

Project Name: Sewerline and Manhole Rehabilitation Phase VI
Project No.: 212231.1
Amendment No: 1
Date:

This Amendment to that certain Standard Form Agreement dated June 11, 2024 by and between the City of Glendale and B & F Contracting, Inc. (CM@Risk) for services, deliverables and work related to Project No. 212231.1, Project Name: Sewerline and Manhole Rehabilitation Phase VI, (the “Agreement”) is made and entered into effective this day of , 2024.

1. This Amendment #1 establishes a Guaranteed Maximum Price (“GMP”) and Construction Phase Fee for Construction Services and incorporates such terms into the Agreement, making the Agreement effective for Construction Phase Services:
 - a. The total fee for Construction Phase Services, which is included in the Guaranteed Maximum Price (GMP) as defined under the Agreement, shall be fixed at seventy-four thousand, five hundred twenty-five dollars and seventy-three cents (\$74,525.73). [\[This amendment for GMP-001 is for Phase 6C only. Future GMP's will be generated to complete Phase 6B and Phase 6D.\]](#)
 - b. The Guaranteed Maximum Price (“GMP”) for Construction Services, as defined under the Agreement, shall be one million, three hundred seventy-one thousand, six hundred forty-nine dollars and forty-four cents (\$1,371,649.44). [\[This amendment for GMP-001 is for Phase 6C only. Future GMP's will be generated to complete Phase 6B and Phase 6D.\]](#)
 - c. The total compensation under the Agreement, as amended by this Amendment, shall be:

	<u>Pre-Construction Phase</u>	<u>Construction Phase</u>	<u>Total</u>
Original Agreement:	\$153,152.00	\$	\$153,152.00
Previous Amendments:	\$	\$	\$
This Amendment:	\$	\$1,371,649.44	\$1,371,649.44
Total (including this Amendment):	\$153,152.00	\$1,371,649.44	\$1,524,810.44

2. DELETE the blank template “Exhibit C – Cost of the Work – Schedule of Values” from the Agreement, and ADD “Exhibit C – B & F Contracting, Inc. Cost of the Work – Schedule of Values” dated May 21, 2024 (10 Pages), attached herein.
3. ADD “Exhibit E – Construction Documents necessary to define Scope of Work and deliverables for the Construction Phase Services, including plans, designs, drawings, specifications and other required Contract Documents” dated May 21, 2024 (88 Pages), attached herein.
4. ADD “Exhibit F - Statement of All Clarifications and Assumptions” dated May 21, 2024 (3 Pages), attached herein.
5. ADD “Exhibit G – Schedule of Major Milestones” dated May 21, 2024 (1 Pages), attached herein.
6. ADD 145 days for Article 5.3.1 Substantial Completion of the Work.
7. ADD 30 days from substantial completion for Article 5.4.1 Final Completion of the Work.
8. ADD one thousand seven hundred and seventy dollars (\$1,070.00) in Article 5.5 Liquidated Damages for

substantial completion and final completion amounts.

9. All other provisions, terms and conditions of the Agreement shall remain unchanged and in full effect.

(Signature on following page)

IN WITNESS WHEREOF, the Parties hereto have duly executed this Amendment, effective as of the date first written above.

OWNER
City of Glendale
5850 W. Glendale Avenue
Glendale, AZ 85301

By: Its Authorized Representative:

Signature

Printed Name

Title

Date

ATTEST:

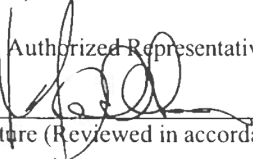
Julie K. Bower (SEAL)
City Clerk

APPROVED AS TO FORM:

Michael D. Bailey
City Attorney

DESIGN PROFESSIONAL
Conzor North America, Inc.
2432 W. Peoria Avenue, Suite 1246
Phoenix, AZ 85029

By Its Authorized Representative:



Signature (Reviewed in accordance with the "Professional Services Agreement")

Mark Lee
Printed Name

AZ District Manager

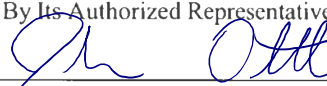
Title

7/24/2024

Date

CM@RISK
B & F Contracting, Inc.
11011 N. 23rd Avenue
Phoenix, AZ 85029

By Its Authorized Representative:



Signature

Joshua Onstott
Printed Name

Executive Director
Title

7/24/24
Date

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EXHIBIT C
Cost of the Work

(One (1) page - template)
(10 pages - final document to be included with GMP Amendment)



EXHIBIT C – COST OF THE WORK
SEWER & MANHOLE REHABILITATION, PHASE 6C

PROJECT NO. 212231.1

MAY 21, 2024

SUBMITTED BY B&F CONTRACTING, INC.

B&F Contracting, Inc., serving as the Construction Manager at Risk, is providing GMP-001 for Sewer & Manhole Rehabilitation Phase 6C. The scope of work for GMP-001 is outlined in further detail in this Exhibit C. GMP(s) will be generated in the future to complete Phase 6B and Phase 6D.

B&F Contracting, Inc.
CONSTRUCTION MANAGER AT RISK AGREEMENT - Exhibit C - Cost of the Work

DIRECT CONSTRUCTION COST						
Cost Code	Item of Work	GMP No. 1	GMP No. 2	GMP No. 3	GMP No. 4	Total GMP
	General Conditions - Personnel Staffing & Site Operations	\$ 151,185.08	\$ -	\$ -	\$ -	\$ 151,185.08
	Mobilization/Demobilization	\$ 13,820.10	\$ -	\$ -	\$ -	\$ 13,820.10
	Cleaning Existing 8" Sewer	\$ 23,778.24	\$ -	\$ -	\$ -	\$ 23,778.24
	Heavy Clean Existing 8" DIP Sewer	\$ 6,898.56	\$ -	\$ -	\$ -	\$ 6,898.56
	Install 8" CIPP Liner	\$ 151,442.60	\$ -	\$ -	\$ -	\$ 151,442.60
	Cleaning Existing 12" Sewer	\$ 2,972.28	\$ -	\$ -	\$ -	\$ 2,972.28
	Install 12" CIPP Liner	\$ 20,802.66	\$ -	\$ -	\$ -	\$ 20,802.66
	Heavy Clean Existing 20" CIP Sewer	\$ 23,400.93	\$ -	\$ -	\$ -	\$ 23,400.93
	Install 20" CIPP Liner	\$ 37,958.89	\$ -	\$ -	\$ -	\$ 37,958.89
	Post-CIPP Cleaning & CCTV Inspection (Pano)	\$ 14,116.00	\$ -	\$ -	\$ -	\$ 14,116.00
	Remove & Replace Frame & Cover	\$ 5,093.38	\$ -	\$ -	\$ -	\$ 5,093.38
	Repair & Coat Chimney, Cone, & Wall	\$ 55,660.00	\$ -	\$ -	\$ -	\$ 55,660.00
	Repair & Coat Bench	\$ 9,900.00	\$ -	\$ -	\$ -	\$ 9,900.00
	Repair/Reshape & Coat Channel	\$ 4,400.00	\$ -	\$ -	\$ -	\$ 4,400.00
	Inspect & Assess Manhole	\$ 400.00	\$ -	\$ -	\$ -	\$ 400.00
	CIPP Liner End Seal Or Line Through & Cut Out Access	\$ 6,228.48	\$ -	\$ -	\$ -	\$ 6,228.48
	Cut & Remove CIPP Coupon To Reinstall Tap	\$ 5,847.01	\$ -	\$ -	\$ -	\$ 5,847.01
	Remove Intruding Gasket	\$ 12,405.40	\$ -	\$ -	\$ -	\$ 12,405.40
	Remove & Replace Existing 8" VCP Sewer	\$ 28,367.22	\$ -	\$ -	\$ -	\$ 28,367.22
	Remove & Replace Asphalt	\$ 7,022.80	\$ -	\$ -	\$ -	\$ 7,022.80
	Remove Existing Cleanout & Construct 5' Diameter Manhole	\$ 18,294.00	\$ -	\$ -	\$ -	\$ 18,294.00
	8" & 12" Sewer Vactor Bypass	\$ 21,054.16	\$ -	\$ -	\$ -	\$ 21,054.16
SUBTOTAL DIRECT CONSTRUCTION COST (DCC)		\$ 621,047.78	\$ -	\$ -	\$ -	\$ 621,047.78
CONSTRUCTION PHASE FEE						
FEE	Fixed Fee, Equal to 12% of DCC	\$ 74,525.73	\$ -	\$ -	\$ -	\$ 74,525.73
SUBTOTAL CONSTRUCTION PHASE FEE		\$ 74,525.73	\$ -	\$ -	\$ -	\$ 74,525.73
INDIRECT CONSTRUCTION COSTS (ICC)						
BONDS	CMR Performance and Payment Bonds - Actual Cost, not-to-Exceed <u>1%</u> of DCC	\$ 7,025.29	\$ -	\$ -	\$ -	\$ 7,025.29
	CMR-managed Sub-Contractor Bond Program - Actual Cost not-to- exceed <u>0%</u> of DCC of covered Sub-Contractors (if applicable)	\$ -	\$ -	\$ -	\$ -	\$ -
INSURANCE	CMR Insurances (Worker's Comp, General Liability, Auto Liability, Umbrella) Actual Cost, not-to-exceed <u>1%</u> of DCC	\$ 6,955.74	\$ -	\$ -	\$ -	\$ 6,955.74
	Builder's Risk - Actual Cost not-to-exceed <u>0%</u> of DCC	\$ -	\$ -	\$ -	\$ -	\$ -
	CMR-managed Sub-Contractor Insurance Program - Actual Cost not-to-exceed <u>0%</u> of DCC of covered Sub-Contractors (if applicable)	\$ -	\$ -	\$ -	\$ -	\$ -
TAXES	Actual Cost, Equal to <u>5.98%</u> of DCC + Fee + Bond + Insurance	\$ 42,431.36	\$ -	\$ -	\$ -	\$ 42,431.36
SUBTOTAL INDIRECT CONSTRUCTION COST (ICC)		\$ 56,412.39	\$ -	\$ -	\$ -	\$ 56,412.39
ALLOWANCES & CONTINGENCIES						
			\$ -	\$ -	\$ -	\$ -
	Traffic Control (Allowance)	\$ 100,000.00	\$ -	\$ -	\$ -	\$ 100,000.00
	Off-Duty Officers (Allowance)	\$ 61,000.00	\$ -	\$ -	\$ -	\$ 61,000.00
	Survey/GIS (Allowance)	\$ 12,000.00	\$ -	\$ -	\$ -	\$ 12,000.00
	Quality Control Material Testing (Allowance)	\$ 6,500.00	\$ -	\$ -	\$ -	\$ 6,500.00
	Additional Point Repairs (Allowance)	\$ 30,000.00	\$ -	\$ -	\$ -	\$ 30,000.00
	Top Hats (Allowance)	\$ 20,000.00	\$ -	\$ -	\$ -	\$ 20,000.00
	Remove Blockage From Tap (Allowance)	\$ 14,298.63	\$ -	\$ -	\$ -	\$ 14,298.63
	20" Sewer Bypass (Allowance)	\$ 300,666.31	\$ -	\$ -	\$ -	\$ 300,666.31
	Project Contingency (10%)	\$ 75,198.59	\$ -	\$ -	\$ -	\$ 75,198.59
TOTAL GMP = DCC + FEE + ICC		\$ 751,985.90	\$ -	\$ -	\$ -	\$ 1,371,649.44
ADDITIONAL GMP PROPOSAL REQUIREMENTS AND INFORMATION						
Attach to this Cost of the Work a detailed breakdown of the complete GMP, including General Conditions, using the CM@Risk's own format.						
City of Glendale Exhibit C - Construction Manager at Risk Agreement Cost of the Work (May 15, 2023)						



Proposal

Corporate: 11011 N. 23rd Ave. Phoenix, AZ 85029

Office: 623-582-1170|Fax: 623-582-3761

Tucson: 1904 W. Prince Rd. Tucson, AZ 85705

Office: 520-207-8228|Fax: 520-305-3323

AZ Licenses: ROC-089744 A General Contracting

ROC-111282 B-04 General Engineering

Cost Detail

Project Name:	Phase 6C Sewer & Manhole Rehabilitation Rev 1	Customer:	City of Glendale
Job Number:	24-3001-PhC	Bid Number:	212231
Bid As:	Prime Contractor	Billing Address:	5850 West Glendale Ave, Suite 315 Glendale, AZ 85301 USA
Estimator:	Travis Monk	Phone:	
Project Address:	67th Ave & Northern, Glendale, AZ	Contact:	Michael Johnson
Completion Date:	5/9/2025		

Pay Items

Description	Quantity	UM	Unit Direct Cost	Total Direct Cost	Unit Price	Total Price	Markup Percent
D 1 - Mobilization/Demobilization	1.00	LS	\$13,820.10	\$13,820.10	\$13,819.61	\$13,819.61	-0.00%
CIPP Mobilization	2.00	EACH	\$1,209.00	\$2,418.00			
Mobilization/Demobilization	6.00	TRIP	\$631.60	\$3,789.60			
GC-Mobilization Crew (2.00 TRIP/DY, 3.00 DY)	6.00	TRIP	\$631.60	\$3,789.60			
Shoring & Plates Delivery/Pickup	4.00	TRIP	\$250.00	\$1,000.00			
Project Signs	2.00	EACH	\$841.25	\$1,682.50			
Labor For Delivery & Initial Setting Of Signs	4.00	HR	\$95.00	\$380.00			
Spring Stand Rental 3 Each X 30 Days	107.00	DY	\$7.50	\$802.50			
Project Signs	2.00	EACH	\$250.00	\$500.00			
Construction Water	1.00	LS	\$2,000.00	\$2,000.00			
Water Meter	1.00	EACH	\$1,500.00	\$1,500.00			
Dust Permit	1.00	EACH	\$1,430.00	\$1,430.00			
Dust Sign	1.00	EACH	\$350.00	\$350.00			
Dust Permit	1.00	EACH	\$1,080.00	\$1,080.00			
D 2 - Cleaning Existing 8" Sewer	3,057.00	LF	\$7.78	\$23,778.24	\$7.78	\$23,783.46	0.02%
Cleaning Support Crew	3,057.00	LF	\$2.36	\$7,224.64			
Cleaning Support Crew (764.25 LF/DY, 4.00 DY)	3,057.00	LF	\$2.36	\$7,224.64			
Sewer Cleaning & Pre-CCTV	3,057.00	LF	\$5.41	\$16,553.60			
Vactor Cleaning & CCTV Crew (764.25 EACH/DY, 4.00 DY)	3,057.00	EACH	\$5.41	\$16,553.60			
D 3 - Heavy Clean Existing 8" DIP Sewer	139.00	LF	\$49.63	\$6,898.56	\$49.63	\$6,898.57	0.00%
Cleaning Support Crew	139.00	LF	\$12.99	\$1,806.16			
Cleaning Support Crew (139.00 LF/DY, 1.00 DY)	139.00	LF	\$12.99	\$1,806.16			
Sewer Cleaning & Pre-CCTV	139.00	LF	\$36.64	\$5,092.40			
Vactor Cleaning & CCTV Crew (139.00 LF/DY, 1.00 DY)	139.00	LF	\$36.64	\$5,092.40			
D 4 - Install 8" CIPP Liner	3,196.00	LF	\$47.39	\$151,442.60	\$47.38	\$151,426.48	-0.01%
CIPP Support Crew	3,196.00	LF	\$6.39	\$20,406.60			
CIPP Lining Support Crew (319.60 LF/DY, 10.00 DY)	3,196.00	LF	\$6.39	\$20,406.60			
CIPP Lining Sub 8" CIPP	3,196.00	EACH	\$41.00	\$131,036.00			
D 5 - Cleaning Existing 12" Sewer	177.00	LF	\$16.79	\$2,972.28	\$16.79	\$2,971.83	-0.02%
Cleaning Support Crew	177.00	LF	\$5.10	\$903.08			
Cleaning Support Crew (354.00 LF/DY, 0.50 DY)	177.00	LF	\$5.10	\$903.08			
Sewer Cleaning & Pre-CCTV	177.00	LF	\$11.69	\$2,069.20			

Description		Quantity	UM	Unit Direct Cost	Total Direct Cost	Unit Price	Total Price	Markup Percent
	Vactor Cleaning & CCTV Crew (354.00 EACH/DY, 0.50 DY)	177.00	EACH	\$11.69	\$2,069.20			
D	6 - Install 12" CIPP Liner	177.00	LF	\$117.53	\$20,802.66	\$117.53	\$20,802.81	0.00%
	CIPP Support Crew	177.00	LF	\$11.53	\$2,040.66			
	CIPP Lining Support Crew (177.00 LF/DY, 1.00 DY)	177.00	LF	\$11.53	\$2,040.66			
	CIPP Lining Sub 12" CIPP	177.00	EACH	\$106.00	\$18,762.00			
D	7 - Heavy Clean Existing 20" CIP Sewer	156.00	LF	\$150.01	\$23,400.93	\$150.00	\$23,400.00	-0.00%
	Cleaning Support Crew	156.00	LF	\$52.08	\$8,123.73			
	Cleaning Support Crew (52.00 LF/DY, 3.00 DY)	156.00	LF	\$52.08	\$8,123.73			
	Sewer Cleaning & Pre-CCTV	156.00	LF	\$97.93	\$15,277.20			
	Vactor & Cleaning CCTV Crew (52.00 EACH/DY, 3.00 DY)	156.00	EACH	\$97.93	\$15,277.20			
D	8 - Install 20" CIPP Liner	156.00	LF	\$243.33	\$37,958.89	\$243.32	\$37,957.92	-0.00%
	CIPP Support Crew	156.00	LF	\$4.33	\$674.89			
	CIPP Lining Support Crew (498.80 LF/DY, 0.31 DY)	156.00	LF	\$4.33	\$674.89			
	CIPP Lining Sub 20" CIPP	156.00	EACH	\$239.00	\$37,284.00			
D	9 - Post-CIPP Cleaning & CCTV Inspection (Pano)	3,529.00	LF	\$4.00	\$14,116.00	\$4.00	\$14,116.00	0.00%
	Subcontractor - Pano	3,529.00	LF	\$4.00	\$14,116.00			
D	10 - Remove & Replace Frame & Cover	2.00	EACH	\$2,546.69	\$5,093.38	\$2,546.60	\$5,093.20	-0.00%
	RH-Manhole Adjust Crew (2.00 EACH/DY, 1.00 DY)	2.00	EACH	\$1,302.36	\$2,604.72			
	Ready Mix Concrete - MAG AA 4000	2.00	CY	\$169.33	\$338.66			
	Shortload	1.00	UNIT	\$250.00	\$250.00			
	Frame & Cover - Manhole Frame & Cover 30in	2.00	EACH	\$950.00	\$1,900.00			
D	11 - Repair & Coat Chimney, Cone, & Wall	1,210.00	SF	\$46.00	\$55,660.00	\$46.00	\$55,660.00	0.00%
	Manhole Sub - Repair & Coat Chimney, Cone, & Wall	1,210.00	SF	\$46.00	\$55,660.00			
D	12 - Repair & Coat Bench	11.00	EACH	\$900.00	\$9,900.00	\$899.97	\$9,899.67	-0.00%
	Manhole Sub - Repair & Coat Bench	11.00	EACH	\$900.00	\$9,900.00			
D	13 - Repair/Reshape & Coat Channel	11.00	EACH	\$400.00	\$4,400.00	\$399.99	\$4,399.89	-0.00%
	Manhole Sub - Repair/Reshape & Coat Channel	11.00	EACH	\$400.00	\$4,400.00			
D	14 - Inspect & Assess Manhole	1.00	EACH	\$400.00	\$400.00	\$399.99	\$399.99	-0.00%
	Manhole Sub	1.00	EACH	\$400.00	\$400.00			
D	15 - CIPP Liner End Seal Or Line Through & Cut Out Access	15.00	EACH	\$415.23	\$6,228.48	\$415.22	\$6,228.30	-0.00%
	CIPP Support Crew	15.00	EACH	\$361.23	\$5,418.48			
	CIPP Lining Support Crew (5.00 LF/DY, 3.00 DY)	15.00	LF	\$361.23	\$5,418.48			
	CIPP Lining Sub	15.00	EACH	\$54.00	\$810.00			
D	16 - Cut & Remove CIPP Coupon To Reinstall Tap	29.00	EACH	\$201.62	\$5,847.01	\$201.61	\$5,846.69	-0.01%
	CIPP Support Crew	29.00	EACH	\$3.62	\$105.01			
	CIPP Lining Support Crew (498.80 LF/DY, 0.06 DY)	29.00	LF	\$3.62	\$105.01			
	CIPP Lining Sub	29.00	EACH	\$198.00	\$5,742.00			
D	17 - Remove Intruding Gasket	19.00	EACH	\$652.92	\$12,405.40	\$652.89	\$12,404.91	-0.00%
	Cleaning Support Crew	19.00	EACH	\$200.68	\$3,813.00			
	Cleaning Support Crew (9.00 EACH/DY, 2.11 DY)	19.00	EACH	\$200.68	\$3,813.00			
	Sewer Cleaning & Pre-CCTV	19.00	EACH	\$452.23	\$8,592.39			
	Vactor & Cleaning CCTV Crew (9.00 EACH/DY, 2.11 DY)	19.00	EACH	\$452.23	\$8,592.39			
D	18 - Remove & Replace Existing 8" VCP Sewer	30.00	LF	\$945.57	\$28,367.22	\$945.54	\$28,366.20	-0.00%
	Dig & Remove Pipe	30.00	LF	\$798.69	\$23,960.64			
	SL-VCP 8in Art Medium Diameter Crew (7.50 LF/DY, 4.00 DY)	30.00	LF	\$798.69	\$23,960.64			
	Dump Fees	4.00	EACH	\$75.00	\$300.00			
	Pipe Material Buy	1.00	LS	\$982.80	\$982.80			

Description		Quantity	UM	Unit Direct Cost	Total Direct Cost	Unit Price	Total Price	Markup Percent
(Item 18 - Remove & Replace Existing 8" VCP Sewer continued)								
	Ready Mix - Slurry ABC Slurry 1/2 Sack	20.00	CY	\$120.25	\$2,405.00			
	Aggregate - ABC MAG Spec	17.00	TON	\$23.79	\$404.43			
	Pipe Pickup & Delivery (3.00 TRIP/DY, 0.33 DY)	1.00	TRIP	\$314.35	\$314.35			
D	19 - Remove & Replace Asphalt	35.00	SY	\$200.65	\$7,022.80	\$200.64	\$7,022.40	-0.01%
	Sawcut & Remove Asphalt	35.00	SY	\$30.65	\$1,072.80			
	CP-Sawcutting Small Crew (70.00 SY/DY, 0.50 DY)	35.00	SY	\$30.65	\$1,072.80			
	Asphalt Replacement	35.00	SY	\$170.00	\$5,950.00			
D	20 - Remove Existing Cleanout & Construct 5' Diameter Manhole	1.00	EACH	\$18,294.00	\$18,294.00	\$18,293.36	\$18,293.36	-0.00%
	Excavate & Prep Manhole	1.00	EACH	\$4,902.56	\$4,902.56			
	SL-VCP 8in Art Medium Diameter Crew (1.00 LF/DY, 1.00 DY)	1.00	LF	\$4,902.56	\$4,902.56			
	Stack & Backfill Manhole	1.00	EACH	\$4,319.76	\$4,319.76			
	SL-VCP 8in Art Medium Diameter Crew (1.00 LF/DY, 1.00 DY)	1.00	LF	\$4,319.76	\$4,319.76			
	Dump Fees	1.00	EACH	\$75.00	\$75.00			
	Ready Mix - Slurry ABC Slurry 1/2 Sack	9.00	CY	\$120.25	\$1,082.25			
	Aggregate - ABC MAG Spec	6.00	TON	\$23.79	\$142.74			
	New Manhole Sub	1.00	EACH	\$6,050.00	\$6,050.00			
	Final Adjustment	1.00	EACH	\$1,721.69	\$1,721.69			
	RH-Manhole Adjust Crew (2.00 EACH/DY, 0.50 DY)	1.00	EACH	\$1,302.36	\$1,302.36			
	Ready Mix Concrete - MAG AA 4000	1.00	CY	\$169.33	\$169.33			
	Shortload	1.00	UNIT	\$250.00	\$250.00			
D	21 - 8" & 12" Sewer Vector Bypass	3.00	EACH	\$7,018.05	\$21,054.16	\$7,017.81	\$21,053.43	-0.00%
	12" Bypass - Segment MH0128994-MH0128997-MH0140068	1.00	EACH	\$10,527.08	\$10,527.08			
	Vector Crew (0.50 EACH/DY, 2.00 DY)	1.00	EACH	\$10,527.08	\$10,527.08			
	8" Bypasses (MH 0127570 - MH 0127658, MH 0130463 - MH 0130461)	2.00	EACH	\$5,263.54	\$10,527.08			
	Vector Crew (0.50 EACH/DY, 4.00 DY)	2.00	EACH	\$5,263.54	\$10,527.08			
D	22 - Indirect Project Management Cost	1.00	LS	\$151,185.08	\$151,185.08	\$151,179.76	\$151,179.76	-0.00%
	Yard Rent	2.00	MO	\$1,500.00	\$3,000.00			
	Portable Toilets (Delivery, Rental, Servicing, & Pickup)	15.00	WK	\$150.00	\$2,250.00			
	Temporary Fence (Delivery, Rental, Pickup)	8.00	WK	\$250.00	\$2,000.00			
	Project Manager (50%)	36.00	DY	\$1,012.48	\$36,449.28			
	JI-Project Manager	288.00	HR	\$126.56	\$36,449.28			
	JI-Project Manager Crew (8.00 HR/DY, 36.00 DY)	288.00	HR	\$126.56	\$36,449.28			
	Project Superintendent (100%)	73.00	DY	\$936.48	\$68,363.04			
	JI-Project Superintendent	584.00	HR	\$117.06	\$68,363.04			
	JI-Project Superintendent Crew (8.00 HR/DY, 73.00 DY)	584.00	HR	\$117.06	\$68,363.04			
	Project Engineer (50%)	36.00	DY	\$822.16	\$29,597.76			
	JI-Project Engineer	288.00	HR	\$102.77	\$29,597.76			
	JI-Project Engineer Crew (8.00 HR/DY, 36.00 DY)	288.00	HR	\$102.77	\$29,597.76			
	Small Tools & Supplies	2,500.00	MH	\$1.50	\$3,750.00			
	Small Tools & Supplies	2,500.00	MH	\$1.50	\$3,750.00			
	Water & Ice	15.00	WK	\$125.00	\$1,875.00			
	Trash/Dumpster Fees	15.00	WK	\$125.00	\$1,875.00			
	Field Communication Devices	15.00	WK	\$85.00	\$1,275.00			
	Direct Job Office Expenses, Printing, & Supplies	15.00	WK	\$50.00	\$750.00			

Direct Cost Totals

	Amount	Percent of Direct Cost
Labor:	\$174,739.56	28.14%
Equipment Owned:	\$118,772.51	19.12%
Equipment Rented:	\$2,320.00	0.37%
Materials Owned:	\$0.00	0.00%
Materials Purchased:	\$13,605.21	2.19%
Subcontracted:	\$311,610.50	50.17%
Trucking Owned:	\$0.00	0.00%
Trucking Hired:	\$0.00	0.00%
Miscellaneous:	\$0.00	0.00%
Plug:	\$0.00	0.00%
Direct Cost:	\$621,047.78	

SCOPE OF WORK

SEWER & MANHOLE REHABILITATION, PHASE 6C
COG PROJECT NUMBER: 212231.1
GMP-001

PROJECT OVERVIEW

This Sewer & Manhole Rehabilitation Phase 6C project is for the rehabilitation of approximately 3,529 L.F. of existing 8-inch to 20-inch sewer lines, rehabilitation of 12 each existing manholes, and 1 new manhole installation. The work includes installing cured-in-place-pipe (CIPP) liner in existing sewer pipe, the replacement of deteriorated sewer pipe, connecting all associated lateral and service connections, and the repair and coating of existing manholes. Some sewer line sections will require the replacement of moderately short sections of deteriorated sewer pipe prior to the installation of the CIPP liner.

