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REPORT

UTILITIES RELOCATION FOR
ARIZONA CANAL DIVERSION CHANNEL

CITY OF GLENDALE
GLENDALE, ARIZONA

1982

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AND DEVELOPMENT
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DIRECTOR, WATER
AND SEWERS
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 **JOHN CAROLLO
ENGINEERS**



A118.968

ESTIMATE OF QM, & R COSTS FOR
WASTEWATER PUMP STATIONS - BASED ON 1982 PRICES

Station: 1 2
 Location: 67th Ave. S. of Greenway Rd 54th Ave & Sweetwater Ave.

| | | |
|---------------------------|---------------|---------------|
| 1. Plant first costs | | |
| a. Pumps & motors | \$ 96,000 | \$ 44,000 |
| b. Controls | 24,000 | 11,000 |
| c. Equipment; hoists, AC. | 72,000 | 33,000 |
| d. Other; basin, piping | <u>48,000</u> | <u>21,000</u> |
| e. Total | \$ 240,000 | \$ 109,000 |

| | | |
|---|-----------|---------|
| 2. Plant sinking fund costs; 8%; No. salvage | | |
| Item | Life-yrs. | Factor |
| a | 10 | 0.06903 |
| b | 15 | .03683 |
| c | 20 | .02185 |
| d | 30 | 0.0883 |
| e. Total annual | | |

| | | |
|--|------------|------------|
| | \$ 6,600 | \$ 3,000 |
| | 900 | 400 |
| | 1,600 | 700 |
| | <u>400</u> | <u>200</u> |
| | \$ 9,500 | \$ 4,300 |

| | | |
|-------------------------|------------------|-----------------|
| 3. Maintenance & repair | | |
| a. Material (a-c) x 4% | \$ 7,700 | \$ 3,500 |
| b. Labor † | 5,400 | 5,400 |
| c. Total annual | \$ <u>13,100</u> | \$ <u>8,900</u> |

| | | |
|-------------------|---------|--------|
| 4. Basin | | |
| a. Diameter/depth | ft./ft. | 12/15 |
| b. Volume | gals. | 12,700 |
| | | 8/7 |
| | | 2,600 |
| | Year: | 1982 |
| | | 2005 |
| | | 1982 |
| | | 2005 |

| | | |
|-----------------------|---------|------------|
| 5. Daily loading rate | | |
| a. Average | mgd/qpm | 0.54/375 |
| b. Peak | mgd/qpm | 1.4/975 |
| | | 3.01/2,100 |
| | | 7.9/5,500 |
| | | 0.04/30 |
| | | 0.1/70 |
| | | 0.31/220 |
| | | 0.8/560 |

| | | |
|-------------------------|---------------|-----------|
| 6. Pumping at peak rate | | |
| a. Time off | min | 34 |
| b. Time on | min | 21 |
| c. Operation | hrs/day | 9.2 |
| d. TDH | | 32 |
| e. Power †(1) | HP | 11 |
| | (2) HPHrs/day | 101 |
| | (3) KWH/yr. | 27,500 |
| f. Annual power costs | | |
| @ 8¢/KWH | \$ 2,200 | \$ 12,500 |
| | | \$ 206 |
| | | \$ 1,300 |

7. Total annual costs: \$ 15,300 \$ 25,600 \$ 9,100 \$ 10,200 Δ
 † @ 13.34/hr. times 220% † 1/2 hr./day
 †† @ 75% OFE
 Δ - 12/14/82 Rev. for HP-KW factor

67th Avenue, 100 years @ 8%

Total annual Costs 1982 = \$ 24,800
" " " 2005 = \$ 35,100

Assume construction is completed in 1984

2005 - 1984 = 21 years @ \$ 24,800

then for a 100 year interval \Rightarrow 79 years @ \$ 35,100

$$\begin{aligned} P/W &= \$ 24,800 \times (P/A, 8\%, 21) + \$ 35,100 \times (P/A, 8\%, 79) \times (P/F, 8\%, 21) \\ &= 24,800 \times (10.017) + 35,100 \times (12.471) \times (0.1987) \\ &= \$ 248,421.60 + \$ 86,977.37 \\ &= \underline{\underline{\$ 335,398.97}} \end{aligned}$$

54th Avenue, 100 years @ 8%

Total annual Costs 1982 = \$ 13,400 for 21 years
" " " 2005 = \$ 14,500 for 79 years

$$\begin{aligned} P/W &= \$ 13,400 \times (10.017) + \$ 14,500 \times (12.471) \times (0.1987) \\ &= \underline{\underline{\$ 170,158.62}} \end{aligned}$$

Total = \$ 505,557.59
@ 8%

930,001

ENGINEERING DIVISION

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September 22, 1982

City of Glendale
P.O. Box 1556
Glendale, Arizona 85311

Attention: Mr. Harold A. Goodman
Director, Engineering & Development

Re: Utilities Relocation For
Arizona Canal Diversion Channel

Gentlemen:

This Report on Utilities Relocation for the Arizona Canal Diversion Channel identifies thirteen principal items of work that have an estimated total cost of \$1,725,000.

Not included is that item of work for relocating the City's 30-inch water main on 51st Avenue. As soon as the Canal-Channel design is finished for the reach across 51st Avenue and Cactus Road, we will consider the water main's conflict in a supplement to this Report.

Very truly yours,

JOHN CAROLLO ENGINEERS

Donald R. Preisler, P.E.

Raymond R. Austin, P.E.

DRP/RRA/cin

REPORT

UTILITIES RELOCATION FOR
ARIZONA CANAL DIVERSION CHANNEL

CITY OF GLENDALE
GLENDALE, ARIZONA

September 1982



JOHN A. CAROLLO, P.E. (1906 - 1971)
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WALTER R. HOWARD, P.E.
J. DAVID GRIFFITH, P.E.
G. WILLIAM KNOPF, P.E.

INTRODUCTION

This Report presents the results of our engineering study for the City of Glendale. The study's concern is the Arizona Canal Diversion Channel (ACDC), and the study's purposes are to:

- . Identify all conflicts between the ACDC and the City's water and sewer facilities.
- . Review alternatives for resolving those conflicts.
- . Select the most feasible alternative for each conflict.
- . Estimate the cost of selected alternatives.

Background material for the study includes information provided by the City and the Flood Control District of Maricopa County and inventory data obtained from site surveys.

The extents of conflicts and proposed work resolution are indicated on Figure No. 1. As indicated on that figure, design for the ACDC has not been completed in the vicinity of 51st Avenue and Cactus Road. When that design is completed, we will prepare a supplement to this Report. The supplement will consider the conflict between the ACDC and the City's 30-inch water main on Cactus Road.

Figures No. 2 through No. 10 indicate, in plan and profile, all conflicts (other than the foregoing) and our proposed items of work for resolving those conflicts. Figures No. 11 and 12 indicate details typical to several work items.

The following two sections present literal descriptions of work items and estimated costs therefor.

Basis of design, calculations, and detailed cost estimates were submitted in work copy for staff review during in-progress meetings.

