CITY OF BULLHEAD CITY

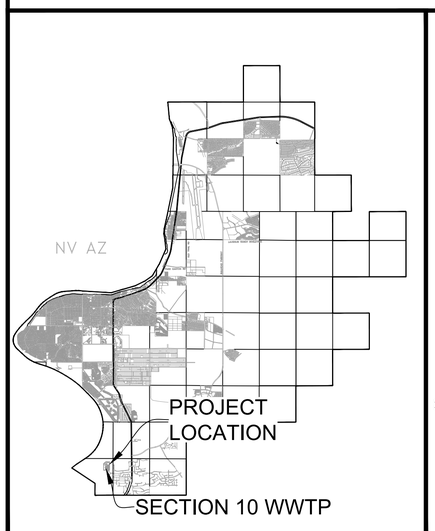
SECTION 10 WRP

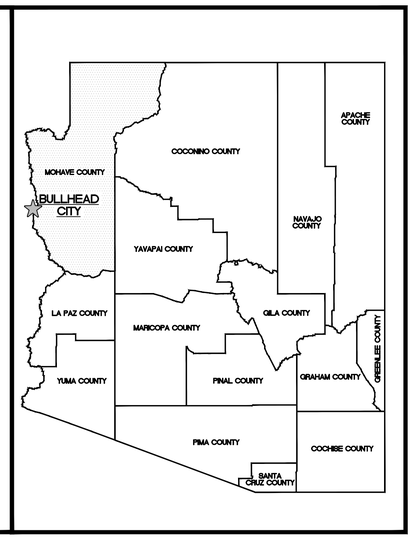
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

ENGINEERING PROJECT NO. 26-U-004

AUGUST 2025

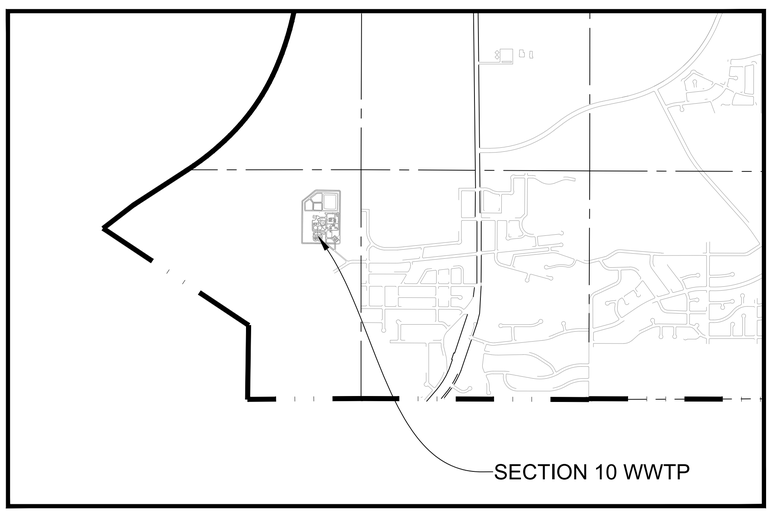
VOLUME 3 OF 3





BHC VICINITY/AREA MAP

SCALE NTS



PROJECT SCOPE AREA MAP

2355 TRANE ROAD
BULLHEAD CITY, ARIZONA 86442

PROJECT DESCRIPTION:

CONSTRUCTION OF A THIRD CLARIFIER AND ASSOCIATED YARD PIPING. ADDITION OF A NEW RAS PUMP, AND REPLACEMENT OF TWO EXISTING RAS PUMPS. CONSTRUCTION OF NEW CLARIFIER SPLITTER BOX AND DEMOLITION OF EXISTING SPLITTER BOX. UPSIZING OF EXISTING SE PIPING AND ADDITION OF SE MANHOLE (ADDITIVE ALTERNATE 1). WORK WILL INCLUDE, BUT NOT BE LIMITED TO, EXCAVATION, CONCRETE WORK, SITE GRADING, AND SCADA UPGRADES.

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DESIGN: RL
DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

COVER

Registered Professional Engineer
CERTIFICATE NO.
44470
JASON C. MERCER
Date Signed:
ARIZONA, U.S.A.
Expires: June 30, 2027

DWG. NO. 0

SHEET NO. 0 OF 60

R:\8519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\0-COVER.DWG

DRAWING INDEX

PROCESS EQUIPMENT DESIGN CRITERIA

Total Clarifier Capacity

Average Flow	6.0 mgd
Peak Hour Flow	9.6 mgd
MLSS	4,500 mg/L
Maximum RAS Flow	3.2 mgd (2,200 gpm)
3 Units in Service	
Effective Surface Area	16,720 ft2
Max. Day Solids Loading Rate	23.3 lb/ft2/day
Peak Hour Surface Overflow Rate	574 gpd/ft2
Weir Loading (peak hour)	18,140 gpd/ft
2 Units in Service	
Effective Surface Area	11,150 ft2
Max. Day Solids Loading Rate	35 lb/ft2/day
Peak Hour Surface Overflow Rate	1,067 gpd/ft2
Weir Loading (peak hour)	22,480 gpd/ft

Clarifier 3

Design Criteria	
WesTech Clarifier Design Flow	3.6 mgd
Design MLSS	3,000 - 4,500 mg/L
Tank	
Diameter	90 ft
Side Water Depth	15 ft
Bottom Slope	1:12
Effective Surface Area	5,575 sf
Weir	
Type	90° V-notch
Size	2.5 in deep at 6-in intervals
Length	264.7 ft
Drive	
Motor Size	1 hp

RAS Pumps

Number	3 (dedicated to each clarifier)
Type	Chopper Pump
Capacity	700 gpm @ 10 ft TDH - 1,100 gpm @ 14 ft TDH
Drive	VFD
Motor Size	7.5 hp
Discharge Size	8 in

GENERAL NOTES:

1. ALL ITEMS OF WORK UNDER THIS CONTRACT WILL BE COMPLETED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS CONTAINED IN THE PROJECT MANUAL.
2. THE CONTRACTOR SHALL RESTORE ALL EXST ROADWAY AND SIDEWALK SURFACES TO EQUAL OR BETTER CONDITION THAN EXISTED PRIOR TO CONSTRUCTION ACTIVITIES, AS DETERMINED BY OWNER AND THE ENGINEER.
3. THE CONTRACTOR SHALL NOTIFY ONE CALL 811 FOR ONSITE UTILITY LOCATION. ALL EXISTING UTILITIES SHALL BE MARKED BEFORE DIGGING.
4. THE CONTRACTOR SHALL ADJUST ALL VALVE BOXES AND MANHOLES TO FINAL GRADE UPON COMPLETION OF ALL CONSTRUCTION. ANY BOXES OR MANHOLES DAMAGED OR OTHERWISE DISTURBED BY THE CONTRACTOR OR ANY SUBCONTRACTOR SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR. THIS WORK SHALL BE INCIDENTAL TO THE PROJECT, SEPARATE PAYMENT WILL NOT BE MADE.
5. THE CONTRACTOR SHALL TAKE APPROPRIATE EROSION CONTROL MEASURES PRIOR TO AND DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL MAINTAIN SERVICE OF ALL EXISTING UTILITIES. IF SAID SERVICE IS DAMAGED, THE CONTRACTOR SHALL IMMEDIATELY REPAIR THE DAMAGE AT THE CONTRACTOR'S EXPENSE.
7. CONTRACTOR SHALL BACKFILL ALL EXCAVATED AREAS TO FINISHED GRADE AND PROVIDE POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES.
8. THE CONTRACTOR SHALL NOTIFY THE OWNER A MINIMUM OF 48 HOURS PRIOR TO BEGINNING ANY WORK REQUIRING MODIFICATIONS OF AND/OR IN COORDINATION WITH THEIR FACILITIES.
9. IN ADDITION TO A 21-DAY ADVANCE NOTICE PER SECTION 01 14 16, CONTRACTOR SHALL NOTIFY OWNER AT LEAST 72 HOURS BEFORE BEGINNING ANY WORK REQUIRING UTILITY SERVICE INTERRUPTIONS.
10. ALL UTILITY CONDUITS FOR ELECTRICAL SHALL BE BURIED A MINIMUM 24" FROM FINISHED GRADE WITH BEDDING AND BACKFILL PER SECTION 31 23 33, TRENCH EXCAVATION AND BACKFILL FOR PIPELINES AND APPURTENANCT STRUCTURES.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL APPLICABLE PERMITS REQUIRED FOR CONSTRUCTION AND COMPLYING WITH ALL TERMS OF THE PERMITS. NO SEPARATE PAYMENT WILL BE MADE FOR THIS WORK.
12. THE LOCATION, DEPTH, AND SIZE OF EXISTING UTILITIES SHOWN ON THESE DRAWINGS IS APPROXIMATE. THE CONTRACTOR SHALL FIELD VERIFY THE EXISTENCE, LOCATION, DEPTH, SIZE, LINE AND GRADE OF EXISTING UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO THE EXISTING FACILITIES DUE TO FAILURE TO LOCATE OR PROVIDE PROPER PROTECTION WHEN LOCATION IS KNOWN.
13. CONTRACTOR SHALL COORDINATE EXACT LOCATION, SIZE, AND ACCESS TO STAGING AREAS WITH OWNER AND ENGINEER.
14. CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY UTILITIES, INCLUDING ELECTRICAL SERVICE DURING CONSTRUCTION.

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Morrison Maierle
engineers • surveyors • planners • scientists

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

DRAWING INDEX, DESIGN CRITERIA, AND GENERAL NOTES

Professional Engineer
ULRIKE LASHLEY
67132
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. G-1

SHEET NO. 1 OF 60

R:\8519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\G-1.DWG

TOPOGRAPHIC LEGEND

- BOUNDARY AND/OR PROPERTY LINE
- FENCE LINE (CHAIN LINK)
- EASEMENT LINE
- SECTION LINE OR DLC LINE
- CENTERLINE (?)
- WATERLINE
- VALVE
- FIRE HYDRANT
- CURB STOP/ WATER SERVICE
- EXISTING WELL
- SANITARY SEWER
- SANITARY SEWER MANHOLE
- STORM DRAIN
- STORM DRAIN MANHOLE
- STORM DRAIN INLET
- BURIED NATURAL GAS
- PETROLEUM PRODUCT LINE
- BURIED TELEPHONE
- TELEPHONE PEDESTAL
- OVERHEAD TELEPHONE
- BURIED POWER
- ELECTRICAL PEDESTAL
- OVERHEAD POWER
- UTILITY OR TELEPHONE POLE
- GUY ANCHOR
- LIGHT POLE
- BURIED FIBER OPTIC
- OVERHEAD FIBER OPTIC/TEL
- BURIED TV
- OVERHEAD TV
- IRRIGATION
- SPRINKLER HEAD
- ROAD (EDGE OF EXISTING PAVEMENT)
- CULVERT (12" AND SMALLER)
- CULVERT (LARGER THAN 12")
- DITCH SHOWING DIRECTION OF FLOW
- CREEK/RIVER W/ DIRECTION OF FLOW
- EXISTING CONTOUR (INDEX)
- EXISTING CONTOUR
- HORIZONTAL/VERTICAL CONTROL POINT
- CONTROL POINT
- COORDINATE POINT
- FOUND PROPERTY PIN
- GEOTECHNICAL BORING LOCATION AND NUMBER. SEE SPECS FOR BORING LOGS.
- SUBSURFACE UTILITY BORING LOCATION AND NUMBER.
- SURVEY HUB AND TACK WITH STATION
- U.S. GOVERNMENT BOUNDARY MARKER. FOUND C.O.E. BRASS CAP STAMPED W/NO.
- BENCHMARK LOCATION AND NUMBER
- PIEZOMETER LOCATION AND NUMBER
- EXISTING GRADE
- ELEVATION ORIGINAL GROUND
- EDGE OF TREES, BRUSH
- DECIDUOUS TREE W/ APPROX. TRUNK DIA.
- BUSH
- CONIFEROUS TREE
- SIGN, ONE POST OR TWO POST
- STREET SIGN
- EXISTING STRUCTURE *
- EXISTING STRUCTURE TO BE REMOVED *
- EXISTING A.C. PAVEMENT *
- NEW A.C. PAVEMENT
- EXISTING GRAVEL SURFACE *
- CONCRETE SURFACE *
- LIMITS OF TOPSOIL AND SEEDING *
- EXISTING EMBANKMENT. SLOPE AS NOTED *
- NEW EMBANKMENT OR CUT SLOPE. SLOPE AS NOTED *
- HORIZONTAL DISTANCE : VERTICAL DISTANCE
- RIPRAP
- GROUND SURFACE

NOTES:
1. * SYMBOL USED ONLY WHERE REQUIRED FOR CLARITY.
2. IN GENERAL, EXISTING STRUCTURES AND FACILITIES ARE NOTED AS "EXISTING" AND ARE SHOWN IN LIGHT LINE WEIGHTS, OR AS SCREENED BACKGROUND. NEW STRUCTURES ARE SHOWN IN HEAVY LINE WEIGHTS.
3. STRUCTURES, EQUIPMENT, PIPES, AND FACILITIES LABELED AS "FUTURE" ARE SHOWN IN LIGHT LIGHT WEIGHTS.
4. PIPES AND EQUIPMENT LOCATED UNDERGROUND OR UNDER CONCRETE SLAB ARE SHOWN WITH DASHED LINETYPE.

MECHANICAL LEGEND AND NOTES

GENERAL PIPING NOTES

1. LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS. MINIMUM COVER SHALL BE 3'-0" UNLESS OTHERWISE SHOWN.
2. SIZE OF FITTINGS SHOWN ON DRAWINGS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINTS AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
3. LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS SHOWN IS ONLY APPROXIMATE. FINAL SUPPORT REQUIREMENTS SHALL BE DETERMINED IN THE FIELD AND APPROVED BY THE ENGINEER PRIOR TO INSTALLATION. COSTS ARE INCIDENTAL TO THE PROJECT. MAXIMUM PIPING SPACING SHALL BE AS SPECIFIED.
4. APPROPRIATE STANDARD WALL PIPE DETAIL SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO BACKFILL.
5. ALL FLEXIBLE CONNECTORS OR FLANGED COUPLING ADAPTERS SHALL BE PROVIDED WITH RESTRAINED JOINTS AND THRUST TIES, BLOCKS, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE ADEQUATE FOR TEST PRESSURES SPECIFIED.
6. SYMBOLS, LEGENDS, AND PIPE USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE DRAWINGS, WHEREVER APPLICABLE. ALL OF THE VARIOUS APPLICATIONS ARE NOT NECESSARILY USED IN THE PROJECT.
7. ALL BURIED PIPING SPECIFIED TO BE PRESSURE TESTED, EXCEPT WELDED, GROOVED END OR SCREWED PIPING, SHALL BE PROVIDED WITH RESTRAINED JOINTS AT ALL DIRECTION CHANGES, UNLESS OTHERWISE NOTED.
8. FLANGED COUPLING ADAPTOR IS SHOWN, A STANDARD FLANGE SHALL BE JOINED TO THE RESTRAINED COUPLING ADAPTOR.
9. VALVE BOXES REQUIRED FOR ALL VALVES IN A BURIED SERVICE.
10. NUMBER AND LOCATION OF UNIONS SHOWN ON DRAWINGS ARE ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.
11. THE CONTRACTOR FOR THIS CONTRACT IS RESPONSIBLE FOR THE COORDINATING AND PERFORMING THE CONNECTION OF THE PIPING AND ASSOCIATED APPURTENANCES INSTALLED UNDER THIS CONTRACT TO BOTH THE EXISTING PIPING AND FACILITIES AND TO THE WORK OF OTHER CONTRACTORS, AS NOTED.
12. PRIOR TO SUBMITTING PIPING DRAWINGS FOR ANY NEW PIPE THAT IS TO CONNECT TO AN EXISTING PIPE OR STRUCTURE, THE CONTRACTOR SHALL EXPOSE THE EXISTING PIPE OR STRUCTURE TO VERIFY ITS EXACT LOCATION, SIZE, MATERIALS, AND INVERT ELEVATIONS.

PIPING DESIGNATION

EXAMPLE

16" RW — 16"RW

PIPE USE IDENTIFICATION LEGEND. SEE FLOW STREAM ID THIS SHEET. FOR PIPE MATERIAL, SEE PIPING SCHEDULE IN THE SPECIFICATIONS.

NOMINAL PIPE DIAMETER

VALVE DESIGNATIONS

CONTROL VALVES: XV OR XCV — DESIGNATION ALL VALVES AS SHOWN ON P&IDs, X=PROCESS VARIABLE; FLOW DIRECTION; VALVE SYMBOL

MANUAL VALVES: 8"-V400 — SIZE OF VALVE; VALVE DESIGNATION; VALVE TYPE, SEE SPECIFICATIONS

PIPE AND FITTING SYMBOLS

DOUBLE LINE / SINGLE LINE

- EXISTING PIPE (SCREENED)
- NEW PIPE
- EXISTING PIPE TO BE ABANDONED
- EXISTING PIPE TO BE REMOVED
- WELDED JOINT
- GROOVED END JOINT – FLEXIBLE
- GROOVED END JOINT – RIGID
- FLANGED JOINT
- MECHANICAL JOINT
- HUB & SPIGOT JOINT (RUBBER GASKET PUSH-ON)
- BALL JOINT
- FLANGE COUPLING ADAPTER
- FLEXIBLE COUPLING
- FLEXIBLE COUPLING WITH THRUST TIES
- STEEL BELLOWS EXPANSION JOINT
- ELASTOMER BELLOWS EXPANSION JOINT
- ELBOW UP
- ELBOW DOWN
- TEE UP
- TEE DOWN
- LATERAL UP
- LATERAL DOWN
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- UNION
- BLIND FLANGE
- PLUG
- CAP
- ANCHOR
- ELBOW 90 DEGREE
- CROSS
- TEE
- ELBOW 45 DEGREE
- LATERAL
- GATE
- BUTTERFLY
- BALL

NOTES:
1. ONLY FLANGED END CONNECTIONS ARE SHOWN HERE FOR DOUBLE LINE FITTINGS. FITTINGS WITH OTHER END PATTERNS ARE SHOWN SIMILARLY ON THE CONSTRUCTION DRAWINGS. ALSO SEE PIPING SPECIFICATIONS.
2. SYMBOLS SHOWN HERE FOR SINGLE LINE FITTINGS ARE GENERIC ONLY. REFER TO PIPING SPECIFICATIONS FOR SPECIFIC END CONNECTIONS FOR SINGLE LINE PIPE AND FITTINGS.
3. EXISTING PIPE AND EQUIPMENT IS SHOWN LIGHT-LINED AND/OR SCREENED AND IS NOTED AS EXISTING. NEW PIPING AND EQUIPMENT IS SHOWN HEAVY LINED.
4. UNDERGROUND PIPING MAY BE SHOWN DASHED ON MECHANICAL DRAWINGS.

VALVE SYMBOLS

- GATE
- KNIFE GATE
- BUTTERFLY
- GLOBE
- BALL
- VEE-BALL
- SEAT PORT
- ECCENTRIC PLUG W/REQUIRED SEAT LOCATION
- PLUG OR COCK
- FULL PORT PLUG
- NEEDLE
- DIAPHRAGM
- PINCH
- SWING CHECK
- DOUBLE DISK CHECK
- BALL CHECK
- HOSE VALVE
- NON FREEZE HOSE VALVE X = NO. IN SPECS
- NON FREEZE HOSE VALVE WITH HOSE RACK X = NO. IN SPECS
- SAMPLE
- MUD
- PRESSURE RELIEF
- AIR AND/OR VACUUM RELEASE
- REGULATED SIDE
- PRESSURE CONTROL
- MULTI-PORT VALVE (BALL VALVE SHOWN. FOR OTHER VALVE TYPES, APPROPRIATE VALVE SYMBOL SHOWN.) ARROWS INDICATE FLOW PATTERN. SEAT PORTS ARE IMPLIED BY INDICATED FLOW PATTERN.
- SOLENOID

MISCELLANEOUS PIPING SYMBOLS

- STRAINER
- SIGHT GLASS
- FLEXIBLE (ELASTOMER) PIPE CONNECTION
- GAUGE WITH COCK
- THERMOMETER
- ROTAMETER
- GALVANIC ANODE
- AIR SET XX = SUPPLY PRESSURE – PSIG
- TYPICAL INSTRUMENT SYMBOL (SEE I & C LEGEND) — PS 26-1-2
- FIRE HYDRANT
- CATHODIC PROTECTION TEST STATION
- CATHODIC PROTECTION ANODE
- FILTER

GATE SYMBOLS

EL. VIEW / PLAN VIEW

- SLUICE
- BUTTERFLY
- FLAP
- SHEAR
- FABRICATED SLIDE

PIPE AND FITTING END PATTERNS

B	BELL
S	SPIGOT
FL	FLANGE
PE	PLAIN END
GE	GROOVED END
MJ	MECHANICAL JOINT
PO	PUSH-ON

EXAMPLE: MJ — FL — PE

GENERAL DESIGN DESIGNATIONS

SECTION (LETTER) OR DETAIL (NUMERAL) DESIGNATION — A — X-X

ON DRAWING WHERE SECTION OR DETAIL IS TAKEN: DRAWING NUMBER WHERE SHOWN

ON DRAWING WHERE SECTION OR DETAIL IS SHOWN: DRAWING NUMBER(S) WHERE TAKEN

DRAWING NUMBER

DETAIL AND SECTION DESIGNATION

STANDARD DETAIL NUMBER — XXXXX — SEE STANDARD DETAILS PROVIDED ON SD DRAWINGS

STANDARD DETAIL DESIGNATION

FLOW STREAM ID

AS	ACTIVATED SLUDGE
BW	BACKWASH
BYP	BYPASS
DR	DRAIN
DS	DIGESTED SLUDGE
E	ELECTRICAL LINE
EFF	EFFLUENT
FA	FOUL AIR
FE	FINAL EFFLUENT
IA	INSTRUMENT AIR
IMLR	INTERNAL MIXED LIQUOR RECYCLE
IRR	IRRIGATION WATER
LPA	LOW PRESSURE AIR
ML	MIXED LIQUOR
NaOCL	SODIUM HYPOCHLORITE
OFL	OVERFLOW LINE
PA	PROCESS AIR
PE	PRIMARY EFFLUENT
PW	POTABLE WATER
RAS	RETURN ACTIVATED SLUDGE
RS	RAW SEWAGE
RW	RECLAIMED WATER
SE	SECONDARY EFFLUENT
SS	SANITARY SEWER
TE	TERTIARY EFFLUENT
TS	THICKENED SLUDGE
UW	UTILITY WATER (NON-POTABLE)
WAS	WASTE ACTIVATED SLUDGE

GENERAL NOTES

1. STANDARD SYMBOLS AND ABBREVIATIONS ARE SHOWN ON STANDARD LEGEND SHEETS. THEREFORE, SOME SYMBOLS OR ABBREVIATIONS SHOWN ON THE STANDARD LEGENDS MAY NOT BE SHOWN ON THE PLANS.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

MISCELLANEOUS LEGENDS AND NOTES

Professional Engineer 67132 ULRIKE LASHLEY ARIZONA, U.S.A. Expires: Sept 30, 2027

DWG. NO. G-2 | SHEET NO. 2 OF 60

R:\8519\021 00 – SECTION 10 CLARIFIER\ACAD\SHEETS\G-2.DWG

ABBREVIATIONS

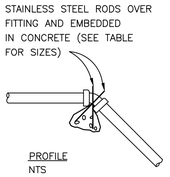
AB	ANCHOR BOLT	FAB	FABRICATE	P&ID	PROCESS AND INSTRUMENTATION DIAGRAM
ABDN	ABANDON	FB	FLAT BAR, FACE BRICK	PC	POINT OF CURVE
ABV	ABOVE	FC	FLEXIBLE COUPLING	PCP	PLANT CONTROL PANEL
AC	ASPHALTIC CONCRETE, ALTERNATING CURRENT	FCA	FLANGE COUPLING ADAPTER	PE	PLAIN END
ADDL	ADDITIONAL	FD	FLOOR DRAIN	PEN	PENETRATION
ADJ	ADJACENT, ADJUST	FDN	FOUNDATION	PERP	PERPENDICULAR
ADPTR	ADAPTER	FE	FINAL EFFLUENT	PH	PIPE HANGER
AFF	ABOVE FINISHED FLOOR	FES	FLARED END SECTION	PI	PRESSURE INDICATOR, POINT OF INTERSECTION
AFG	ABOVE FINISHED GRADE	FET	FLARED END TERMINAL	PJF	PREMOLDED JOINT FILLER
AHR	ANCHOR	F. EXT	FIRE EXTINGUISHER	PL	PLATE, PROPERTY LINE
ALUM	ALUMINUM	FF	FINISHED FLOOR	PLYWD	PLYWOOD
ALT	ALTERNATE	FG	FINISH GRADE	PMP	PLANT MONITORING PANEL
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	FIN.	FINISH	PNL	PANEL
APPROX	APPROXIMATE	FHYD	FIRE HYDRANT	PRCST	PRECAST
APVD	APPROVED	FL	FLOOR, FLOW	PREFAB	PREFABRICATED
ARCH	ARCHITECTURE, ARCHITECTURAL	FLEX	FLEXIBLE	PRELIM	PRELIMINARY
ASPH	ASPHALT	FLG	FLANGE	PREP	PREPARE, PREPARATION
AVG	AVERAGE	FLL	FLOW LINE	PROP	PROPERTY
@	AT	FLR	FLOOR	PRV	PRESSURE REDUCING VALVE
BD	BOARD	FM	FORCE MAIN	PS	PRESSURE SWITCH, PIPE SUPPORT
BE	BOTTOM ELEVATION	FOC	FACE OF CONCRETE	PT	POINT, POINT OF TANGENCY
BFVLV	BUTTERFLY VALVE	FRP	FIBERGLASS REINFORCED PLASTIC	PVC	POLYVINYL CHLORIDE
BETW	BETWEEN	FSTL	FABRICATED STEEL	PVMT	PAVEMENT
BF	BOTTOM FACE	FT	FOOT, FEET	RAD	RADIUS
BLDG	BUILDING	FTG	FOOTING, FITTING	RC	REINFORCED CONCRETE
BLK	BLOCK	F TO F	FACE TO FACE	RCP	REINFORCED-CONCRETE PIPE
BLW	BELOW	FWD	FORWARD	RD	ROAD, ROOF DRAIN
BM	BEAM, BENCHMARK	GA	GAGE, GAUGE	RDCR	REDUCER
BOT	BOTTOM	GAL	GALLON	REBAR	REINFORCEMENT BAR
BRG	BEARING	GALV	GALVANIZED	REF	REFERENCE
BRKT	BRACKET	GALVS	GALVANIZED STEEL	REINF	REINFORCE
BYP	BYPASS	GND	GROUND	RELOC	RELOCATE, RELOCATION
CHAN	CHANNEL	GRTG	GRATING	REQD	REQUIRED
CHK	CHECK	GSKT	GASKET	REV	REVERSE
CI	CAST IRON	GSP	GALVANIZED STEEL PIPE	RJ	RESTRAINED JOINT
CIMJ	CAST-IRON PIPE MECHANICAL JOINT	GVL	GRAVEL	RST	REINFORCING STEEL
CIP	CAST-IRON PIPE FLANGED JOINT	GWB	GYPSUM WALLBOARD	RT	RIGHT
CIPC	CAST-IN-PLACE CONCRETE	HAS	HEADED ANCHOR STUD	RTU	REMOTE TERMINAL UNIT
CIRC	CIRCULAR	HB	HOSE BIB	R/W	RIGHT-OF-WAY
CJ	CONSTRUCTION JOINT, CONTROL JOINT	HD	HUB DRAIN	SAN	SANITARY
CL	CENTER LINE	HDW	HARDWARE	SCHED	SCHEDULE
CLDI	CEMENT LINED DUCTILE IRON	HDR	HEADER	SDWK	SIDEWALK
CLG	CEILING	HK	HOOK	SECT	SECTION
CLR	CLEAR, CLEARANCE	HM	HOLLOW METAL	SHT	SHEET
CMP	CORRUGATED METAL PIPE	HORIZ	HORIZONTAL	SIM	SIMILAR
CMU	CONCRETE MASONRY UNITS	HP	HORSEPOWER	SLP	SLOPE
CO	CLEANOUT	HR	HOSE RACK, HOUR	SP	SPACE, SPACED
COH	CITY OF HELENA	HT	HEIGHT, HEAT TRACE	SPEC	SPECIFICATION
COL	COLUMN	HV	HOSE VALVE	SPG	SPACING
COMB	COMBINATION	HVAC	HEATING, VENTILATING, AND AIR CONDITIONING	SPRT	SUPPORT
CONC	CONCRETE OR CONCENTRIC	HWL	HIGH WATER LEVEL	SQ	SQUARE
CONN	CONNECT, CONNECTION	HWY	HIGHWAY	SQ FT	SQUARE FOOT
CONSTR	CONSTRUCTION	HYD	HYDRANT	SQ IN	SQUARE INCH
CONT	CONTINUE, CONTINUED, CONTINUOUS	ID	INSIDE DIAMETER	SST	STAINLESS STEEL
CONTR	CONTRACTOR	IE	INVERT ELEVATION	STA	STATION
COORD	COORDINATE	IF	INSIDE FACE	SS	SANITARY SEWER
CORR	CORRUGATED	IN.	INCH	STD	STANDARD
CP	CONTROL PANEL	INFL	INFLUENT	STIF	STIFFENER
CPLG	COUPLING	INSTL	INSTALL, INSTALLATION	STL	STEEL
C TO C	CENTER TO CENTER	INSTR	INSTRUMENT	STRUCT	STRUCTURE
CTR	CENTER	INSUL	INSULATE	SYM	SYMMETRICAL
CTU	CENTRAL TERMINAL UNIT	INT	INTERIOR	T&B	TOP AND BOTTOM
CTSK	COUNTERSINK	JB	JUNCTION BOX	TB	THRUST BLOCK
CU	CUBIC	JST	JOIST	TBC	TOP BACK OF CURB
CU FT	CUBIC FEET	JT	JOINT	TF	TOP FACE
CU IN	CUBIC INCH	L	ANGLE	TEMP	TEMPORARY, TEMPERATURE
CULV	CULVERT	LBS	POUNDS	THK	THICK
CU YD	CUBIC YARD	LF	LINEAR FEET	THRU	THROUGH
D	DRAIN	LNTL	LINTEL	T.O.	TOP OF
d	PENNY (NAIL SIZE)	LONG	LONGITUDINAL	T.P.	OUTSIDE TOP OF PIPE
DBA	DEFORMED BAR ANCHOR	LP	LOCAL PANEL	TOC	TOP OF CONCRETE, TOP OF CURB
DBL	DOUBLE	LR	LONG RADIUS	TST	TOP OF STEEL
DET	DETAIL	LS	LIFT STATION	TW	TOP OF WALL
DI	DUCTILE IRON, DRAIN INLET	LT	LEFT	TYP	TYPICAL
DIA	DIAMETER	LVL	LEVEL	UBC	UNIFORM BUILDING CODE
DIAG	DIAGONAL	LVR	LOUVER	UG	UNDERGROUND
DIM	DIMENSION	MATL	MATERIAL	ULT	ULTIMATE
DIMJ	DUCTILE-IRON MECHANICAL JOINT	MAX	MAXIMUM	UTIL	UTILITY
DIR	DIRECTION	MB	MACHINE BOLT		VALVE, VOLT
DN	DOWN	MCC	MOTOR CONTROL CENTER	VB	VALVE BOX
DR	DOOR	MCP	MOTOR CONTROL PANEL	VERT	VERTICAL
DWG	DRAWING	MDT	MONTANA DEPARTMENT OF TRANSPORTATION	VOL	VOLUME
EA	EACH	MECH	MECHANICAL	VRFY	VERIFY
EF	EACH FACE, EXHAUST FAN	MFD	MANUFACTURED	VTR	VENT THROUGH ROOF
EL, ELEV	ELEVATION	MFR	MANUFACTURE, MANUFACTURER	W	WIDTH
ELB	ELBOW	MH	MANHOLE	WD	WOOD
ELEC	ELECTRIC, ELECTRICAL	MIN	MINIMUM	W/	WITH
ENCL	ENCLOSE	MISC	MISCELLANEOUS	W/O	WITHOUT
ENGR	ENGINEER	MJ	MECHANICAL JOINT	WL	WATERLINE
EOR	ENGINEER OF RECORD	MPWSS	MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS	WM	WIRE MESH, WATER MAIN
EP	EDGE OF PAVEMENT			WS	WATERSTOP, WATER SURFACE
EQL	EQUAL, EQUALLY	NIC	NOT IN CONTRACT	WSTL	WELDED STEEL, WROUGHT STEEL
EQL SP	EQUALLY SPACED	NO	NUMBER	WT	WEIGHT
EQUIP	EQUIPMENT	NOM	NOMINAL	WTR	WATER
EQUIV	EQUIVALENT	NTS	NOT TO SCALE	WV	WATER VALVE
EW	EACH WAY	OAE	OR APPROVED EQUAL	WWF	WELDED WIRE FABRIC
EXC	EXCAVATE	OC	ON CENTER	WWM	WELDED WIRE MESH
EXH	EXHAUST	OD	OUTSIDE DIAMETER	WWTP	WASTEWATER TREATMENT PLANT
EXP	EXPANSION	OF	OUTSIDE FACE	XFMR	TRANSFORMER
EXP JT	EXPANSION JOINT	OHP	OVERHEAD POWER	YD	YARD
EXST	EXISTING	OPNG	OPENING		
EXT	EXTENSION, EXTERIOR				
F	FLANGE				
FA	FOUL AIR				

THRUST BLOCK NOTES AND DETAILS

BEARING AREA OF THRUST BLOCKS IN SQ. FT. (HORIZONTAL BENDS)							
FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22 1/2°	11 1/4°
4	1.0	1.4	1.9	1.4	1.0	–	–
6	2.1	3.0	4.3	3.0	1.6	1.0	–
8	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24	34.0	48.0	68.0	48.0	26.2	13.6	6.8
30	53.0	75.0	106.0	75.0	41.0	21.5	11.0
36	76.5	108.0	153.0	108.0	59.0	30.6	15.3
42	104.0	147.0	208.0	147.0	81.0	42.0	21.0

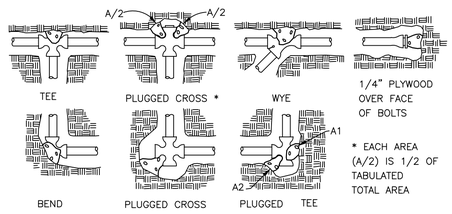
VOLUME OF THRUST BLOCK IN CUBIC YARDS (VERTICAL BENDS)			
FITTING SIZE	BEND ANGLE		
	45°	22 1/2°	11 1/4°
4	1.1	0.4	0.2
6	2.7	1.0	0.4
8	4.0	1.5	0.6
10	6.0	2.3	0.9
12	8.5	3.2	1.3
14	11.5	4.3	1.8
16	14.8	5.6	2.3

FITTING SIZE	ROD SIZE	EMBEDMENT
12" AND LESS	#6	30"
14" – 16"	#8	36"



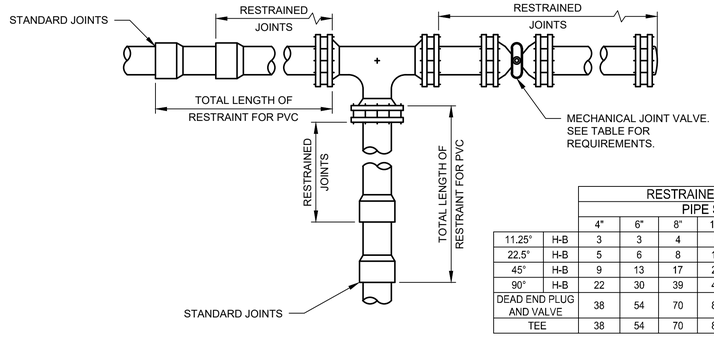
THRUST BLOCK NOTES

1. KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
2. CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.
3. REQUIRED VOLUMES OR BEARING AREAS AT FITTINGS SHALL BE AS INDICATED HEREIN, ADJUSTED, IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED BELOW. FOR PIPES LARGER THAN SHOWN, CHECK THRUST BLOCK SIZING WITH ENGINEER.
4. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 PSIG AND THE WEIGHT OF CONCRETE = 4050 LBS/CU YD. TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION: VOLUME = (TEST PRESS./150) x (TABLE VALUE).
5. BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS ARE BASED ON TEST PRESSURE OF 150 PSIG AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 LBS/SQ FT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, MULTIPLY TABLE VALUES BY THE FACTOR $(13.33)(P^1/S_b^1)$, WHERE: P^1 = ACTUAL TEST PRESSURE, PSIG; S_b^1 = ACTUAL SOIL BEARING PRESSURE, PSF.
6. THRUST BLOCKS FOR VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.
7. BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER THIS STANDARD.
8. BEARING AREA OF THRUST BLOCK SHALL NOT BE LESS THAN 1.0 SQ FT.
9. VERTICAL BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS REQUIRE SPECIAL BLOCKING DETAILS. SEE PLANS FOR VOLUMES SHOWN TO LEFT OF SOLID LINE IN TABLE.
10. TEST PRESSURES ARE AS INDICATED IN SECTION 15000 OF THE SPECIFICATIONS.
11. ALLOWABLE SOIL BEARING STRESS IS 2000 LBS/SQ. FT.



THRUST BLOCK DETAILS (USED ONLY WHEN IDENTIFIED)

SCALE: NTS



RESTRAINED LENGTH PIPE SIZE								
		4"	6"	8"	10"	12"	16"	24"
11.25°	H-B	3	3	4	5	6	7	10
22.5°	H-B	5	6	8	10	11	14	20
45°	H-B	9	13	17	20	23	29	40
90°	H-B	22	30	39	47	55	70	96
DEAD END PLUG AND VALVE		38	54	70	84	99	127	178
TEE		38	54	70	84	99	127	178

MINIMUM DESIGN CRITERIA

TRENCH TYPE:	3
DESIGN PRESSURE:	150 PSI
SAFETY FACTOR:	2.0
DEPTH OF COVER:	3.0 FT

MINIMUM FOOTAGE OF PIPE RESTRAINT

H-B:	HORIZONTAL BEND
VU-B:	VERTICAL-UP BEND
VD-B:	VERTICAL-DOWN BEND
TEE:	ASSUMES EQUAL SIZE PIPE FOR BRANCH AND RUN. LENGTH ALONG RUN EQUAL TO 0.

GENERAL NOTES

1. FOR LENGTHS OF PIPE AND NUMBER OF JOINTS TO BE RESTRAINED, SEE TABLE.
2. ONLY DUCTILE IRON PIPE FITTINGS SHALL BE USED AT JOINTS TO BE RESTRAINED UNLESS OTHERWISE SPECIFIED BY THE CITY ENGINEER.
3. NOT ALL RESTRAINING SITUATIONS ARE LISTED. SEE EBAA IRON RESTRAINT LENGTH CALCULATOR FOR ADDITIONAL INFORMATION.

RESTRAINED JOINT DETAIL

SCALE: 3/4" = 1'-0"

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DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

ABBREVIATIONS AND THRUST BLOCK DETAILS

Professional Engineer
CERTIFICATE
67132
ULRIKE LASHLEY
Date Signed: 08-01-25
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. G-3

SHEET NO. 3 OF 60

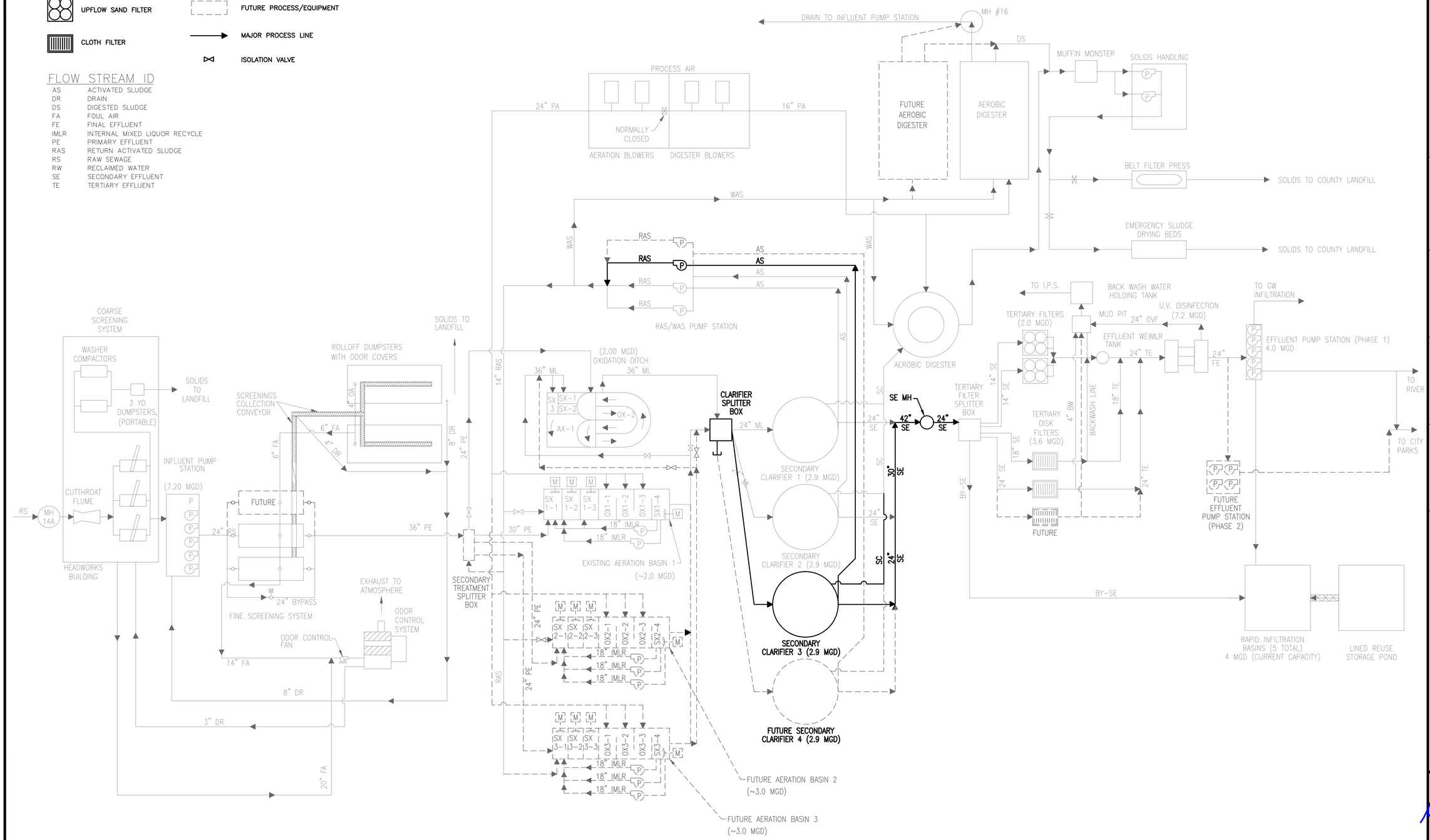
R:\8519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\G-3.DWG

LEGEND

- PUMP
- SUBMERSIBLE MIXERS
- UPFLOW SAND FILTER
- CLOTH FILTER
- EXISTING PROCESS/EQUIPMENT
- NEW PROCESS/EQUIPMENT
- FUTURE PROCESS/EQUIPMENT
- MAJOR PROCESS LINE
- ISOLATION VALVE

FLOW STREAM ID

AS	ACTIVATED SLUDGE
DR	DRAIN
DS	DIGESTED SLUDGE
FA	FOUL AIR
FE	FINAL EFFLUENT
IMLR	INTERNAL MIXED LIQUOR RECYCLE
PE	PRIMARY EFFLUENT
RAS	RETURN ACTIVATED SLUDGE
RS	RAW SEWAGE
RW	RECLAIMED WATER
SE	SECONDARY EFFLUENT
TE	TERTIARY EFFLUENT



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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

PROCESS FLOW DIAGRAM

Registered Professional Engineer
67132
ULRIKE LASHLEY
Date Signed: 08-11-25
ARIZONA U.S.A.
Expires: Sept. 30, 2027

DWG. NO. G-4

SHEET NO. 4 OF 60

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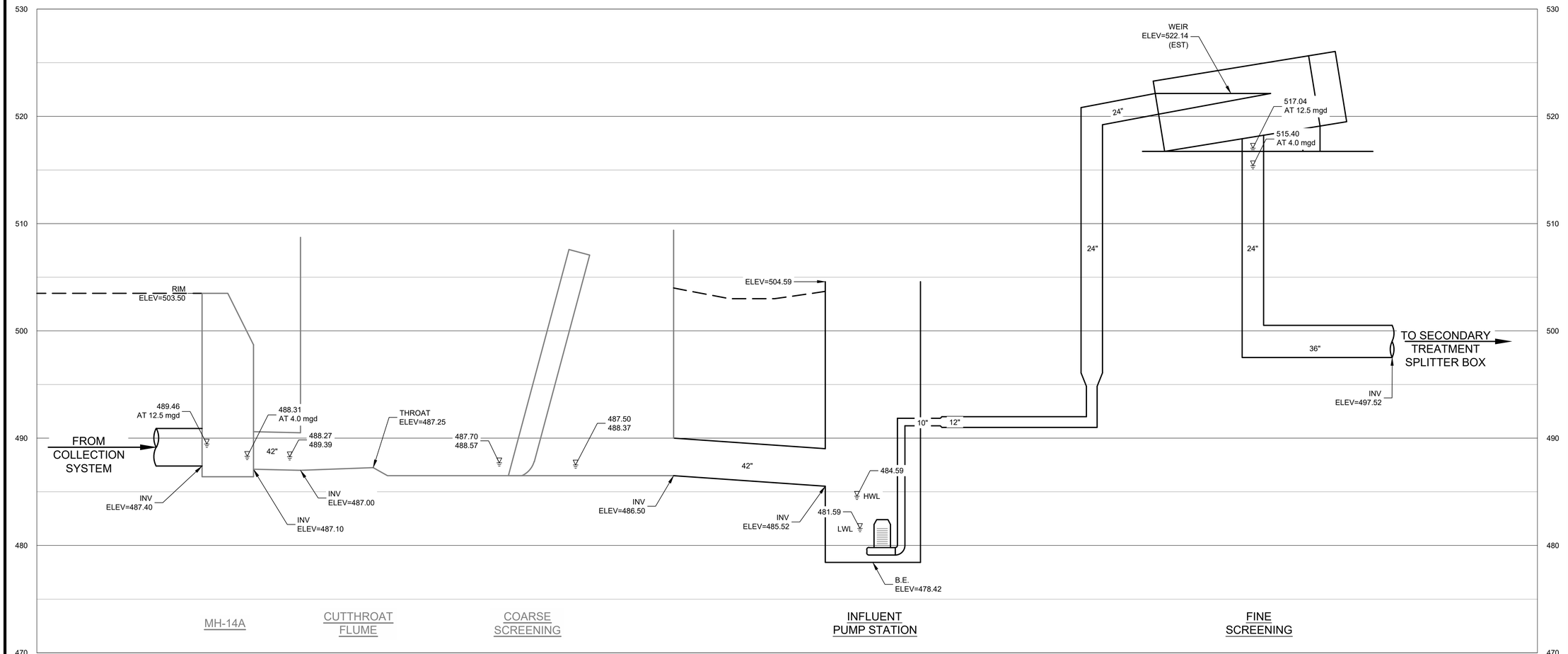

WATER SURFACE ELEVATIONS:

XXX.XX AT FLOW OF 6.0 mgd (ANNUAL AVG)
XXX.XX AT FLOW OF 9.6 mgd (PEAK HOUR)

NOTES:

1. ELEVATIONS FOR FLOW OF 6.0 mgd ASSUME OPERATION OF THREE UV CHANNELS, THREE CLOTH FILTERS, THREE CLARIFIERS, AERATION BASINS 1 AND 2, AND THE OXIDATION DITCH.
2. LISTED STRUCTURE ELEVATIONS WERE VERIFIED BY SURVEY IN 2020, 2021, AND 2023.

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DATE: 08/2025

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

HYDRAULIC PROFILE

Registered Professional Engineer
67132
ULRIKE
LASHLEY
Date Signed: 08-22-25
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. G-5

SHEET NO. 5 OF 60

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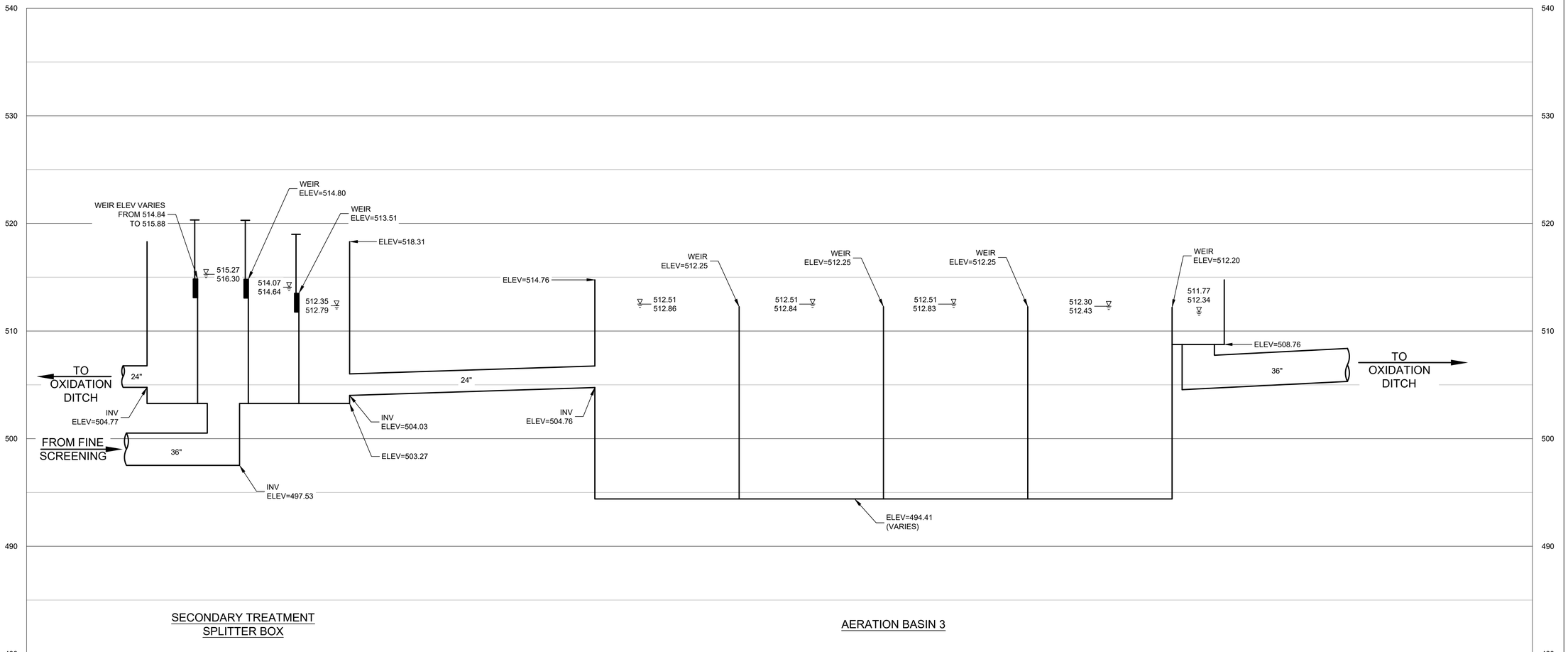

WATER SURFACE ELEVATIONS:

XXX.XX AT FLOW OF 6.0 mgd (ANNUAL AVG)
XXX.XX AT FLOW OF 9.6 mgd (PEAK HOUR)

NOTES:

1. ELEVATIONS FOR FLOW OF 6.0 mgd ASSUME OPERATION OF THREE UV CHANNELS, THREE CLOTH FILTERS, THREE CLARIFIERS, AERATION BASINS 1 AND 2, AND THE OXIDATION DITCH.
2. LISTED STRUCTURE ELEVATIONS WERE VERIFIED BY SURVEY IN 2020, 2021, AND 2023.

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DATE: 08/2025

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

HYDRAULIC PROFILE

Registered Professional Engineer
67736
ULRIKE LASHLEY
Date Signed: 08-25-25
ARIZONA U.S.A.
Expires: Sept. 30, 2027

DWG. NO. G-6
SHEET NO. 6 OF 60

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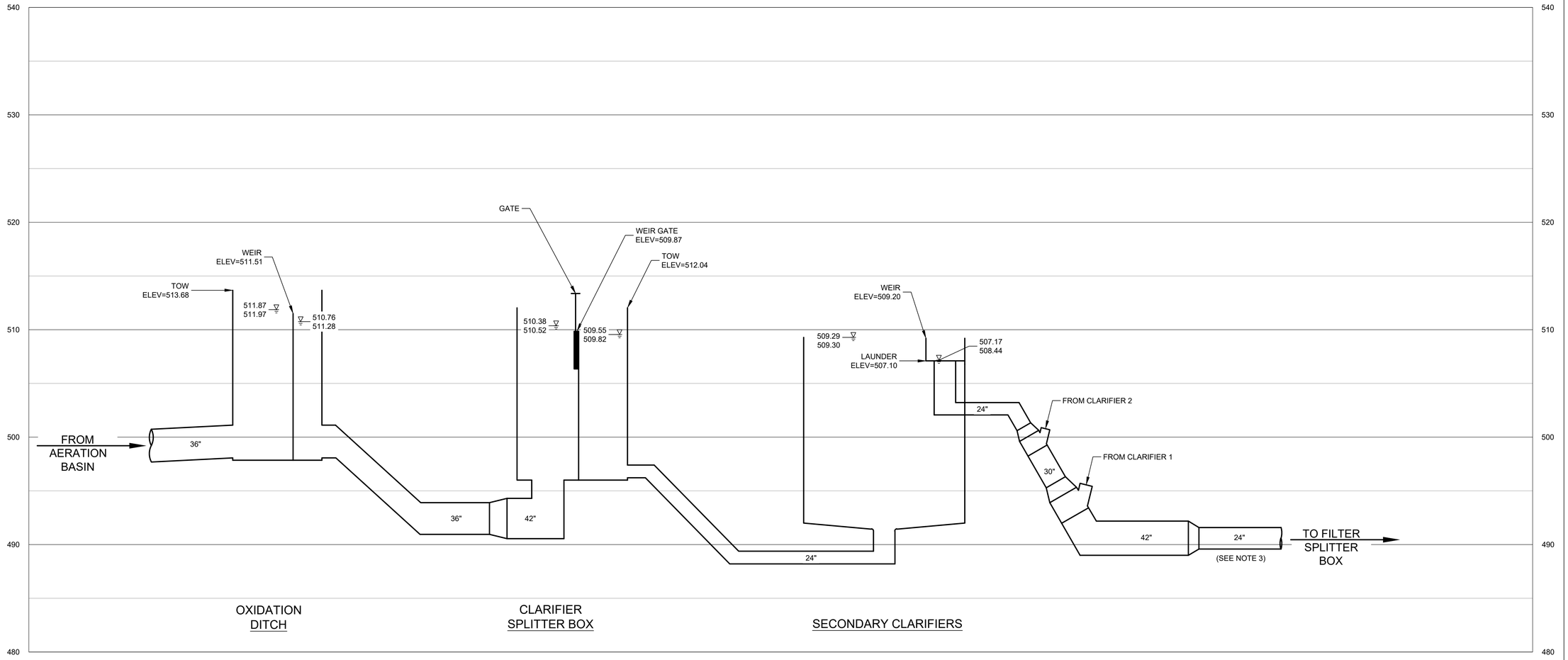

WATER SURFACE ELEVATIONS:

XXX.XX AT FLOW OF 6.0 mgd (ANNUAL AVG)
XXX.XX AT FLOW OF 9.6 mgd (PEAK HOUR)

NOTES:

1. ELEVATIONS FOR FLOW OF 6.0 mgd ASSUME OPERATION OF THREE UV CHANNELS, THREE CLOTH FILTERS, THREE CLARIFIERS, AERATION BASINS 1 AND 2, AND THE OXIDATION DITCH.
2. LISTED STRUCTURE ELEVATIONS WERE VERIFIED BY SURVEY IN 2020, 2021, AND 2023.

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CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

HYDRAULIC PROFILE

Registered Professional Engineer
67132
ULRIKE
LASHLEY
ARIZONA, U.S.A.
Date Signed: 08-29-25
Expires: Sept. 30, 2027

DWG. NO. G-7

SHEET NO. 7 OF 60

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

OVERALL SITE PLAN

Professional Engineer
67138
ULRIKE LASHLEY
Date Signed: 08-25
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. C-1

SHEET NO. 8 OF 60

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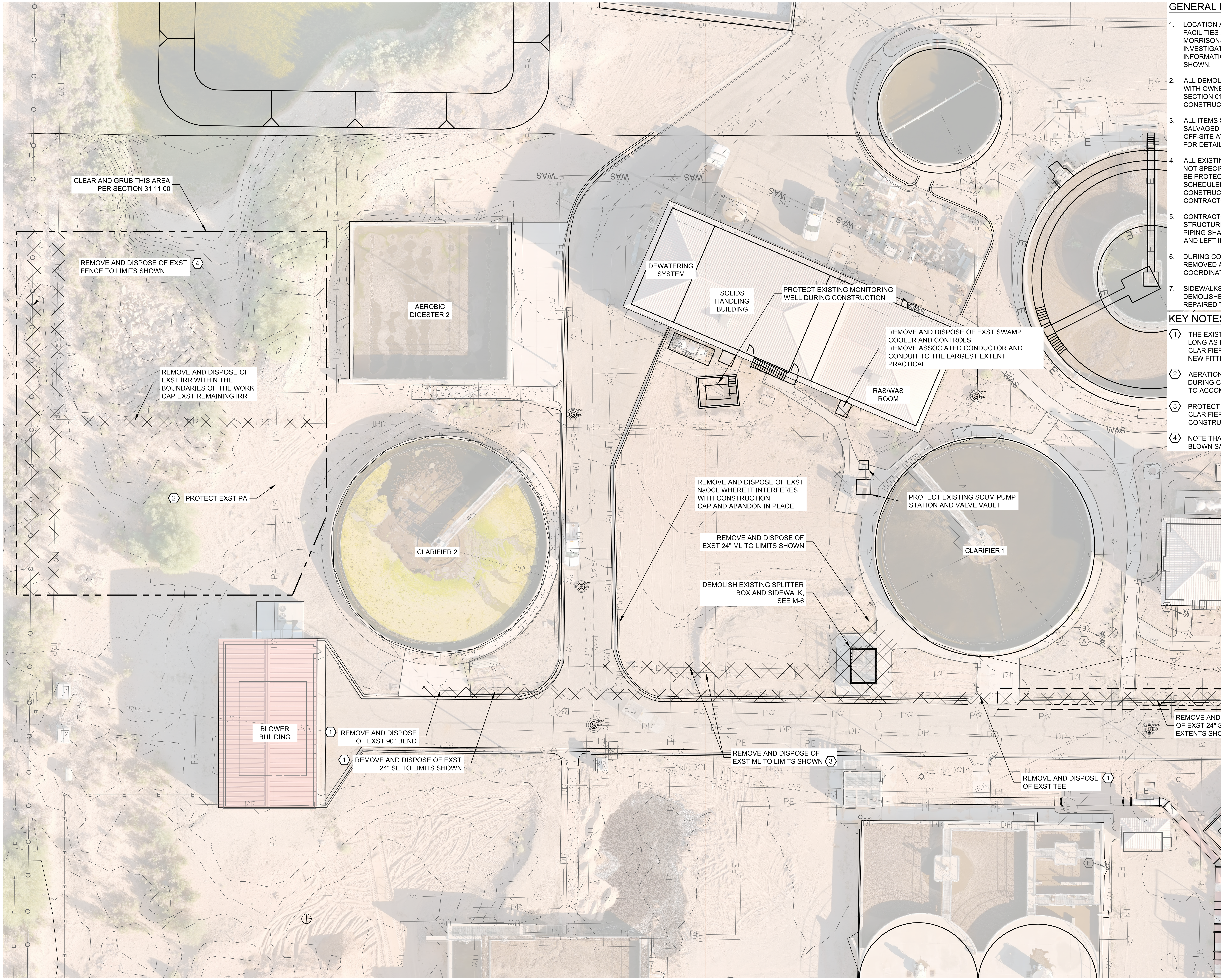

GENERAL NOTES:

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS, SURVEY BY MORRISON-MAIERLE AND OTHERS, AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. ALL DEMOLITION WORK SHALL BE COORDINATED AND SCHEDULED WITH OWNER AND ENGINEER. ALSO SEE SECTION 02 41 10 AND SECTION 01 14 16 FOR ADDITIONAL INFORMATION AND CONSTRUCTION SEQUENCING.
3. ALL ITEMS SHOWN TO BE REMOVED AND NOT SPECIFIED TO BE SALVAGED OR RELOCATED SHALL BE REMOVED AND DISPOSED OF OFF-SITE AT AN APPROVED LOCATION. ALSO SEE SECTION 02 41 10 FOR DETAILED DEMOLITION INFORMATION.
4. ALL EXISTING EQUIPMENT, PIPING, ELECTRICAL FACILITIES, ETC. NOT SPECIFICALLY SHOWN TO BE REMOVED OR MODIFIED SHALL BE PROTECTED BY THE CONTRACTOR. ANY ITEMS NOT SCHEDULED FOR DEMOLITION THAT ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. CONTRACTOR SHALL REMOVE AND DISPOSE OF PIPE AND RELATED STRUCTURES WHERE INDICATED ON THE DRAWINGS. ABANDONED PIPING SHALL BE PLUGGED WITH CONCRETE BY THE CONTRACTOR AND LEFT IN PLACE.
6. DURING CONSTRUCTION SMALL DIAMETER UW OR IRR PIPE CAN BE REMOVED AND REPLACED TO EQUAL OR BETTER CONDITION. COORDINATE FINAL LOCATION OF PIPE WITH OWNER.
7. SIDEWALKS, CURBS, AND ASPHALT THAT ARE DAMAGED OR DEMOLISHED DURING CONSTRUCTION SHALL BE REPLACED OR REPAIRED TO EQUAL OR BETTER CONDITION.