SCOPE OF WORK

Construction Phase Services by the CMAR includes:

1. In accordance with Project Drawings, clean, perform pre-CIPP pipe preparations, and pre-CIPP CCTV inspection of existing 8-inch, 12-inch, and 20-inch sewer.
2. Install 8-inch, 12-inch, and 20-inch CIPP liner, terminate CIPP liners at manholes, and reinstate sewer laterals per project drawings.
3. Sewer service lateral out of service planning and coordination.
4. Rehabilitate manholes per Project Drawings.
5. Mill, Sawcut and removal of asphalt.
6. Removal and replacement of 30 L.F. 8-inch sewer.
7. Removal of existing clean-out to be replaced with 5-foot diameter manhole.
8. Additional manhole and sewer segment inspections identified on Project Drawings.
9. Remove blockages from taps through allowance authorization.
10. Vactor bypass for 8-inch and 12-inch sewerline rehabilitation efforts.
11. 20-inch sewer bypass for cleaning, inspection, and CIPP lining efforts to be reimbursed through "20-inch Sewer Bypass Allowance."
12. Hardscape removal and replacement.
13. Landscape restoration in disturbed areas as required by the work.
14. Asphalt removal and replacement.
15. Coordinate with various City of Glendale departments, other agencies, utility companies, etc.
16. Arrange for procurement of materials and equipment.
17. Schedule and manage site operations.
18. Bond and insure the construction.
19. Maintain a safe work site for all project participants.
20. GIS/Asset data.
21. Traffic control and Off-Duty Officers through allowance authorization.
22. SWPPP installation, inspection, and maintenance.
23. Quality control material testing.

SCOPE OF WORK BID ITEMS:

- 1) Mobilization & Demobilization:
 - a) Mobilization and demobilization of equipment, shoring, and steel plates for 8-inch sewerline dig and replace Mobilization/demobilization for 20-inch sewer bypass to be included in "20-inch Sewer Bypass" allowance bid item (see bid item description no. 23).
 - b) Mobilization for CIPP lining subcontractor.
 - c) Furnishing and installing 2 each project signs.
 - d) Dust permit and dust sign.
 - e) Construction water meter and construction water.
- 2) Clean Existing 8-inch Sewer
 - a) Labor and equipment to complete cleaning and Pre-CIPP CCTV inspection of 8-inch ductile iron sewer
- 3) Heavy Clean Existing 8-inch Ductile Iron Pipe Sewer
 - a) Labor and equipment to complete heavy cleaning and Pre-CIPP CCTV inspection of 8-inch ductile iron sewer
- 4) Install 8-inch CIPP Liner
 - a) Labor, equipment, materials, and subcontractor costs to complete the installation of 12-inch CIPP liner.
- 5) Clean Existing 12-inch Sewer
 - a) Labor and equipment to complete cleaning and Pre-CIPP CCTV inspection of 12-inch sewer.
- 6) Install 12-inch CIPP Liner
 - a) Labor, equipment, materials, and subcontractor costs to complete the installation of 12-inch CIPP liner.
- 7) Heavy Clean Existing 20-inch Ductile Iron Pipe Sewer
 - a) Labor and equipment to complete heavy cleaning and Pre-CIPP CCTV inspection of 20-inch ductile iron sewer.
- 8) Install 20-inch CIPP Liner
 - a) Labor, equipment materials, and subcontractor costs to complete the installation of 20-inch CIPP liner.
- 9) Post-CIPP CCTV Inspect (Pano)
 - a) Subcontractor costs for performing Post-CIPP liner inspection with Pano camera.
- 10) Remove & Replace Frame & Cover
 - a) Labor, equipment, and materials for removing existing manhole frames and covers and replacing with new sewer manhole frames and cover per Project Drawings.
- 11) Repair & Coat Chimney, Cone, & Wall
 - a) Subcontractor costs for repairing and coating manhole chimneys, cones, and wall identified on the plans to be rehabilitated.
- 12) Repair & Coat Bench
 - a) Subcontractor costs for repairing and coating manhole benches identified on the plans to be rehabilitated.
- 13) Repair/Reshape & Coat Channel
 - a) Subcontractor costs for repairing/reshaping and coating manhole channels identified on the plans to be rehabilitated.
- 14) Inspect & Assess Manhole

- a) Subcontractor costs to perform man entry into designated manhole to inspect and assess manhole condition and, if needed, determine preliminary rehabilitation scope.
- 15) CIPP Liner End Seal or Line Through & Cut Out Access
- a) Labor, equipment, materials, and subcontractor costs for install CIPP end seals at all new CIPP liner termination points or lining through manholes and cutting out a coupon for sewer access.
- 16) Cut & Remove CIPP Coupon to Reinstate Tap
- a) Labor, equipment, materials, and subcontractor costs for cutting CIPP coupon out to reinstate lateral.
- 17) Remove Intruding Gasket
- a) Labor and equipment to remove intruding gaskets via cutter inside the pipe.
- 18) Remove & Replace Existing 8-inch VCP Sewer
- a) Labor, equipment, and materials to remove the existing sewerline, replace, and backfill new sewerline pipe prior to CIPP lining.
- 19) Remove & Replace Asphalt
- a) Labor, equipment, material, subcontractor costs for replacing asphalt for 2 point repairs that total 30 linear feet.
- 20) Remove Existing Cleanout & Construct 5-foot Diameter Manhole
- a) Labor, equipment, material, and subcontractor costs for excavating, removing existing cleanout, installing new manhole, and backfilling.
- 21) Remove Blockage From Tap (Allowance)
- a) Includes anticipated costs for removing 2 each blockages from sewer lateral taps via trenchless method and utilization of the sewer cleaning and CCTV crew. Costs to be reimbursed as an allowance on “Time and Material” basis.
 - b) If the blocked sewer tap shall be excavated, exposed, and repaired, additional costs that exceed this allowance shall be reimbursed via the “Additional Point Repairs” allowance or “Contingencies”.
- 22) 8-inch & 12-inch Sewer Vector Bypass
- a) Costs for specifically providing flow management/vector bypass during cleaning/CCTV efforts and CIPP lining 12-inch segment MH 0128994-MH 0128997-MH 0140068, 8-inch segment MH 0127570-MH 0127658, and 8-inch segment MH 0130463-MH 0130463.
- 23) 20-inch Sewer Bypass (Allowance)
- a) Trenching, installation, teardown, operation, and hardscape restoration for bypass required for bypassing the 20-inch ductile pipe section under BNSF railroad.
 - b) Due to bypass scope not being defined at time of pricing, costs shall be reimbursed through this allowance for said work, which specifically includes, but is not limited to: trenching; milling/recessing plates; steel plates for buried bypass piping; HDPE fusion, HDPE pipe, and all appurtenances to construction bypass system; spill containment, spill kits, repair clamps, and lighting for bypass monitoring; fuel and fuel cells; pump maintenance; modifications and repair for discharge location and any other structure utilized for the bypass piping alignment/configuration; testing of bypass system; Engineered stamped bypass plan; water ramps as needed; mobilization and demobilization of all equipment, bypass pumps, and bypass piping; vector bypass costs for 8-inch and 12-inch sewer systems entering manhole 0140068; and street sweeping.
- 24) Indirect Project Management Cost
- a) Project Manager – Half Time Project Manager
 - b) Project Engineer – Half Time Project Engineer

- c) Project Superintendent – Full Time Project Superintendent
- d) Waste management service and trash disposal.
- e) Water and ice for the crews
- f) Yard rental for project materials, equipment, and personnel.
- g) Project Sanitation portable restrooms, handwashing station, and disinfection supplies.
- h) Temporary fence rental for project security.
- i) Field Communication – Radios, Cellular Devices, Tablets, and Procore for the project.
- j) ST&S, Safety Supplies, Training, Fall Protection, and small tools – Per Direct Labor Manhours.
- k) Job Office Expense – Printing, ink, paper, supplies, and consumables

25) Traffic Control (Allowance)

- a) Allowance for all costs associated with Traffic Control, including, but not limited to: traffic control plans, permits, device rental, labor and equipment, sandbags, flags and dowels, pedestrian relocations, visual message boards, etc.

26) Off-Duty Officers (Allowance)

- a) Allowance for all required Off-Duty Officers.

27) Survey/GIS (Allowance)

- a) Allowance to capture Project specific GIS data for the City.

28) Quality Control Material Testing (Allowance)

- a) All costs associated with testing on the project including but not limited to compaction, concrete cylinder, sieve analysis, proctor, etc.

29) Additional Point Repairs (Allowance)

- a) Allowance for all costs associated with additional sewerline remove and replace scope of work not identified on the plans.
- b) Additional costs include, but are not limited to: labor and equipment for potholing, excavation, pipe removal, installation of replacement sewer, backfill material, trench shoring, trench plates, milling/recessing plates, asphalt restoration, traffic control, material testing, and flow management.

30) Top Hats (Allowance)

- a) Allowance for costs associated with installing tops hats for locations tops hats are deemed required and are not identified on the plans.
- b) This allowance shall include reimbursement for any additional vector bypass, support crew labor and equipment, and top hat subcontractor.

31) Project Contingency

- a) Project Contingency is based on 10% of the Project Direct Cost, excluding allowance and contingency totals.
- b) This contingency is for additional Owner directed/concurrence scope of work or additional risk items.

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EXHIBIT E

Construction Documents necessary to define Scope of Work and Deliverables for the Construction Phase Services, including plans, designs, drawings, specifications and other required Contract Documents

(88 pages - To be Incorporated by Amendment)

Exhibit E: List of GMP Documents

SEWER & MANHOLE REHABILITATION, PHASE 6C
COG PROJECT NUMBER: 212231
GMP-001

DOCUMENTS:

- Drawings: City of Glendale, Glendale, Arizona – Project No. 212231 Sewer & Manhole Rehabilitation, Phase 6C Sealed 4-22-2024
- Technical Specifications: City of Glendale, Water Services Department – Sewer & Manhole Rehabilitation Phase 6-C Project No. 212231 Sealed 4-22-2024

CITY OF GLENDALE

GLENDALE, ARIZONA

PROJECT # 212231 SEWER & MANHOLE REHABILITATION, PHASE 6C



Glendale
ARIZONA

MAYOR

JERRY P. WEIERS

CITY COUNCIL

LEANDRO BALDENEGRO
JOYCE V. CLARK
IAN HUGH
RAY MALNAR
LAUREN TOLMACHOFF
BART TURNER

CITY MANAGER

KEVIN R. PHELPS

CITY CLERK

JULIE K. BOWER

CITY ATTORNEY

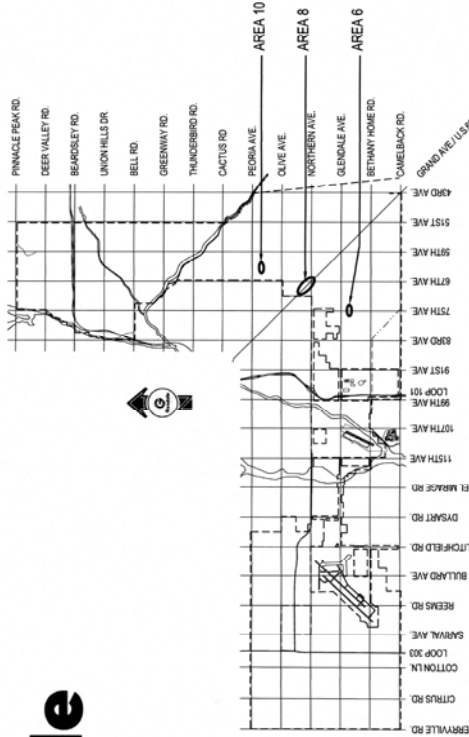
MICHAEL D. BAILEY

consor
2413 W. PUEBLO AVENUE, SUITE 1246
PHOENIX, AZ 85027
Phone: (602) 966-1901

PROJECT BENCHMARK:

BRASS CAP IN HANDHOLE
AT THE INTERSECTION OF 75TH AVENUE & MARYLAND AVENUE
ELEVATION = 1108.558' (NAVD88 DATUM)

VICINITY MAP



RECORD DRAWING

I certify that the locations, elevations, depths and record drawing comments accurately reflect the existing field conditions and materials actually used during construction. This certification is based on periodic field observations and the contractors representations of the facilities as constructed.

NAME _____ DATE _____

REGISTRATION NO. _____ EXP. DATE _____

REV. BY: _____ TECHNICAL REGISTRANT _____

SHEET INDEX

SHT. #	
1	COVER SHEET
2	KEY MAP SHEET
3	CONTROL SHEET
4	GENERAL NOTES, LEGEND, & ABBREVIATIONS
5	AREA 6 - SEWER PLAN SHEET
6-13	AREA 8 - SEWER PLAN AND PROFILE SHEETS
14	AREA 10 - SEWER PLAN AND PROFILE SHEET
15	MANHOLE REHABILITATION SCHEDULE & DETAILS
16	MANHOLE DETAILS

PLANS ACCEPTANCE

The City of Glendale accepts these plans for construction, as being in general compliance with plan preparation requirements of the City. Responsibility for the completeness and accuracy of the plans and related design resides with the Licensed Design Professional and Firm of Record which shall meet State of Arizona Board of Technical Registration requirements.

David D. Bailey CITY ENGINEER May 25, 2024 DATE

Ray Servo WATER SERVICES DIRECTOR 5-29-2024 DATE

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Project Name COS SEWER&MANHOLE PH6	
☐ APPROVED REVISIONS	☒ REVIEWED
☐ ZONING APPROVAL ONLY	
BY JCHAPIN	DATE 5/30/2024
DISCIPLINE	
SUBMITTAL# 241207	SPEC

This drawing is for the project and is not to be used for any other project. It is the responsibility of the user to ensure that the drawing is used in accordance with the project requirements. The user is not to be held responsible for any errors or omissions in the drawing. The user is to be held responsible for any errors or omissions in the drawing.

REVISIONS

NO. DATE DESCRIPTION

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LEGEND

-  BRASS CAP IN HANDHOLE
 BRASS CAP FLUSH
 SECTION OR 1/4 CORNER
 AREA OF SEWER & MANHOLE

PROJECT RENCH MARKS

(119) BRASS CAP IN HANDHOLE
AT THE INTERSECTION OF 75TH AVENUE & MARYLAND AVENUE
ELEVATION = 1108.588' (NAVD88 DATUM)

(121) BRASS CAP IN HANDHOLE
AT THE INTERSECTION OF 55TH AVENUE & CAMEBACK ROAD
ELEVATION = 1127.598' (NAVD88 DATUM)

(122) BRASS CAP FLUSH
AT THE INTERSECTION OF 61ST AVENUE & CHOLLA STREET
ELEVATION = 1315.378' (NAVD88 DATUM)



CONTROL PLAN

CONTROL COORDINATE TABLE

ID	Nothing	Flushing	Flushing	Descriptions
13	920663.62	917848.09		Section of 1/4 Corner
14	915027.17	917884.4		Section of 1/4 Corner
15	920717.1	91782.42		Section of 1/4 Corner
16	920131.3	91809.63		Section of 1/4 Corner
17	920131.3	91809.63		Section of 1/4 Corner
18	920131.3	91809.63		Section of 1/4 Corner
19	941903.33	92017.8		Section of 1/4 Corner
20	941903.33	91766.18		Section of 1/4 Corner
21	919307.3	91765.77		Section of 1/4 Corner
22	919325.25	92020.3		Section of 1/4 Corner
23	919325.25	92107.09		Section of 1/4 Corner
24	919325.25	92107.09		Section of 1/4 Corner
25	941914.36	92140.37		Section of 1/4 Corner
26	915103.33	92157.57	1185.88	Section of 1/4 Corner
27	920822.83	91524.79		Section of 1/4 Corner
28	920871.37	91793.93		Section of 1/4 Corner
29	920871.37	91793.93		Section of 1/4 Corner
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JOB SITE COPY
THESE PLANS SHALL BE KEPT AT THE
JOB SITE AND BE AVAILABLE TO CITY
OF GLENDALE INSPECTORS DURING
WORKING HOURS. PLANS SHALL NOT
BE ALTERED WITHOUT BUILDING
OFFICIALS'S APPROVAL.



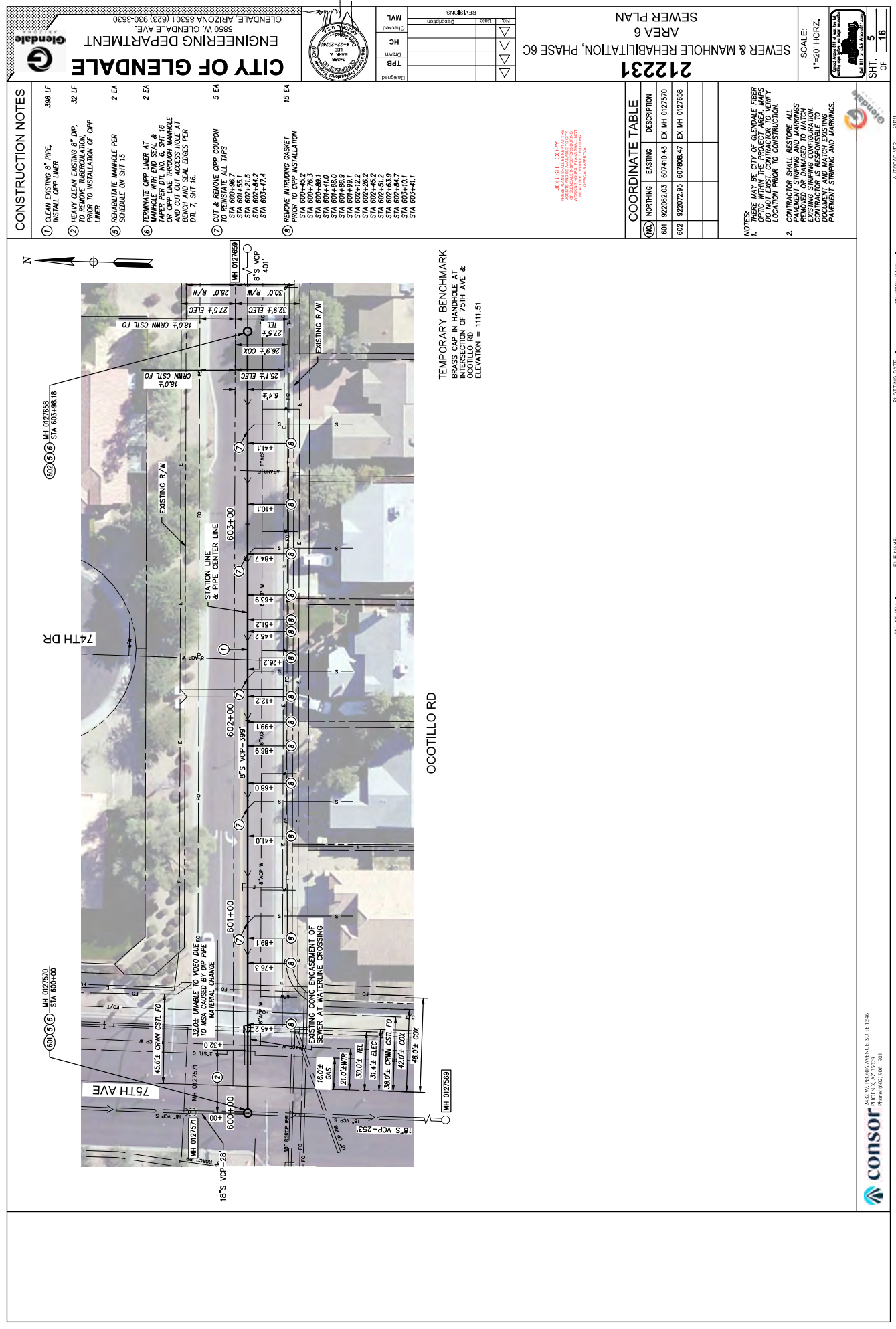
CITY OF GLENDALE
ENGINEERING DEPARTMENT
5850 W. GLENDALE AVE.
GLENDALE, ARIZONA 85301 (623) 930-3630

212231
SEWER & MANHOLE REHABILITATION, PHASE 6C
AREAS 6, 8 & 10
CONTROL SHEET

SCALE:



SHT. 3



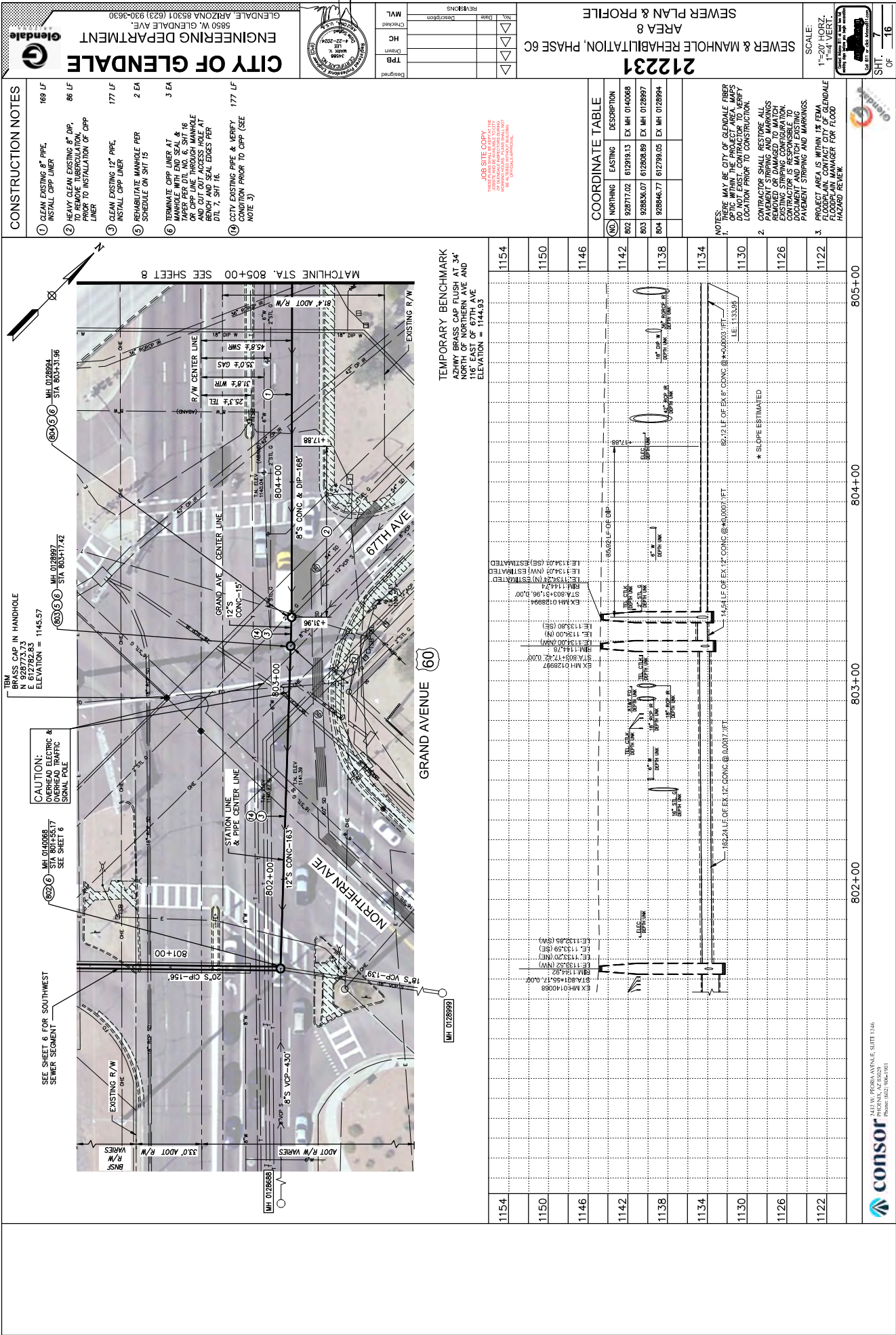
CONSTRUCTION NOTES	
1	CLEAN EXISTING 8" PIPE, INSTALL CPP LINER
2	HEAVY CLEAN EXISTING 8" PIPE, TO REMOVE SUBEROLLATION, PRIOR TO INSTALLATION OF CPP LINER
3	REHABILITATE MANHOLE PER SCHEDULE ON SHT 15
4	TERMINATE CPP LINER AT MANHOLE WITH END SEAL & TAPE PER DTL NO. 6, SCHEDULE ON SHT 15, AND CUT OUT ACCESS HOLE AT BENCH AND SEAL EDGES PER DTL 7, SHT 16.
5	CUT & REMOVE ORP COUPON PRIOR TO CPP INSTALLATION
6	REMOVE INTRODUCING GASKET
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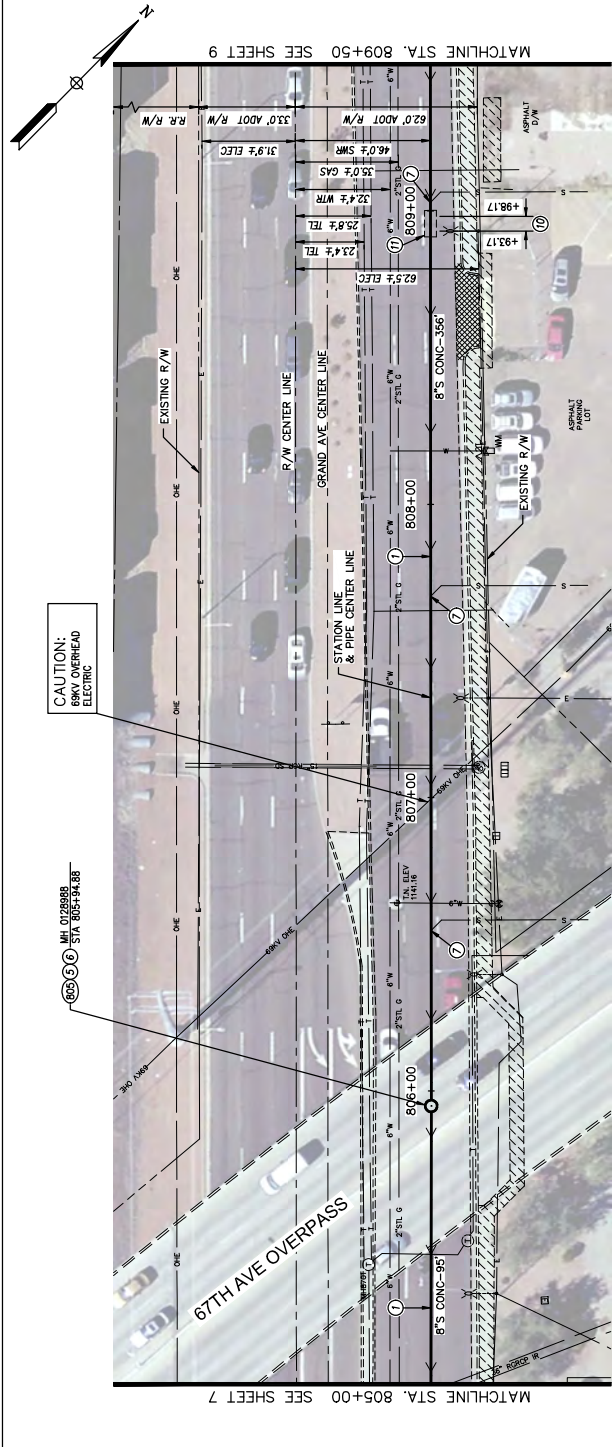
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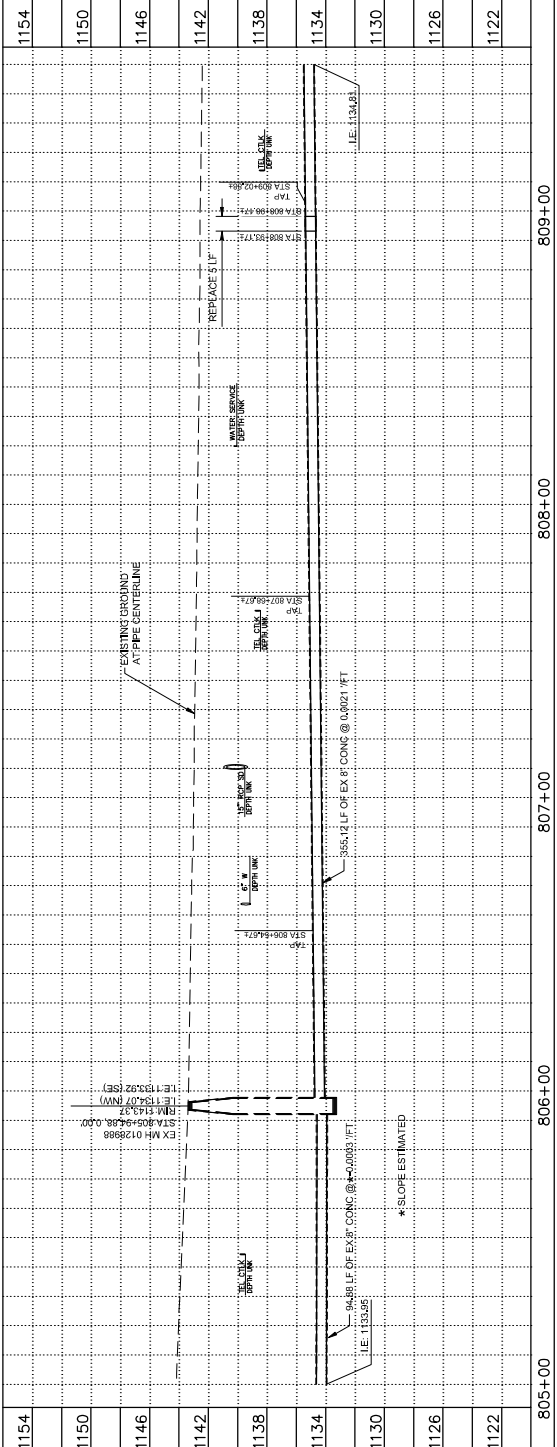
1. THERE MAY BE CITY OF GLENDALE FIBER OPTIC CABLES IN THE AREA. CONTRACTOR SHALL VERIFY LOCATION PRIOR TO CONSTRUCTION.

