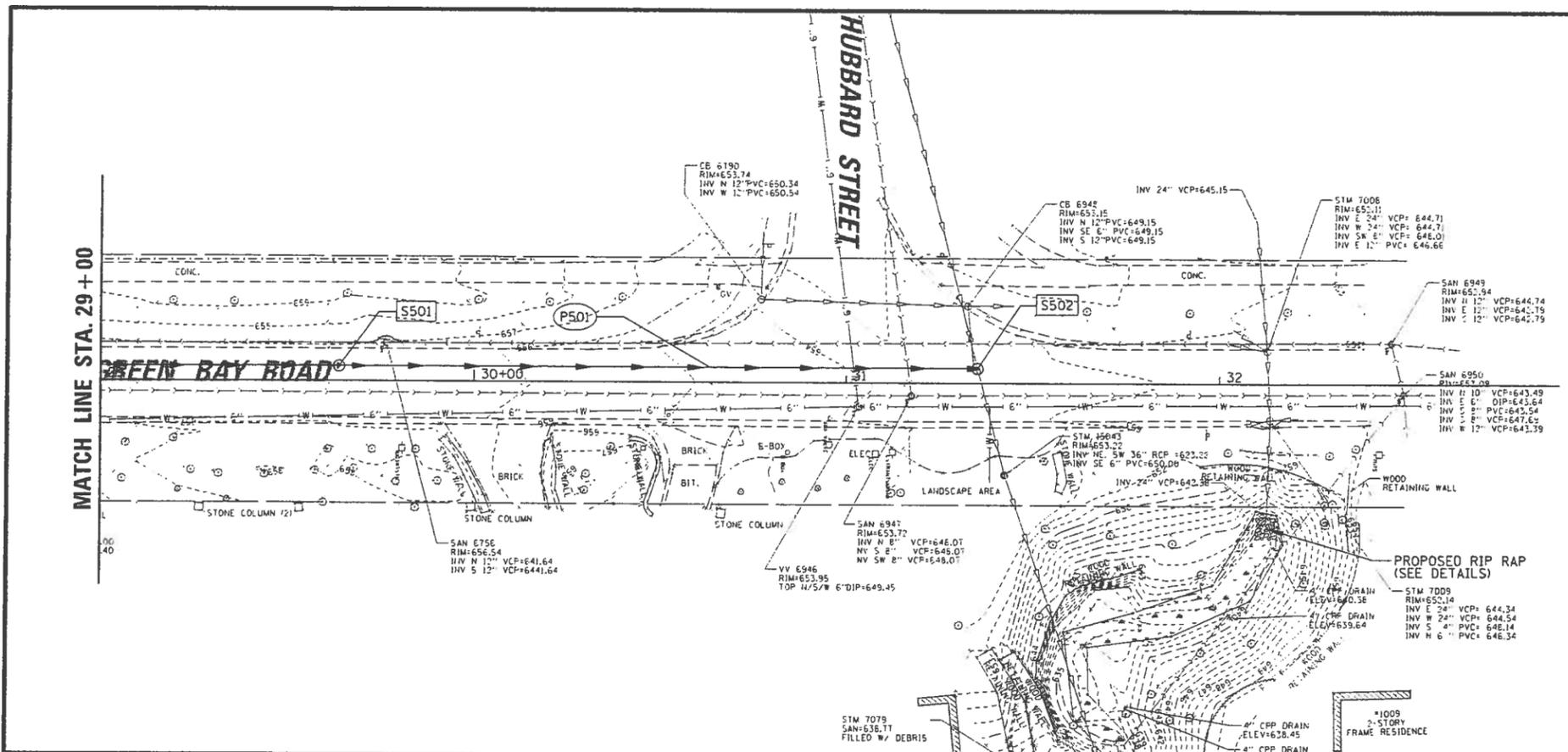
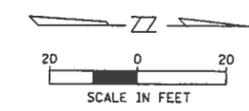
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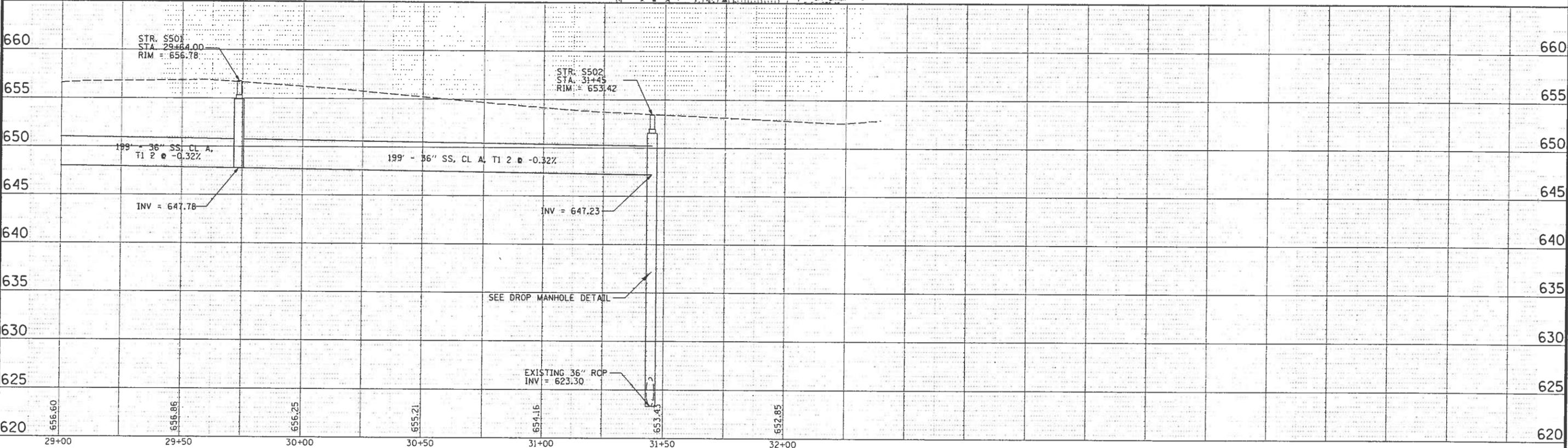
TITLE:
**TOWER ROAD/OLD GREEN BAY ROAD
 STORM SEWER IMPROVEMENTS**
DRAFT