KEY NOTES:

1. THE EXISTING CLARIFIERS NEED TO REMAIN IN SERVICE FOR AS LONG AS POSSIBLE. COORDINATE TEMPORARY SHUTDOWN OF CLARIFIERS WITH OWNER. COORDINATE WITH INSTALLATION OF NEW FITTINGS AND PIPE ON DWG C-3.
2. AERATION TO THE AEROBIC DIGESTER MUST BE MAINTAINED DURING CONSTRUCTION. PA MAY BE TEMPORARILY RELOCATED TO ACCOMMODATE EXCAVATION AND CONSTRUCTION TRAFFIC.
3. PROTECT AND SUPPORT DURING CONSTRUCTION OF NEW CLARIFIER SPLITTER BOX. SEE SECTION 01 14 16 FOR CONSTRUCTION SEQUENCING.
4. NOTE THAT EXISTING FENCE MAY BE PARTIALLY BURIED BY BLOWN SAND.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

EXISTING CONDITIONS & SITE DEMOLITION PLAN

Registered Professional Engineer, 67138, ULRIKE LASHLEY, ARIZONA, U.S.A. Expires: Sept 30, 2027

DWG. NO. C-2

R:\8519\021 00 – SECTION 10 CLARIFIER\ACAD\SHEETS\C-2.DWG

GENERAL NOTES:

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE SECTION 40 02 05, PIPING SCHEDULE, SECTION 40 05 10, PIPING-GENERAL AND DETAILED PIPE SPECIFICATIONS FOR PIPE MATERIALS. USE EPOXY LINED DUCTILE IRON FITTINGS FOR ALL BURIED PVC PIPE LARGER THAN 3" DIAMETER.
3. ALL VALVES AND FITTINGS SHALL HAVE THRUST RESTRAINT IN ACCORDANCE WITH THE SPECIFICATIONS AND DETAILS OF G-3.
4. SEE M-DRAWINGS FOR PIPE ELEVATIONS AT STRUCTURES AND BUILDINGS.
5. SEE SECTION 09 90 00, PAINTING, FOR PIPING EXTERIOR COATING REQUIREMENTS.
6. SEE PLAN AND PROFILES FOR DETAILED YARD PIPE FITTINGS AND LOCATIONS.

KEY NOTES:

(1) CONTRACTOR TO PROVIDE REQUIRED PVC FITTINGS TO CONNECT AND ROUTE UW AS GENERALLY SHOWN.

TRUCK BAY
SOLIDS HANDLING BUILDING
RAS/WAS ROOM, SEE M-DWGS
CLARIFIER 1
CLARIFIER 2
AEROBIC DIGESTER 2
NEW CLARIFIER 3 SEE DWG M-9
BLOWER BUILDING
6" DI WYE - MJ CONNECT TO EXST SC
CONNECT TO EXST 8" DR WYE
12" AS, SEE DWG C-7
8" DR
6" SC
24" SE
ADDITIVE ALTERNATE 2
CONNECT TO (1) EXST UW
24" ML, SEE DWG C-8
3" UW
N: 1475194.91 E: 444863.29
24" DI WYE - MJ
24" SE, SEE DWG C-5
2" UW (1)
1½" HOSE BIB, (TYP OF 3) SEE DETAIL (15105)
EXST 24" SE
24" DI 45° BEND - MJ CONNECT TO EXST SE PIPING
30" SE, SEE DWG C-5
CONNECT TO EXST ML PIPE
24" ML, SEE DWG C-10
N: 1475115.97 E: 445114.08
NEW CLARIFIER SPLITTER BOX, SEE DWG M-7
1½" HOSE BIB SEE DETAIL (15105)
2" UW
(1) CONNECT TO EXST UW
24" ML, SEE DWG C-10
CONNECT TO EXST ML PIPE
N: 1475102.97 E: 445095.08
36" ML SEE DWG C-9
CONNECT TO EXST ML PIPE
CONNECT TO EXST SE PIPE
42" SE
EXST 24" SE
ADDITIVE ALTERNATE 1
42" SE SEE DWG C-6
CONNECT TO EXST SE PIPING
CONNECT TO EXST ML PIPE
36" ML, SEE DWG C-9

20 10 0 20 40
SCALE IN FEET

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

SITE AND YARD PIPING PLAN

Registered Professional Engineer
STATE OF ARIZONA
67138
ULRIKE LASHLEY
Date Signed: 08-25
ARIZONA U.S.A.
Expires: Sept. 30, 2027

DWG. NO. C-3
SHEET NO. 10 OF 60

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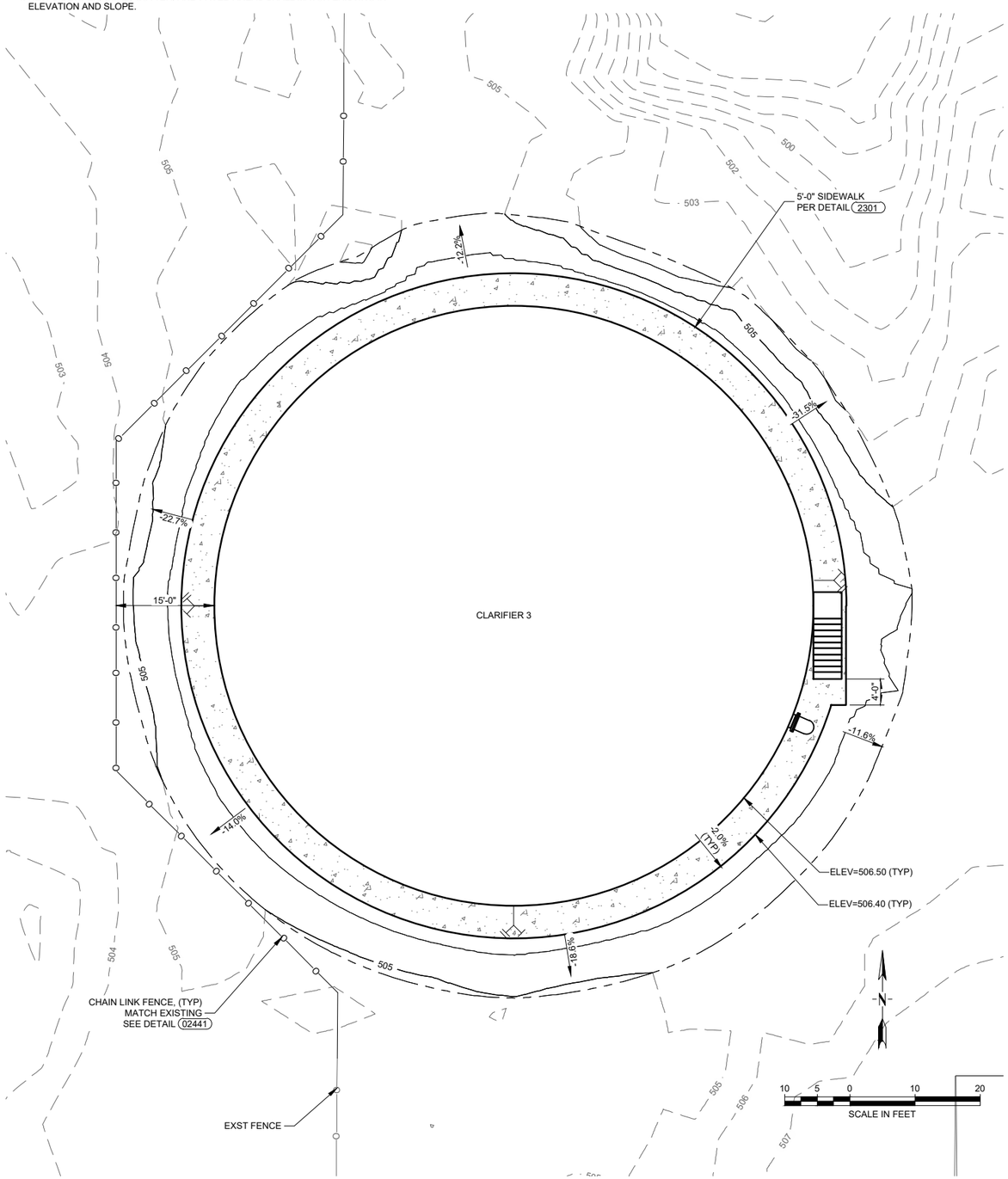
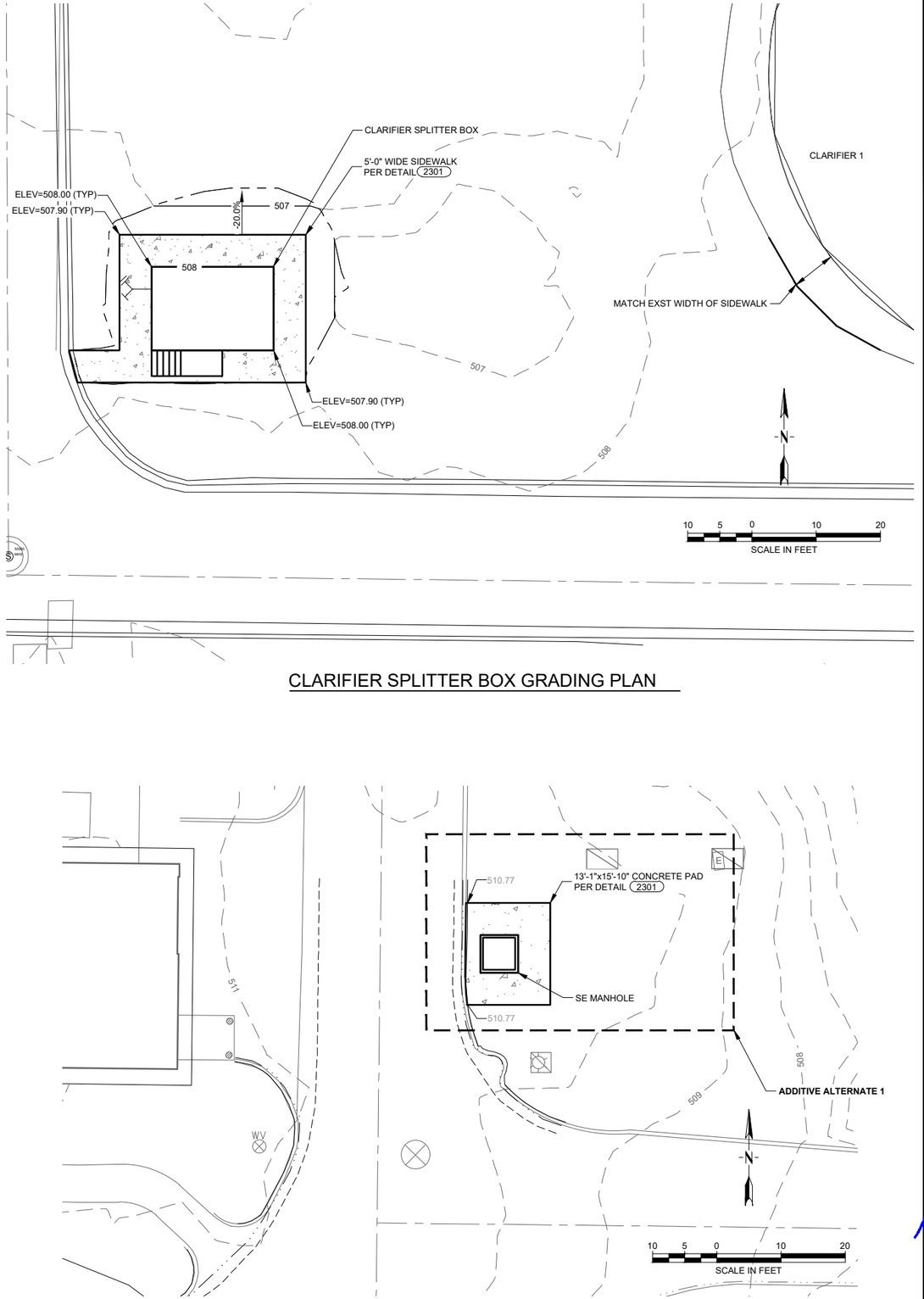
GENERAL NOTES:

1. FIELD VERIFY ALL ELEVATIONS ON EXISTING UTILITIES PRIOR TO CONSTRUCTION. COORDINATE CONFLICTS WITH THE ENGINEER.
2. GRADE FINISHED GRADE TO DRAIN AWAY FROM STRUCTURES.
3. CLEAN SPOIL MATERIAL MAY BE USED FOR SITE GRADING. EXCESS CLEAN MATERIAL MAY BE TEMPORARILY STORED IN OWNERS DESIGNATED AREA.
4. NEW SIDEWALK, CURB, GUTTER, AND PAVED AREAS SHALL MATCH EXISTING IN ELEVATION AND SLOPE.



CLARIFIER 3 GRADING PLAN



CLARIFIER SPLITTER BOX GRADING PLAN

SE MANHOLE GRADING PLAN - ADDITIVE ALTERNATE 1

1 Engineering Place
Helena, MT 59602
406.442.3050
www.m-m.net
Morrison Maierle
engineers ▪ surveyors ▪ planners ▪ scientists

DESIGN: RL
DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

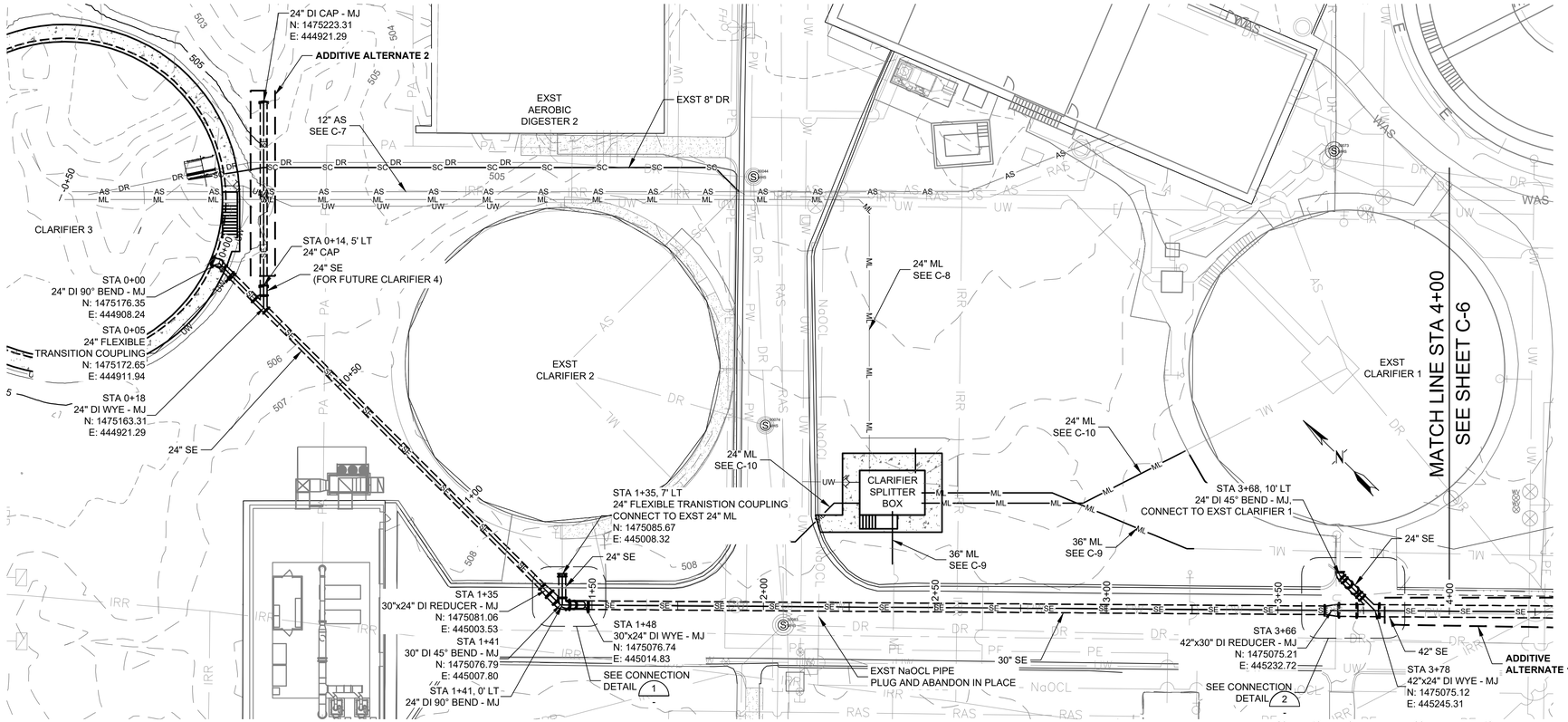
GRADING AND PAVING PLAN

Registered Professional Engineer
67132
ULRIKE
LASHLEY
Date Signed: 08-29-25
ARIZONA U.S.A.
Expires: Sept 30, 2027

DWG. NO. C-4

SHEET NO. 11 OF 60

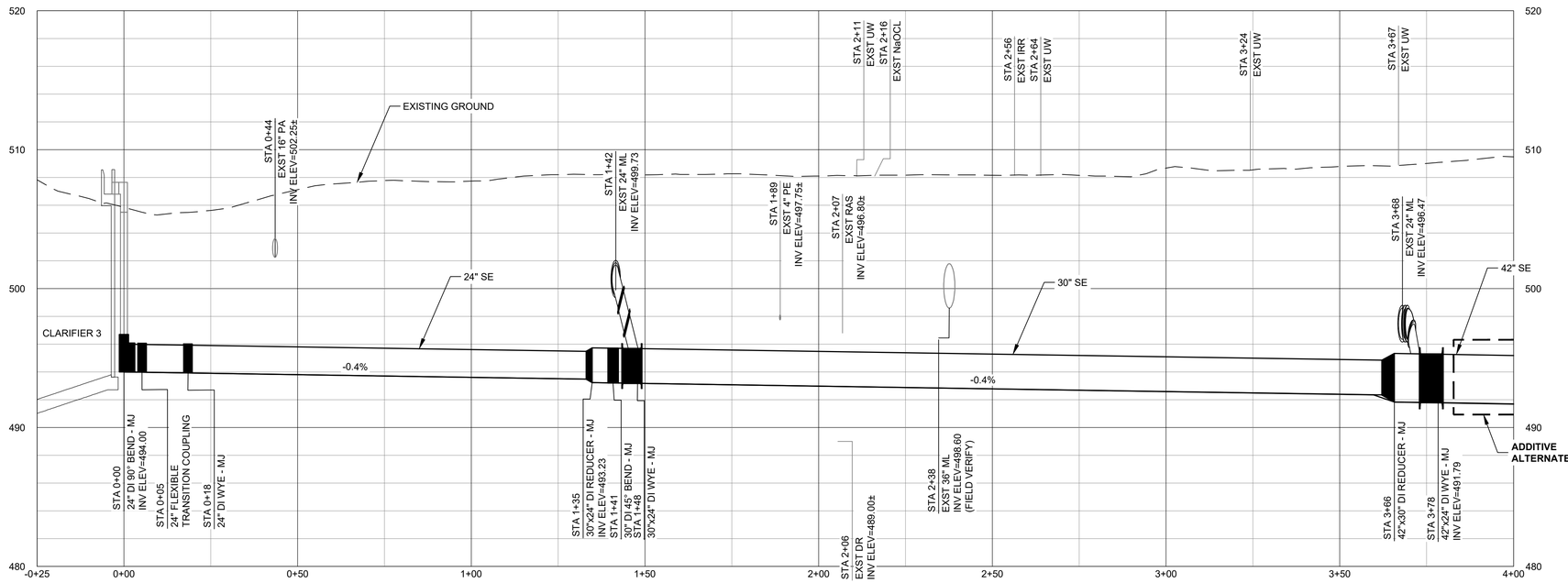
R:\8519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\C-4.DWG



CLARIFIER 3 TO SE MANHOLE - 24" - 42" SE PIPE PLAN

HORIZ. SCALE IN FEET

VERT. SCALE IN FEET



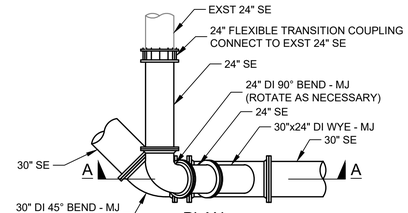
CLARIFIER 3 TO SE MANHOLE - 24" - 42" SE PIPE PROFILE

GENERAL NOTES:

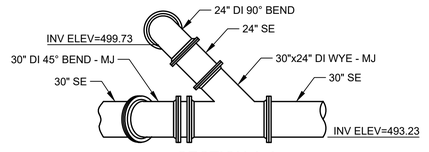
1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE SECTION 40 02 05, PIPING SCHEDULE, SECTION 40 05 10, PIPING-GENERAL AND DETAILED PIPE SPECIFICATIONS FOR PIPE MATERIALS. USE EPOXY LINED DUCTILE IRON FITTINGS FOR ALL BURIED PVD PIPE LARGER THAN 3" DIAMETER.
3. ALL VALVES AND FITTINGS SHALL HAVE THRUST RESTRAINT IN ACCORDANCE WITH THE SPECIFICATIONS AND DETAILS ON G-3.
4. SEE M-DRAWINGS FOR PIPE ELEVATIONS AT STRUCTURES AND BUILDINGS.
5. SEE SECTION 09 90 00, PAINTING, FOR PIPING EXTERIOR COATING REQUIREMENTS.
6. REROUTE IRR AND UW AS NEEDED IF CONFLICTING WITH NEW PIPE.

KEY NOTES:

(1) IF ADDITIVE ALTERNATE 1 IS NOT AWARDED, INSTALL A 24"x42" DI REDUCER - FL IMMEDIATELY AFTER THE 42" DI WYE AND CONNECT TO THE EXISTING 24" SE. PROVIDE SPOOL PIECES AS NEEDED TO MAKE THE TRANSITION AND CONNECTION.



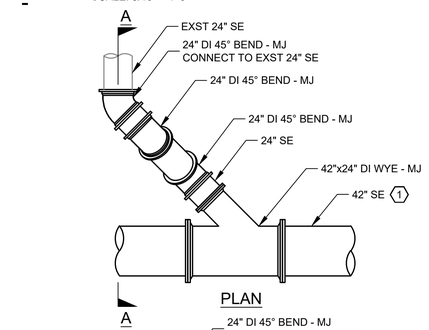
PLAN



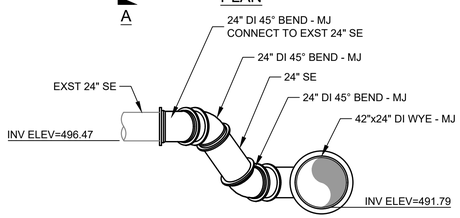
SECTION A-A

1 CLARIFIER 2 CONNECTION DETAIL

SCALE: 3/16" = 1'-0"



PLAN



SECTION A-A

2 CLARIFIER 1 CONNECTION DETAIL

SCALE: 3/16" = 1'-0"

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www.m-m.net

DESIGN: RL
DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

SE PIPE PLAN AND PROFILES

Registered Professional Engineer
STATE OF ARIZONA
ULRIKE LASHLEY
Date Signed: 08-25-25
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. C-5

SHEET NO. 12 OF 60

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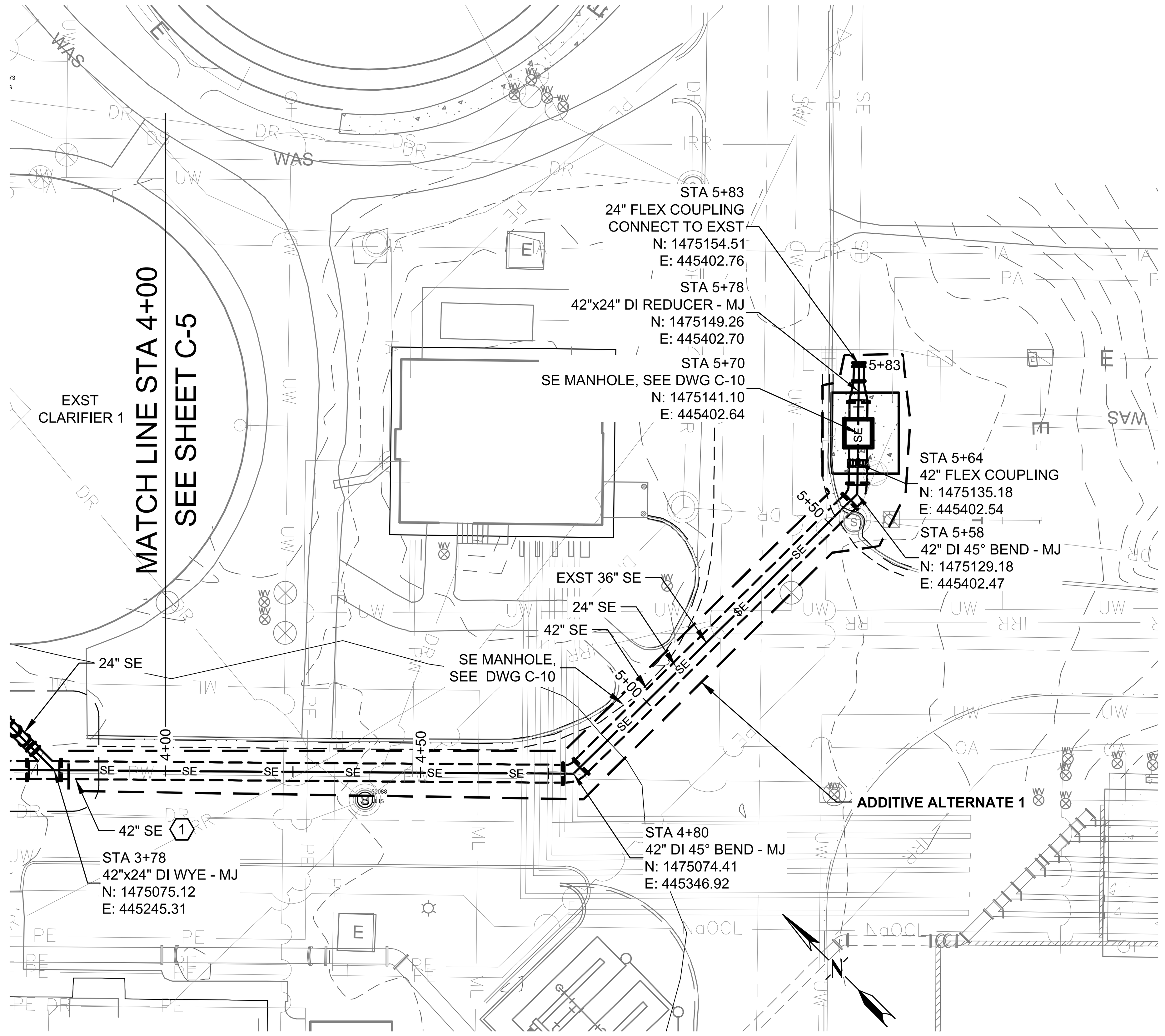
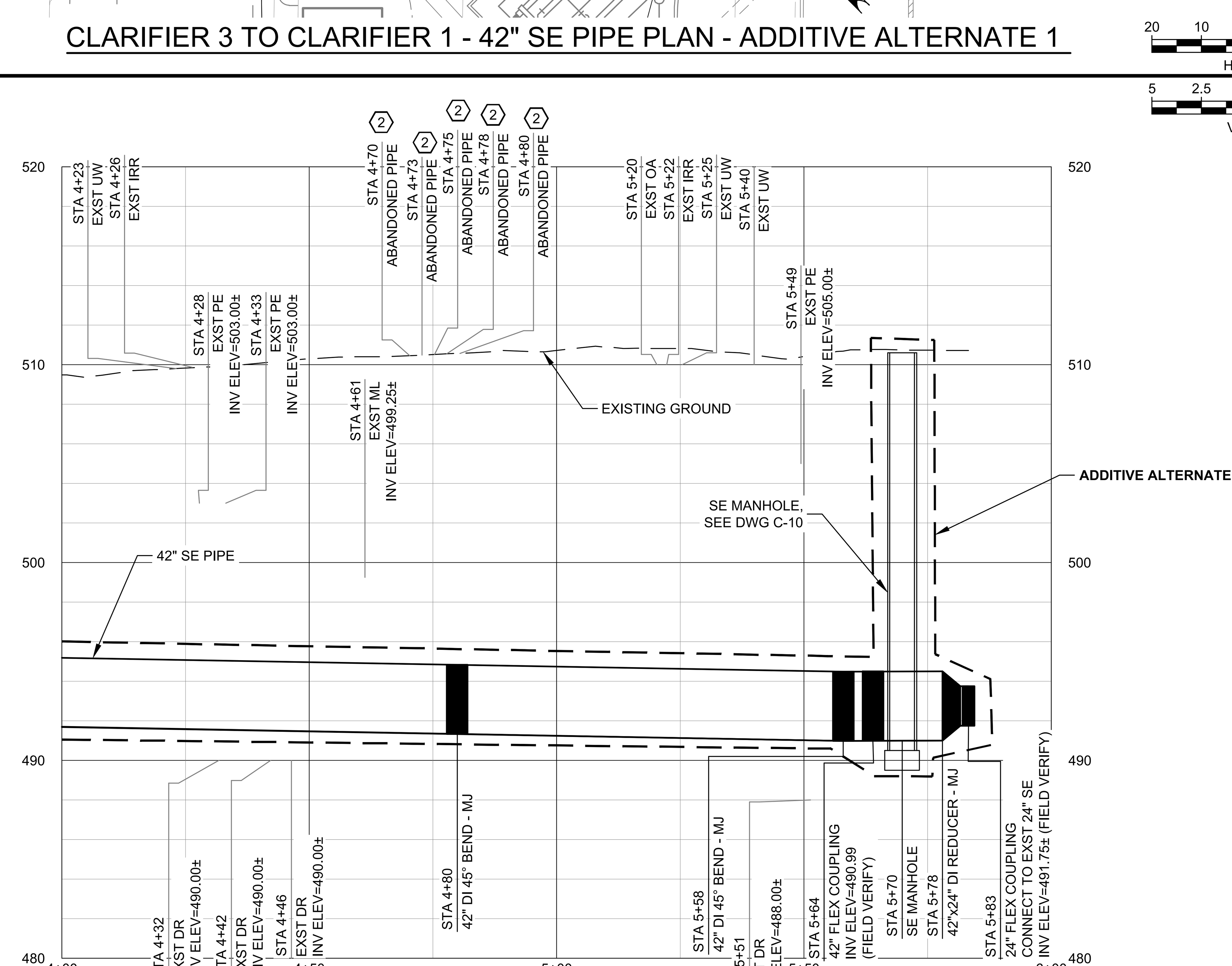


CLARIFIER 3 TO CLARIFIER 1 - 42" SE PIPE PLAN - ADDITIVE ALTERNATE 1



CLARIFIER 3 TO CLARIFIER 1 - 42" SE PIPE PROFILE

GENERAL NOTES

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE SECTION 40 02 05, PIPING SCHEDULE, SECTION 40 05 10, PIPING-GENERAL AND DETAILED PIPE SPECIFICATIONS FOR PIPE MATERIALS. USE EPOXY LINED DUCTILE IRON FITTINGS FOR ALL BURIED PVD PIPE LARGER THAN 3" DIAMETER.
3. ALL VALVES AND FITTINGS SHALL HAVE THRUST RESTRAINT IN ACCORDANCE WITH THE SPECIFICATIONS AND DETAILS ON G-3.
4. SEE M-DRAWINGS FOR PIPE ELEVATIONS AT STRUCTURES AND BUILDINGS.
5. SEE SECTION 09 90 00, PAINTING, FOR PIPING EXTERIOR COATING REQUIREMENTS.
6. REROUTE IRR AND UW AS NEEDED IF CONFLICTING WITH NEW PIPE.

KEY NOTES:

(1) IF ADDITIVE ALTERNATE 1 IS NOT AWARDED, INSTALL A 24"x42" DI REDUCER - FL IMMEDIATELY AFTER THE 42" DI WYE AND CONNECT TO THE EXISTING 24" SE. PROVIDE SPOOL PIECES AS NEEDED TO MAKE THE TRANSITION AND CONNECTION.

(2) CUT ABANDONED PIPES TO ACCOMMODATE 42" SE, PLUG WITH CONCRETE AND LEAVE IN PLACE.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

ADDITIVE ALTERNATE NO. 1 SE PIPE PLAN AND PROFILE

DESIGN: RL	DRAWN: DAH	CHECKED: JCM
DATE: 08/2025		

REVISION	DATE	DESCRIPTION

ULRIKE LASHLEY
Expires: Sept 30, 2027

DWG. NO. C-6

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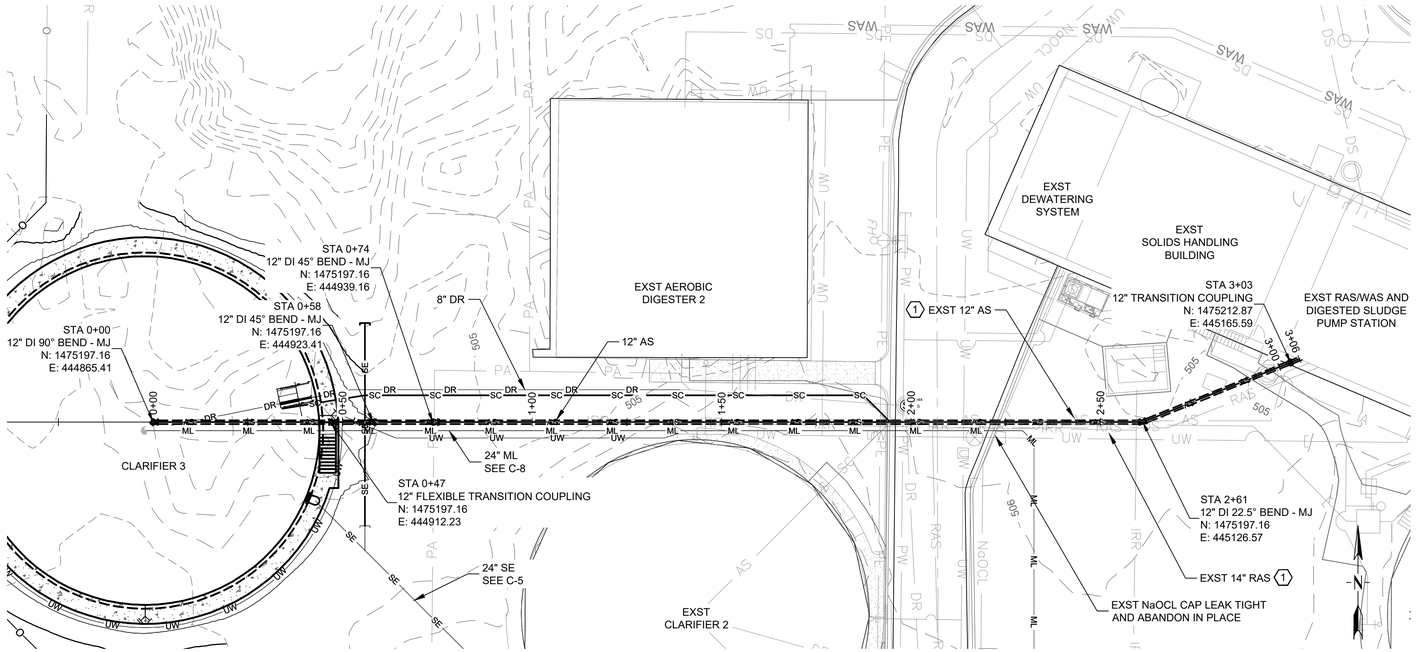
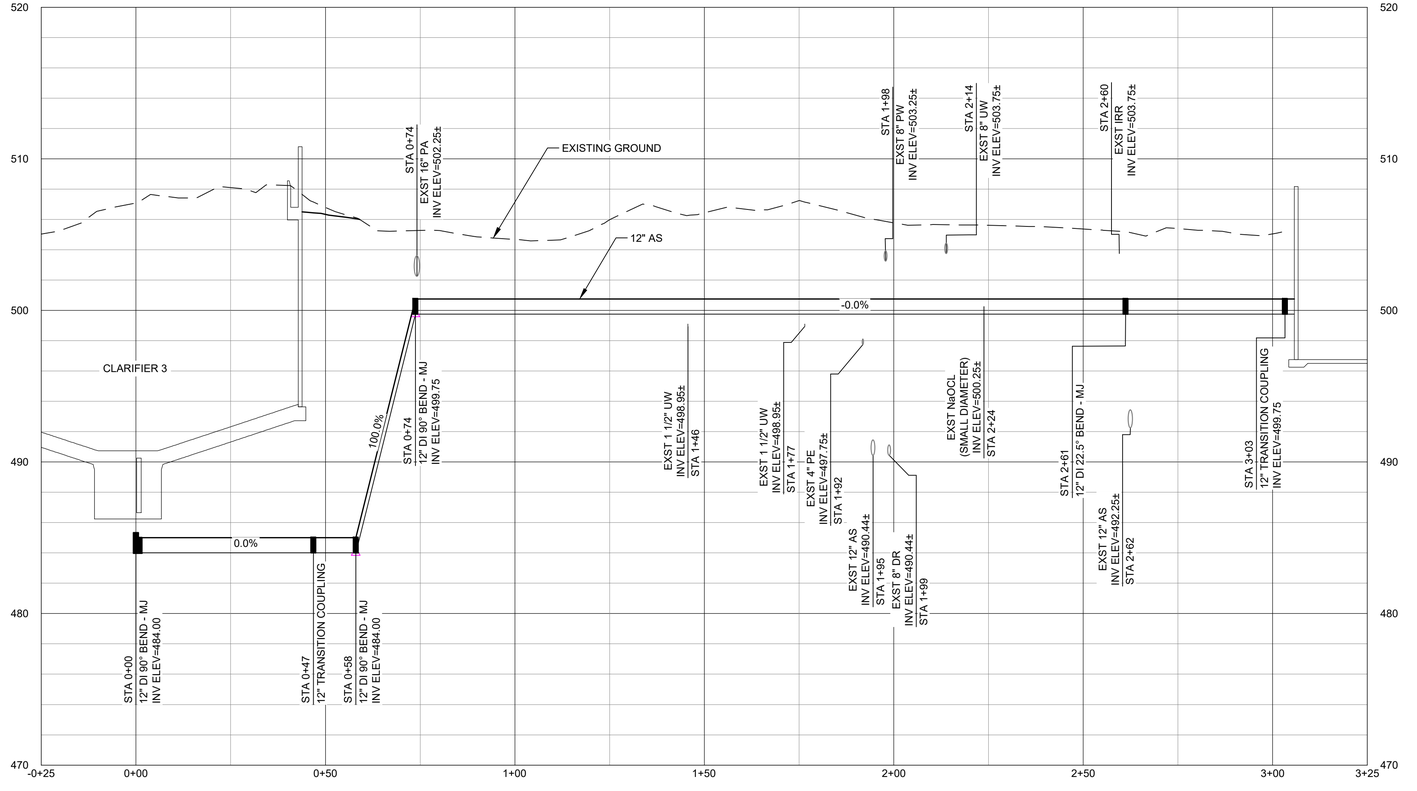


CLARIFIER 3 TO RAS PUMP STATION - 12" AS PIPE PLAN

HORIZ. SCALE IN FEET: 10 5 0 10 20

VERT. SCALE IN FEET: 5 2.5 0 5 10



CLARIFIER 3 TO RAS PUMP STATION - 12" AS PIPE PROFILE

GENERAL NOTES:

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
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3. ALL VALVES AND FITTINGS SHALL HAVE THRUST RESTRAINT IN ACCORDANCE WITH THE SPECIFICATIONS AND DETAILS ON G-3.
4. SEE M-DRAWINGS FOR PIPE ELEVATIONS AT STRUCTURES AND BUILDINGS.
5. SEE SECTION 09 90 00, PAINTING, FOR PIPING EXTERIOR COATING REQUIREMENTS.
6. REROUTE IRR AND UW AS NEEDED IF CONFLICTING WITH NEW PIPE. COORDINATE WITH CITY FOR FINAL LOCATION.

KEY NOTES:

1 EXISTING RAS AND AS PIPING IS SHOWN BASED ON AVAILABLE RECORD DRAWINGS. HOWEVER, ACTUAL ELEVATION AND LOCATION MAY VARY. CONTRACTOR SHALL FIELD VERIFY THE DEPTH AND LOCATION OF THESE PIPES PRIOR TO START OF CONSTRUCTION. NOTIFY ENGINEER IF ACTUAL PIPE LOCATIONS OR ELEVATIONS PRESENT CONFLICTS WITH THE ALIGNMENT FOR THE NEW AS PIPING SHOWN.

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DATE: 08/2025

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

AS PIPE PLAN AND PROFILE

Professional Engineer
STATE OF ARIZONA
67138
ULRIKE LASHLEY
Date Signed: 08-25-25
ARIZONA U.S.A.
Expires: Sept 30, 2027

DWG. NO. C-7

SHEET NO. 14 OF 60

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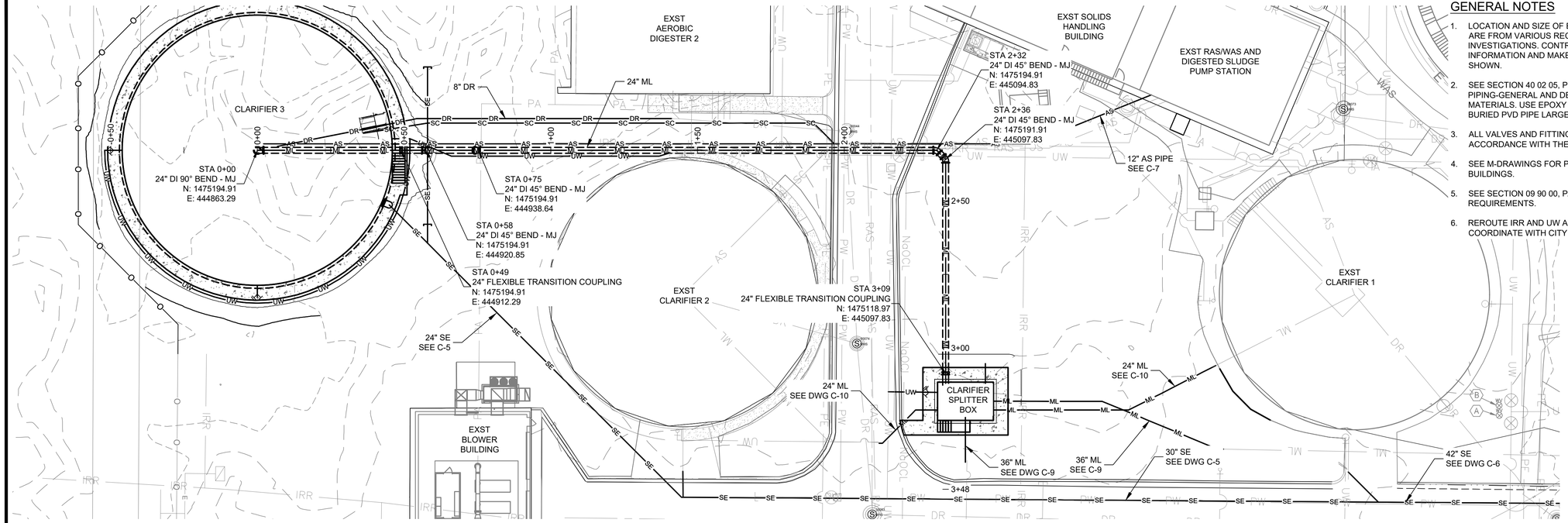

CLARIFIER SPLITTER BOX TO CLARIFIER 3 - 24" ML PIPE PLAN

GENERAL NOTES

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
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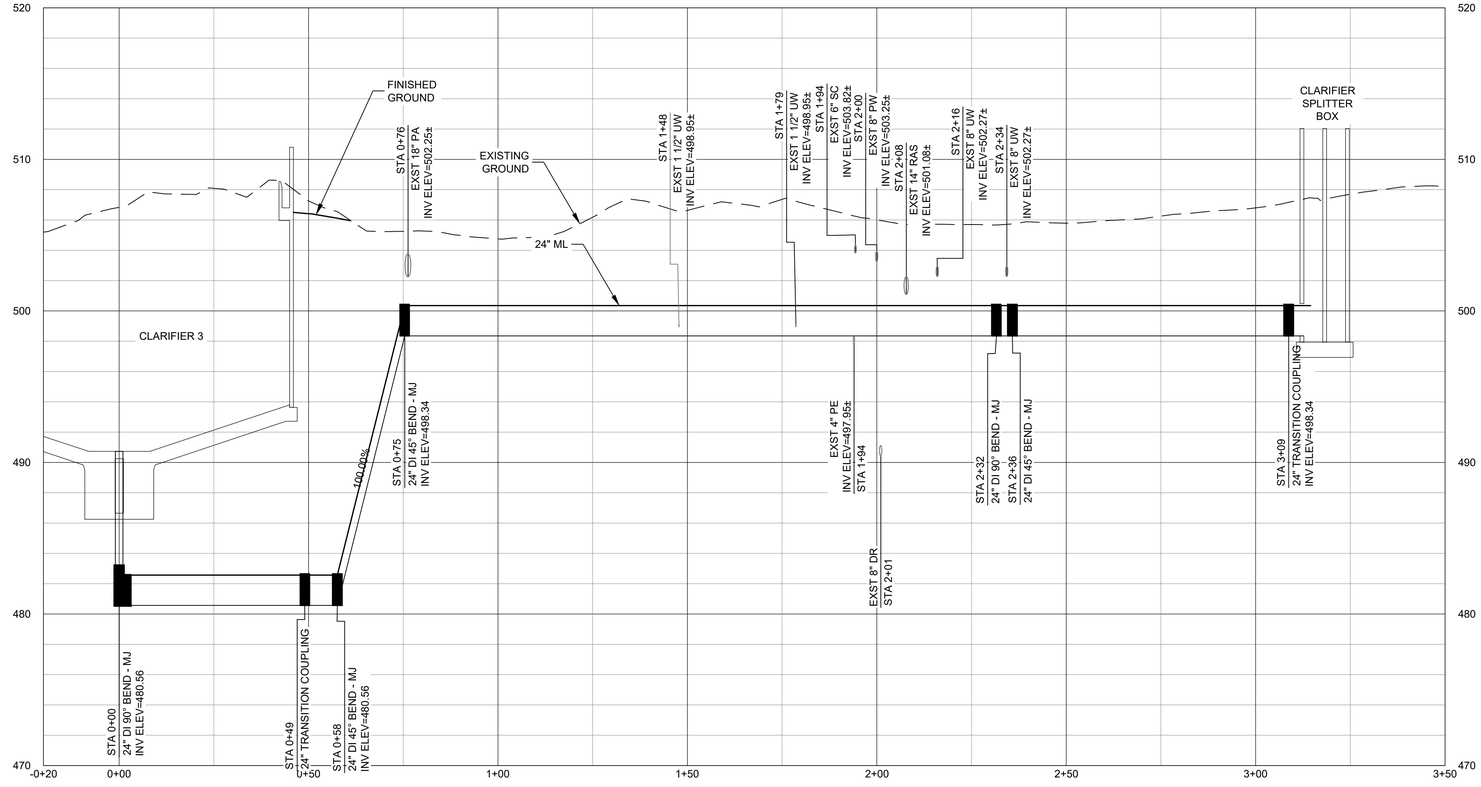
5. SEE SECTION 09 90 00, PAINTING, FOR PIPING EXTERIOR COATING REQUIREMENTS.
6. REROUTE IRR AND UW AS NEEDED IF CONFLICTING WITH NEW PIPE. COORDINATE WITH CITY FOR FINAL LOCATION.



CLARIFIER SPLITTER BOX TO CLARIFIER 3 - 24" ML PIPE PROFILE

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DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 ML PIPE PLAN AND PROFILE

Registered Professional Engineer
STATE OF ARIZONA
67138
ULRIKE LASHLEY
Date Signed: 08-25-25
ARIZONA, U.S.A.
Expires: Sept 30, 2027

DWG. NO. C-8

SHEET NO. 15 OF 60

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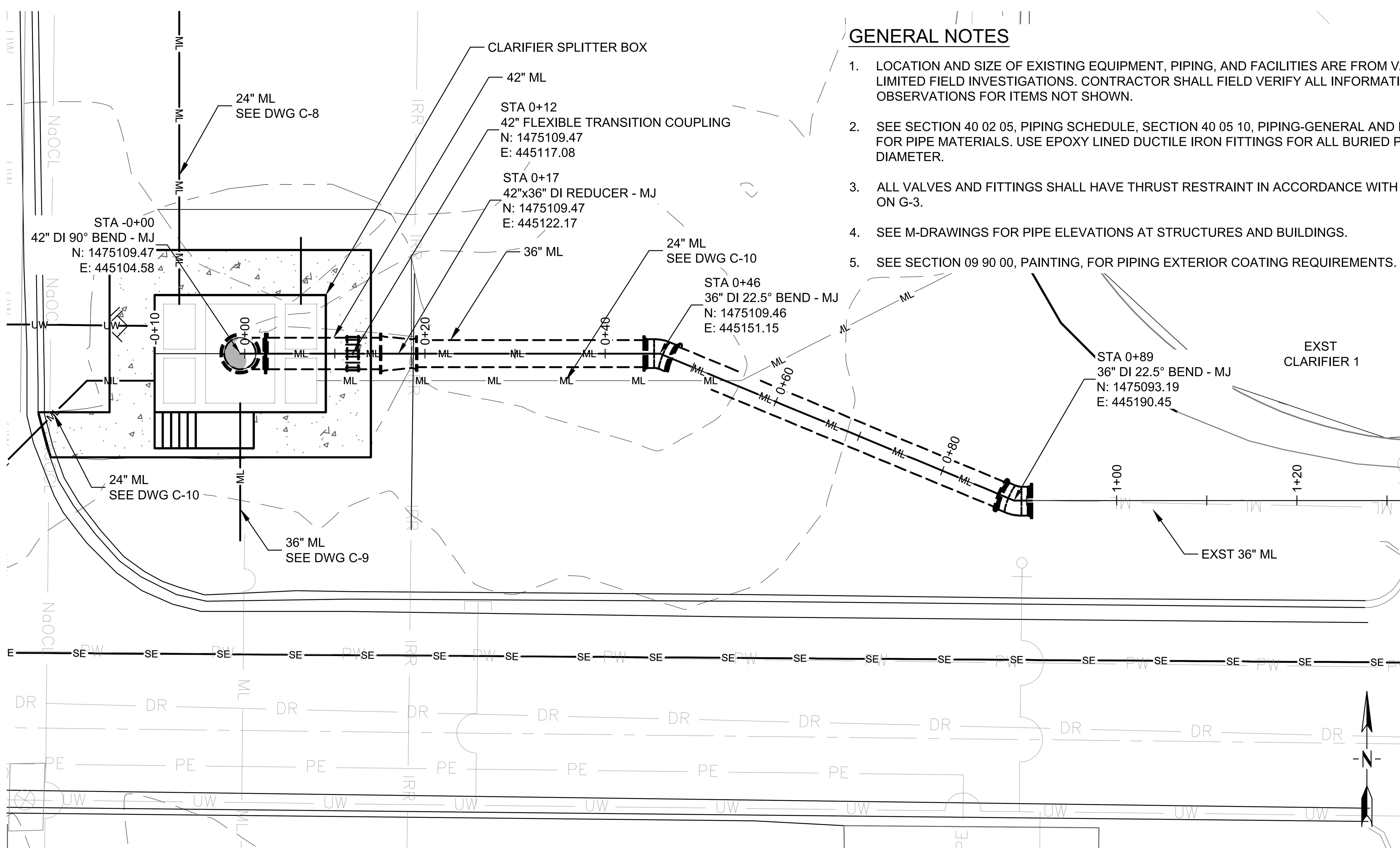

OXIDATION DITCH TO CLARIFIER SPLITTER BOX - 36" ML PIPE PLAN

HORIZ. SCALE IN FEET

VERT. SCALE IN FEET

GENERAL NOTES

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
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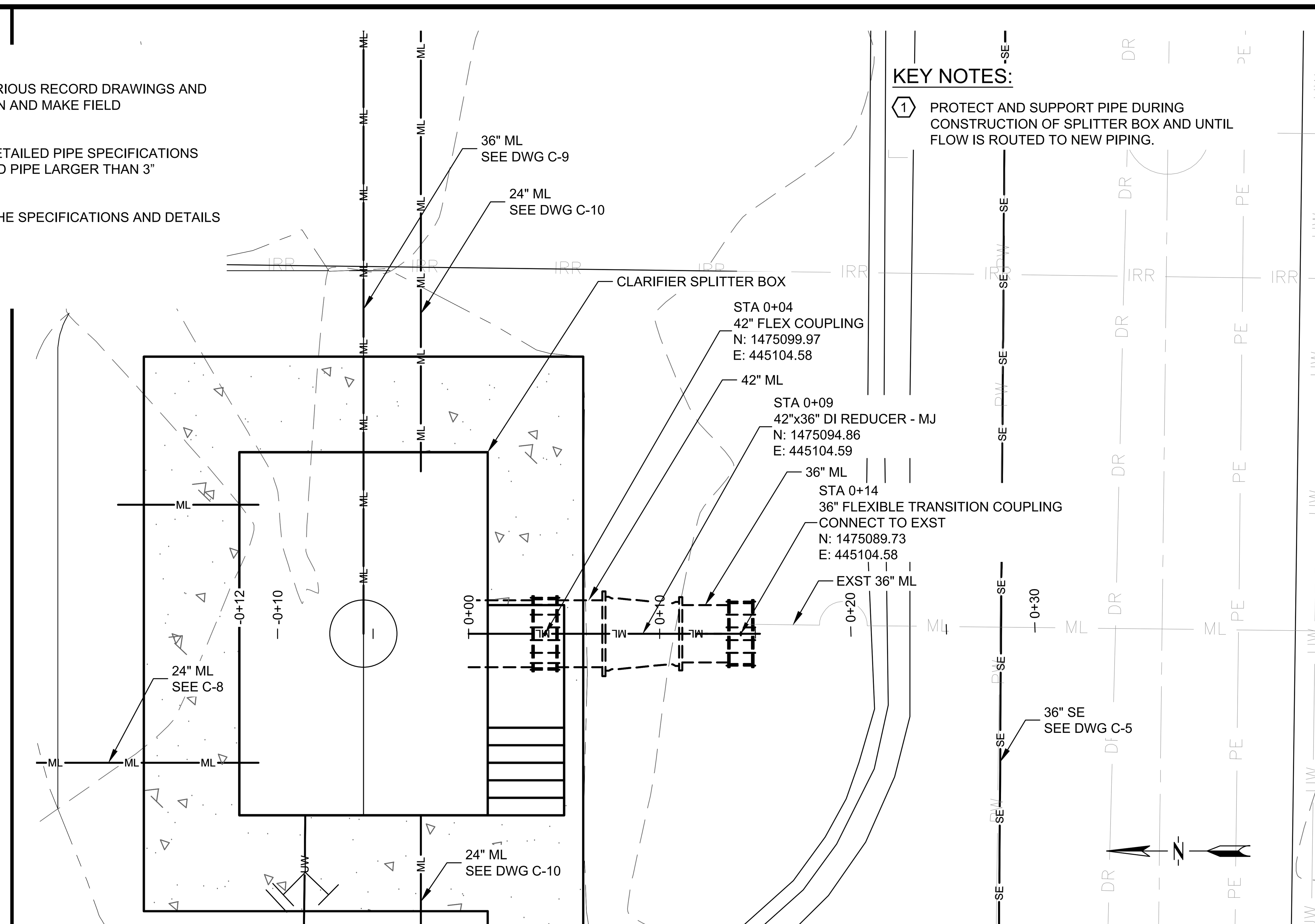


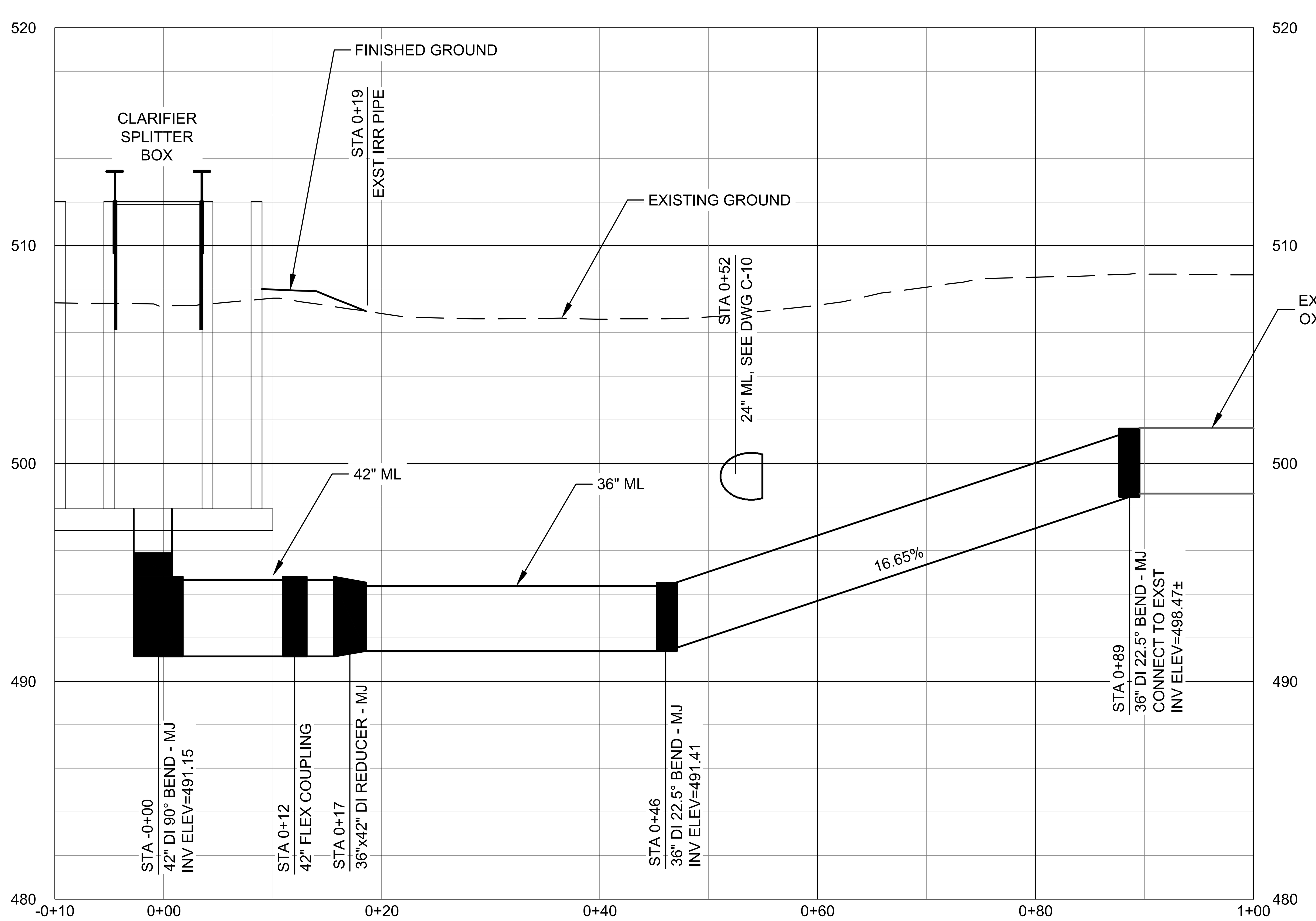
KEY NOTES:

1. PROTECT AND SUPPORT PIPE DURING CONSTRUCTION OF SPLITTER BOX AND UNTIL FLOW IS ROUTED TO NEW PIPING.

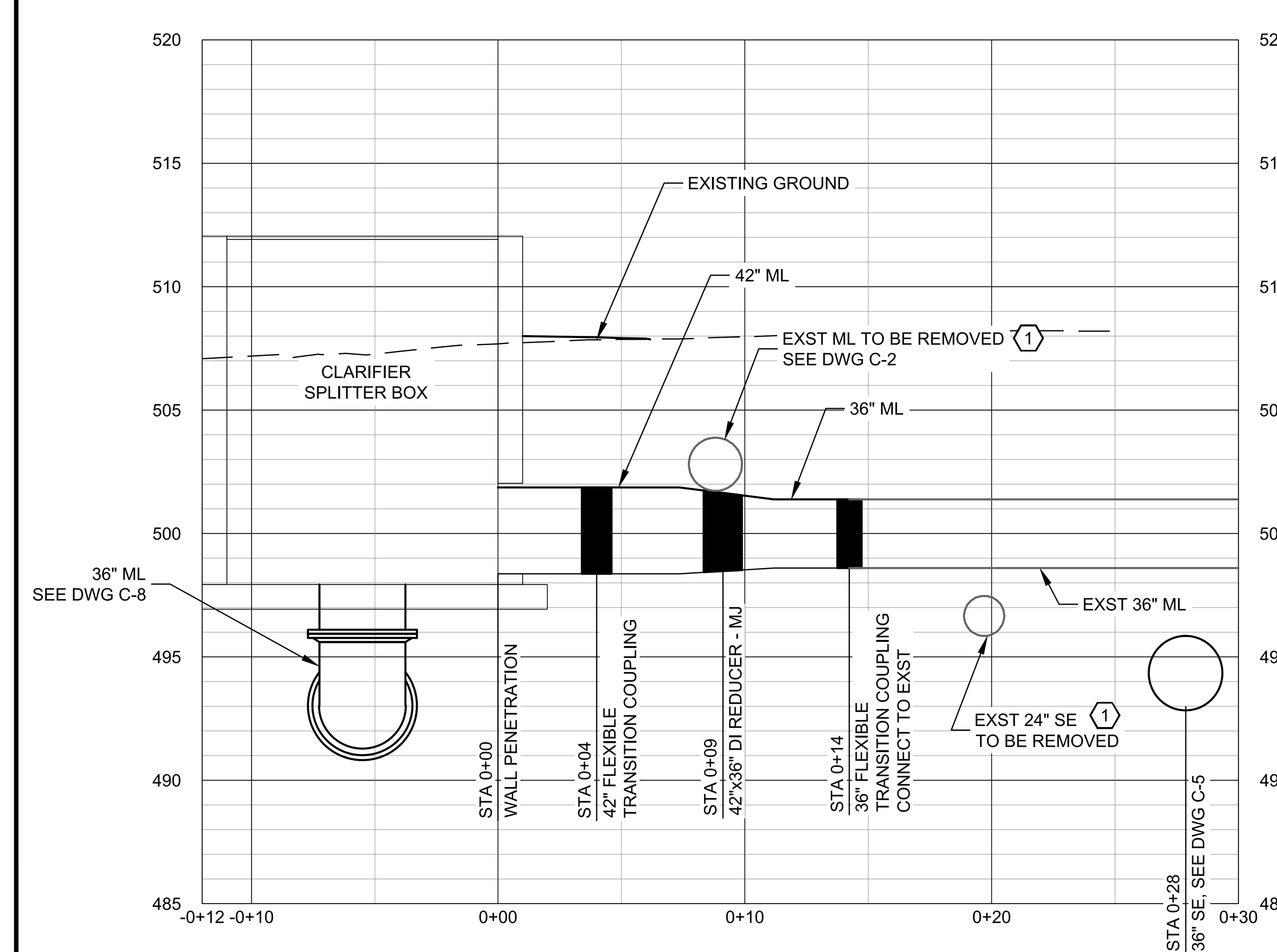
AERATION BASIN TO CLARIFIER SPLITTER BOX - 36" ML PIPE PLAN

HORIZ. SCALE IN FEET

VERT. SCALE IN FEET



OXIDATION DITCH TO CLARIFIER SPLITTER BOX - 36" ML PIPE PROFILE



AERATION BASIN TO CLARIFIER SPLITTER BOX - 36" ML PIPE PROFILE

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406.442.3050
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DESIGN: RL | DRAWN: DAH | CHECKED: JCM

DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

AERATION BASIN ML PIPE PLAN AND PROFILE

Professional Engineer 67132 ULRIKE LASHLEY ARIZONA, U.S.A. Expires: Sept 30, 2027

DWG. NO. C-9

SHEET NO. 16 OF 60

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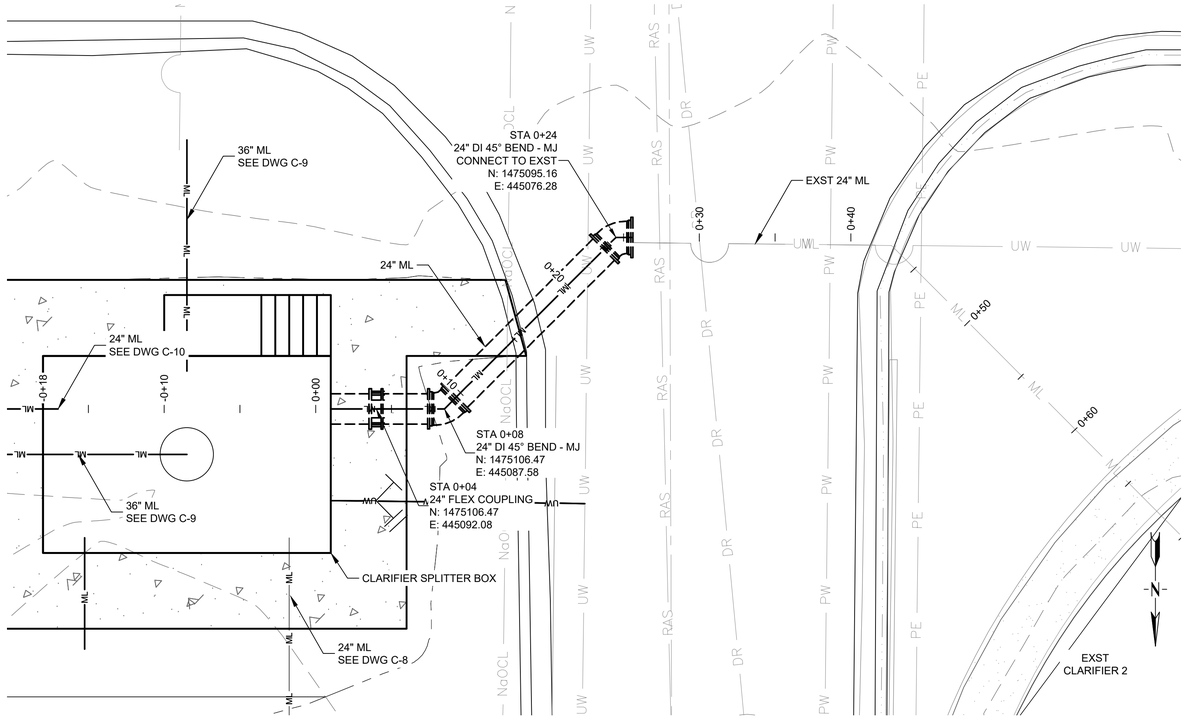
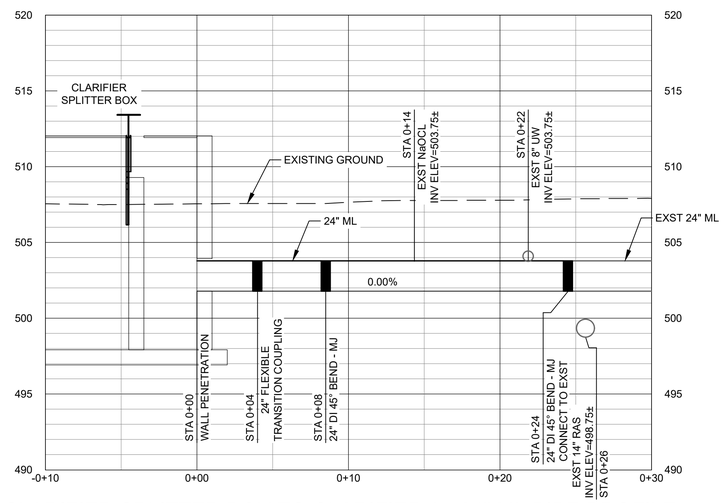


CLARIFIER SPLITTER BOX TO CLARIFIER 2 - 24" ML PIPE PLAN

5 2.5 0 5 10
HORIZ. SCALE IN FEET

5 2.5 0 5 10
VERT. SCALE IN FEET



CLARIFIER SPLITTER BOX TO CLARIFIER 2 - 24" ML PIPE PROFILE

GENERAL NOTES

1. LOCATION AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
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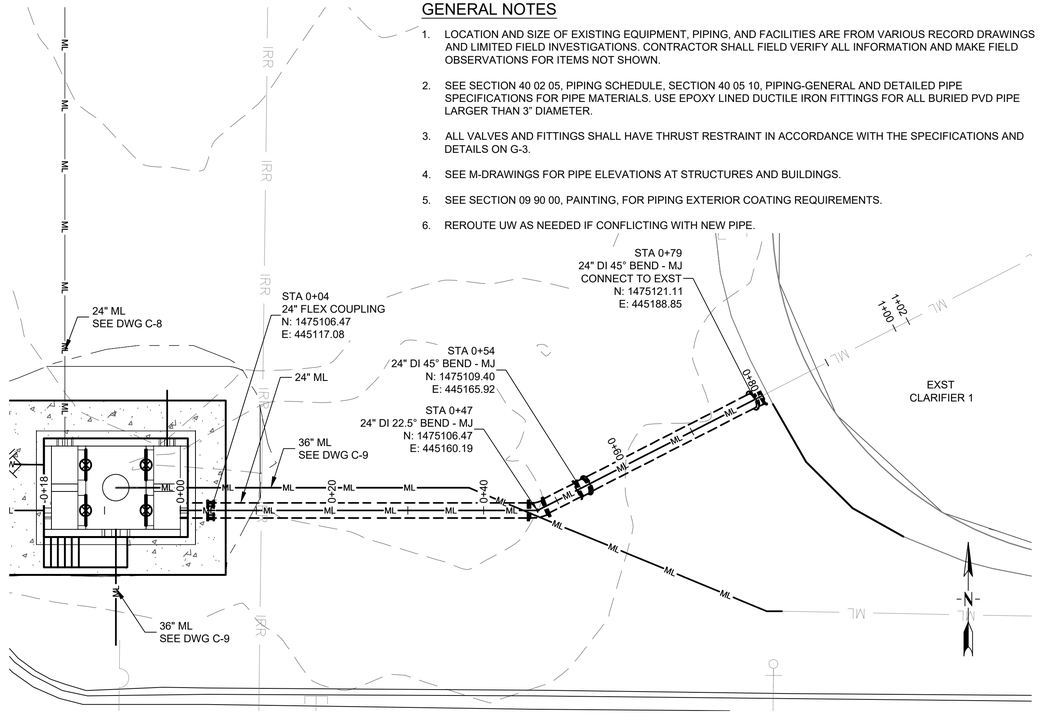
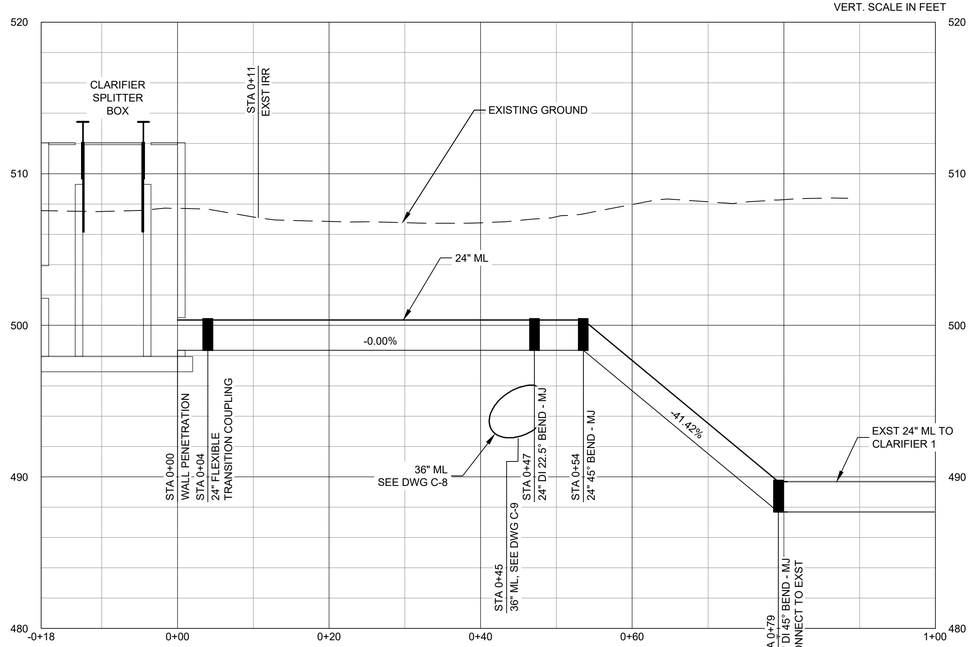
4. SEE M-DRAWINGS FOR PIPE ELEVATIONS AT STRUCTURES AND BUILDINGS.
5. SEE SECTION 09 90 00, PAINTING, FOR PIPING EXTERIOR COATING REQUIREMENTS.
6. REROUTE UW AS NEEDED IF CONFLICTING WITH NEW PIPE.



CLARIFIER SPLITTER BOX TO CLARIFIER 1 - 24" ML PIPE PLAN

10 5 0 10 20
HORIZ. SCALE IN FEET

5 2.5 0 5 10
VERT. SCALE IN FEET



CLARIFIER SPLITTER BOX TO CLARIFIER 1 - 24" ML PIPE PROFILE

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1 Engineering Place
Helena, MT 59602
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DESIGN: RL
DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 1 & 2 ML PIPE PLAN AND PROFILE

Registered Professional Engineer
STATE OF ARIZONA
67132
ULRIKE
LASHLEY
Date Signed: 08-25-25
ARIZONA U.S.A.
Certificate Expires: Sept. 30, 2027

DWG. NO. C-10

SHEET NO. 17 OF 60

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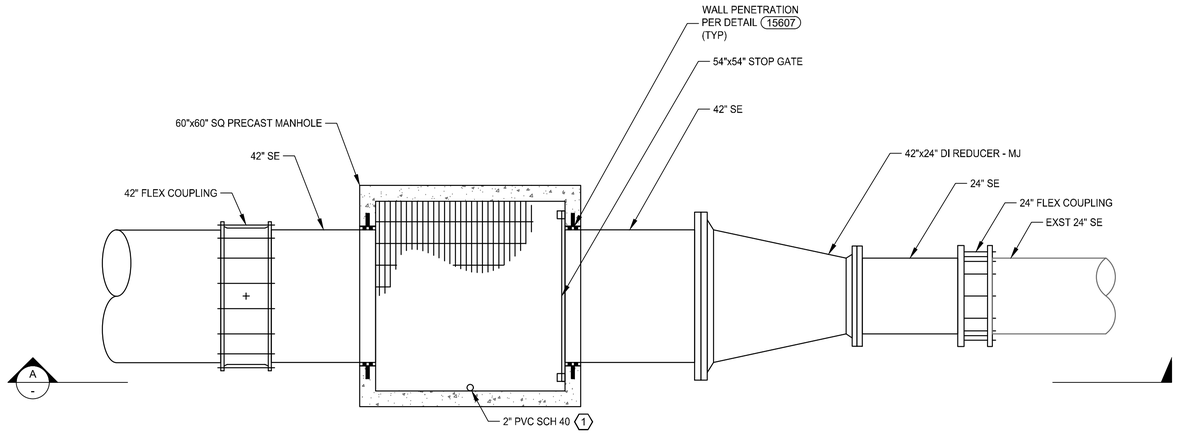
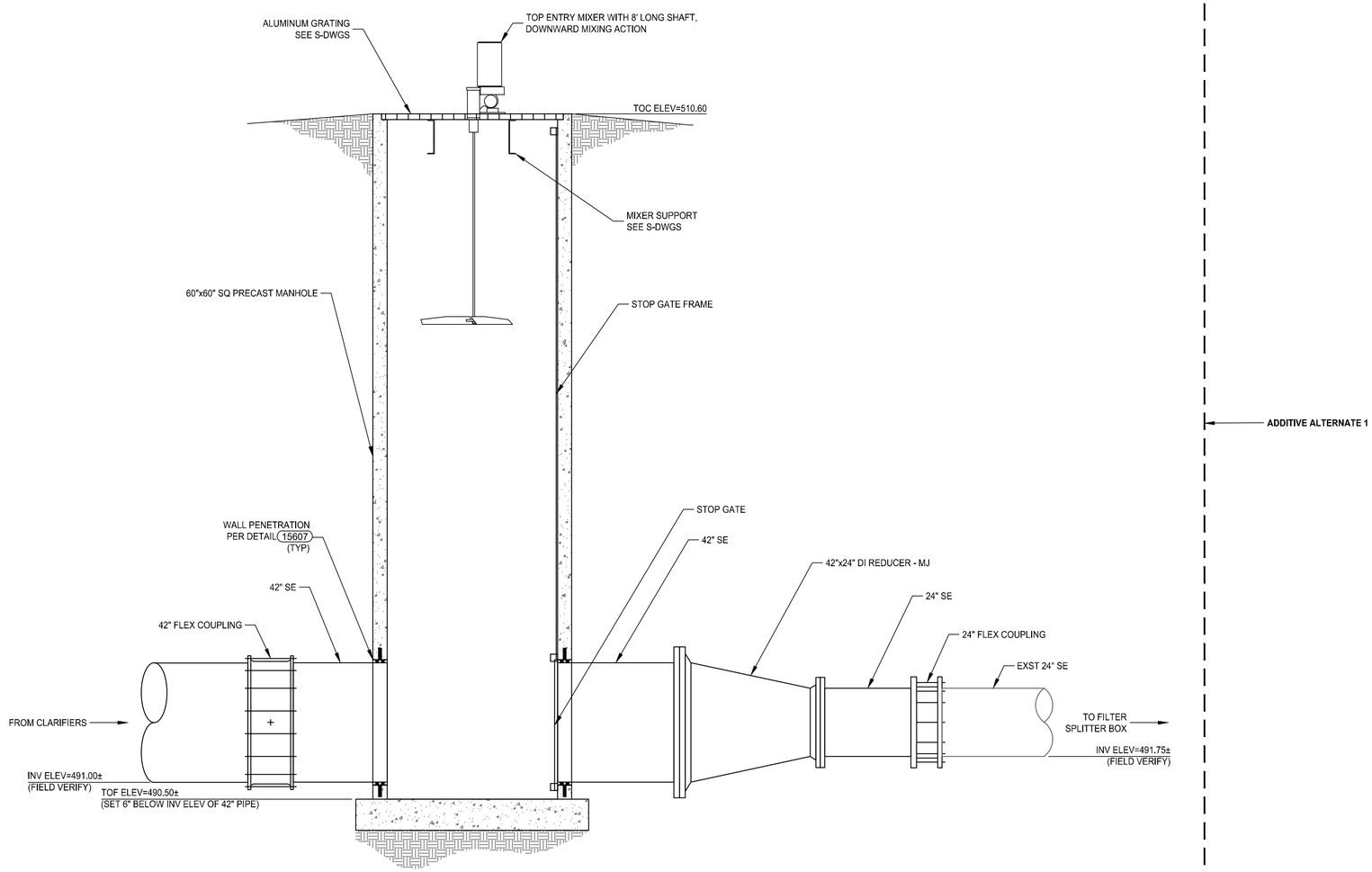


SE MANHOLE PLAN

SCALE: 1/2" = 1'-0"



A - SE MANHOLE SECTION

SCALE: 1/2" = 1'-0"

GENERAL NOTES

1. IF ADDITIVE ALTERNATE 1 IS NOT AWARDED, INSTALL ALUM MIXER SUPPORT IN CENTER PORTION OF THE NEW CLARIFIER SPLITTER BOX. COORDINATE WITH ENGINEER ON FINAL LOCATION.

KEY NOTES:

(1) MOUNT 2" PVC PIPE TO MANHOLE PER DETAIL 15500 SPACED AT 3'-0" OC. PIPE SHALL EXTEND FROM 2' ABOVE TOP OF 42" PIPE TO 6" BELOW THE GRATING.

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DESIGN: RL
DRAWN: DAH
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CHECKED: JCM

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

ADDITIVE ALTERNATE NO. 1
SE MANHOLE PLAN AND SECTION

Registered Professional Engineer
STATE OF ARIZONA
21736
ULRIKE
LASHLEY
Date Signed: 08-25-25
Expires: Sept. 30, 2027

DWG. NO. C-11

SHEET NO. 18 OF 60

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GENERAL:

1. THESE DRAWINGS HAVE BEEN PREPARED SOLELY FOR USE IN THE CONSTRUCTION OF CLARIFIER #3 AT THE LOCATION OF BULLHEAD CITY, ARIZONA POSSESSION OF THESE DRAWINGS DOES NOT GRANT A LICENSE TO CONSTRUCT OR FABRICATE THE WHOLE, OR PARTS OF THIS PROJECT IN OTHER LOCATIONS.

2. STRUCTURAL DRAWINGS ARE A PORTION OF THE CONTRACT DOCUMENTS AND ARE INTENDED TO BE USED WITH PROCESS, MECHANICAL, ELECTRICAL, AND SITE CIVIL DRAWINGS. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE REQUIREMENTS FROM THESE DRAWINGS INCLUDING BUT NOT LIMITED TO DIMENSIONS, BLOCKOUTS, OPENINGS, SLEEVES, EMBEDDED ITEMS, ETC. INTO THEIR SHOP DRAWINGS AND WORK. NOTIFY THE ARCHITECT/STRUCTURAL ENGINEER OF RECORD OF ANY DISCREPANCIES OR IF ACTUAL CONDITIONS DIFFER FROM THOSE SHOWN OR NOTED.

3. DO NOT SCALE OR RESIZE THE DRAWINGS IN ANY MANNER. ANY ADJUSTMENTS TO THE SIZE OR SCALE OF THE DRAWINGS MAY RESULT IN MISINTERPRETATION OF CRITICAL DIMENSIONS AND DETAILS.

4. THE STRUCTURAL DRAWINGS ARE INTENDED TO SHOW THE GENERAL CHARACTER AND EXTENT OF THE PROJECT AND ARE NOT INTENDED TO SHOW ALL DETAILS OF WORK. USE ENTIRE DETAIL SHEETS AND SPECIFIC DETAILS REFERENCED IN THE PLANS AS "TYPICAL" WHEREVER THEY APPLY. USE DETAILS ON ENTIRE SHEETS WITH "TYPICAL" IN THE NAME WHEREVER THEY APPLY.

5. WHERE DESCREPANCIES OCCUR BETWEEN THE GENERAL STRUCTURAL NOTES, SPECIFICATIONS, PLANS/DETAILS OR REFERENCE STANDARDS, THE ARCHITECT/ENGINEER SHALL DETERMINE WHICH SHALL GOVERN. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER BEFORE PROCEEDING WITH THE WORK. SHOULD ANY DISCREPANCY BE FOUND IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL INCLUDE IN THE PRICE THE MOST EXPENSIVE WAY OF COMPLETING THE WORK, UNLESS PRIOR TO THE SUBMISSION OF THE PRICE, THE CONTRACTOR ASKS FOR A DECISION FROM THE ARCHITECT AS TO WHICH SHALL GOVERN. CONFLICTS BETWEEN THE CONTRACT DOCUMENTS SHALL NOT BE A BASIS FOR ADJUSTMENT IN CONTRACT PRICE.

6. THE CONTRACTOR SHALL FURNISH THE PRODUCTS SPECIFIED ON THE DRAWINGS. SUBSTITUTIONS WILL BE CONSIDERED ONLY IF THE CONTRACTOR PROVIDES DOCUMENTATION TO PROVE THE ALTERNATIVE EQUALS OR EXCEEDS THE STRUCTURAL PERFORMANCE CHARACTERISTICS OF THE SPECIFIED PRODUCT.

7. **CODE REQUIREMENTS:**
   A. ALL WORK SHALL BE IN STRICT COMPLIANCE WITH:
      a. 2018 INTERNATIONAL BUILDING CODE (IBC)
      b. ALL OTHER STATE AND LOCAL BUILDING REQUIREMENTS THAT APPLY.

8. **TEMPORARY CONDITIONS:**
   A. THE STRUCTURAL DRAWINGS REPRESENT THE STRUCTURE IN THE FINAL CONSTRUCTED CONDITION, CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY SUPPORT PRIOR TO COMPLETION OF VERTICAL AND LATERAL LOAD SYSTEMS. MORRISON-MAIERLE HAS NOT BEEN RETAINED TO PROVIDE ANY SERVICES RELATED TO JOB SITE SAFETY PRECAUTIONS, OR TO REVIEW THE MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES FOR THE CONTRACTOR TO PERFORM WORK. UNLESS WE ARE SPECIFICALLY RETAINED AND COMPENSATED TO DO OTHERWISE, OUR WORK IS LIMITED TO THE FINAL DESIGN OF THE WORK DESCRIBED ON OUR DRAWINGS FOR THIS PROJECT.
   B. CONTRACTOR'S CONSTRUCTION AND/OR ERECTION SEQUENCES SHALL RECOGNIZE AND CONSIDER THE EFFECTS OF THERMAL MOVEMENTS OF STRUCTURAL ELEMENTS DURING THE CONSTRUCTION PERIOD.

1. **EXISTING CONDITIONS:**
   A. EXISTING BUILDING/SITE DIMENSIONS AND ASSUMED CONDITIONS ARE TO BE VERIFIED IN THE FIELD AND ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/STRUCTURAL ENGINEER OF RECORD OF ALL DISCREPANCIES WHICH REQUIRE A SIGNIFICANT CHANGE IN THE DESIGN AND/OR CONSTRUCTION FROM THAT SHOWN ON THE DRAWINGS.

2. **ASSUMED FUTURE CONSTRUCTION:**
   A. VERTICAL: NONE
   B. HORIZONTAL: NONE

DESIGN CRITERIA:

1. DESIGN IS BASED ON THE FOLLOWING LOADING FOR THE BASIS OF STRENGTH, PERFORMANCE, AND SERVICEABILITY OF THE STRUCTURE:

DESIGN CRITERIA

LIVE LOAD CRITERIA (IBC 1603.1.1)

FLOOR LIVE LOADS:	UNIFORM LOAD	CONCENTRATED LOAD
WALKWAYS AND ELEVATED PLATFORMS	100 PSF	N/A

ROOF LIVE LOAD CRITERIA (IBC 1603.1.2)

ORDINARY FLAT, PITCHED, CURVED	20 PSF	N/A

SNOW LOAD CRITERIA (IBC 1603.1.3)

DESIGN ROOF SNOW LOAD	20 PSF MINIMUM (SEE ROOF LIVE LOAD)
GROUND SNOW LOAD	Pg = 0 PSF

WIND LOAD CRITERIA (IBC 1603.1.4)

BASIC DESIGN WIND SPEED	V = 105 MPH
RISK CATEGORY	III
WIND EXPOSURE	C

SEISMIC LOAD CRITERIA (IBC 1603.1.5)

RISK CATEGORY	III	
SEISMIC IMPORTANCE FACTOR	Ie = 1.25	
MAPPED SPECTRAL RESPONSE	Ss = 0.238	S1 = 0.118
SITE CLASS	C	
DESIGN SPECTRAL RESPONSE	Sds = 0.207	Sd1 = 0.118
SEISMIC DESIGN CATEGORY	B	

GEOTECHNICAL CRITERIA (IBC 1603.1.6)

BASED ON REPORT BY	DMJM HARRIS DATED 08/07/2002 WITH ADDENDUMS	
DESIGN SOIL BEARING PRESSURE	1500 PSF (DL + LL)	2000 PSF (EL / WL INCLUDED)
RETAINING WALLS EQ. FLUID PRESSURE	35 PCF (ACTIVE)	55 PCF (AT REST)
PASSIVE BEARING PRESSURE	250 PSF/FT	
COEFFICIENT OF SLIDING FRICTION	0.3	

STRUCTURAL OBSERVATIONS:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE ENGINEER OF RECORD A MINIMUM OF 24 HOURS IN ADVANCE OF LISTED OBSERVATION STAGES BELOW. CONTRACTOR SHALL PROVIDE SUFFICIENT NOTICE AND ACCESS FOR THE OBSERVER. APPROVAL BY THE MUNICIPAL INSPECTOR DOES NOT PRECLUDE OBSERVATIONS BY THE ENGINEER OF RECORD AND APPROVAL BY THE ENGINEER OF RECORD DOES NOT PRECLUDE THE INSPECTION PROCESS BY THE MUNICIPAL INSPECTOR AND ANY OTHER CODE REQUIREMENTS FOR INSPECTION.

2. UPON COMPLETION OF WORK THE STRUCTURAL OBSERVER SHALL SUBMIT A REPORT TO THE OWNER AND BUILDING OFFICIAL ATTESTING TO THE VISUAL OBSERVATION MADE. THE REPORT SHALL IDENTIFY ANY REPORTED DEFICIENCIES WHICH HAVE NOT BEEN RESOLVED.

STRUCTURAL OBSERVATIONS

STAGE	COMMENTS
PRIOR TO FIRST CONCRETE POUR	AFTER REBAR PLACEMENT
COMPLETION OF STEEL ERECTION	
AS REQUIRED TO ADDRESS STRUCTURAL ISSUES	

EARTHWORK:

1. **GENERAL:**
   A. A GEOTECHNICAL INVESTIGATION AND REPORT HAS BEEN COMPLETED AS NOTED IN THE 'DESIGN CRITERIA'. REFER TO GEOTECHNICAL REPORT FOR RECOMMENDATIONS ON SITE PREPARATIONS, FILL SPECIFICATIONS AND SITE SPECIFIC CONSTRUCTION CONSIDERATIONS.

   B. STABILITY OF CONSTRUCTION EXCAVATION AND WORKER SAFETY ARE THE RESPONSIBILITY OF THE CONTRACTOR. BASED UPON THE GEOTECHNICAL REPORT, TEMPORARY CONSTRUCTION EXCAVATIONS, ABOVE GROUNDWATER, TO BE PLANNED IN ACCORDANCE WITH OSHA PROVISIONS SHOULD ASSUME TYPE B MATERIAL FOR STIFF CLAY, AND TYPE C MATERIAL FOR SAND.

   C. DO NOT EXCAVATE CLOSER THAN 2:1 SLOPE BELOW FOOTING EXCAVATIONS.

   D. ALL SLABS-ON-GRADE SHALL BEAR ON COMPACTED STRUCTURAL FILL OR COMPETENT NATIVE SOIL PER THE GEOTECHNICAL REPORT. ALL MOISTURE SENSITIVE SLABS-ON-GRADE OR THOSE SUBJECT TO RECEIVE MOISTURE SENSITIVE COATINGS OR COVERINGS SHALL BE PROVIDED WITH AN APPROPRIATE CAPILLARY BREAK AND VAPOR BARRIER OR RETARDANT OVER THE SUBGRADE PREPARED AND INSTALLED AS NOTED IN THE GEOTECHNICAL REPORT, BARRIER MANUFACTURER'S WRITTEN RECOMMENDATIONS AND COORDINATED WITH THE FINISHES SPECIFIED BY THE ARCHITECT.

STRUCTURAL STEEL

1. DESIGN, FABRICATION AND ERECTION OF STEEL MEMBERS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF AISC 360 *SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS* AND AISC 303 *CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES*., STRUCTURAL STEEL SHALL BE:

STRUCTURAL STEEL

SHAPE	MATERIAL SPECIFICATION AND GRADE
CHANNELS (C-SHAPES)	ASTM A36, GRADE 36
ANGLES (L-SHAPES)	ASTM A36, GRADE 36
HOLLOW STRUCTURAL SECTIONS (HSS)	ASTM A500, GRADE C
STRUCTURAL PIPES	ASTM A53, GRADE B
PLATES	ASTM A36, GRADE 36

2. BOLTS SHALL CONFORM TO THE ASTM AND RCSC SPECIFICATIONS FOR JOINTS USING GROUP A OR GROUP B HIGH STRENGTH BOLTS. BOLTS SHALL BE INSTALLED SNUG-TIGHT UNLESS NOTED OTHERWISE. WHERE SLIP CRITICAL IS SPECIFIED ON PLANS, ALL FAYING SURFACES SHALL BE PREPARED AS REQUIRED FOR CLASS A OR BETTER SLIP CRITICAL JOINTS. ALL BOLTS SPECIFIED AS SLIP CRICIAL AND UTILIZED IN SEISMIC FORCE RESISTING ELEMENTS SHALL BE FULLY TENSIONED.

3. ANCHOR RODS SHALL CONFORM TO ASTM F1554, GRADE 36 UNLESS NOTED OTHERWISE. ANCHOR RODS TO BE WELDED SHALL CONFORM TO ASTM F1554, GRADE 55. THREADED RODS SHALL CONFORM TO ASTM A36 UNLESS NOTED OTHERWISE.

4. WELDING SHALL CONFORM TO AWS D1.1, *STRUCTURAL WELDING CODE - STEEL* WITH PREQUALIFIED WELDING PROCESSES EXCEPT AS MODIFIED BY AISC 360 SECTION J2. WELDING SHALL BE COMPLETED BY AWS-CERTIFIED WELDERS.

5. WELDS SHALL BE MADE USING E70XX ELECTRODES FOR SHIELDED METAL ARC WELDING (SMAW) AND E71TX WIRE FOR FLUX-CORED ARC WELDING (FCAW) PROCESSES. FOR COMPLETE JOINT PENETRATION WELDS ASSOCIATED WITH MEMBER SPLICES AND CONNECTIONS NOT PART OF THE SEISMIC FORCE RESISTING SYSTEM, WELDS SHALL BE MADE WITH FILLER METAL THAT HAS A MINIMUM CVN TOUGHNESS OF 20 FT-LBS AT 40°F.

6. FIELD WELDING SYMBOLS HAVE NOT NECESSARILY BEEN INDICATED ON THE DRAWING. WHERE SHOWN, PROPER FIELD WELDING PER AWS SHALL BE USED. WHERE NO FIELD WELDING SYMBOLS ARE SHOWN, IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE USE OF SHOP AND FIELD WELDS.

7. ERECTION AIDS ARE TO BE DETERMINED AND PROVIDED BY THE CONTRACTOR. THE CONTRACTOR'S ERECTOR AND FABRICATOR SHALL COORDINATE THE TYPE AND QUANTITY OF ERECTION AIDS. THE CONTRACTOR IS SOLELY REPONSIBLE FOR ERECTION SEQUENCING, TEMPORARY BRACING, SAFETY OF WORKERS, AND OVERALL COMPLIANCE WITH APPLICABLE OSHA REQUIREMENTS.

8. PROVIDE WEEP HOLES AT EXTERIOR CLOSED SECTIONS WHERE MOISTURE MAY ACCUMULATE.

9. INTERIOR FRAMING THAT IS TO BE PAINTED SHALL HAVE A SHOP APPLIED PRIMER. EXTERIOR FRAMING SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 AND EXTERIOR FASTENERS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A153. REPAIR GALVANIZING AFTER ERECTION IS COMPLETE IN ACCORDANCE WITH ASTM A780.

CAST-IN-PLACE CONCRETE:

1. CONCRETE SHALL BE IN ACCORDANCE WITH ACI 301, *SPECIFICATION FOR STRUCTURAL CONCRETE*, AND ACI 117, *SPECIFICATION FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS*, UNLESS NOTED OTHERWISE.

2. AVERAGE CONCRETE STRENGTH DETERMINED BY JOB CAST LAB CURED CYLINDER PER ASTM C39 TO BE AS INDICATED BELOW PLUS INCREASE DEPENDING ON THE PLANT'S STANDARD DEVIATION AS SPECIFIED IN ACI 318. MINIMUM CONCRETE PROPERTIES SHALL BE AS FOLLOWS:

CONCRETE PROPERTIES

USE	FREEZE & THAW EXPOSURE	MIN COMPRESSIVE STRENGTH	TEST AGE DAYS	AIR CONTENT	MAX WATER TO CEMENT RATIO	MAX AGGERGATE SIZE
EXTERIOR FOOTINGS AND WALLS	F2	4,500 PSI	28	6% +/- 1.5%	0.45	1"
EXTERIOR SLABS ON GRADE	F1	4,500 PSI	28	4.5% +/- 1.5%	0.55	1"

3. THE CONTRACTOR SHALL SUBMIT CONCRETE MIX DESIGNS ALONG WITH TEST DATA A MINIMUM OF TWO WEEKS PRIOR TO PLACING CONCRETE. ADDITIONAL WATER SHALL NOT BE ADDED TO THE CONCRETE MIX AT THE JOBSITE UNLESS SPECIFICALLY NOTED IN THE MIX DESIGN.

4. SLEEVES, OPENINGS, CONDUITS AND OTHER EMBEDDED ITEMS IN SLABS SHALL NOT BE LARGER IN OUTSIDE DIMENSION THAN ONE THIRD OF THE THICKNESS OF THE SLAB AND SHALL NOT BE SPACED CLOSER THAN THREE DIAMETERS ON CENTER AND SHALL BE APPROVED BY THE EOR BEFORE POURING.

5. CURING OF CONCRETE SHALL COMPLY WITH ACI 308, UNLESS NOTED OTHERWISE.

6. WHERE CONCRETE IS PLACED AGAINST EXISTING CONCRETE, THE EXISTING CONCRETE SURFACE SHALL BE CLEANED AND ROUGHENED TO A MINIMUM 1/4" AMPLITUDE.

7. PROVIDE 3/4" CHAMFERS ON ALL EXPOSED CONCRETE CORNERS UNLESS NOTED OTHERWISE.

8. SHORING AND RESHORING DESIGN IS THE CONTRACTOR'S RESPONSIBILITY. SHORING FORMWORK SHALL NOT BE REMOVED FROM HORIZONTAL MEMBERS BEFORE CONCRETE STRENGTH IS AT LEAST 70 PERCENT OF DESIGN STRENGTH AS DETERMINED BY FIELD CURED CYLINDERS AND THE DURATION OUTLINED IN ACI 347.2 HAS BEEN SATISFIED.

9. CONSTRUCTION JOINT LOCATIONS FOR CONCRETE WORK ARE NOT SHOWN IN THE DRAWINGS. THE CONTRACTOR SHALL SUBMIT PROPOSED LOCATIONS FOR REVIEW AND APPROVAL PRIOR TO COMMENCING CONSTRUCTION OF THE JOINTS.

10. PROVIDE TOOLED OR SAW-CUT CONTROL JOINTS OR CONSTRUCTION JOINTS IN SLABS ON GRADE COMPLYING WITH THE FOLLOWING CRITERIA. THE CONTRACTOR SHALL SUBMIT CONTROL JOINT PLAN AT LEAST (7) DAYS PRIOR TO POURING THE SLABS WHERE THE JOINTS ARE NOT EXPLICITLY SPECIFIED BY THE ARCHITECT.
    A. JOINT SPACING SHALL NOT EXCEED 30 TIMES THE SLAB THICKNESS
    B. ASPECT RATIO OF SLAB PANELS SHALL BE MAXIMUM OF 1.5 TO 1.0; HOWEVER A RATIO OF 1.0 TO 1.0 IS PREFERRABLE
    C. JOINTS SHALL BE CONTINUOUS ACROSS INTERSECTING JOINTS, NOT STAGGERED OR OFFSET
    D. JOINTS SHALL EXTEND FROM ISOLATION JOINT AROUND COLUMNS AND WALLS

REINFORCING STEEL:

1. REINFORCING STEEL SHALL CONFORM TO THE FOLLOWING PROPERTIES:

REINFORCEMENT STEEL PROPERTIES

USE	REINFORCEMENT SIZE	SPECIFICATION
GENERAL USE	#7 & SMALLER	ASTM A615, GRADE 60

2. REINFORCING STEEL TO BE WELDED SHALL USE ONLY LOW HYDROGEN ELECTRODES. ALL WELDING TO BE IN COMPLIANCE WITH AWS D1.4. WELD REINFORCING STEEL ONLY WHERE INDICATED ON THE DRAWINGS. WELDING OR TACK WELDING OF REINFORCEMENT BARS TO OTHER BARS OR STEEL COMPONENTS IS PROHIBITED.

3. REINFORCING STEEL IN BEAMS AND SLABS SHALL BE SUPPORTED ON CONCRETE DOBBIES, OR APPROVED CHAIRS IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT. FABRICATE AND INSTALL REINFORCING STEEL ACCORDING TO THE MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES - ACI STANDARD 315.

4. CONTACT LAP ALL REINFORCING BARS PER THE TYPICAL LAP SPLICE LENGTH SCHEDULE, EXCEPT AS NOTED ON DRAWINGS. MECHANICAL SPLICES NOTED ON THE DRAWINGS SHALL BE DAYTON SUPERIOR BAR-LOCK OR APPROVED WITH A CURRENT ICC-ES OR IAPMO-ES EVALUATION REPORT.

GRADE 60 REINFORCING STEEL LAP SPLICE LENGTH AND DEVELOPMENT LENGTH

BAR SIZE	f'c = 3,000 PSI					f'c = 4,000 PSI					f'c = 5,000 PSI				
	MISC BARS		TOP BARS (SEE NOTE 3)		HOOK BARS	MISC BARS		TOP BARS (SEE NOTE 3)		HOOK BARS	MISC BARS		TOP BARS (SEE NOTE 3)		HOOK BARS
	Ld	LAP	Ld	LAP	Ldh	Ld	LAP	Ld	LAP	Ldh	Ld	LAP	Ld	LAP	Ldh
#3	17	22	22	28	9	15	19	29	25	8	13	17	17	22	7
#4	22	29	29	38	11	19	25	25	33	10	17	23	23	29	9
#5	28	36	36	47	14	24	31	31	41	12	22	28	28	36	11
#6	33	43	43	56	17	29	37	37	49	15	26	34	34	44	13

   A. ALL TABULATED VALUES ARE IN INCHES, FOR GRADE 60, UNCOATED REINFORING, NORMAL WEIGHT CONCRETE WITH CLEAR SPACING AND CLEAR COVER GREATER THAN THE BAR DIAMETER.
   B. IT SHALL BE PERMITTED TO INTERPOLATE BETWEEN CONCRETE STRENGTHS OR USE THE NEXT LOWER CONCRETE STRENGTH.
   C. TOP BARS ARE ANY HORIZ BAR PLACED SUCH THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE BAR IN ANY SINGLE POUR. HORIZ WALL BARS ARE CONSIDERED TOP BARS.
   D. LAP SPLICES ARE FOR NON-LATERAL LOAD RESISTING ELEMENTS. FOR REBAR LAPS SPLICES AT LATERAL LOAD RESISTING ELEMENTS, REFERENCE PLANS AND ELEVATIONS.
   E. Ld = DEVELOPMENT LENGTH IN TENSION OF DEFORMED BAR
      Ldh = DEVELOPMENT LENGTH IN TENSION OF DEFORMED BAR OR DEFORMED WIRE WITH A STANDARD HOOK
      LAP = LAP SPLICE LENGTH OF DEFORMED BAR OR DEFORMED WIRE

5. REINFORCING STEEL SHALL BE PROTECTED BY PLACING BARS WITH A MINIMUM COVER, UNLESS NOTED OTHERWISE.

REINFORCING STEEL CONCRETE COVER

USE	CLEAR COVER
SLABS	3/4"
WALLS (INTERIOR FACES)	3/4"
CONCRETE CAST AGAINST EARTH	3"
CONCRETE EXPOSED TO WEATHER OR EARTH	1-1/2" (FOR #5 OR SMALLER), 2" (FOR #6 AND LARGER)

6. PROVIDE DOWELS FROM FOOTINGS TO MATCH ALL VERTICAL WALL, PILASTER AND COLUMN REINFORCING. PROVIDE CORNER BARS TO MATCH HORIZONTAL REINFORCING IN WALLS AND FOOTINGS AT ALL CORNERS AND INTERSECTIONS. CONTINUE HORIZONTAL WALL BARS THROUGH PILASTERS COLUMNS AND INTERSECTING WALLS.

CONCRETE CONNECTORS:

1. STEEL HEADED STUD ANCHORS SHALL BE NELSON GRANULAR FLUX-FILLED HEADED STUDS OR PRIOR APPROVED EQUAL AND BE MANUFACTURED FROM ASTM A29-12 / A108, GRADES 1010-1020 COLD ROLLED CARBON STEEL WITH A MINIMUM TENSILE STRENGTH OF 60,000 PSI. DEFORMED BAR ANCHORS SHALL BE NELSON, TYPE D2L. STUDS AND DEFORMED BAR SHALL BE AUTOMATICALLY END WELDED WITH A STUD WELDING GUN TO FULLY DEVELOP THE CONNECTOR.

2. UNLESS A SPECIFIC ANCHOR PRODUCT IS NOTED IN THE DRAWINGS, POST-INSTALLED ANCHORS MAY USE ONE OF THE ANCHORS LISTED BELOW FOR THE REQUIRED TYPE.

POST INSTALLED CONCRETE ANCHORS

TYPE	PRODUCT	REPORT #
ADHESIVE ANCHORS & DOWELS	SIMPSON SET-3G	ICC-ES ESR-4057
	SIMPSON AT-XP	ICC-ES ESR-5026
	HILTI HIT-HY 200	ICC-ES ESR-3187
EXPANSION ANCHOR	SIMPSON STRONG-BOLT 2	ICC-ES ESR-3037
	HILTI KWIK BOLT TZ2	ICC-ES ESR-4266
SCREW ANCHOR	SIMPSON TITEN HD	ICC-ES ESR-2713
	HILTI KWIK HUS-EZ	ICC-ES ESR-3027

3. ALL ANCHORS SHALL BE INSTALLED IN STRICT CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND PRODUCT EVALUATION REPORTS.

4. EMBEDMENTS SPECIFIED ON DRAWINGS ARE "EFFECTIVE" EMBEDMENTS. REFERENCE MANUFACTURER LITERATURE FOR CORRESPONDING ACTUAL EMBEDMENT DEPTHS.

5. ANCHORS RODS EXPOSED TO EARTH OR WEATHER SHALL BE PROTECTED FROM CORROSION BY HOT-DIP GALVANIZING OR USE OF STAINLESS STEEL. POST INSTALLED EXPANSION AND SCREW ANCHORS EXPOSED TO EARTH OR WEATHER SHALL BE STAINLESS STEEL.

6. FOR POST-INSTALLED ANCHORS, LOCATE REINFORCEMENT AND CONFIRM FINAL ANCHOR LOCATIONS PRIOR TO FABRICATING PLATES, MEMBERS, OR OTHER STEEL ASSEMBLIES ATTACHED.

7. IF REINFORCEMENT IS ENCOUNTERED DURING DRILLING, ABANDON AND SHIFT THE HOLE LOCATION TO AVOID THE REINFORCEMENT. PROVIDE A MINIMUM OF (2) ANCHOR DIAMETERS OR 1 INCH, WHICHEVER IS LARGER, OF SOUND CONCRETE BETWEEN THE ANCHOR AND THE ABANDONED HOLE. FILL THE ABANDONED HOLE WITH NON-SHRINK GROUT. IF THE ANCHOR OR DOWEL MANY NOT BE SHIFTED AS NOTED ABOVE, SEEK GUIDANCE FROM THE STRUCTURAL ENGINEER OF RECORD.

8. SPECIAL INSPECTION OF ANCHOR INSTALLATION IS REQUIRED UNLESS SPECIFICALLY NOTED OTHERWISE IN DRAWINGS. SEE SPECIAL INSPECTION AND MATERIALS TESTING PROGRAM AND NOTES.

9. ALL ANCHOR BOLTS, HOLDDOWNS AND OTHER REQUIRED ACCESSORIES SHALL BE SECURED IN PLACE PRIOR TO INSPECTION AND CONCRETE PLACEMENT. DO NOT STAB THE ABOVE LISTED ITEMS INTO FRESH CONCRETE AFTER PLACEMENT. PROPERLY VIBRATE AROUND INSTALLED ITEMS TO ENSURE PROPER CONSOLIDATION OF CONCRETE.

CRACK INJECTION EPOXY REPAIR ADHESIVE:

1. EPOXY REPAIR ADHESIVE SHALL CONFORM TO ASTM C881 AND SHALL BE A TWO-COMPONENT, LIQUID EPOXY WITH NON-SAG CONSISTENCY AND A LONG POT LIFE. THE EPOXY ADHESIVE SHALL BE SUITABLE FOR USE ON DRY OR DAMP SURFACES. EPOXY SHALL MEET REQUIREMENTS OF A "TYPE IV" BONDING SYSTEM WITH A MINIMUM TENSILE STRENGTH OF 7,000 PSI. HOLE SIZES AND INSTALLATION SHALL BE IN STRICT ACCORDANCE WITH THE APPROVED EVALUATION REPORT REQUIREMENTS. DO NOT CUT REINFORCING IN NEW OR EXISTING CONCRETE DURING INSTALLATION.

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Morrison Maierle
engineers surveyors planners scientists

DESIGN: ETH
DRAWN: DAH
DATE: 08/2025
CHECKED:MJB

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

GENERAL STRUCTURAL NOTES

Professional Engineer (Civil) CERTIFICATE NO. 53501 MICHAEL J. BRENNAN Date Signed: 08-28-25 ARIZONA U.S.A. Expires: June 30, 2027

DWG. NO. S-1

SHEET NO. 19 OF 60

STATEMENT OF SPECIAL INSPECTION AND TESTING NOTES:

1. SPECIAL INSPECTIONS SHALL CONFORM TO SECTION 1705 OF THE 2021 IBC, CONTRACT DOCUMENTS AND APPROVED SUBMITTALS. REFER TO SPECIAL INSPECTION AND TESTING TABLES FOR PROJECT REQUIREMENTS.

2. SPECIAL INSPECTIONS AND ASSOCIATED TESTING SHALL BE PERFORMED BY AN APPROVED ACCREDITED INDEPENDENT AGENCY MEETING THE REQUIREMENTS OF ASTM E329 (MATERIALS). THE INSPECTION AND TESTING AGENCY SHALL FURNISH TO THE STRUCTURAL ENGINEER/ ARCHITECT A COPY OF THEIR SCOPE OF ACCREDITATION. SPECIAL INSPECTORS SHALL BE APPROVED BY THE BUILDING OFFICIAL. WELDING INSPECTORS SHALL BE QUALIFIED PER SECTION 6.1.4.1(1) OF AWS D1.1.

3. THE SPECIAL INSPECTOR SHALL OBSERVE THE INDICATED WORK FOR COMPLIANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS. ALL DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTOR FOR CORRECTION AND NOTED IN THE INSPECTION REPORTS. ISSUES REQUIRING IMMEDIATE CORRECTIVE ACTIONS OR ENGINEERING INPUT ARE TO BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY UPON DISCOVERY.

4. THE CONSTRUCTION OR WORK FOR WHICH SPECIAL INSPECTION IS REQUIRED SHALL REMAIN ACCESSIBLE AND EXPOSED FOR SPECIAL INSPECTION PURPOSES UNTIL COMPLETION OF THE REQUIRED SPECIAL INSPECTIONS.

5. THE SPECIAL INSPECTOR AND GEOTECHNICAL ENGINEER SHALL FURNISH INSPECTION REPORTS FOR EACH INSPECTION TO THE BUILDING OFFICIAL, STRUCTURAL ENGINEER, ARCHITECT, CONTRACTOR, AND OWNER. THE SPECIAL INSPECTION AGENCY SHALL SUBMIT A FINAL REPORT STATING THAT THE WORK REQUIRING SPECIAL INSPECTION WAS INSPECTED AND IS IN CONFORMANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS AND THAT ALL DISCREPANCIES NOTED IN THE INSPECTION REPORTS HAVE BEEN CORRECTED.

6. QUALITY ASSURANCE (QA) IS REQUIRED FOR STRUCTURAL STEEL ITEMS PER AISC 360 AND 341 UNLESS SPECIFICALLY NOTED OTHERWISE. QUALITY CONTROL (QC) TO BE PROVIDED BY THE FABRICATOR, ERECTOR OR OTHER RESPONSIBLE CONTRACTOR AS APPLICABLE. CONTRACTOR AND SPECIAL INSPECTOR TO DOCUMENT QUALITY CONTROL AS REQUIRED IN AISC 360 SECTION N3 AND AISC 341 SECTION J2

7. **INSPECTION TYPES:**
   - CONTINUOUS : THE FULL-TIME OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION BY AN APPROVED SPECIAL INSPECTOR WHO IS PRESENT IN THE AREA WHERE THE WORK IS BEING PERFORMED.
   - PERIODIC : THE PART-TIME OR INTERMITTENT OBSERVATION OF WORK REQUIRING SPECIAL INSPECTION BY AN APPROVED SPECIAL INSPECTOR WHO IS PRESENT IN THE AREA WHERE THE WORK HAS BEEN OR IS BEING PERFORMED AND AT THE COMPLETION OF THE WORK.
   - OBSERVE (O) : OBSERVE THESE FUNCTIONS ON A RANDOM, DAILY BASIS. OPERATIONS NEED NOT BE DELAYED PENDING OBSERVATIONS.
   - PERFORM (P) : INSPECTIONS SHALL BE PERFORMED PRIOR TO THE FINAL ACCEPTANCE OF THE ITEM.
   - DOCUMENT (D): INDICATES CONTRACTOR AND SPECIAL INSPECTOR TO PROVIDE DOCUMENTATION IN ACCORDANCE WITH AISC 341.

8. SPECIAL INSPECTION OF MECHANICAL POST INSTALLED ANCHORS SHALL BE IN STRICT CONFORMANCE WITH THE ICC REPORT AND MANUFACTURER'S INSTALLATION REQUIREMENTS. ANCHOR INSTALLERS SHALL BE QUALIFIED AS REQUIRED BY JURISDICTION REQUIREMENTS.
   - INSPECTION REPORTS SHALL IDENTIFY NAMES OF INSTALLERS.
   - SPECIAL INSPECTOR SHALL PROVIDE DOCUMENTATION AT THE END OF ANCHOR INSTALLATIONS STATING THAT THE ANCHORS WERE INSPECTED PER APPROVED ANCHOR EVALUATION REPORT.

9. EACH CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION OF THE MAIN WIND-OR SEISMIC-FORCE-RESISTING SYSTEM, DESIGNATED SEISMIC SYSTEM OR A WIND-OR SEISMIC- RESISTING COMPONENT LISTED IN THE TABLES SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE BUILDING OFFICIAL AND THE OWNER PRIOR TO THE COMMENCEMENT OF WORK ON THE SYSTEM OR COMPONENT. THE CONTRACTOR'S STATEMENT OF RESPONSIBILITY SHALL CONTAIN THE FOLLOWING
   - ACKNOWLEDGEMENT OF AWARENESS OF THE SPECIAL REQUIREMENTS CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS.
   - ACKNOWLEDGEMENT THAT CONTROL WILL BE EXERCISED TO OBTAIN CONFORMANCE WITH THE CONSTRUCTION DOCUMENTS APPROVED BY THE BUILDING OFFICIAL.
   - PROCEDURES FOR EXERCISING CONTROL WITHIN THE CONTRACTOR'S ORGANIZATION, THE METHOD AND FREQUENCY OF REPORTING AND DISTRIBUTION OF THE REPORTS.
   - IDENTIFICATION AND QUALIFICATIONS OF THE PERSON(S) EXERCISING SUCH CONTROL AND THEIR POSITION(S) IN THE ORGANIZATION.