2. CONTRACTOR SHALL RESTORE ALL PAVEMENT STRIPPING AND MARKINGS EXISTING PRIOR TO CONSTRUCTION. CONTRACTOR IS RESPONSIBLE TO MAINTAIN EXISTING PAVEMENT STRIPPING AND MARKINGS.





MATCHLINE STA. 805+00 SEE SHEET 7
 MATCHLINE STA. 809+50 SEE SHEET 9
 67TH AVE OVERPASS
 8\"/>



NO.	NORTHING	EASTING	DESCRIPTION
1154	929034.17	612614.63	EX MH 0128988
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1146			
1142			
1138			
1134			
1130			
1126			
1122			

CITY OF GLENDALE
 ENGINEERING DEPARTMENT
 5850 W. GLENDALE AVE.
 GLENDALE, ARIZONA 85301 (623) 930-3630

SEWER & MANHOLE REHABILITATION, PHASE 6C
AREA 8
212231

SCALE:
 1"=20' HORIZ.
 1"=4' VERT.

CONSTRUCTION NOTES:
 1. CLEAN EXISTING 8" PIPE, INSTALL OPP LINER
 2. REHABILITATE MANHOLE PER SCHEDULE ON SHT 15
 3. TERMINATE OPP LINER AT EXISTING 8" CONCRETE MANHOLE AND SET NEW 18" MANHOLE R/W TO 16' FROM EXISTING MANHOLE AND CUT OUT ACCESS HOLE AT EXISTING MANHOLE PER DET 1, SHT 16
 4. CUT & REMOVE OPP COUPON TO REINSTATE ALL TAPS
 5. STA 806+54.67 TO STA 807+68.67
 6. REMOVE EX. 8" CONC SEWER PIPE & REINSTATE WITH NEW 8" SEWER PIPE PRIOR TO OPP INSTALLATION. VERIFY LOCATION VIA CCTV PRIOR TO EXCAVATION
 7. STA 808+93.17 TO STA 808+98.17
 8. REMOVE & REPLACE ASPHALT PAVEMENT PER ADOPT STD DET C-07.06

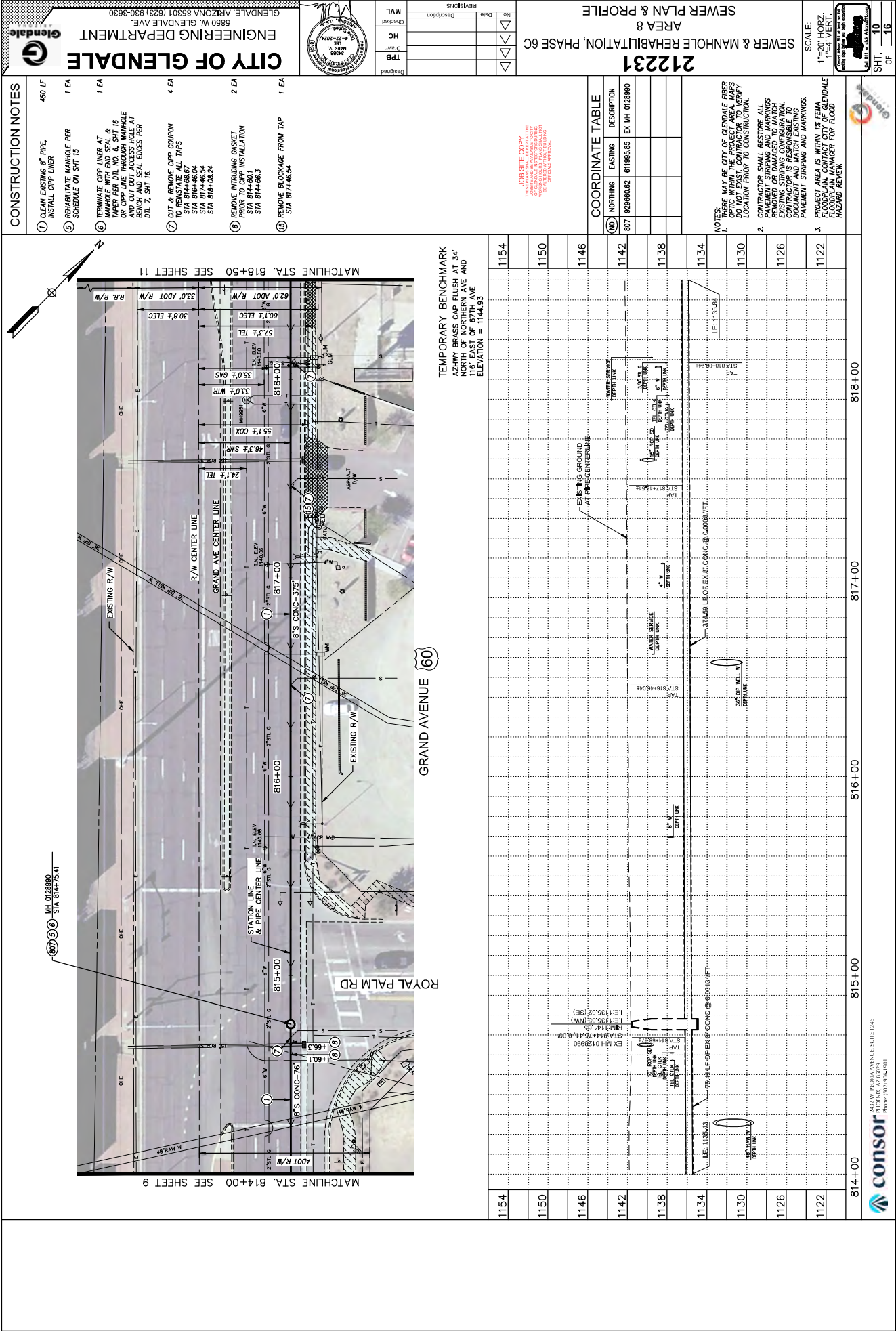
COORDINATE TABLE
 NO. NORTHING EASTING DESCRIPTION
 1154 929034.17 612614.63 EX MH 0128988
 1150
 1146
 1142
 1138
 1134
 1130
 1126
 1122

NOTES:
 1. THERE MAY BE CITY OF GLENDALE FIBER OPTIC CABLES IN THE AREA. CONTRACTOR SHALL VERIFY LOCATION PRIOR TO CONSTRUCTION.
 2. CONTRACTOR SHALL RESTORE ALL PAVEMENT STRIPPING AND MARKINGS EXISTING STRIPPING CONFIGURATION. CONTRACTOR IS RESPONSIBLE TO REPAIR ALL EXISTING PAVEMENT STRIPPING AND MARKINGS.
 3. PROJECT AREA IS WITHIN 15' FROM FLOODPLAIN. CONTACT CITY OF GLENDALE FLOODPLAIN MANAGER FOR FLOOD HAZARD REVIEW.

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MFL
 HC
 TPB
 Designated

SHEET 8 OF 16
 SHT. OF



- CONSTRUCTION NOTES**
- 1. CLEAN EXISTING 8" PIPE, INSTALL ORP LINER
 - 2. REHABILITATE MANHOLE PER SCHEDULE ON SHT 15
 - 3. TERMINATE ORP LINER AT MANHOLE WITH END SEAL & TAPER PER DETAIL NO. 8, SHT 16
 - 4. CUT & REMOVE ORP COUPON
 - 5. REMOVE WITHING CASSET
 - 6. REMOVE BLOCKAGE FROM TAP



Checked	____
Designed	____
Drawn	____
HC	____
TPB	____
MVL	____

SEWER & MANHOLE REHABILITATION, PHASE 6C

AREA 8

212231

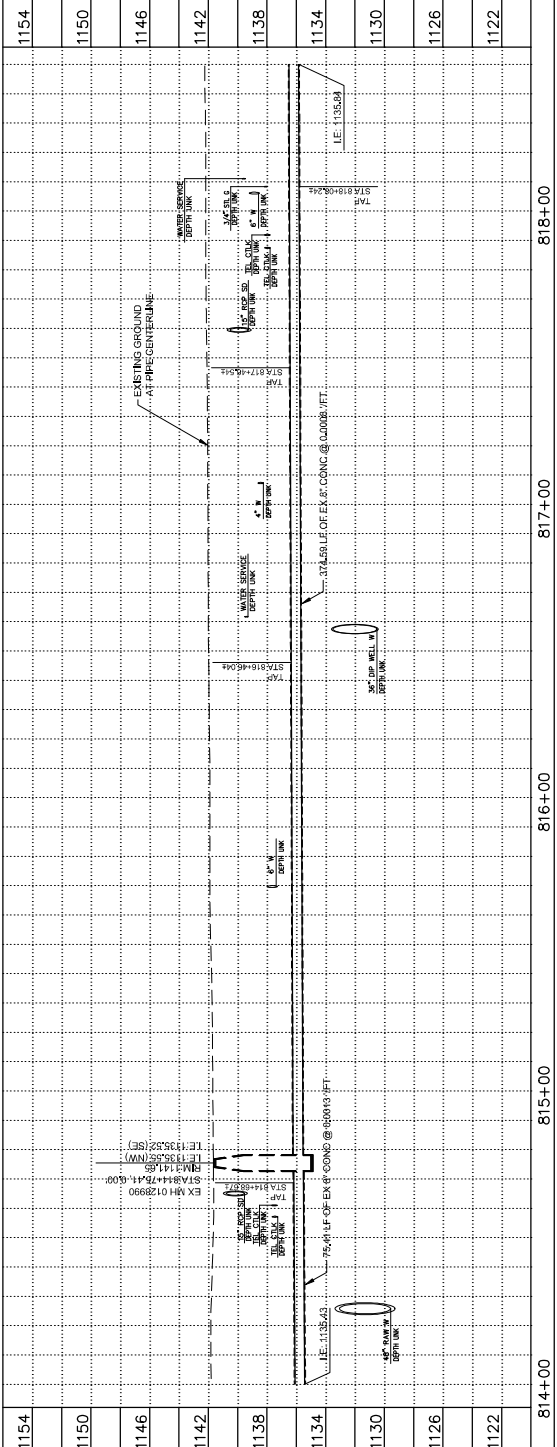
SEWER PLAN & PROFILE

SCALE: 1"=20' HORIZ. 1"=4' VERT.

SHT. 10 OF 16

CONSISTENT WITH THE CITY OF GLENDALE

TEMPORARY BENCHMARK
AZHWY BRASS CAP FLUSH AT 34"
NORTH OF NORTHERN AVE AND
116' EAST OF 67TH AVE
ELEVATION = 1144.33



COORDINATE TABLE

NO.	NORTHING	EASTING	DESCRIPTION
1	807	92980.62	611985.85 EX MH 0128990

- NOTES:**
- 1. THERE MAY BE CITY OF GLENDALE FIBER OPTIC CABLES IN THE AREA. CONTRACTOR SHALL VERIFY LOCATION PRIOR TO CONSTRUCTION.
 - 2. CONTRACTOR SHALL RESTORE ALL PAVEMENT STRIPPING AND MARKINGS EXISTING STRIPPING CONFIGURATION. CONTRACTOR IS RESPONSIBLE TO MAINTAIN ALL EXISTING PAVEMENT STRIPPING AND MARKINGS.
 - 3. PROJECT AREA IS WITHIN 15' FROM FLOODPLAIN. CONTACT CITY OF GLENDALE FLOODPLAIN MANAGER FOR FLOOD HAZARD REVIEW.

SEWER & MANHOLE REHABILITATION, F
AREA 8
SEWER PLAN & PROFILE

212231

MVL	REVISIONS	
	No.	Description
Checked	☐	
	☐	
HC	☐	
	☐	
Drawn	☐	
	☐	
TPB	☐	
	☐	



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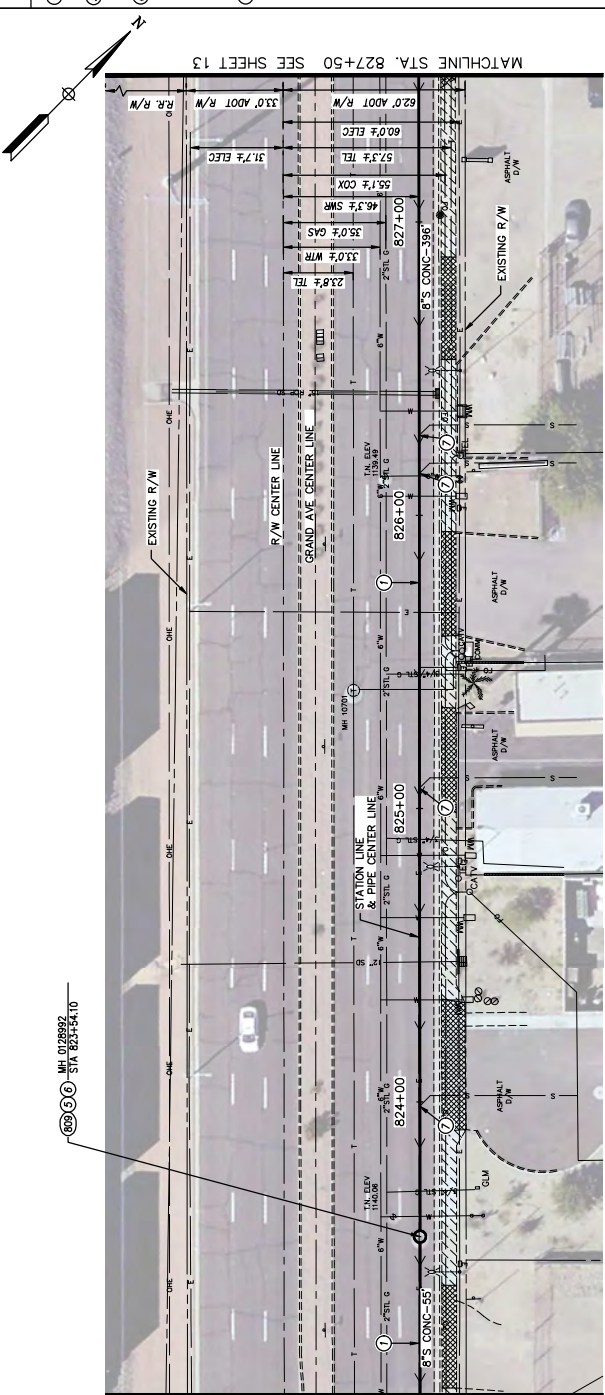
CONSTRUCTION NOTES	450 LF	1 EA	1 EA	4 EA
① CLEAN EXISTING 8" PIPE, INSTALL COPR LINER				
⑤ REHABILITATE MANHOLE PER SCHEDULE ON SHT 15				
⑥ TERMINATE COPR LINER AT MANHOLE WITH END SEAL, & BRANCH OFF 18" COPR LINE THROUGH HOLE AT AND CUT OUT ACCESS HOLE AT BENCH AND SEAL EDGES PER SHT 7, SHT 16.				
⑦ CUT & REMOVE COPR COUPON AT EXISTING MANHOLE, SHT 5 STA 823+98.60 SHT 825+07.00 SHT 826+14.26 SHT 826+27.28				

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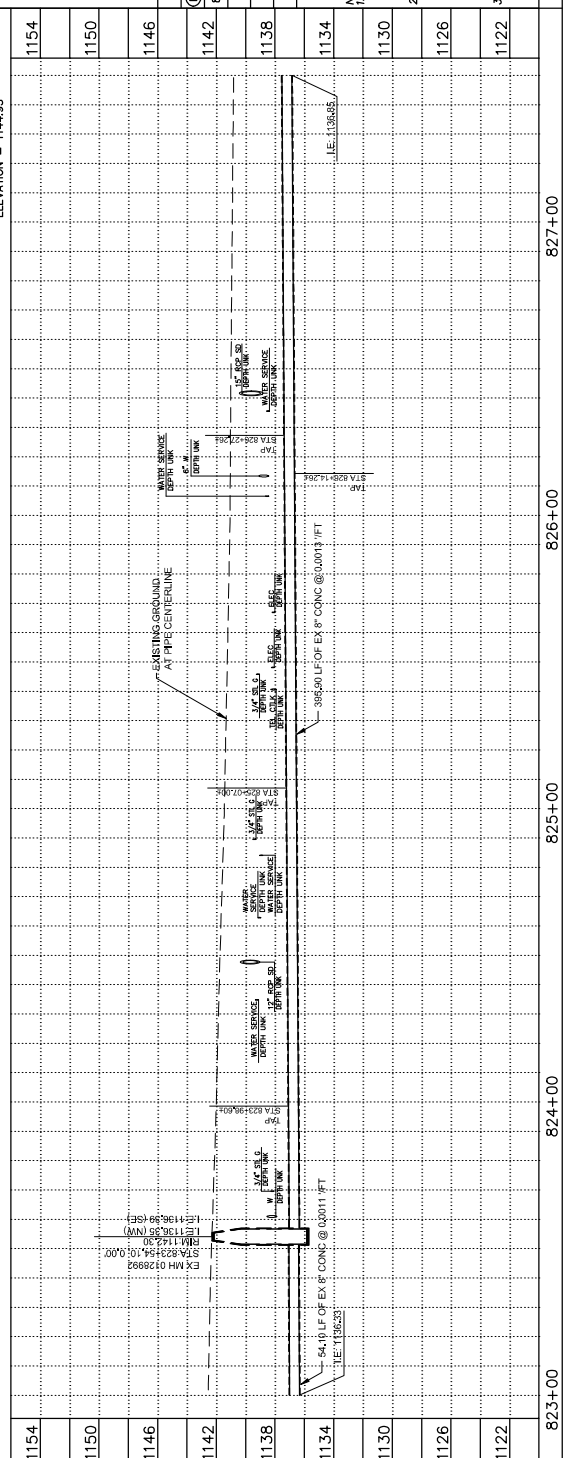
COORDINATE TABLE		
NORTHING	EASTING	DESCRIPTION
309	930285.95	611376.56 EX M 0128992
NOTES: 1. THERE MAY BE CITY OF GLENDALE FIBER OPTIC CABLES IN THE AREA. CONTRACTOR SHALL VERIFY LOCATION PRIOR TO CONSTRUCTION. 2. CONTRACTOR SHALL RESTORE ALL EXISTING STRIPING AND MARKINGS. CONTRACTOR IS RESPONSIBLE TO EXISTING STRIPING CONFIGURATION. 3. PROJECT AREA IS WITHIN 1/8 FEET FLOODPLAIN. CONTACT CITY OF GLENDALE FLOODPLAIN MANAGER FOR FLOODPLAIN MAP.		

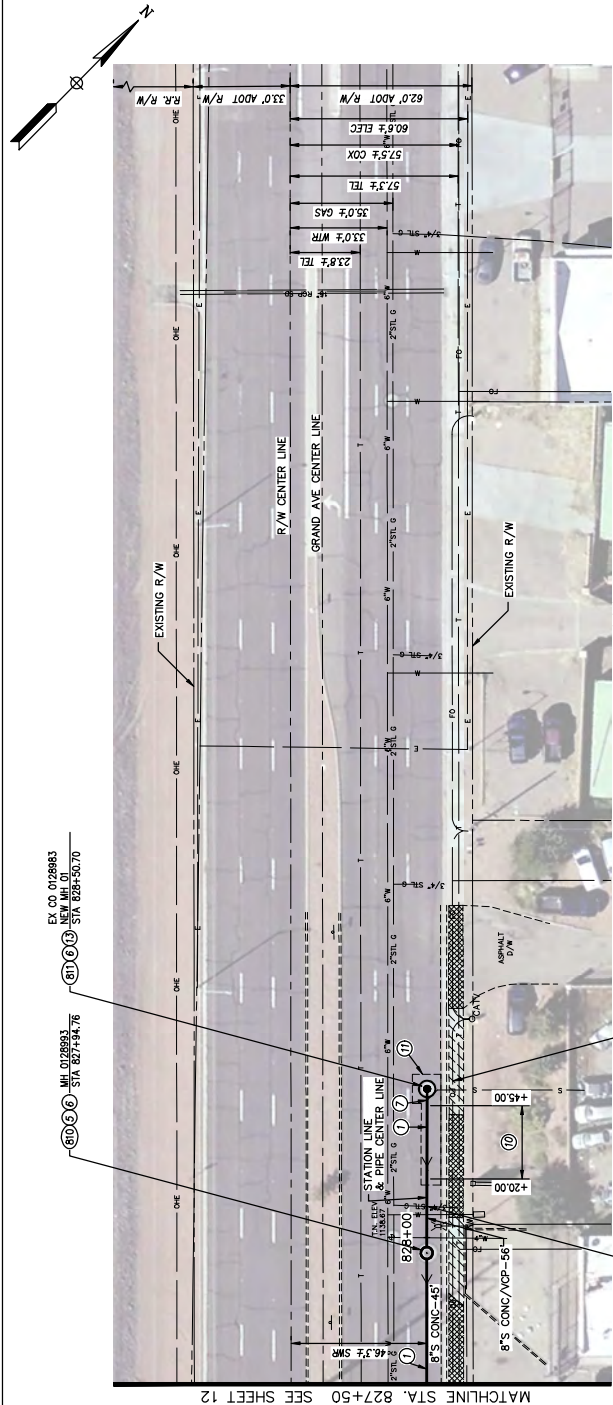
NOTES:

1. PROJECT MAY BE CITY OF GLENDALE FIBER OPTIC WITHIN THE PROJECT AREA. MAPS DO NOT EXIST. CONTRACTOR TO VERIFY LOCATION PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL RESTORE ALL PAYMENT STRIPING AND MARKINGS EXISTING STRIPING DESIGNED TO MATCH EXISTING STRIPING FOR INFORMATION. CONTRACTOR IS RESPONSIBLE TO DOCUMENT AND MATCH EXISTING PAYMENT STRIPING AND MARKINGS.
3. PROJECT AREA IS WITHIN 1% FEMA FLOODPLAIN; CONTACT CITY OF GLENDALE HAZARDOUS WILDERNESS FOR FLOOD HAZARD REVIEW.