No time schedule of work items has been developed. However, in consideration of the reported plan for ACDC construction, the following areal sequence of work is proposed:

| <u>Priority</u> | <u>Work Area</u> |
|-----------------|----------------------------------|
| 1 | 59th Avenue and Thunderbird Road |
| 2 | 67th Avenue and Arizona Canal |
| 3 | New Northwest Sewer Trunk |
| 4 | 51st Avenue and Cactus Road |

PROPOSED WORK ITEMS

| <u>No.</u> | <u>Description</u> |
|------------|--|
| 1A-1 | Refer Figures No. 2, 3, & 12 Water main, relocation, on 59th Ave. south of Thunderbird Road 700 LF DIP concrete encased; 200 LF CI 200; 12-inch 2 each NRS gate valves AWWA 175 (400'-25'; 300'-5'; 200'-5'/25') Bend thrust blocks, cut-ins |
| 1A-2 | Refer Figures No. 2 & 11 New SRVWUA well, connect to City system, east of 59th Ave. south of Arizona Canal relocated. 12-inch supply; 8-inch flush; 200 LF 12-inch ACP, 5' |
| 1A-3 | Refer Figure No. 2 Existing SRVWUA Well No. 30, remove and salvage equipment and fittings, west of 59th Ave. south of Arizona Canal. To follow 1A-2 |
| 1B-1 | Refer Figures No. 2 & 4 Sewer, temporary relocation, on Thunderbird Rd. west of 59th Ave. around bridge for Arizona Canal relocated. Laterally, offset north to clear bridge footings. 4 each 5-foot manholes; 60 VF; 200 LF 15-inch VCP, 15' |
| 1B-2 | Refer Figures No. 2, 4, & 12 Water main, relocation, on Thunderbird Rd. west of 59th Ave. as 1A-1 |

| No. | Description |
|------|--|
| 1B-3 | Refer Figures No. 2 & 11 SRVWUA pay-back main, relocation, on Thunderbird Rd. west of 59th Ave. Two existing AC pipes, 16-inch and 12-inch, to be valved (butterfly 100-foot head) and shaped to 20-inch steel pipe header AWWA C-200, 590 LF, supported on Channel Bridge, extend to Arizona Canal relocated; bends and thrust blocks |
| 2A-1 | Refer Figure No. 5 New well, replace No. 8, west of 67th Ave. north of Diversion Channel, drill, case, develop and test. 100'/24-inch conductor, 600'/16-inch casing, 300'/12-inch casing. 150 hp motor and controls. 500'/8-inch column, 800 gpm/500 TDH pump. City-owned property |
| 2A-2 | Refer Figures No. 5 & 11 New well, 2A-1, equip and connect to City system. 8-inch supply, 6-inch flush, 200 LF 8-inch ACP, 5' |
| 2A-3 | Refer Figures No. 5 & 11 Well No. 19, 63rd Ave. extended to south of Arizona Canal. SRP to rotate and reset motor and discharge head. City to retrofit existing pipe and equipment |
| 2A-4 | Refer Figures No. 5, 6, & 11 Rebuild sewer on 67th Ave. north of Arizona Canal to cross under Diversion Channel. 35 VF 6-foot manhole upstream; drops 19 feet and 1.5 feet; 800 LF 24-inch DIP concrete encased. 33-foot average trench depth. Lift station to existing sewer downstream |
| 2A-5 | Refer Figures No. 5, 6, & 11 Water main relocation of 8-inch main on 67th Ave. across Diversion Channel Bridge. 590 LF supported 8-inch steel pipe. TS&V, bends, and thrust blocks south side. Gate valve, plug, bends and thrust block north side; connect to new well; 900 LF new pipe |
| 1-2 | Refer Figures No. 2, 5, 8, & 11 Northwest sewer trunk from Thunderbird Rd. (60th Ave.) northwest along north side of Diversion Channel to Granada Estates (64th Ave.) and northwest to 67th Ave. 3,100 LF 15-inch VCP (1,000'-14 ft. deep; 1,000'-18 ft. deep; 1,100'-22 ft. deep). 3,400 LF 21-inch VCP (1,000'-26 ft. deep; 1,000'-28 ft. deep; 1,400'-30 ft. deep). 5-foot manholes at 600' to 20 ft. 6-foot manholes at 600' above 20 ft. |
| 3-C1 | Refer Figures No. 9, 10, & 11 Rebuild sewer on 55th Ave. extended to cross under Arizona Canal and Diversion Channel. 30 VF 6-foot manhole upstream. Drop 16 ft., 750 LF 10-inch DIP concrete encased. 25-foot average trench depth. Lift station to existing sewer downstream |

ESTIMATED COSTS OF WORK ITEMS

| Location | Item | Cost |
|--|--|----------------|
| 59th Avenue | 1A-1; Water main relocation | \$ 72,000 |
| | 1A-2; New well; equip and connect | 55,000 |
| | 1A-3; Salvage existing well equipment | 3,000 |
| Thunderbird Road | 1B-1; Temporary sewer | 21,000 |
| | 1B-2; Water main relocation | 72,000 |
| | 1B-3; SRVWUA pay-back main relocation | 50,000 |
| 67th Avenue | 2A-1; New well construction | 260,000 |
| | 2A-2; New well; equip and connect | 55,000 |
| 63rd Avenue | 2A-3; Reset existing well equipment | 12,000 |
| 67th Avenue | 2A-4; Rebuild sewer and build lift station | 485,000 |
| | 2A-5; Water main relocation and extension | 30,000 |
| Thunderbird and 60th to Diversion Channel & 67th | 1-2; New northwest sewer trunk | 370,000 |
| 55th Avenue | 3C-1; Rebuild sewer and build lift station | <u>240,000</u> |
| | Total | \$1,725,000 |

NOT INCLUDING RELOCATION OF 30-INCH WATER MAIN ON CACTUS ROAD

- Notes:
1. Construction costs at current (August 1982) prices with ENR Construction Cost Index = 3850 (20-City Average).
 2. Construction costs include 20% contingency item.
 3. Project costs are sum of construction costs plus 20% thereof for:

| | |
|---------------------------|----|
| Planning & Design | 8% |
| Supervision | 4% |
| Administration & Clerical | 4% |
| Legal Counseling | 2% |
| Fiscal Counseling | 2% |

ESTIMATED COSTS OF WORK ITEMS

| <u>Location</u> | <u>Item</u> | <u>Cost</u> |
|--|--|----------------|
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|---------------------------|----|
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| Administration & Clerical | 4% |
| Legal Counseling | 2% |
| Fiscal Counseling | 2% |

WORK AREA NO. 2

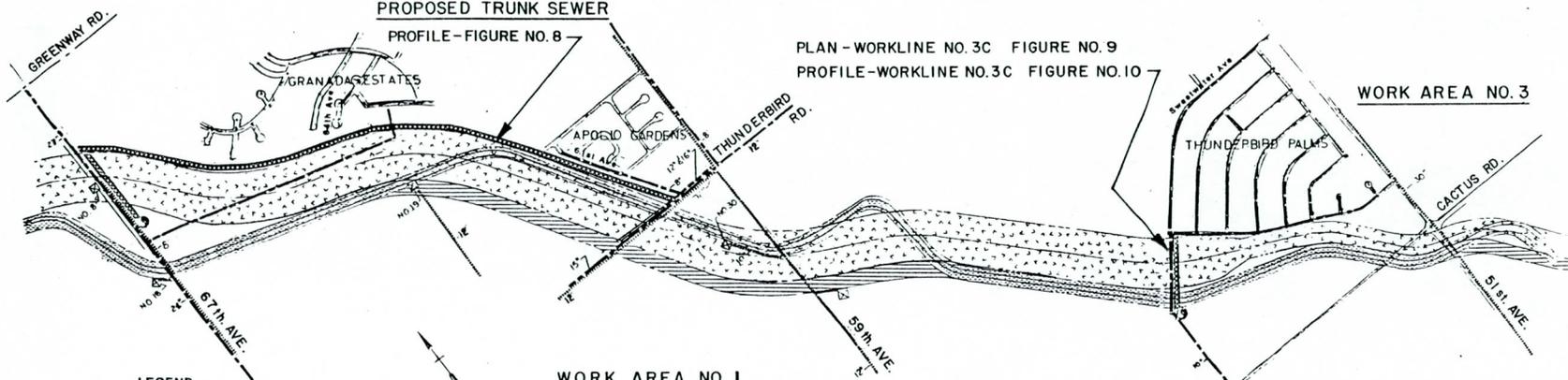
PLAN - WORK AREA NO. 2 FIGURE NO. 5
 PROFILE - WORKLINE NO. 2A FIGURE NO. 6
 PROFILE - WORKLINE NO. 2B FIGURE NO. 7

PROPOSED TRUNK SEWER

PROFILE - FIGURE NO. 8

PLAN - WORKLINE NO. 3C FIGURE NO. 9
 PROFILE - WORKLINE NO. 3C FIGURE NO. 10

WORK AREA NO. 3



LEGEND

| | | |
|-----------------------|--|--|
| DIVERSION CHANNEL ROW | | |
| ARIZONA CANAL ROW | | |
| EXISTING | | |
| RELOCATED | | |
| | | |
| WATER MAINS | | |
| CITY SYSTEM | | |
| BRWUA PAY-BACK | | |
| WELL SITE | | |
| SEWERAGE | | |
| GRAVITY MAIN | | |
| LIFT STATION | | |



WORK AREA NO. 1

PLAN - WORK AREA NO. 1 FIGURE NO. 2
 PROFILE - WORKLINE NO. 1A FIGURE NO. 3
 PROFILE - WORKLINE NO. 1B FIGURE NO. 4

TYPICAL DETAILS - FIGURE NO. 11 & 12

DESIGN FOR CHANNEL AND CANAL, NOT FINAL FOR THIS REACH.