GENERAL - SPECIAL INSPECTIONS

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY (NOTE 7)		REMARKS
			CONTINUOUS	PERIODIC	
DEFERRED SUBMITTALS				X	SPECIAL INSPECTION REQUIREMENTS FOR DEFERRED SUBMITTAL ITEMS, INCLUDING REQUIREMENTS FOR DESIGNATED SEISMIC SYSTEMS IN ACCORDANCE WITH IBC SECTION 1705.13.4 IF APPLICABLE, TO BE SPECIFIED BY THE SYSTEM ENGINEER AND INCLUDED WITH DEFERRED SUBMITAL DOCUMENTS.
SUBMITTALS TO THE BUILDING OFFICIAL	1704.5			X	CERTIFICATES OF COMPLIANCE, REPORTS OF PRE-CONSTRUCTION TESTS, OR REPORTS OF MATERIAL PROPERTIES SHALL BE SUBMITTED TO TH...
PRE-ENGINEERED STRUCTURES	1705.1.1	MBMA	X	X	REFER TO DEFERRED SUBMITTALS AND FABRICATORS REQUIREMENTS
FIBER-REINFORCED COMPOSITE SYSTEMS	1705.1.1	AC178		X	MATERIALS AND INSTALLATION SPECIAL INSPECTIONS PER ICC REPORT
POST INSTALLED ADHESIVE ANCHORS WITH SUSTAINED TENSION LOADS INSTALLED HORIZONTALLY OR AT AN UPWARD INCLINE IN HARDENED CONCRETE AND COMPLETED MASONRY			X		SPECIAL INSPECTION OF MECHANICAL POST INSTALLED ANCHORS SHALL BE IN STRICT CONFORMANCE WITH THE ICC REPORT AND MANUFACTURER'S INSTALLATION REQUIREMENTS. ANCHOR INSTALLERS SHALL BE QUALIFIED AS REQUIRED BY JURISDICTION REQUIREMENTS.INSPECTION - REPORTS SHALL IDENTIFY NAMES OF INSTALLERS.
POST INSTALLED MECHANICAL ANCHORS AND ADHESIVE ANCHORS (EXCLUDING CONDITIONS NOTED ABOVE) IN HARDENED CONCRETE AND COMPLETED MASONRY				X	

SOILS/GEOTECHNICAL - SPECIAL INSPECTIONS

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARDS REFERENCE	FREQUENCY (NOTE 7)		REMARKS
			CONTINUOUS	PERIODIC	
SOILS					
VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY	1705.6	GEOTECHNICAL REPORT		X	BY THE GEOTECHNICAL ENGINEER OR QUALIFIED SPECIAL INSPECTOR
VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL				X	
PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS				X	
DURING FILL PLACEMENT, VERIFY USE OF PROPER MATERIALS AND PROCEDURES IN ACCORDANCE WITH THE PROVISIONS OF THE APPROVED GEOTECHNICAL REPORT. VERIFY DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.			X		
PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY				X	

SOILS/GEOTECHNICAL - TESTING

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY (NOTE 7)		REMARKS
			CONTINUOUS	PERIODIC	
FILL IN-PLACE DENSITY OR PREPARED SUBGRADE DENSITY	1705.6	VARIES; GEOTECHNICAL REPORT OR MINIMUM PER IBC APPENDIX J107.5, WHICHEVER IS GREATER		X	BY THE GEOTECHNICAL ENGINEER OR QUALIFIED SPECIAL INSPECTOR
MATERIAL VERIFICATION		VARIES; CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS		X	BY THE GEOTECHNICAL ENGINEER OR QUALIFIED SPECIAL INSPECTOR

CONCRETE - SPECIAL INSPECTIONS

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY (NOTE 7)		REMARKS
			CONTINUOUS	PERIODIC	
GENERAL	1705.3 1901.6	ACI 318: 26.13			SPECIAL INSPECTIONS OF CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF SECTION 1705.3 OF THE IBC AND SECTION 26.13 OF ACI 318.
REINFORCING STEEL PLACEMENT	1901.5	ACI 318: CH. 20, 25.2, 25.3, 26.6.1-26.6.3		X	REINFORCING TO COMPLY WITH ALL CODE PROTECTION, SPACING AND TOLERANCE LIMITS.
INSPECT ANCHORS/BOLTS CAST IN CONCRETE	-	ACI 318:		X	ALL CAST-IN-PLACE ANCHORS/BOLTS SHALL BE VISUALLY INSPECTED. REFERENCE STEEL INSPECTIONS FOR ADDITIONAL INSTALLATION, MATERIAL AND WELDING INSPECTIONS OF STEEL ITEMS EMBEDDED IN CONCRETE (HEADED STUDS, DBA's, ETC.)
VERIFYING USE OF REQUIRED MIX DESIGN(S)	1904.1 1904.2 1908	ACI 318: CH. 19, 26.4.3, 26.4.4		X	
CONCRETE SPECIMENS FOR TESTING		ASTM C172 ASTM C31 ACI 318: 26.5, 26.12	X		PRIOR TO CONCRETE PLACEMENT, FABRICATE CONCRETE SPECIMENS FOR TESTING. SEE THE CONCRETE TESTING TABLE FOR ADDITIONAL INFORMATION.
CONCRETE PLACEMENT	1908	ACI 318: 26.5, 26.13.3.2(a)	X		
CONCRETE CURING	1908.1	ACI 318: 26.5.3 - 26.5.5		X	VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURES AND TECHNIQUES
ERECTION OF PRECAST MEMBERS		ACI 318: 26.9, 26.13.3.3		X	ALL CONNECTIONS VISUALLY INSPECTED. REFER TO ANCHOR BOLT AND WELDING REQUIREMENTS.
VERIFICATION OF FORMWORK		ACI 318: 26.11.1.2(b), 26.13.3.3		X	SPECIAL INSPECTIONS APPLY TO SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED

CONCRETE - TESTING

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY (NOTE 7)	REMARKS
CONCRETE STRENGTH	1705.3 ASTM C172 ASTM C31 ACI 318 26.12, ACI 318 26.5	ASTM C39	EACH 150 CY NOR LESS THAN EACH 5000 SF OF SLAB OR WALL PLACED EACH SHIFT	FABRICATE SPECIMENS AT TIME FRESH CONCRETE IS PLACED
CONCRETE SLUMP		ASTM C143		
CONCRETE AIR CONTENT		ASTM C231		
CONCRETE TEMPERATURE		ASTM C1064		

STEEL - TESTING

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY (NOTE 7)	REMARKS
STEEL				
ULTRASONIC (UT) TESTING OF WELDS	1705.2.1	AWS D1.1 6.13 & 6.14.3 AISC 341 N5.5	P (D)	- IN RISK CATEGORY III AND IV, ALL C.J.P. WELDS IN MATERIAL 5/16" AND THICKER SUBJECT TO TRANSVERSLY APPLIED TENSION. - IN RISK CATEGORY II, 10% OF C.J.P. WELDS IN MATERIAL 5/16" AND THICKER SUBJECT TO TRANSVERSLY APPLIED TENSION. - INCREASE OR DECREASE RATES PER AISC 341 N5.5E AND N5.5F
MAGNETIC PARTICLE (MT) TESTING OF WELDS	1705.2.1	AWS D1.1 6.14.4 AISC360 N5.5c	P (D)	- REQUIRED AT THERMALLY CUT ACCESS HOLES WHERE FLANGE THICKNESS EXCEEDS 2" FOR ROLLED SHAPES OR WHEN THE WEB THICKNESS EXCEEDS 2" FOR BUILT-UP SHAPES. - REQUIRED WHERE SPECIFICALLY NOTED ON DRAWINGS
PRE-CONSTRUCTION TESTING OF WELDING STUDS, WELDED REINFORCING BARS AND DBA'S	1705.2.1	AWS D1.1 7.7.1	EACH SIZE AND TYPE OF STUD/BAR EACH SHIFT	THIS TESTING PERFORMED BY CONTRACTOR AND CONFIRMED BY SPECIAL INSPECTOR
STUD/DBA APPLICATION QUALIFICATION	1705.2.1	AWS D1.1 7.6	NON-PREQUALIFIED APPLICATIONS	THIS TESTING PERFORMED BY CONTRACTOR AND CONFIRMED BY SPECIAL INSPECTOR

STEEL - SPECIAL INSPECTIONS

SYSTEM OR MATERIAL	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY (NOTE 7)		REMARKS
			CONTINUOUS/ PERFORM	PERIODIC/ OBSERVE	
CONTRACTOR QUALITY CONTROL REQUIREMENTS		AISC 360 CHAPTER N	X	X	CONTRACTOR TO PROVIDE QUALITY CONTROL FOR ALL ITEMS INDICATED TO BE OBSERVED AND/OR PERFORMED IN TABLE BELOW
STEEL FABRICATION					
FABRICATION OF STRUCTURAL ELEMENTS	1704.2.5.1	AISC 360		X	REFER TO INSPECTION OF FABRICATOR...
MATERIAL VERIFICATION OF STRUCTURAL STEEL COMPONENTS	1705.2	ASTM A6 ASTM STANDARDS SPECIFIED IN CONSTRUCTION DOCUMENTS AISC 360 A3.1 AISC 360 N2.1		X	CERTIFIED MILL TEST REPORTS
MATERIAL VERIFICATION OF ANCHOR BOLTS AND THREADED RODS		AISC 360 A3.4 AISC 360 N3.2 ASTM STANDARDS SPECIFIED IN CONSTRUCTION DOCUMENTS		X	MANUFACTURER'S CERTIFIED TEST REPORTS
MATERIAL VERIFICATION OF WELD FILLER METALS	1705.2.1.1 TABLE 1705.2-5	AISC 360 A3.5 AISC 360 N3.2APPLICABLE AWS A5 DOCUMENTS		X	MANUFACTURER'S CERTIFIED TEST REPORTS
PLACEMENT OF ANCHOR RODS AND OTHER EMBEDMENTS SUPPORTING STRUCTURAL STEEL: VERIFY THE DIAMETER, GRADE, TYPE, AND LENGTH OF THE ANCHOR ROD OR EMBEDDED ITEM AND THE EXTENT OR DEPTH OF EMBEDMENT INTO THE CONCRETE PRIOR TO PLACEMENT OF CONCRETE	1705.2	AISC N5.8		X	
INSPECT THE FABRICATED STEEL OR ERECTED STEEL FRAME TO VERIFY COMPLIANCE WITH THE DETAILS AS SHOWN ON THE CONSTRUCTIONS DOCUMENTS, SUCH AS BRACES, STIFFENERS, MEMBER LOCATIONS, AND PROPER APPLICATION OF JOINT DETAILS AT EACH CONNECTION	1705.2	AISCN5.8		X	
INSPECTION TASKS PRIOR TO WELDING					
WELDER QUALIFICATION RECORDS AND CONTINUITY RECORDS	1705.2	AISC TABLE N5.4-1		O	
WELDING PROCEDURE SPECIFICATIONS AVAILABLE			P		
MANUFACTURER CERTIFICATIONS FOR WELDING CONSUMABLES AVAILABLE			P		
MATERIAL IDENTIFICATION (TYPE/GRADE)				O	
WELDER IDENTIFICATION SYSTEM				O	
FIT-UP OF GROOVE WELDS (INCLUDING JOINT GEOMETRY): JOINT PREPARATION, DIMENSIONS (ALIGNMENT, ROOT OPENING, ROOT FACE, BEVEL), CLEANLINESS (CONDITION OF STEEL SURFACES), TACKING (TACK WELD QUALITY AND LOCATION), BACKING TYPE AND FIT (IF APPLICABLE)				O	
FIT-UP OF CJP GROOVE WELDS OF HSS T-, Y- AND K-JOINTS WITHOUT BACKING (INCLUDING JOINT GEOMETRY): JOINT PREPARATIONS, DIMENSIONS (ALIGNMENT, ROOT OPENING, ROOT FACE, BEVEL), CLEANLINESS (CONDITION OF STEEL SURFACES), TACKING (TACK WELD QUALITY AND LOCATION)				O	
CONFIGURATION AND FINISH OF ACCESS HOLES				O	
FIT-UP OF FILLET WELDS: DIMENSIONS (ALIGNMENT, GAPS AT ROOT), CLEANLINESS (CONDITION OF STEEL SURFACE), TACKING (TACK WELD QUALITY AND LOCATION)				O	
INSPECTION TASKS DURING WELDING					
CONTROL AND HANDLING OF WELDING CONSUMABLES: PACKAGING, EXPOSURE CONTROL	1705.2	AISC TABLE N5.4-2		O	
NO WELDING OVER CRACKED TACK WELDS				O	
ENVIRONMENTAL CONDITIONS: WIND SPEED WITHIN LIMITS, PRECIPITATION AND TEMPERATURE				O	
WPS FOLLOWED: SETTINGS ON WELDING EQUIPMENT, TRAVEL SPEED, SELECTED WELDING MATERIALS, SHIELDING GAS TYPE/FLOW RATE, PREHEAT APPLIED, INTERPASS TEMPERATURE MAINTAINED, PROPER WELDING POSITION				O	
WELDING TECHNIQUES: INTERPASS AND FINAL CLEANING, EACH PASS WITHIN PROFILE LIMITATIONS, EACH PASS MEETS QUALITY REQUIREMENTS				O	
PLACEMENT AND INSTALLATION OF STEEL HEADED STUD ANCHORS			P		
INSPECTION TASKS AFTER WELDING					
WELDS CLEANED	1705.2	AISC TABLE N5.4-3		O	
SIZE, LENGTH, AND LOCATION OF WELDS			P		
WELDS MEET VISUAL ACCEPTANCE CRITERIA: CRACK PROHIBITION, WELD/BASE-METAL FUSION, CRATER CROSS SECTION, WELD PROFILES, WELD SIZE, UNDERCUT, POROSITY			P		
ARC STRIKES			P		
WELD ACCESS HOLES IN ROLLED HEAVY SHAPES AND BUILT-UP HEAVY SHAPES			P		AFTER ROLLED HEAVY SHAPES (SEE SECTION A3.1c) AND BUILT-UP HEAVY SHAPES (SEE SECTION A3.1d) ARE WELDED, VISUALLY INSPECT THE WELD ACCESS HOLE FOR CRACKS
BACKING REMOVED AND WELD TABS REMOVED (IF REQUIRED)			P		
REPAIR ACTIVITIES			P		
DOCUMENT ACCEPTANCE OR REJECTION OF WELDED JOINT OR MEMBER			P		
NO PROHIBITED WELDS HAVE BEEN ADDED WITHOUT THE APPROVAL OF THE EOR				O	
INSPECTION TASKS PRIOR TO BOLTING					
MANUFACTURER'S CERTIFICATIONS AVAILABLE FOR FASTENER MATERIALS	1705.2	AISC 360 TABLE N5.6-1 AISC 360 M2.5	P		
FASTENERS MARKED IN ACCORDANCE WITH ASTM REQUIREMENTS				O	
PROPER FASTENERS SELECTED FOR THE JOINT DETAIL (GRADE, TYPE, BOLT LENGTH, IF THREADS ARE TO BE EXCLUDED FROM THE SHEAR PLANE)				O	
PROPER BOLTING PROCEDURE SELECTED FOR JOINT DETAIL				O	
CONNECTING ELEMENTS< INCLUDING THE APPROPRIATE FAYING SURFACE CONDITION AND HOLE PREPARATION, IF SPECIFIED, MEET APPLICABLE REQUIREMENTS				O	
PRE-INSTALLATION VERIFICATION TESTING BY INSTALLATION PERSONNEL OBSERVED AND DOCUMENTED FOR FASTENER ASSEMBLIES AND METHODS USED				O	
PROPER STORAGE PROVIDED FOR BOLTS, NUTS, WASHERS AND OTHER FASTENER COMPONENTS				O	
INSPECTION TASKS AFTER BOLTING					
DOCUMENT ACCEPTANCE OR REJECTION OF BOLTED CONNECTIONS	1705.2	AISC 360 TABLE N5.6-3	P		

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REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STATEMENT OF SPECIAL INSPECTIONS

Registered Professional Engineer (Civil)
CERTIFICATE NO.
53501
MICHAEL J. BRENNAN
Date Signed 08-21-25
ARIZONA, U.S.A.
Expires: June 30, 2027

DWG. NO. S-2

SHEET NO. 20 OF 60

SYMBOL/ANNOTATION	DESCRIPTION	SYMBOL/ANNOTATION	DESCRIPTION
	EARTH/SOIL HATCH		SLAB/DECK STEP
	GRANULAR FILL/GRAVEL HATCH		SLAB/DECK SLOPE TRANSITION
#	KEYED NOTE		NONSTRUCTURAL PARTITION WALL EXTENDING TO FLOOR ABOVE
1 S5.1	DETAIL CALLOUT (90 DEGREE ORIENTATION TO CURRENT VIEW) VIEW ORIENTED TOWARD ARROW		STEEL HATCH
2 S5.1	DETAIL CALLOUT (MATCHES ORIENTATION OF CURRENT VIEW) ENLARGED VIEW		SQUARE/RECTANGULAR HSS COLUMN
1 S4.1	ELEVATION CALLOUT		STEEL BEAM SIMPLE SHEAR CONNECTION TO COLUMN, UNLESS NOTED OTHERWISE
1 S4.1	SECTION CALLOUT		STEEL BEAM SIMPLE SHEAR CONNECTION TO BEAM, UNLESS NOTED OTHERWISE
TOF = 97' - 0 "	COMPONENT ELEVATION		CONCRETE HATCH
	SLAB/DECK/WALL OPENING		GROUT HATCH

STRUCTURAL ANNOTATIONS

#	NUMBER OR POUNDS
&	AND
@	AT
Ø	DIAMETER
AA	ADHESIVE ANCHOR
AB	ANCHOR BOLT
ABV	ABOVE
ACI	AMERICAN CONCRETE INSTITUTE
AD	ADHESIVE DOWEL
ADDL	ADDITIONAL
ADJ	ADJACENT
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AOR	ARCHITECT OF RECORD
APA	AMERICAN PLYWOOD ASSOCIATION
AR	ANCHOR ROD
ARCH	ARCHITECT
AS	ANGLE STRUT
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
AWS	AMERICAN WELDING SOCIETY
BLDG	BUILDING
BLKG	BLOCKING
BLW	BELOW
BM	BEAM
BO	BOTTOM OF
BOT	BOTTOM
BP	BASE PLATE
BRG	BEARING
BSMT	BASEMENT
BTWN	BETWEEN
BU	BUILT UP
C	CHANNEL
CANTL	CANTILEVER
CB	CARRIAGE BOLT
CC	CONCRETE COLUMN
CD	CONSTRUCTION DOCUMENTS
CDF	CONTROLLED DENSITY FILL
CFS	COLD FORMED STEEL
CG	CENTER OF GRAVITY
CIP	CAST IN PLACE
CJ	CONSTRUCTION/CONTROL JOINT
CJP	COMPLETE JOINT PENETRATION
CL	CENTERLINE
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUOUS/ CONTINUED
CONTR	CONTRACTOR
COORD	COORDINATE
CTR	CENTER
CTRD	CENTERED
D	PENNY (NAIL) OR DEPTH
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLITION
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DIST	DISTANCE
DL	DEAD LOAD
DWG	DRAWING
DWL	DOWEL
(E)	EXISTING
EA	EACH
EAP	ENGINEERED AGGREGATE PIER
EF	EACH FACE
EL	ELEVATION
ELEV	ELEVATOR
EMBED	EMBEDMENT
ENGR	ENGINEER
EOR	ENGINEER OF RECORD
EQ	EQUAL/ EQUALLY
EQUIP	EQUIPMENT
EW	EACH WAY
EXST	EXISTING
EXT	EXTERIOR
FDN	FOUNDATION
FLR	FLOOR
FO	FACE OF
FS	FOOTING STEP
FSTNR	FASTENER
FT	FEET
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GL	GLUE LAMINATED
GLB	GLUE LAMINATED BEAM
GR	GRADE
GR BM	GRADE BEAM
GSN	GENERAL STRUCTURAL NOTES
GYP	GYPSUM
H	HIGH
HD	HOLD-DOWN
HDR	HEADER
HG	WOOD BEAM HANGER
HGR	HANGER
HORIZ	HORIZONTAL
HSA	HEADED STUD ANCHOR
HSS	HOLLOW STRUCTURAL SECTION
HT	HEIGHT
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
INFO	INFORMATION
INT	INTERIOR
J	JOIST
JT	JOINT
K	KIP(S)
KSI	KIPS PER SQUARE INCH
L	ANGLE
2L	DOUBLE ANGLE
LBS	POUND
LD	DEVELOPMENT LENGTH
LF	LINEAR FEET
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LS	LAP SPLICE
M	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBR	MEMBER
MD	METAL DECK
MECH	MECHANICAL
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MEZZ	MEZZANINE
MF	MOMENT FRAME
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
ML	MASONRY LINTEL
MMI	MORRISON-MAIERLE INC
MP	MASONRY PIER
MTL	METAL
N	NORTH
(N)	NEW
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NLB	NONLOAD BEARING
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OPNG	OPENING
OPP	OPPOSITE
OWJ	OPEN WEB JOIST
PAF	POWER-ACTUATED FASTENERS
PAR	PARALLEL
PC	PIER CAP/CONCRETE PILE
PERP	PERPENDICULAR
PH	PHASE
PJP	PARTIAL JOINT PENETRATION
PL	PLATE
PLF	POUNDS PER LINEAR FOOT
PLYWD	PLYWOOD
PREFAB	PREFABRICATE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSL	PARALLEL STRAND LUMBER
PT	PRESSURE TREATED/POST TENSIONED
QA	QUALITY ASSURANCE
R/RAD	RADIUS
RD	ROUND
REBAR	REINFORCING STEEL BARS
REF	REFERENCE OR REFER TO
REINF	REINFORCE, REINFORCING
REQD	REQUIRED
REQT	REQUIREMENT
REV	REVISION
RO	ROUGH OPENING
RT	RIGHT
SA	SCREW ANCHOR
SC	SLIP CRITICAL
SCHED	SCHEDULE
SD	STEEL DECK
SF	SQUARE FEET
SHTHG	SHEATHING
SI	SQUARE INCH
SIM	SIMILAR
SIP	STRUCTURAL INSULATED PANEL
SL	SNOW LOAD
SMS	SHEET METAL SCREW
SOG	SLAB ON GRADE
SOMD	SLAB ON METAL DECK
SPEC	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
STIFF	STIFFENER
STL	STEEL
STRUCT	STRUCTURAL
SUB	SUBSTITUTE
T	TON
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
THRU	THROUGH
TO	TOP OF
TOB	TOP OF BEAM
TOC	TOP OF CONCRETE
TOD	TOP OF DECK/SHEATHING
TOF	TOP OF FOOTING
TOM	TOP OF MASONRY
TOS	TOP OF STEEL
TOW	TOP OF WALL
TRANS	TRANSVERSE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
URM	UNREINFORCED MASONRY
VERT	VERTICAL
VIF	VERIFY IN FIELD
W OR WF	WIDE FLANGE
W/	WITH
W/O	WITHOUT
WD	WOOD
WL	WIND LOAD
WLD	WELD/WELDED
WP	WORKING POINT
WSP	WOOD STRUCTURAL PANEL
WT	STRUCTURAL TEE
WWF	WELDED WIRE FABRIC

STRUCTURAL ABBREVIATIONS

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CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STRUCTURAL ABBREVIATIONS & SYMBOLS

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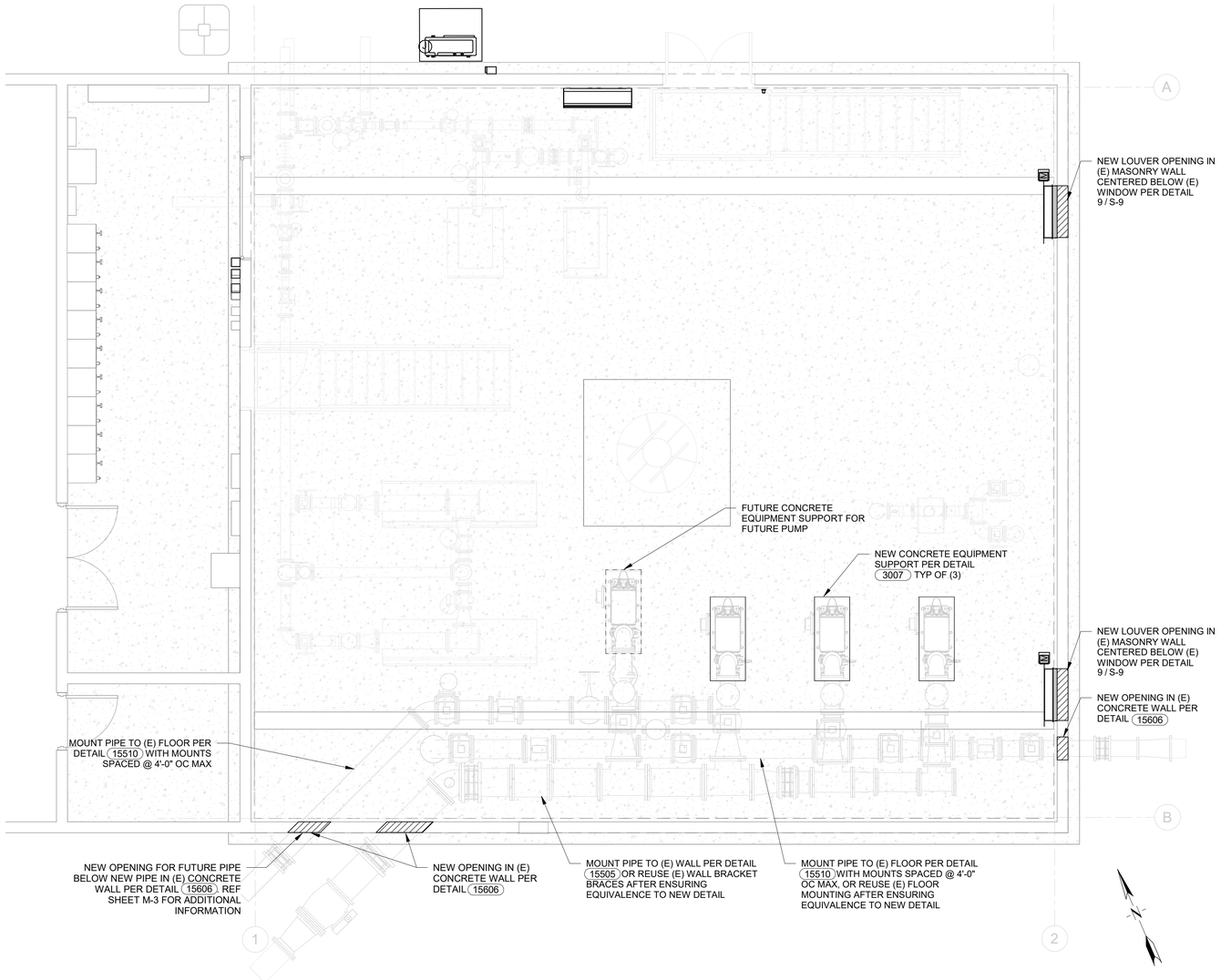
DWG. NO. S-3

SHEET NO. 21 OF 60



1 RAS/WAS ROOM PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. REFER TO THE GENERAL NOTES FOR ADDITIONAL REQUIREMENTS.
2. REFER TO THE DRAWING ANNOTATIONS & SYMBOLS FOR EXPLANATION OF DRAWING CONVENTIONS.
3. REFER TO THE STRUCTURAL DETAILS AND THE SD SERIES OF DRAWINGS FOR TYPICAL DETAILS. TYPICAL DETAILS ARE NOT NECESSARILY REFERENCED BY CALLOUTS ON PLAN; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW THE REQUIREMENTS OF THE DETAILS AT THE LOCATION AT WHICH THEY OCCUR.
4. COORDINATE THE FOLLOWING ITEMS WITH DRAWINGS OF OTHER DISCIPLINES:
   - SIZES AND LOCATIONS OF OPENINGS AND PENETRATIONS THROUGH WALLS AND FLOORS; SEE PROCESS, CIVIL, ELECTRICAL, MECHANICAL, AND PLUMBING DRAWINGS.
   - EXTERIOR CONCRETE, INCLUDING SLABS AND SITE RETAINING WALLS; SEE CIVIL DRAWINGS
   - LOCATION, SIZE, AND ANCHORAGE OF PROCESS, ELECTRICAL, MECHANICAL, AND PLUMBING EQUIPMENT; SEE PROCESS, ELECTRICAL, MECHANICAL, AND PLUMBING DRAWINGS.
5. SEE H DRAWINGS FOR LOUVER AND LOCATIONS AND DIMENSIONS

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REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM PLAN & DETAILS

Registered Professional Engineer (Civil)
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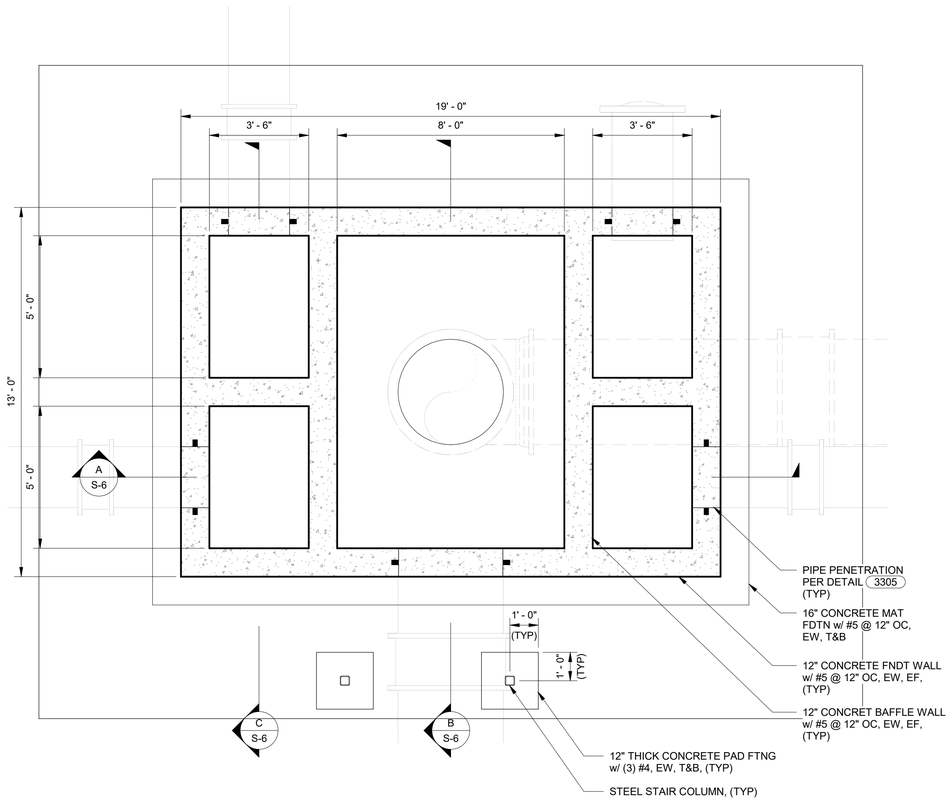
Expires June 30, 2027

DWG. NO. S-4

SHEET NO. 22 OF 60

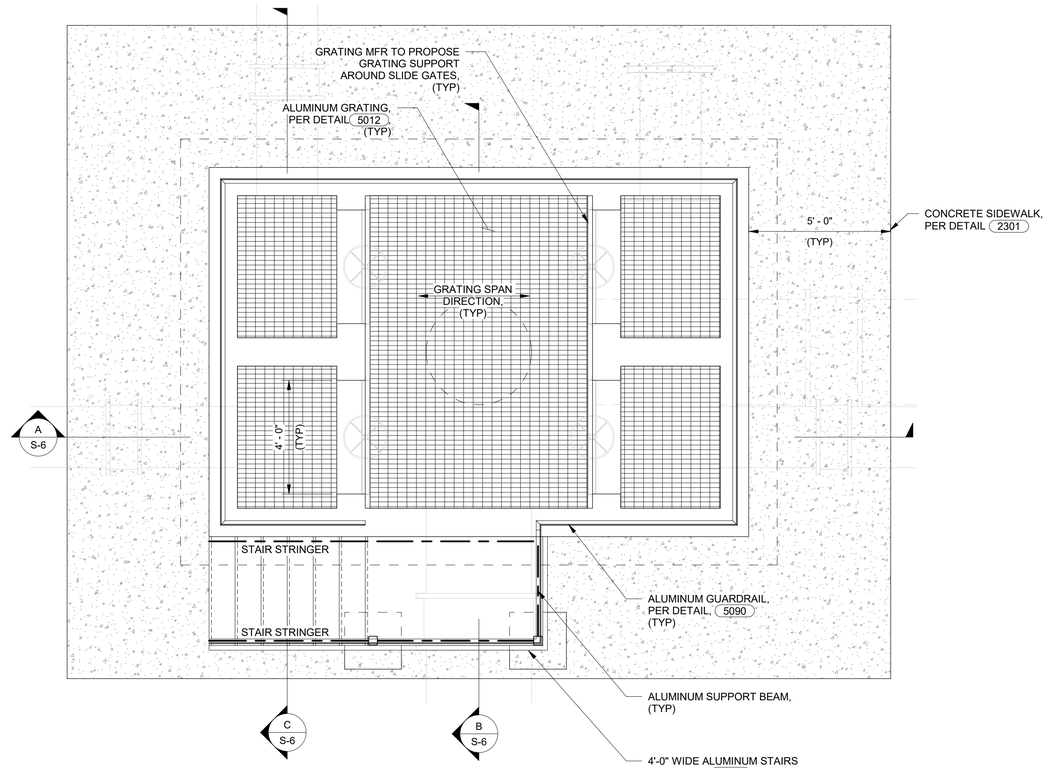
GENERAL NOTES:

1. REFER TO THE GENERAL STRUCTURAL NOTES FOR ADDITIONAL REQUIREMENTS.
2. REFER TO THE DRAWING ANNOTATIONS & SYMBOLS FOR EXPLANATION OF DRAWING CONVENTIONS.
3. REFER TO THE STRUCTURAL DETAILS AND THE SD SERIES OF DRAWINGS FOR TYPICAL DETAILS. DETAILS ARE NOT NECESSARILY REFERENCED BY CALLOUTS ON PLAN; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW THE REQUIREMENTS OF THE DETAILS AT THE LOCATION AT WHICH THEY OCCUR.
4. COORDINATE THE FOLLOWING ITEMS WITH DRAWINGS OF OTHER DISCIPLINES:
   - SUBGRADE PREPARATION REQUIREMENTS BELOW FOOTINGS AND SLABS ON GRADE AND BACKFILL REQUIREMENTS BEHIND RETAINING WALLS, SEE THE PROJECT GEOTECHNICAL INFORMATION.
   - SIZES AND LOCATIONS OF OPENINGS AND PENETRATIONS THROUGH WALLS AND FLOORS; SEE PROCESS, CIVIL, ELECTRICAL, MECHANICAL, AND PLUMBING DRAWINGS.
   - EXTERIOR CONCRETE, INCLUDING SLABS AND SITE RETAINING WALLS; SEE CIVIL DRAWINGS.
   - LOCATION , SIZE, AND ANCHORAGE OF PROCESS, ELECTRICAL, MECHANICAL, AND PLUMBING EQUIPMENT; SEE PROCESS, ELECTRICAL, MECHANICAL, AND PLUMBING DRAWINGS.
5. CONSTRUCTION JOINT LOCATIONS FOR CONCRETE WORK ARE NOT SHOWN. THE CONTRACTOR SHALL SUBMIT PROPOSED LOCATIONS FOR REVIEW AND APPROVAL.
6. LOCATIONS OF SLAB ON GRADE CONTROL JOINTS ARE NOT SHOWN. THE CONTRACTOR SHALL SUBMIT A DETAILED LAYOUT OF PROPOSED JOINT LOCATIONS AT LEAST (7) DAYS PRIOR TO SLAB PLACEMENT FOR REVIEW AND APPROVAL.
7. SEE DETAIL 3305 FOR REINFORCEMENT AT OPENINGS IN CONCRETE WALLS AND SLABS.
8. ALUMINUM STAIR, HANDRAIL, AND ASSOCIATED CONNECTION DESIGN BY OTHERS, TYPE DETAILS WITHIN FOR REFERENCE OF ASSUMED CONNECTION TYPES, LAYOUT, ETC.
9. SEE DETAIL 3400 FOR TYPICAL WALL BASE CONSTRUCTION JOINT REQUIREMENTS.
10. IF ADDITIVE ALTERNATE 1 IS NOT AWARDED, INSTALL MIXER SUPPORT SHOWN ON DWG S-9 (FOUR ALUMINUM CHANNELS) IN THE CENTER PORTION OF THE NEW SPLITTER BOX. NECESSARY MODIFICATIONS WILL BE HANDLED THROUGH THE SUBMITTAL PROCESS.



CLARIFIER SPLITTER BOX FOUNDATION PLAN

SCALE: 3/8" = 1'-0"



SPLITTER BOX FLOOR PLAN

SCALE: 3/8" = 1'-0"

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Place Helena, MT
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Morrison Maierle
engineers surveyors planners scientists

DESIGN: ETH
DRAWN: DAH
DATE: 08/2025
CHECKED:MJB

REVISION	DATE	DESCRIPTION

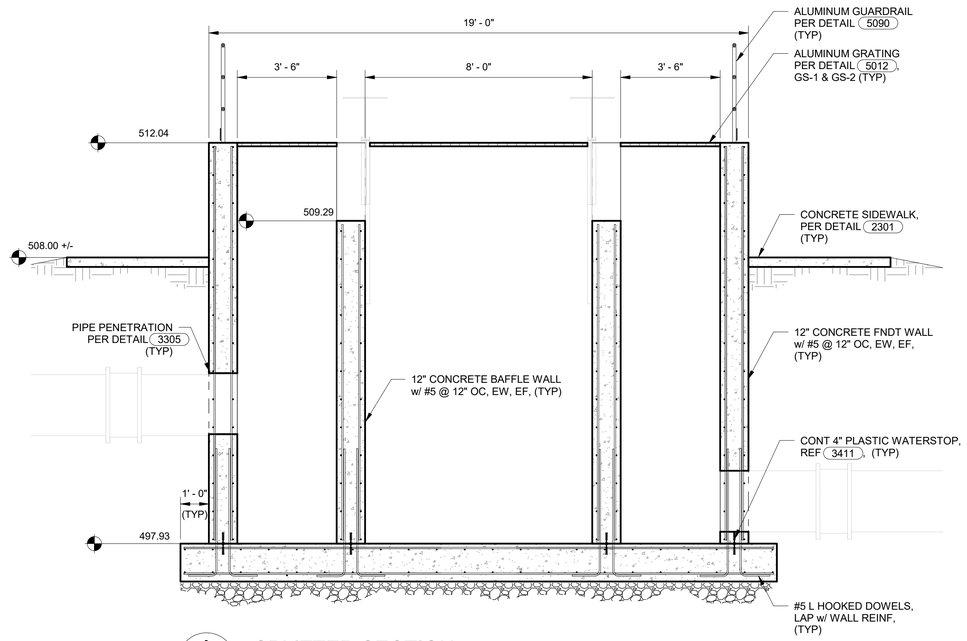
CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

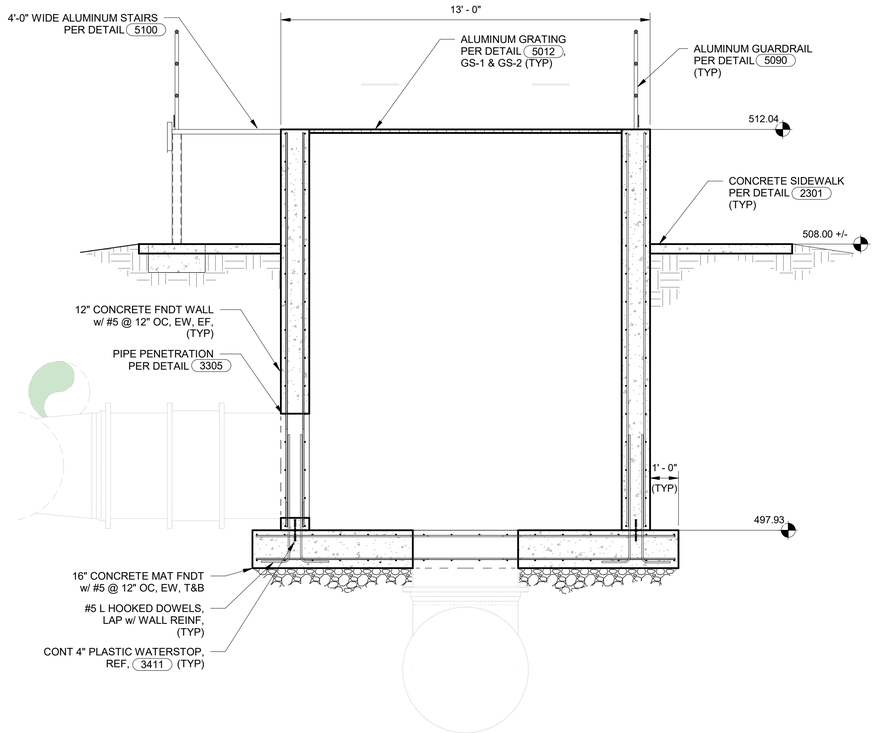
SPLITTER BOX PLANS

DWG. NO. S-5

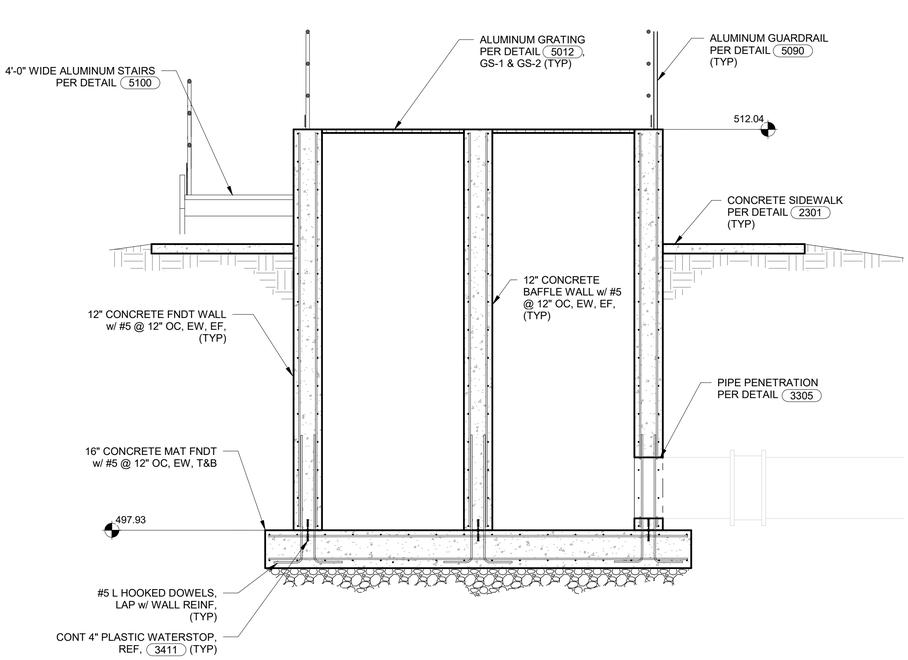
SHEET NO. 23 OF 60



A S-5 SPLITTER SECTION
SCALE: 3/8" = 1'-0"



B S-5 SPLITTER SECTION
SCALE: 3/8" = 1'-0"



C S-5 SPLITTER SECTION
SCALE: 3/8" = 1'-0"

GENERAL NOTES:

1. REFER TO THE GENERAL STRUCTURAL NOTES FOR ADDITIONAL REQUIREMENTS.
2. REFER TO THE DRAWING ANNOTATIONS & SYMBOLS FOR EXPLANATION OF DRAWING CONVENTIONS.
3. REFER TO THE STRUCTURAL DETAILS AND THE SD SERIES OF DRAWINGS FOR TYPICAL DETAILS. DETAILS ARE NOT NECESSARILY REFERENCED BY CALLOUTS ON PLAN; IT IS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW THE REQUIREMENTS OF THE DETAILS AT THE LOCATION AT WHICH THEY OCCUR.
4. COORDINATE THE FOLLOWING ITEMS WITH DRAWINGS OF OTHER DISCIPLINES:
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   - SIZES AND LOCATIONS OF OPENINGS AND PENETRATIONS THROUGH WALLS AND FLOORS; SEE PROCESS, CIVIL, ELECTRICAL, MECHANICAL, AND PLUMBING DRAWINGS.
   - EXTERIOR CONCRETE, INCLUDING SLABS AND SITE RETAINING WALLS; SEE CIVIL DRAWINGS.
   - LOCATION , SIZE, AND ANCHORAGE OF PROCESS, ELECTRICAL, MECHANICAL, AND PLUMBING EQUIPMENT; SEE PROCESS, ELECTRICAL, MECHANICAL, AND PLUMBING DRAWINGS.
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6. LOCATIONS OF SLAB ON GRADE CONTROL JOINTS ARE NOT SHOWN. THE CONTRACTOR SHALL SUBMIT A DETAILED LAYOUT OF PROPOSED JOINT LOCATIONS AT LEAST (7) DAYS PRIOR TO SLAB PLACEMENT FOR REVIEW AND APPROVAL.
7. SEE DETAIL 3305 FOR REINFORCEMENT AT OPENINGS IN CONCRETE WALLS AND SLABS.
8. ALUMINUM STAIR, HANDRAIL, AND ASSOCIATED CONNECTION DESIGN BY OTHERS, TYPE DETAILS WITHIN FOR REFERENCE OF ASSUMED CONNECTION TYPES, LAYOUT, ETC.
9. SEE DETAIL 3400 FOR TYPICAL WALL BASE CONSTRUCTION JOINT REQUIREMENTS.

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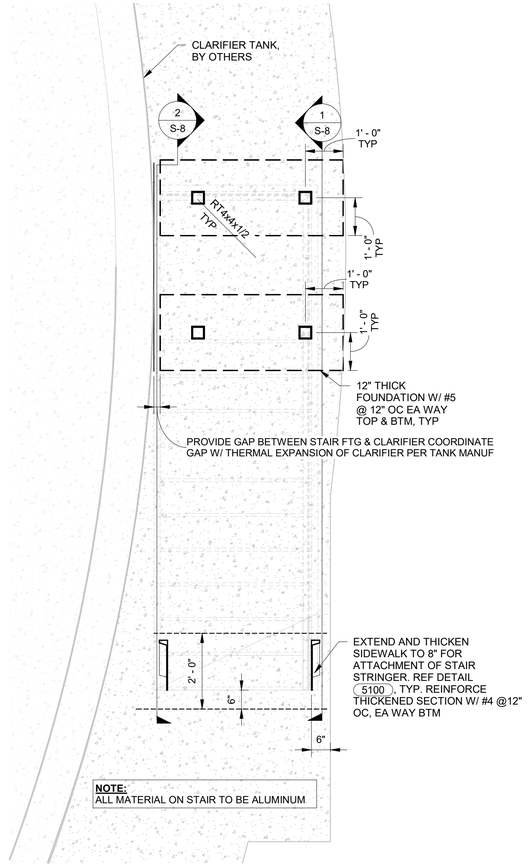
CITY OF BULLHEAD CITY
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
SPLITTER BOX SECTIONS

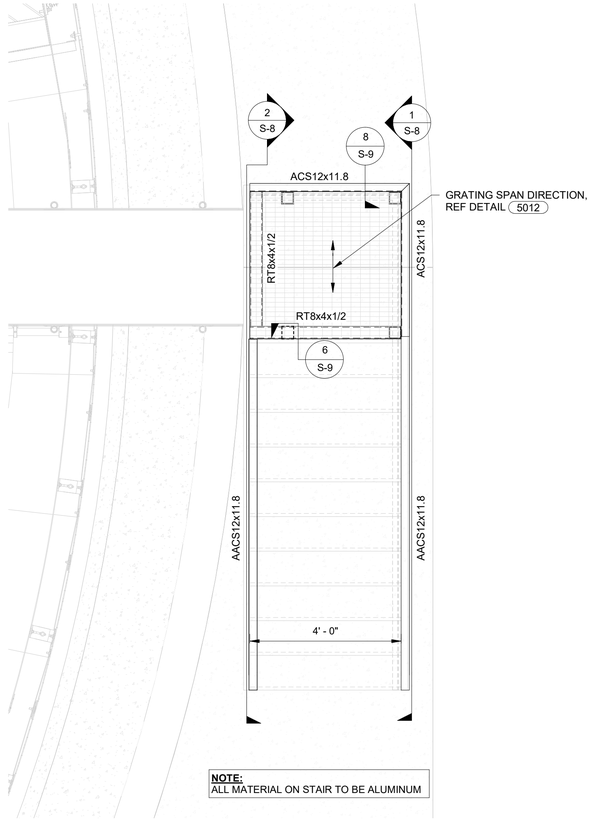
Registered Professional Engineer (Civil)
53501
MICHAEL J. BRENNAN
Date Signed: 08/26/25
ARIZONA, U.S.A.
Expires: June 30, 2027

DWG. NO. S-6
SHEET NO. 24 OF 60



1 CLARIFIER 3 - STAIR FOUNDATION PLAN

SCALE: N.T.S.



2 CLARIFIER 3 - STAIR FRAMING PLAN

SCALE: N.T.S.

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CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 - STAIR PLAN

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MICHAEL J.
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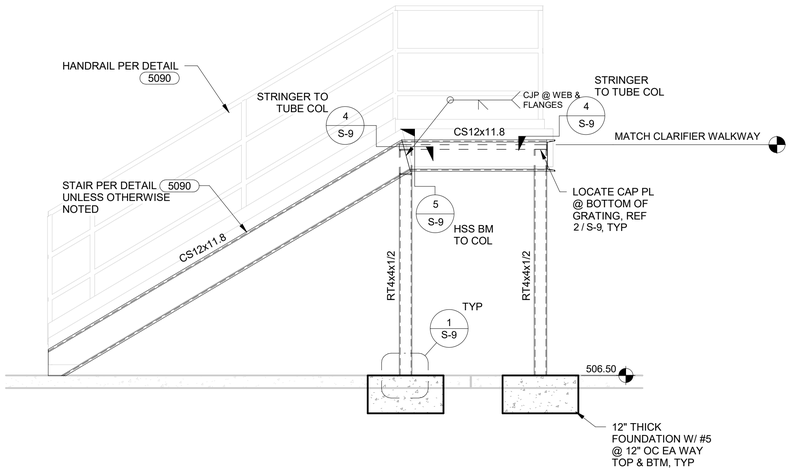
Expires: June 30, 2027

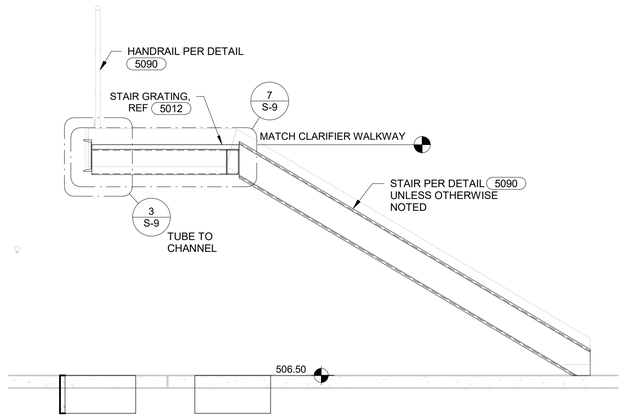
DWG. NO. S-7

SHEET NO. 25 OF 60



1 S-7 STAIR SECTION - EAST SIDE

SCALE: N.T.S.



2 S-7 STAIR SECTION - WEST SIDE

SCALE: N.T.S.

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CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 - SECTIONS

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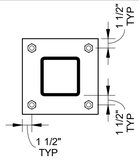
BRENNAN
Date Signed 08-21-25
ARIZONA, U.S.A.
Expires: June 30, 2027

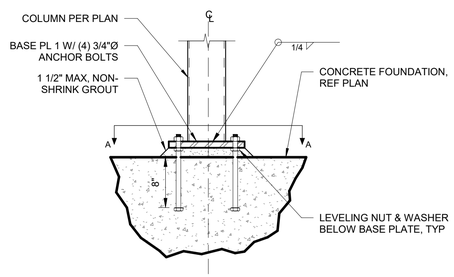
DWG. NO. S-8

SHEET NO. 26 OF 60

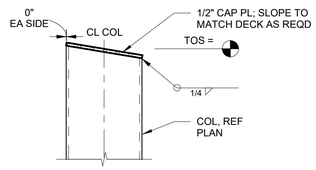


NOTES:
1. THE CONTRACTOR MAY SELECT ONE OF THE FOLLOWING OPTIONS FOR HOLES IN BASE PLATE:
   A. USE TEMPLATE PLATES WITH CAST-IN-ANCHORS AND PROVIDE ANCHOR DIAMETER + 1/8" HOLES.
   B. PROVIDE 1/2" OVERSIZED HOLES AND 1/4"X2X2 PLATE WASHERS WITH STANDARD HOLES WELDED TO TOP OF BASE PLATE WITH 3/16" FILLET ON TWO SIDES.
   C. PROVIDE STANDARD HOLES IN BASE PLATE AND SUBSTITUTE CAST-IN-ANCHORS WITH POST-INSTALLED ADHESIVE ANCHORS WITH EQUIVALENT EMBEDMENT.
2. ANCHOR BOLTS SHALL BE HEADED OR THREADED AND NUTTED.

SECTION A-A



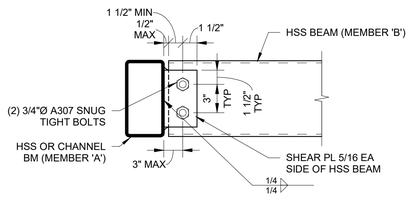
1 TYPICAL BASE PL DETAIL
S-8 SCALE: N.T.S.



ELEVATION VIEW - COL

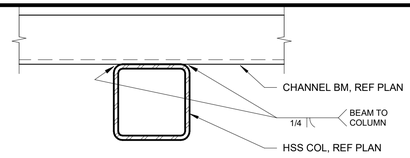
NOTES:
1. TOP OF STEEL ELEVATION IS MEASURED AT TOP OF CAP PLATE AT CENTERLINE OF COLUMN.
2. AT HSS COLUMNS, PROVIDE SQUARE CAP PLATE AT SQUARE SECTIONS & ROUND PLATES AT ROUND SECTIONS.

2 TYPICAL CAP PL @ TOP OF COL
SCALE: N.T.S.

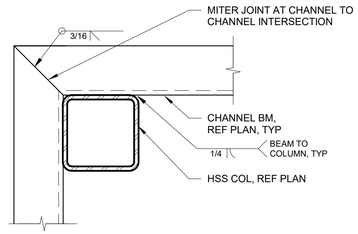


NOTE:
AT END OF HSS (MEMBER 'A'), SHEAR PL SHALL COPE AND CAP END OF HSS. PROVIDE A 1/4" PREPPED SEAL WELD ALL AROUND HSS TO CAP PL CONNECTION

3 HSS BEAM TO HSS BEAM
S-8 SCALE: N.T.S.

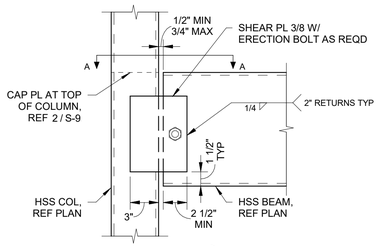


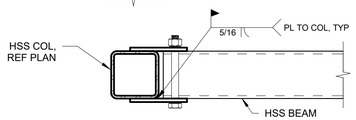
TYPICAL CONDITION



CORNER CONDITION

4 CHANNEL TO HSS COLUMN CONN
S-8 SCALE: N.T.S.

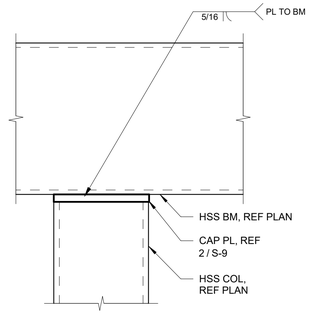




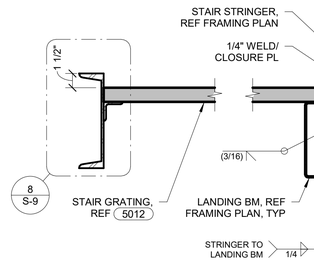
SECTION A - A AT PERPENDICULAR BEAM

NOTE:
WHERE CONNECTION IS EXPOSED TO VIEW IN FINAL CONDITION, REMOVE ERECTION BOLTS AND PLUG HOLES AFTER WELDING.

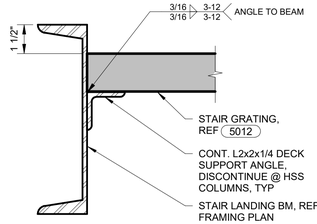
5 HSS BEAM TO HSS COLUMN
S-8 SCALE: N.T.S.



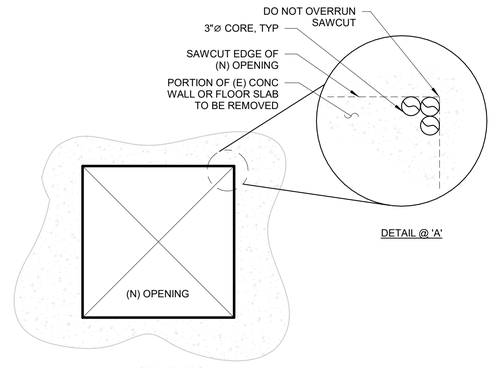
6 HSS BEAM OVER HSS COLUMN
S-7 SCALE: N.T.S.



7 STAIR FRAMING DETAIL
S-8 SCALE: N.T.S.



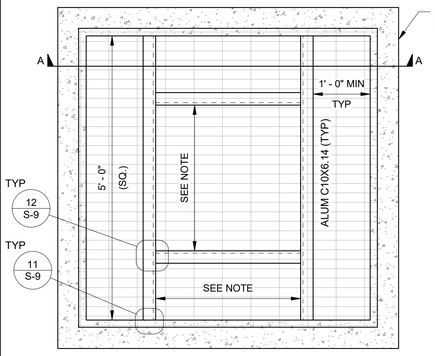
8 STAIR FRAMING DETAIL
S-7 SCALE: N.T.S.



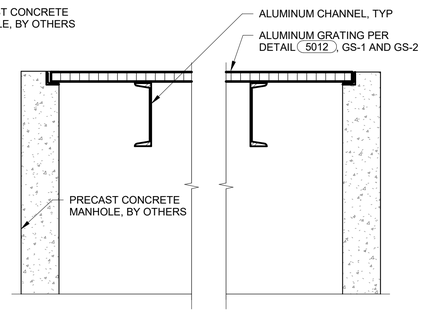
PLAN OR ELEVATION

NOTES:
1. SCAN FOR (E) REINF PRIOR TO DRILLING AND CUTTING. CARE SHOULD BE TAKEN TO AVOID (E) REINFORCING WHEN DRILLING AND CUTTING.
2. ENSURE (E) TRIM REINFORCING FOR WINDOW ABOVE IS NOT CUT OR OTHERWISE DAMAGED.
3. INFORM EOR BEFORE CUTTING IF ANY UNEXPECTED OR CLUSTERED REINFORCMENT IS DISCOVERED BY THE SCAN

9 (N) OPENING IN (E) CMU WALL
SCALE: 1" = 1'-0"



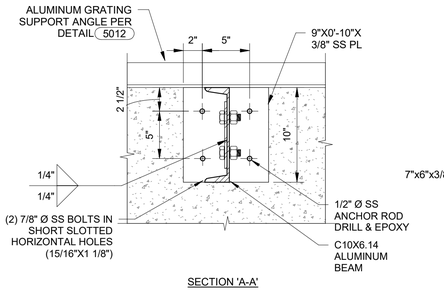
10 SE MANHOLE PLAN
SCALE: 3/4" = 1'-0"



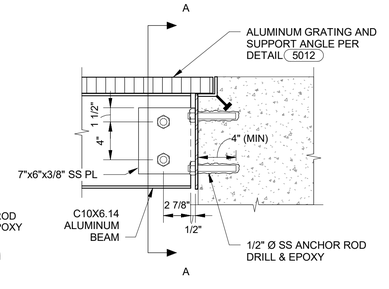
SECTION A-A

NOTE:
COORDINATE MIXER MOUNTING DIMENSIONS AND BOLT HOLES w/ MANUFACTURER

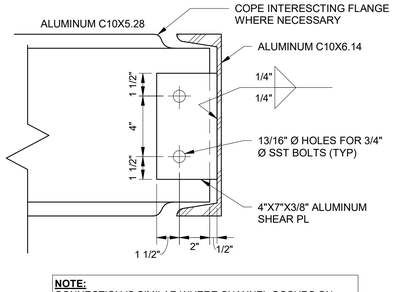
11 SE MANHOLE DETAIL 1
S-9 SCALE: N.T.S.



SECTION 'A-A'



12 SE MANHOLE DETAIL 2
S-9 SCALE: N.T.S.



NOTE:
CONNECTION IS SIMILAR WHERE CHANNEL OCCURS ON OPPOSITE SIDE OF CHANNEL WEB

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DATE: 08/2025

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
STRUCTURAL DETAILS

Registered Professional Engineer (Civil)
CERTIFICATE NO.
53501
MICHAEL J. BRENNAN
Date Signed 08-28-25
ARIZONA U.S.A.
Expires June 30, 2027

DWG. NO. S-9
SHEET NO. 27 OF 60

GENERAL NOTES:

1. ALL DEMOLITION WORK SHALL BE COORDINATED AND SCHEDULED WITH OWNER AND ENGINEER. ALSO SEE SECTION 02 41 10 AND SECTION 01 14 16 FOR ADDITIONAL INFORMATION AND CONSTRUCTION SEQUENCING.
2. REMOVE AND DISPOSE OF ALL EXISTING RAS PUMPS, EQUIPMENT PADS, PIPE, SUPPORTS, FITTINGS, VALVES, AND INSTRUMENTATION TO THE EXTENTS SHOWN, UNLESS OTHEWISE NOTED.
3. WHEREVER EXISTING FACILITIES ARE BOLTED TO CONCRETE WALLS OR FLOORS, CUT EXISTING BOLTS FLUSH WITH WALL OR FLOOR AND COAT EXPOSED BOLT AT SURFACE PER SECTION 09 90 00, SYSTEM NO. 2.
4. FOR DEMOLITION OF ELECTRICAL EQUIPMENT, SEE E-DWGS.