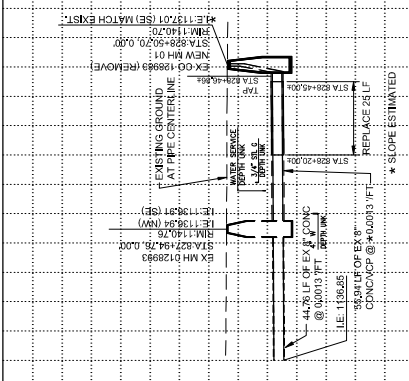
GRAND AVENUE





MATCHLINE STA. 827+50 SEE SHEET 12
 8\"/>

1154	1154
1150	1150
1146	1146
1142	1142
1138	1138
1134	1134
1130	1130
1126	1126
1122	1122
828+00	828+00
830+00	830+00
831+00	831+00
832+00	832+00



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SEWER & MANHOLE REHABILITATION, PHASE 6C
AREA 8
212231

SCALE: 1"=20' HORIZ.
1"=4' VERT.

SHEET 13 OF 16

CONSTRUCTION NOTES

- CLEAN EXISTING 8" PIPE. INSTALL CIPP LINER.
- REHABILITATE MANHOLE PER SCHEDULE ON SHEET 15.
- TERMINATE CIPP LINER AT MANHOLE WITH END SEAL & TAPER PER DETAIL NO. 8, SHEET 16. EXISTING MANHOLE AND CUT OUT ACCESS HOLE AT DETAIL 7, SHEET 16.
- CUT & REMOVE CIPP COUPON PER DETAIL 16. ALL TAPS STA. 828+16.86.
- REMOVE EX. 8" VCP SEWER PIPE & REPLACE WITH NEW 8" SEWER PIPE PRIOR TO CIPP. INSTALL NEW JOINTS TO CORRECT OFFSET JOINTS. CONTRACTOR TO VERIFY LOCATION VIA CCTV PRIOR TO CONSTRUCTION. STA. 828+20.00 TO 828+45.00.
- REMOVE & REPLACE ASPHALT PAVEMENT PER ADOT STD DETAIL C-7108.
- REMOVE EXISTING CLEANOUT AND CONSTRUCT 5" DIA. MANHOLE PER MAG STD DETAIL 420-1, TYPE A; 30" FRAME AND COVER PER MAG STD DETAIL 420-1, TYPE A; 6" DIA. & COG 7.32. NO STEPS. COAT INTERIOR OF MANHOLE WITH 1/2" THICK POLYURETHANE RESISTANT COATING PER SPECIFICATIONS. SEE GENERAL NOTES FOR SEWER MAIN CONSTRUCTION ON SHEET 4 FOR ADDITIONAL MANHOLE DETAILS. (M 01) STA. 828+50.70.

COORDINATE TABLE

NO.	NORTHING	EASTING	DESCRIPTION
810	930599.41	61068.83	EX MH 0128983
811	930639.32	610209.63	EX CO 0128983 & NEW MH 01

NOTES:
1. THERE MAY BE CITY OF GLENDALE FIBER OPTIC CABLES IN THE PROJECT AREA. CONTRACTOR SHALL VERIFY LOCATION PRIOR TO CONSTRUCTION.
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3. PROJECT AREA IS WITHIN 15' FROM FLOODPLAIN. CONTACT CITY OF GLENDALE FLOODPLAIN MANAGER FOR FLOOD HAZARD REVIEW.

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Project Name

COG SEWER&MANHOLE PH6C



☐ APPROVED REVISIONS ☒ REVIEWED

☐ ZONING APPROVAL ONLY

BY JCHAPIN

DATE 5/29/2024

DISCIPLINE

SUBMITTAL# 241207

SPEC

This review is only for general conformance of the project and general compliance. Corrections or comments made on these drawings during this review do not relieve Contractor/Subcontractor from compliance with the requirements of the plans and specifications. Contractor is responsible for all dimensions and fabrication to be confirmed and correlated at the job site



**CITY OF GLENDALE
WATER SERVICES DEPARTMENT**

**SEWER AND MANHOLE REHABILITATION
PHASE 6-C
PROJECT NO. 212231**

**TECHNICAL SPECIFICATIONS
April 2024**

Prepared by:



2432 W. Peoria Avenue, Suite 1246
Phoenix, Arizona 85029
602-906-1901

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**CITY OF GLENDALE
WATER SERVICES DEPARTMENT**

**SEWER AND MANHOLE REHABILITATION
PHASE 6-C
PROJECT NO. 212231**

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

SECTION 02100	MANHOLE REHABILITATION
SECTION 02603	CORROSION PROTECTIVE COATING SYSTEM
SECTION 02661	DIVERSION OF SEWAGE FLOW AND DEWATERING
SECTION 02760	SEWER AND STRUCTURE CLEANING
SECTION 02761	CCTV INSPECTION OF SANITARY SEWERS
SECTION 02767	CIPP LINING OF EXISTING SANITARY SEWERS
SECTION 02950	PIPELINE POINT REPAIRS
SECTION 03600	GROUT



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SECTION 02100

MANHOLE REHABILITATION

PART 1 - GENERAL

1.1 - DESCRIPTION

1.1.1. - Scope

This section specifies rehabilitation of existing sanitary sewer manholes due to deterioration, corrosion, damage, etc. Rehabilitation will restore the manholes and provide protection against infiltration and corrosion to the manhole interior. Corrosion protection of existing manholes in the sewer project consists of the installment of an approved protective coating or replacement of the manhole.

Manholes shall be rehabilitated according to the Contract Documents.

1.1.2. - Requirements

- A. CONTRACTOR shall furnish all labor, materials, and equipment required to clean, modify, and apply specified rehabilitation system to the structures indicated on the Contract Documents or to remove and/or remove and replace with manholes. CONTRACTOR shall comply with the local authority and all Occupational Safety and Health Administration (OSHA) requirements for confined space entry.
- B. CONTRACTOR shall field verify all manhole dimensions prior to the purchase of materials to be used for the rehabilitation of manholes.
- C. All materials specified by name brand or manufacturer shall be delivered unopened to the job in original containers. All safety precautions recommended by the manufacturer in printed instructions or special bulletins shall be obtained and followed.
- D. Application of the specified rehabilitation system shall be performed by a contractor certified and trained by the manufacturer.
- E. In this specification, unless otherwise specifically noted, the word “manhole” shall mean “sewer structure” and shall encompass sewer manholes, sewage lift station wet wells, sewer diversion structures, sewer junction structures, and other sewer structures. It also encompasses sewer pipes (or portions thereof) that are located within the sewer structure but does not include sewer pipes (or portions thereof) that are located outside of the limits of the structure.
- F. In this specification, “existing manholes” shall mean those manholes that are (or were) not constructed as part of this project work.

- G. Where required by the Contract Documents; existing manholes shall be rehabilitated and an approved corrosion protective coating applied to their interior surfaces or a structural insert installed, as specified herein.
- H. The approved coating system (as specified herein) shall be applied to all exposed brick, concrete, grout, mortar, and cementitious surfaces within the manhole, including unlined concrete pipes within the manhole, bench-to-pipe transitions, bench, risers, cones, adjusting rings, etc. Coating of the metallic manhole frame and cover is not required.

1.1.3. - References

Comply with the applicable provisions and recommendations of the following, unless otherwise shown or specified.

Reference	Title
ASTM C478	Standard Specification for Precast Concrete Manhole Sections
ASTM D16	Standard Terminology for Paint, Coatings, Materials, etc.
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers-Tension
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D3359	Standard Test Methods for Measuring Adhesion by Tape Test
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
MAG 601	Trench Excavation, Backfilling and Compaction
MAG 625	Manhole Construction and Drop Sewer Connections
MAG 725	Portland Cement Concrete
MAG 741	Lining for Reinforced Concrete Sanitary Sewer Pipe
NASSCO MACP	National Association of Sewer Service Companies, Manhole Assessment and Certification Program

1.2 - QUALITY ASSURANCE

Rehabilitated or restored manholes shall be inspected by the ENGINEER prior to coating and documented with photographs per PART 3 – POST-EXECUTION, literal D of this section.

1.3 - GUARANTEE

All structural rehabilitation work performed by the CONTRACTOR shall be guaranteed against faulty workmanship and/or materials for a period of one (1) year after final acceptance of work.

PART 2 - EXECUTION

2.1 - SEQUENCE OF REHABILITATION

If the manhole, bench, or channel are coded to be rehabilitated, then cleaning, coating, structural insert, and testing activities shall be done simultaneously.

The following numerals of sequence of rehabilitation include all the tasks that need to be performed to rehabilitate a manhole.

Refer to the Contract Documents to identify all manholes included for rehabilitation and which rehabilitation tasks are included for each manhole.

2.1.1. - Remove and Replace Manhole Collar, Frame and Cover

- A. Removal of the existing defective collar, frame and cover is included in this item of work and shall be completed and disposed of by the CONTRACTOR at a suitable location for disposal.
- B. Replacement and installation of the collar, frame and cover shall be per MAG Standard Details 422 and 423. Cast iron frames and covers shall be Class 35 with weights and dimensions in conformance with MAG Standard Detail 423 and COG Standard Detail G-704, see Detail 8, Sheet 16.
- C. Cleaning or coating of the adjustment rings shall be included in the replacement of the frame and cover. Cleaning and coating of the adjustment rings shall be per Cleaning and Preparation Activities of SECTION 02603.

2.1.2. - Repair and Coat Chimney, Cone and Wall

Repair and Coat Chimney, Cone and Wall of existing manholes shall include the following activities:

- A. Cleaning the manhole, removing corroded/deteriorated materials from the manhole, and otherwise preparing the manhole for one of the approved coating systems per SECTION 02603.
- B. Applying one of the approved coatings as specified herein SECTION 02603.
- C. Testing the finished surface, as required herein SECTION 02603.
- D. Repairs to the interior of the manhole do not include the bench or channel. Repairs to the bench and channel are included as separate rehabilitation tasks.
- E. For manholes coded for rehabilitation with an approved coating system, the entire manhole interior shall be coated including the adjustment rings, cone, riser section, bench, and channel. For manholes coded for rehabilitation with

an approved structural insert system, any of the manhole components not protected by the structural insert shall be coated.

- F. The coating system shall also extend to the water line of the manhole unless the channel consists of a corrosion resistant pipe material or has been lined through with cured-in-place pipe (CIPP). Coating edges shall be terminated at or below the water line by keying into the concrete with a minimum ¼-inch wide x ¼-inch deep saw cut. Prior to coating application, the saw cut shall be dried and vacuumed to remove all dust and residue. During coating application, a liberal amount of material shall be applied to the saw-cut area and smoothed level. At no time shall the existing reinforcement be cut or damaged during installation of the keyways.
- G. Coating and structural insert shall include sealing between the adjustment rings and frame.
- H. Replacement of adjustment rings is included in this item of work.
- I. The outside of grading rings shall be neatly plastered with 1/2-inch of cement mortar as the Work progresses.
- J. Grading rings shall be used for all manholes, where required. Grade rings shall be a maximum of 12-inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the grade rings shall be such as is necessary to bring the manhole frame to the proper grade.
- K. Each grading ring shall be laid in a full bed of mortar and shall be thoroughly bonded.
- L. Cleaning of the adjustment rings prior to the job shall be per SECTION 02603.
- M. Coating of the existing adjustment rings shall be the same procedures as given for the entire manhole interior surfaces in SECTION 02603.
- N. Removal of all existing manhole steps is included in this item of work. Unless otherwise noted, for existing manholes that have existing manhole steps installed in them, the CONTRACTOR shall remove said steps from the manhole. If the manhole steps are "strongly embedded" in the concrete (for manhole steps, this is defined as a pulling force of 100 pounds per step being insufficient to dislodge them from the concrete), the CONTRACTOR may cut them off flush with the surface of the surrounding manhole and leave the embedded portion in place in the concrete. When the manhole is fully prepared and ready for the coating system, any portion of the steps that remain embedded in the concrete shall not protrude above the surface of the concrete. and includes removal of existing steps by cutting the protruding parts as close as possible to the manhole surface.
- O. The remaining nub shall be ground down and grouted over to form a smooth surface.

2.1.3. - Repair and Coat Bench

- A. Cleaning of the manhole bench prior to the job shall be Cleaning and Preparation Activities of SECTION 02603.
- B. Rebuilding of the bench shall include grouting in accordance with SECTION 03600 as necessary to restore the bench to the original or better grade.
- C. Benches shall be built up and given a uniform wood float finish. Care shall be taken to slope all benches for proper drainage to the invert. ALL manhole bench reconstruction work shall be done in accordance with MAG Standard Detail 420.
- D. Rebuilt Benches shall be coated in accordance with the procedures as given for the entire manhole interior surfaces in SECTION 02603.
- E. In order to reconstruct the benches, the CONTRACTOR will be required to provide dry working conditions in all manhole benches and invert areas to allow the concrete and other materials to set properly.

2.1.4. - Repair/Reshape and Coat Channel

- A. Cleaning of the manhole channel prior to the job shall be per Cleaning and Preparation Activities of SECTION 02603.
- B. Rebuilding and reshaping of the channels through manholes shall be constructed of Class "A" concrete per MAG Section 725, Portland Cement Concrete. Channels shall be properly formed to the sizes, cross sections, grades, and shapes as per MAG Standard Detail 420-3 and as shown in the project plans.
- C. Reshaped channel shall be coated in accordance with the procedures as given for the entire manhole interior surfaces in SECTION 02603.
- D. In order to reconstruct the channels, the CONTRACTOR will be required to provide dry working conditions in all manhole channel areas to allow the concrete and other materials to set properly.

2.1.5. - New 60-inch Diameter Manhole

- A. At the locations shown on the plans the CONTRACTOR shall provide a new 60-inch diameter manhole. All work shall be in accordance with MAG Detail 420, Type A with a 30-inch frame and cover per MAG Detail 423-2 and COG Detail G-704.
- B. No steps are to be installed in the new manhole.
- C. New manholes shall be coated with an approved corrosion protective coating in accordance with SECTION 02603.

2.1.6. - Remove Existing Manhole, Flushing Tank, or Cleanout

- A. At the locations shown on the plans the CONTRACTOR shall remove existing manholes, flushing tanks, or cleanouts. Work includes excavation of material sufficient to remove the existing structure in preparation for construction of a new manhole or new pipe installation.

2.1.7. - Usage of Temporary Flow-Through Plugs

- A. Where determined necessary, the CONTRACTOR may install temporary flow-through plugs so that repair materials are installed over a dry substrate and are allowed to cure in accordance with manufacturer recommendations before coming in contact with sewage.
- B. The CONTRACTOR shall insure that flow-through plugs are of adequate capacity and size to maintain flow throughout the rehabilitation process without sewer backup.
- C. If sewage backup occurs, the CONTRACTOR shall be solely responsible for any cleanup, repair, property damage costs and claims, or resultant regulatory agency fines.

PART 3 - POST-EXECUTION

Upon completion of this rehabilitation project, the CONTRACTOR shall provide to the City with the Project Record Documents, which will include but not be limited to:

- A. Exhibits and/or As-Builts drawing reflecting all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the work completed for every manhole under the contract.
- B. Change orders approved during the construction process and other modifications to the contract should be reflected on the final Exhibits and As-Builts.
- C. Product data and specifications.
- D. Photographic record of all the work performed and every manhole showing the pre-execution and the post-execution condition. Frame and cover, and adjustment ring replacements should also be documented.
- E. Field test records.

PART 4 - MEASUREMENT AND PAYMENT

- A. DEFINITION: Full compensation for all labor, materials and equipment required to clean manholes, prepare surface of manholes, remove manholes, construct new manholes, excavation, saw cutting, removal and replacement of surrounding finish grade materials, remove and replace frame and cover,

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MANHOLE REHABILITATION | 02100-6



adjusting rings, cone, shaft, bench, channel, etc., repair manhole walls, grouting, furnish and install coating and insert liner in accordance with manufacturer's recommendations and these technical specifications, all safety and support systems required to complete the work as described in these special provisions, restoration of adjacent site, and including any incidental items necessary to complete the work.

B. MEASUREMENT AND PAYMENT: Measurement and Payment of Manhole Rehabilitation shall be on a unit price for each item of work described as follows:

1. Remove and Replace Manhole Collar, Frame and Cover: measurement and payment shall be on a unit price bid per each for the work complete in place.
2. Repair and Coat Chimney, Cone and Wall: measurement and payment shall be on a unit price bid per square foot of manhole completely coated as described herein.
3. Repair and Coat Bench: measurement and payment shall be on a unit price bid per each for the work, complete in place.
4. Repair and Coat Channel: measurement and payment shall be on a unit price bid per each for the work, complete in place.
5. New 60-inch Diameter Manhole: measurement and payment shall be on a unit price bid per each for the work complete in place.
6. Remove Existing Manhole, Flushing Tank, or Cleanout: measurement and payment for removal of existing manhole, flushing tank, or cleanout shall be on a unit price bid per each for the work complete in place.

+ + END OF SECTION + +

SECTION 02603

CORROSION PROTECTIVE COATING SYSTEM

PART 1 - GENERAL

1.1 - DESCRIPTION

1.1.1. - Scope

This section specifies the coating system used for the coating of the manholes as indicated in the Contract Documents.

The coating shall yield a hard, durable chemical resistant coating and shall be specifically designed to be applied on a dry surface. The finished coating shall provide a watertight seal and shall adhere to all components of the manhole and adjoining pipeline and any pipeline liner systems if present.

1.1.2. - Definitions

Specific coating terminology used in this section is in accordance with definitions contained in ASTM D16, ASTM D3960, and the following definitions:

Replacement of the adjustment rings shall include the following:

- A. Dry Film Thickness (DFT): The thickness of one fully cured continuous application of coating.
- B. Field Coat: The application or the completion of application of the coating system after installation of the surface at the site of the work.
- C. Shop Coat: One or more coats applied in a shop or plant prior to shipment to the site of erection or fabrication, where the field or finishing coat is applied.
- D. Tie Coat: An intermediate coat used to bond different types of paint coats. Coatings are used to improve the adhesion of a succeeding coat.
- E. Volatile Organic Compound (VOC) Content: The portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing, expressed in grams per liter or pounds per gallon.
- F. Touch-Up Painting: The application of paint on areas of painted surfaces to repair marks, scratches, and areas where the coating has deteriorated to restore the coating film to an unbroken condition.

1.1.3. - References

This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements

of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM D16	Standard Terminology Relating for Paint, Related Coatings, Material, and Applications
ASTM D256	Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D638	Standard Test Method For Tensile Properties Of Plastics
ASTM D695	Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics
ASTM D3359	Standard Test Methods for Measuring Adhesion by Tape Test
ASTM D1653	Standard Test Methods for Water Vapor Transmission of Organic Coating Films
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D4060	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D4258	Standard Practice for Surface Cleaning Concrete for Coating
ASTM D4262	Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
NACE RP0274	High-Voltage Electrical Inspection of Pipeline Coatings
SSPC-SP13	Surface Preparation of Concrete

1.1.4. - Quality Assurance

- A. STANDARDIZATION: Materials and supplies provided shall be the standard products of manufacturers. Materials in each coating system shall be the products of a single manufacturer.
- B. SPARK TESTING: Spark testing shall be used on all manholes that are coated to detect cracks and thin spots in the coating system. A 1/8-inch hole shall be drilled through the coating as a control for the holiday detector. A stainless-steel concrete anchoring bolt shall be installed in the manhole interior for grounding during spark testing. The entire interior surface of the manhole shall

be spark tested per NACE RP0274 standard in the presence of the ENGINEER. Areas that fail the spark test as well as the 1/8-inch control hole shall be promptly repaired and retested. Subsequent inspections and repair work shall be at the expense of the CONTRACTOR. The spark testing will be performed by the CONTRACTOR and witnessed by the ENGINEER and shall be completed and any repairs made prior to the final acceptance inspection. Spark test results shall be provided in writing by the CONTRACTOR to the CITY.

C. PHYSICAL TESTING: Results of the following tests, performed on cured and coated concrete specimens, shall be provided.

1. Compressive Strength – ASTM D695
2. Water Vapor Transmission – ASTM D1653
3. Impact Resistance – ASTM D256
4. Abrasion Resistance – ASTM D4060
5. Flexural Strength and Modulus of Elasticity – ASTM D790
6. Tensile Strength – ASTM D638

D. ADHESION TESTING: At a minimum one in four of the manholes coated, the CONTRACTOR shall perform an adhesion test after proper cure in accordance with ASTM D4541 to demonstrate that the specified field coatings adhere to the substrate. Manholes to be tested will be chosen by the ENGINEER and the adhesion test shall be witnessed by the ENGINEER. Test results showing an adhesion rating of that specified by the manufacturer or better for all surfaces shall be considered acceptable provided the test results in failure at or within the substrate. If the test dolly should pull off with failure in the epoxy or coating additional testing will be required. Where unacceptable test results are obtained, the CONTRACTOR shall be responsible for removing and reapplying the specified coatings at no cost to the CITY. A failed test shall require testing two additional manholes at no additional cost to the CITY.

1.1.5. - Delivery and Storage

Materials shall be delivered to the job site in their original, unopened containers. Each container shall bear the manufacturer's name, coating type, batch number, date of manufacture, storage life, and special directions.

Materials shall be stored in enclosed structures and shall be protected from weather an excessive heat or cold. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life recommended by the manufacturer shall be removed from the site.

PART 2 - PRODUCTS

The coating system shall be a trowel-able 100% solids epoxy monolithic surfacing system for use in coating new or existing manholes, wet wells, lift stations, treatment plants and other structures.

2.1 - MATERIALS

- A. COATING: All pre-approved corrosion protective coating systems for application to existing manholes for the City of Glendale sewer rehabilitation projects are listed in the CITY's Design Standards.
- B. PRIMER: Primer shall be as recommended by the manufacturer for each application.
- C. UNDERLAYMENT: Underlayment applied prior to coating shall be as recommended by the manufacturer for each application.
- D. INFILTRATION CONTROL: Manhole infiltration control material shall be as recommended by the manufacturer. Surface preparation and application shall be as recommended by the manufacturer.

2.2 - COATING SYSTEM APPLICATION PLAN

Coating System Application Plan shall be prepared that includes a description of the following:

- A. Quality Assurance Procedures:
 - 1. Training program to qualify personal in the correct storage and handling of coating materials, and the necessary safety requirements.
 - 2. List of application and testing equipment to be used, including inspections confirming satisfactory conditions of equipment.
 - 3. Detailed procedures and methods for surface preparation including repair and reprofiling as required, application of primer and final coating and testing.
- B. Criteria for acceptance of the preparation of concrete and other manhole surfaces.
- C. Plan for sewage diversion or the use of flow-through plugs, if required.
- D. Method and material for sealing active leaks.
- E. Detailed plan of surface preparation, including repair and reprofiling.
- F. Details of application primer and finish coats, including required curing times.
- G. Detailed environmental provisions such as shading from the sun.
- H. Procedures for adhesion testing.
- I. Dry film thickness testing.

2.3 - PRODUCT DATA

Before materials are delivered to the job site, the CONTRACTOR shall provide the following information:

- A. For the underlayment filler, primer, and finish coating, the CONTRACTOR shall furnish a Material Safety Data Sheet (MSDS).
- B. For the underlayment filler and finish coating, the CONTRACTOR shall provide the manufacturer's application instructions, which shall include the following:
 - 1. Surface preparation recommendations.
 - 2. Primer type, where required.
 - 3. Maximum dry and wet mil thickness per coat.
 - 4. Minimum and maximum curing time between coats, including atmospheric conditions for each.
 - 5. Curing time before submergence in liquid.
 - 6. Thinner to be used with coating material.
 - 7. Ventilation requirements.
 - 8. Minimum atmospheric conditions during which the coating shall be applied.
 - 9. Allowable application methods.
 - 10. Maximum allowable moisture content.
 - 11. Maximum storage life.
- C. List of materials proposed to be used under this section and manufacturer's data for each material including test data referenced in part 1.1.4 C. of this section.

PART 3 - EXECUTION

3.1 - COATING APPLICATOR QUALIFICATIONS

- A. The CONTRACTOR or SUBCONTRACTOR performing the work covered by this specification (also referred to herein as "the coating applicator") shall be an approved applicator of the manufacturer. It shall be the CONTRACTOR's responsibility to ensure that any SUBCONTRACTOR used for such work is an approved applicator.

3.2 - COATING SYSTEM APPLICATION

3.2.1. - Cleaning and Preparation of Surfaces to be Coated

- A. The CONTRACTOR shall clean manholes to be rehabilitated per SSPC-SP13. Before application of the coating system, the surface must be clean and free of all contaminants including oil, grease, incompatible existing coatings, waxes,

form release, curing compounds, efflorescence, sealers, salts, dust, and chemical contaminants. Suitable heaters shall be used as needed to produce a surface-dry condition. The surface will be vacuumed to make sure that loose particles are not present. The entire manhole interior including frame, walls and bench shall be cleaned using either abrasive blasting and/or high-pressure water blast as recommended by the coating and/or repair product manufacturer and approved by the ENGINEER. All concrete, brick or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound, neutralized surface. Manholes designated for spot repair or bench coating only shall be cleaned in their entirety as previously described.

Other manhole cleaning methods may be used in addition to abrasive blasting or water blasting, as necessary to properly clean and prepare the manhole, but shall not be used as a substitute for abrasive blasting or water blasting. Subject to CITY approval, other methods that may be used in addition to abrasive blasting or water blasting (but not as a substitute for them) are high pressure shotblasting, grinding, mechanical removal methods, chemical cleaning, detergent cleaning, hot water blasting and acid etching. If chemical cleaning or acid etching are used, the substrate shall be neutralized and washed of residue. The CONTRACTOR shall use whatever methods are required to properly clean and prepare the manhole for the coating system.

Unless otherwise noted, for existing manholes lined or coated with a previously applied corrosion protective coating, the CONTRACTOR shall entirely remove the existing liner/coating (including any underlayment layers) prior to performing other cleaning activities.

The CONTRACTOR shall also remove all dirt, rocks, rust, spalled masonry including mortar, concrete and brick, roots, sludge, grit and other deleterious materials and debris from the interior manhole. The finished interior surface shall consist of sound concrete or brick with adequate profile and porosity to provide a strong bond between the necessary repair materials and/or coating and the substrate.

During cleaning and preparation, methods shall be taken to prevent any debris from entering the downstream sewer mains.

- B. CONTRACTOR shall also be responsible for any additional surface preparation beyond water blasting as required by the coating system manufacturer. Where additional preparation is required, the CONTRACTOR shall provide all labor, materials, and equipment as necessary, and at no additional cost to the CITY.
- C. Visual Appearance of the Manhole – The prepared substrate shall have the appearance of sound concrete (or brick and/or mortar), free from discolored, white, chalky, and cracked areas.
- D. Aural Observations – When struck with a metal hammer or tool, the prepared substrate shall exhibit the characteristic sound of solid, competent concrete (or brick).

- E. CONTRACTOR shall test prepared surfaces after cleaning but prior to application of the coating system to determine the pH and moisture content of the concrete, as required according to manufacturer's recommendations. Testing may include pH and Phenolphthalein as described below:

pH testing – The ENGINEER shall use wetted litmus paper applied to the surface of the substrate to ensure that the pH of the substrate is 7 or higher. This test will be considered obligatory.