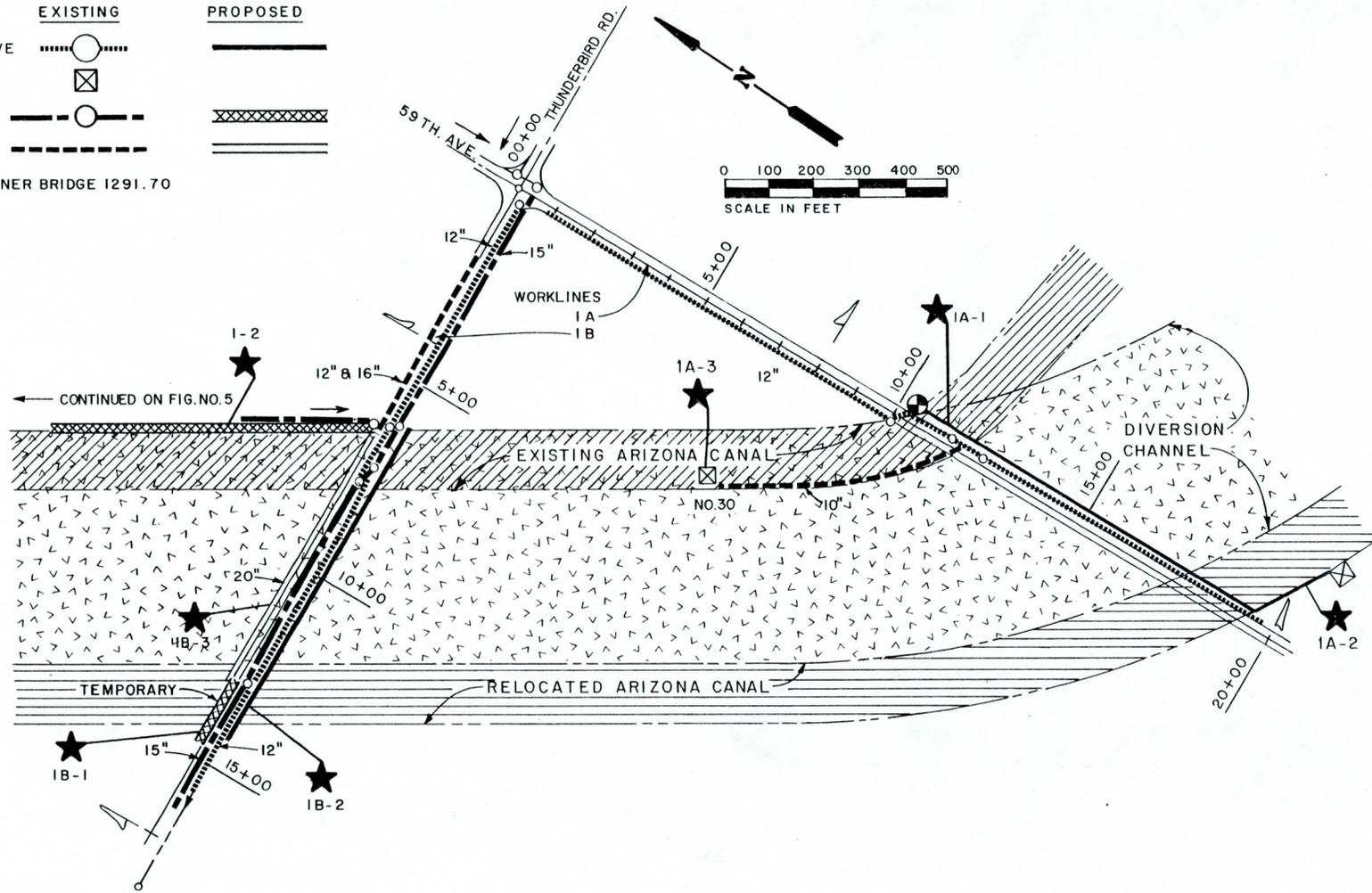
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 PHOENIX, ARIZONA

GLENDALE, ARIZONA
 UTILITIES RELOCATION
 ARIZONA CANAL DIVERSION CHANNEL

FIGURE NO. 1
 INDEX MAP

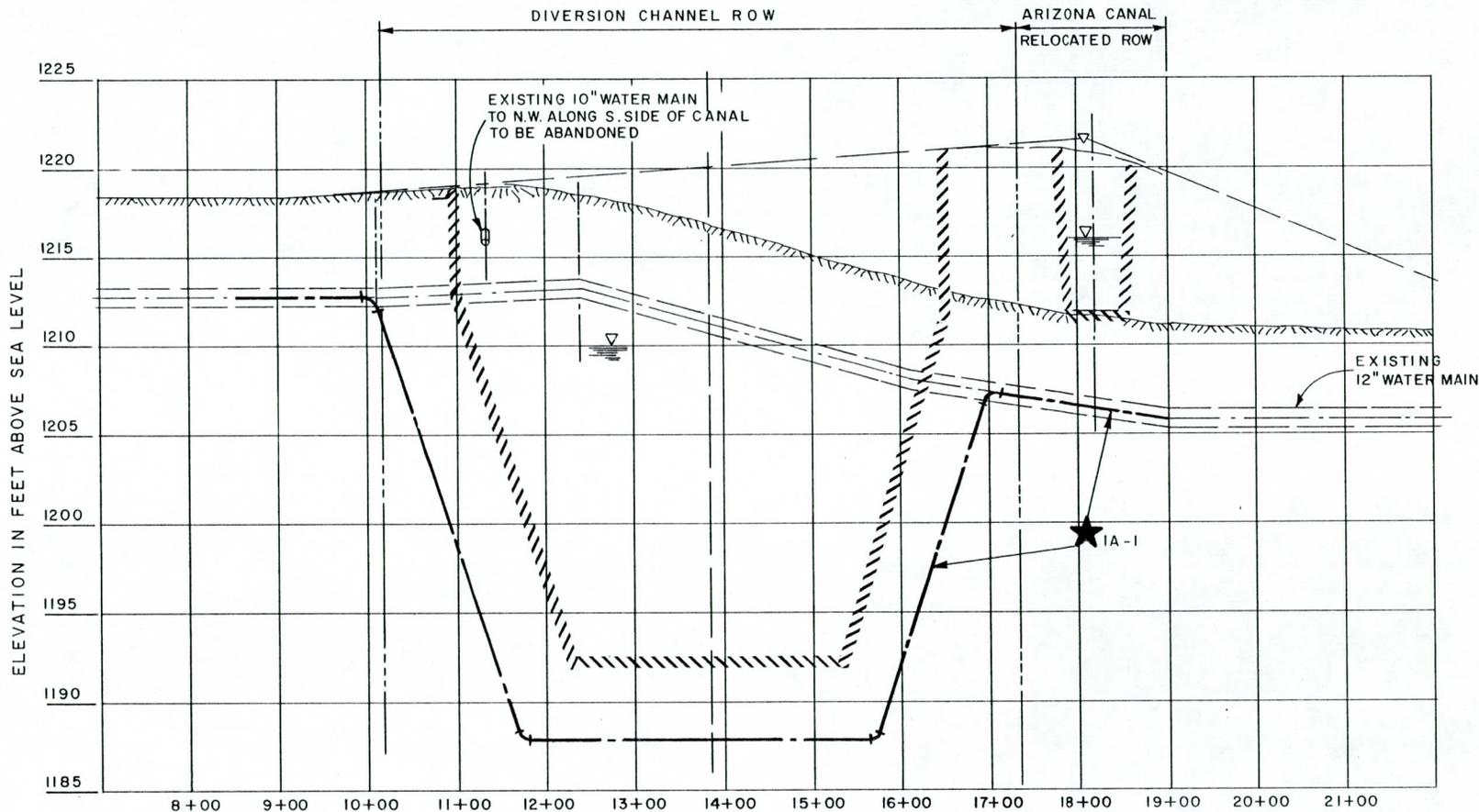
LEGEND

| | EXISTING | PROPOSED |
|----------------------|-------------|--------------------------------|
| WATER MAIN AND VALVE |○..... | ————— |
| WELL SITE | ⊠ | |
| SEWER AND MANHOLE | ——○—— | ⊠ |
| SRVWUA PAYBACK | ----- | ==== |
| BM | ⊕ | MC BC NE CORNER BRIDGE 1291.70 |