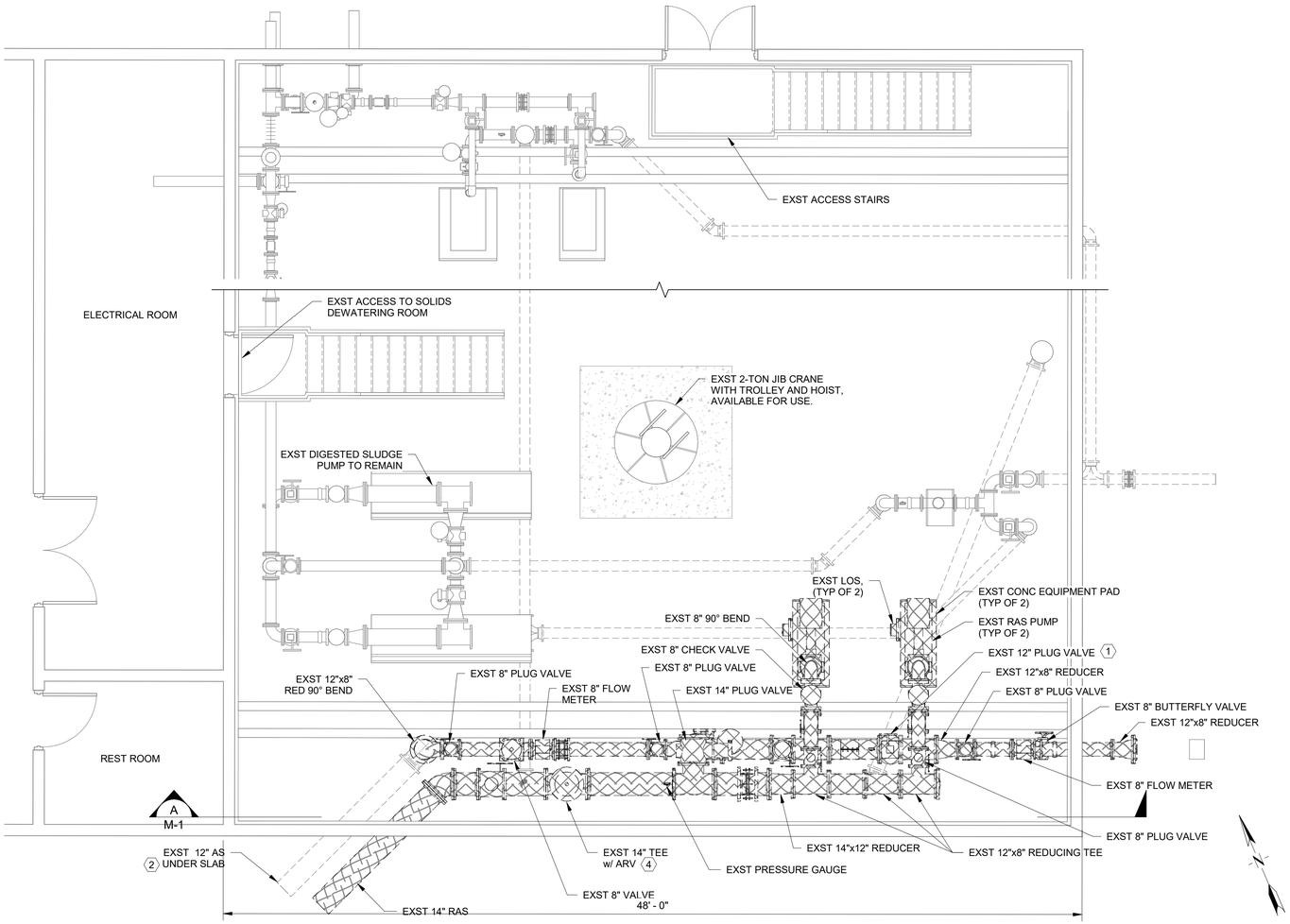
KEY NOTES:

(1) REMOVE AND SALVAGE TO OWNER.

(2) APPROXIMATE LOCATION OF INDICATED PIPE IS SHOWN ON THESE DRAWINGS; CONTRACTOR TO CONFIRM LOCATION AS NEEDED TO AVOID DAMAGE TO EXISTING PIPE DURING CONSTRUCTION.

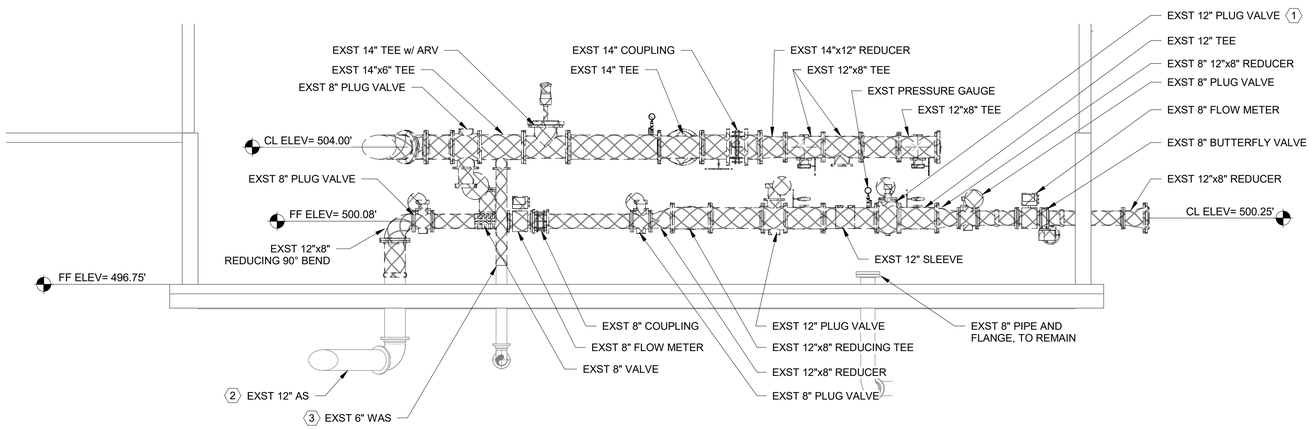
(3) MAINTAIN 12" OF EXISTING PIPE ABOVE FINISHED FLOOR TO ALLOW FOR CONNECTION OF NEW PIPE.

(4) REMOVE AND DISPOSE OF UTILITY WATER PIPE AND DRAIN PIPE/TUBE ASSOCIATED WITH ARV.



RAS/WAS ROOM DEMOLITION PLAN

SCALE: 1/4" = 1'-0"



A SECTION

M-1

SCALE: 1/4" = 1'-0"

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DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM DEMOLITION

Registered Professional Engineer
CERTIFICATE
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ULRIKE
LASHLEY
Date Signed 06-23-21
ARIZONA, U.S.A.
Expires: Sept 30, 2021

DWG. NO. M-1

SHEET NO. 28 OF 60

GENERAL NOTES:

1. INSTALL EQUIPMENT AND ACCESSORIES PER MFR'S RECOMMENDATIONS.
2. COORDINATE LOCATIONS, ELEVATIONS, DIMENSIONS, ETC. FOR WALL PIPES, EQUIPMENT PADS, FLOOR/WALL SLEEVES, AND OTHER SIMILAR ITEMS WITH STRUCTURAL.
3. VERIFY ALL PROCESS EQUIPMENT AND PIPE FITTING DIMENSIONS WITH MFR PRIOR TO CONSTRUCTING AND INSTALLATION. ALSO COORDINATE WITH STRUCTURAL DRAWINGS.
4. ALL DIMENSIONS TO PROCESS EQUIPMENT AND PIPING ARE SHOWN FROM INSIDE OF THE FOUNDATION WALL.
5. ALL PIPE HANGERS AND SUPPORTS NOT SHOWN FOR CLARITY. LOCATE AND SPACE ALL PIPE HANGERS AND SUPPORTS PER SECTION 40 05 10 AND APPLICABLE STANDARD DETAILS.
6. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.
7. REFER TO SECTION 09 90 00 FOR EXPOSED PIPING EXTERIOR COATING REQUIREMENTS.

** INDICATES EQUIPMENT OR ITEMS SUPPLIED BY DIVISION 43 OR 46 AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND FOR PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

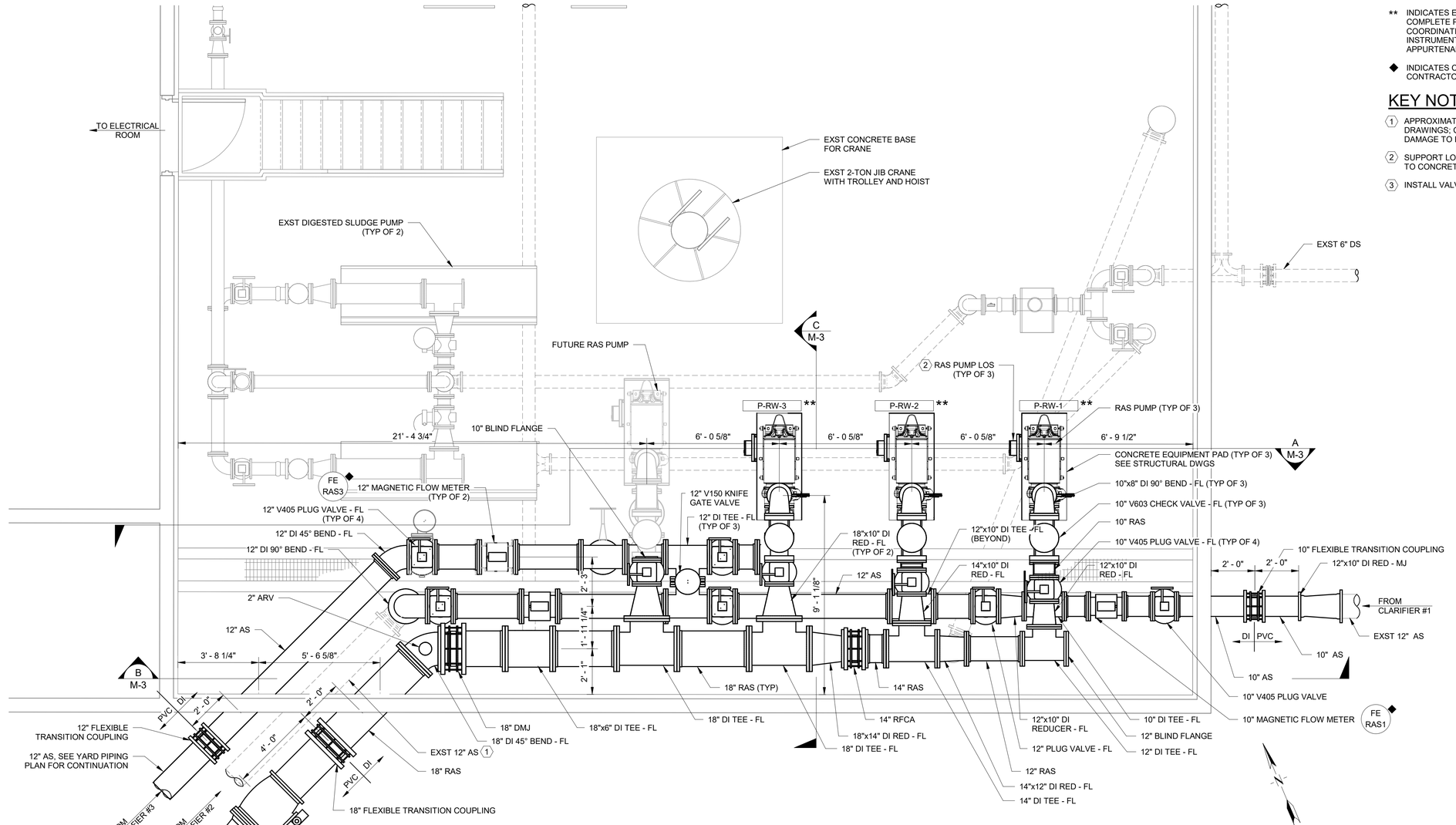
◆ INDICATES COMPONENTS SUPPLIED BY DIVISION 40 AND INSTALLED BY CONTRACTOR.

KEY NOTES:

(1) APPROXIMATE LOCATON OF INDICATED PIPE IS SHOWN ON THESE DRAWINGS; CONTRACTOR TO CONFIRM LOCATION AS NEEDED TO AVOID DAMAGE TO EXISTING PIPE DURING CONSTRUCTION.

(2) SUPPORT LOCAL OPERATOR STATION PANEL WITH UNISTRUT AND BOLT TO CONCRETE EQUIPMENT PAD. INSTALL LOS 3'-6" ABOVE FINISHED FLOOR.

(3) INSTALL VALVE BOX AND EXTENSION STEM.



RAS/WAS ROOM PLAN

SCALE: 3/8" = 1'-0"

1 Engineering Place Helena, MT 59602
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Morrison Maierle
engineers surveyors planners scientists

DESIGN: RL
DRAWN: DAH
DATE: 08/2025
CHECKED: JCM

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

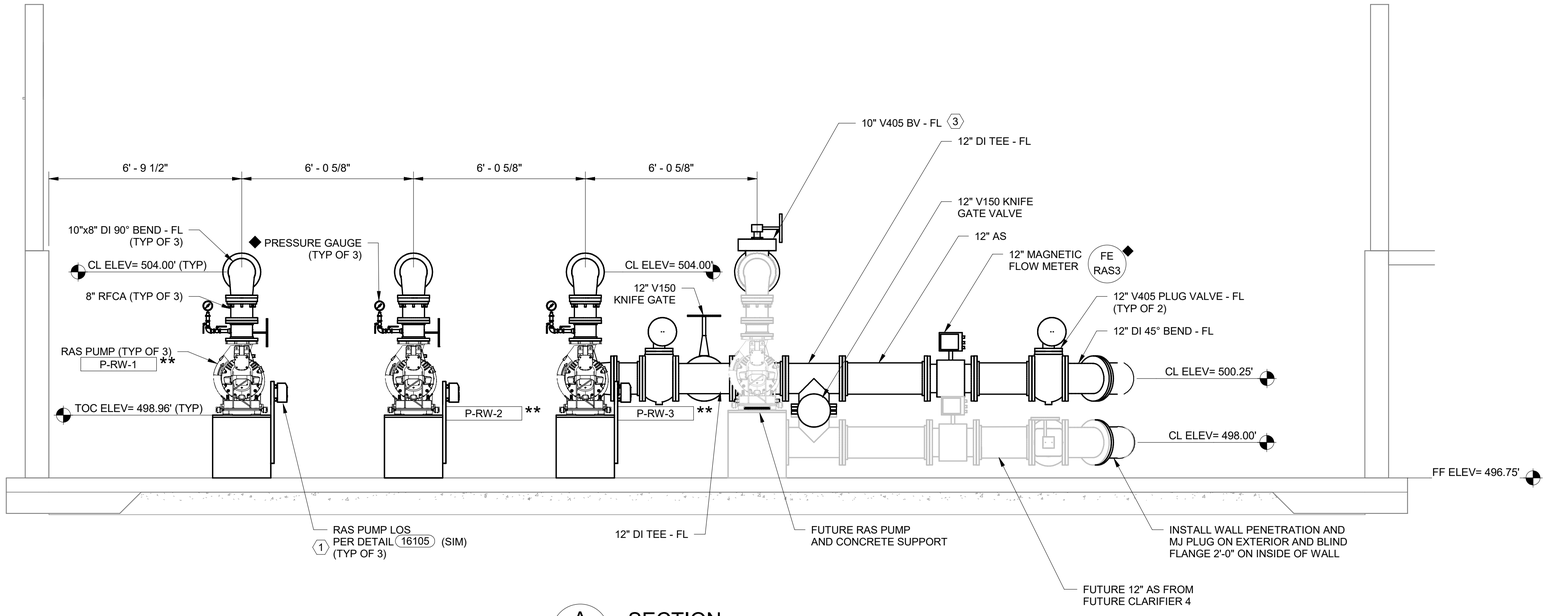
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM PLAN

Registered Professional Engineer
CERTIFICATE
67132
ULRIKE
LASHLEY
Date Signed 12-3-25
ARIZONA, U.S.A.
Expires: Sept 30, 2027

DWG. NO. M-2

SHEET NO. 29 OF 60



A M-2 SECTION
SCALE: 3/8" = 1'-0"

GENERAL NOTES:

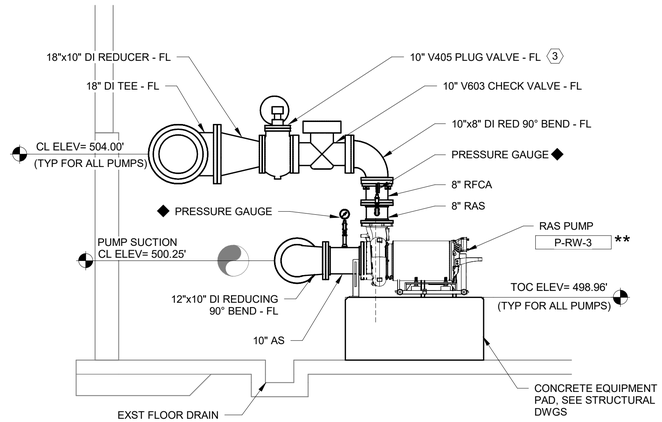
1. INSTALL EQUIPMENT AND ACCESSORIES PER MFR'S RECOMMENDATIONS.
2. COORDINATE LOCATIONS, ELEVATIONS, DIMENSIONS, ETC. FOR WALL PIPES, EQUIPMENT PADS, FLOOR/WALL SLEEVES, AND OTHER SIMILAR ITEMS WITH STRUCTURAL.
3. VERIFY ALL PROCESS EQUIPMENT AND PIPE FITTING DIMENSIONS WITH MFR PRIOR TO CONSTRUCTING AND INSTALLATION. ALSO COORDINATE WITH STRUCTURAL DRAWINGS.
4. ALL DIMENSIONS TO PROCESS EQUIPMENT AND PIPING ARE SHOWN FROM INSIDE OF THE FOUNDATION WALL.
5. ALL PIPE HANGERS AND SUPPORTS NOT SHOWN FOR CLARITY. LOCATE AND SPACE ALL PIPE HANGERS AND SUPPORTS PER SECTION 40 05 10 AND APPLICABLE STANDARD DETAILS.
6. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.
7. REFER TO SECTION 09 90 00 FOR EXPOSED PIPING EXTERIOR COATING REQUIREMENTS.

** INDICATES EQUIPMENT OR ITEMS SUPPLIED BY DIVISION 43 OR 46 AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND FOR PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

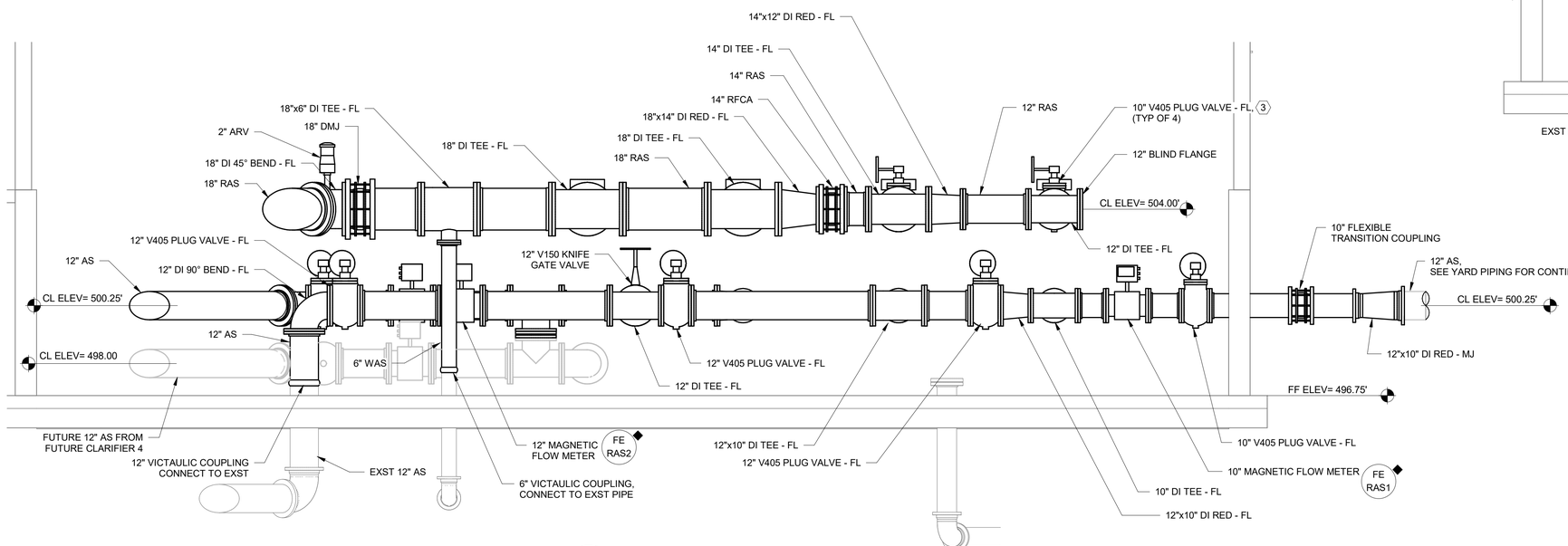
◆ INDICATES COMPONENTS SUPPLIED BY DIVISION 40 AND INSTALLED BY CONTRACTOR.

KEY NOTES:

1. APPROXIMATE LOCATON OF INDICATED PIPE IS SHOWN ON THESE DRAWINGS; CONTRACTOR TO CONFIRM LOCATION AS NEEDED TO AVOID DAMAGE TO EXISTING PIPE DURING CONSTRUCTION.
2. SUPPORT LOCAL OPERATOR STATION PANEL WITH UNISTRUT AND BOLT TO CONCRETE EQUIPMENT PAD. INSTALL LOS 3'-6" ABOVE FINISHED FLOOR.
3. PROVIDE CHAIN WHEEL OPERATOR PER SECTION 40 05 53.



C M-2 SECTION
SCALE: 3/8" = 1'-0"



B M-2 SECTION
SCALE: 3/8" = 1'-0"

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CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM SECTIONS

DWG. NO. M-3
SHEET NO. 30 OF 60

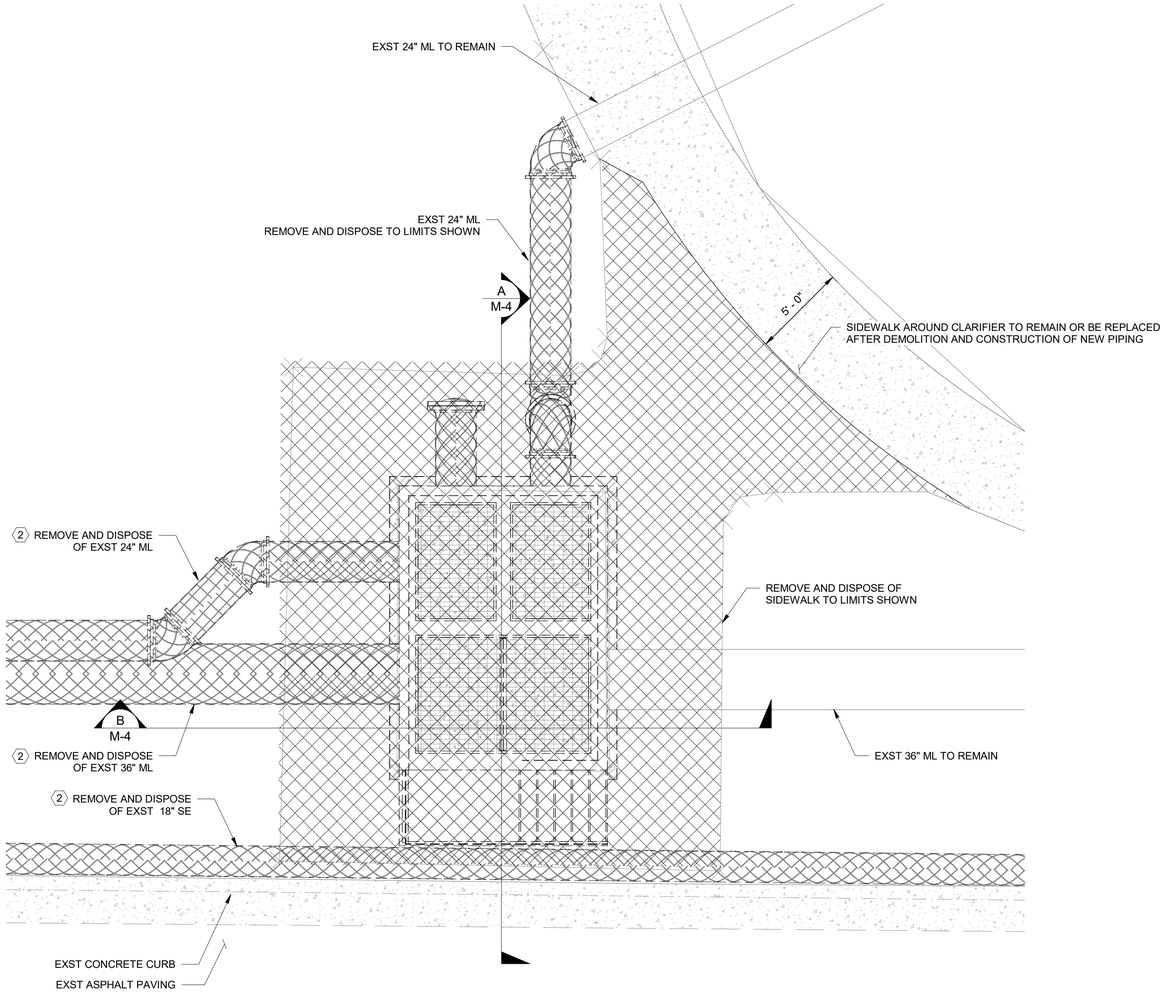
GENERAL NOTES:

1. ALL DEMOLITION WORK SHALL BE COORDINATED AND SCHEDULED WITH OWNER AND ENGINEER. ALSO SEE SECTION 02 41 10 AND SECTION 01 14 16 FOR ADDITIONAL INFORMATION AND CONSTRUCTION SEQUENCING.
2. REMOVE AND DISPOSE OF THE SPLITTER BOX IN ITS ENTIRETY SO THAT NO CONCRETE STRUCTURES ARE LEFT IN THE GROUND.
3. REMOVE AND DISPOSE OF PIPING SHOWN TO BE DEMOLISHED COMPLETELY SO THAT NO ABANDONED PIPING IS LEFT IN PLACE.
4. THE EXISTING CLARIFIERS NEED TO REMAIN IN SERVICE FOR AS LONG AS POSSIBLE. COORDINATE TEMPORARY SHUTDOWN OF CLARIFIERS WITH OWNER. COORDINATE WITH INSTALLATION OF NEW FITTINGS AND PIPE ON DWG C-3.
5. SIDEWALKS, CURBS, AND ASPHALT THAT ARE DAMAGED OR DEMOLISHED DURING CONSTRUCTION SHALL BE REPLACED OR REPAIRED TO EQUAL OR BETTER CONDITION.

KEY NOTES:

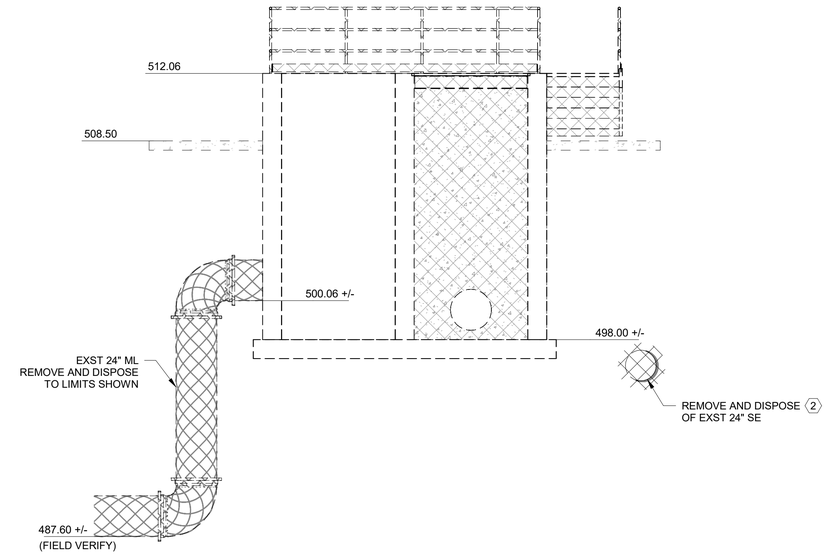
(1) PROTECT AND SUPPORT PIPE DURING CONSTRUCTION OF SPLITTER BOX AND UNTIL FLOW IS ROUTED TO NEW PIPING.

(2) SEE DWG C-2 FOR CONTINUATION.



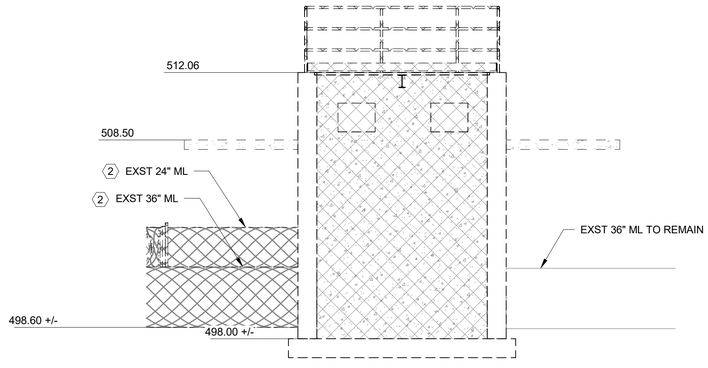
SPLITTER BOX DEMOLITION PLAN

SCALE: 1/4" = 1'-0"



A M-4 SECTION

SCALE: 1/4" = 1'-0"



B M-4 SECTION

SCALE: 1/4" = 1'-0"

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REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

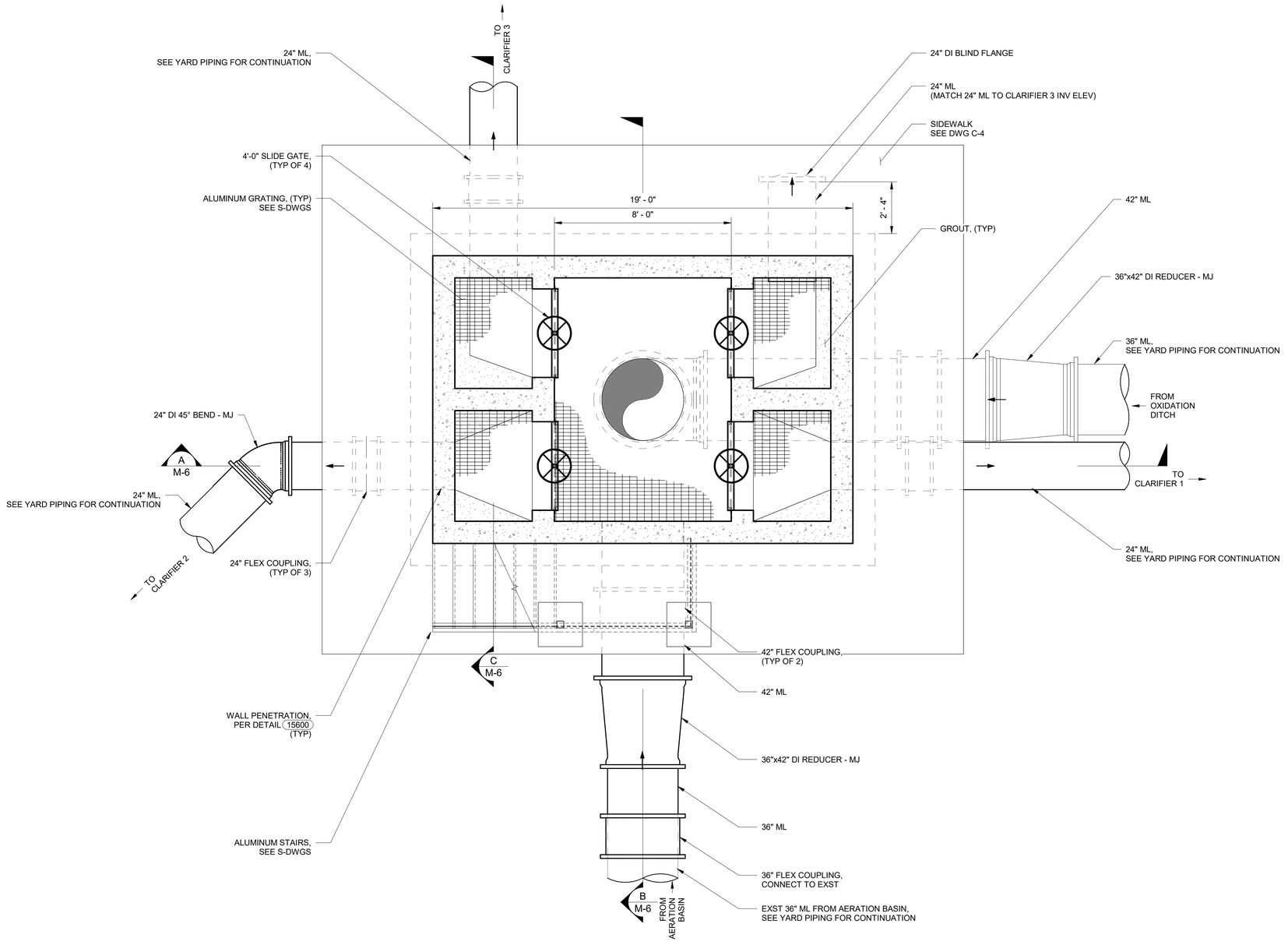
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

SPLITTER BOX DEMOLITION PLAN AND SECTIONS

Registered Professional Engineer (Civil) CERTIFICATE 67132 ULRIKE LASHLEY Date Signed 08.21.25 ARIZONA, U.S.A. Expires: Sept 30, 2027

DWG. NO. M-4

SHEET NO. 31 OF 60



SPLITTER BOX PLAN

SCALE: 3/8" = 1'-0"

GENERAL NOTES:

1. LOCATION, ELEVATION, AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED SURVEY AND FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.
3. INSTALL EQUIPMENT AND ACCESSORIES PER MFR'S RECOMMENDATIONS.
4. COORDINATE LOCATIONS, ELEVATIONS, DIMENSIONS, ETC. FOR WALL PIPES, FLOOR/WALL SLEEVES, AND OTHER SIMILAR ITEMS WITH STRUCTURAL.
5. VERIFY ALL EQUIPMENT AND PIPE FITTING DIMENSIONS WITH MFR PRIOR TO CONSTRUCTING AND INSTALLATION. ALSO COORDINATE WITH STRUCTURAL DRAWINGS.
6. REFER TO SECTION 09 90 00 FOR PIPING EXTERIOR COATING REQUIREMENTS.

KEY NOTES:

(1) GROUT SMOOTH CHANNELS TO PIPE INVERTS IN EACH CLARIFIER OUTLET BOX. USE NON-SHRINK GROUT.

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DESIGN: RL
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DATE: 08/2025

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

SPLITTER BOX PLAN

Registered Professional Engineer
CERTIFICATE
67132
ULRIKE LASHLEY
Date Signed 12-11-25
ARIZONA U.S.A.
Expires Sept 30, 2027

DWG. NO. M-5

SHEET NO. 32 OF 60

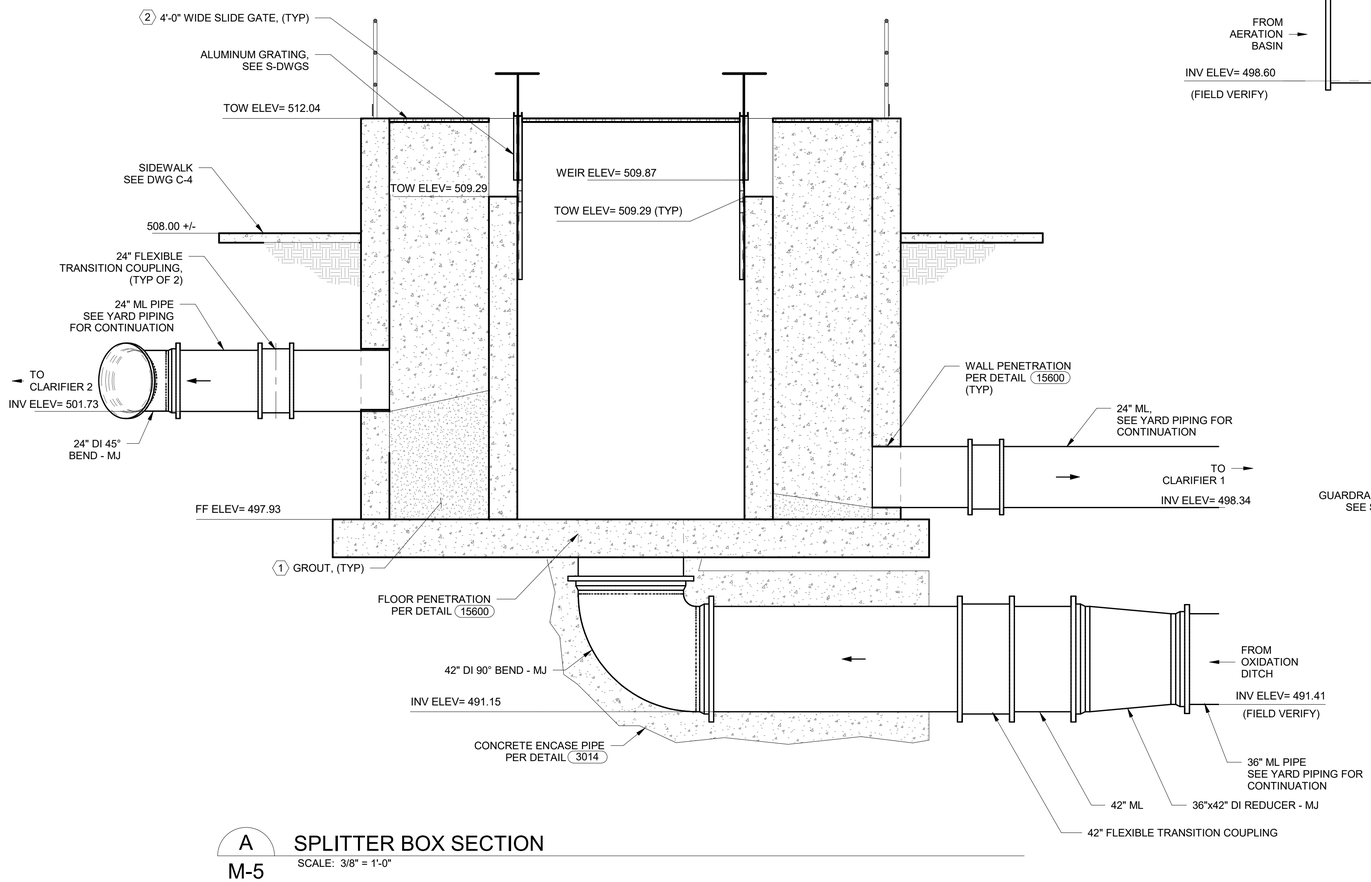
GENERAL NOTES:

1. LOCATION, ELEVATION, AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED SURVEY AND FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.
3. INSTALL EQUIPMENT AND ACCESSORIES PER MFR'S RECOMMENDATIONS.
4. COORDINATE LOCATIONS, ELEVATIONS, DIMENSIONS, ETC. FOR WALL PIPES, FLOOR/WALL SLEEVES, AND OTHER SIMILAR ITEMS WITH STRUCTURAL.
5. VERIFY ALL EQUIPMENT AND PIPE FITTING DIMENSIONS WITH MFR PRIOR TO CONSTRUCTING AND INSTALLATION. ALSO COORDINATE WITH STRUCTURAL DRAWINGS.
6. REFER TO SECTION 09 90 00 FOR PIPING EXTERIOR COATING REQUIREMENTS.

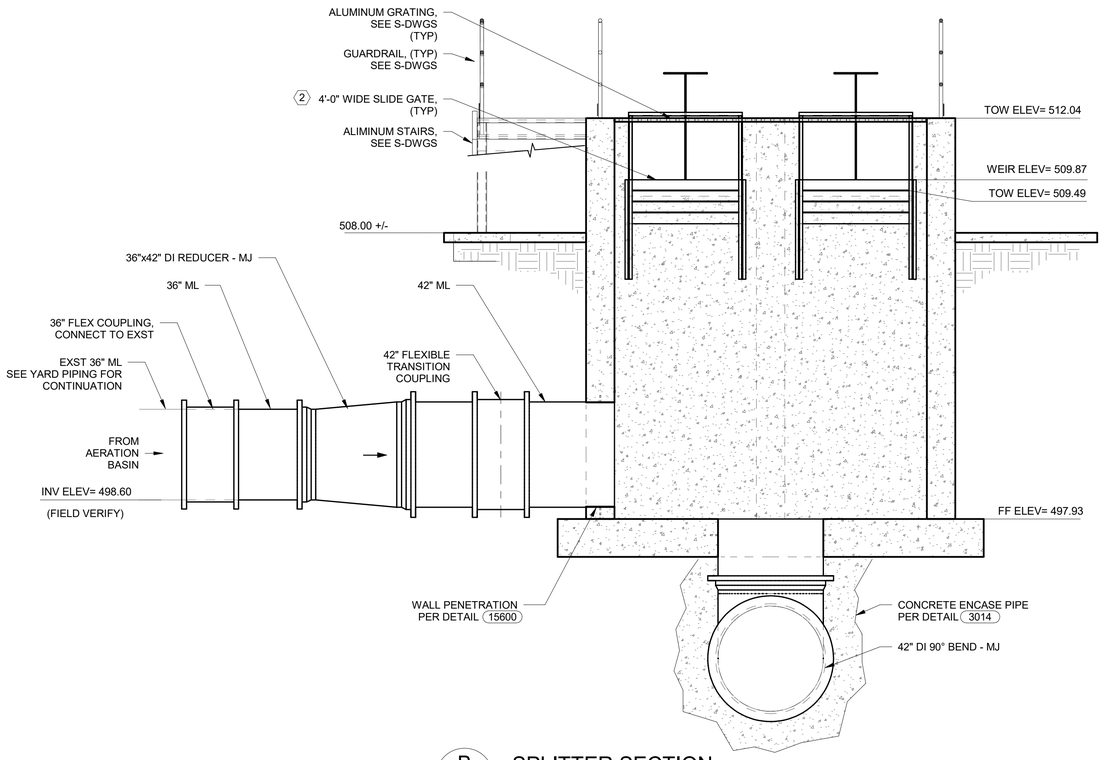
KEY NOTES:

(1) GROUT SMOOTH CHANNELS TO PIPE INVERTS IN EACH CLARIFIER OUTLET BOX. USE NON-SHRINK GROUT.

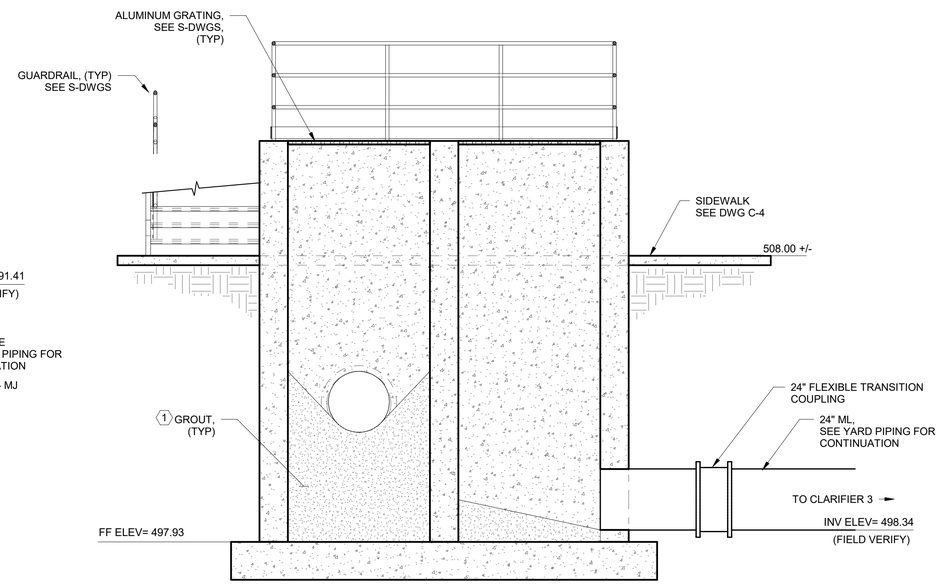
(2) GATE HEIGHT SHALL ACCOMMODATE FULL GATE TRAVEL FROM ELEV 509.29 TO 511.54 (GATE CLOSED ELEVATION).



A SPLITTER BOX SECTION
M-5
SCALE: 3/8" = 1'-0"



B SPLITTER SECTION
M-5
SCALE: 3/8" = 1'-0"



C SPLITTER SECTION
M-5
SCALE: 3/8" = 1'-0"

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DESIGN: RL | DRAWN: DAH | CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

SPLITTER BOX SECTIONS AND DETAILS

Registered Professional Engineer CERTIFICATE
67132 ULRIKE LASHLEY
ARIZONA U.S.A.
Date Signed 08-21-25
Expires: Sept 30, 2027

DWG. NO. M-6
SHEET NO. 33 OF 60

Autodesk Docs://8519021_BHC_Clarifier3_RASWAS_Pump_Station/8519021_RASWAS_PRC_v2024.rvt

DIRECTION OF ROTATION

DENSITY CURRENT BAFFLE **

SIDEWALK
SEE DWG C-4

EFFLUENT LAUNDER * (2)

FOOTING *

SCUM BOX **

SCUM FLUSHING VALVE **

FEED WELL **

ACCESS PLATFORM **

CLARIFIER DRIVE **

12" AS
N 1475197.16
E 444866.19

24" ML

8" DR
N 1475196.27
E 444870.15

36" WALKWAY **

8" DI 11.25° BEND - MJ

8" DR

6" SC (4)

3"x2" PVC RED - FL (TYP OF 2)

3" UW

12" AS

TO RAS PUMPS

FROM CLARIFIER SPLITTER BOX

24" ML

HOSERACK
SEE DETAIL (5251A)
(TYP OF 3)

SCUM SKIMMER BLADE, **
(TYP OF 2)

1/2" HOSE BIB
PER DETAIL (15105)

2" UW

C
M-8

11.25°

9.1°

A
M-8

** RAKE ARM WITH SPIRAL
BLADE SLUDGE SCRAPER,
(BELOW), (TYP OF 2)

HOSERACK,
(MOUNT INSIDE GUARDRAIL)

22.43°

ACCESS WALKWAY **

LOCAL CONTROL PANEL **

B
M-8

EFFLUENT BOX *

24" SE

TO FILTER
SPLITTER BOX

SECONDARY CLARIFIER 3 **

** BAFFLE PLATE AND SUPPORT

** V-NOTCH WEIR PLATE

CLARIFIER BOTTOM * (1)

2" UW (3)

N

GENERAL NOTES:

1. LOCATION, ELEVATION, AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED SURVEY AND FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.
3. COORDINATE LOCATIONS, ELEVATIONS, DIMENSIONS, ETC. FOR WALL PIPES, FLOOR/WALL SLEEVES, AND OTHER SIMILAR ITEMS WITH PRESTRESSED CONCRETE TANK MFR.
4. INSTALL CLARIFIER MECHANISM PER WESTECH RECOMMENDATION.
5. CONTRACTOR SHALL COORDINATE ALL CLARIFIER EQUIPMENT MOUNTING REQUIREMENTS WITH WESTECH AND PRESTRESSED CONCRETE TANK MFR.
6. VERIFY ALL EQUIPMENT AND PIPE FITTING DIMENSIONS WITH WESTECH PRIOR TO CONSTRUCTION AND INSTALLATION.
7. REFER TO SECTION 09 90 00 FOR PIPING EXTERIOR COATING REQUIREMENTS.
8. REFER TO SECTION 09 90 00 AND WESTECH RECOMMENDATIONS FOR CLARIFIER MECHANISM COATING TOUCH UP REQUIREMENTS.

* DENOTES STRUCTURAL COMPONENTS PROVIDED BY PRESTRESSED CONCRETE TANK SUPPLIER. GENERAL CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF CLARIFIER MECHANISM AND PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

** DENOTES EQUIPMENT OR ITEMS SUPPLIED BY DIVISIONS 43 OR 46 MANUFACTURER AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND FOR PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

KEY NOTES:

(1) APPLY MAX 2 INCHES OF GROUT TO CLARIFIER BOTTOM TO CREATE A SMOOTH SURFACE FOR SLUDGE RAKE.

(2) APPLY GROUT TO EFFLUENT LAUNDER WITH A THICKNESS OF 6" AT A POINT EXACTLY OPPOSITE OF THE EFFLUENT BOX. SLOPE GROUT EVENLY TOWARD THE EFFLUENT BOX TO CREATE A SMOOTH SLOPE OF ABOUT 0.35%.

(3) CONTRACTOR TO PROVIDE NECESSARY PVC FITTINGS TO CONSTRUCT UW PIPE AS GENERALLY SHOWN.

(4) PROVIDE 6" DI FITTINGS AS NEEDED TO ALIGN PIPE.

CLARIFIER 3 PLAN

SCALE: 3/16" = 1'-0"

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DESIGN: KOB
DRAWN: DAH
CHECKED:RL
DATE: 08/2025

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

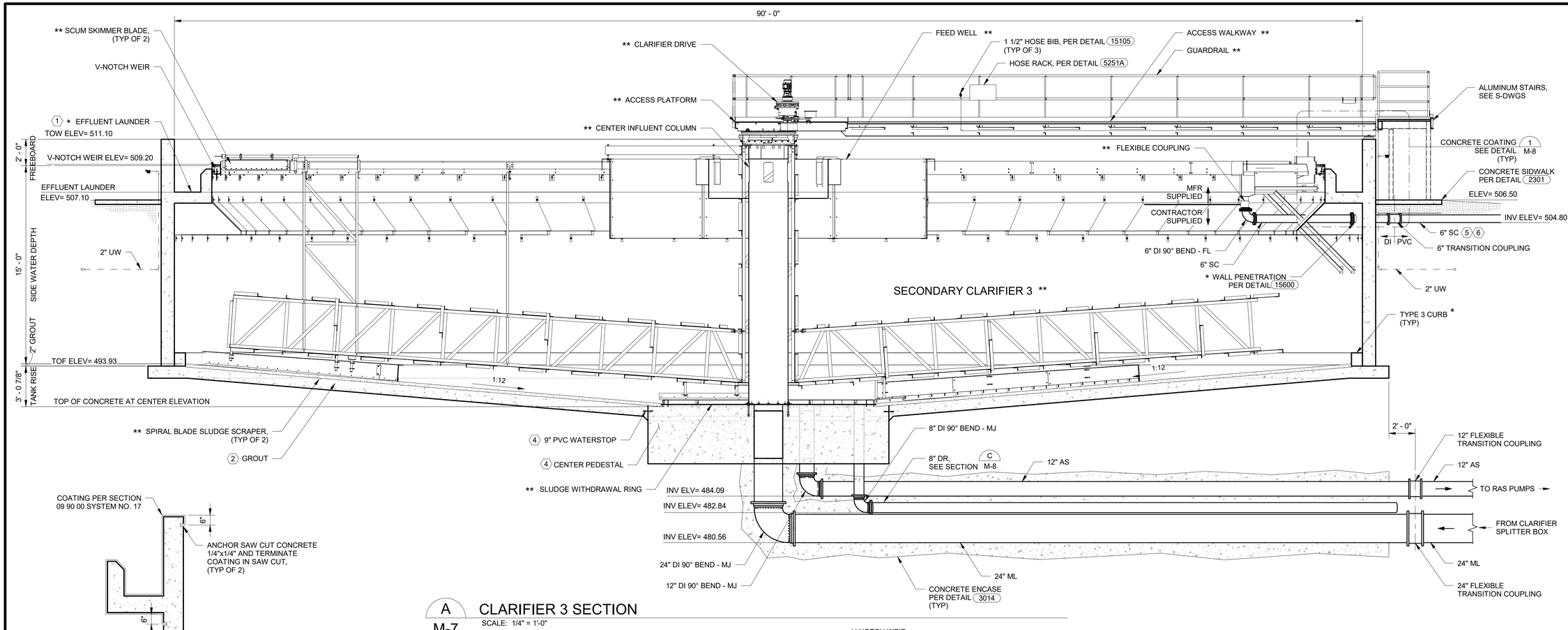
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 PLAN

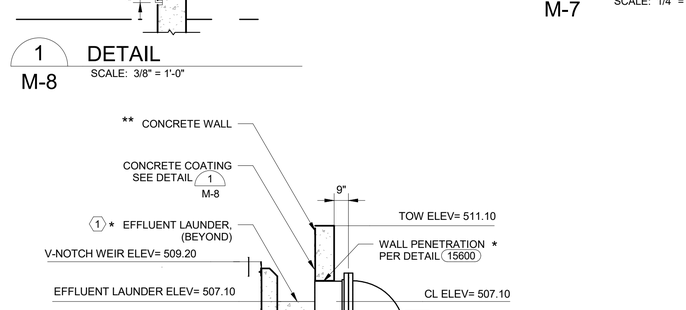
Registered Professional Engineer
CERTIFICATE NO.
67132
ULRIKE
LASHLEY
Date Signed 10-21-25
ARIZONA, U.S.A.
Expires: Sept 30, 2027

DWG. NO. M-7

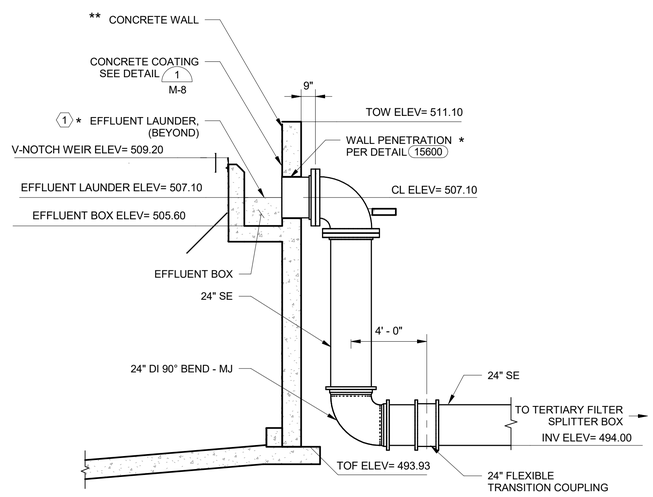
SHEET NO. 34 OF 60



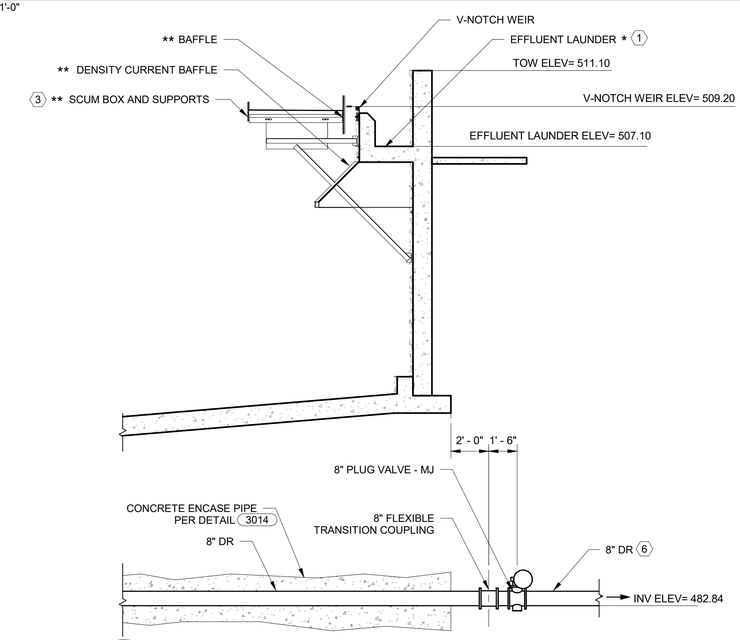
A CLARIFIER 3 SECTION
M-7
SCALE: 1/4" = 1'-0"



1 DETAIL
M-8
SCALE: 3/8" = 1'-0"



B EFFLUENT COLLECTION SECTION
M-7
SCALE: 1/4" = 1'-0"



C DRAIN SECTION
M-7
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

1. LOCATION, ELEVATION, AND SIZE OF EXISTING EQUIPMENT, PIPING, AND FACILITIES ARE FROM VARIOUS RECORD DRAWINGS AND LIMITED SURVEY AND FIELD INVESTIGATIONS. CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND MAKE FIELD OBSERVATIONS FOR ITEMS NOT SHOWN.
2. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.
3. COORDINATE LOCATIONS, ELEVATIONS, DIMENSIONS, ETC. FOR WALL PIPES, FLOOR/WALL SLEEVES, AND OTHER SIMILAR ITEMS WITH PRESTRESSED CONCRETE TANK MFR.
4. INSTALL CLARIFIER MECHANISM PER WESTECH RECOMMENDATION.
5. CONTRACTOR SHALL COORDINATE ALL CLARIFIER EQUIPMENT MOUNTING REQUIREMENTS WITH WESTECH AND PRESTRESSED CONCRETE TANK MFR.
6. VERIFY ALL EQUIPMENT AND PIPE FITTING DIMENSIONS WITH WESTECH PRIOR TO CONSTRUCTION AND INSTALLATION.
7. REFER TO SECTION 09 90 00 FOR PIPING EXTERIOR COATING REQUIREMENTS.
8. REFER TO SECTION 09 90 00 AND WESTECH RECOMMENDATIONS FOR CLARIFIER MECHANISM COATING TOUCH UP REQUIREMENTS.

* DENOTES STRUCTURAL COMPONENTS PROVIDED BY PRESTRESSED CONCRETE TANK SUPPLIER. GENERAL CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF CLARIFIER MECHANISM AND PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

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KEY NOTES:

1. APPLY GROUT TO EFFLUENT LAUNDER TO CREATE AN APPROXIMATE 0.35% FT/FT SLOPE BETWEEN FAR END OF EFFLUENT LAUDER AND THE EFFLUENT COLLECTION BOX.
2. APPLY MAX 2 INCHES OF GROUT TO CLARIFIER BOTTOM TO CREATE A SMOOTH SURFACE FOR SLUDGE RAKE.
3. CONTRACTOR TO MODIFY FRP BAFFLE PLATE TO ACCOMMODATE SCUM BOX SUPPORTS AND SCUM BOX PIPE.
4. DESIGN BY PRESTRESSED CONCRETE TANK MFR, INSTALLATION BY GENERAL CONTRACTOR
5. SLOPE PIPE TOWARD CONNECTION WITH EXISTING SC NEAR CLARIFIER 2. MINIMUM SLOPE = 0.6%.
6. FIELD VERIFY ELEVATION OF EXST PIPE AT TIE-IN LOCATION AND NOTIFY ENGINEER OF DISCREPANCIES.

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CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 SECTIONS AND DETAILS

Registered Professional Engineer
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ULRIKE LASHLEY
Date Signed 08-21-25
ARIZONA U.S.A.
Expires: Sept 30, 2027

DWG. NO. M-8
SHEET NO. 35 OF 60

HVAC SPECIFICATIONS

GENERAL

1. THE MECHANICAL CONTRACTOR SHALL INCLUDE ALL ITEMS, ARTICLES, MATERIALS, OPERATIONS AND METHODS LISTED, MENTIONED, OR SCHEDULED IN THESE SPECIFICATIONS AND THE ACCOMPANYING DRAWINGS. ALL MATERIAL, EQUIPMENT, AND LABOR SHALL BE FURNISHED TOGETHER WITH ALL INCIDENTAL ITEMS REQUIRED BY GOOD PRACTICE TO PROVIDE THE COMPLETE SYSTEMS DESCRIBED. THE EXISTING MECHANICAL EQUIPMENT AND BUILDING SPACES SHOWN ON THE DRAWINGS ARE BASED ON RECORD DRAWINGS AND FIELD OBSERVATIONS. CONTRACTOR SHALL FIELD VERIFY PRESENCE, LOCATION, AND SIZE OF ALL EXISTING EQUIPMENT.