Phenolphthalein testing – The ENGINEER shall apply a few drops of phenolphthalein to the surface of the concrete, which if the concrete is competent should yield a purple color.

The ENGINEER is not obligated to use all of the above tests but may do so at CITY's sole discretion. Often visual, mechanical and/or aural observations and tests alone will be adequate, but the pH and/or phenolphthalein tests may be used if there is still some uncertainty.

- F. The area between the manhole and the manhole ring and any other area that might exhibit movement or cracking due to expansion and contraction shall be grouted with a watertight, expansive grout, approved for use by the manufacturer's representative and the ENGINEER.
- G. The CONTRACTOR shall apply an approved underlayment to the interior of all manholes on this project to reshape and re-profile portions of the interior surface of the manholes. Prior to any surface coating work in existing manholes, the CONTRACTOR shall fill all voids, including any left by the removal of manhole steps; removal of loose and spalled concrete material in accordance with cleaning and preparation recommendations; and removal of concrete where evidence of exposed reinforcement is visible in the interior of the manhole. These areas will require buildup and re-profiling of the manhole wall as needed such that the manhole and bench surface is restored to an even and uniform surface profile using one of the underlayment materials approved and recommended by the selected coating material manufacturers.

The underlayment shall be installed over a clean surface prepared in accordance with the requirements of this specification. The CONTRACTOR shall employ whatever means necessary (e.g., humidity control, temperature control, additional blasting, mechanical surface preparation, etc.) to ensure proper curing of the underlayment layer, strong adherence of the underlayment layer to the prepared manhole surface, and strong adherence to any layer installed over the underlayment layer.

The underlayment shall be applied throughout the entire manhole at a minimum ½-inch total cured thickness. Underlayment shall be hand troweled and in accordance with the manufacturer's recommendations. After installation, the underlayment shall be free of trowel marks and irregularities. Notwithstanding the thickness requirement, an additional underlayment thickness requirement may be required by the ENGINEER for existing manholes that exhibit extreme deterioration.

3.2.2. - Coating Application Preparation

- A. CONTRACTOR shall protect the newly lined sewer from debris, overspray, or any detrimental activity due to restoration of the manholes.
- B. Manholes to be coated shall be cleaned in their entirety in accordance with the requirements of subsection 3.2.1 of this specification. The CONTRACTOR shall employ whatever means necessary (e.g., humidity control, temperature control, additional blasting, mechanical surface preparation, etc.) to ensure strong adherence of the surface coating layer(s) to any underlying and overlying layers and proper curing of the surface coating layer(s). If the surface coating is applied in two or more layers, the time between applications of the various layers shall be controlled to ensure proper bond between layers. Loose and protruding concrete shall be removed. Missing brick and mortar shall be filled using a grout as recommended by the coating manufacturer and approved by the ENGINEER. The grout filler shall be used to bring all areas of holes and pitting up to the nominal surface of the manhole so that there is an even interior surface in the manhole without waves, pits, or holes. Any exposed rebar shall be cleaned, and all areas of corrosion removed prior to application of the grout as recommended by the coating manufacturer and approved by the ENGINEER.
- C. After surface preparation is complete, all materials dislodged during cleaning shall be removed from the work area. The CONTRACTOR shall be responsible for transporting and disposing, including all disposal fees, of any sediments and material removed from the sewer structures. All sediment and debris removed from the sewer structures shall be disposed off-site in a lawful manner. Hauling containers shall be watertight. On-site stockpiling of removed material will not be permitted.

The CONTRACTOR is responsible for obtaining all necessary permits, fees, and approval from all regulatory agencies required to perform the work, including transport of sediments. Off-site disposal of all material removed from the sewer shall be the CONTRACTOR's responsibility.

A letter identifying the methods the CONTRACTOR plans to employ to remove sediment, debris, grease, scale, encrustations, and roots in the sewer structures to be repaired or coated shall be submitted to ENGINEER. The letter shall include a detailed explanation of the cleaning process and a schedule of activities and a list of the actions he plans to take to mitigate impact to the public during the cleaning operation.

Any sediment or debris from cleaning operations larger than U.S. #8 sieve shall not be deposited downstream in the sewer main. Sedimentation deposited downstream, as determined by the ENGINEER, shall be removed at no cost to the CITY. The CONTRACTOR shall be thoroughly familiar with all phases of sewer structure cleaning to ensure the completion of this Contract without causing a health hazard or damage to the sewage system, public and private properties.

3.2.3. - Coating System Installation

- A. The CONTRACTOR shall install the coating system in the manholes after all removals, replacements, rebuilding, re-shaping, re-profiling, and adjustment activities are completed. Quantities of materials may vary significantly based on interior surface and conditions.
- B. COATING TERMINATION: The CONTRACTOR shall submit shop drawings for approval detailing coating termination work.
- C. ATMOSPHERIC CONDITIONS: Maintain sufficient forced air supply to provide and maintain a temperature of 50 to 90 degrees F and a circulating airflow inside the structures during the coating process or per manufacturer's recommendations.
- D. REPAIR OF DEFECTS: CONTRACTOR shall repair all defects in the coating system where directed by the ENGINEER.
- E. SPOT REPAIR AND BENCH COATING: The CONTRACTOR shall follow the coating manufacturer recommendations in regard to the distance the coating should be extended beyond the damaged area. If there is no recommendation from the coating manufacturer, the CITY shall provide direction to the CONTRACTOR.

3.2.4. - Coatings

- A. GENERAL: Coating products shall not be used until the ENGINEER has inspected the materials and the coating manufacturer's technical representative has instructed the CONTRACTOR and ENGINEER in the surface preparation, mixing, and application of the coating. The coating manufacturer's technical representative must be a factory representative, not a local representative or an affiliate of the CONTRACTOR.
- B. COATING SYSTEMS: Field coats shall consist of one or more finish coats to build up the coating to the specified dry film thickness. Unless otherwise specified, finish coats shall not be applied until other work in the area is complete and until all previous coats have been inspected.
- C. COATING REQUIREMENTS: All items of equipment, or parts and surfaces of equipment, which are immersed when in service, with the exception of pumps and valves, shall have all surface preparation and coating work performed in the field.

3.2.5. - Application

- A. WORKMANSHIP: Coated surfaces shall be free from runs, drops, ridges, waves, laps, and brush marks. Coats shall be applied so as to produce an even film of uniform thickness completely coating corners and crevices. Painting shall be done in accordance with the requirements of SSPC Paint Application Specification No. 1.

The CONTRACTOR's equipment shall be designed for application of the materials specified. The coating shall be applied using a trowel or spray equipment to the proper thickness and surface characteristics as recommended by the coating manufacturer.

When possible, the application of the coating to the required minimum thickness shall be applied in a single coat sharply cut to line. Care shall be exercised to avoid over-coating or spattering on surfaces not to be coated.

- B. **ATMOSPHERIC CONDITIONS:** Coatings shall be applied only to surfaces that are dry, and only under conditions of evaporation rather than condensation. Coatings shall not be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation. During damp weather, when the temperature of the surface to be coated is within 10 degrees F of the dew point, the surfaces shall be heated to prevent moisture condensation thereon. During coating, and for a period of at least 8 hours after the coating has been applied, the temperature of the surfaces to be coated, the coated surfaces, and the atmosphere in contact shall be maintained at or above 40 degrees F and 10 degrees F above the dew point. Paint, when applied, shall be approximately the same temperature as that of the surface on which it is applied. Fans or heaters shall be used inside enclosed areas where conditions causing condensation are severe.
- C. **PROTECTION OF COATED SURFACES:** Items which have been coated shall not be handled, worked on, or otherwise disturbed, until the coating is completely dry and hard.
- D. **FILM THICKNESS AND CONTINUITY:** Coating system thickness is the total thickness of finish coats. The coating system shall have a minimum wet film thickness of 125 mils applied in a single application where possible or as specified by the manufacturer.

The surface area covered for various types of surfaces shall not exceed those recommended by the manufacturer. Coatings shall be applied to the thickness specified, and in accordance with these special provisions.

In testing for continuity of coating about welds, projections (such as bolts and nuts), and crevices, the ENGINEER will determine the minimum conductivity for smooth areas of like coating where the dry mil thickness has been accepted. This conductivity shall then be taken as the minimum required for these rough or irregular areas. Pinholes and holidays shall be repainted to the required coverage.

- E. **SAFETY AND VENTILATION REQUIREMENTS:** Requirements for safety and ventilation shall be in accordance with the Society for Protective Coatings (SSPC) Paint Application Guide No. 3.

3.2.6. - Cleanup

Upon completion of coating, the CONTRACTOR shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean all surfaces and repair any overspray or other paint-related damage.

PART 4 - MEASUREMENT AND PAYMENT

The application of corrosion protective coating system is part of the Manhole Rehabilitation described on SECTION 02100 and it is subjected to the scenario of manhole rehabilitation, which could be to fully coat a manhole or to partially coat a manhole as required for spot repairs.

Measurement and payment of Corrosion Protective Lining System is as described on PART 4 - MEASUREMENT AND PAYMENT, SECTION 02100.

+ + END OF SECTION + +

SECTION 02661

DIVERSION OF SEWAGE FLOW AND DEWATERING

PART 1 - GENERAL

1.1 - DESCRIPTION

A. SCOPE

This section describes the requirements for temporary bypassing and dewatering of sewer pipes and structures during rehabilitation and installation. Temporary diversion of sewage flows is a key aspect of this project and includes the maintenance of service to the customer connections and/or making alternative arrangements for customers.

The CONTRACTOR is made aware that sewer pipe and structure rehabilitation may occur during the monsoon months with severe thunderstorms and possible flash flooding events. Adverse weather conditions may impact the capacity of the bypassing system. The CONTRACTOR shall be prepared for these weather conditions and alter procedures accordingly.

B. EXPERIENCE

CONTRACTOR shall utilize staff and/or a subcontractor that has been directly responsible for completion of a pipe rehabilitation project that required the bypass pumping of sewage flows.

1.2 - QUALITY ASSURANCE

The CONTRACTOR is solely responsible for maintaining the quality assurance of his work during the length of the project. The contractor is responsible for any costs associated with corrective measures required to replace or repair items not meeting the quality standards specified by the CITY.

- A. BYPASS DESIGN: The actual design of the bypass arrangement shall be prepared by the CONTRACTOR and shall be submitted to the ENGINEER to determine conformance to project objectives. Means and methods of accomplishing the bypassing shall be the responsibility of the CONTRACTOR.
- B. TESTING: The CONTRACTOR shall have the entire bypassing system in place and successfully pressure tested at 1.5 times the maximum operating pressure of the system before bypassing any sewage.

1.3 - SUBMITTALS

At the Preconstruction Conference, the CONTRACTOR shall submit drawings and complete design data showing methods and equipment he proposes to utilize in sewer bypassing for approval by the ENGINEER. The submittal shall include the following information.

1. Drawings indicating the scheme and location of temporary sewer plugs and bypass discharge lines. The drawings shall also show the method and location for discharging the bypass lines as well as routing of bypass piping including placement in roadway or landscape area behind sidewalk, locations where bypass piping is to be recessed into the pavement, road closures, closure of pedestrian facilities, etc.
2. Capacities of pumps, prime movers, and standby equipment.
3. Design calculations proving adequacy of the system and selected equipment.
4. Standby power source.
5. Staffing plan.
6. Show suction and discharge points with elevations and stationing on the design plans.
7. Proposed noise control and exhaust control plans for pumping equipment.
8. Proposed plan for disruption of sewer service laterals.
9. Bypass piping inspection plan.
10. Odor control plan.
11. SSO response plan.
12. Emergency contacts, including names, job titles, email addresses, and 24-hour phone numbers.

1.4 - JOB CONDITIONS

A. AVAILABLE FLOW DATA

The CITY Water Services Department may be able to provide available flow data however, this is not guaranteed. CONTRACTOR is responsible for obtaining current flow condition information at the time of construction. Any additional monitoring or gathering of flow data to properly size the bypass system is the responsibility of the CONTRACTOR. The CONTRACTOR shall include

considerations for increased flows due to rainfall events, fluctuations of peak flows due to holidays, civic events, etc., equipment failure risks, etc., and provide adequate reserve capacity and redundancy to maintain sewer flows within the sewer pipe upstream and downstream of the bypass. The CITY is not responsible for any deviations in quantity of sewage flow at any time during the construction period. If necessary, the CONTRACTOR shall provide additional means of flow diversion at no additional cost to the CITY to handle deviations in quantity of sewage flow at any time during the construction period.

B. SERVICE OR COLLECTOR LINES

The CONTRACTOR shall determine the location of service lines connected to adjacent users or collector pipes at manholes of sanitary sewers to be bypassed.

1.5 - MEASUREMENT AND PAYMENT

- A. DEFINITION: Full compensation for all labor, material, equipment, and monitoring required to temporarily bypass wastewater flows around the rehabilitation and/or replacement work and/or dewater pipelines in preparation for cleaning and rehabilitation or replacement. Bypass shall include standby pumps and piping. Also includes installation, maintenance and removal of bypass pumps and bypass pipes, noise suppression, odor control, plugging of sewers, vactoring, excavation and backfill of any required trenches, steel plating, sawcut, removal and repair or replacement of asphalt and concrete pavement, removal and repair or replacement of concrete curb, gutter and sidewalk, construction of suction and discharge structures to facilitate bypass pumping, temporary bridging structure to facilitate bypass across Burlington National Santa Fe (BNSF) Railway tracks, all coordination with BNSF Railway, permits from BNSF Railway, landscape restoration, and all other incidentals necessary to complete the work in conformance with Plans and Specifications.
- B. MEASUREMENT: Measurement of Diversion of Sewage Flow and Dewatering shall be on a lump sum basis. Intermediate measurements for payment shall be made by the ENGINEER on a percentage of project completed basis. The CONTRACTOR shall be responsible for additional costs associated with an underestimate of the means required to divert sewage flows during the construction period.
- C. PAYMENT: Payment for Diversion of Sewage Flow and Dewatering shall be per the price bid on a lump sum basis. Intermediate payments for this work shall be made on a percentage of work completed basis.

PART 2 - PRODUCTS

2.1 - MATERIALS

- A. CONTRACTOR shall provide temporary pumps, conduits, and other equipment to bypass sewer flow around the CONTRACTOR's work area as required. CONTRACTOR shall furnish all necessary labor and supervision to set up and operate the pumping and bypass system. Critical grade sound attenuated pumps shall be provided for the bypass pumping as required unless otherwise approved – see Section 3.6 Noise Control. Sound measurements shall be made in accordance with American National Standard S.13-1971. Pumps and bypass lines shall be of adequate capacity and size to handle the required capacity. The bypass system shall be designed to normally maintain the wastewater flow below the top of the pipe without surcharging.
- B. The CONTRACTOR shall maintain on site sufficient equipment and materials to ensure continuous and successful operation of the bypass and dewatering systems. The standby pumps shall be installed and fully operational at all times including all pumps, equipment and piping being in-place. Standby pumps shall be fueled and operational at all times. The CONTRACTOR shall maintain on site enough valves, tees, elbows, connections, tools, sewer plugs, piping, and other parts of system hardware to ensure immediate repair or modification of any part of the system as necessary. Piping shall be leak free.
- C. For bypassing systems with a required capacity equal to or less than 2 MGD and piping lengths greater than 1,000 feet, and for systems with required capacity greater than 2 MGD, the CONTRACTOR shall provide multiple bypass lines to convey 150% of the maximum anticipated flow (as determined by the CONTRACTOR). Redundant lines should be fully connected to the bypass system to allow the system to be switched over quickly in the event of a leak. In all cases, redundant standby pump(s) shall be on site and operational at all times in case of primary pump failure.
- D. All pumps, generators, and other equipment shall be placed in spill containment impound or on a new plastic tarp to provide containment and protect against sewage spills, or the spill of gasoline, oil, and hydraulic fluid spills.

PART 3 - EXECUTION

The CONTRACTOR shall notify the ENGINEER a minimum of 48 hours prior to shutting down of a pipeline and start of bypassing.

3.1 - SERVICE LINES

Every effort shall be made by the CONTRACTOR to ensure that sewer service to customers is maintained during the course of the work. When disruptions are necessary, service to laterals shall be disrupted for a period of no more than eight

hours. Laterals within residential areas shall only be disrupted during the period of 8:00 a.m. to 5:00 p.m. Monday through Friday. Laterals within business areas shall be addressed on a case-by-case basis. The CONTRACTOR shall provide a public information representative when customers are visited to discuss bypass pumping of services or making alternative arrangements with the customer for service outages. No matter what arrangement is made, the CONTRACTOR must cooperate with the ENGINEER to provide CITY documentation that all affected users have been contacted and arrangements made for disruption or alternate accommodations. This documentation must be submitted prior to the start of work on the section of sewer line affected.

3.2 - PUBLIC NOTIFICATIONS

The CONTRACTOR shall notify the ENGINEER and the CITY of any planned service interruptions at least two weeks prior to the event. The CONTRACTOR shall retain the services of a local Public Involvement firm to perform notification of the work to the public. At a minimum, the first notification shall be 5 days before the interruption of service. Much greater advance notice may be required if an alternate to pumping the customer's service is proposed by the CONTRACTOR. The second notification shall be 24 hours prior to the interruption of service. Notification shall be made door to door with printed handouts or door hangers. The information provided shall include, at a minimum, the reason for the interruption, the time period of the interruption, and a local 24-hour telephone hotline number for project information. ALL INFORMATION ON THE PRINTED HANDOUTS AND/OR DOOR HANGERS SHALL BE APPROVED BY THE CITY PRIOR TO DISTRIBUTION.

3.3 - MONITORING

The bypassing system shall not be shut down between shifts, on holidays or weekends, or during work stoppages without written permission from the ENGINEER. The bypass system will have an attendant around the clock whose only duty is to maintain the bypass pumping system until the bypassing of that specific pipeline is no longer required.

The CONTRACTOR shall inspect the entire bypass pumping system for leaks or spills on an hourly basis. The CONTRACTOR shall also create an inspection log and shall enter the time of inspection and the condition of the piping and the name of the inspector into the log for review by the ENGINEER.

3.4 - PUBLIC AND PRIVATE ACCESS

The CONTRACTOR shall maintain public and private access along project routes. Bypass lines shall be protected from damage due to traffic and shall not impede pedestrian or vehicular traffic routes unless otherwise allowed by approved traffic control plans. Bypass lines shall be buried at street crossings and business entrances unless otherwise approved by the ENGINEER. Temporary steel plating with milled edges may be used with approval for buried lines. Ramps protecting

bypass lines shall be a minimum level of protection at accesses to private residences unless otherwise approved by the ENGINEER.

CONTRACTOR shall maintain pedestrian traffic and comply with ADA regulations for access to all residential and commercial property unless written approval is otherwise obtained from the property owner allowing for reduced access.

3.5 - DISCHARGE

In areas where flows are bypassed, all bypass flows shall be discharged as approved by the ENGINEER. Bypass discharge velocities shall not exceed 10 feet per second. The CONTRACTOR shall employ mitigation measures to protect the discharge structure from potential damage caused by discharge flows. Mitigation measures may include extending discharge piping deeper into the discharge structure or configuring the discharge piping to direct flows into the downstream pipe.

No bypassing to the ground surface, receiving waters, storm drains, or bypassing which results in soil or groundwater contamination or any potential health hazards shall be permitted. In addition, no backups and overflows onto private property shall be permitted.

3.6 - NOISE CONTROL

The CONTRACTOR shall perform all work in compliance with OSHA standards and in no case will noise levels be permitted which would interfere with the work of the CITY or others. Noise levels shall be in accordance with the City of Glendale noise ordinance.

The CONTRACTOR shall utilize sound attenuated bypass pumps with a maximum decibel rating of 70 decibels at 50 feet. Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without previously mentioned muffler.

Noisy portable equipment, such as generators or compressors, shall be located as far away from sensitive noise receptor areas as practicable. (Sensitive noise receptors are defined as occupied buildings with windows or doors facing the site). Noise barriers shall be constructed around noisy stationary construction equipment such as compressors or generators that have to be utilized at locations near (within 100 feet of) sensitive noise receptors as defined above. Idling equipment not actively utilized for extended periods of time shall be shutoff.

3.7 - DAMAGES

The CONTRACTOR shall repair, without cost to the CITY, any damage that may result from his negligence, inadequate or improper installation, maintenance, and operation of bypassing system, including mechanical or electrical failures.

3.8 - ODOR CONTROL

The CONTRACTOR shall employ methods and procedures that mitigate the generation and discharge of objectionable odors to the surface environment at all times.

If odor complaints arise, the CONTRACTOR shall add ferric chloride to the wastewater flow upstream of bypass pumping operations to reduce odor. The CONTRACTOR shall make his own determination of flow characteristic for required dosing.

The CONTRACTOR shall add the ferric chloride from a location upstream that will allow 10 to 15 minutes reaction time before the flow enters the work area. The chemical dosing shall reduce odors generated from the wastewater stream to a level acceptable to the CITY. If this is not accomplished by adding the ferric chloride only, an additional control may be required. If odors are still unacceptable after addition of ferric chloride, the CONTRACTOR may also add hydrogen peroxide. The CONTRACTOR shall add hydrogen peroxide downstream to the flow that has been dosed with ferric chloride. The Hydrogen peroxide shall be added to allow a 5-minute reaction time before flow enters the work area. Any dosage combination of the two chemicals may be used to ensure continuous control of odors acceptable to the CITY.

3.9 - SANITARY SEWER OVERFLOWS

The CONTRACTOR shall take any and all precautions necessary to prevent backups and overflows on private property from blocked laterals during all sewer rehabilitation work. Special arrangements or supplemental bypasses may be required for some property owners.

CONTRACTOR is responsible for immediate and proper cleanup should any spill occur, regardless of amount.

3.10 - TERMINATION OF BYPASS

Bypass operations shall not be terminated until approvals are obtained from the ENGINEER for:

1. Pipe Rehabilitation
2. Manhole and/or Structure Rehabilitation

+ + END OF SECTION + +

SECTION 02760

SEWER AND STRUCTURE CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

A. SCOPE:

This section specifies the requirements for cleaning and/or heavy cleaning of the sewers and sewer structures prior to CCTV inspection, ENGINEER's inspection, and pipe or structure rehabilitation. Also included are removal of intruding and hanging gaskets from inside the pipe and removal of blockage from within the service tap prior to CCTV inspection and pipe rehabilitation.

B. REQUIREMENTS:

The work to be done under this Contract consists of furnishing all labor and equipment to remove the accumulated corrosion, tuberculation, sediments and debris, down to sound, solid structural material of the sanitary sewer pipes and sewer manhole and structures. Work also includes removal of all intruding or hanging gaskets from within the pipe prior to pipe rehabilitation. Also included is removal of any blockages from within the service tap at the locations shown on the plans.

The CONTRACTOR shall remove existing corrosion, tuberculation, sediment, debris, pipe supports, roots, scale, encrustations, intruding gaskets, blockages, and grease accumulations from the sanitary sewer pipes, taps, and structures to be inspected and/or rehabilitated and adequately prepare the surfaces for installation of CIPP liner, coating system and/or repair grout. All materials dislodged during cleaning shall be removed from the work area and carried to an approved disposal site.

Cleaning of the sewer is required prior to CCTV inspection of the sewer to view current line conditions.

1.2 SUBMITTALS

The following submittal shall be provided.

1. A letter identifying the methods the CONTRACTOR plans to employ to remove corrosion, tuberculation, sediment, debris, grease, scale, encrustations, and roots throughout the sewer pipe to be rehabilitated and in the sewer structures to be repaired or coated. The letter shall include a detailed explanation of the cleaning process and a schedule of activities, references where the CONTRACTOR has used the identified cleaning method successfully in the past and a list of the actions he plans to take to mitigate impact to the public during the cleaning operation.

1.3 MEASUREMENT AND PAYMENT

Heavy Cleaning of Existing Pipe (Allowance) where required to clean existing ductile iron pipe (DIP) due to excessive buildup of corrosion and tuberculation inside the pipe will be measured and paid for per hour of heavy cleaning that is completed. All tools, materials, personnel, and equipment required for removal and disposal of excessive tuberculation, corrosion, sediment, and other materials are included in this item of work.

No separate measurement or payment will be made for standard Sewer and Structure Cleaning of pipe, the cost considered as included in CIPP lining of existing pipes or manhole rehabilitation depending on which work the cleaning is associated with.

Removal of Intruding Gasket will be measured and paid for at the unit price per each for each gasket cut and removed from within the pipe prior to CIPP lining of the pipe at the locations shown in the plans.

Remove Blockage from Service Tap will be measured and paid for at the unit price per each for each service tap that requires removal of blockage from within the tap at the locations shown in the plans.

PART 2 – MATERIALS

2.1 CHEMICAL ADDITIVES

No chemicals shall be used without written approval of the OWNER. In no case shall any chemical additive be used which might be considered hazardous or might be considered detrimental to organisms or equipment of a wastewater treatment plant, or detrimental to old or new pipe materials.

2.2 PRODUCT DATA

Copies of all disposal receipts shall be provided.

PART 3 – EXECUTION

3.1 GENERAL

The CONTRACTOR shall, at all times, conduct its work so as to prevent any blockage and minimize surcharging in the sewer manholes and connecting sewer pipelines. Damage to existing facilities as a result of the CONTRACTOR's work shall be promptly repaired in kind at the CONTRACTOR's expense.

3.2 SEWER BYPASSING AND DEWATERING

If required, the sewer flow shall be bypassed as specified in Section 02661 during the cleaning of the sewers.

3.3 CLEANING

The CONTRACTOR shall grit blast or hydro blast with a minimum 3,000 PSI water pressure for duration sufficient to clean to coating or lining manufacturer's recommendations the pipe or structure surface receiving a protective coating or lining.

- A. Manholes and Pipes: Cleaning shall remove all loose coatings previously applied, sediment, rocks, debris, roots, grease accumulations and obstructions from the sewer to be rehabilitated and from the structures to be coated (if applicable). Cleaning of the sewer and structure interior surfaces shall remove all grease, scale, encrustation, and any other material from the surface that may impede application or performance of applied coatings. Multiple passes with cleaning equipment may be required at no additional cost to the OWNER.

Sediment, material or debris from cleaning operations larger than U.S. #8 sieve shall not be deposited downstream in the sewer main. Sedimentation deposited downstream shall be removed at no cost to the OWNER.

The CONTRACTOR shall be thoroughly familiar with all phases of sewer pipe and structure cleaning to ensure that surface preparation is adequate for coating or pipe rehabilitation to be installed without causing a health hazard or damage to the sanitary sewage system, public and private properties.

The CONTRACTOR shall clean the sanitary sewer pipe and structures so that there is no visible residue, rocks, debris, roots, grease accumulation and/or obstructions. The CONTRACTOR shall clean the pipe and/or manhole structure adequately to ensure proper installation of the

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SEWER AND STRUCTURE CLEANING | 02760-3



rehabilitation method proposed. CONTRACTOR shall clean all exposed rebar to remove areas of corrosion down to solid steel.