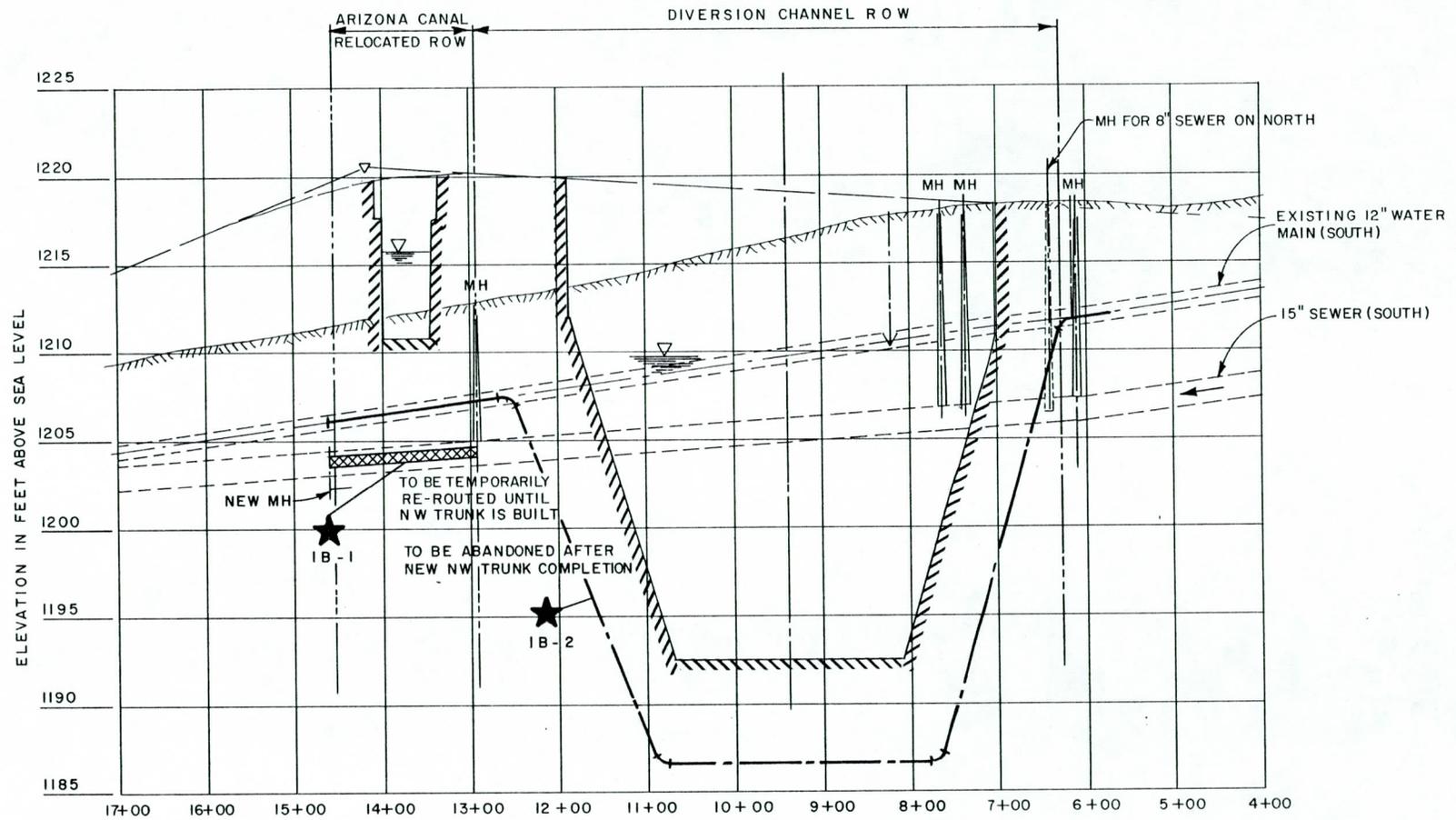


59TH AVENUE AND THUNDERBIRD ROAD

| | | |
|--|--|--------------------------------------|
| JOHN CAROLLO ENGINEERS PHOENIX, ARIZONA | GLENDALE, ARIZONA UTILITIES RELOCATION ARIZONA CANAL DIVERSION CHANNEL | FIGURE NO.2 PLAN - WORK AREA NO.1 |
|--|--|--------------------------------------|



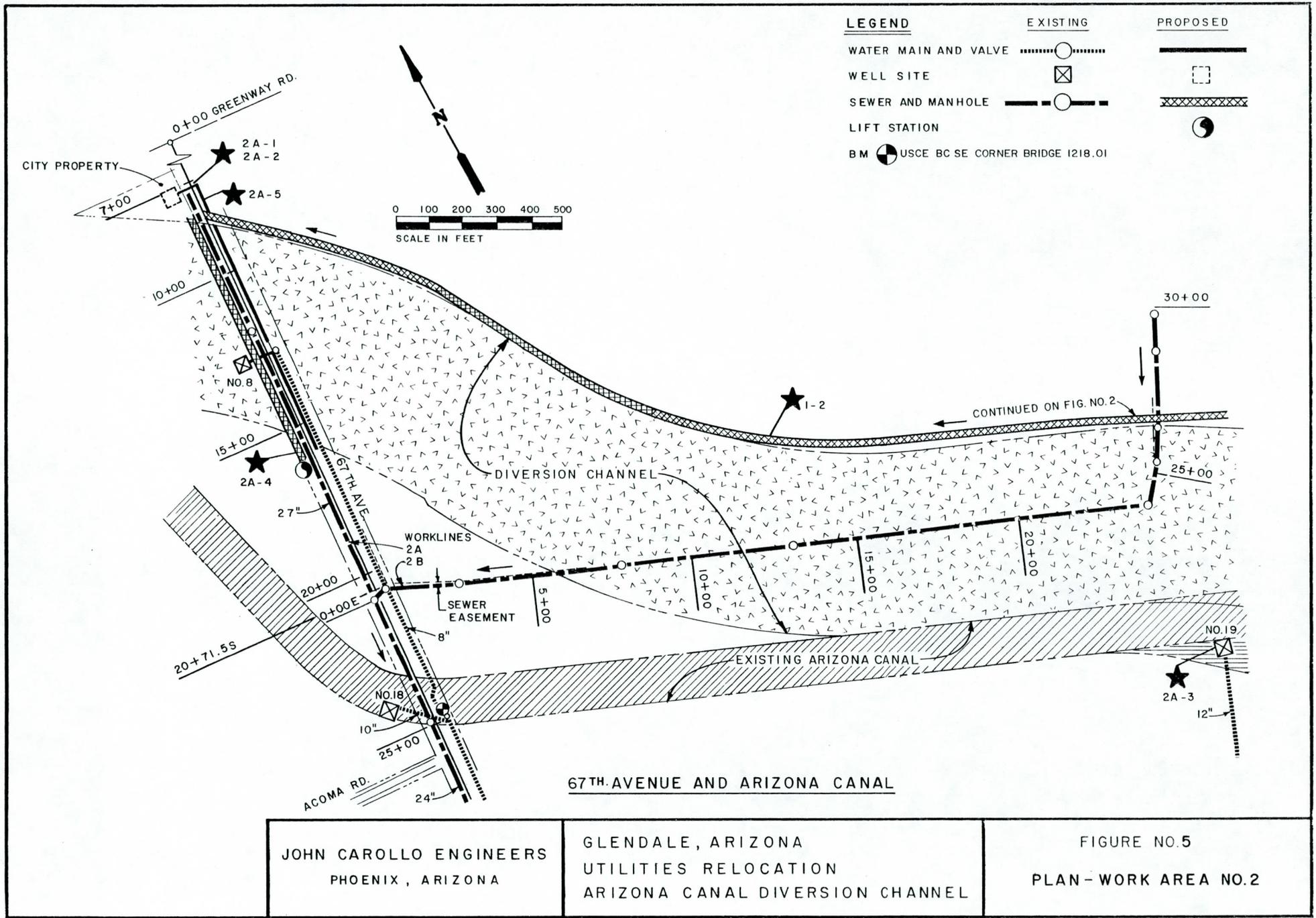
| | | |
|--|--|---|
| JOHN CAROLLO ENGINEERS PHOENIX, ARIZONA | GLENDALE, ARIZONA UTILITIES RELOCATION ARIZONA CANAL DIVERSION CHANNEL | FIGURE NO. 3 PROFILE - WORKLINE IA 59TH AVENUE LOOKING EAST |
|--|--|---|