PROJ. NO. 120145
 DATE:
 SHEET 11 OF 12
 DRAWING NO.
 169PP4



STRUCTURE TABLE STA. 29+00 TO STA. 32+00									
STRUCTURE NO.	STRUCTURE TYPE	DIA.	STATION	OFFSET	RIM ELEV.	INV. NORTH	INV. SOUTH	INV. EAST	INV. WEST
S501	MH TY A, T1F CL	5'	29+64	4' LT	656.78	647.78	647.78		
S502	DROP MH TY A, T1F CL	5'	31+35	4' LT	653.04	647.23	647.23	623.3	623.3

PIPE TABLE STA. 29+00 TO STA. 32+00										
PIPE NO.	FROM STR.	TO STR.	MATERIAL	TYPE	LENGTH	DIA.	UPPER INV.	LOWER INV.	SLOPE %	TRENCH B.F.
P501	S501	S502	RCCP	2	171	36	647.78	647.23	-0.32	156.0



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**TOWER ROAD/OLD GREEN BAY ROAD
 STORM SEWER IMPROVEMENTS**
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PROJ. NO. 120145
 DATE:
 SHEET 12 OF 12
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ATTACHMENT 3
CBBEL TECHNICAL MEMORANDUM

MEMORANDUM

June 21st, 2012

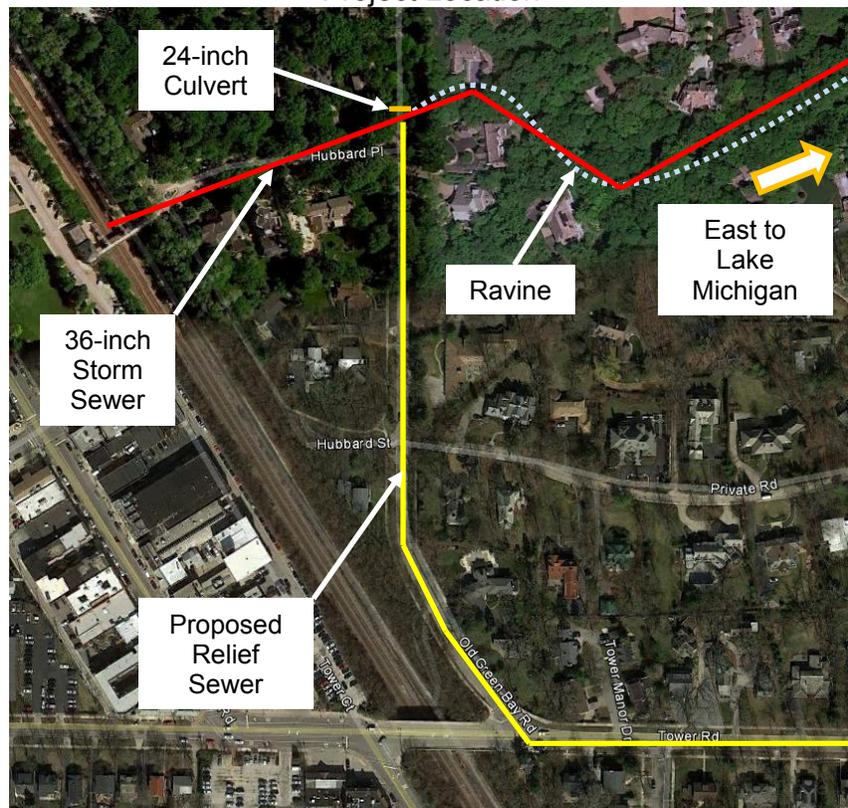
TO: Steve Saunders, PE

FROM: Thomas T. Burke, PE
Steve Sugg, PE
Dave Buckley, PE

SUBJECT: Ravine Outlet – Old Green Bay Road
(CBBEL Project No. 12-0145)

Christopher B. Burke Engineering, Ltd. (CBBEL) has completed an analysis of the proposed relief storm sewer that will drain the intersections of Tower Road at Foxdale and Lincoln Avenues. The need for this improvement was identified for the Spruce Street Outlet study area in the October 2011 Flood Risk Reduction Assessment (25-, 50-, 100-year Protection). The proposed relief sewer will convey runoff north along Old Green Bay Road and outlet to the Ravine at Hubbard Place (Figure 1).

Figure 1.
Project Location



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Existing Conditions

There is an existing 36-inch storm sewer that drains the railroad right-of-way as shown in Figure 1. This sewer is approximately 30 feet deep at Old Green Bay Road and flows east underneath the Ravine before outletting to Lake Michigan through a 4-foot by 5-foot concrete box culvert east of Sheridan Road.

There is also a 24-inch cross road culvert draining approximately 15 acres of tributary area that outlets to the Ravine east of Old Green Bay Road near the 36-inch storm sewer crossing (Figure 1). The downstream end of the 24-inch culvert is approximately 3 feet above the bottom of the Ravine. The area has become eroded over time as shown in Figure 2.

Figure 2.
Downstream End of 24-inch Cross Culvert at Old Green Bay Road



Analysis

This analysis determined the feasibility of connecting the proposed relief sewer to the existing 36-inch storm sewer draining the railroad and/or the 24-inch cross road culvert. The new connections will minimize erosion in the Ravine by avoiding the need for a new outlet for the proposed relief sewer. The Village would also like to provide erosion control measures at the existing 24-inch outlet.