Unless otherwise noted, for existing manholes or portions of the manhole lined or coated with a previously applied cured-in-place epoxy corrosion protective coating, the CONTRACTOR shall entirely remove the existing liner/coating (including any underlayment layers) prior to performing other cleaning activities.

Pipe or manhole structures discovered by the CONTRACTOR or his Subcontractor to be physically deteriorated to the extent where cleaning may detrimentally impact the structural integrity of the existing pipe or manhole structure shall be brought to the attention of the OWNER prior to conducting cleaning operations. Once cleaning operations commence, the CONTRACTOR accepts all liability and responsibility for damage to existing pipes and structures.

It shall be the responsibility of the CONTRACTOR to repeat the cleaning process if root re-growth or other detrimental obstructions or residue becomes present at no additional cost to the OWNER.

- B. Heavy Cleaning: Heavy cleaning shall be used for cleaning of existing ductile iron pipe (DIP) with excessive buildup of corrosion and tuberculation inside the pipe. Heavy cleaning includes additional cleaning of DIP using specialized mechanical equipment specific to the removal of interior coating and accumulation of sediment, corrosion, and tuberculation within the pipe. Specialized equipment shall be chain flail or rotating sawblade. In each case, the CONTRACTOR shall use extreme caution when heavy cleaning so as not to damage the pipe.

Heavy cleaning shall remove all accumulation of corrosion and tuberculation from within the DIP such that the original existing pipe diameter is restored in preparation for installation of cured-in-place pipe (CIPP) lining. All sediment, material, or debris from heavy cleaning operations larger than U.S. #8 sieve shall not be deposited downstream in the sewer main. Sedimentation deposited downstream shall be removed at no cost to the OWNER.

The CONTRACTOR shall be thoroughly familiar and experienced with heavy cleaning techniques and equipment to ensure that the existing pipe is not damaged, and the surface preparation is adequate for CIPP installation without causing a health hazard or damage to the sanitary sewage system, public and private properties.

- C. Remove Intruding Gasket: Removal of intruding or hanging gasket from within the pipe shall be done with remotely controlled mechanical cutter equipment or through other methods that can remove the intruding gasket without damaging the interior pipe wall. This work shall be completed for all locations shown on the project plans prior to CIPP lining of the pipe.

Remove intruding gasket shall remove all gaskets that are intruding into the pipe such that the interior pipe diameter is restored such that no intruding material will reflect through the newly installed CIPP liner.

- D. Remove Blockage from Service Tap: Removal of blockage from service tap shall be completed from within the sewer main pipe. In locations where this is not possible, blockages shall be removed from the nearest cleanout.

3.4 DISPOSAL OF SEDIMENTS

The CONTRACTOR shall be responsible for transporting and disposing, including all disposal fees, of any sediments and material removed from the sewer or structures.

All sediment and debris removed from the sewer shall be disposed off-site in a lawful manner. Hauling containers shall be watertight. On-site stockpiling of removed material will not be permitted.

The CONTRACTOR is responsible for obtaining all necessary permits, fees, and approval from all regulatory agencies required to perform the work, including transport of sediments. Off-site disposal of all material removed from the sewer shall be the CONTRACTOR's responsibility.

+ + END OF SECTION + +

SECTION 02761

CCTV INSPECTION OF SANITARY SEWERS

PART 1 – GENERAL

1.1 DESCRIPTION

This specification defines the requirements for internal television inspection of existing sewer pipe before and after rehabilitation.

The CONTRACTOR shall inspect the sewer pipe interior using a color closed circuit television (CCTV) camera and document the inspection on video with audio location and date information, video title information, and hard copy inspection logs. A television inspection shall be performed after cleaning of the sewer as specified in Section 02760, Sewer and Structure Cleaning. The rehabilitated sewer will be CCTV inspected again in the same direction as the previous inspection after the CIPP lining of the sewer has been completed to ensure proper installation. The CONTRACTOR shall be responsible for properly inspecting the pipe.

1.2 QUALITY ASSURANCE

CONTRACTOR'S Qualifications: The CONTRACTOR shall have a minimum of three (3) years of experience in such work necessary to successfully meet this specification and provide references for five (5) sewer inspection projects involving remote CCTV pan and tilt inspection.

The CONTRACTOR shall have all operators who are successfully trained and certified through the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP). The CONTRACTOR shall provide copies of the PACP certificate for the operator and project references.

A. PRE-REHABILITATION

The CONTRACTOR shall complete CCTV inspection of the interior of each pipe segment scheduled for rehabilitation prior to commencement of rehabilitation activities. The CCTV footage shall be reviewed by the ENGINEER for any obstructions or defects that would prohibit proper installation of the liner or repair sleeve.

The pre-rehabilitation CCTV inspection shall be approved by the ENGINEER prior to installation of the CIPP liner or repair sleeve. If the

sewer line is determined not to be adequately cleaned, it shall be re-cleaned, and CCTV inspected by the CONTRACTOR at no additional cost to the OWNER. If the inspection is not completed such that all of the interior surface of the pipe is able to be viewed, the pipe shall be re-inspected at no additional cost to the OWNER.

B. POST – REHABILITATION

After rehabilitation of the pipe has been completed, the CONTRACTOR shall again complete CCTV inspection of the interior of each pipe that was rehabilitated. Inspection shall be sufficient to clearly see all the interior of the pipe and the newly installed CIPP liner or point repair sleeve. Any errors or required corrections for the rehabilitation method should be addressed by the Contractor.

The ENGINEER will review video recordings and logs to ensure compliance with the requirements listed in this specification and contract documents. If any portion of the liner/pipe is determined not acceptable, the liner/pipe shall be repaired or replaced, whichever the ENGINEER deems appropriate, and re-inspected by CCTV, at no additional cost to the OWNER.

1.3 SUBMITTALS

- A. The following submittals shall be provided by the CONTRACTOR for review.
1. CONTRACTOR reference projects per 02761-1.2.
 2. Operator PACP certificate and reference projects per 02761-1.2.
 3. Manufacturer's product literature for video equipment to be used.
 4. One copy each, of the finished video recordings/photographs and USB external hard drive, showing the existing sewer pipelines after cleaning and the sewer pipelines after liner installation, shall be submitted to the ENGINEER. The ENGINEER will review the recordings, not for accuracy of content, but to make sure that the required information is provided, and the recording is of acceptable quality. If the ENGINEER determines that the video recording is defective or not of adequate quality, the CONTRACTOR shall CCTV inspect again at the CONTRACTOR's expense.

1.4 MEASUREMENT AND PAYMENT

CCTV shall be incidental to the Work with no separate measurement or payment. Additional CCTV inspections required after the initial inspection, due to the failure of the initial inspection, shall be paid for by the CONTRACTOR.

Part 2 – PRODUCTS

2.1 MATERIALS

A. TELEVISION INSPECTION CAMERA(S)

Camera(s) shall be intrinsically safe and shall be operative in 100 percent humidity conditions. Lighting intensity shall be remote controlled and shall be adjusted to minimize reflective glare. Lighting and camera quality shall provide a clear, in-focus picture of the entire inside periphery of the sewer.

B. VIDEO RECORDINGS

Video recordings of all sewer line inspections shall be made on a high-quality color USB external hard drive. The audio portion of the composite videotape shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report.

C. FOOTAGE COUNTER

A footage counter device, which measures the distance traveled by the camera in the sewer, shall be accurate to plus or minus 2 feet in 1,000 feet.

D. VIDEO TITLING

Video equipment shall include genlocking capabilities to the extent that computer generated data (i.e., footage, date, size, address, and location, etc.) as determined by CITY can be overlaid onto video, and both indicated on the television monitor and permanently recorded on the inspection video.

E. FLOW IN SEWERS

During CCTV inspections, and continuously until completion of liner installation and inspection, the CONTRACTOR shall provide temporary dry conditions in the sewer pipelines. The bypassing requirements are provided in Section 02661, Diversion of Sewage Flow and Dewatering.

Part 3 – EXECUTION

3.1 INSPECTION METHODS

A. VERBAL COMMENTARY

The CONTRACTOR shall record on the audio track of the video inspection recording narrative of the location, upstream and downstream control points, date, and time of the inspection.

B. ACCESS

The ENGINEER shall have access to observe the monitor and all other operations at all times. The system of cabling employed to transport the camera and transmit its signal shall not obstruct the camera's view.

C. INSPECTION RATE

The camera shall be pulled through the sewer in either direction, but all inspections at each location shall be in the same direction. The maximum rate of travel shall be 30 feet per minute when recording.

D. IMAGE PERSPECTIVE

The camera image shall be down the center axis of the pipe when the camera is in motion. The CONTRACTOR is required to provide a 360-degree view of the pipe interior. Points of interest shall also be video recorded and shall include, but not be limited to, defects, encrustations, mineral deposits, debris, sediment, any location determined not to be clean or part of a proper liner installation, or defects in the liner (including, but not limited to bumps, folds, tears, dimples, etc.).

E. SEWER IDENTIFICATION

All inspection documentation shall include the sewer location.

+ + END OF SECTION + +

SECTION 02767

CIPP LINING OF EXISTING SEWERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. SCOPE

This section specifies a cured-in-place pipe (CIPP) liner for the rehabilitation of sanitary sewer pipe as indicated on the plans. The CIPP liner is a flexible tube composed of either fiberglass or felt. The tube is impregnated with a thermosetting or ultraviolet (UV) activated resin. The liner is placed inside a deteriorated sewer pipe by either inversion or insertion. The liner is then cured via exposure to hot water, steam, or UV light. The finished product is a continuous watertight liner from manhole to manhole, tight fitting to the host pipe, and smooth interior surface.

The CONTRACTOR is made aware that the lining of the sewers may occur during the summer months with temperatures exceeding 115 degrees F and severe thunderstorms. The CONTRACTOR shall be prepared for these weather conditions and alter installation procedures accordingly.

This section also specifies service lateral connection (SLC) seal also referred to as Top Hats™. The SLC seals the point of connection from a main pipeline to a connecting lateral pipeline and is installed without excavation using a resin-impregnated, flexible laminate installed into the existing service lateral, lapping over the main pipeline, sealing the connection.

This section also specifies removal of intruding gasket material from the pipe joint prior to commencement of CIPP lining such that the material doesn't reflect through the newly installed liner. Removal of intruding gasket may be completed using a remotely operated cutting device or by other means as approved by the ENGINEER.

1.2 QUALITY ASSURANCE

A. REFERENCES

This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM D543	Test Method for Resistance of Plastics to Chemical Reagents
ASTM D638	Test Method for Tensile Properties of Plastics
ASTM D790	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D883	Definitions and Terms Relating to Plastics
ASTM D1600	Abbreviations, Acronyms, and Codes for Terms Relating to Plastics
ASTM D2990	Test Method for Tensile, Compressive and Flexural Creep and Creep-Rupture of Plastics
ASTM D3567	Standard Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
ASTM D5813	Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems
ASTM F216	Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin Impregnated Tube
ASTM F412	Definitions of Terms relating to Plastic Piping Systems
ASTM F1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin Impregnated Tube
ASTM F1743	Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
ASTM F2019	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
DIN EN 761	Plastic piping systems – Glass-reinforced thermosetting plastics (GRP) pipes – Determination of the creep factor under dry conditions

B. CIPP LINER SAMPLES AND TESTING

1. **SAMPLE PREPARATION:** The CONTRACTOR shall prepare samples of the installed CIPP liner for subsequent testing of its physical properties. Samples shall be prepared and tested using the flat plate sampling method in accordance with the procedures in Section 8.1 of ASTM F1216 or ASTM F1743, or Section 7 of ASTM 2019, as is

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applicable. For fiberglass tube that is UV light cured, restrained samples shall be taken at the manholes. The sample will be constructed on the same materials (tube and resin/catalyst) as is used for that given liner installation. The flat plate sample shall be large enough to provide five sample specimens for each Short Term Flexural (Bending) properties as per ASTM D790 and ASTM D638 respectively. The sample will be clamped in a mold and placed in the downtube during the curing period of the CIPP tube. The samples shall be removed after all the water is removed from the cured pipe tube.

2. **SAMPLE LABELING:** The CONTRACTOR shall individually label the samples with permanent ink with the following information:
 - a. Date and time the sample was removed and bagged
 - b. Sample location
 - c. Liner length, diameter, and thickness
 - d. Resin
 - e. Catalyst or hardener
 - f. Installation method (inversion or pull-in)
 - g. Curing process (hot water or steam)
3. **CHAIN OF CUSTODY:** The CONTRACTOR shall prepare a chain of custody form for the CIPP samples and submit to the ENGINEER with the following documentation:
 - a. Project name
 - b. Project number
 - c. Contractor name and person responsible for collecting samples
 - d. Sample number (use manhole number or location where the sample was cured)
 - e. Date and time the sample was removed and bagged
 - f. Location of curing (downtube, silencer, outlet chamber, etc.)
 - g. Type of restraint used

The signed chain of custody form shall be presented to the ENGINEER, who will independently verify that the sample is the correct sample and has been properly bagged and labeled for shipment. The ENGINEER will sign the chain of custody form and sample so attesting. A copy of the delivery manifest and chain of custody form will be given to the ENGINEER after all signatures are affixed and the sample is ready for shipment.

4. **SAMPLE TESTING.** The cured sample shall be tested by an independent third-party testing laboratory, as recommended by the CIPP liner manufacturer and approved by the ENGINEER, for the following properties:

- a. The flexural (bending) properties of the cured resin shall have minimum initial test values as given in Table 1 of ASTM F1216, ASTM F1743, or ASTM F2019, whichever is applicable.
- b. 50-year Flexural Creep Modulus in accordance with ASTM D2990 at 10,000 hours or equal test as approved by the ENGINEER. If approved 10,000-hour tests are not available, CONTRACTOR shall use a minimum 50% reduction (50% retention) of Flexural Modulus of Elasticity (per ASTM F1216, ASTM F1743, or ASTM F2019 whichever is applicable) for all formula calculations.
- c. Long term properties in accordance with ASTM D2990.
- d. The CONTRACTOR shall be responsible for all costs associated with the testing of the liner physical properties.

Final payment to CONTRACTOR will not be made until test results are received. The CONTRACTOR shall be responsible for any deviation from the specified physical properties and those evaluated through testing. Failure to meet the specified physical properties will result in the CIPP liner being considered defective work which will be handled in accordance with MAG Section 106.

5. **SAMPLING FREQUENCY:** The above-stated sampling shall be performed for each truckload of shipped CIPP. For example: one flat plate sample from each CIPP delivery.
6. **WALL THICKNESS:** The wall thickness of the felt tube shall be ordered to the next standard 1.5 mm incremental thickness above the minimum calculated design thickness. Unless otherwise specified to provide for excess resin migration, the gap thickness of the wetting-out equipment shall be sized to allow an excess of 5 to 10 percent resin to pass during impregnation. The minimum wall thickness shall be determined at a minimum of three locations on a cut section of the CIPP flat plate sample using a method of measurement accurate to the nearest 0.005 inch. Thickness measurements do not take into account the outer or inner foil layers. The minimum value shall meet the requirements of Section 02767.

C. INSPECTION:

The ENGINEER shall inspect the CIPP after installation, which shall include end seals, seals at manholes, service reconnections, and SLC seals. The inspection will be performed and recorded using CCTV equipment in accordance with Section 02761. If visible defects are observed in the CIPP liner, it will result in the CIPP liner being considered defective work which will be handled in accordance with MAG Section 106.

D. LAYER INSPECTION

The layers of the cured fiberglass CIPP sample shall be uniformly bonded. It shall not be possible to separate any two layers with a probe so that the layers separate cleanly. If separation of the layers occurs during inspection of the field samples, then new samples will be cut from the manhole and inspected. Any reoccurrence may cause rejection of the work.

E. CIPP LINER HANDLING:

The CONTRACTOR shall be responsible for the delivery, storage, handling, and installation of all materials for CIPP in accordance with the written manufacturer's requirements and recommendations.

CONTRACTOR shall exercise adequate care during transportation, handling, and installation to ensure the CIPP material is not torn, cut, exposed to direct sunlight, or otherwise damaged. If any part or parts of the CIPP materials becomes torn, cut, or otherwise damaged before or during insertion, it shall be repaired or replaced in accordance with the manufacturer's recommendations and approval by the ENGINEER before proceeding further, and at the CONTRACTOR'S expense.

F. WARRANTY:

The CONTRACTOR shall warrant the completed work against defects in workmanship and material for a period of one year from the date of final acceptance. The ENGINEER, while not acting as quality control agent for the CONTRACTOR, shall be allowed to view and document any portion of this contract, including but not limited to, verifying the type and quantities of resin used at any point during this work.

Testing for chemical resistance shall be performed on a previously prepared sample of the finished product, proposed for this project. A certified affidavit, signed by an officer of the company, shall be provided stating that the resin the tests apply to, and the resin submitted for this project are the same.

Finished and cured CIPP liner properties specified in Part 2 shall be tested as specified. Previous test data will not be acceptable.

1.3 SUBMITTALS

The following submittals shall be provided:

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- A. Certification showing the CONTRACTOR is currently licensed by the appropriate licensor to perform CIPP installation and curing. Certification shall be given to the ENGINEER before any materials are delivered to the job site.
- B. A certified affidavit, signed by an officer of the company, shall be provided stating that the CONTRACTOR'S on-site Field Superintendent has received proper training by the manufacturer for the steam and hot water CIPP liner installation methods and procedures, as applicable. Certification shall be given to the ENGINEER before any materials are delivered to the job site.
- C. The type of tube material, resin and catalyst/hardener to be used. Certification stating CIPP tube has been manufactured in accordance with ASTM F1216, ASTM F1743, or ASTM F2019, as applicable, and resin is suitable for its intended use.
- D. Prior to insertion, the CONTRACTOR shall provide data on the maximum allowable stresses, maximum pulling force (if pull-in-place method is used), and maximum elongation of the tube.
- E. Shop drawings which detail short- and long-term properties (providing all supporting test data) of all component materials and construction and recommendations for material storage and temperature control, CIPP liner handling, insertion, curing, trimming, and finishing.
- F. Materials, methods, and equipment to be used for end seals at manholes and structures.
- G. Structural design calculations for each CIPP liner segment (manhole to manhole) for fully deteriorated pipe condition to include size, the recommended thicknesses, field measurements, and assumptions used as the basis for calculations which demonstrate that the liner has been properly sized to avoid the creation of wrinkles or folds. All calculations shall be signed and sealed by a Registered Civil Engineer in the state of Arizona and submitted in duplicate to the ENGINEER at least 10 working days prior to the start of work.
- H. Detailed method for addressing CIPP sampling requirements including location and size of each sample, method of removal, method of liner repair.
- I. CCTV Inspection reports as specified in Section 02761.
- J. The CONTRACTOR shall provide a delivery manifest for each liner with the following information:
 - 1. The inversion location where the liner will be installed.
 - 2. Provide the manhole numbers for each end of the inversion.

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3. If the CONTRACTOR has assigned an inversion number provide that number as well.
- K. Liner diameter, length, and thickness.
- L. CIPP manufacturer's recommended installation procedures, including resin manufacturer's curing requirements.
- M. Manhole connection details.
- N. Third party laboratory test results of required testing.
- O. Material safety data sheets for all hazardous chemicals used or expected to be on-site. At a minimum, sheets for the resin, catalyst, cleaners, and repair agents should be submitted.
- P. Written warranties as required herein.
- Q. Intruding Gasket Removal:
 1. Method and procedure for removal of intruding pipe gaskets at the locations identified in the Design Drawings.
 2. Contractor shall confirm all locations where intruding gaskets are observed prior to removal and insertion of CIPP liner.
- R. Service Lateral Connection (SLC) Seal (Top Hat™):
 1. Method, procedure, or information per the specifications to provide either an adhesive, water-tight seal to the host pipeline or a mechanical seal between the cured SLC and host pipeline connections.
 2. Technical procedure or information regarding the control and mitigation of shrinkage and wrinkling during installation and cure.
 3. Minimum of three (3) references from municipal or public wastewater service providers in which the system proposed was used in accordance with the specifications herein.
 4. Wet-out procedures or information if wet-out at the manufacturing plant.
 5. Physical properties test for the proposed technology in accordance with the specifications herein that meet the minimum requirements as identified herein.
 6. Copy of the chemical resistance test for the proposed technology in accordance with the specifications herein that meets the minimum requirements herein.
 7. MSDS Sheets.

1.4 CONTRACTOR QUALIFICATIONS

- A. The licensed CONTRACTOR, or Subcontractor, shall have CIPP lining experience on sanitary sewers of similar size to this project and as defined herein. The CONTRACTOR shall submit the attached CONTRACTOR Qualification Form. The minimum qualifying CONTRACTOR experience for this project is 3 or more projects totaling a minimum of 20,000 feet of CIPP liner successfully installed in sewers within the past 5 years. This experience shall be for projects completed within the United States with the same CIPP liner and resin combination proposed for this project. CONTRACTOR shall provide project lengths, diameters, date of installation, owner name and telephone number, CIPP liner manufacturer and resin type on the Qualification Form. References may be checked.
- B. The CONTRACTOR shall provide a full-time project Superintendent for the project. The Superintendent shall meet all the same qualifications called out above for the CONTRACTOR. The CONTRACTOR shall submit the attached Superintendent Qualification Form six (6) working days after bid opening. All requested information must be provided. References may be checked.
- C. Service Lateral Connection (Top Hat™): Current certification by manufacturer to install the system proposed in accordance with the specifications herein. Certification shall indicate the Contractor has been licensed or certified by the manufacturer for a minimum of two (2) years.

1.5 MEASUREMENT AND PAYMENT

CURED IN PLACE PIPE (CIPP)

- A. Definition: Full compensation for all work associated with preparation and installation of fully deteriorated cured-in-place pipe (CIPP) liner as indicated in the Design Drawings and as described in these Technical Specifications. Work includes field measurement of existing interior pipe diameter prior to ordering materials; preparation of existing sewer pipe including standard cleaning of pipe including removal of sediments, roots, grease, and other materials; heavy cleaning for removal of tuberculation from DIP will be measured and paid for separately under item Heavy Cleaning of Existing Pipe (Allowance); pre- and post-construction CCTV inspection; removal of any objects protruding into the pipe such as service taps, removal of any gaskets hanging in the pipe at the joints, repair of severely offset joints, and other items as required to ensure a smooth profile once the CIPP is installed; wetting out of CIPP bag; transportation of CIPP to project locations; on-site storage of CIPP as required to prevent curing of CIPP prior to insertion; insertion of CIPP bag into the pipe via inversion or pull-in

method; heated water or steam curing of the CIPP in accordance with the manufacturer's recommendations and the approved design; reopening of service taps; end seals; sampling, third-party testing; disposal of curing water; and all necessary safety and support systems required to perform the work.

- B. Measurement: Measurement for CIPP lining of existing sewers shall be per linear foot along the longitudinal axis of the pipe and shall extend from center of upstream manhole to center of downstream manhole.
- C. Payment: Payment for CIPP lining of existing sewers shall be per linear foot of CIPP installed at the appropriate diameter as called for on the plans including all work as described above.

SERVICE LATERAL CONNECTION (SLC) SEAL

- A. Definition: Service lateral connection (SLC) seal (also known as Top Hat™) includes all materials, equipment, and labor necessary to install SLC seal at the locations shown on the plans with the intent of providing a seal at the existing sewer service connections where there may be a gap in the existing connection of the service lateral to the pipe.
- B. Measurement: Measurement for SLC Seal (Top Hat™) shall be per each.
- C. Payment: for SLC Seal (Top Hat™) will be made per the unit price bid per each for each unit installed at the locations shown in the plans.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All materials and installation procedures provided by the CONTRACTOR for use in the CIPP installation process shall be equal to or exceed the requirements of Section 5 of ASTM F1216, Section 5 of ASTM F1743, or ASTM F2019, as is applicable.
- B. CONTRACTOR shall be responsible for control of all material and process variables to provide a finished CIPP possessing the minimum properties specified in ASTM F1216, ASTM F1743, or ASTM F2019, as is applicable and supplemented herein.
- C. The finished SLC seal product shall be fabricated from materials which when cured will be chemically resistant to withstand internal exposure to domestic sewage and shall meet the chemical resistance requirements of

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ASTM D-543. It shall also be compatible with the lining system materials utilized in the main sewer line.

2.2 CIPP TUBE

A. FABRIC TUBING:

FELT: The Felt tube shall consist of one or more layers of absorbent, flexible felt fabric. The layers may be woven or non-woven materials or combination thereof, capable of carrying resin, withstand installation pressures, sufficient strength to bridge missing pipe, and hold up under curing temperatures. The seams of the tube must be leak free and stronger than the non-seamed felt.

GLASS REINFORCED PLASTIC (GRP): The GRP tube shall consist of a seamless, spirally wound fiberglass that is flexible and has strain values (expandable) up to ten (10) percent. The tube will not have a longitudinal seam, including a stitched seam, stitch-free-weld or bond, or stitch-free overlap. The tube shall be constructed to withstand installation pressures and have sufficient strength to bridge missing pipe.

B. CHEMICAL RESISTANCE

The chemical resistance tests should be completed in accordance with Test Method D543. Exposure should be for a minimum of one month at 73.4 degrees F. During this period, the CIPP test specimens should lose no more than 20 percent of their initial flexural strength and flexural modulus when tested in accordance with Section 8 of ASTM F1216 or ASTM F1743, or Section 6 of ASTM F2019, whichever is applicable, when subjected to the following solutions:

Chemical Solution	FELT TUBE Concentration [percent]	GRP TUBE Concentration [percent]
Tap Water (pH 6-9)	100	n/a
Nitric Acid	5	1
Phosphoric Acid	10	n/a
Sulfuric Acid	10	5
Gasoline	100	100
Vegetable Oil	100	100
Detergent	0.1	0.1
Soap	0.1	0.1

The CONTRACTOR shall be responsible for all costs associated with the chemical resistance tests.

Proof of meeting these requirements shall be provided to the engineer for approval at least seven (7) days prior to commencement of work.

C. PHYSICAL APPEARANCE:

The tube shall be free from defects, such as tears, holes, cuts, foreign materials, blisters, cracks, and other surface defects. The tube shall be homogenous across the entire wall thickness. No dry or unsaturated layers shall be evident.

2.3 RESINS

A. GENERAL

Resins shall be tinted for visibility and provide positive indication of adequate liner wet-out. Resins should be appropriate for conditions encountered in a sanitary sewer environment. Resins should withstand the corrosive effect of residential, commercial, and industrial effluents, liquids, and/or gases common to sewers. Resins should be resistant to abrasion caused by solids, grit, aggregate, and/or sand.