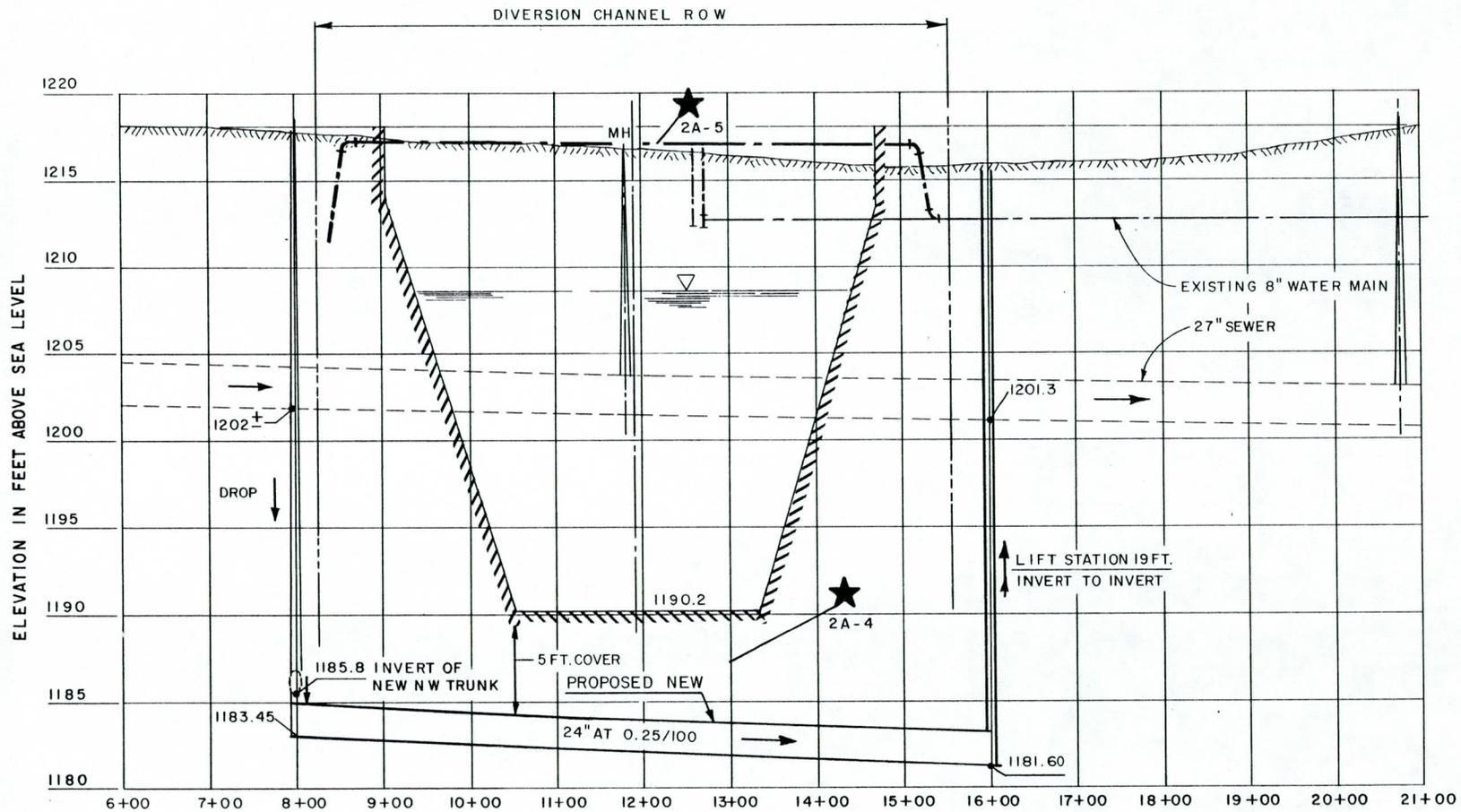


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ARIZONA CANAL DIVERSION CHANNEL