2. EXAMINE AND REFER TO ALL CIVIL, STRUCTURAL, ELECTRICAL AND MECHANICAL DRAWINGS AND SPECIFICATIONS FOR CONSTRUCTION CONDITIONS WHICH MAY AFFECT THE MECHANICAL WORK. INSPECT THE BUILDING SITE AND EXISTING FACILITIES FOR VERIFICATION OF PRESENT CONDITIONS. MAKE PROPER PROVISIONS FOR THESE CONDITIONS IN PERFORMANCE OF THE WORK AND COST THEREOF.

3. ALL WORK ON THE PROJECT SHALL CONFORM TO ALL ADOPTED CITY, STATE, AND NATIONAL CODES & REGULATIONS. SUCH CODES & REGULATIONS INCLUDE, BUT ARE NOT LIMITED TO, THE IBC, IMC, IECC, UPC, NFPA, NEC, SERVICING UTILITY COMPANIES AND THE AUTHORITY HAVING JURISDICTION.

4. THE MECHANICAL AND ELECTRICAL CONTRACTORS SHALL BE RESPONSIBLE FOR AND PAY FOR ALL FEES AND PERMITS REQUIRED FOR WORK UNDER THEIR CONTRACT AND UNDER THEIR SUPERVISION BY SUBCONTRACT.

5. ALL USAGE CONTRACTS BETWEEN THE OWNER AND THE SERVING UTILITIES COMPANY, SUCH AS MEMBERSHIP AND USAGE CHARGES OR FEES, ETC., FOR THE PURPOSE OF OBTAINING THE SERVICES FOR THE UTILITY COMPANY SHALL BE APPLIED FOR AND PAID FOR BY THE OWNER.

RESPONSIBILITY

1. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF A SATISFACTORY AND COMPLETE SYSTEM IN ACCORDANCE WITH THE INTENT OF THE DRAWINGS AND SPECIFICATIONS. PROVIDE, AT NO EXTRA COST, ALL INCIDENTAL ITEMS, MATERIALS, ACCESSORIES AND LABOR REQUIRED FOR COMPLETION OF THE WORK EVEN THOUGH THEY ARE NOT SPECIFICALLY MENTIONED OR INDICATED ON THE DRAWINGS OR IN THE SPECIFICATIONS.

2. THE DRAWINGS DO NOT ATTEMPT TO SHOW COMPLETE DETAILS OF THE BUILDING CONSTRUCTION WHICH AFFECT THE MECHANICAL INSTALLATION; AND REFERENCE IS THEREFORE REQUIRED TO THE CIVIL, STRUCTURAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS AND TO SHOP DRAWINGS OF ALL TRADES FOR ADDITIONAL DETAILS WHICH AFFECT THE INSTALLATION OF THE WORK COVERED UNDER THIS DIVISION OF THE CONTRACT.

3. LOCATION OF MECHANICAL SYSTEM COMPONENTS SHALL BE CHECKED FOR CONFLICTS WITH OPENINGS, STRUCTURAL MEMBERS AND COMPONENTS OF OTHER SYSTEMS HAVING FIXED LOCATIONS. IN THE EVENT OF ANY CONFLICTS, THE OWNER'S REPRESENTATIVE SHALL BE CONSULTED AND THEIR DECISION SHALL GOVERN. NECESSARY CHANGES SHALL BE MADE AT THE CONTRACTOR'S EXPENSE.

4. DO NOT INSTALL EQUIPMENT UNTIL COMPLETE SHOP DRAWINGS OF SUCH EQUIPMENT HAVE BEEN APPROVED BY THE OWNER'S REPRESENTATIVE. ANY WORK INSTALLED BY THE CONTRACTOR, PRIOR TO APPROVAL OF SHOP DRAWINGS, WILL BE AT THE CONTRACTOR'S RISK.

5. ALL MODIFICATIONS AND CHANGES REQUIRED DUE TO INSTALLATION OF EQUIPMENT OTHER THAN THE EQUIPMENT SCHEDULED AND SPECIFIED SHALL BE MADE AT THE CONTRACTOR'S EXPENSE, THIS INCLUDES WORK BY OTHER TRADES. IF THE INSTALLATION OF EQUIPMENT OTHER THAN THE SCHEDULED AND SPECIFIED EQUIPMENT REQUIRES MODIFICATIONS TO STRUCTURE, ELECTRICAL SYSTEMS, PLUMBING SYSTEMS, FIRE PROTECTION OR FIRE ALARM SYSTEMS, ANY AND ALL CHANGES SHALL BE MADE AT THE MECHANICAL CONTRACTORS EXPENSE.

6. ALL WORK TO BE PERFORMED SHALL FIRST BE SCHEDULED AND SUBMITTED TO THE OWNER'S REPRESENTATIVE FOR ACCEPTANCE.

7. THE CONTRACTOR SHALL BE CAREFUL NOT TO BLOCK ANY PATHS OF EGRESS WHILE PERFORMING THE WORK SPECIFIED.

8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANUP OF ALL MATERIALS RESULTING FROM HIS/HER WORK. CLEANUP SHALL BE PERFORMED TO THE LEVEL OF ACCEPTANCE OF THE OWNER'S REPRESENTATIVE & THE ENGINEER.

9. THE CONTRACTOR SHALL GUARANTEE THAT ALL WORK EXECUTED UNDER THEIR CONTRACT SHALL BE FREE OF DEFECTS OF MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION.

INTENT OF DRAWINGS

1. THE DRAWINGS ARE PARTLY DIAGRAMMATIC AND DO NOT NECESSARILY SHOW EXACT LOCATION OF PIPING AND DUCTWORK UNLESS SPECIFICALLY DIMENSIONED. RISER AND OTHER DIAGRAMS ARE SCHEMATIC AND DO NOT NECESSARILY SHOW THE PHYSICAL ARRANGEMENT OF THE EQUIPMENT. THEY SHALL NOT BE USED FOR OBTAINING LINEAL RUNS OF PIPING OR DUCTWORK, NOR SHALL THEY BE USED FOR SHOP DRAWINGS FOR PIPING AND DUCTWORK FABRICATION OR ORDERING. DISCREPANCIES SHOWN ON DIFFERENT PLANS, OR BETWEEN PLANS AND ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER FOR RESOLUTION.

MATERIALS AND EQUIPMENT

1. MANUFACTURER'S TRADE NAMES AND CATALOG NUMBERS ARE LISTED TO INDICATE THE QUALITY OF EQUIPMENT OR MATERIALS DESIRED FOR INSTALLATION.

2. STORE MATERIALS AND EQUIPMENT INDOORS AT THE JOB SITE OR, IF THIS IS NOT POSSIBLE, STORE ON RAISED PLATFORMS AND PROTECT FROM THE WEATHER BY MEANS OF WATERPROOF COVERS. COVERINGS SHALL PERMIT CIRCULATION OF AIR AROUND THE MATERIALS TO PREVENT CONDENSATION OF MOISTURE. SCREEN OR CAP OPENINGS IN EQUIPMENT TO PREVENT THE ENTRY OF VERMIN.

3. ALL NEW PIPING SHALL BE IDENTIFIED WITH SETON SET MARK PIPE MARKERS, LETTERED TO MATCH EXISTING - IF APPLICABLE - AND MARKED AT A MAXIMUM OF EVERY 25 FT. ALL NEW VALVES SHALL BE IDENTIFIED WITH BRASS OR ALUMINUM VALVE TAGS.

MATERIALS AND EQUIPMENT (CONT.)

4. SEE THE MECHANICAL SCHEDULE ON THE DRAWINGS FOR MATERIAL AND INSULATION REQUIREMENTS.

5. VERIFY THE LOCATION OF THERMOSTATS AND SENSORS WITH THE OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.

SHOP DRAWINGS AND SUBMITTALS

1. THE MECHANICAL CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND/OR SUBMITTALS FOR ALL SCHEDULED EQUIPMENT AND MATERIALS INCLUDED IN THE CONSTRUCTION DOCUMENTS IN ACCORDANCE WITH SECTION 01 30 00 AND THE BELOW.

2. ALL SHOP DRAWINGS AND SUBMITTALS SHALL BE IN THE FORM OF ELECTRONICALLY TRANSMITTED PDFS. SHOP DRAWINGS AND SUBMITTALS SHALL INCLUDE SHOP DRAWINGS AND LITERATURE SHOWING ITEMS TO BE USED, SIZE, DIMENSIONS, CAPACITY, ROUGH-IN, AND ANY OTHER INFORMATION NECESSARY FOR A COMPLETE REVIEW. MANUFACTURER'S LITERATURE SHOWING MORE THAN ONE ITEM SHALL BE CLEARLY MARKED AS TO WHICH ITEM IS BEING FURNISHED OR IT WILL BE REJECTED AND RETURNED WITHOUT REVIEW.

3. EACH SUBMITTED ITEM MUST BE CLEARLY MARKED WITH THE PROJECT NAME, DATE, BRANCH OF WORK, SUBMITTING PARTY, REVISION NUMBER, AND ASSOCIATED SCHEDULE. SUBMITTALS NOT IDENTIFIED AS DESCRIBED ABOVE WILL BE REJECTED AND RETURNED WITHOUT REVIEW.

4. PRIOR TO THEIR SUBMISSION, EACH SUBMITTAL SHALL BE THOROUGHLY CHECKED BY THE CONTRACTOR FOR COMPLIANCE WITH THE CONTRACT DOCUMENT REQUIREMENTS. EACH SUBMITTAL SHALL THEN BEAR A STAMP EVIDENCING SUCH CHECKING AND SHALL SHOW CORRECTIONS MADE, IF ANY. SUBMITTALS REQUIRING EXTENSIVE CORRECTIONS SHALL BE REVISED BEFORE SUBMISSION TO THE ENGINEER. EACH SUBMITTAL NOT STAMPED AND SIGNED BY THE CONTRACTOR EVIDENCING SUCH CHECKING WILL BE REJECTED AND RETURNED WITHOUT REVIEW.

5. REVIEW OF THE SHOP DRAWINGS AND LITERATURE BY THE ENGINEER SHALL NOT RELIEVE THE CONTRACTOR FOR RESPONSIBILITY FOR DEVIATIONS FOR THE DRAWINGS OR SPECIFICATIONS, NOR SHALL IT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN THE SHOP DRAWINGS OR LITERATURE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE MATERIALS AND EQUIPMENT WHICH MEET THE SPECIFICATIONS AND JOB REQUIREMENTS.

REVIEW & SITE INSPECTIONS

1. ALL WORK AND MATERIAL IS SUBJECT TO REVIEW AT ANY TIME BY THE OWNER'S REPRESENTATIVE. IF THE OWNER'S REPRESENTATIVE FINDS MATERIAL THAT DOES NOT CONFORM TO THESE SPECIFICATIONS OR THAT IS NOT PROPERLY INSTALLED OR FINISHED, CORRECT THE DEFICIENCIES IN A MANNER SATISFACTORY TO THE OWNER'S REPRESENTATIVE AT THE CONTRACTOR'S EXPENSE.

STARTUP, TESTING AND OWNER TRAINING

1. ENGAGE A FACTORY AUTHORIZED REPRESENTATIVE TO CONDUCT AN INSPECTION OF THE INSTALLATION OF THEIR COMPANY'S EQUIPMENT PRIOR TO START-UP OF ANY EQUIPMENT. THE REPRESENTATIVE SHALL SUBMIT A REPORT IDENTIFYING ANY DEFICIENCIES TO THE OWNER'S REPRESENTATIVE AND CONSTRUCTION MANAGER. ANY DEFICIENCIES IDENTIFIED SHALL BE ADDRESSED PRIOR TO START-UP. START-UP SHALL BE CONDUCTED BY A FACTORY AUTHORIZED REPRESENTATIVE. STARTUP REPORTS SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE ONCE COMPLETED.

2. NEW AIR AND WATER SYSTEMS SHALL BE BALANCED IN THEIR ENTIRETY TO THE SATISFACTION OF THE ENGINEER IN ACCORDANCE WITH NEBB STANDARDS.

3. THE MECHANICAL CONTRACTOR SHALL PROVIDE 2 HRS OF TRAINING TO THE OWNER TO ENSURE THE OWNER KNOWS HOW TO OPERATE THE SYSTEMS INSTALLED UNDER THE MECHANICAL CONTRACT. PROVIDE AN ADDITIONAL 4 HRS OF ADDITIONAL SERVICE THROUGH THE FIRST YEAR OF OPERATION TO ADDRESS QUESTIONS THAT MAY ARISE.

PROJECT CLOSEOUT

1. THE MECHANICAL CONTRACTOR SHALL MAINTAIN AT THE PROJECT SITE, A "RECORD SET OF DRAWINGS" SHOWING FIELD CHANGES, AS-BUILT ELEVATIONS, UNUSUAL CONDITIONS ENCOUNTERED DURING CONSTRUCTION, AND SUCH OTHER DATA AS REQUIRED TO PROVIDE THE OWNER WITH AN ACCURATE "AS CONSTRUCTED" SET OF RECORD DRAWINGS. THE CONTRACTOR SHALL FURNISH THIS "RECORD SET" TO THE ENGINEER FOLLOWING THE FINAL INSPECTION OF THE PROJECT.

2. THE MECHANICAL CONTRACTOR SHALL PROVIDE AN "OPERATION AND MAINTENANCE MANUAL" (O&M MANUAL). THE O&M MANUAL SHALL BE SUBMITTED TO THE GENERAL CONTRACTOR IN ACCORDANCE WITH SECTION 01 77 00 FOR INCLUSION INTO THE OVERALL O&M MANUAL.

HVAC SHEET INDEX

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DRAWN: JTW
CHECKED: JTW
DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10

CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

HVAC SPECIFICATIONS

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
84062
JODY T. WAVEREK
Date Signed: 08-21-25
ARIZONA U.S.A.
Expires: September 30, 2026

DWG. NO. H-1

SHEET NO. 36 OF 60

DUCTLESS MINI-SPLIT SYSTEM SCHEDULE

ACCESSORIES:
1. ALL STANDARD ACCESSORIES
2. FILTER KIT
3. LOW AMBIENT KIT
4. PROVIDE BIG FOOT FIX-IT FOOT SUPPORT FOR OUTDOOR UNIT.
5. PROVIDE INTERNAL CONDENSATE PUMP FOR INDOOR UNIT.

CONTROLS:
1. FACTORY PROVIDED CONTROLSEM.

ELECTRICAL DATA:
SEE MEP COORDINATION SCHEDULE FOR STARTER/DISCONNECT AND ALL OTHER ELEC. DATA.

INDOOR COOLING UNIT					OUTDOOR CONDENSING UNIT				MANUF.	NOMIAL COOLING (TONS)	COOLING CAPACITY (MBH)
MARK	MODEL	TYPE	OUTSIDE AIR (CFM)	WEIGHT (LBS)	MARK	MODEL	TYPE	WEIGHT (LBS)			
MS-1A	FTX36NVJU	WALL MOUNT	- -	38	MS-1B	RX36NMVJU	HEAT PUMP	133	DAIKIN	3.0	34,400
MS-2A	FTX36NVJU	WALL MOUNT	- -	38	MS-1B	RX36NMVJU	HEAT PUMP	133	DAIKIN	3.0	34,400

EXHAUST FAN SCHEDULE

ACCESSORIES:
1. STANDARD DISCONNECT PREWIRED.
2. FAN SPEED CONTROLLER.
3. PROVIDE WITH GRAVITY BACKDRAFT DAMPER. SEE DETAILS.
5. STANDARD FINISH.
6. ALUMIUM BIRD SCREEN.

CONTROLS:
1. MANUAL SWITCH BY DIV. 26 ELECTRICAL

ELECTRICAL DATA:
SEE MEP COORDINATION SCHEDULE FOR STARTER/DISCONNECT AND ALL OTHER ELEC. DATA.

NOTE: INTERLOCK FANS W/ INTAKE LOUVER DAMPER/ ACTUATORS, PROVIDED AND INSTALLED BY DIV. 23 MECHANICAL AND WIRED BY DIV. 26 ELECTRICAL.

MARK	MANUF.	MODEL	SIZE	TYPE	SERVES	AIRFLOW (CFM)	FAN RPM	SONES	ESP (IN WC)	MOTOR (HP)	DRIVE	MOUNTING	CONTROL	SPEED CONTROL	WAL/ ROOF OPENING SQ.(IN)	WEIGHT (LBS)
EF-1	LOREN COOK	ACED	165C17D	CENTRIFUGAL, DOWNBLAST ROOFTOP VENTILATOR	RAS/ WAS ROOM	4,800	1771	29	0.2	2	DIRECT	ROOF	1	SSSC	19-1/2" SQ.	88

LOUVER SCHEDULE

REMARKS:
1. VERIFY ROUGH OPENING DIMENSIONS WITH CONSTRUCTION MANAGER PRIOR TO ORDERING.
2. 6" DEEP DRAINABLE LOUVER WITH BIRDSCREEN.
3. PROVIDED MOTORIZED CONTROL DAMPER AS SCHEDULED.

MARK	MANUF.	MODEL	WIDTH (IN)	HEIGHT (IN)	TYPE	MATERIAL	FUNCTION	AIRFLOW (CFM)	FREE AREA (%)	PRESSURE DROP (IN WC)	AIR VELOCITY (FPM)
LV-1	RUSKIN	ELF6375DX	32	48	STATIONARY	ALUMINUM	INTAKE	2,400	49	0.11	823
LV-2	RUSKIN	ELF6375DX	32	48	STATIONARY	ALUMINUM	INTAKE	2,400	49	0.11	823

CONTROL DAMPER SCHEDULE

MARK	MFGR	MODEL	PHYSICAL DIMENSION (IN.)			FUNCTION	MAX CFM	MOUNTING	VOLTAGE	MATERIAL	REMARKS
			WIDTH	HEIGHT	DEPTH						
CD-1	RUSKIN	CD40	36	24	4	OSA INTAKE	2,400	DUCT W/ LOUVER	LINE VOLTAGE (120V)	ALUMINUM	SEE NOTES
CD-2	RUSKIN	CD40	36	24	4	OSA INTAKE	2,400	DUCT W/ LOUVER	LINE VOLTAGE (120V)	ALUMINUM	SEE NOTES

NOTES: ACTUATORS ARE TO BE INTERLOCKED TO OPEN/ CLOSE WITH ASSOCIATED EXHAUST FAN (OR WATER HEATER). DAMPERS ARE TO BE PROVIDED AND INSTALLED BY DIV. 23, MECHANICAL, AND WIRED BY DIV. 26, ELECTRICAL. PROVIDE DAMPERS WITH EXTRUDED TPR BLADE EDGE SEALS AND FLEXILBE METAL COMPRESSION TYPE JAM SEALS.

MEP COORDINATION SCHEDULE

CONTROL TYPE:
- BAS BUILDING AUTOMATION SYSTEM
- CO CARBON MONOXIDE DETECTOR
- CONT CONTINUOUS OPERATION
- EF INTERLOCK WITH EXHAUST FAN
- HCP HOOD CONTROL PANEL
- INT INTEGRAL
- L LIGHT SWITCH
- MS MANUAL SWITCH
- OS OCCUPANCY SENSOR
- PS PRESSURE SWITCH
- T THERMOSTAT
- TC TIME CLOCK
- UC UNIT CONTROLLER
- VE VEHICLE EXHAUST DETECTION SYSTEM
- N/A NOT APPLICABLE

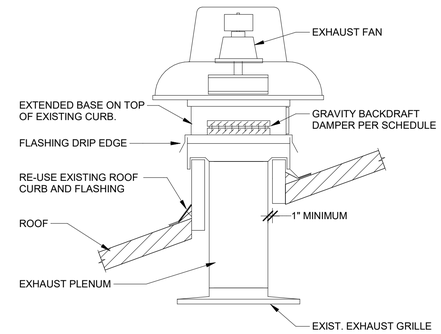
DISCONNECT/STARTER TYPE:
- CB PANELBOARD CIRCUIT BREAKER WITHIN SIGHT OF EQUIPMENT
- CSFD COMBINATION STARTER/DISCONNECT - HOA
- FD FUSED DISCONNECT
- FST FUSTAT
- FW FACTORY-WIRED SINGLE POINT CONNECTION
- MOCP MOTOR OVER-CURRENT PROTECTION
- MSS MANUAL STARTER SWITCH WITH THERMAL OVERLOADS (1-, 2- OR 3-POLE AS REQUIRED)
- NFD NON-FUSED DISCONNECT
- RCPT 20A DUPLEX RECEPTACLE (GFCI PROTECTED AS REQUIRED), CORD AND PLUG
- RVSS REDUCED VOLTAGE SOLID-STATE
- VFD VARIABLE FREQUENCY DRIVE - HOA
- N/A NOT APPLICABLE

DIVISION OF RESPONSIBILITIES:
- 22/22 FURNISHED AND INSTALLED BY DIV. 22, WIRED BY DIV. 22
- 22/26 FURNISHED AND INSTALLED BY DIV. 22, WIRED BY DIV. 26
- 23/23 FURNISHED AND INSTALLED BY DIV. 23, WIRED BY DIV. 23
- 23/26 FURNISHED AND INSTALLED BY DIV. 23, WIRED BY DIV. 26
- 26/26 FURNISHED AND INSTALLED BY DIV. 26, WIRED BY DIV. 26

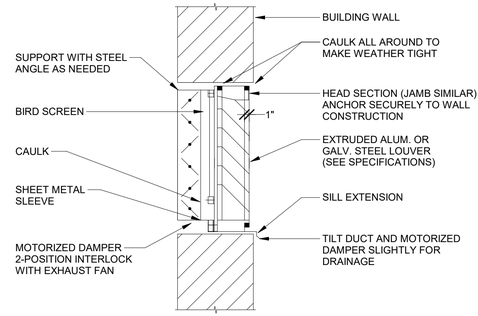
NOTES:
1. INTEGRAL DISCONNECTS AND OVERLOADS
2. INTEGRAL OVERLOADS
3. SINGLE POINT CONNECTION
4. PROVIDE RECEPTACLE AND DATA CONNECTION FOR PANEL
5. MOUNT ON UNI-STRUT IN FRONT OF UNIT
6. SIZE FUSES IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES FOR INSTALLED EQUIPMENT
7. INTEGRAL VARIABLE FREQUENCY DRIVE
8. INDOOR UNIT POWERED FROM OUTDOOR UNIT
9. SOLID STATE SPEED CONTROL

GENERAL NOTES:
A. CONTROL WIRING SHALL BE CONCEALED WITHIN WALL CONSTRUCTION, ABOVE CEILING, OR RUN IN CONDUIT. EXPOSED CONTROL WIRING IS UNACCEPTABLE.
B. UNLESS SPECIFICALLY NOTED, ALL FEEDERS SHALL INCLUDE A FULL SIZE NEUTRAL. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY WITH THE MANUFACTURER OF THE ACTUAL EQUIPMENT BEING SUPPLIED WHETHER A NEUTRAL IS REQUIRED PRIOR TO ROUGH-IN.
C. ALL DUCT SMOKE DETECTORS FURNISHED BY DIV. 26, INSTALLED BY DIV. 23, AND WIRED BY DIV. 26. DIV. 26 SHALL WIRE ALL FANS TO SHUT DOWN WHEN ALARM IS INITIATED BY ANY DUCT SMOKE DETECTOR.

MARK	DESCRIPTION	ELECTRICAL DATA			CONTROL		NOTES	DISCONNECT / STARTER		DISCONNECT				FEEDER	
		LOAD	MOCP	VOLT-PHASE	TYPE	DIV		TYPE	DIV	SIZE (NEMA)	SWITCH (AMPS)	FUSE (AMPS)	ENCLOSURE (NEMA)	COPPER WIRE (AWG)	CONDUIT (INCHES)
CD-1	CONTROL DAMPER/ ACTUATOR	FRACT.	- -	120V-1	MS W/ EF-1	23/26		- -	- -	- -	- -	- -	- -		
CD-2	CONTROL DAMPER/ ACTUATOR	FRACT.	- -	120V-1	MS W/ EF-1	23/26		- -	- -	- -	- -	- -	- -		
EF-1	ROOF-MOUNTED EXHAUST FAN	2 HP	MS	208V-1	MS	26/26	9	MSS	26/26	- -	- -	- -	1	#12	3/4"
MS-1A	MINI SPLIT INDOOR UNIT	- -	- -	208/230-1	T	23/23	8	MSS (2-POLE)	26/26	- -	- -	- -	1	#12	3/4"
MS-1B	MINI SPLIT OUTDOOR UNIT	19.8 MCA	- -	208/230-1	UC	23/23	6	NFD	26/26	- -	30	- -	3	#10	3/4"
MS-2A	MINI SPLIT INDOOR UNIT	- -	- -	208/230-1	T	23/23	8	MSS (2-POLE)	26/26	- -	- -	- -	1	#12	3/4"
MS-2B	MINI SPLIT OUTDOOR UNIT	19.8 MCA	- -	208/230-1	UC	23/23	6	NFD	26/26	- -	30	- -	3	#10	3/4"



ROOF EXHAUST FAN DETAIL
SCALE: N.T.S.



LOUVER WITH CONTROL DAMPER DETAIL
SCALE: N.T.S.

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DATE: 08/2025

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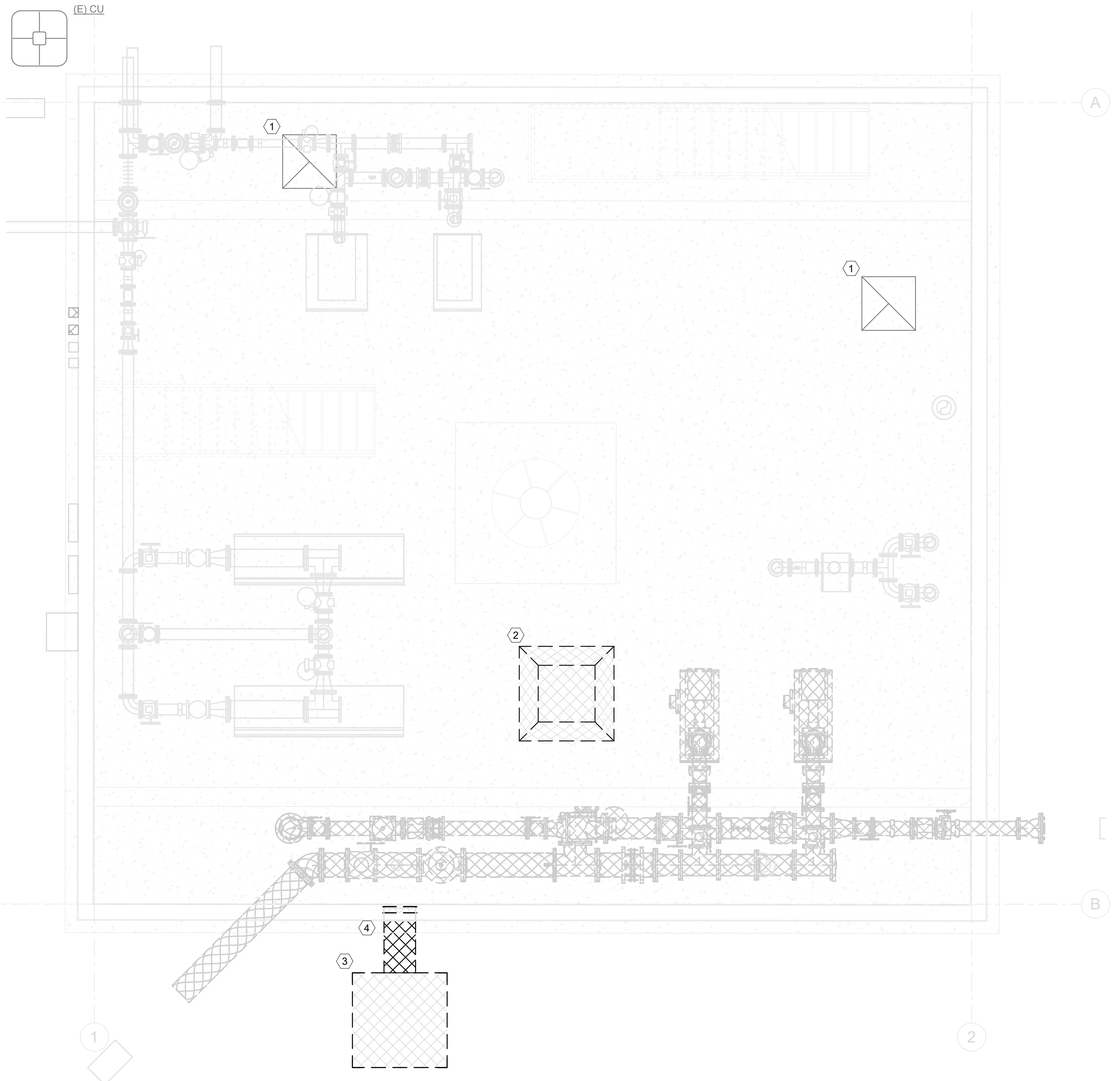
BULLHEAD CITY SECTION 10
CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS
HVAC SCHEDULES & DETAILS

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
84062
JODY T. WAVEREK
Date Signed 08.21.25
ARIZONA U.S.A.
Expires: September 30, 2026

DWG. NO. H-2
SHEET NO. 37 OF 60



KEY NOTES:

1. EXIST. CEILING GRILLES TO REMAIN.
2. DEMO. EXIST. ROOF-MOUNTED EXHAUST FAN. REUSE EXIST. ROOF CURB AND ROOF PENETRATION FOR NEW FAN. SEE DETAIL.
3. DEMO. EXIST. EVAPORATIVE COOLING UNIT, SUPPORT STAND, DUCTWORK AND CONTROL WIRING. REMOVE ELECTRICAL FEEDERS AND CONDUIT BACK TO NEAREST JUNCTION BOX (OR BREAKER). RELABEL BREAKER AS "SPARE" IF UNUSED.
4. REPAIR WALL DUCT OPENING. COORD. W/ GEN. CONT'R.

RAS/WAS ROOM HVAC DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

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BULLHEAD CITY SECTION 10

CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM HVAC DEMOLITION PLAN

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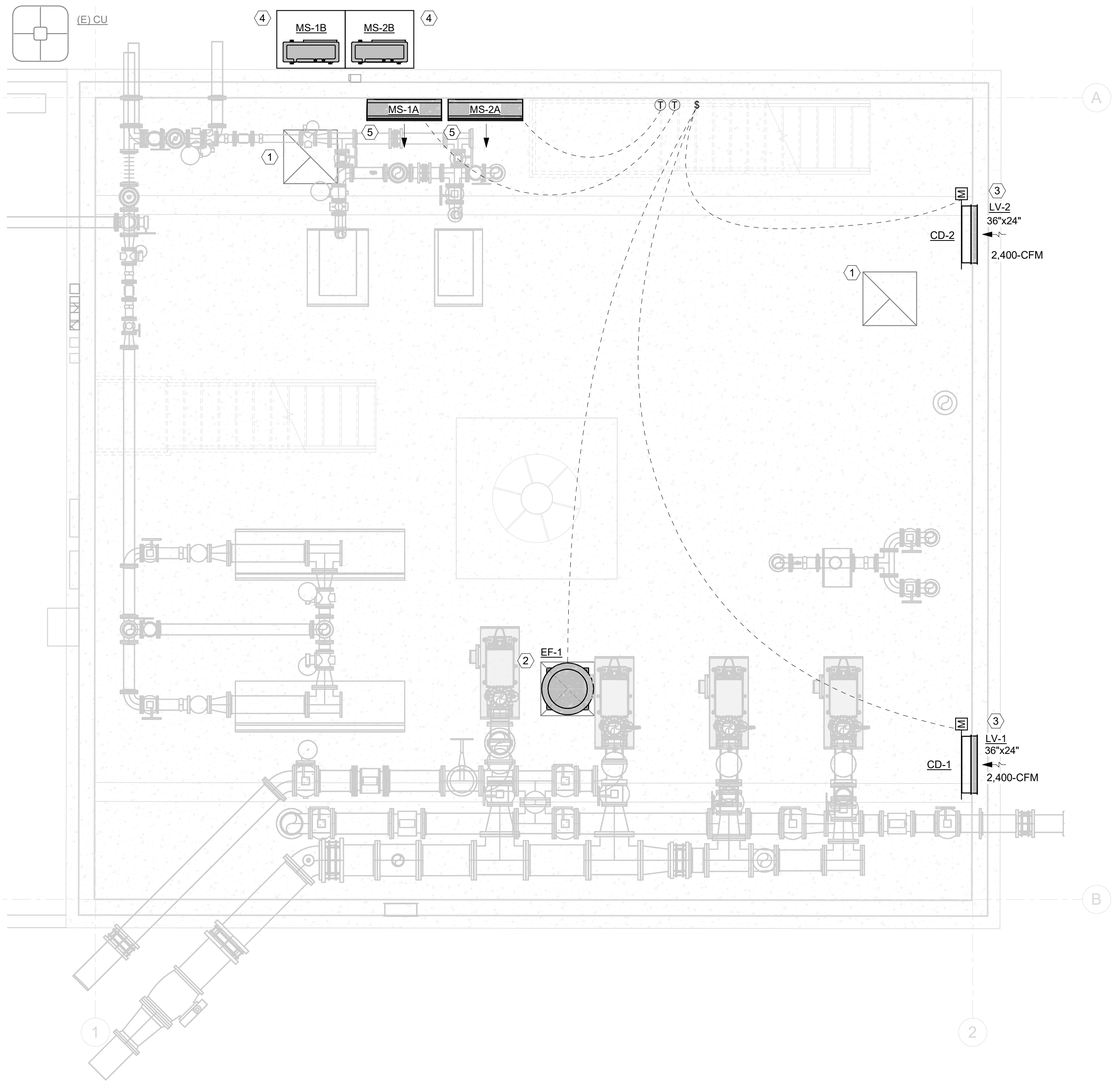
DWG. NO. H-3

SHEET NO. 38 OF 60



KEY NOTES:

1. EXIST. CEILING GRILLES TO REMAIN.
2. NEW ROOF-MOUNTED EXHAUST FAN. REUSE EXIST. ROOF CURB AND ROOF PENETRATION. CONTROLLED BY MANUAL WALL SWITCH PER DIV. 26. SEE DETAIL.
3. NEW STATIONARY LOUVER MOUNTED BELOW WINDOW. COORD. CMU WALL PENETRATION W/ GEN CONT'R. 120V-1 CONTROL DAMPER/ ACTUATOR. BOTH CD-1 & CD-2 ARE TO BE INTERLOCKED TO OPEN WITH THE OPERATION OF EF-1.
4. SPLIT-SYSTEM HEAT PUMP (OUTDOOR UNIT) MOUNTED ON CONCRETE PAD. COORD. EXACT PLACEMENT WITH GEN. CONT'R.
5. SPLIT-SYSTEM WALL-MOUNTED FAN COIL (INDOOR UNIT). COORD. EXACT PLACEMENT WITH GEN. CONT'R. ROUTE CONDENSATE DRAIN LINES AS REQ'D.

RAS/WAS ROOM HVAC PLAN

SCALE: 1/4" = 1'-0"

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CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM HVAC PLAN

Registered Professional Engineer (Mechanical)
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ARIZONA, U.S.A.
Expires: September 30, 2026

DWG. NO. H-4

SHEET NO. 39 OF 60

X 20A 3P OR X 100AF 80AT 3P — LOW – VOLTAGE CIRCUIT BREAKER (CB). RATINGS AND NO. OF POLES AS SHOWN. WHEN SPECIFIC TYPE IS REQUIRED, X INDICATES TYPE.

TYPES:
MCCB – MOLDED CASE
ICCB – INSULATED CASE
LVP – LOW – VOLTAGE POWER
MCP – MOTOR CIRCUIT PROTECTOR
(RATING PER CONNECTED LOAD)

CB — SEPARATELY MOUNTED CIRCUIT BREAKER; SEE ELECTRICAL ONE – LINE DIAGRAM OR SCHEDULE FOR DESCRIPTION

GFP — GROUND FAULT PROTECTION

52 — MEDIUM – VOLTAGE CIRCUIT BREAKER

FUSE, SIZE, AND NUMBER OF FUSES AS NOTED

FUSED CUTOUT, CURRENT RATING, FUSE SIZE, AND NUMBER OF POLES AS NOTED

FUSIBLE SWITCH, CURRENT RATING, FUSE SIZE, AND QUANTITY AS NOTED

NON–FUSED SWITCH, CURRENT RATING, AND NUMBER OF POLES AS NOTED

DISCONNECT OR DRAWOUT CONNECTION

A C & A C B B — MAGNETIC MOTOR STARTER AND SEPARATELY MOUNTED COMBINATION MAGNETIC MOTOR STARTER

D C & D C — MOTOR CONTROLLER AND SEPARATELY MOUNTED MOTOR CONTROLLER WITH SHORT CIRCUIT PROTECTION AND DISCONNECT

MOTOR STARTER AND CONTROLLER SUBSCRIPTS:

A – MAGNETIC STARTER NEMA SIZE

B – STARTER TYPE
NONE – FULL VOLTAGE NON–REVERSING (FVNR)
FVR – FULL VOLTAGE REVERSING
2S – TWO SPEED
RVAT – REDUCED VOLTAGE AUTO TRANSFORMER

C – CONTROL DIAGRAM OR CONTROLS SCHEDULE NUMBER (IF REQUIRED)

D – CONTROLLER TYPE
VFD – VARIABLE FREQUENCY DRIVE
SS – SOLID STATE

SEPARATELY MOUNTED COMBINATION MOTOR STARTER OR CONTROLLER; SEE ELECTRICAL ONE – LINE DIAGRAM OR SCHEDULE FOR DESCRIPTION

THERMAL OVERLOAD ELEMENT

OL — THERMAL OVERLOAD RELAY CONTACT

DISCONNECT OR SAFETY SWITCH, 30A, 3P, NON–FUSED UNLESS OTHERWISE NOTED

7 1/2 OR HP — MOTOR WITH DESIGN HORSEPOWER (WHEN INDICATED)

G — GENERATOR

TRANSFER SWITCH, CURRENT RATING, AND NUMBER OF POLES AS NOTED

ATS — ATS – AUTOMATIC
MTS – MANUAL

TRANSFORMER

△ — 3–PHASE, 3–WIRE DELTA CONNECTION

Y — 3–PHASE, 4–WIRE GROUNDED WYE CONNECTION

LP100 208/120V 3Ø, 4W — SWITCHBOARD OR PANELBOARD; NAME, VOLTAGE, PHASE, NUMBER OF WIRES WHEN INDICATED

100 KVA — NON–MOTOR LOAD WITH DESIGN KVA, KW, OR AMP

GENERAL NOTES:

1. THIS IS A STANDARD ELECTRICAL SYMBOLOGY SHEET. NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE–EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.
3. REFERENCES OTHER LEGEND SHEETS FOR PROJECT–SPECIFIC EQUIPMENT SYMBOLS, EQUIPMENT ABBREVIATIONS, AND PIPING SYSTEM ABBREVIATIONS.

CPT — CONTROL POWER TRANSFORMER (CPT)

VOLTAGE TRANSFORMER (VT OR PT)

CURRENT TRANSFORMER (CT)

WH — UTILITY WATT–HOUR METER PER UTILITY REQUIREMENTS

DMP — DIGITAL METERING PACKAGE

ETM — ELAPSED TIME METER

GROUND

LIGHTNING ARRESTER

SPD — LOW VOLTAGE SURGE PROTECTIVE DEVICE

ELECTRICAL CONNECTION

OR OR — NO ELECTRICAL CONNECTION

SV OR — SOLENOID VALVE

X / Y — CONTROL/RELAY COIL; X INDICATES TYPE, Y INDICATES LOOP NO. WHEN USED

TYPES:
CR – CONTROL RELAY
DP – DEFINITE PURPOSE RELAY
LC – LIGHTING CONTACTOR
M – MOTOR STARTER
PC – PHOTO CELL
TC – TIME CLOCK
TR – TIMING RELAY

NORMALLY OPEN CONTACT (N.O.)

NORMALLY CLOSED CONTACT (N.C.)

NORMALLY OPEN TIME DELAY RELAY CONTACT WITH TIME DELAY ON CLOSING AFTER COIL IS ENERGIZED

NORMALLY CLOSED TIME DELAY RELAY CONTACT WITH TIME DELAY ON OPENING AFTER COIL IS ENERGIZED

NORMALLY OPEN TIME DELAY RELAY CONTACT WITH TIME DELAY ON OPENING AFTER COIL IS DE–ENERGIZED

NORMALLY CLOSED TIME DELAY RELAY CONTACT WITH TIME DELAY ON CLOSING AFTER COIL IS DE–ENERGIZED

NORMALLY OPEN TEMPERATURE SWITCH; CLOSE ON RISING TEMPERATURE

NORMALLY CLOSED TEMPERATURE SWITCH; OPEN ON RISING TEMPERATURE

NORMALLY OPEN FLOW SWITCH; CLOSE ON INCREASING FLOW

NORMALLY CLOSED FLOW SWITCH; OPEN ON INCREASING FLOW

NORMALLY OPEN LEVEL SWITCH, CLOSE ON RISING LEVEL

NORMALLY CLOSED LEVEL SWITCH, OPEN ON RISING LEVEL

NORMALLY OPEN PRESSURE SWITCH, CLOSE ON INCREASING PRESSURE

NORMALLY CLOSED PRESSURE SWITCH, OPEN ON INCREASING PRESSURE

NORMALLY CLOSED PRESSURE SWITCH, OPEN ON INCREASING PRESSURE

NORMALLY OPEN LIMIT SWITCH, CLOSE ON REACHING LIMIT

NORMALLY CLOSED LIMIT SWITCH, OPEN ON REACHING LIMIT

FIELD WIRING EXTERNAL TO CONTROL PANEL

X — INTERLOCK; X INDICATES TYPE

TYPES:
E – ELECTRICAL
M – MECHANICAL
K – KEY

HAND OFF AUTO / XOO / OOX — 3 POSITION SELECTOR SWITCH, MAINTAINED CONTACTS; UNLESS OTHERWISE NOTED, 2–POSITION SIMILAR

NORMALLY OPEN PUSHBUTTON, MOMENTARY CONTACT UNLESS OTHERWISE NOTED

NORMALLY CLOSED PUSHBUTTON, MOMENTARY CONTACT UNLESS OTHERWISE NOTED

X — INDICATING LIGHT, X INDICATES LENS COLOR

X — PUSH TO TEST INDICATING LIGHT, X INDICATES LENS COLOR

LENS COLORS:
R – RED
G – GREEN
B – BLUE
Y – YELLOW
W – WHITE
A – AMBER

T — TRANSFORMER

SS — SELECTOR SWITCH

PB — PUSHBUTTON

IC — INSTRUMENTATION/CONTROL DEVICE

CONTROL PANEL INTEGRAL OR PROVIDED WITH ASSOCIATED EQUIPMENT

CONTROL PANEL WITH DISCONNECT SWITCH INTEGRAL OR PROVIDED WITH ASSOCIATED EQUIPMENT

J — JUNCTION OR PULL BOX

PANELBOARD (250V TO 600V)

PANELBOARD (LESS THAN 250V)

ELECTRICAL EQUIPMENT ENCLOSURE: SWITCHBOARD, MOTOR CONTROL CENTER, CONTROL PANEL, OR OTHER EQUIPMENT AS INDICATED

D — MOTION DETECTOR, PROVIDE POWER PACK AS NEEDED

PC — PHOTOCELL

Z X/Y — CEILING/PENDANT–MOUNTED LUMINAIRE – HID, COMPACT FLUORESCENT, OR INCANDESCENT

Z X/Y — WALL–MOUNTED LUMINAIRE – HID, COMPACT FLUORESCENT, OR INCANDESCENT

Z X/Y — CEILING/PENDANT–MOUNTED FLUORESCENT FIXTURE

Z X/Y — WALL–MOUNTED FLUORESCENT FIXTURE

Z X/Y — CEILING/PENDANT–MOUNTED FLUORESCENT FIXTURE NORMAL/EMERGENCY

Z X/Y — WALL–MOUNTED FLUORESCENT FIXTURE NORMAL/EMERGENCY

X/Y — EMERGENCY LIGHT FIXTURE, 2 ATTACHED HEADS AS SHOWN

X/Y — EMERGENCY LIGHT, REMOTE MOUNTED HEAD

X/Y — DOUBLE–FACED CEILING OR WALL–MOUNTED EXIT LIGHT; DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS

X/Y — SINGLE–FACED CEILING OR WALL–MOUNTED EXIT LIGHT; DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS

X/Y — AREA OR ROADWAY LIGHT – POLE–MOUNTED

LIGHTING FIXTURE SUBSCRIPTS:
X – INDICATES FIXTURE TYPE PER LIGHTING FIXTURE SCHEDULE
Y – INDICATES CIRCUIT NUMBER FROM PANELBOARD
z – INDICATES CONTROLLING SWITCH (IF REQUIRED)

m — MANUAL MOTOR STARTER

X/Y — TOGGLE SWITCH

SUBSCRIPTS:
X – INDICATES TYPE
NONE – SINGLE POLE
3 – THREE–WAY
4 – FOUR–WAY
HP – TOGGLE SWITCH, HORSEPOWER RATED
K – KEY SWITCH
TE – MANUAL MOTOR STARTER WITH THERMAL ELEMENT
P – PILOT LIGHT
L – LIGHTED HANDLE
Y – SWITCH NAME/DESIGNATION

SPECIAL–PURPOSE RECEPTACLE AS DEFINED ON PLANS

PLUG–IN RECEPTACLE STRIP, QUANTITY AND SPACING OF RECEPTACLES AS NOTED OR SPECIFIED

GROUNDING BUS

TELECOMMUNICATIONS OUTLET JUNCTION BOX

X/Y — QUAD–DUPLEX RECEPTACLE, TWO NEMA 5–20R UNDER COMMON COVER PLATE

X/Y — DUPLEX RECEPTACLE, NEMA 5–20R

X/Y — SIMPLEX RECEPTACLE, NEMA 5–20R

SUBSCRIPTS:
X – INDICATES TYPE
GFCI – GROUND FAULT CIRCUIT INTERRUPTER
Y – INDICATES CIRCUIT NUMBER FROM PANELBOARD

CONDUIT TURNING UP

CONDUIT TURNING DOWN

HOME RUN TO PANEL, 2 #12, 1 #12G IN 3/4"C UNLESS OTHERWISE NOTED

HOME RUN WITH CONDUIT SEAL–OFF

CIRCUIT RUN BETWEEN DEVICES EXPOSED IN NON–ARCHITECTURALLY FINISHED AREAS; CONCEALED IN ARCHITECTURALLY FINISHED AREAS. CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN FOR THE CIRCUIT.

CONDUIT RUN BETWEEN DEVICES CONCEALED IN NON–ARCHITECTURALLY FINISHED AREAS OR UNDER FLOOR SLAB. CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN FOR THE CIRCUIT.

CIRCUIT HASH MARKS (WHEN INDICATED); LONG, SHORT, SINGLE DOT, AND DOUBLE DOT REPRESENT PHASE, NEUTRAL, EQUIPMENT GROUND, AND ISOLATED EQUIPMENT GROUND, RESPECTIVELY. #12 IN 3/4" CONDUIT UNLESS OTHERWISE INDICATED.

CIRCUIT CONTINUATION

CONDUIT STUBBED OUT AND CAPPED

XXX — CONDUIT TAG OR CIRCUIT NUMBER – WIRE AND CONDUIT SIZE AS SPECIFIED IN CIRCUIT SCHEDULE ON THE SHEETS

GROUND CABLE

GROUND ROD

FAA — FIRE ALARM ANNUNCIATOR

FACP — FIRE ALARM CONTROL PANEL

F — FIRE ALARM MANUAL PULL STATION

CR — FIRE ALARM CONTROL RELAY

FS — FIRE ALARM CONTACT, FLOW SWITCH

TS — FIRE ALARM CONTACT, TAMPER SWITCH

PS — FIRE ALARM CONTACT, PRESSURE SWITCH

X AND X — SMOKE AND DUCT DETECTOR

SUBSCRIPT:
I – IONIZATION TYPE
P – PHOTOELECTRIC TYPE

X — HEAT DETECTOR

SUBSCRIPT:
R/C – RATE COMPENSATION
R/F – COMBINATION RATE OF RISE AND FIXED TEMP
R – RATE OF RISE
F – FIXED

X — ALARM BELL

X — ALARM HORN

X — ALARM FLASHING LIGHT

X — ALARM BELL AND FLASHING LIGHT COMBINATION UNIT

X — ALARM HORN AND FLASHING LIGHT COMBINATION UNIT

SUBSCRIPT:
NONE – GENERAL ALARM DEVICE
F – FIRE ALARM DEVICE

ABBREVIATIONS:

A or AMP	AMPERES
AC	ALTERNATING CURRENT
AFF	ABOVE FINISHED FLOOR
ATS	AUTOMATIC TRANSFER SWITCH
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CU	COPPER
EF	EXHAUST FAN
ELEC	ELECTRIC
EMT	ELECTRICAL METALLIC TUBING
EXP	EXPLOSION PROOF
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
HOA	HAND–OFF–AUTOMATIC
HP	HORSEPOWER
HVAC	HEATING, VENTILATING & AIR CONDITIONING
HZ	HERTZ
J–BOX	JUNCTION BOX
kW	KILOWATTS
kVA	KILOVOLT AMPERES
LFMC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
MAN	MANUAL
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MFR	MANUFACTURER
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NO	NORMALLY OPEN
#	NUMBER
PB	PUSHBUTTON
PDR	POWER DISTRIBUTION RECEPTACLE
PH	PHASE
PNL	PANEL
PVC	POLYVINYL CHLORIDE CONDUIT
PWR	POWER
RECPT	RECEPTACLE
RGS	RIGID GALVANIZED STEEL
SV	SOLENOID VALVE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
T	THERMOSTAT
TD	TIME DELAY
TEL	TELEPHONE
TTB	TELEPHONE TERMINAL BOARD
UG	UNDERGROUND
UH	UNIT HEATER
V	VOLT
VA	VOLT AMPERES
VFD	VARIABLE FREQUENCY DRIVE
W	WATTS
WP	WEATHERPROOF
XFMR	TRANSFORMER
Y	WYE CONNECTED
△	DELTA CONNECTED
Ø	PHASE

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BULLHEAD CITY SECTION 10
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
ELECTRICAL LEGEND

DWG. NO. E-1
SHEET NO. 40 OF 60

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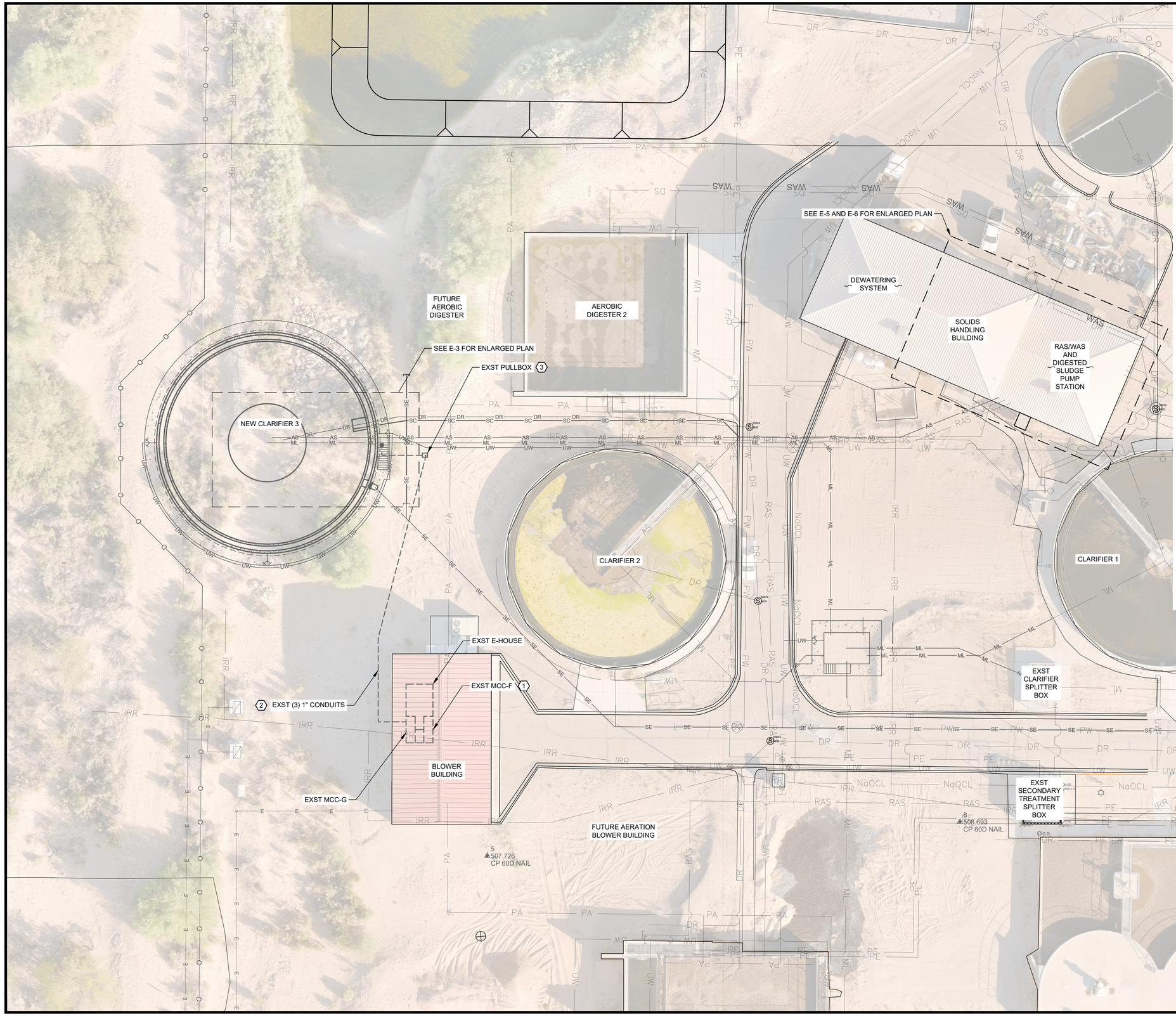

GENERAL ELECTRICAL NOTES:

(APPLIES TO ALL ELECTRICAL DRAWINGS)

A. IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INVOLVED TO COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, DIFFUSERS, BOXES, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIAL.

B. ELECTRICAL CONTRACTOR (EC) IS RESPONSIBLE FOR ALL CUTTING OF FLOORS, WALLS, CEILINGS, AND ROOFS TO PERFORM THE REQUIRED WORK DEPICTED IN THESE DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR ALL PATCHING OF HOLES TO THE SATISFACTION OF THE ARCHITECT/ ENGINEER. COORDINATE WITH GENERAL CONTRACTOR.

C. ALL POWER INTERRUPTIONS SHALL BE COORDINATED WITH OWNER. ANY DISRUPTION OF WORKERS IN THE SPACE SHALL BE KEPT TO A MINIMUM AND BE COORDINATED WITH THE OWNER PRIOR TO WORK COMMENCING IN THAT SPACE.

D. ALL BUILDING EXTERIOR RECEPTACLES SHALL BE: GFI STYLE, WEATHER RESISTIVE CONSTRUCTION AND FEATURE A METALLIC WEATHERPROOF-IN-USE COVER THAT IS CAPABLE OF ACCEPTING A STANDARD HASP STYLE PADLOCK, AS WELL AS ANY ADDITIONAL FEATURES WHEN CALLED FOR ON PLANS.

E. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR EACH 120V BRANCH CIRCUIT.

** DENOTES EQUIPMENT OR ITEMS SUPPLIED BY THE SCREENING SYSTEM MANUFACTURER AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

* DENOTES EQUIPMENT OR ITEMS SUPPLIED BY DIVISIONS 22 AND 23 AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

◆ DENOTES INSTRUMENTATION AND CONTROL COMPONENTS SPECIFIED IN SECTION 40 60 10. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

KEY NOTES:

1. EXST MCC-F IS AN EATON CUTLER-HAMMER FREEDOM 2100 SERIES UNIT. PROVIDE A 15A CIRCUIT BREAKER BUCKET IN A SPARE LOCATION IN THE MCC FOR THE CLARIFIER CONTROL PANEL FEEDER. EXST SECTIONS ARE RATED AT 65kAIC.

2. FURNISH AND INSTALL 1" CONDUIT FOR THE FOLLOWING:

   CLARIFIER CONTROL PANEL
   (3 #10, 1 #10 GND, 1"C)

   CLARIFIER LIGHTING & RECEPTACLE (2 SEPARATE CIRCUITS)
   (2 #10, 1 #10 GND LIGHTING, 2 #8, 1 #10 GND RECEPTACLE, 1"C)

   CLARIFIER CONTROL
   (1 CAT 6, 1"C, ROUTE TO MCC F)

   NOTE THAT THERE ARE THREE EXISTING SPARE CONDUITS. AT CONTRACTOR'S OPTION AND IF THE CONDITION OF THE EXISTING CONDUITS IS ACCEPTABLE, CONTRACTOR MAY USE THE EXISTING CONDUIT.

3. PROVIDE CONDUIT AND CONDUCTORS CALLED OUT IN KEY NOTE 2 FROM THE PULLBOX TO CLARIFIER EQUIPMENT.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

ELECTRICAL SITE PLAN

Registered Professional Engineer
CERTIFICATE
44827
MICHAEL D. BRANDT
Date Signed: 08-25-25
ARIZONA U.S.A.
Expires: June 30, 2026

DWG. NO. E-2

SHEET NO. 41 OF 60

R:\9519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\E-2.DWG

GENERAL NOTE:

1. IF ADDITIVE ALTERNATE 1 IS NOT AWARDED, THE ALUM MIXER WILL BE INSTALLED IN THE NEW CLARIFIER SPLITTER BOX. PROVIDE POWER FROM MCC E IN THE SOLIDS HANDLING BUILDING.