B. TYPES OF RESIN

INVERSION METHOD: a general purpose, unsaturated, styrene-based thermoset resin and catalyst system or an epoxy resin and hardener that is compatible with the inversion process,

PULL-IN-PLACE METHOD: an isophthalic based polyester, or vinyl ester thermoset resin and catalyst or an epoxy resin and hardener that is compatible with pull-in-place installation.

C. STRUCTURAL PROPERTIES

The structural properties of the cured resin shall have minimum initial test values as given in Table 1 of ASTM F1216, ASTM F1743, or ASTM F2019, whichever is applicable, (and supplemented below in the table below). Properties for these or any other enhanced resins shall be substantiated with test data.

Test Property	Test Method	FELT TUBE Minimum Value [psi]	GRP TUBE Minimum Value [psi]
Flexural strength	ASTM D790	4,500	6,500
Flexural modulus	ASTM D790	300,000	725,000
50-year flexural creep modulus	ASTM D2990	150,000	

2.4 DIMENSIONS

- A. **LENGTH:** CONTRACTOR shall make allowances in determining the tube length for stretch during installation and shrinkage during curing. The minimum length shall be that which continuously spans the distance from the center of the inlet manhole to the center of the outlet manhole. The CONTRACTOR shall verify the lengths in the field before the tube is cut and impregnated. Individual installation runs may include one or more manhole-to-manhole sections as approved by the ENGINEER and will only be allowed when no more than 20 lateral services are interrupted at one time. Installation of the liner shall be through existing or new manholes. Excavation for liner insertion shall not be permitted except to replace the manhole cones, if necessary and/or required. The maximum inversion installation shall be 660 linear feet without prior approval from the ENGINEER.
- B. **DIAMETER:** CONTRACTOR shall make allowances in determining the tube circumference for stretch during installation and shrinkage during curing. The tube shall be sized such that when installed it will tightly fit the internal circumference of the original pipe. The diameter of the existing pipes may be larger than the nominal inside diameter. It is the CONTRACTOR's responsibility to determine the required diameter of the liner prior to ordering materials.
- C. **THICKNESS:** The nominal wall thickness shall be at least the calculated design thickness, or the minimum specified, and may be up to 15 percent greater except where felt layers overlap, in which case it may be in excess of this value. The wall thickness of the felt tube shall be ordered to the next standard 1.5 mm incremental thickness above the minimum calculated design thickness. Unless otherwise specified to provide for excess resin migration, the gap thickness of the wetting-out equipment shall be sized to allow an excess of 5 to 10 percent resin to pass during impregnation.

1. Fiberglass: The impregnated tube shall have a thickness that when compressed at installation pressures and cured will meet or exceed the design thickness in accordance with ASTM F1216, Appendix XI. The minimum allowable wall thickness for fiberglass CIPP is 2.8mm.

2.5 MANUFACTURER

A. CIPP LINER COMPOSITION:

1. FELT LINER: The felt tube shall have an inner film and outer film to prevent resin migration and contamination. The inner film and outer film must both be styrene gas barriers.
2. GRP LINER: The fiberglass tube shall be saturated with the appropriate resin using a resin bath to allow for the lowest possible amount of air entrapment. Vacuum-suction impregnation methods are not allowed due to the introduction of air using this method. The liner will then be formed into a spirally wound shape for the purpose of being seamless in its cured state. Inner film and outer film material will be added that are both impervious to airborne styrene. The outer film will also have UV blocking characteristics. The inner membrane will be removed after the curing process is complete.

B. MANUFACTURERS:

All impregnation or “wet-out” of the tube must be done at an EPA-regulated, quality-controlled facility. Approved CIPP liner manufacturers are Insituform Technologies, Inliner Technologies, Spiniello Companies, Applied Felts, Inc., Reline America Inc., or equal.

2.6 DESIGN CRITERIA

- A. The liner shall be designed for a “fully deteriorated” pipe condition in accordance with the procedures of ASTM F1216, Appendix XI and these special provisions. All material properties used in design calculations shall be long-term (time-corrected) values. The CONTRACTOR shall be familiar with the existing site conditions when preparing the liner design.
- B. CONTRACTOR shall prepare design calculations for approval prior to performing the lining work. The submitted design calculations shall provide the following information as a minimum:

Project Number No. X through No. XX

Manhole to Manhole designation QS-XX-MHXX to QS-XX-MHXX

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Pipe Nominal Diameter (inches)

Minimum Liner thickness (inches)

Proposed Liner Thickness (inches)

The CONTRACTOR shall note that the actual level of deterioration may vary within any given section of sewer.

C. The following parameters shall be assumed for the liner design:

1. Fully deteriorated host pipe
2. Safety factor of 2.0
3. Modulus of soil reaction, E'S = 1,500 psi (fully deteriorated)
4. Unit weight of soil = 140 pcf
5. The minimum ovality for straight runs shall be 5.0 percent
6. AASHTO H20 traffic loads
7. AREMA E-80 railroad loads
8. Head of groundwater of 5 feet above top of pipe
9. Minimum 50-year service life

D. External Buckling Design: Where the CIPP is designed as a stand-alone pipe in a fully deteriorated condition, acceptable third-party testing and verification of design analysis techniques (ASTM F 1216, Section XI.2.2) shall be submitted by each manufacturer and/or CIPP product. This testing requirement can be accomplished with soil box testing.

2.7 CIPP TERMINATION POINTS

A. The CONTRACTOR shall provide shop drawings for approval detailing the proposed CIPP liner terminations.

2.8 SERVICE LATERAL CONNECTION (SLC) SEAL (TOP HAT™)

A. The SLC shall form a "tee" section with a lap inside the main pipe and a tube which shall extend continuously from the sewer main into the lateral for a minimum of 12-inches. Configuration of laterals or other obstructions

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- that prevent the full installation of the SLC must be approved by the ENGINEER or CITY. Excavation for SLC installation shall not be permitted. The SLC shall be capable of sealing a combination of “tees” or “wyes” of varying angle. The resin shall be cured to form the tube into a hard, impermeable pipe-within-a-pipe.
- B. When cured, the SLC shall seal the connection of the lateral to the mainline in a continuous tight-fitting, watertight pipe-within-a-pipe to eliminate any visible leakage between the lateral and mainline and shall provide a leak-proof seal to prevent root intrusion, infiltration, and exfiltration between a liner and a host pipe.
 - C. Seals installed with resins that do not bond to host pipeline shall include either (A) an adhesive epoxy compound applied at the edges of the seal both inside the lateral and around the brim inside the main line, or (B) a mechanical seal inside the lateral.
 - D. After inspection and cleaning of the mainline pipe, the Contractor shall proceed with installing the SLC seal. Rehabilitated mains shall have previously reinstated active lateral connections to the full diameter of the lateral connection and include any finished brushing for a smooth cut.
 - E. The SLC material shall be fabricated from either a non-woven felt or fiberglass laminate or combination thereof. The SLC manufacturer shall supply either technical procedure or information to control or mitigate shrinkage and wrinkling during cure.
 - F. The SLC material shall be fabricated to neatly fit the internal circumference of the lateral pipeline, extends into the lateral pipeline a minimum of 12-inches, and laps over the main pipeline wall a minimum of 4-inches.
 - G. The SLC shall use a polyester resin, vinyl ester resin, or epoxy-resin. The watertight seal shall either be an adhesive epoxy compound or rubberized seal.

PART 3 – EXECUTION

3.1 PREPARATORY PROCEDURES

A. TRAFFIC CONTROL:

Traffic control devices and plans as approved by the CITY.

B. SEWER CLEANING:

Prior to CIPP tube installation, the CONTRACTOR shall clean or heavy clean the existing sewer including removal of intruding and hanging gaskets and any blockages in the pipe or service tap in accordance with Section 02760. The CONTRACTOR shall clear the existing sewer of obstructions such as tuberculation, sediment or other solids or collapsed pipe that will prevent or hinder CIPP liner installation.

C. ODOR CONTROL

At the project site prior to bypassing sewage flow, the CONTRACTOR shall provide odor control measures, see Section 02661.

D. SEWER BYPASSING AND DEWATERING

The CONTRACTOR shall be responsible for bypassing flow around his work and dewatering of sewer lines in accordance with the requirements of Section 02661.

E. CCTV INSPECTION

Experienced personnel training in locating breaks, obstacles, and service connections by visual inspection shall perform inspection of the sewer main. The interior of the sewer shall be carefully inspected in accordance with Section 02761 to determine the location of conditions which may prevent proper installation of CIPP. CONTRACTOR shall furnish television inspection data to the ENGINEER.

F. MEASUREMENT

The existing sewer lines may be larger than their nominal size due to corrosion of the pipe. It is the CONTRACTOR's responsibility to measure the actual inside diameter at different locations of the sewer to determine the appropriate size of CIPP liner to use.

G. SERVICE LATERAL CONNECTION (SLC) SEAL (TOP HAT™)

1. It is required that the service lateral be inactive during the time of installation. This is normally accomplished by turning off the services or requesting that the businessowner/homeowner relinquish its services during the required period of installation.
2. Line Obstructions - It shall be the responsibility of the CONTRACTOR to clear the line of obstructions that will prevent the insertion of the SLC material. If inspection reveals an obstruction that cannot be removed

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by conventional sewer cleaning equipment, the CONTRACTOR shall make an external point repair excavation to uncover and remove the obstruction. The CONTRACTOR shall inform the ENGINEER prior to the commencement of the Work.

3. The mainline pipe opening shall be prepared to accept the SLC and the mainline rehabilitated pipe shall be maximized to obtain the best possible connection.
4. The transition from the mainline pipe to the service lateral shall be smooth and continuous to provide adequate support for the SLC during installation and cure.

3.2 INSTALLATION PROCEDURES

A. GENERAL

All procedures performed by the CONTRACTOR in the CIPP installation shall be equal to or exceed the requirements of Section 7 of ASTM F1216, Section 7 in ASTM F1743, or Section 6 of ASTM F2019, as is applicable.

The CONTRACTOR shall designate the location where the CIPP felt tube would be impregnated with resin ("wet-out"). Locations shall be subject to approval by the ENGINEER and applicable local agencies. The CONTRACTOR shall allow the ENGINEER to inspect the materials and "wet-out" procedure.

If the "wet-out" location is not at the project site, the impregnated CIPP tube shall be transported to site under controlled environmental conditions. Transport vehicles shall include a tamper-resistant, sealed temperature-recording device which records the temperature of the liner at all times after leaving the wet-out site. The CONTRACTOR shall decide when to transport the impregnated CIPP tube to site and when to commence insertion with respect to weather conditions.

CONTRACTOR is responsible for obtaining construction/fire hydrant meters from the CITY and for paying all applicable deposit fees and water usage fees.

The CONTRACTOR shall ensure that the pressure inside of the CIPP tube exceeds the pressure exerted on the pipe by groundwater.

The exterior of the manufactured tube shall be marked along its length at regular intervals not to exceed five (5) feet. These marks shall be used as a gauge to measure elongation during insertion. Should the overall

elongation of a reach exceed five percent (5%) of the overall length for fabric tube and two percent (2%) for GRP tube, the liner tube shall be rejected and replaced.

B. CIPP INSTALLATION PROCESS

CIPP installations will not be undertaken in weather conditions that could jeopardize the installation of the CIPP or be detrimental to the long-term performance of the CIPP. All equipment, labor, and materials required to complete the work must be ready on-site before installation begins. The felt CIPP liner will be installed by the inversion tube method or the pull/winch method. The fiberglass CIPP liner will be installed winching or pull-in-place method.

1. **INVERSION METHOD:** The tube shall be impregnated with a liquid thermosetting resin and lowered into the manhole through an inversion tube. The inversion tube will then be filled with water or air where the weight of the water or air pressure will push the tube through the damaged pipe inside out, while pressing the resin impregnated side firmly against the inside walls of the damaged pipe. The smooth coated side of the liner shall become the new interior surface of the pipe.
2. **PULL/WINCHING METHOD:** The bottom half of the sewer pipe throughout the section to be lined shall be covered with a polyethylene foil or other suitable material to facilitate threading of the liner and reduce the risk of damage to the liner material. The tube liner shall be formed with a polyurethane coating on its interior surface. Rollers shall be installed in the upstream and downstream manholes to guide the liner into and out of the host pipe and to guard against chafing of the crowns at the entry and exit from the winch cable. The resin impregnated tube liner shall be lowered into the manhole. The tube shall then be pulled into position within the existing pipe with the aid of a power winch that is equipped with a device to monitor the force and prevent excessive tension. Should the pulling force exceed the manufacturer's recommendations, the tube shall be rejected and replaced. In addition, the tube liner shall use a sliding foil on the bottom one-third of the existing conduit during winching.

The CONTRACTOR shall cap each end of the liner and use liner restraints in the manholes. The CONTRACTOR shall introduce water or air into the liner to inflate the liner until it has a tight fit against the inner walls of the host pipe producing dimples at lateral and side connections and flared ends at manholes. All hoses/pipes used for introducing water or air shall be ramped during the installation and curing process to allow for the ease of vehicular and pedestrian traffic. All hoses/pipes shall be color-coded for identification

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to prevent the use of hoses/pipes used for water conveyance are not used for wastewater conveyance or vice versa.

C. SERVICE LATERAL CONNECTION (SLC) SEAL (TOP HAT™) INSTALLATION PROCESS

1. The resin impregnated tube shall be loaded inside a pressure apparatus. The pressure apparatus, attached to a robotic device, shall be positioned in the mainline pipe at the service connection. The robotic device, together with a television camera, shall be used to align the SLC repair with the service connection opening. Air pressure, supplied to the pressure apparatus through an air hose, shall be used to invert or expand the resin impregnated SLC into the lateral pipe. The pressure shall be adjusted to fully place the SLC into the lateral pipe and hold the tube tight to the pipe wall. Care shall be taken during the curing process not to over-stress the tube. The pressure apparatus shall include a bladder which shall inflate in the mainline pipe, effectively seating the SLC repair against the service connection.
2. After inversion or pull in is completed, recommended pressure is maintained on the impregnated tube for the duration of the curing process.

D. CIPP CURING

The curing process shall follow a step cure or similar approach recommended by the manufacturer and approved by the ENGINEER and shall be held at the top step for an adequate length of time as determined by the liner manufacturer to ensure that the design physical properties are attained.

1. HOT WATER CURING

- a. CONTRACTOR shall use a flexible and impermeable calibration hose to inflate the tube. The calibration hose may or may not remain in the complete installation. Any dry tube or inflation hose material that enters the existing pipe that has not been previously vacuum impregnated with resin under controlled conditions cannot be included in the structural wall of the CIPP. The nominal thickness of this material shall be deducted from the field sample thickness measured in order to verify that the minimum specified wall thickness is achieved. Hose material remaining in the installation shall be compatible with the resin system used, shall bond permanently with the tube, and shall be translucent to facilitate post installation inspection. Hose materials which are to

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be removed after curing, shall be of non-bondable material. After the tube is inserted through the pipe section, the CONTRACTOR shall heat the water by circulating it through a boiler, where the hot water will cause the resin to cure.

- b. The CONTRACTOR shall monitor the temperature of the tube liner during curing by remote temperature sensors placed at the interface of the existing pipe and the CIPP. A minimum of two temperature sensors shall be installed, one at either end of the length being lined. The curing process shall not be terminated until the temperature sensor readings indicate that a satisfactory cure has been completed. Any extended cure times shall not adversely affect the properties of the CIPP lining material.
- c. Circulation water shall cool down to at least 100 degrees F for 1 hour before releasing the hydrostatic head.
- d. The rate of temperature rise and fall during heating and cooling shall not exceed 2 degrees F per minute.
- e. The water shall be evacuated from the pipe at a controlled rate to prevent negative pressure in the pipe. The water shall not be released until the water is at an ambient air temperature.

2. STEAM CURING

- a. Steam source and air compressors are used to circulate the steam/air mixture through the pipe at a temperature recommended by the manufacturer causing the resin to harden.
- b. The CONTRACTOR shall monitor the temperature of the tube liner during curing by remote temperature sensors placed at the interface of the existing pipe and the CIPP. A minimum of two temperature sensors shall be installed, one at either end of the length being lined. The curing process shall not be terminated until the temperature sensor readings indicate that a satisfactory cure has been completed. Any extended cure times shall not adversely affect the properties of the CIPP lining material.
- c. The temperature of the air shall cool down to at least 140 degrees F for 1 hour before releasing air pressure.
- d. The outlet hose shall be equipped with a pressure regulating valve, temperature gauge, and pressures gauge.

3. ULTRAVIOLET CURING

- a. During the curing process, infrared sensors will record the curing parameters using a computer and database that are tamper proof. The curing parameters shall be controlled as determined by the manufacturers' quality protocol. The curing data shall consist of the following:
 - 1) Curing speed
 - 2) Light source working and wattage
 - 3) Inner air pressure

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- 4) Exothermic temperature
- 5) Date and time
- 6) Length of liner
- b. The ultraviolet curing apparatus shall operate between 200 to 400-nm ranges.
- c. The ultraviolet curing apparatus shall be pulled through the liner at a speed recommended by the manufacturer while a constant air pressure maintains inflation and pressing of the liner material tightly against the inner walls of the host pipe.

E. SERVICE LATERAL CONNECTION (SLC) SEAL (TOP HAT™) CURING

1. Curing method shall be compatible with the resin selected. The initial cure shall be deemed to be completed when the SLC has been exposed to the UV light, heat source or held in place for the time period specified by the manufacturer.
2. The Contractor shall cool (if heat cured) the hardened SLC before relieving the pressure in the pressure apparatus. Cool-down may be accomplished by the introduction of cool air into the pressure apparatus. Care shall be taken to maintain proper pressure throughout the cure and cool-down period.
3. If cured by ambient-cure process, the Contractor shall maintain bladder pressure until SLC has completely cured per manufacturer's recommendations before relieving the pressure in the pressure apparatus.
4. SLC shall be cured in place by the manufacturer's suggested resin technology, using a polyester resin, vinyl ester resin, or epoxy-resin with a watertight seal which shall be comprised of either an adhesive epoxy compound or rubberized seal.
5. Material shall be impregnated with resin in a controlled environment and stored per manufacturer's recommendations for transport.
6. Method of cure shall be either heat-cure process, ultra-violet light exposure, or ambient-cure process and shall result in a cured in place seal per all specifications herein and meet the minimum physical properties represented herein.
7. Contractor shall maintain a visible, written log of all activities in accordance with manufacturer's recommendations and shall include time/location of wet out, time of insertion, time/location of lateral insertion, bladder pressure requirements, required cure time, actual cure time, and cool down duration.

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3.3 FINISHED CIPP PRODUCT

A. FINISH:

The finished CIPP shall be continuous over the entire length of an installation run, manhole to manhole. The wall color of the interior CIPP surface after installation shall be a light reflective color so that a clear detailed examination with CCTV equipment may be made.

B. DEFECTS:

Any defects or non-conforming work as determined by the ENGINEER shall be corrected at the CONTRACTOR'S expense.

1. UNDER THICKNESS LINER:

A minimum wall thickness at any point shall not be less than 90% of the design thickness, or the product will be considered unacceptable. An under-thickness liner may be brought into compliance by either:

- a. Removal and replacement of the undersized liner, or
- b. Install a second liner with full wall thickness as stated on the liner design submittal after acceptable surface preparation of the undersized liner interior. This option will be considered by the CITY on a case-by-case basis. The CITY will consider the loss of flow capacity and this option may be refused for that reason. The addition of a thin liner that makes up the difference of the under sizing is not an acceptable remedy because the structural properties are not additive if they are not cured simultaneously.

2. FLEXURAL TESTING FAILURE:

In the event of a failure of the flexural strength, flexural modulus or flexural creep tests, another flat plate sample shall be tested. Should the second sample fail, the liner shall be brought to compliance by either:

- a. Removal and replacement of the undersized liner, or
- b. Install a second liner with full wall thickness as stated on the liner design submittal after acceptable surface preparation of the undersized liner interior. This option will be considered by the CITY on a case-by-case basis. The CITY will consider the loss of flow capacity and this option may be refused for that reason. The addition of a thin liner that makes up the difference of the under sizing is not an acceptable remedy because the structural properties are not additive if they are not cured simultaneously.

3. WRINKLES:

- a. Circumferential wrinkles in the bottom half of the finished liner pipe which exceed three (3) percent of the nominal diameter in height are unacceptable and shall be removed or repaired by the CONTRACTOR. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for approval.
- b. Circumferential or longitudinal wrinkles in the finished liner pipe which reduce the hydraulic capacity of the pipe (wrinkles which exceed five (5) percent of the nominal pipe diameter) are unacceptable and shall be removed or repaired by the CONTRACTOR. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for approval.
- c. Wrinkles in the finished liner pipe that reduce the structural stability of the pipe are unacceptable. If a void between the wrinkle and the pipe exists, the CONTRACTOR shall repair or replace that section of the pipe. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for approval.
- d. Wrinkles in the finished CIPP that reduce the structural integrity of the CIPP are unacceptable. CONTRACTOR shall repair or replace that section of the pipe. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for approval.

4. OTHER DEFECTS:

Other defects such as foreign inclusions, dry spots, pinholes, delamination, or wrinkling beyond the specification allowances, determined by the ENGINEER as affecting the integrity or strength of the CIPP, or as adversely affecting the hydraulic capacity of the CIPP, shall be repaired or replaced at the CONTRACTORS' expense. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for approval.

C. GRP CIPP LINER

1. INNERFILM: The inner film of the fiberglass CIPP liner should be removed and discarded to provide optimal quality of the final product.
2. FLUSHING: Flushing of the UV cured fiberglass liner (to reduce styrene residual) is not required provided third party testing results document styrene residual levels (without flushing) are within acceptable defined levels.

D. CIPP TERMINATION POINTS (END SEALS):

1. End seals shall be not be installed until the CIPP pipe has relaxed for a minimum period of 24 hours.
2. The CIPP shall make a tight seal at the manhole opening with no annular gaps. The liner shall be cut neat and trimmed.
3. The CONTRACTOR shall secure the connections between the CIPP and the connection liner end seals. The securing materials shall adequately bond with the host CIPP pipe per CIPP manufacturer's specifications and shall be significantly different in color from the liner.
4. The CONTRACTOR shall furnish and apply epoxy resin to CIPP liner end seal at all upstream and downstream ends of the CIPP liner to form a watertight seal.

E. SERVICE RECONNECTIONS:

1. After the curing is complete, existing lateral service connections shall be re-established. The cut liner shall have no jagged edges and shall be sanded smooth. The CONTRACTOR shall provide a seal, recommended by the lining manufacturer, at the service connection so that no leakage of fluids may infiltrate between the liner and the existing sewer surface. Seals must be submitted and approved prior to use.
2. Reinstate service laterals using only remote internal methods (prior to CIPP acceptance).
3. Where the CIPP liner does not create dimples at the service connections or in other ways indicate the locations, the exact location shall be determined from the internal inspection data. It shall be the CONTRACTOR's responsibility to accurately locate and reinstate all service connections after the CIPP installation and curing has been completed. All service connections shall be reinstated to a minimum of 95% of the original opening, centered on the lateral opening.
4. Any misplaced cuts made by the remote internal method while reinstating service laterals will be repaired using approved materials and a remote internal method at no additional cost to OWNER.

3.4 FINISHED SERVICE LATERAL CONNECTION (SLC) SEAL (TOP HAT™) PRODUCT

A. DEFECTS

1. The finished SLC shall be free of dry spots, lifts and de-lamination. The lateral SLC shall not inhibit the closed-circuit television post video

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inspection of the mainline or service lateral pipes. Frayed ends of the SLC repair shall be removed prior to acceptance.

2. During the warranty period, any defects which will affect the integrity or strength of the SLC shall be repaired at the CONTRACTOR'S expense in a manner mutually agreed upon by the Manufacturer, CITY and the CONTRACTOR.

B. PROPERTIES

1. The structural performance of the finished pipe shall be adequate to accommodate all anticipated loads throughout its design life. No cured-in-place pipe rehabilitation technology will be allowed that requires bonding to the existing pipe for any part of its structural strength.

3.5 FINISHED LIQUID WASTE DISPOSAL

The CONTRACTOR shall obtain the ENGINEER'S written approval prior to the disposal of the water and/or condensate from the curing process into the sanitary sewage system.

3.6 CLEANUP

Following inspection, the CONTRACTOR shall clean up the entire project area. The CONTRACTOR shall dispose of all excess material and debris not incorporated into the permanent installation off-site.

+ + END OF SECTION + +

SECTION 02950

PIPELINE POINT REPAIRS

PART 1 - GENERAL

1.1 REQUIREMENTS

This section specifies point repair within the sewer pipeline by correcting offset joints, broken pipe, removing obstructions or any other deficiencies that would affect the installation of the new CIPP liner where applicable. Point repair include removal and replacement of defective pipe at the locations identified in the Design Drawings.

1.2 QUALITY ASSURANCE

The CONTRACTOR is solely responsible for maintaining the quality assurance of his work during the length of the project. The contractor is responsible for any costs associated with corrective measures required to replace or repair items not meeting the quality standards specified by the CITY.

A. INSPECTION

1. CCTV or visual inspection of point repair shall be required by the CITY inspector or approved person. Point repair location shall be approved by the CITY inspector prior to commencement of point repair activities and any remaining pipeline rehabilitation activities such as CIPP.
2. The ENGINEER will review CCTV or visually inspect the point repair to ensure compliance with the requirements listed in this specification and contract documents. If any portion of the point repair is determined not acceptable, the point repair shall be repaired or replaced, whichever the ENGINEER deems appropriate, and re-inspected, at no cost to the CITY or at the CONTRACTOR's expense.

1.3 SUBMITTALS

CONTRACTOR shall provide submittals to the ENGINEER for approval on all materials and methods to be used for point repairs. All new pipe submittals shall be in accordance with the MAG Specifications.

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PIPELINE POINT REPAIRS | 02950-1



1.4 MEASUREMENT AND PAYMENT

- A. **DEFINITION:** Full compensation for all labor, material and required equipment, and all safety and support required for the localized repair of voids in the pipe, holes in the pipe, joints in the pipe, etc. as required and as shown on the Design Drawings including removal and replacement of small sections of pipe.
- B. **MEASUREMENT AND PAYMENT:** Measurement and Payment shall be made on a unit price for each item of work described as follows:
 - 1. **Remove Existing Pipe:** measurement and payment shall be made on a unit price bid per linear foot of pipe removed at the locations shown in the Design Drawings including all excavation and backfill.
 - 2. **Install New 8-inch Sanitary Sewer Pipe:** measurement and payment shall be made on a unit price bid per linear foot of new pipe installed in accordance with the MAG Standard Specifications, Section 615.
 - 3. **8-inch Pipe Removal and Replacement (Allowance):** measurement and payment shall be made on a unit price bid per linear foot of deteriorated pipe that has to be removed and replaced in addition to the lengths shown in the Design Drawings. It is intended that this allowance cover unforeseen conditions where small point repair sections of pipe require longer lengths of removal and replacement. All work shall be in accordance with the MAG Standard Specifications, Section 615.