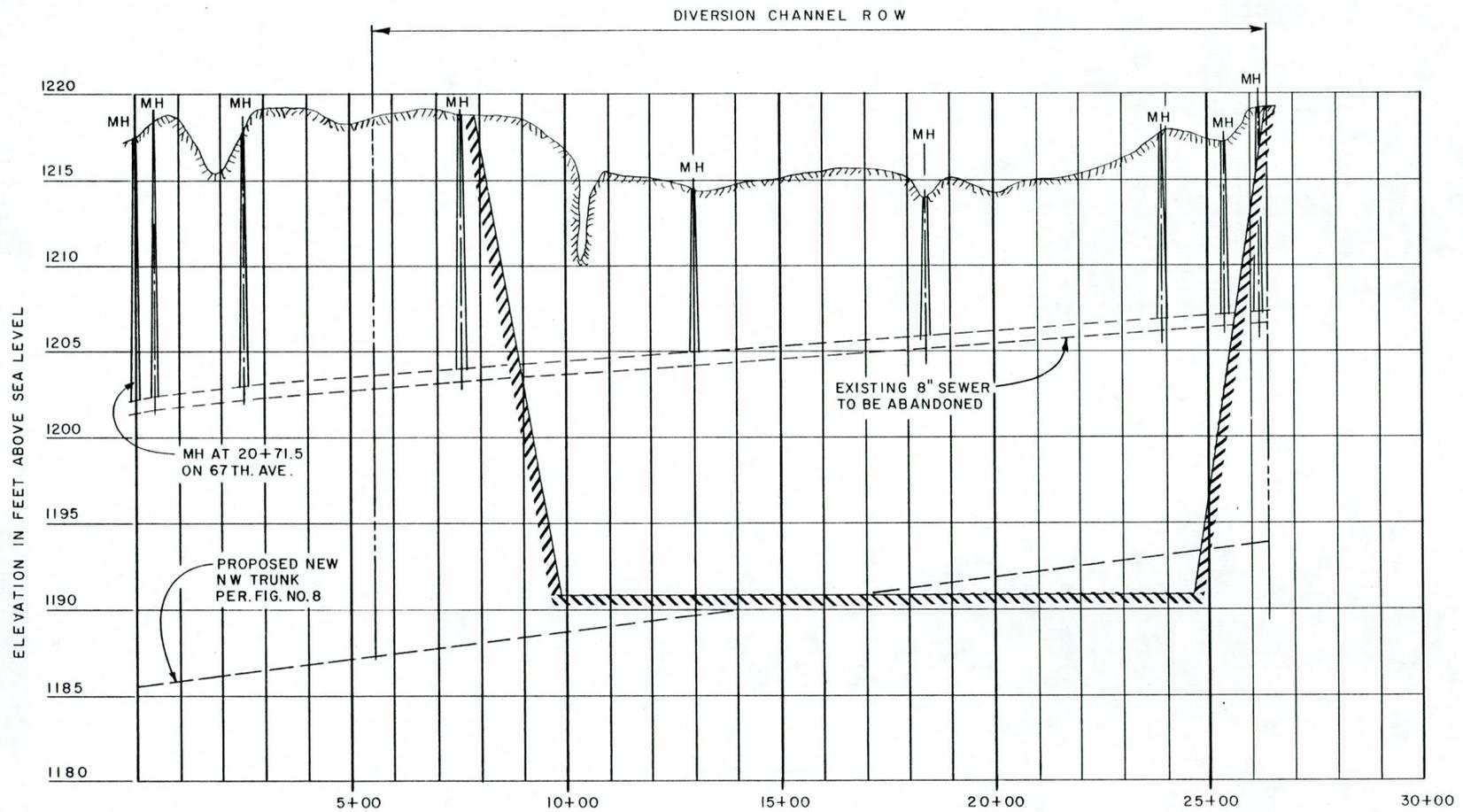
FIGURE NO. 4
PROFILE-WORKLINE IB
THUNDERBIRD RD. LOOKING NORTH





| | 1982 | 2005 |
|------------------|------|------|
| Q PEAK mgd | 1.4 | 7.9 |
| d/D AT Q PK. II | 0.29 | 0.8 |
| VEL AT Q PK. fps | 2.8 | 4.1 |

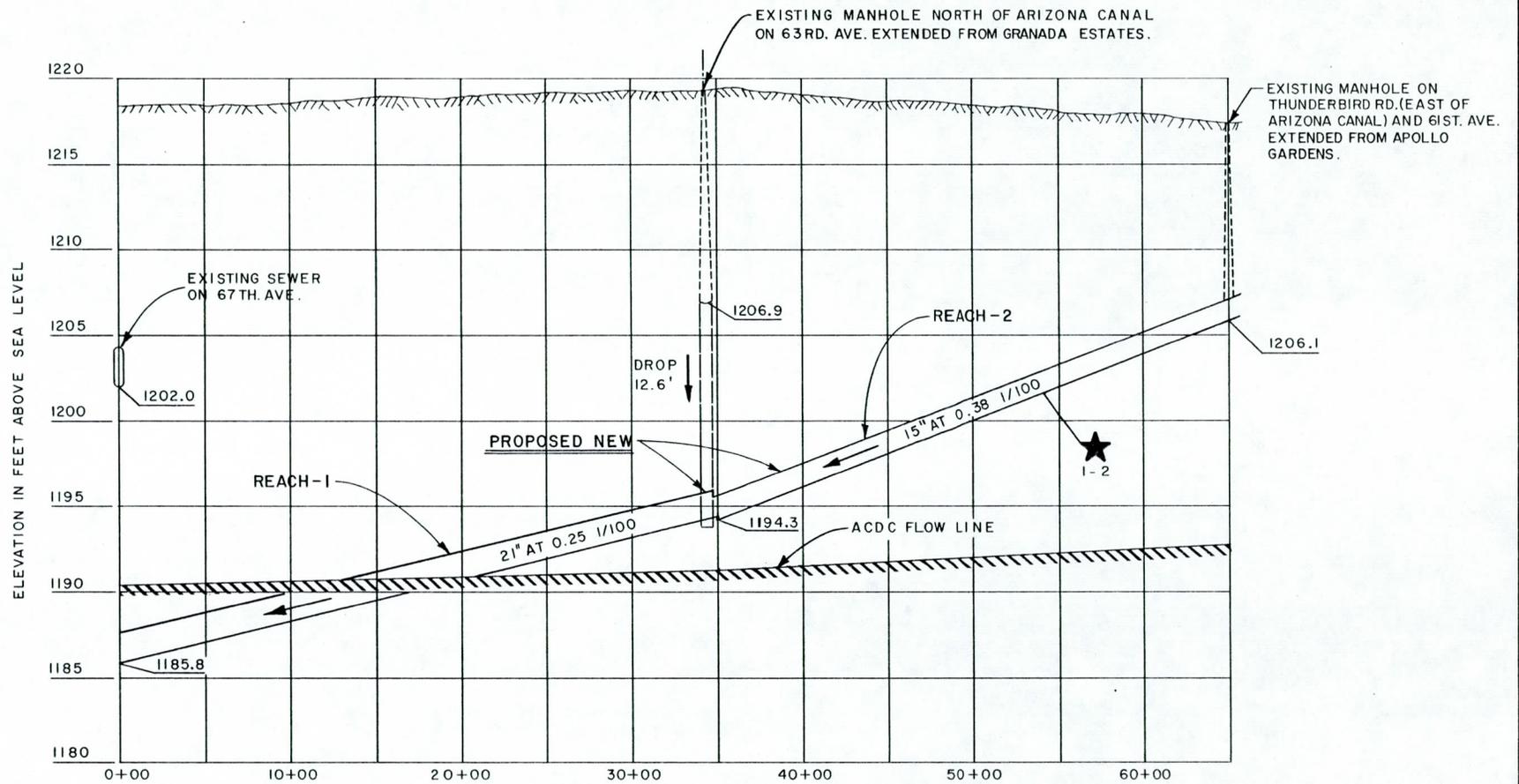
| | | |
|--|--|---|
| JOHN CAROLLO ENGINEERS PHOENIX, ARIZONA | GLENDALE, ARIZONA UTILITIES RELOCATION ARIZONA CANAL DIVERSION CHANNEL | FIGURE NO.6 PROFILE-WORKLINE 2A 67TH. AVENUE LOOKING EAST |
|--|--|---|



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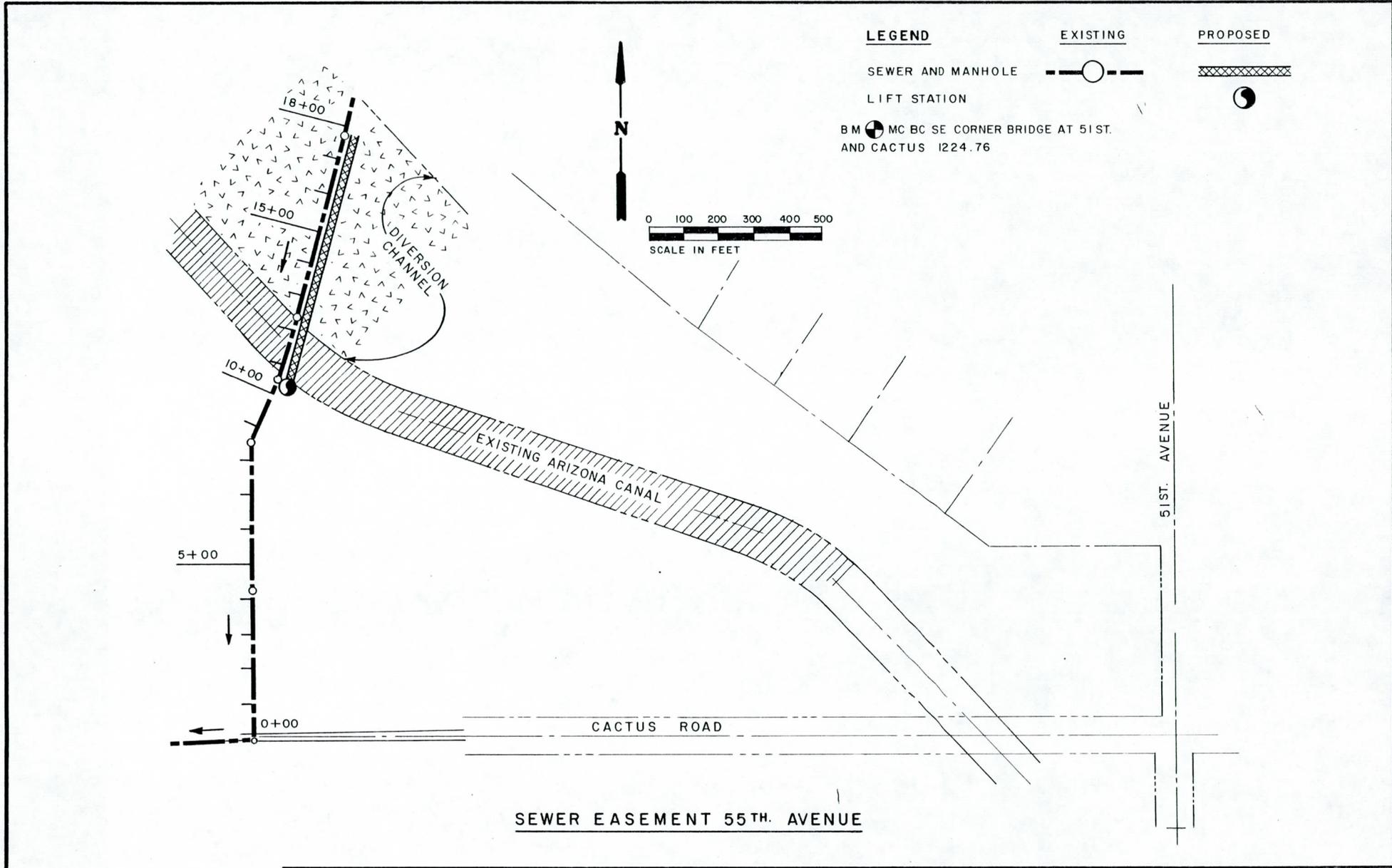
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UTILITIES RELOCATION
ARIZONA CANAL DIVERSION CHANNEL