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MEMORANDUM

CBBEL completed a field survey that identified the depth on Old Green Bay Road of the 36-inch storm sewer that drains the railroad right-of-way. The upstream invert elevation of the storm sewer at the railroad is unknown. A sensitivity analysis was performed utilizing multiple upstream invert elevations to determine the impact of an assumed invert elevation at the railroad. The 36-inch storm sewer information was entered into XP-SWMM, and the sensitivity analysis showed that the hydraulic grade line is not affected by varying inverts at the upstream end of this pipe. According to the XP-SWMM analysis, the hydraulic grade line in the 36-inch storm sewer is approximately 633.0 feet at the railroad for the 100-year design storm. The lowest ground elevation in the railroad right-of-way on either side of the tracks is approximately 643.0 feet. Downstream of Old Green Bay Road, the 36-inch storm sewer can surcharge into the Ravine during very intense storm events. According to the XP-SWMM analysis, the sewer does not surcharge during the 100-year event.

The proposed relief sewer was connected to the 36-inch storm sewer at Old Green Bay Road and analyzed in XP-SWMM. The new connection increases the hydraulic grade line to approximately 642.0 feet at the upstream end in the railroad right-of-way for the 100-year design storm. This is 1 foot below the lowest ground elevation shown on the Cook County 1-foot aerial topography in the railroad corridor. The proposed connection also causes two structures, located at the approximate midpoint of the Ravine, to overflow with approximately 3.5 cfs each.

Recommendation

The Ravine at Old Green Bay Road has a known erosion problem and it is not recommended that a new outfall for the proposed relief sewer be constructed at this location. We recommend tying the proposed relief sewer into the existing 36-inch storm sewer at Old Green Bay Road. The proposed hydraulic grade line in the existing sewer will remain below the lowest ground elevations in the railroad right-of-way and the overflow from two structures in the bottom of the ravine is minimal. We recommend constructing erosion control measures at the downstream end of the existing 24-inch cross culvert in the Ravine as part of construction of the relief sewer. Erosion control measures at this location will require approval from the US Army Corps of Engineers for maintenance within the area identified as Waters of the US. We will modify the plans and obtain the necessary approval to complete this work as part of the relief sewer project.

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