PART 2 - PRODUCTS

2.1 REMOVE AND REPLACE PIPE

All new pipe installed shall be in accordance with the MAG Standard Specifications, Sections 615, 743, or 745.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Bypass Pumping/Flow Control:** As specified in Section 02661, Diversion of Sewage Flow and Dewatering, for locations where offset joint is being corrected or other point repairs are required to be completed prior to CIPP.

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PIPELINE POINT REPAIRS | 02950-2



3.2 INSTALLATION

- A. CONTRACTOR shall clean sewer pipe prior to installation of new pipe point repair in accordance with Section 02760, Sewer and Sewer Structure Cleaning.
- B. CONTRACTOR shall complete a CCTV inspection of the pipeline prior to installation of the point repair to determine the exact location of the repair and to determine existing conditions at the time of installation. All such work shall be in accordance with Section 02761, CCTV Inspection of Sanitary Sewers.
- C. Removal of existing pipe and installation of new pipe shall be in accordance with MAG Standard Specifications, Section 615.

+ + END OF SECTION ++

SECTION 03600

GROUT

PART 1 - GENERAL

1.1 - DESCRIPTION

This section specifies grout for uses other than masonry or annular space grouting.

1.1.1. - References

This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM C33	Concrete Aggregates
ASTM C40	Organic impurities in Fine Aggregates for Concrete
ASTM C88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Material Finer than 75 um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C150	Portland Cement
ASTM C289	Potential Reactivity of Aggregates (Chemical Method)
ASTM C494	Chemical Admixtures for Concrete
ASTM 3881	Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E329	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
CRD-C621-91	Corps of Engineers Specification for Nonshrink Grout

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GROUT | 03600-1



1.1.2. - Quality Assurance

To demonstrate conformance with the specified requirements for grout, the CONTRACTOR shall provide the services of an independent testing laboratory that complies with the requirements of ASTM E329. The testing laboratory shall sample and test grout materials as required in this section. Costs of testing laboratory services shall be borne by the CONTRACTOR.

1.2 - MEASUREMENT AND PAYMENT

No separate measurement or payment for this item. Grouting shall be considered incidental to the Work for which grouting is necessary, such as, manhole installation and sewer connection to manholes.

PART 2 - PRODUCTS

2.1 - MATERIALS

2.1.1. - Cement

Portland cement shall be ASTM C150 Type II or Type V, low alkali, containing less than 0.60 percent alkalis.

2.1.2. - Aggregate

- A. GENERAL: Aggregate shall be nonreactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing grout work.
- B. FINE AGGREGATE: Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine and shall conform to ASTM C33 as modified herein. When tested in accordance with ASTM C136, gradation shall be such that 100 percent by weight will pass a standard No. 8 mesh sieve and no less than 45 percent by weight will pass a standard No. 40 mesh sieve.

Variation from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below:

U.S. standard sieve size	Permissible variation in individual tests [percent]
30 or coarser	2
50 or finer	0.5

Other tests shall be in accordance with the following specifications:

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GROUT | 03600-2



Test	Test Method	Requirements
Organic Impurities	ASTM C40	Color lighter than Amount of Material Standard
Passing No. 200 Sieve	ASTM C117	3% maximum by weight
Soundness	ASTM C88	10% maximum loss with sodium sulfate
Reactivity	ASTM C289	Innocuous aggregate
Sand Equivalent	ASTM D2419	Minimum 80

2.1.3. - Admixtures

- A. GENERAL: Admixtures shall be compatible with the grout. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the grout mix.
- B. WATER REDUCING RETARDER: Water reducing retarder shall be ASTM C494 Type D and shall be Master Builders Pozzoloth 300-R, Sika Corporation Plastiment, or equal.
- C. LUBRICANT FOR CEMENT PRESSURE GROUTING: Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or equal.
- D. Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1000 mg/1 of chlorides as C1, nor more than 1300 mg/1 of sulfates as SO₄; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the grout at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the grout.

2.1.4. - Bonding Compounds

Epoxy resin bonding compounds shall be used for wet areas and shall be Sika Chemical Corporation, Sikadur 32 Hi-Mod, 32 Hi-Mod LPL, or 35 Hi-Mod LV 350, 370, or 390m as applicable; or equal.

Non-epoxy bonding compounds shall be used for dry areas and shall be Burke Company, Acrylic Bondcrete; Imperial Chemical Industrial, Inc., Thoro System Products, Acryl 60; Thoro Bond; or equal.

A. CURING COMPOUND

Curing compound shall be Master Builders, MasterSeal; A.C. Horn Inc., Horn ClearSeal EM 180, Burke Company Spartan Cote WB Cure Seal Hardener; or

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equal, conforming to ASTM C309. Curing compounds shall be clear and shall be applied in accordance with the manufacturer's instructions.

2.2 - GROUT

2.2.1. - Cement Grout

Cement grout shall be a mixture of one part cement, two parts sand, proportioned by volume, admixtures for pressure grouting, and sufficient water to form a workable mix.

2.2.2. - Non-shrink Grout

Non-shrink grout is available with both metallic and nonmetallic aggregate. Metallic aggregate grout shall be Master Builders Embeco 636, Burke Company Metallic Spec Grout, Sonneborn Ferroligh G Redimix, or equal. Nonmetallic aggregate grout shall be Five Star Products, Inc. Five Star Grout, Master Builders Masterflow 713, Burke Company Non-Ferrous, Non-Shrink Grout, or equal.

2.2.3. - Epoxy Grout for Crack Repair and Dowel Anchorage

Except as noted below, epoxy grout shall be a high modulus, two-component, moisture insensitive, 100 percent solids, thermosetting modified polyamide epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C881 Type 1, Grade 3, such as Adhesive Owning Concrese 1440 series, Sika Corporation Sikadur Hi-Mod Series, Adhesive Technology Corporation Solidbond 200 or equal, and shall have a heat deflection temperature in excess of 130 degrees F.

Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100 percent solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881 Type 1 Grade 1, such as Sika Corporation Sikadur 52, Adhesive Owning Company SCB products, Adhesive Technology Corporation SLV 300 series, or equal.

2.2.4. - Polymer Concrete (for Resurfacing or Patching)

Polymer concrete (for resurfacing or patching) shall consist of a liquid binder and dry aggregate mixed together to make a mortar or grout of a consistency as required for the application. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C881 Type 3 Grade 1, such as Sika Corporation Sikadur Lo-Mod series, Adhesive Owning Concrese 1470, Adhesive Technology Corporation 400 series, or equal.

The aggregate shall be oven dry in sealed packages until time of mixing, and shall be of size and consistency compatible with recommendations of manufacturer of liquid binder for intended application.

2.3 - PRODUCT DATA

2.3.1. - Manufacturer's Data

Manufacturer's data shall be provided for the following.

- A. Bonding compounds
- B. Nonshrink grout
- C. Pressure grout
- D. Retardants
- E. Epoxy grout
- F. Polymer concrete

2.3.2. - Laboratory Test Reports

Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:

- A. Cement
- B. Aggregates
- C. Retardants
- D. Bonding compounds
- E. Epoxy resin

2.3.3. - Evidence of Testing Laboratory Competence

The CONTRACTOR shall require that the laboratory provide directly to CITY evidence of the most recent inspection of its facilities by the Cement and Concrete Reference Laboratory of the National Bureau of Standards. The evidences shall show that deficiencies mentioned in the report of that inspection have been corrected. The evidence of inspection shall be provided prior to delivery of materials to the job site.

PART 3 - EXECUTION

3.1 - GENERAL

Bonding compound for use with grout shall be recommended by grout manufacturer. Primer, if required for polymer concrete, shall be provided per manufacturer's recommendation.

3.2 - CEMENT GROUT

Cement grout shall be used for filling nonbearing portions of equipment pads and pressure grouting.

Except for the specialized equipment for pressure grouting, mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete. Grout shall be mixed for a period of at least 1 minute. Diluted grout shall be agitated to keep ingredients mixed.

3.3 - NONSHRINK GROUT

Nonshrink, nonmetallic aggregate grout shall be used for the bearing surfaces of machinery and equipment bases, column base plates and bearing plates. Nonshrink metallic aggregate grout shall be used for setting anchor bolts and grouting reinforcing steel holes. Grout shall meet the requirements of CRD-C621 and shall be placed in accordance with manufacturer's instructions.

Holes required for grouting shall be blown clean with compressed air and left free of dust or standing water. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be centered in the drilled hole.

3.4 - EPOXY GROUT

- A. Epoxy grout shall be used for repairing cracks, repairing structural concrete, and may be used for setting reinforcing dowels or anchor bolts into holes for grouting. Concrete shall be primed in accordance with the grout manufacturer's instructions.
- B. Use of epoxy grout for anchorage of bolts or reinforcing dowels shall be subject to the following conditions:
 - 1. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.
 - 2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above the product's heat deflection temperature or 120 degrees F (whichever is less) is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns shall be disallowed.

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3. Approval from CITY for specific application and from supplier of equipment to be anchored is applicable.
4. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
5. Embedment depth and hole diameter shall be as specified.
6. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
7. Holes shall be blown clean with compressed air and be free of dust or standing water prior to application of grout.
8. Anchor shall be left undisturbed and unloaded for full curing period.
9. Anchor shall not be placed on concrete below 25 degrees F.

+ + END OF SECTION + +

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EXHIBIT F
Statement of All Clarifications and Assumptions (if any)
(3 pages - To be Incorporated by Amendment)

Exhibit F: Clarification & Assumptions

SEWER & MANHOLE REHABILITATION, PHASE 6C

COG PROJECT NUMBER: 212231.1

GMP-001

1. Mobilization/Demobilization for this GMP-001 is a onetime round trip for personnel, equipment, and supplies. Project delays that result in demobilization of personnel and/or equipment are not included, and any additional costs incurred are a change in scope.
2. No temporary signals are included in GMP and if required they will be reimbursed through Project Contingency.
3. Any costs associated with Permits, Paving Permit/Fees, Waterline and Trench Permit/Fees and Haul Permit/Fees are not included in the GMP, with the exception of the dust control permit fee.
4. Dust Control permits are included in the mobilization item of the GMP.
5. Any costs associated with City and/or ADOT permit and plan review fees, Quality Assurance (QA) (i.e. City/ADOT inspection and testing) costs, impact fees, and utility company fees, water meters/meter installations except for construction water, and/or any other fees not specifically identified within this GMP, shall be reimbursed through "Allowances and Contingency" budgets.
6. This GMP does not include costs for the remediation of hazardous waste materials.
7. Traffic Control Allowance includes anticipated costs for traffic control labor and equipment for setup and teardown, barricade device rental, sandbags, and flags with dowels. Traffic control item will be cost reimbursable with appropriate backup documentation plus applicable mark-ups, insurance, bond, and taxes per the contract.
8. CMAR GMP is based on a full 8-hour closure allowing 8 full hours of work to be performed on the site by CMAR crews.
9. For the efforts and sewer bypass associated with rehabilitating the 20-inch DIP sewer, 24-hour barricade setups will be required to safely protect the sewer bypass system and traveling public. Barricade setups shall be mutually agreed upon by the Project Team. If additional costs are incurred due to site-specific constraints, which result in an overrun of the 20-inch Sewer Bypass Allowance Bid Item, overruns shall be reimbursed through Project Contingency or Contract Change Order.
10. Excludes any costs associated with blasting or hydraulic breakers of any kind.
11. Project indirect costs were estimated at 15 weeks for this GMP and will be billed monthly.
12. Includes a Project Contingency to cover material escalation costs related to aggregates, asphalt, pipeline, CIPP liner materials as compared to the vendor/supplier quote. This will be cost reimbursable with appropriate back-up showing the cost impacts on the project from GMP to construction.
13. Excludes costs for repair of pre-existing damage to any private and public roadways used to access this project. If required, costs to be reimbursed from Project Contingency.
14. GMP assumes access can be granted to CMAR for suitable staging and installation of the sewer replacements and rehabilitation efforts at the various sections of right of way (ROW).
15. GMP excludes costs for utility relocation. If any utility relocations are required, CMAR shall be reimbursed through Project Contingency.

16. Costs for Private Irrigation and any other unmarked utility damaged and/or relocated as part of this project to be compensated out of Project Contingency line items.
17. No asphalt surface treatment - Crack, Slurry, Micro, or Fog Seal - were included in the GMP.
18. CMAR expectation is to close sidewalks and bike paths in the construction zone and route pedestrians to the nearest ADA compliant crossing and detour pedestrians to the opposite of the roadway around the work zone.
19. Survey/GIS Allowance includes costs to record assest data directly associated with the rehabilitation scope of work and incorporating that data into the GIS system.
20. Off-Duty Officer Allowance will be utilized for Off-Duty Officers as designated by the COG traffic department and will be cost reimbursable with appropriate backup plus applicable mark-up, insurance, bond, and taxes.
21. Allowances are only anticipated/estimated costs and overruns of the Allowances will be compensated through Project Contingency.
22. 8-inch sewer replacement scope of work does not include air testing. New pipe sections installed will be CCTV inspected and approved by the Engineer prior to CIPP lining.
23. All specialty asphalt, concrete, and/or paver unless expressed explicitly on the plans would be compensated through Project Contingency.
24. Unit Price Contract Administration: This GMP will be administered as a Measured Quantity/Unit Price, Guaranteed Not-to-Exceed Contract. The Schedules of Values is defined by the individual work/pay items plus fee structure, and markups. Final contract price/payout will be based on field measured, final completed quantities at the approved unit prices, approved allowance and/or contingency utilization, and approved change orders. It is understood that these City approved prices including mark-ups are the "Cost of the Work". The mark-up structure on the Schedule of Values will apply to Change Orders and/or Extra Work, allowances, and contingencies. Pay Item under-runs and/or unused items shall fall to Project contingency for the duration of the project. Quantity over-runs shall be paid at the unit price established in the Schedule of Values for the pay item and shall be paid from Contingency or Change Orders.
25. In regard to the 20-inch DIP Sewer Bypass, due to bypass scope not being defined at time of pricing, costs shall be reimbursed through 20-inch Sewer Bypass Allowance Bid Item for said work, which specifically includes, but is not limited to: trenching; backfill material; cold patch; milling/recessing plates; steel plates for buried bypass piping; HDPE fusion, HDPE pipe, and all appurtenances to construction bypass system; spill containment, spill kits, repair clamps, and lighting for bypass monitoring; fuel and fuel cells; pump maintenance; modifications and repair for discharge location and any other structure utilized for the bypass piping alignment/configuration; testing of bypass system; Engineered stamped bypass plan; water ramps as needed; mobilization and demobilization of all equipment, bypass pumps, and bypass piping; bypasses for 8-inch, 12-inch, and 18-inch sewer systems entering manhole 0140068, including any vactor bypass needed; street sweeping; loop detector replacements; landscape restoration; asphalt replacement; and pavement striping.
26. Vactor bypass costs have specifically been included for only the rehabilitation efforts associated with 12" segments MH0128994-MH0128997-MH0140068, 8" segment

MH0127570-MH0127658, and 8" segment MH0130463-MH0130461. For the other segments identified in the Project Documents, with exception to the 20" DIP segment, B&F plans on managing flow with a vactor trailer since flows were observed to be insignificant and manageable with a vactor trailer. If flows exceed the capabilities of the vactor trailer, B&F shall be reimbursed through "Allowances and Contingencies" for vactor truck costs associated with said vactor bypass needed to complete the rehabilitation scope of work.

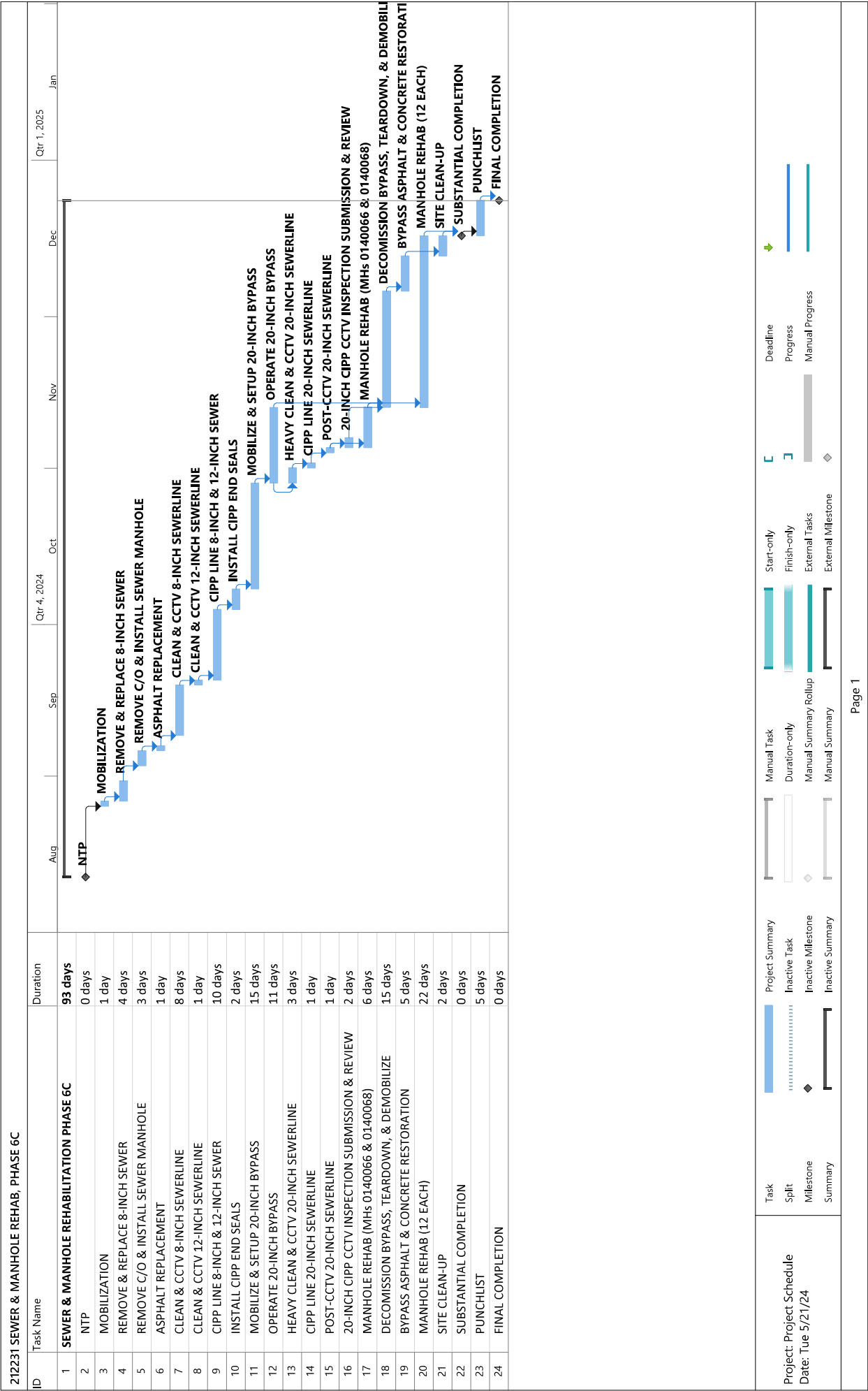
27. Rehabilitation of the 20" DIP sewer line on Grand Avenue will require a 24-hour traffic control setup during CIPP lining efforts.
28. The sewer bypass setup for rehabilitation of the 20" DIP sewer line on Grand Ave will require a 24-hour traffic control setup at the suction point. Other areas may require 24-hour setups, which will be dependent upon site constraints that impact the feasibility of trenching and burying bypass piping. Bypass setup and trenching plan to be determined based on final bypass design.

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EXHIBIT G
Schedule of Major Milestones

(1 page - To be Incorporated by Amendment)

EXHIBIT G - SCHEDULE OF MAJOR MILESTONES



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EXHIBIT H
Dispute Resolution Procedures

1. Disputes.

- 1.1** Each Dispute arising out of or related to this Agreement (including Disputes regarding any alleged breaches of this Agreement) shall be initiated and decided under the provisions of this Exhibit.
- 1.2** CMAR and City shall each designate in writing to the other party, from time to time, a member of senior management who shall be authorized to attempt to expeditiously resolve any Dispute relating to the subject matter of this Agreement in an equitable manner.
- 1.3** A party shall initiate a Dispute by delivery of written notice to the members of management designated by the respective parties under Section 1.2 of this Exhibit.
- 1.4** The parties must:
 - (A) Attempt to resolve all Disputes promptly, equitably and in a good faith manner; and
 - (B) Provide each other with reasonable access during normal business hours to any and all non-privileged records, information and data pertaining to any such Dispute.
- 1.5** With respect to matters concerning modification of the GMP or any schedule, CMAR must first follow the provisions of any Claim procedure established by the Design-Build Agreement before seeking relief under these Procedures.

2. Emergency Arbitration.

- 2.1** If the parties are unable to accomplish resolution of a Dispute, the expedited resolution of which either party considers necessary to prevent or mitigate a material delay to the critical path of the Services (a "Time Sensitive Dispute") within two days after the Time Sensitive Dispute has been initiated by a party, either party may thereafter seek emergency relief before an emergency arbitrator (the "Emergency Arbitrator") appointed as follows:
 - (A) The parties will exercise best efforts to pre-select an Emergency Arbitrator within 20 days after entering into this Agreement;
 - (B) If the Emergency Arbitrator has not been selected at the time a party delivers Notice of a Time Sensitive Dispute, the parties will each select a representative within one day after the Notice is delivered and the two representatives will then select the Emergency Arbitrator by the third day following delivery of the Notice.
 - (C) The Emergency Arbitrator shall be an attorney with at least ten (10) years' experience with commercial construction legal matters in Maricopa County, Arizona, be independent, impartial, and not have engaged in any business for or adverse to either party for at least ten (10) years.
- 2.2** The Emergency Arbitrator will conduct a hearing and render a written determination on the Dispute to both parties within five business days of the matter being referred to him or her, all in accordance with Rules O-1 to O-8 of the

American Arbitration Association ("AAA") Commercial Rules-Optional Rules for Emergency Protection Commercial Rules ("AAA Emergency Rules").

- 2.3 Although the hearing will be conducted using AAA rules, unless both parties agree otherwise, this dispute process will not be administered by the AAA but will be conducted by the parties in accordance with these procedures.
- 2.4 If, however, an Emergency Arbitrator has not selected within three days after delivery of the Notice, either party may upon three days additional notice, thereafter seek emergency relief before the AAA, in accordance with the AAA Emergency Rules, provided that the Emergency Arbitrator meets the qualifications set forth above.
- 2.5 All proceedings to arbitrate Time Sensitive Disputes shall be conducted in Glendale, Arizona.
- 2.6 Presentation, request for determination (i.e., a party's prayer), and the Emergency Arbitrators decision will adhere to the procedures required in Section 3.6 of this Exhibit.
- 2.7 The finding of the Emergency Arbitrator with respect to any Time Sensitive Dispute will be binding upon the parties on an interim basis during progress of the Services, subject to review de novo by arbitration after the Project Substantial Completion Date.
- 2.8 The time and extent of discovery will be as determined by the Emergency Arbitrator.
 - (A) Discovery orders of the Emergency Arbitrator will consider the time sensitivity of the matter and the parties desire to resolve the issue in the most time and costs efficient manner;
 - (B) The parties are obligated to cooperate fully and completely in the provision of documents and other information, including joint interviews of individuals with knowledge such that the matter moves toward resolution in the most time and costs efficient manner and the Emergency Arbitrator is empowered to fashion any equitable penalty against a party that fail to meet this obligation.

3. Non-Emergency Arbitration.

- 3.1 Except as provided in Section 5 of this Exhibit, any Dispute that is either a non-emergency Dispute that has not been resolved by negotiation, or a de novo review of an AAA emergency arbitration will be decided by binding arbitration by a panel of three arbitrators in accordance with, but not necessarily administered by, the Construction Industry Rules of the AAA.
 - (A) The parties shall each select an arbitrator within 15 days after notice that a party desires to resolve a dispute by arbitration.
 - (B) The two arbitrators shall then each select a third arbitrator. If an arbitrator is not selected within any such 15 day period, then the arbitrator shall be appointed by the AAA.
- 3.2 The arbitrator(s) shall meet the qualifications of Emergency Arbitrators as provided in Section 2 of this Exhibit.

- 3.3 The arbitrators do not have the authority to consider or award punitive damages as part of the arbitrators' award.
- 3.4 In connection with such arbitration, each party shall be entitled to conduct up to five depositions, and, no less than 90 days prior to the date of the arbitration hearing, each party shall deliver to the other party copies of all documents in the delivering party's possession that are relevant to the dispute.
- 3.5 The arbitration hearing shall be held within 150 days of the appointment of the arbitrators.
- 3.6 At the arbitration hearing, each party will argue its position to the arbitrators in support of one proposed resolution to the dispute (a "Proposed Resolution").
- (A) Each party's Proposed Resolution must be fully dispositive of the dispute.
 - (B) The arbitrators must select one Proposed Resolution by majority consent and are not free to fashion any alternative resolutions.
 - (C) The parties must submit their proposed resolution of the matter to the arbitrators and the other party 15 days prior to the date set for commencement of the arbitration proceeding.
 - (D) The decision of the arbitrators will be forwarded to the parties within 15 days after the conclusion of the arbitration hearing.
 - (E) The decision of the arbitration panel is final and binding on the parties and may be entered in any court of competent jurisdiction for the purpose of securing an enforceable judgment.
 - (F) All costs and expenses associated with the arbitration, including the reasonable legal fees and costs incurred by the prevailing party, must be paid by the party whose position was not selected by the arbitrators.
4. **Continuing Work.** Unless otherwise agreed to in writing, CMAR must continue to perform and maintain progress of the Work during any Dispute Resolution or arbitration proceedings, and City will continue to make payment to CMAR in accordance with the Agreement.
5. **Exceptions.**
- 5.1 Neither City nor CMAR are required to arbitrate any third-party claim, cross-claim, counter claim, or other claim or defenses in any action that is commenced by a third-party who is not obligated by contract to arbitrate disputes with City and CMAR.
- 5.2 City or CMAR may commence and prosecute a civil action to contest a lien or stop notice, or enforce any lien or stop notice (but only to the extent the lien or stop notice the party seeks to enforce is enforceable under Arizona law), including, without limitation, an action under A.R.S. § 33-420, without the necessity of initiating or exhausting the procedures of this Exhibit.
- 5.3 This Exhibit does not apply to, and may not be construed to require arbitration of, any claims, actions or other process undertaken, filed, or issued by the City of Glendale Building Safety Department, Code Compliance Department, Police Department, Fire Department, or any other agency of City acting in its

governmental permitting, for the benefit of public health, safety, and welfare, or other regulatory capacity.

- 5.4** In connection with any arbitration, the arbitrators do not have the authority to, and may not enforce, any provision of the Federal or Arizona Rules of Civil Procedure.