FIGURE NO. 7
PROFILE - WORKLINE 2B
SEWER EASEMENT LOOKING NORTH & WEST



| | REACH - 1 | | REACH - 2 | |
|-----------------|-----------|------|-----------|------|
| | 1982 | 2005 | 1982 | 2005 |
| Q PEAK mgd | 1.0 | 3.2 | 0.4 | 2.5 |
| d/D AT Q PK ≠ | 0.30 | 0.58 | 0.26 | 0.8 |
| Vel AT Q PK fps | 2.6 | 3.5 | 2.4 | 3.6 |

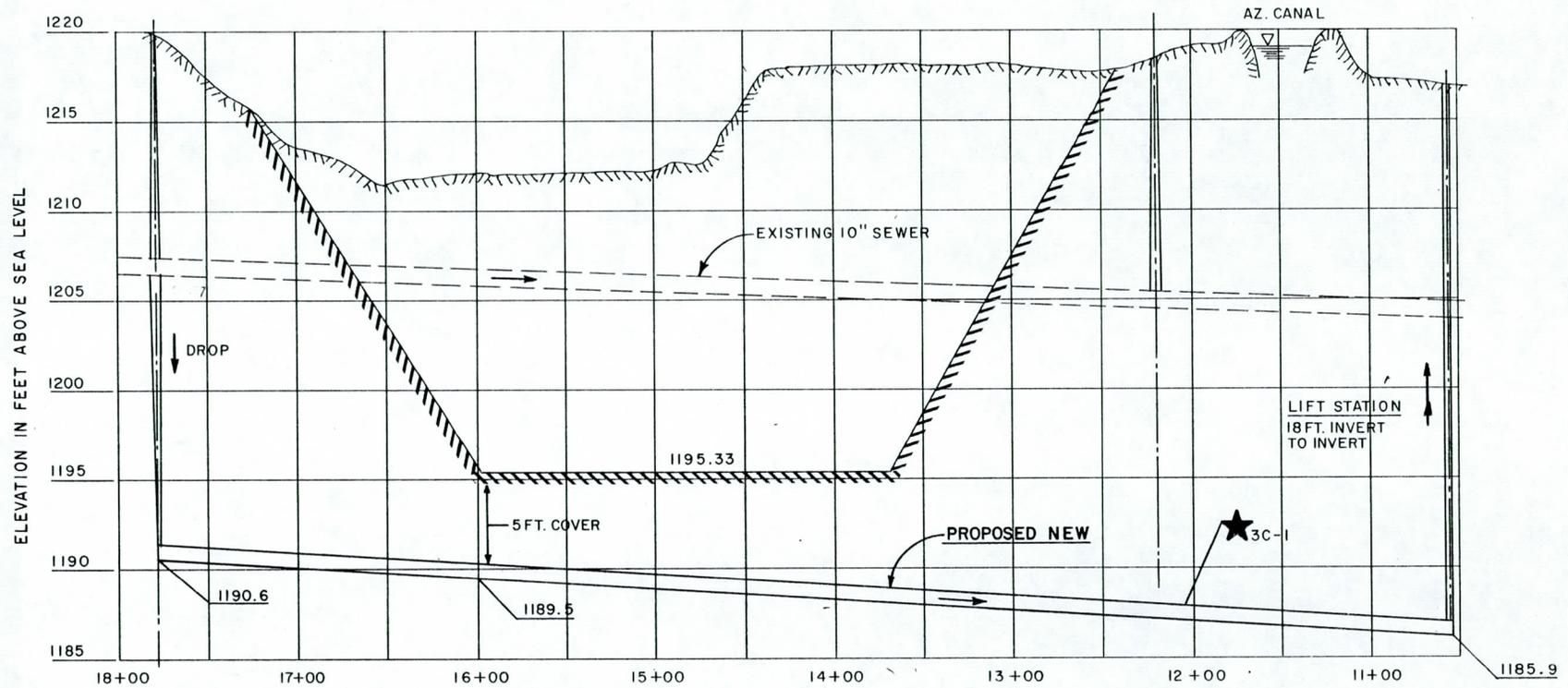
| | | |
|--|--|--|
| JOHN CAROLLO ENGINEERS PHOENIX, ARIZONA | GLENDALE, ARIZONA UTILITIES RELOCATION ARIZONA CANAL DIVERSION CHANNEL | FIGURE NO. 8 PROFILE OF PROPOSED TRUNK SEWER LOOKING NORTH |
|--|--|--|