KEY NOTES:

1. PROVIDE A 1HP, 480VAC, 3PH FVNR MOTOR STARTER BUCKET IN MCC C IN A SPARE LOCATION. PROVIDE HOA CONTROL ON THE FRONT PANEL OF THE BUCKET. PROVIDE 65kAIC RATED EQUIPMENT IN THE BUCKET.
2. ROUTE (3#8, 1#10 GND, 1"C) THROUGH BUILDING TO EXTERIOR WALL FOR MOTOR FEEDER.
3. USE A TYPE LB CONDUIT BODY ON EXTERIOR PENETRATION. USE RGS CONDUIT FOR THE EXPOSED EXTERIOR CONDUIT RUN DOWN THE WALL AND THROUGH THE SWEEP. TRANSITION TO SCH 40 PVC CONDUIT BELOW GRADE.
4. TRANSITION FROM SCH 40 PVC TO RGS CONDUIT AT THE SWEEP AND ABOVE GRADE. SEE DETAIL 16110 FOR THE DISCONNECT SWITCH MOUNTING PEDESTAL. MOUNT DISCONNECT SWITCH, 30A, HD, 3-POLE, NEMA 3R WITH INTERLOCKED PIN AND SLEEVE RECEPTACLE MOUNTED TO SWITCH ENCLOSURE, SQUARE D H361AWA, OR EQUAL, TO THE PEDESTAL.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

SE MANHOLE ELECTRICAL PLAN

Registered Professional Engineer
CERTIFICATE
44487
MICHAEL W. BRANDT
Signed details
ARIZONA, U.S.A.
Expires: June 30, 2027

DWG. NO. E-3

SHEET NO. 42 OF 60

R:\8519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\E-3.DWG

GENERAL NOTES:

A. ALL EXPOSED CONDUIT TO BE RGS.

B. ROUTE CONDUITS BELOW CATWALK.

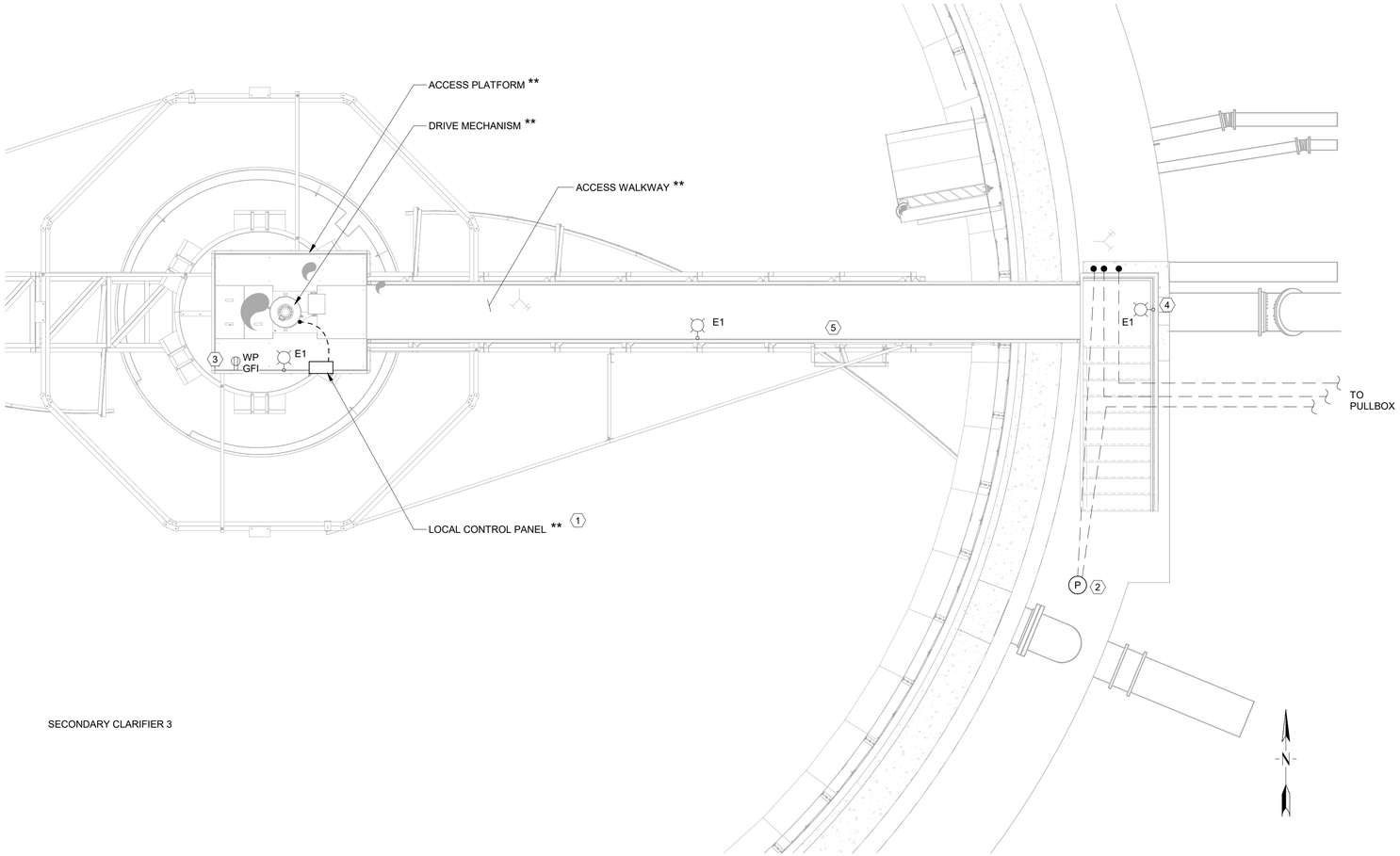
** DENOTES EQUIPMENT OR ITEMS SUPPLIED BY DIVISION 11 MANUFACTURER AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INTRUMENTATION AND FOR PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

KEY NOTES:

1. ROUTE CONDUIT BELOW CATWALK STRUCTURE AND TRANISTION TO LFMC BEFORE CONNECTING TO THE MOTOR.
2. MOUNT PHOTOCELL ON THE SIDE OF THE EFFLUENT COLLECTION BOX TO CONTROL THE CLARIFIER LIGHTING.
3. PROVIDE A WR RATED, GFCI RECEPTACLE IN A WP "IN-USE" COVER. MOUNT TO HAND RAIL.
4. MOUNT LIGHT FIXTURE POLES TO HANDRAIL, SEE DETAIL 1/-
5. PROVIDE CONDUIT EXPANSION COUPLINGS AT THE MIDPOINT OF ECH CONDUIT RUN. LIGHTING CONDUIT TO HAVE AN EXPANSION COUPLING AT THE MIDPOINT OF CONDUIT RUNS BETWEEN FIXTURES.

LUMINAIRE SCHEDULE:

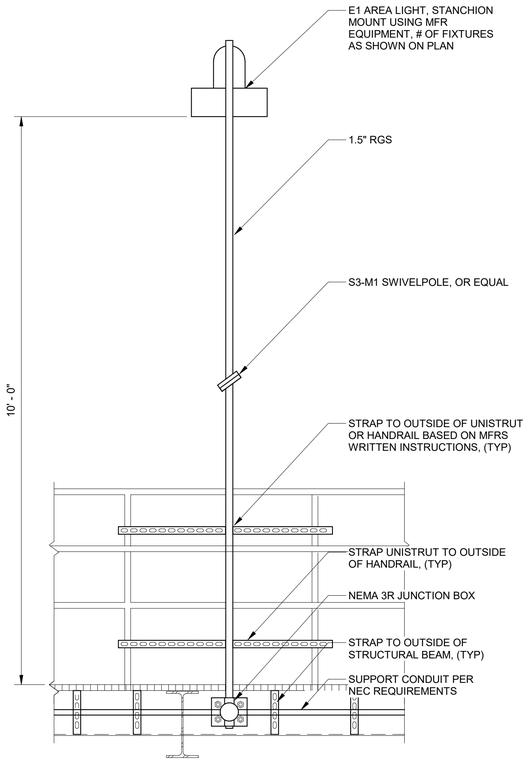
1. E1 LED AREA LIGHT, 5000K, 80CRI, 9000 PLUS LUMENS, ALUMINUM HOUSING, POLYCARBONATE DIFFUSED LENS, 66W, UNIVERSAL VOLTAGE, 360 DEGREE BEAM DISTRIBUTION, SURFACE JBOX MOUNT, DIALIGHT ALU7BC26DxWNGN OR APPROVED EQUAL. PROVIDE MFR APPROVED SWIVEL BRACKET FOR POLE MOUNTING.



SECONDARY CLARIFIER 3

ENLARGED CLARIFIER 3 ELECTRICAL PLAN

SCALE: 1/4" = 1'-0"



1 CATWALK AREA LIGHT MOUNT DETAIL

SCALE: N.T.S.

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BULLHEAD CITY SECTION 10

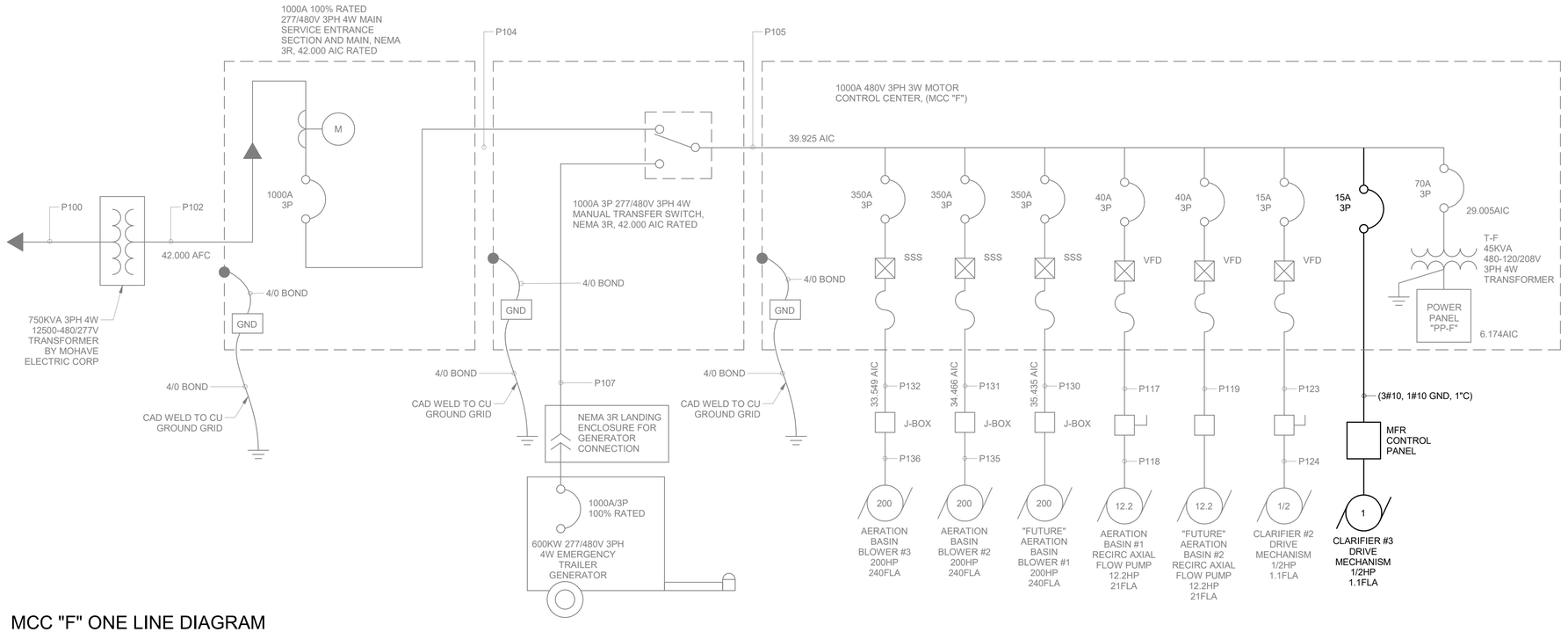
CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 ELECTRICAL AND LIGHTING PLAN

Registered Professional Engineer CERTIFICATE 44967 MICHAEL W. BRANDT Date Signed 08-21-25 ARIZONA, U.S.A. Expires: June 30, 2027

DWG. NO. E-4

SHEET NO. 43 OF 60



MCC "F" LOAD CALCULATION

480V

AERATION BASIN #3 BLOWER (200HP) (*1.25)	300 AMPS
AERATION BASIN #2 BLOWER (200HP)	240 AMPS
"FUTURE" AERATION BASIN #1 BLOWER (200HP)	240 AMPS
AERATION BASIN #1 RECIRCULATION AXIAL FLOW PUMP	21.0 AMPS
AERATION BASIN #2 RECIRCULATION AXIAL FLOW PUMP	21.0 AMPS
CLARIFIER #2 DRIVE (1/2HP)	1.1 AMPS
CLARIFIER #3 DRIVE (1/2 HP)	1.1 AMPS
PANEL "PP-AB"	19.67 AMPS
TOTAL CONNECTED	580.67 AMPS
TOTAL INCLUDING FUTURE	842.77 AMPS

EXISTING CONDUIT CALLOUTS CAN BE FOUND IN THE 2005 DMJM-HARRIS RECORD DRAWINGS.

MCC "F" ONE LINE DIAGRAM

SCALE: N.T.S.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

CLARIFIER 3 ONE-LINE & FEEDER SCHEDULE

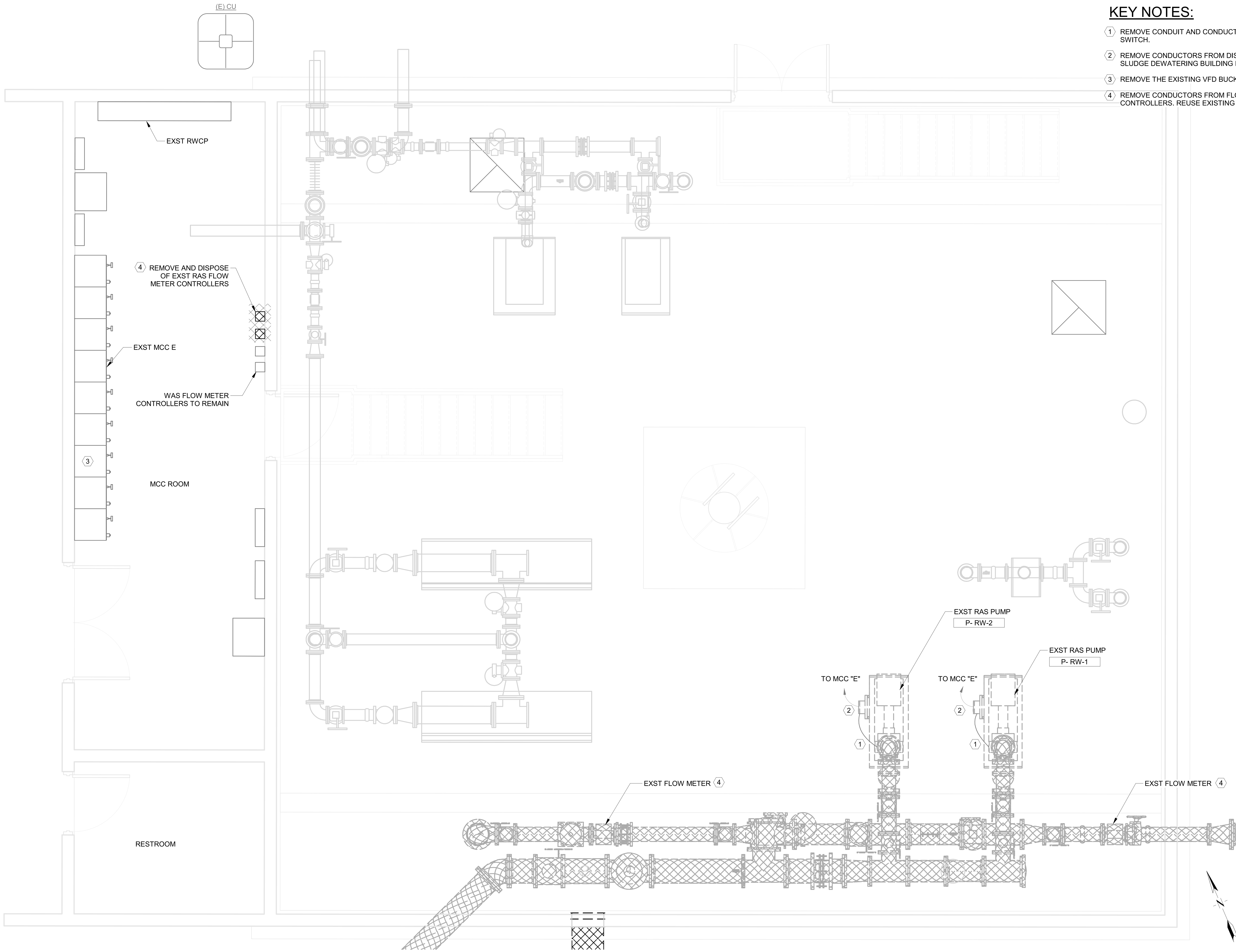
Registered Professional Engineer CERTIFICATE 44947 MICHAEL W. BRANDT Date Signed 08-21-25 ARIZONA U.S.A. Expires: June 30, 2027

DWG. NO. E-5

SHEET NO. 44 OF 60

KEY NOTES:

1. REMOVE CONDUIT AND CONDUCTORS BETWEEN PUMP MOTOR AND DISCONNECT SWITCH.
2. REMOVE CONDUCTORS FROM DISCONNECT SWITCH BACK TO MCC E LOCATED IN THE SLUDGE DEWATERING BUILDING ELECTRICAL ROOM. CONDUIT TO REMAIN FOR REUSE.
3. REMOVE THE EXISTING VFD BUCKETS FROM MCC E FOR RAS PUMPS P-RW-1, 2, AND 3.
4. REMOVE CONDUCTORS FROM FLOW METERS TO THE REMOTE MOUNTED CONTROLLERS. REUSE EXISTING CONDUIT TO GREATEST EXTENT POSSIBLE.



RAS/WAS ROOM AND MCC ROOM DEMOLITION PLAN

SCALE: 3/8" = 1'-0"

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CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

RAS/WAS ROOM AND MCC ELECTRICAL DEMOLITION PLAN

Registered Professional Engineer, Certificate 44487, MICHAEL W. BRANDT, ARIZONA, U.S.A., Expires June 30, 2027

DWG. NO. E-6

MEP COORDINATION SCHEDULE

CONTROL TYPE:

BAS	BUILDING AUTOMATION SYSTEM
CO	CARBON MONOXIDE DETECTOR
CONT	CONTINUOUS OPERATION
EF	INTERLOCK WITH EXHAUST FAN
HCP	HOOD CONTROL PANEL
INT	INTEGRAL
L	LIGHT SWITCH
MS	MANUAL SWITCH
OS	OCCUPANCY SENSOR
PS	PRESSURE SWITCH
T	THERMOSTAT
TC	TIME CLOCK
UC	UNIT CONTROLLER
VE	VEHICLE EXHAUST DETECTION SYSTEM
N/A	NOT APPLICABLE

DISCONNECT/STARTER TYPE:

CB	PANELBOARD CIRCUIT BREAKER WITHIN SIGHT OF EQUIPMENT
CSFD	COMBINATION STARTER/DISCONNECT - HOA
FD	FUSED DISCONNECT
FST	FUSTAT
FW	FACTORY-WIRED SINGLE POINT CONNECTION
MOCP	MOTOR OVER-CURRENT PROTECTION
MSS	MANUAL STARTER SWITCH WITH THERMAL OVERLOADS (1-, 2- OR 3-POLE AS REQUIRED)
NFD	NON-FUSED DISCONNECT
RCPT	20A DUPLEX RECEPTACLE (GFCI PROTECTED AS REQUIRED), CORD AND PLUG
RVSS	REDUCED VOLTAGE SOLID-STATE
VFD	VARIABLE FREQUENCY DRIVE - HOA
N/A	NOT APPLICABLE

DIVISION OF RESPONSIBILITIES:

22/22	FURNISHED AND INSTALLED BY DIV. 22, WIRED BY DIV. 22
22/26	FURNISHED AND INSTALLED BY DIV. 22, WIRED BY DIV. 26
23/23	FURNISHED AND INSTALLED BY DIV. 23, WIRED BY DIV. 23
23/26	FURNISHED AND INSTALLED BY DIV. 23, WIRED BY DIV. 26
26/26	FURNISHED AND INSTALLED BY DIV. 26, WIRED BY DIV. 26

NOTES:

1. INTEGRAL DISCONNECTS AND OVERLOADS
2. INTEGRAL OVERLOADS
3. SINGLE POINT CONNECTION
4. PROVIDE RECEPTACLE AND DATA CONNECTION FOR PANEL
5. MOUNT ON UNI-STRUT IN FRONT OF UNIT
6. SIZE FUSES IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES FOR INSTALLED EQUIPMENT
7. INTEGRAL VARIABLE FREQUENCY DRIVE
8. INDOOR UNIT POWERED FROM OUTDOOR UNIT
9. SOLID STATE SPEED CONTROL

GENERAL NOTES:

A. CONTROL WIRING SHALL BE CONCEALED WITHIN WALL CONSTRUCTION, ABOVE CEILING, OR RUN IN CONDUIT. EXPOSED CONTROL WIRING IS UNACCEPTABLE.
B. UNLESS SPECIFICALLY NOTED, ALL FEEDERS SHALL INCLUDE A FULL SIZE NEUTRAL. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY WITH THE MANUFACTURER OF THE ACTUAL EQUIPMENT BEING SUPPLIED WHETHER A NEUTRAL IS REQUIRED PRIOR TO ROUGH-IN.
C. ALL DUCT SMOKE DETECTORS FURNISHED BY DIV. 26, INSTALLED BY DIV. 23, AND WIRED BY DIV. 26. DIV. 26 SHALL WIRE ALL FANS TO SHUT DOWN WHEN ALARM IS INITIATED BY ANY DUCT SMOKE DETECTOR.

MARK	DESCRIPTION	ELECTRICAL DATA			CONTROL		NOTES	DISCONNECT / STARTER		DISCONNECT				FEEDER	
		LOAD	MOCP	VOLT-PHASE	TYPE	DIV		TYPE	DIV	SIZE (NEMA)	SWITCH (AMPS)	FUSE (AMPS)	ENCLOSURE (NEMA)	COPPER WIRE (AWG)	CONDUIT (INCHES)
CD-1	CONTROL DAMPER/ ACTUATOR	FRACT.	- -	120V-1	MS W/ EF-1	23/26		- -	- -	- -	- -	- -	- -		
CD-2	CONTROL DAMPER/ ACTUATOR	FRACT.	- -	120V-1	MS W/ EF-1	23/26		- -	- -	- -	- -	- -	- -		
EF-1	ROOF-MOUNTED EXHAUST FAN	2 HP	MS	208V-1	MS	26/26	9	MSS	26/26	- -	- -	- -	1	#12	3/4"
MS-1A	MINI SPLIT INDOOR UNIT	- -	- -	208/230-1	T	23/23	8	MSS (2-POLE)	26/26	- -	- -	- -	1	#12	3/4"
MS-1B	MINI SPLIT OUTDOOR UNIT	19.8 MCA	- -	208/230-1	UC	23/23	6	NFD	26/26	- -	30	- -	3	#10	3/4"

GENERAL NOTES:

A. ALL VFD CONDUCTORS WILL MEET THE REQUIREMENTS OF SECTION 26 0519 PARAGRAPH 2.3.

B. REFERENCE DIVISION 26 SPECIFICATIONS FOR EQUIPMENT REQUIREMENTS.

C. IT IS ABSOLUTELY NECESSARY FOR CONTRACTOR TO VERIFY AND PROVIDE ALL POWER AND CONTROL CONDUCTORS FOR EQUIPMENT SUPPLIED.

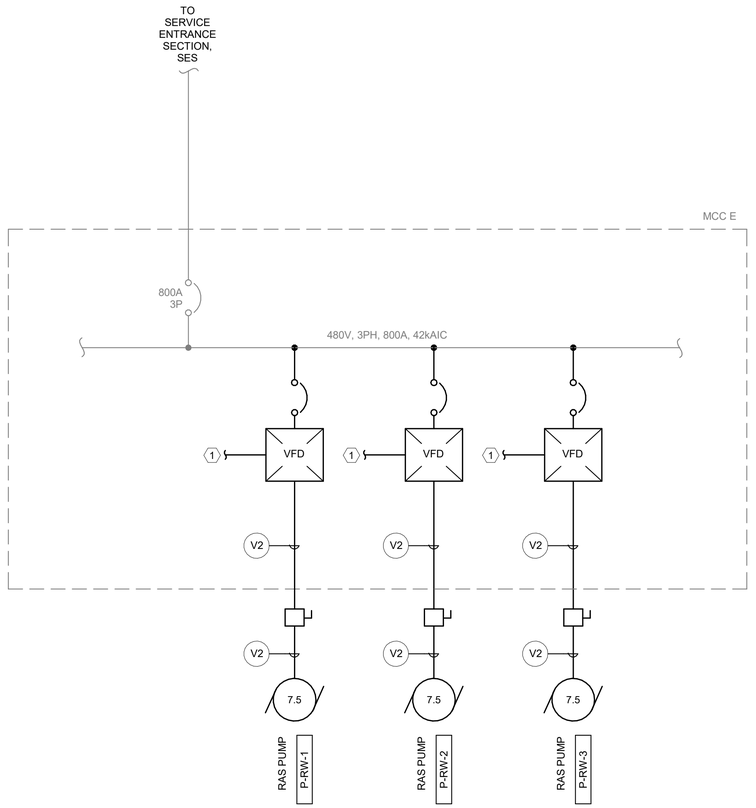
D. PROVIDE VFD LINE AND LOAD REACTOR PER SPECIFICATION 26 2419.

E. MCC MANUFACTURER TO PROVIDE BUCKETS THAT WILL ALLOW LOCKOUT TAG OUT OF EACH STARTER OR BREAKER INSIDE OF MCC-DB.

(NO.) (NO.) NUMBER IN CIRCLE CORRESPONDS TO CONDUIT AND CABLE SCHEDULE, DWG E-9. NUMBER OUTSIDE CIRCLE DESIGNATES NUMBER OF PARALLEL CONDUITS AND CONDUCTORS. SEE CABLE AND CONDUIT SCHEDULE ON E-9.

KEY NOTES:

(1) ALL VFD'S TO HAVE AN ETHERNET COMM MODULE THAT SUPPORTS ETHERNET/IP COMM PROTOCOL. CONNECT A CAT5e CABLE FROM EACH DRIVE AND ROUTE IT TO A NETWORK SWITCH IN RWCP.



ONE LINE DIAGRAM
SCALE: N.T.S.

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DATE: 08/2025
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BULLHEAD CITY SECTION 10

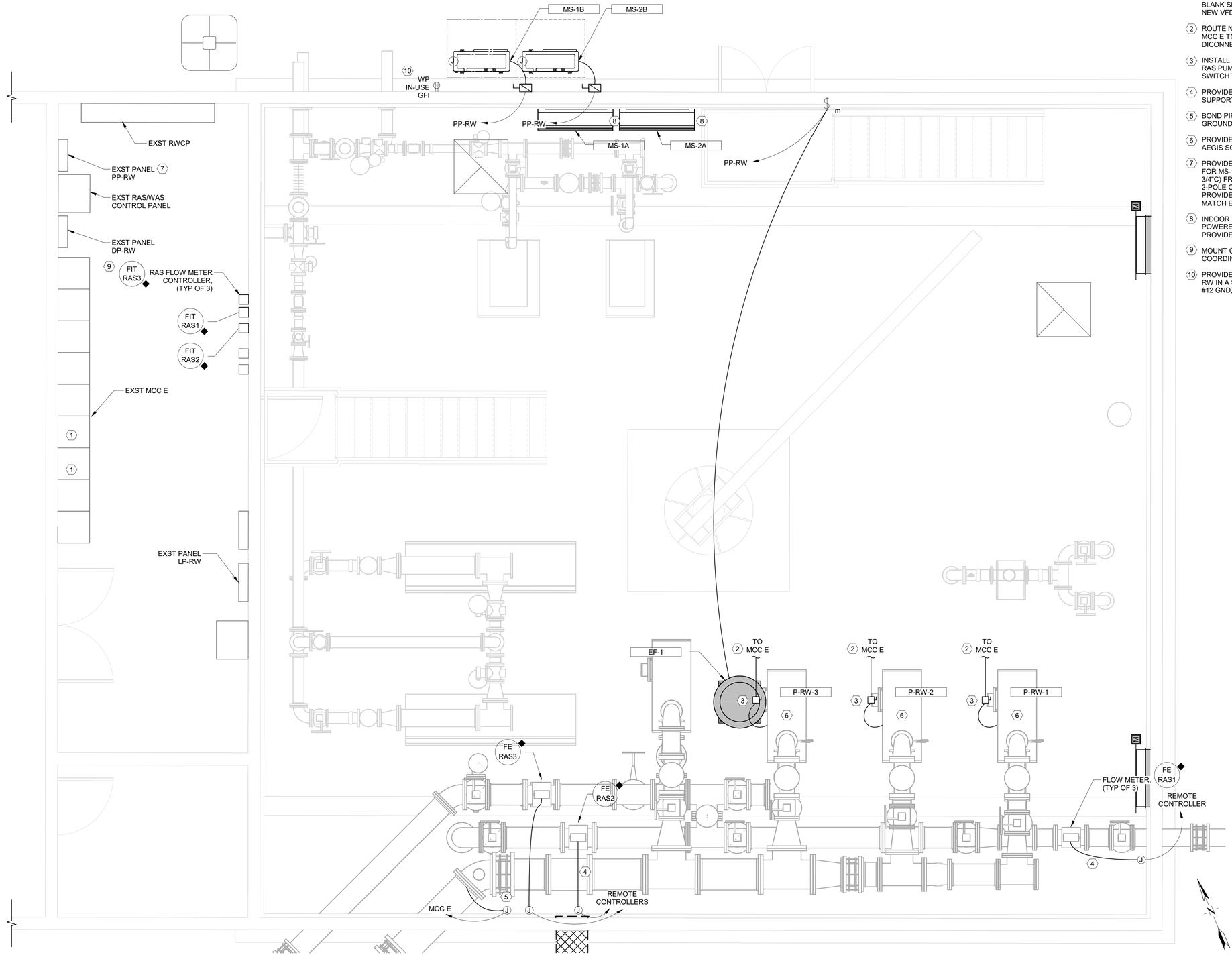
CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

PARTIAL RAS/WAS ONE-LINE AND MEP COORDINATION SCHEDULE

Registered Professional Engineer CERTIFICATE 44987 MICHAEL W. BRANDT Date Signed 12-3-25 ARIZONA U.S.A. Expires June 30, 2027

DWG. NO. E-8

SHEET NO. 47 OF 60



RAS/WAS ROOM AND MCC ROOM ELECTRICAL PLAN

SCALE: 3/8" = 1'-0"

KEY NOTES:

1. INSTALL NEW VFD BUCKETS FOR NEW RAS PUMP MOTORS. EXISTING MCC E IS A GE SERIES 8000 LINE. INSTALL INTO LOCATIONS THAT THE OLD VFDS WERE REMOVED FROM. INSTALL BLANK SPACER COVERS AS NEEDED TO COVER OPEN AREAS IF NEW VFD BUCKETS ARE SMALLER.
2. ROUTE NEW VFD CABLE THROUGH THE EXISTING CONDUIT FROM MCC E TO THE DISCONNECT SWITCH. TRANSITION TO LFMC FROM DICONNECT SWITCH TO MOTOR.
3. INSTALL A NEW 30A, HD, NON-FUSED DISCONNECT SWITCH FOR RAS PUMP 3. TRANSITION TO LFMC FROM THE DISCONNECT SWITCH TO MOTOR.
4. PROVIDE LFMC BETWEEN FLOW METER AND JUNCTION BOX. SUPPORT CONDUIT ALONG PIPING PER THE NEC.
5. BOND PIPING TO GROUND WITH (1#4 GND, 3/4"C) BACK TO GROUND BAR INSIDE MCC E.
6. PROVIDE MOTOR SHAFT GROUNDING RINGS ON PUMP MOTORS, AEGIS SGR, OR EQUAL.
7. PROVIDE (2) 30A, 2-POLE CIRCUIT BREAKERS IN SPARE SLOTS FOR MS-1B AND MS-2B FEEDERS. PROVIDE (2) (2#10, 1#12 GND, 3/4"C) FROM PANELBOARD TO MS-1B AND MS-2B. PROVIDE A 20A, 2-POLE CIRCUIT BREAKER IN SPARE SLOTS FOR EF-1 FEEDER. PROVIDE (2#12, 1#12 GND, 3/4"C) FROM PANELBOARD TO EF-1. MATCH EXST BREAKER TYPE AND kAIC RATING.
8. INDOOR UNIT, MS-1A, IS POWERED FROM MS-1B, MS-2A IS POWERED FROM MS-2B. FEEDERS NOT SHOWN FOR CLARITY. PROVIDE (2) (2#12, 1#12 GND, 3/4"C).
9. MOUNT CONTROLLER UNDER WINDOW OPENING OR COORDINATE LOCATION WITH OWNER.
10. PROVIDE A 20A, 1-POLE CIRCUIT BREAKER IN PANELBOARD PP-RW IN A SPARE SLOT FOR RECEPTACLE POWER. PROVIDE (2#12, 1 #12 GND, 3/4"C) FOR THE FEEDER TO THE RECEPTACLE.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

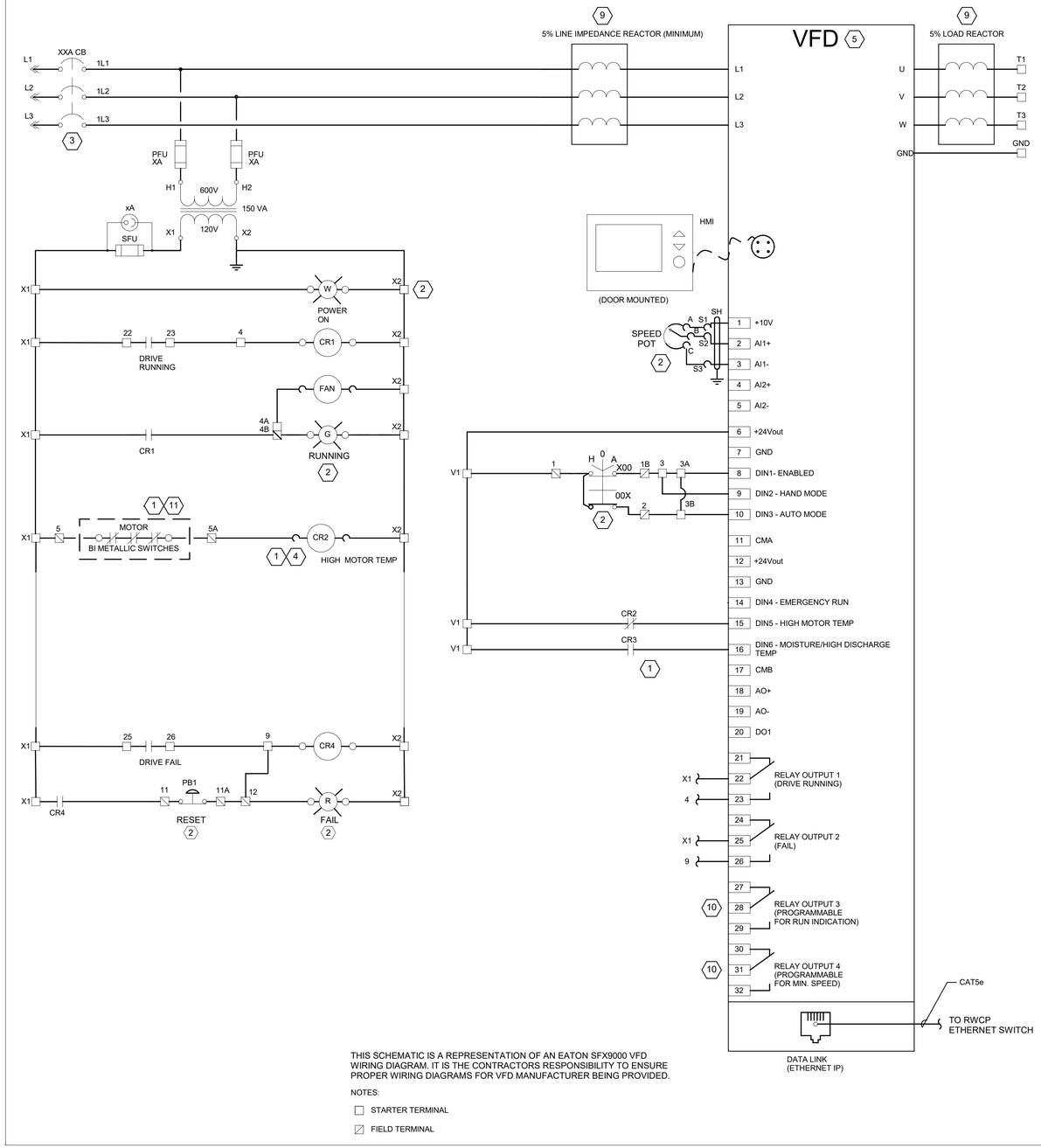
RAS/WAS ROOM AND ELECTRICAL ROOM ELECTRICAL PLAN

Registered Professional Engineer CERTIFICATE 44967 MICHAEL W. BRANDT Date Signed 12-31-25 ARIZONA U.S.A. Expires: June 30, 2027

DWG. NO. E-7

SHEET NO. 46 OF 60

SCHEMATIC DIAGRAM



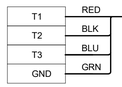
THIS SCHEMATIC IS A REPRESENTATION OF AN EATON SFX9000 VFD WIRING DIAGRAM. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE PROPER WIRING DIAGRAMS FOR VFD MANUFACTURER BEING PROVIDED.

NOTES:

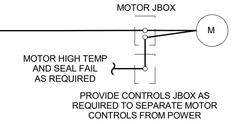
☐ STARTER TERMINAL

☒ FIELD TERMINAL

STARTER TERMINALS



FIELD CONNECTIONS



GENERAL NOTES:

EACH DRIVE SHALL HAVE ASSIGNED DIGITAL INPUTS/OUTPUTS FOR THE FOLLOWING SIGNALS:
DIGITAL INPUTS
- VFD ENABLED
- VFD HAND MODE
- VFD AUTO MODE
- EMERGENCY RUN
- HIGH TEMP
- MOISTURE/HIGH BLOWER DISCHARGE TEMP

DIGITAL OUTPUTS
- PUMP RUNNING (DOUT)
- PUMP FAILURE (DOUT)
- PROGRAMMABLE (DOUT) - SET TO RUNNING INDICATION
- PROGRAMMABLE (DOUT) - SET TO MIN. SPEED REACHED INDICATION

THE OPERATION OF TEH VFD SHALL BE AS FOLLOWS:
1. HOA IN HAND; THE VFD RUNS AT THE SPEED AS SET ON THE ASSOCIATED SPEED POT. A COMMAND TO START/STOP THE VFD THROUGH ETHERNET/IP WILL HAVE NO EFFECT
2. HOA IN OFF; THE VFD WILL STOP IF RUNNING AND WILL NOT BE ABLE TO BE STARTED.
3. HOA IN AUTO; THE VFD WILL BE CONTROLLED THROUGH THE ETHERNET/IP NETWORK (START/STOP AND SPEED REFERENCE COMMANDS ARE CONTROLLED BY THE SCADA SYSTEM).

THE FOLLOWING INFORMATION MUST BE AVAILABLE THROUGH ETHERNET/IP AT THE PLC:
1. VFD RUNNING
2. VFD FAULT
3. HOA SWITCH IN AUTO
4. HOA SWITCH IN HAND
5. BLOWER OVER TEMP
6. VFD CURRENT
7. VFD FREQUENCY

PLC TO VFD
1. START/STOP COMMAND
2. RESET FAULT
3. VFD FREQUENCY COMMAND

KEY NOTES:

(1) IF APPLICABLE.

(2) DOOR MOUNTED.

(3) VFD SHORT CIRCUIT PROTECTION TO MATCH VFD MANUFACTURER REQUIREMENTS.

(4) TWO SETS OF CONTACTS; SECOND SET OF NC CONTACTS WIRED DIRECTLY TO VFD INPUT.

(5) VFD FOR BLOWER APPLICATION WILL BE HEAVY-DUTY RATED FOR CONSTANT TORQUE.

(6) UNASSIGNED

(7) UNASSIGNED

(8) UNASSIGNED

(9) LOAD AND LINE REACTOR BY VFD MANUFACTURER OR MTE CORPORATION. INSTALL INSIDE THE VFD BUCKET. NOT REQUIRED FOR MOTORS RATED AT 5HP OR UNDER.

(10) PROVIDE TWO N.O. RELAYS THAT ARE PROGRAMMABLE FOR DIFFERENT SETTINGS INSIDE THE VFD.

(11) DIAGRAM SHOWS BI-METALLIC SWITCHES. CONTRACTOR TO COORDINATE EQUIPMENTREQUIRED IF OTHER TYPES OF SENSORS ARE PROVIDED.

VFD SCHEMATIC

SCALE: N.T.S.

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BULLHEAD CITY SECTION 10

CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

TYPICAL VFD MOTOR CONTROL SCHEMATIC

Registered Professional Engineer CERTIFICATE 44941 MICHAEL W. BRANDT Date Signed 08.21.25 ARIZONA U.S.A. Expires: June 30, 2027

DWG. NO. E-9

SHEET NO. 48 OF 60

NO.	POWER CONDUCTORS	GROUND CONDUCTOR	CONDUIT SIZE
P1	2#12	1#12	3/4"
P2	3#12	1#12	3/4"
P3	4#12	1#12	3/4"
P4	2#10	1#10	3/4"
P5	3#10	1#10	3/4"
P6	4#10	1#10	3/4"
P7	2#8	1#10	1"
P8	3#8	1#10	1"
P9	4#8	1#10	1"
P10	2#6	1#8	1"
P11	3#6	1#8	1-1/2"
P12	4#6	1#8	1-1/2"
P13	3#4	1#8	1-1/2"
P14	4#4	1#8	1-1/2"
P15	3#2	1#6	2"
P16	4#2	1#6	2"
P17	3#1	1#6	2"
P18	4#1	1#6	2"
P19	3#1/0	1#4	2"
P20	4#1/0	1#4	2-1/2"
P21	3#2/0	1#4	2-1/2"
P22	4#2/0	1#4	2-1/2"
P23	3#3/0	1#4	2-1/2"
P24	4#3/0	1#4	2-1/2"
P25	3#4/0	1#2	3"
P26	4#4/0	1#2	3"
P27	3#250	1#2	3"
P28	4#250	1#2	3"
P29	3#350	1#2	3"
P30	4#350	1#2	3-1/2"
P31	3#400	1#1/0	3-1/2"
P32	4#400	1#1/0	3-1/2"
P33	3#500	1#1/0	3-1/2"
P34	4#500	1#1/0	4"
P35	3#600	1#1/0	4"
P36	4#600	1#1/0	4"
P37	3#700	1#2/0	4"
P38	4#700	1#2/0	4"
P39	3#750	1#2/0	4"
P40	4#750	1#2/0	4"

NO.	SHLD VFD PWR CONDUCTORS	GROUND CONDUCTOR	CONDUIT SIZE
V1	3#12	1#12	3/4"
V2	3#10	1#10	1"
V3	3#8	1#8	1.5"
V4	3#6	1#6	2"
V5	3#4	1#4	2"
V6	3#2	1#2	3"
V7	3#1/0	3#8	3"
V8	3#2/0	3#8	3"
V9	3#3/0	3#8	3.5"
V10	3#4/0	3#8	4.5"

NO.	UNSHIELDED CNTRL CABLES SINGLE COND. OR TRAY CABLE	CONDUIT SIZE
C1	2#14	3/4"
C2	3#14	3/4"
C3	4#14	3/4"
C4	5#14	3/4"
C5	6#14	3/4"
C6	7#14	3/4"
C7	8#14	3/4"
C8	9#14	3/4"
C9	10#14	3/4"
C10	12#14	1"
C11	16#14	1"
C12	24#14	1"
C13	36#14	1-1/2"
C14	72#14	2-1/2"
C15	VENDOR SUPPLIED CABLE	AS REQ'D
C16	PLC REMOTE I/O COMM CABLE	2"
C17	ANTENNA COAXIAL CABLE	2"
C18	RS485 NETWORK CABLE	2"
C19	TELEPHONE CABLE	2"
C20	FIBER OPTIC	2"
C21	CATEGORY 5e ETHERNET CABLE	2"
C22	RESERVED	
C23	RESERVED	
C24	RESERVED	
C25	RESERVED	

NO.	INSTRUMENTATION CABLES	CONDUIT SIZE
J1	1 CABLE TSP #16	3/4"
J2	2 CABLES TSP #16	3/4"
J3	3 CABLES TSP #16	1"
J4	4 CABLES TSP #16	1"
J5	5 CABLES TSP #16	1"
J6	6 CABLES TSP #16	1-1/2"
J7	1 CABLE TST #16	3/4"
J8	2 CABLES TST #16	3/4"
J9	3 CABLES TST #16	1"
J10	4 CABLES TST #16	1"
J11	1 CABLE STSP, 4 PAIR, #18	3/4"
J12	1 CABLE STSP, 6 PAIR, #18	1"
J13	1 CABLE STSP, 8 PAIR, #18	1"
J14	1 CABLE STSP, 12 PAIR, #18	1-1/2"
J15	1 CABLE STSP, 24 PAIR, #18	2"
J16	1 CABLE STSP, 36 PAIR, #18	2"
J17	1 CABLE STST, 4 TRIADS, #18	1"
J18	1 CABLE STST, 8 TRIADS, #18	1-1/2"
J19	1 CABLE STST, 12 TRIADS, #18	2"
J20	1 CABLE STST, 24 TRIADS, #18	2"
J21	1 CABLE STST, 36 TRIADS, #18	2"
J22	VENDOR SUPPLIED CABLE	AS REQ'D
J23	RESERVED	
J24	RESERVED	
J25	RESERVED	

CABLE AND CONDUIT NOTES:

1. FOR CIRCUITS WITH PARALLEL CONDUCTORS, INCREASE THE EQUIPMENT GROUNDING CONDUCTOR SIZE AS REQUIRED IN NEC 250-122.
2. (DISCRETE) CONTROL CONDUCTORS ARE ALLOWED TO ROUTE IN SAME CONDUIT WITH POWER CONDUCTORS OR CABLE WHERE THE POWER CONDUCTORS ARE LESS THAN OR EQUAL TO #8 AWG AND BOTH MUST HOMERUN TO THE SAME PANEL, UNLESS NOTED OTHERWISE ON THE DRAWINGS. MAXIMUM NUMBER OF COMBINED CONDUCTORS IN SAME CONDUIT - (8) CONTROL CONDUCTORS AND (4) POWER CONDUCTORS #8 AWG OR LESS. OTHERWISE, PROVIDE A SEPARATE CONDUIT FOR CONTROL CONDUCTORS ONLY. SIZE CONDUIT PER NATIONAL ELECTRICAL CODE REQUIREMENTS.
3. WHERE ONLY CONTROL OR INSTRUMENTATION WIRING AND NO POWER IS INDICATED, PROVIDE CONDUIT.
4. ANY CIRCUIT NOT IDENTIFIED WITH A MARK NUMBER OR DESCRIPTIVE NOTE IS A BRANCH CIRCUIT REQUIRING 2 OR 3#12, 1#12 GND, 3/4" CONDUIT.
5. CIRCUIT SCHEDULES ARE STANDARD SCHEDULES. SOME NUMBERS MAY NOT BE USED.
6. INCREASING THE SIZE OF CONDUIT IS ACCEPTABLE TO ALLOW FOR INCREASED DIAMETER AND EASE OF INSTALLATION. DECREASING THE SIZE OF CONDUIT FROM THIS TABLE IS NOT ACCEPTABLE.
7. SIZING IN THESE TABLES IS BASED ON TABLE1, CHAPTER 9 OF THE NEC AND IS FOR THHN/THWN CONDUCTORS IN SCHEDULE 80 PVC CONDUIT.
8. PROVIDE SHIELDED VFD POWER CONDUCTORS PER SPECIFICATION SECTION 26 0519 PARAGRAPH 2.3.

CABLE AND CONDUIT LEGEND:

CNTRL	CONTROL
COND	CONDUCTOR
GND	GROUND
PWR	POWER
SHLD	SHIELDED
VFD	VARIABLE FREQUENCY DRIVE
TC	TRAY CABLE
TSP	TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED TRIAD

CABLE AND CONDUIT SCHEDULE

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BULLHEAD CITY SECTION 10

CLARIFIER 3 RAS/WAS PUMP STATION IMPROVEMENTS

CABLE AND CONDUIT SCHEDULES

Registered Professional Engineer CERTIFICATE 44941 MICHAEL W. BRANDT Date Signed 08-21-25 ARIZONA U.S.A. Expires: June 30, 2027

DWG. NO. E-10

SHEET NO. 49 OF 60

LINE SYMBOLS

PROCESS LINES

MAJOR PROCESS
MINOR PROCESS
MAJOR EXISTING PROCESS
MINOR EXISTING PROCESS

INSTRUMENTATION LINES

PARALLELING LINES (PARENTHETICAL NUMBER INDICATES THE NUMBER OF SIGNALS REPRESENTED)
CONNECTING LINES
NON-CONNECTING LINES
DATA LINK
ELECTRIC POWER
PNEUMATIC
HYDRAULIC
CAPILLARY
DISCRETE/POWER SIGNAL (ON,OFF,ETC.)
DIGITAL
ANALOG

VALVES

GATE
GLOBE
BALL
PLUG
SEAT PORT
ECCENTRIC PLUG
SWING CHECK
BUTTERFLY
SILENT CHECK
PRESSURE RELIEF
SAMPLE TAP
DOUBLE DOOR CHECK
BALL CHECK
NEEDLE
KNIFE
PRESSURE RELEASE
DIAPHRAGM
PINCH
FLOAT
BACKFLOW PREVENTER
RUBBER FLEXIBLE CHECK VALVE
ANGLE
THREE-WAY PLUG
FOUR-WAY PLUG
AIR AND/OR VACUUM RELIEF
REGULATED SIDE PRESSURE CONTROL
TELESCOPING

GATES AND VALVE ACTUATORS

GATE SYMBOLS

SLUICE
BUTTERFLY
FLAP
FABRICATED SLIDE
SHEAR
STOP LOGS

ACTUATOR SYMBOLS

PNEUMATIC W/ POSITIONER
PNEUMATIC W/ SOLENOID
ELECTRIC
ELECTRIC W/ POSITIONER
ELECTROHYDRAULIC
HYDRAULIC
PNEUMATIC WITH VOLUME BOOSTER
SOLENOID
MANUAL

NOTE:
ON LOSS OF PRIMARY POWER
(PNEUMATIC, ELECTRICAL OR HYDRAULIC)
XX: FO=FAIL OPEN
FC=FAIL CLOSED
FLP=FAIL TO LAST POSITION

INSTRUMENTATION/LOGIC/FUNCTION SYMBOLS

SCADA, FLOW INDICATOR, CONTROLLER, ACCESSIBLE
SCADA, FLOW INDICATOR, CONTROLLER, NON-ACCESSIBLE
SCADA/PLC/DCS, DIGITAL PROCESSOR, ALARMS, SET POINTS, ETC. ACCESSIBLE
SCADA/PLC/DCS, DIGITAL PROCESSOR, ALARMS, SET POINTS, ETC. NON-ACCESSIBLE
PLC/DCS COMPUTATION, ACCESSIBLE
HAND SWITCH, MAIN CONTROL PANEL (MCP)
HAND SWITCH, MOTOR CONTROL CENTER
PID FLOW CONTROLLER, MAIN CONTROL PANEL (MCP)
PID FLOW CONTROLLER, MOTOR CONTROL CENTER
FIELD MOUNTED INSTRUMENT, TRANSMITTER, SWITCH
PANEL MOUNTED DISPLAY, INDICATOR, CONTROL
VFD — VARIABLE FREQUENCY DRIVE

A ON-TD X-SEC B — "ON" TIME DELAY
B "ON" X-SEC. AFTER A "ON".
INSTANT "OFF".

OFF-TD X-SEC — OFF" TIME DELAY
B "OFF" X-SEC. AFTER A "OFF".
INSTANT "ON".

OR

I — SIGNAL INTEGRATOR OR INTERLOCK. SEE CONTROL DIAGRAMS

A B S R C — MEMORY ELEMENT
S=SET, R=RESET

S R — SWITCHING SIGNAL
ON/OFF RELAY, INPUT IS CONNECTED TO OUTPUT WHEN SWITCHING SIGNAL IS PRESENT.

S R — SWITCHING SIGNAL
SWITCHING RELAY, INPUT WITH DOT IS CONNECTED TO OUTPUT WHEN SWITCHING SIGNAL IS PRESENT. OTHER OUTPUT IS CONNECTED TO OUTPUT WHEN SWITCHING SIGNAL IS NOT PRESENT.

PRIMARY ELEMENTS/METERS

ORIFICE PLATE
FLUME
WEIR
FINGER WEIR
ROTAMETER
ULTRASONIC LEVEL
PRESSURE (LEVEL) TRANSDUCER
PROPELLER OR TURBINE
PITOT TUBE
AVERAGING PITOT
MAGMETER
THERMAL MASS FLOW METER
ULTRASONIC
ANALYTICAL PROBE
DO = DISSOLVED OXYGEN
PH = PH
NOX= NITRATE
VORTEX
FLOW TUBE QUICK CHANGE
RESTRICTION ORIFICE
ORIFICE
BUBBLER LEVEL STRAIGHTENING VANES
LEVEL (BUBBLER TUBE)
FLOAT LEVEL
HYDROSTATIC LEVEL

INSTRUMENT SOCIETY OF AMERICA TABLE

ID	FIRST LETTER (S) PROCESS OR INITIATING VARIABLE	SUCCEEDING LETTERS MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER	I/O TYPES ASSOCIATED DEVICES
A	ANALYSIS (+)		ALARM			DI
B	BURNER, COMBUSTION			CLOSE-STOP-DECREASE		DO
C	CONDUCTIVITY		CLOSE	CONTROL OR CONTROLLER		DI/AO
D	DENSITY	DIFFERENTIAL		OPEN-START-INCREASE		DO
E	VOLTAGE		SENSOR, PRIMARY ELEMENT			
F	FLOW RATE	RATIO/FRACTION			FAIL	DI
G	GAS		GLASS VIEWING DEVICE			
H	HAND				H-HIGH ALARM HH-HIGH HIGH	DI
I	CURRENT (ELECTRICAL)		INDICATE			AI
J	POWER	SCAN				DO/AI
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION		DO/AO
L	LEVEL		LIGHT		L-LOW ALARM LL-LOW LOW	DI
M	MOTION	MOMENTARY	OPEN OR OPERATE		MIDDLE, INTERMEDIATE	DI
N	MOISTURE			START		DO
O	UNCLASSIFIED		OPEN ORIFICE, TEST RESTRICTION	STOP	OVERLOAD	DO
P	PRESSURE, VACUUM			PNEUMATIC		
Q	QUANTITY	INTEGRATE, TOTALIZE		INTEGRATE OR TOTALIZE		DI/AI
R	RADIATION		RECORD			AI
S	SPEED, FREQUENCY, SOLENOID	SAFETY		SWITCH OR SAFETY		DI/DO
T	TEMPERATURE			TRANSMIT		AI
TQ	TORQUE					
U	MULTIVARIABLE (+)		MULTIFUNCTION (+)	MULTIFUNCTION (+)	MULTIFUNCTION (+)	DI
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER		
W	WEIGHT, FORCE, TORQUE		WELL			
X	ON/OFF	X-AXIS	UNCLASSIFIED (+)	UNCLASSIFIED (+)	UNCLASSIFIED (+)	DI/DO
Y	EVENT, STATE OR PRESENCE	Y-AXIS		RELAY, COMPUTE, CONVERT		
Z	POSITION, DIMENSION	Z-AXIS		DRIVE, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT		

(+) WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL. SEE ABBREVIATIONS AND LETTER SYMBOLS.

EQUIPMENT/VALVE DESIGNATION

AC	ADSORPTION CLARIFIER			ARV	AIR RELEASE VALVE
ACF	AUTOMATIC CLEANING FILTER			ACV	AIR/VACUUM COMBINATION VALVE
ATS	AUTOMATIC TRANSFER SWITCH			BFV	BUTTERFLY VALVE
B	BLOWER			BLV	BALL VALVE
CFS	CHEMICAL FEED PUMP SKID			BPV	BACKFLOW PREVENTION VALVE
CP	CONTROL PANEL			CKV	CHECK VALVE
CT	CHEMICAL TOTE			DIV	DIAPHRAGM VALVE
EME	EMERGENCY EYEWASH PRESS			GLV	GLOBE VALVE
EMS	EMERGENCY SHOWER			GTV	GATE VALVE
EXF	EXHAUST FAN			HSV	HOSE VALVE
GEN	STANDYBY GENERATOR			KGV	KNIFE GATE VALVE
H	HEATER			OC	ODOR CONTROL SYSTEM
LCP	LOCAL CONTROL PANEL			PCV	PRESSURE CONTROL VALVE
LOS	LOCAL OPERATOR STATION			PLV	PLUG VALVE
M	MIXER			PRV	PRESSURE RELIEF VALVE
MCC	MOTOR CONTROL CENTER			PSV	PRESSURE SUSTAINING VALVE
MH	MANHOLE			SCR	SCREEN
P	PUMP			SCV	SCREW CONVEYOR
PDC	POWER DISTRIBUTION CENTER			SOV	SOLENOID VALVE
RTU	REMOTE TERMINAL UNIT			WAP	WASH PRESS PRESS
SDG	SLIDE GATE			WAPG	WASH PRESS PRESS GATE
SM	SUBMERSIBLE MIXER			YH	YARD HYDRANT
T	TANK (PLASTIC/METAL)				
VFD	VARIABLE FREQUENCY DRIVE				
WG	WEIR GATE				
WW	WET WELL				

GENERAL NOTES

1. THIS IS A STANDARD LEGEND, THEREFORE, NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.
2. SEE ELECTRICAL LEGEND FOR CONTROL DIAGRAM LEGEND.
3. OWNER WILL ESTABLISH TAG NUMBERING SYSTEM.

INSTRUMENT/CONTROLS IDENTIFICATION

AE XXY — ANALYTICAL ELEMENT (PROBE) – DO/NOX/PH/LEL/H2S
AIT XXY — ANALYTICAL INDICATOR AND TRANSMITTER
AL XXY — ALARM LIGHT
ES XXY — EMERGENCY SWITCH
FE XXY — FLOW ELEMENT
FIT XXY — FLOW INDICATOR AND TRANSMITTER
FS XXY — FLOW SWITCH
HS XXY — HAND SWITCH
JI XXY — POWER INDICATE
LAX XXY — LEVEL ALARM – HIGH/LOW
LE XXY — LEVEL ELEMENT
LIT XXY — LEVEL INDICATOR AND TRANSMITTER
LOS XXY — LOCAL OPERATOR STATION
LSX XXY — LEVEL SWITCH – HIGH/LOW
MC XXY FVNR — MOTOR CONTROL –FULL VOLTAGE NON REVERSING
MC XXY FVR — MOTOR CONTROL –FULL VOLTAGE REVERSING
MM XXY — EQUIPMENT RUN
NS XXY — MOISTURE SWITCH
PDX XXY — PRESSURE DIFFERENTIAL –ELEMENT/INDICATE/SWITCH (HIGH/LOW)
PE XY — PRESSURE ELEMENT
PIT XXY — PRESSURE INDICATOR AND TRANSMITTER
PSX XXY — PRESSURE SWITCH – HIGH/LOW
SC XXY VFD — SPEED CONTROL –VAIRABLE FREQUENCY DRIVE
SC XXY DCD — SPEED CONTROL –DIRECT CURRENT DRIVE
SE XXY — SPEED ELEMENT
SS XXY — SPEED SWITCH
TE XXY — TEMPERATURE ELEMENT
TIT XXY — TEMPERATURE INDICATOR AND TRANSMITTER
TQX XXY — TORQUE SWITCH – HIGH/LOW
TSX XXY — TEMPERATURE SWITCH – HIGH/LOW
UA XXY — EQUIPMENT FAIL
XA XXY — ALARM POWER
YL XXY — EVENT LIGHT
ZS XXY — POSITION SWITCH

GENERAL NOTES

1. COMPONENTS AND PANELS SHOWN WITH A (◆) ARE SPECIFIED UNDER DIVISION 40.
2. SEE DWG G-4 FOR FLOW STREAM IDENTIFICATION.