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UTILITIES RELOCATION
ARIZONA CANAL DIVERSION CHANNEL

FIGURE NO. 9
PLAN - WORKLINE 3C

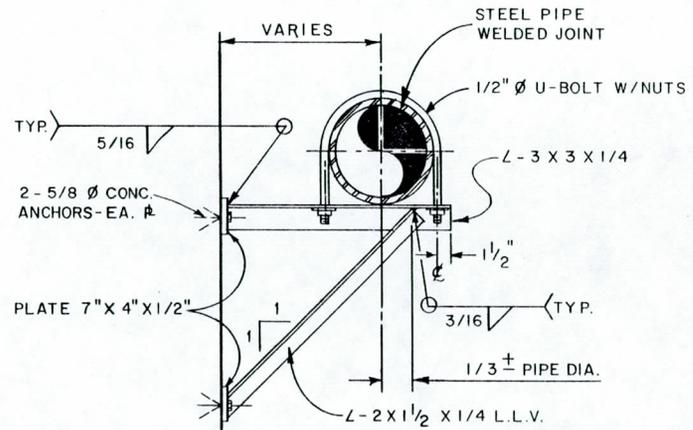
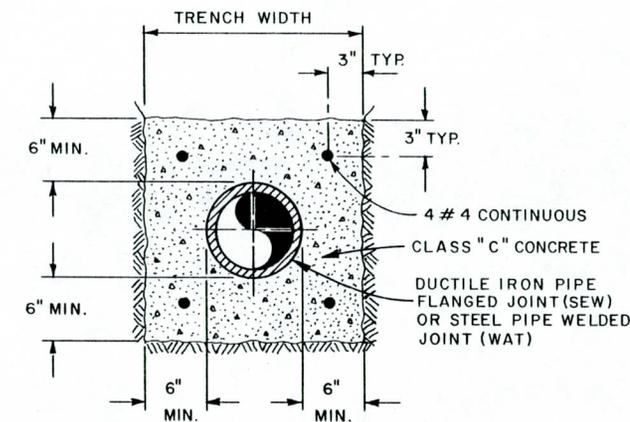
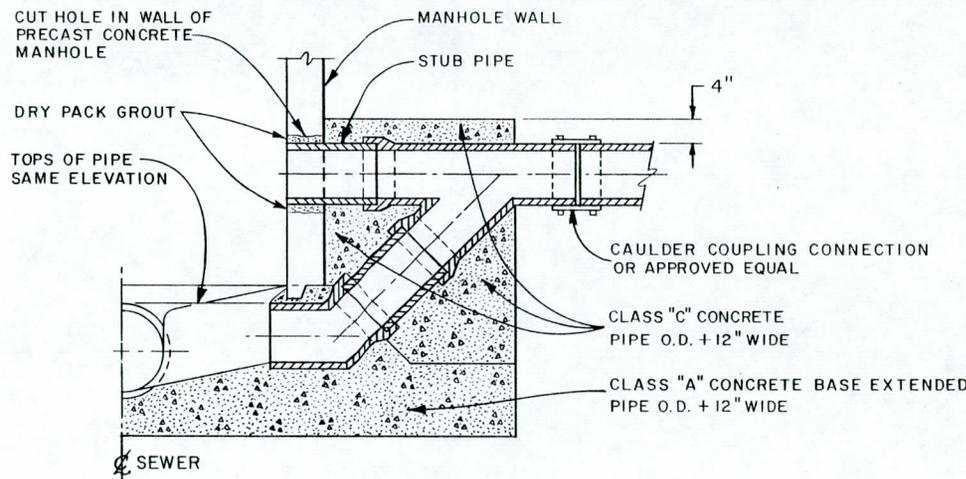
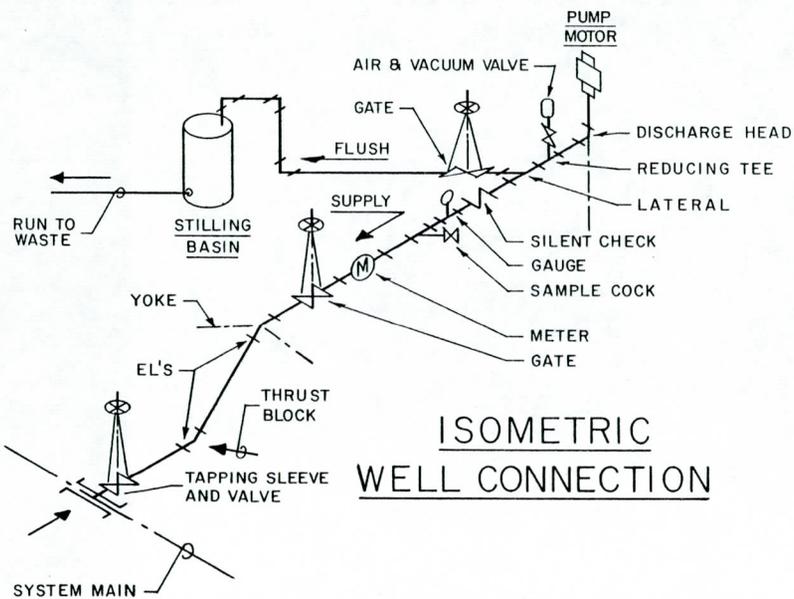


| | 1982 | 2005 |
|-----------------|------|------|
| Q pk mgd | 0.1 | 0.8 |
| d/D AT Q pk # | 0.2 | 0.62 |
| Vel AT Q pk fps | 2.0 | 3.5 |

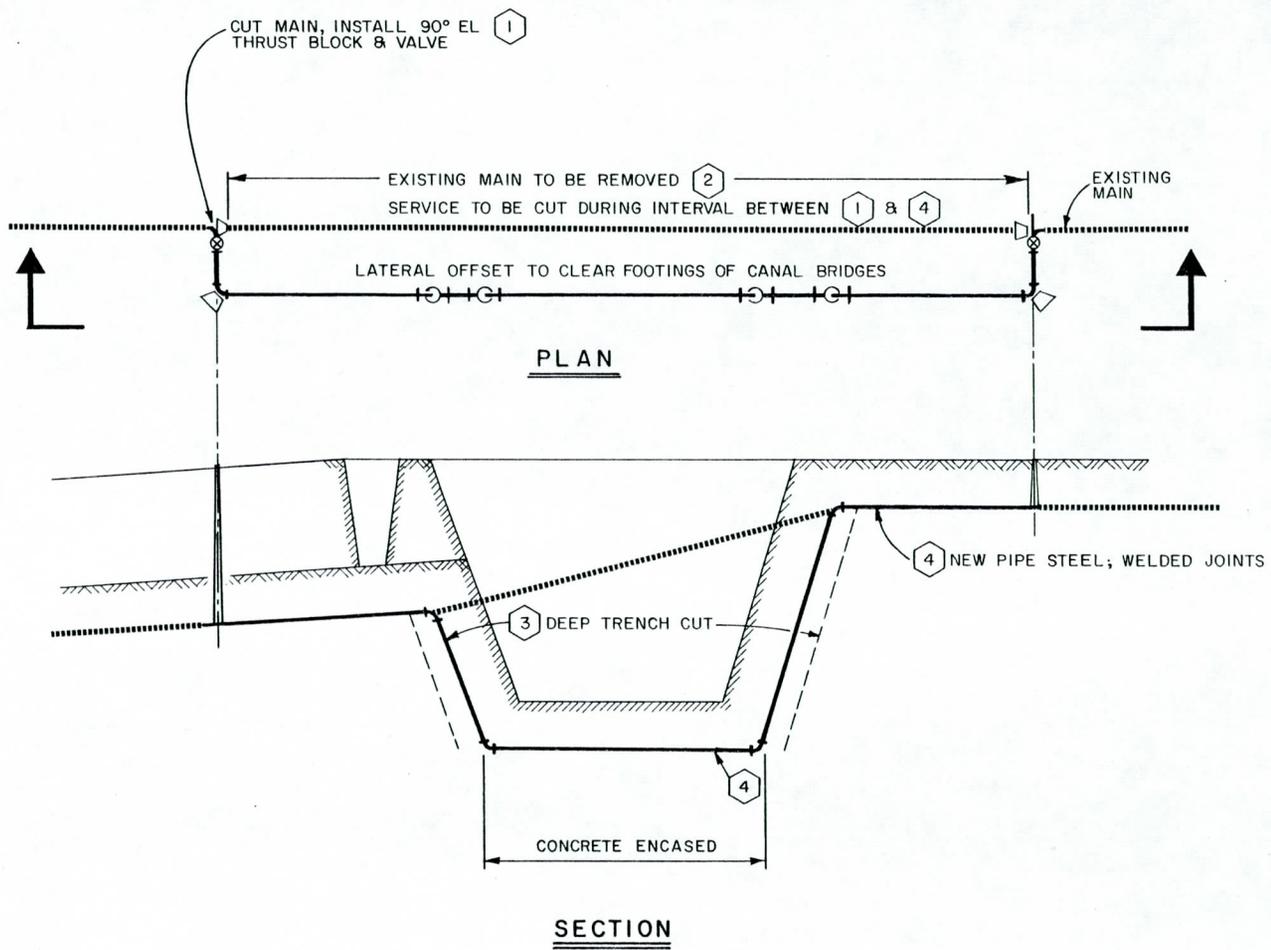
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UTILITIES RELOCATION
ARIZONA CANAL DIVERSION CHANNEL

FIGURE NO.10
PROFILE-WORKLINE 3C
SEWER EASEMENT LOOKING EAST



| | | |
|--|--|----------------------------------|
| JOHN CAROLLO ENGINEERS PHOENIX, ARIZONA | GLENDALE, ARIZONA UTILITIES RELOCATION ARIZONA CANAL DIVERSION CHANNEL | FIGURE NO. II TYPICAL DETAILS |
|--|--|----------------------------------|



JOHN CAROLLO ENGINEERS
PHOENIX, ARIZONA

GLENDALE, ARIZONA
UTILITIES RELOCATION
ARIZONA CANAL DIVERSION CHANNEL

FIGURE NO.12
TYPICAL DETAILS
WATER MAIN RELOCATION
59TH. AVE. AND THUNDERBIRD ROAD