ABBREVIATIONS & LETTER SYMBOLS

A ANALOG DATA CABLE
C CONTROL CABLE
D DIGITAL CABLE i.e. DATA HIGHWAY
ETM ELAPSED TIME METER
F FEEDER CABLE
FVNR FULL VOLT NON-REVERSING
HS HAND SWITCH
HOA HAND-OFF-AUTO
JB JUNCTION BOX
M MOTOR CABLE
N NETWORK CABLE
O FIBER OPTIC CABLE
T TEMPERATURE CABLE i.e. RTD
TS TERMINAL STRIP
ZL LIMIT SWITCH STATUS LIGHT

INTERFACE SYMBOLS

S A — A D
=PROCESS INTERFACE
=SIGNAL INTERFACE
A OR a =INTERFACE LETTER
D =DESIGNATION DRAWING NO.
S =SOURCE DRAWING NO.
N — PROCESS OR SIGNAL LINE CONTINUATION N=1,2,3,ETC.
INTERFACE TO OR FROM PROCESS EXTERNAL TO PROJECT

MISCELLANEOUS SYMBOLS

SIGHT GLASS
DIAPHRAGM SEAL
BLIND FLANGE
AIR GAP
VENT TO ATMOSPHERE
HOT WATER HEATER
SELF CONTAINED AIR SUPPLY
RADIO ANTENNA
120V — 120 VOLT, 60 HZ POWER
480V — 480 VOLT, 60 HZ POWER
ANNULAR DIAPHRAGM SEAL
MIXER
ELECTRIC MOTOR
PRESSURE GAUGE
VOICE COMMUNICATION POINT
REDUCER
BASKET STRAINER
Y STRAINER
WATER SURFACE
FLUSHING CONNECTION
HOSE ADAPTOR
SEAL WATER SET
PULSATION DAMPENER
NATURAL GAS HEAT COIL
FILTER
FLAME ARRESTER
MANUAL DRIP TRAP
HOSE CONNECTION
PIPE CAP
FLEX HOSE
FLOOR DRAIN
HEAT EXCHANGER
DRAIN
TANK INSULATION
AUTOMATIC DRAIN TRAP
TEMPERATURE GAUGE
CALIBRATION COLUMN
EXHAUST FAN
COMPRESSED AIR TANK
ANNUNCIATOR
OUTSIDE AIR DAMPER
BACKFLOW PREVENTION VALVE
TRENCH DRAIN
INTAKE DUCT

PUMP AND COMPRESSOR SYMBOLS

CENTRIFUGAL PUMP (DRY PIT)
CENTRIFUGAL WET PIT PUMP OR TURBINE PUMP
CHEMICAL FEED PUMP
GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
PISTON PUMP
DIAPHRAGM PUMP
PROGRESSIVE CAVITY PUMP
SUBMERSIBLE SUMP PUMP
COMPRESSOR (CENTRIFUGAL), BLOWER OR TURBINE
COMPRESSOR (PISTON)
EJECTOR

NOTE: XX:
AS ADJUSTABLE SPEED
CS-1 CONSTANT SPEED (SINGLE SPEED)
CS-2 CONSTANT SPEED (TWO SPEED)

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DRAWN: DAH
CHECKED: RL
DATE: 08/2025

REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
PROCESS INSTRUMENTATION LEGEND

Registered Professional Engineer
67132
ULRIKE LASHLEY
Date Signed: 08-22-25
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. I-1
SHEET NO. 50 OF 60

R:\6519\021 00 - SECTION 10 CLARIFIER\ACAD\SHEETS\I-1.DWG

RWCP
(IN SOLIDS HANDLING BUILDING)

MCC-E
(IN SOLIDS HANDLING BUILDING)

FLOW INDICATION (FI) | SPEED CONTROL (SC) | START/STOP (HS) | RUN STATUS (MM) | RUN HOURS (KQI) | CURRENT INDICATOR (II) | AUTO SELECTED (YS) | GENERAL FAULT (UA) | COMMUNICATION FAULT (YA) | FLOW INDICATION (FI)

SEE P-RW-3 CONTROLS

SEE P-RW-3 CONTROLS

FLOW INDICATION (FI)

SC VFD

SC VFD

SC VFD

CLARIFIER CONTROL PANEL
CP-CLR3 **

MC FVNR
HS HOA
MM RUN
HS RESET
UA MOTOR OVERLOAD
UA TORQUE HIGH ALARM
HS ALARM SILENCE
UA DRIVE CUTOUT

TQH **
TORQUE HIGH SWITCH

TO FILTER SPLITTER BOX
24" SE

CLARIFIER 3
X **

FROM CLARIFIER SPLITTER BOX
24" ML

12" AS

FIT RAS3
FE RAS3
LOS 03
TSH **
P-RW-3 **
10" RAS

FIT RAS2
FE RAS2
LOS 02
TSH **
FROM CLARIFIER 2
12" AS
P-RW-2 **
10" RAS

FIT RAS1
FE RAS1
LOS 01
TSH **
FROM CLARIFIER 1
12" AS
P-RW-1 **
10" RAS

12" RAS
14" RAS
14" RAS
18" RAS
18" RAS
ARV
TO DIGESTER
6" WAS
TO SECONDARY SPLITTER BOX
14" RAS

GENERAL NOTES :

** INDICATES EQUIPMENT OR ITEMS SUPPLIED BY DIVISION 43 OR 46 MANUFACTURER AS A COMPLETE PACKAGE. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND FOR PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

◆ INDICATES INSTRUMENTATION AND CONTROL COMPONENTS TO BE SUPPLIED BY THE PICS CONTRACTOR AS SPECIFIED IN SECTION 40 60 10. GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING INSTALLATION OF ALL SUPPLIED EQUIPMENT AND INSTRUMENTATION AND PROVIDING ALL PROCESS CONNECTIONS AND APPURTENANCES.

HS HOA | HS RESET | MM RUN | UA FAIL

TYP FOR LOS 01, 02, 03
SUPPLIED BY DIV 26

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REVISION	DATE	DESCRIPTION

BULLHEAD CITY SECTION 10
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
PROCESS & INSTRUMENTATION DIAGRAM

Registered Professional Engineer
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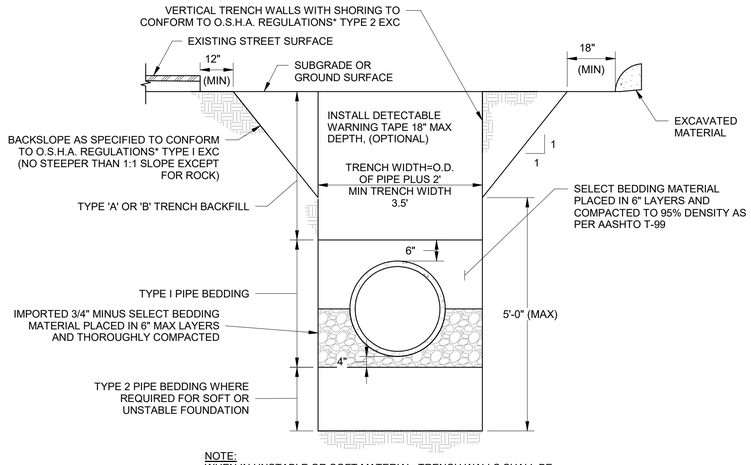
ARIZONA, U.S.A.
Expires: Sept. 30, 2027

DWG. NO. I-2
SHEET NO. 51 OF 60

R:\8519\021 00 – SECTION 10 CLARIFIER\ACAD\SHEETS\I-2.DWG

NOTE:
WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT THE PAVEMENT SHALL BE CUT ALONG A NEAT VERTICAL LINE A MINIMUM OF 12" FROM THE EDGE OF THE TRENCH OPENING. WHERE NEAT LINE IS LESS THAN 3' FROM EDGE OF EXISTING PAVEMENT OR CURB AND GUTTER SECTION, REMOVE AND REPLACE ENTIRE PAVEMENT SECTION BETWEEN TRENCH AND EDGE OF PAVEMENT.

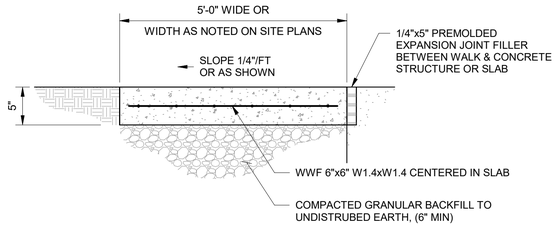


NOTE:
WHEN IN UNSTABLE OR SOFT MATERIAL, TRENCH WALLS SHALL BE BACKSLOPED FROM THE BOTTOM OF THE TRENCH. (TYPE 1 EXCAVATION).

* SEE O.S.H.A. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION, SECTION 1926.652.

TYPICAL UTILITY TRENCH DETAIL 2221

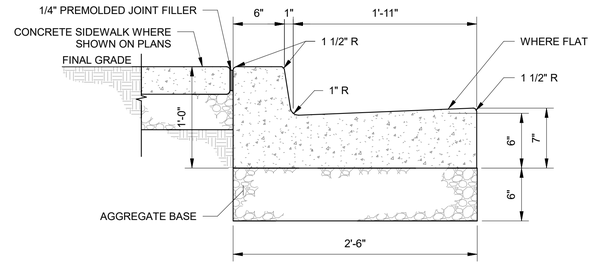
N.T.S.



NOTES:
1. PROVIDE TOOLED CONTRACTION JOINTS AT SAME INTERVAL AS WALK WIDTH.
2. PROVIDE EZPANSION JOINTS CONSISTING OF 1/4" CONCRETE PREMOLDED JOINT FILLER AT SPACING NOT GREATER THAN 30 FEET.

TYPICAL CONCRETE WALK DETAIL 2301

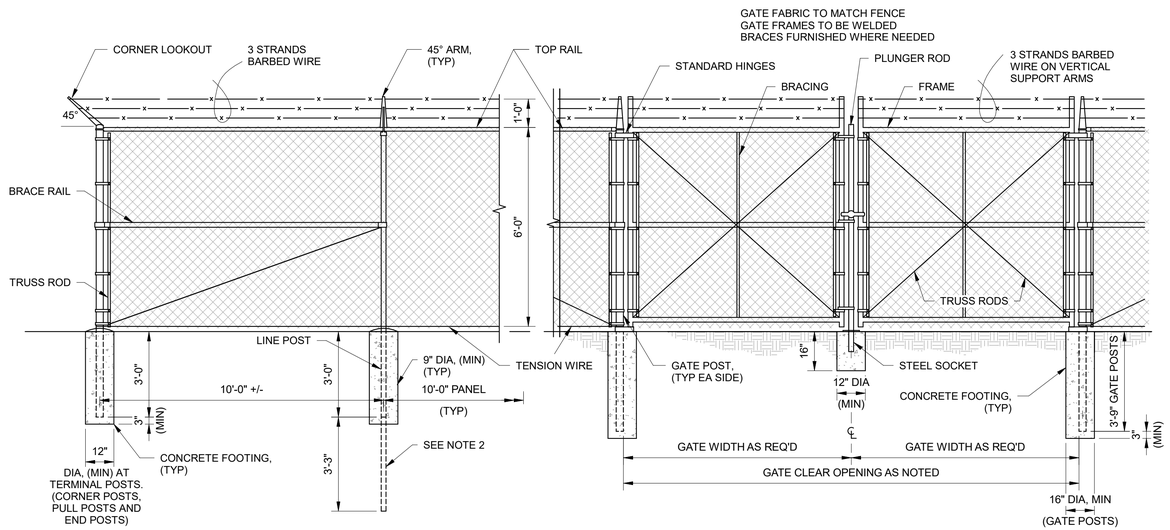
N.T.S.



NOTES:
1. PROVIDE PREMOLDED EXPANSION JOINTS AT 30 FT MAX ON CENTERS AND AT ALL CORNERS AND RETURNS.

TYPE 1 CONCRETE CURB AND GUTTER 2302

N.T.S.



TYPICAL CORNER PANEL

DOUBLE GATE DETAIL

NOTES:

1. PROVIDE DOUBLE PANELS AT ALL CORNERS AND AT 300' MAXIMUM INTERVALS ON TANGENT. (TO BE USED FOR PULLING) DOUBLE PANELS SHALL BE PLACED AT END OF CURVES SHARPER THAN 5°, AND BE EVENLY SPACED BETWEEN AT ±20° CENTRAL ANGLE, 10° DEFLECTION ANGLE NOT TO EXCEED 250' CURVE.
2. AT INTERVALS NOT TO EXCEED 500', ONE POST WILL BE EXTENDED 3' INTO THE GROUND FOR LIGHTNING PROTECTION.

6 FOOT CHAIN LINK FENCE & GATE DETAIL 2441

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CITY OF BULLHEAD CITY
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
STANADARD DETAILS

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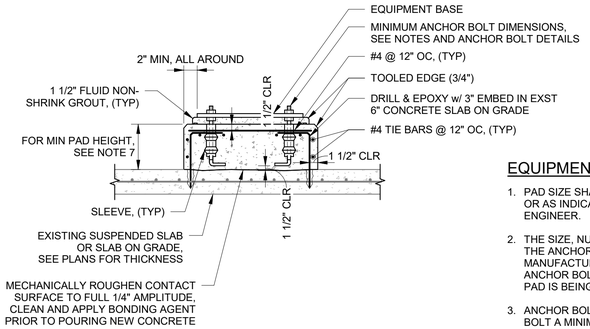
DWG. NO. SD-1
SHEET NO. 52 OF 60



NOTE:
SEE EQUIPMENT BASE NOTES DETAIL (3009)

EQUIPMENT PAD DETAIL (3007)

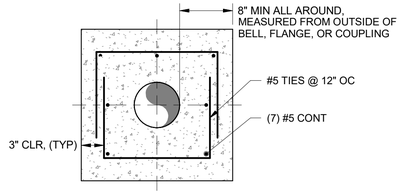
N.T.S.

EQUIPMENT BASE NOTES:

1. PAD SIZE SHALL BE MINIMUM INDICATED OR AS SHOWN ON THE PLANS OR AS INDICATED BY THE MANUFACTURER AND APPROVED BY THE ENGINEER.
2. THE SIZE, NUMBER, TYPE, LOCATION, AND THREAD PROJECTION OF THE ANCHOR BOLTS SHALL BE DETERMINED BY THE EQUIPMENT MANUFACTURER, AND SHALL BE AS APPROVED BY THE ENGINEER. ANCHOR BOLTS SHALL BE HELD IN POSITION WITH A TEMPLATE WHILE PAD IS BEING POURED.
3. ANCHOR BOLT SLEEVES SHALL BE USED TO PROVIDE THE ANCHOR BOLT A MINIMUM MOVEMENT OF 1/2" IN ALL DIRECTIONS. THE MINIMUM SLEEVE LENGTH SHALL BE 8 TIMES THE BOLT DIAMETER. SLEEVES SHALL BE FILLED WITH NON-SHRINK GROUT.
4. ANCHOR BOLT SLEEVES SHALL HAVE A MINIMUM INTERNAL DIAMETER 1" GREATER THAN BOLT DIAMETER AND A MAXIMUM INTERNAL DIAMETER 3" GREATER THAN ANCHOR BOLT DIAMETER. SLEEVES SHALL BE FILLED WITH NON-SHRINK GROUT.
5. EQUIPMENT BASES SHALL BE INSTALLED LEVEL UNLESS SPECIFIED OTHERWISE.
6. LEVELING NUTS, WEDGES OR SHIMS SHALL BE USED TO SUPPORT THE BASE WHILE NON-SHRINK GROUT IS PLACED. UNLESS OTHERWISE APPROVED BY MANUFACTURER, REMOVE WEDGES AND SHIMS OR BACK OFF LEVELING NUTS AFTER GROUT HAS CURED. SEAL CAVITIES LEFT BY REMOVED WEDGES WITH NON-SHRINK GROUT. IF WEDGES OR SHIMS ARE LEFT IN PLACE THEY SHALL NOT BE EXPOSED TO VIEW.
7. HEIGHT OF PADS SHALL BE MINIMUM REQUIRED FOR ANCHOR BOLT CLEARANCE TO KEEP ANCHOR BOLT OUT OF SLAB. WHERE EQUIPMENT OR PIPING ELEVATION REQUIRE A PAD HEIGHT LESS THAN THE MINIMUM SHOWN, USE EQUIPMENT PAD DETAIL (3007) WITH BLOCKOUT.

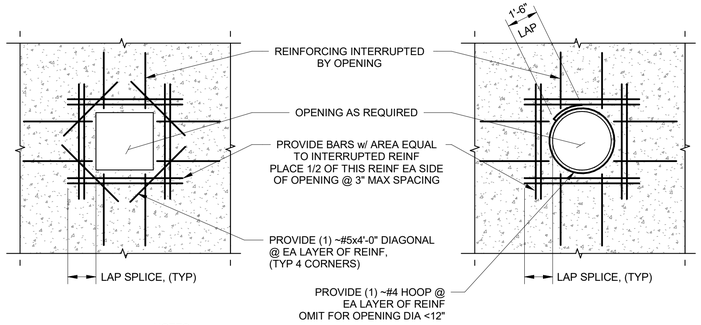
EQUIPMENT BASE NOTES (3009)

N.T.S.



PIPE ENCASEMENT (3014)

N.T.S.

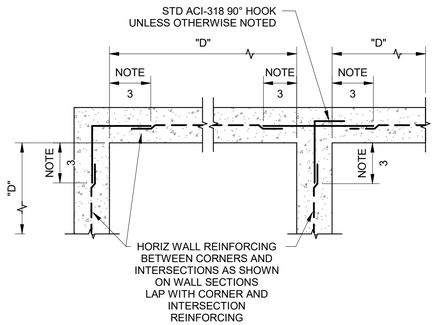


NOTES:

1. TYPICAL FOR ALL OPENINGS IN CONCRETE, UNLESS NOTED OTHERWISE.
2. DO NOT WELD REINFORCEMENT TO PIPE SLEEVES OR INSERTS.
3. PROVIDE MINIMUM LAP AS NOTED OR SHOWN ON PLANS.

REINFORCEMENT FOR OPENINGS IN WALLS AND SLABS (3305)

N.T.S.

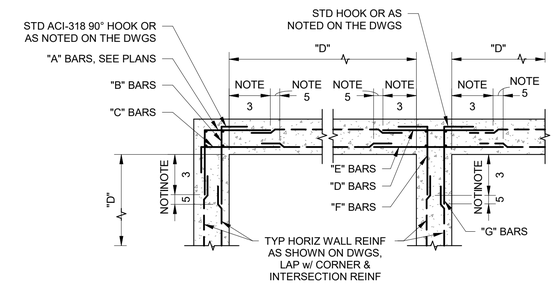


CORNER AND INTERSECTION REINFORCING NOTES:

1. TYPICAL HORIZONTAL WALL CORNER AND INTERSECTION REINFORCING LAYOUT IS SHOWN TO AVOID CONGESTION AND PERMIT PROPER PLACEMENT, FOR SIZE AND SPACING SEE PLANS. ALL HORIZONTAL REINFORCING AT CORNERS AND INTERSECTIONS SHALL BE FABRICATED AND INSTALLED WITH SPLICES LOCATED WHERE SHOWN REGARDLESS OF BAR SIZE AND SPACING.
2. WHERE THE CORNER OR INTERSECTION REINFORCING SIZE AND SPACING IS NOT SHOWN, NOTED OR TABULATED ON THE PLANS, THE SIZE AND SPACING SHALL BE THE SAME AS THE WALL HORIZONTAL REINFORCING SHOWN ON THE WALL SECTIONS OR AS NOTED FOR THE REINFORCING BETWEEN THE CORNERS OR INTERSECTIONS.
3. EXCEPT WHERE OTHERWISE SHOWN ON THE DRAWINGS, THE LENGTH INDICATED AS "NOTE 3" SHALL BE THE LESSER OF D/4, 10 FEET, OR 1.0 TIMES THE HEIGHT OF THE WALL, EXCEPT THAT IN NO CASE SHALL IT BE LESS THAN 2.0 FEET.
4. D = LENGTH OF WALL PARALLEL TO THE BAR LENGTH IN QUESTION.

TYPICAL SINGLE MAT CORNER AND INTERSECTION REINFORCING (3306)

N.T.S

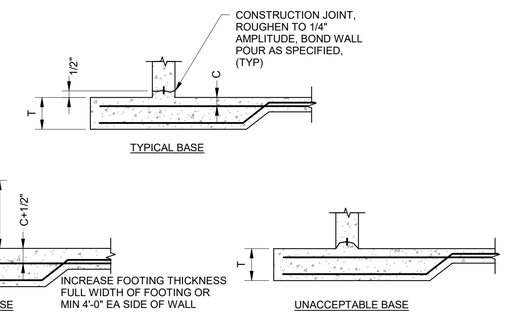


CORNER AND INTERSECTION REINFORCING NOTES:

1. TYPICAL HORIZONTAL WALL CORNER AND INTERSECTION REINFORCING LAYOUT IS SHOWN TO AVOID CONGESTION AND PERMIT PROPER PLACEMENT, FOR SIZE AND SPACING SEE PLANS. ALL HORIZONTAL REINFORCING AT CORNERS AND INTERSECTIONS SHALL BE FABRICATED AND INSTALLED WITH SPLICES LOCATED WHERE SHOWN REGARDLESS OF BAR SIZE AND SPACING.
2. WHERE THE CORNER OR INTERSECTION REINFORCING SIZE AND SPACING IS NOT SHOWN, NOTED OR TABULATED ON THE PLANS, THE SIZE AND SPACING SHALL BE THE SAME AS THE WALL HORIZONTAL REINFORCING SHOWN ON THE WALL SECTIONS OR AS NOTED FOR THE REINFORCING BETWEEN THE CORNERS OR INTERSECTIONS.
3. EXCEPT WHERE OTHERWISE SHOWN ON THE DRAWINGS, THE LENGTH INDICATED AS "NOTE 3" SHALL BE THE LESSER OF D/4, 10 FEET, OR 1.0 TIMES THE HEIGHT OF THE WALL, EXCEPT THAT IN NO CASE SHALL IT BE LESS THAN 2.0 FEET.
4. D = LENGTH OF WALL PARALLEL TO THE BAR LENGTH IN QUESTION.
5. EXCEPT WHERE OTHERWISE SHOWN ON THE DRAWINGS, THE LENGTH INDICATED AS "NOTE 5" SHALL BE EQUAL TO ONE "LAP LENGTH" AS REQUIRED BY THE GENERAL STRUCTURAL NOTES. USE THE LAP LENGTH AS REQUIRED FOR THE SMALLER OF THE TWO REINFORCING BARS BEING SPLICED.
6. UNLESS OTHERWISE NOTED, "B" AND "C" BARS ARE THE SAME SIZE AND SPACING AND, "F" AND "G" BARS ARE THE SAME SIZE AND SPACING.

TYPICAL DOUBLE MAT CORNER AND INTERSECTION REINFORCING (3307)

N.T.S. (SEE PLANS FOR SIZE AND SPACING)



NOTES:

1. C= MIN CLR FOR REINF BARS, SEE GENERAL STRUCTURAL NOTES.
2. T= FOOTING THICKNESS AS DETAILED.
3. WHEN USING ALTERNATE BASE INCREASE DOWEL BARS TO PROVIDE SAME LAP LENGTH AS TYPICAL BASE.

WALL BASE CONSTRUCTION JOINT (3400)

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CITY OF BULLHEAD CITY
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS
STANADARD DETAILS

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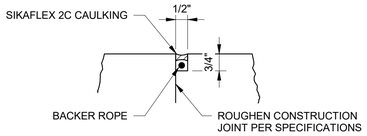
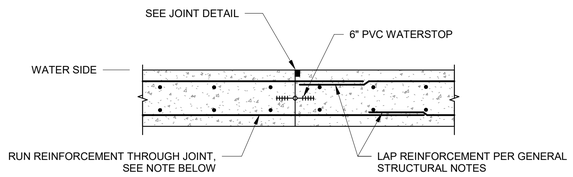
ULRIKE
LASHLEY
Date Signed 08-21-25
ARIZONA U.S.A.
Expires: Sept 30, 2027

DWG. NO. SD-2
SHEET NO. 53 OF 60



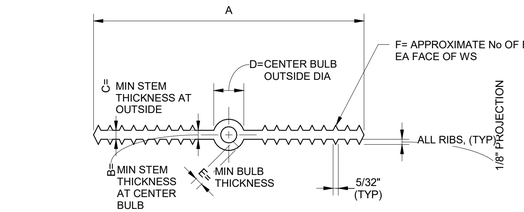
JOINT DETAIL



NOTE:
REINFORCING CONTINUOUS ACROSS JOINT. STAGGER LAPS AS SHOWN UNLESS INDICATED OTHERWISE.

TYPICAL CONSTRUCTION JOINT THRU WALLS AND SLABS 3410A

N.T.S.



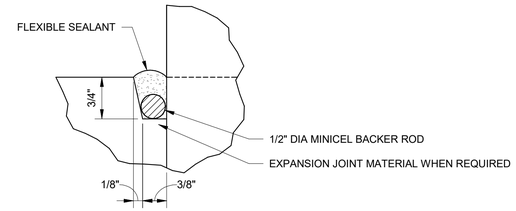
SIZE	A	B	C	D	E	F
4"x3/16"	4"	3/16"	3/16"	3/4"	1/4"	4
6"x3/8"	6"	3/8"	3/8"	7/8"	1/4"	6
9"x3/8"	9"	3/8"	3/8"	1"	1/4"	8

NOTES:

1. MATERIAL QUALITY PER SPECIFICATIONS.
2. DIM REQUIREMENTS INDICATED SHOULD BE GIVEN TO SUPPLIERS PRIOR TO PLACING ORDERS.
3. NON-ROUND CENTER BULBS SHALL HAVE A MIN OUTSIDE DIM OF "D".

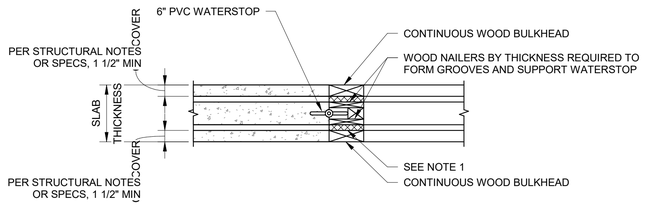
PLASTIC WATERSTOP 3411

N.T.S.



JOINT SEALANT 3415

N.T.S.

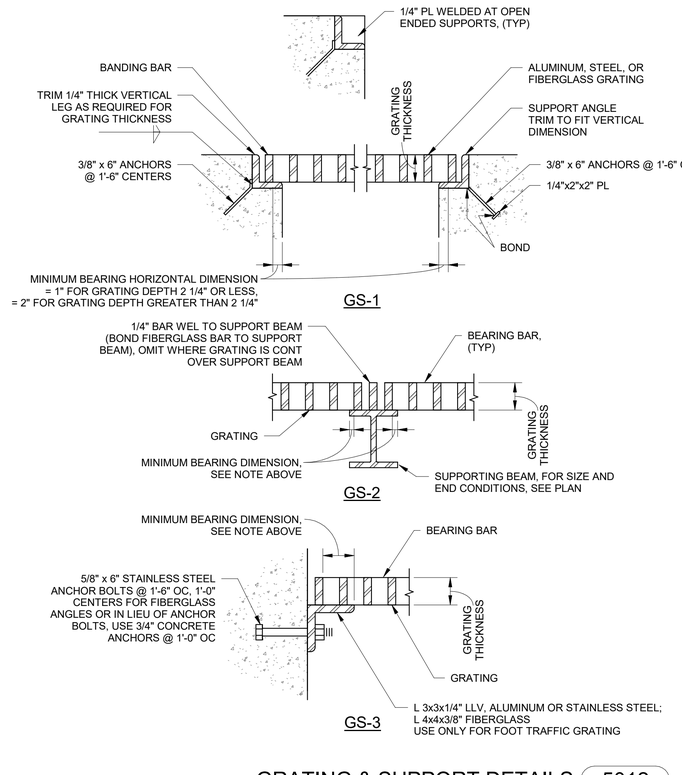


NOTES:

1. SPACES BETWEEN STOCK MATERIAL WHERE REINFORCING BARS DO NOT PENETRATE BULKHEAD SHALL BE FILLED WITH STYROFOAM CUT TO FIT (▨) THICKNESS OF REINFORCING BARS.
2. REINFORCING BARS AT CONSTRUCTION JOINTS SHALL NOT BE SPLICED, CUT, WELDED, OR OTHERWISE ALTERED FROM THAT SHOWN ON THE PLANS.
3. STRIP WOOD FROM ONE DAY FOLLOWING CASTING AND ROUGHEN CONCRETE WITH WIRE BRUSH TO INCREASE BOND CAPACITY OF CONCRETE.

SLAB CONSTRUCTION JOINT 3426

N.T.S.



GRATING & SUPPORT DETAILS 5012

N.T.S.

GRATING NOTES:

1. GRATING SPAN, ←→ SEE PLAN.
2. WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
3. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.
4. MATERIAL FOR SUPPORTS OF STEEL AND ALUMINUM GRATING TO BE SAME AS GRATING, EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE SHALL BE TYPE 316 STAINLESS STEEL.
5. UNLESS NOTED OTHERWISE ON PLANS, GRATING THICKNESS SHALL BE AS TABULATED IN "GRATING THICKNESS TABLE" FOR APPLICABLE TRAFFIC.
6. BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM.
7. BAND ALL EDGES WITH 3/16" x DEPTH OF BEARING BAR.
8. PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED.
9. TYPE OF MATERIAL USED SHALL BE AS SHOWN ON PLANS OR AS SPECIFIED. THIS STANDARD DETAIL INCLUDES 3 TYPES, ALTHOUGH ALL 3 MAY NOT BE INCLUDED IN PROJECT.
10. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN 1/4" NOR GREATER THAN 1/2" AND AS SPECIFIED.
11. ALL GRATING SECTIONS, WHEN IN PLACE, SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS AS SPECIFIED.

FOOT TRAFFIC
GRATING THICKNESS TABLE

MAXIMUM SPAN	ALUMINUM (IN.)	STEEL (IN.)	FIBERGLASS (IN.)
3'-6"	1 1/4"	1"	1 1/2"
4'-0"	1 1/2"	1"	1 1/2"
4'-6"	1 3/4"	1"	1 1/2"
5'-0"	1 3/4"	1 1/4"	MAXIMUM ALLOWABLE SPAN IS 4'-6" LIMIT DEFLECTION TO 1/2" MAX
5'-6"	2"	1 1/4"	
6'-0"	2 1/4"	1 1/2"	
6'-6"	2 1/4"	1 1/2"	
8'-0"	2 1/2"	1 3/4"	

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CITY OF BULLHEAD CITY

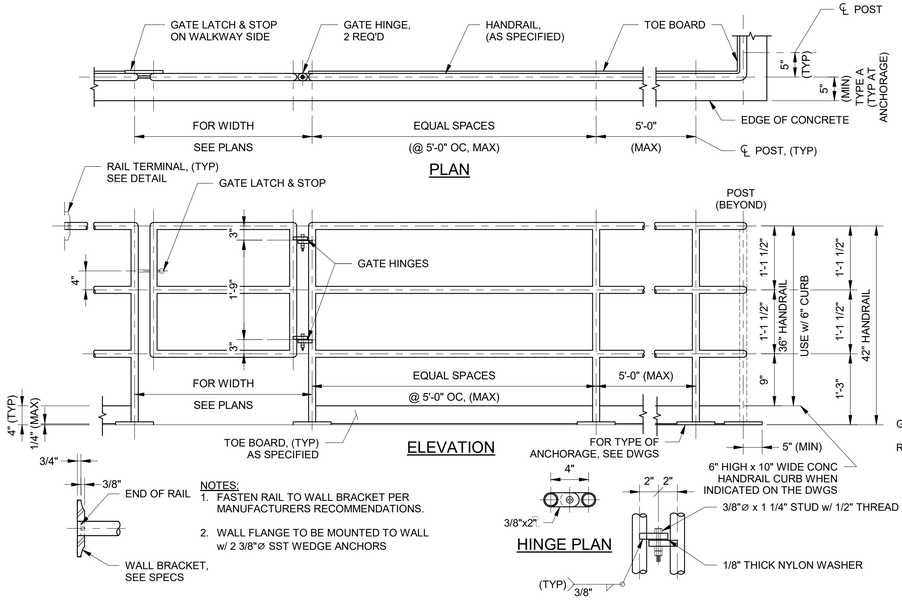
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STANADARD DETAILS

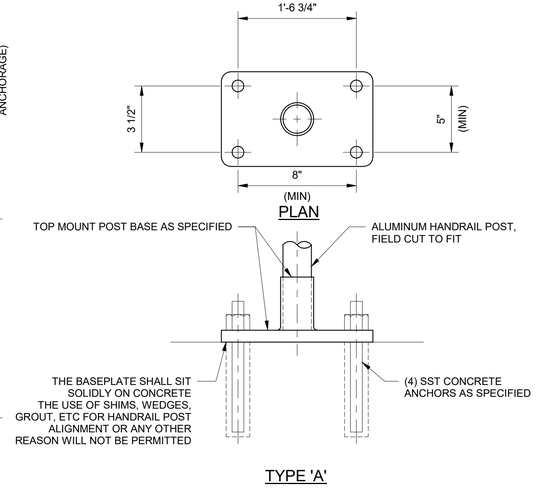
Registered Professional Engineer
CERTIFICATE
67132
ULRIKE
LASHLEY
Date Signed 10-2-25
ARIZONA U.S.A.
Expires: Sept 30, 2027

DWG. NO. SD-3

SHEET NO. 54 OF 60

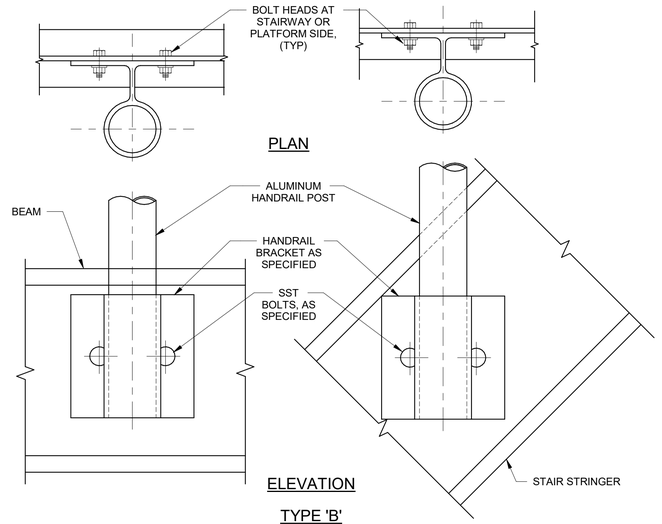


THREE RAIL HANDRAIL



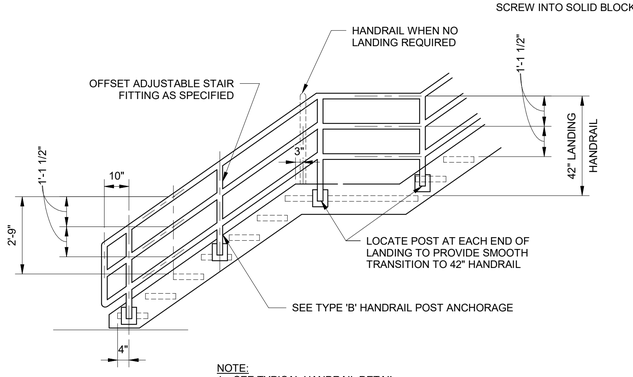
NOTE:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS & CONCRETE PER SPECS.

HANDRAIL POST ANCHORAGE



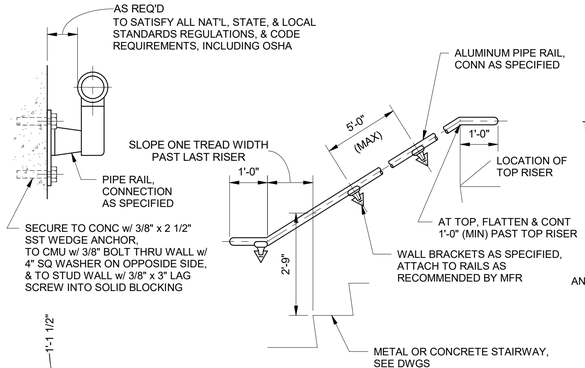
NOTE:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS & CONCRETE PER SPECS.

HANDRAIL POST ANCHORAGE

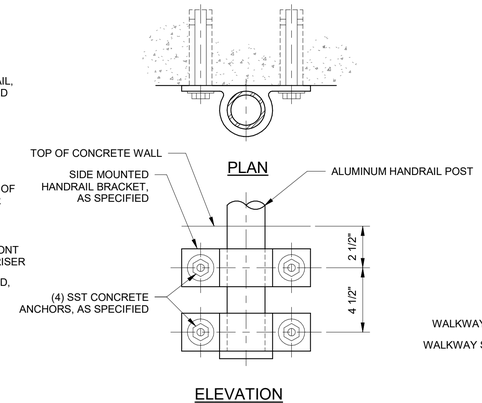


NOTE:
1. SEE TYPICAL HANDRAIL DETAIL.

THREE-RAIL STAIR HANDRAIL

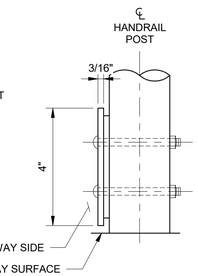


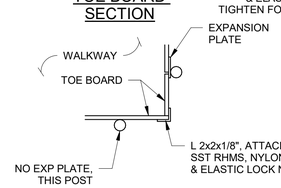
WALL HANDRAIL

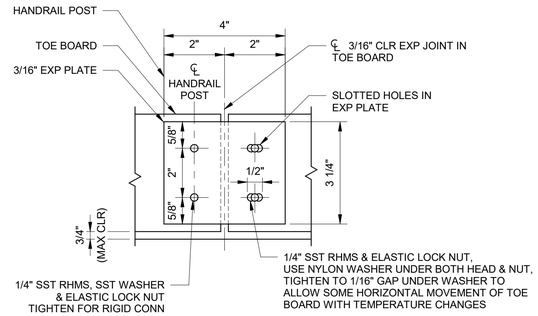


NOTES:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS & CONCRETE PER SPECS.
2. USE SIDE MOUNTED HANDRAIL BRACKET AS A TEMPLATE FOR THE ANCHOR BOLTS.
3. MAINTAIN THE CLEARANCES BETWEEN THE TOE BOARD & THE CONCRETE SURFACES REQUIRED BY ALL STATE & FEDERAL SAFETY REQUIREMENTS.

HANDRAIL POST ANCHORAGE







NOTES:
1. WHERE BOLTED BASE PLATE EXTENDS ABOVE WALKWAY SURFACE, NOTCH TOE BOARD TO FIT AROUND BASE PLATE WITH MAX OF 1/4" GAP.
2. TOE BOARD TO BE MOUNTED ON WALKWAY SIDE OF HANDRAIL.
3. RHMS = ROUND HEAD MACHINE SCREW AS SPECIFIED, SST.

HANDRAIL TOE BOARD

HANDRAIL DETAILS 5090

N.T.S.

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1 Engineering Place Helena, MT 59602
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DESIGN: RL
DRAWN: DAH
CHECKED: JCM
DATE: 08/2025

REVISION	DATE	DESCRIPTION

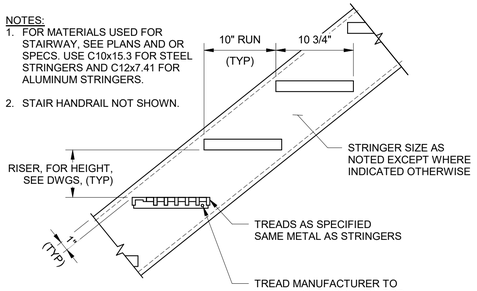
CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

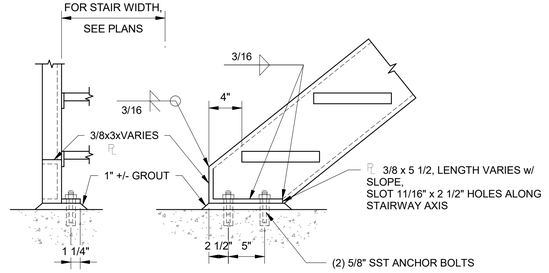
STANADARD DETAILS

DWG. NO. SD-4

SHEET NO. 55 OF 60



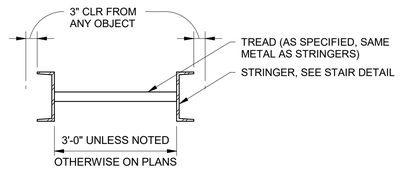
STAIR DETAIL



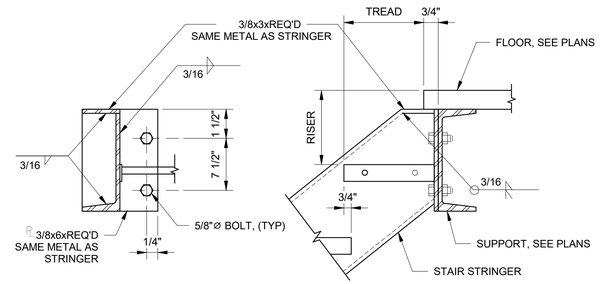
NOTES:
1. USE BASE PLATE OF SAME METAL AS STRINGER.
2. PROVIDE PROTECTION FOR DISSIMILAR METALS AND CONCRETE AS SPECIFIED.
3. STAIR HANDRAIL NOT SHOWN.

STAIR BOTTOM CONNECTION

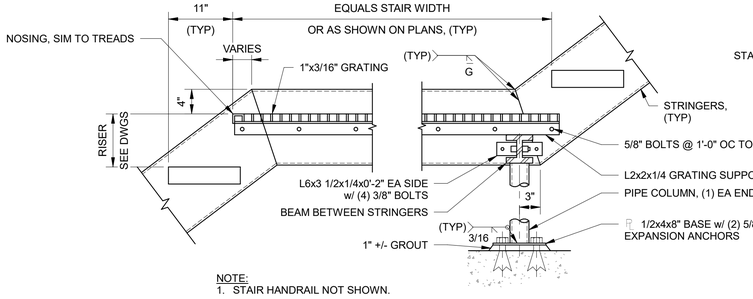
STAIRWAY WIDTH	BEARING BARS	
	ALUMINUM THREAD	STEEL THREAD
2'-3" OR LESS	1"x3/16"	3/4"x3/16"
2'-9" OR LESS	1 1/4"x3/16"	1"x3/16"
3'-3" OR LESS	1 1/2"x3/16"	1 1/4"x3/16"
4'-7" OR LESS	1 3/4"x3/16"	1 1/2"x3/16"



STAIR TREADS

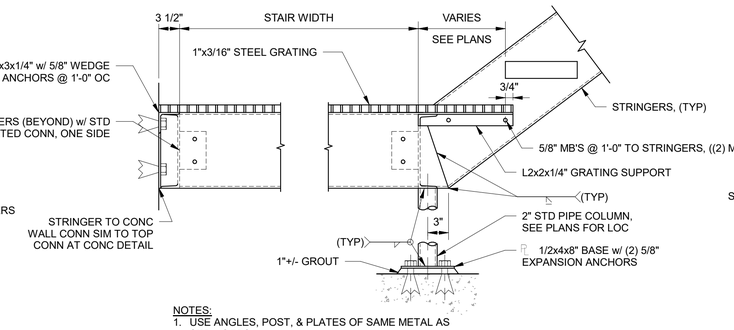


TO METAL FRAMING



NOTE:
1. STAIR HANDRAIL NOT SHOWN.

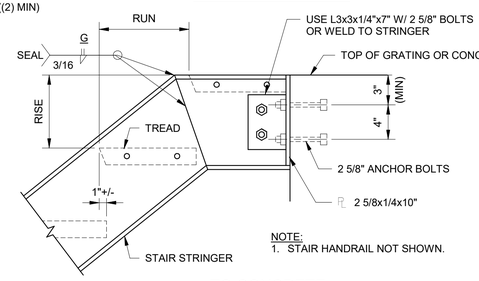
STAIR LANDING w/ SUPPORTS



NOTE:
1. STAIR HANDRAIL NOT SHOWN.

NOTES:
1. USE ANGLES, POST, & PLATES OF SAME METAL AS STRINGERS.
2. FOR ALUMINUM STAIRS, USE ALUMINUM GRATING. (5012) (5102)
3. FOR ALUMINUM STAIRS, USE SST BOLTS & SST ANCHOR BOLTS.

STAIR LANDING w/ SUPPORTS



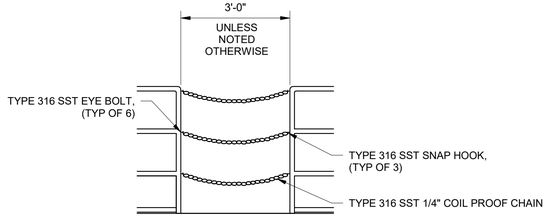
NOTE:
1. STAIR HANDRAIL NOT SHOWN.

TO CONCRETE

STAIR TIP CONNECTION

STAIR DETAILS (5100)

N.T.S.



SAFETY CHAIN (5110)

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CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STANADARD DETAILS

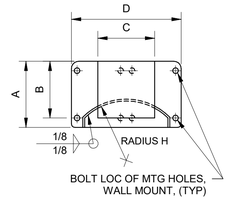
DESIGN: RL	DRAWN: DAH	CHECKED: JCM
DATE: 08/2025		

REVISION	DATE	DESCRIPTION

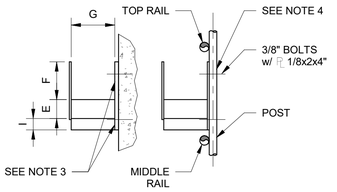
Registered Professional Engineer
CERTIFICATE
67132
ULRIKE LASHLEY
Date Signed 08.13.25
ARIZONA, U.S.A.
Expires: Sept 30, 2027

DWG. NO. SD-5

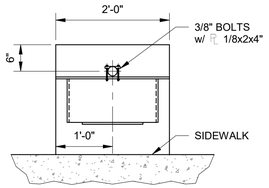
SHEET NO. 56 OF 60



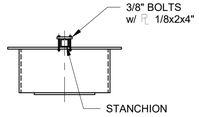
WALL MOUNTED



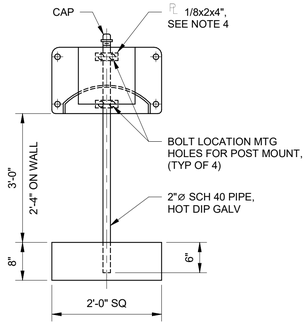
HANDRAIL POST MOUNTED



PLAN - POST MOUNTED



STANCHION MOUNTED



SECTION

SEE (5251B) FOR NOTES.

HOSE RACK DETAILS (5251A)

N.T.S.

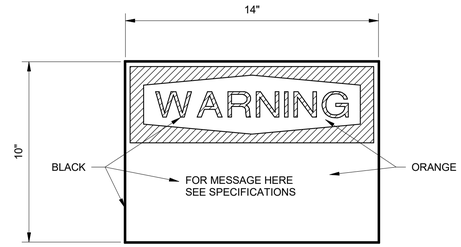
RACK TYPE	DIMENSION IN INCHES								
	A	B	C	D	E	F	G	H	I
TYPE A - 3/4" & 1" HOSE	10 1/2	9	9	18	3	6	7 1/2	9 3/4	1 1/2
TYPE B - 1 1/2" HOSE	14	12	12	24	4	8	10	13	2

NOTES:

1. INTERIOR UNITS SHALL BE FABRICATED FROM 3/16" 6061-T6 ALUMINUM ALLOY PLATE.
2. EXTERIOR UNITS SHALL BE FABRICATED FROM 3/16" 6061-T6 ALUMINUM ALLOY PLATE.
3. ATTACH TO CONCRETE WALL WITH (4) -1/4" STAINLESS STEEL STUD TYPE WEDGE ANCHORS.
4. ATTACH TO VERTICAL HANDRAIL OR INDIVIDUAL POST WITH PLATES AND (4) -1/4" STAINLESS STEEL BOLTS.
5. ATTACH TO STEEL COLUMN WITH (4) -1/4" ROUND HEAD BOLTS, ONE IN EACH CORNER. INSERT DOUBLE SPACER NUTS BETWEEN COLUMN AND HOSE RACK.

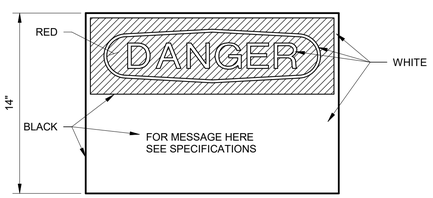
HOSE RACK NOTES (5251B)

N.T.S.



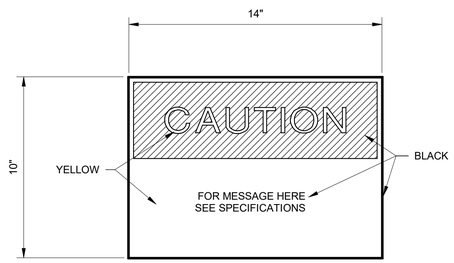
SIGN DETAIL (10134)

N.T.S.



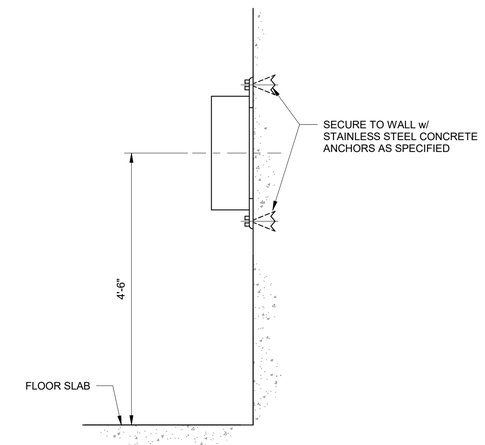
SIGN DETAIL (10135)

N.T.S.



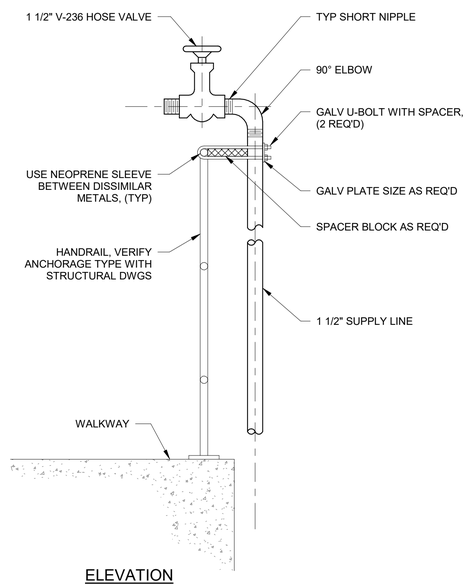
SIGN DETAIL (10136)

N.T.S.



WALL MOUNTED INSTRUMENT INSTALLATION (13480)

N.T.S.



ELEVATION

EXTERIOR HOSE VALVE (15105)

N.T.S.

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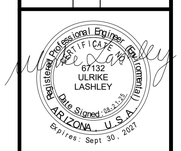
DESIGN: RL
DRAWN: DAH
DATE: 08/2025
CHECKED: JCM

REVISION	DATE	DESCRIPTION

CITY OF BULLHEAD CITY

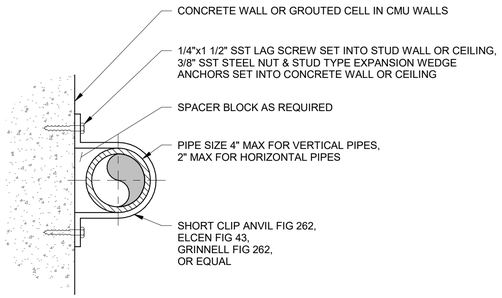
CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STANADARD DETAILS



DWG. NO. SD-6

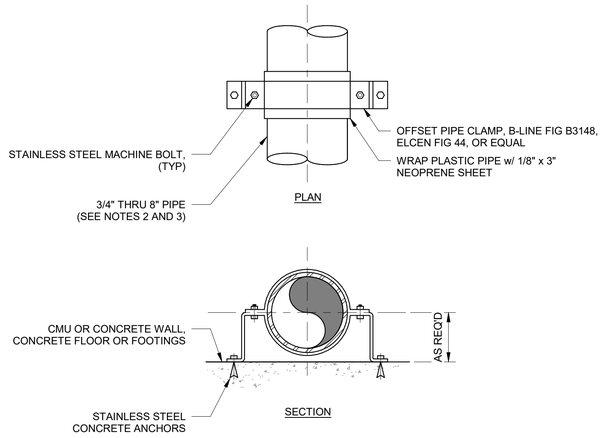
SHEET NO. 57 OF 60



NOTE:
USE STAINLESS STELL HARDWARE WHERE NOTED ON DRAWINGS

PIPE SUPPORT 15500

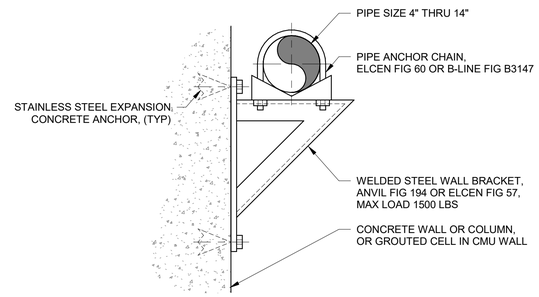
N.T.S.



NOTES:
1. USE SST MATERIALS AS SPECIFIED AND IF NOTED ON THE DRAWINGS.
2. NOT SUITABLE FOR PIPING OVER 3" DIAMETER THAT IS HORIZONTALLY MOUNTED ON VERTICAL WALLS OR CEILINGS.
3. FOR PIPES LARGER THAN 3" DIAMETER, USE ONLY FOR HORIZ PIPING MOUNTED TO FLOORS.

PIPE SUPPORT 15501

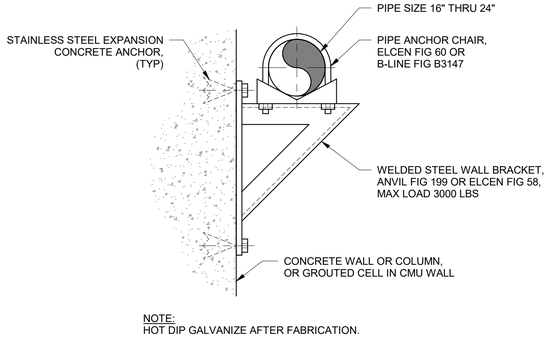
N.T.S.



NOTE:
HOT DIP GALVANIZE AFTER FABRICATION.

PIPE SUPPORT - MEDIUM 15504

N.T.S.



NOTE:
HOT DIP GALVANIZE AFTER FABRICATION.

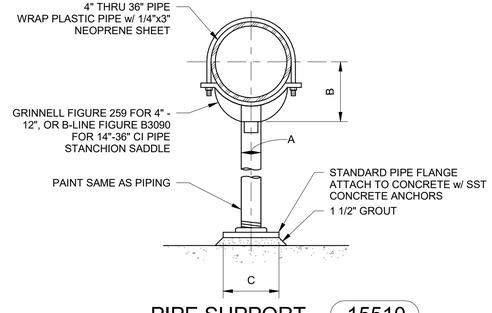
PIPE SUPPORT - HEAVY 15505

N.T.S.

DIMENSION TABLE

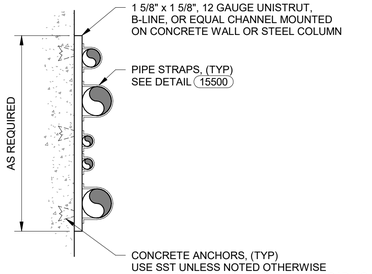
PIPE SIZE	A	B	C
4"	3"	4 3/16"	7 1/2"
5"	3"	4 13/16"	7 1/2"
6"	3"	5 7/16"	7 1/2"
8"	3"	6 15/16"	7 1/2"
10"	3"	8 7/16"	7 1/2"
12"	3"	8 15/16"	7 1/2"
14"	4"	10 15/16"	9"
16"	4"	12 3/8"	9"
18"	4"	13 7/8"	9"
20"	6"	15 3/8"	11"
22"	6"	16 5/8"	11"
24"	6"	17 15/16"	11"
26"	6"	19 1/8"	11"
30"	6"	21 5/16"	11"
32"	6"	22 1/2"	11"
36"	8"	24 1/2"	13 1/2"

NOTES:
1. PROVIDE HALF ROUND RIGID INSULATION AND INSULATION PROTECTION SHIELD, SIMILAR TO GRINNELL FIGURE 167 OR B-LINE FIGURE B3154, WHERE PIPING IS INSULATED.
2. PROVIDE NEOPRENE WAFFLE ISOLATION PAD, SIMILAR TO MASON TYPE 'W' OR KORFUND KORPAD 40, UNDER SUPPORT FOOT WHEN PIPING IS ISOLATED OR SUPPORT IS ADJACENT TO MECHANICAL EQUIPMENT.
3. FOR BASE, HEIGHT AND FLANGE DIMENSIONS SEE TABLE.
4. PROVIDE ALL SST MATERIALS WHERE NOTED.



PIPE SUPPORT 15510

N.T.S.



NOTES:
1. USE NEOPRENE SLEEVE ON COPPER AND PVC PIPING AT STRAPS AND BRACKETS.
2. PAINT w/ SYSTEM NO 5, DIP COATED OR USE SST.

STACKED PIPE WALL SYSTEM 15525

N.T.S.

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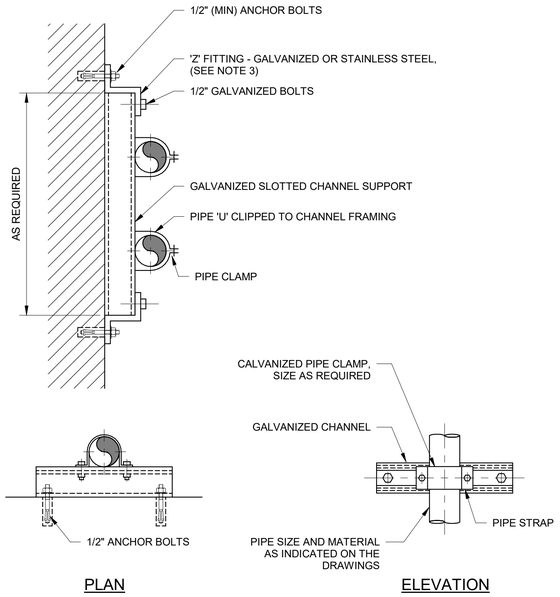
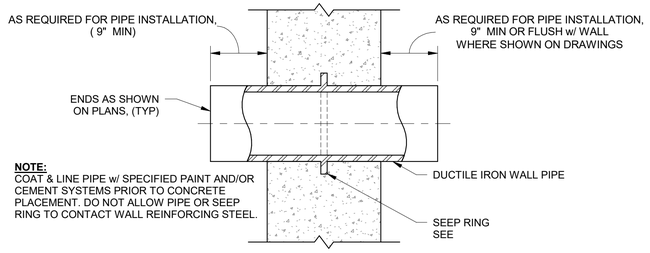
DWG. NO. SD-7
SHEET NO. 58 OF 60



NOTES:
1. FOR COPPER PIPE, WRAP PIPE UNDER 'U' CLIP WITH POLYETHYLENE TAPE.
2. PROVIDE STAINLESS STEEL SHIELD BETWEEN CLAMP AND PIPE FOR ALL STAINLESS STEEL PIPE.
3. SUPPORT CHANNEL AND PIPE CLAMP SHALL BE UNISTRUT, OR APPROVED ALTERNATIVE.

STACKED PIPE SUPPORT 15532

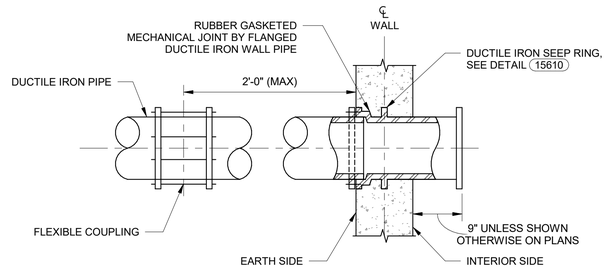
N.T.S.



NOTE:
COAT & LINE PIPE w/ SPECIFIED PAINT AND/OR CEMENT SYSTEMS PRIOR TO CONCRETE PLACEMENT. DO NOT ALLOW PIPE OR SEEP RING TO CONTACT WALL REINFORCING STEEL.

DUCTILE IRON WALL PIPE 15600

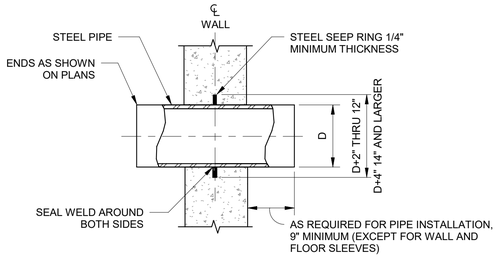
N.T.S.



NOTE:
COAT AND LINE WALL PIPE w/ SPECIFIED PAINT AND/OR CEMENT SYSTEMS PRIOR TO CONCRETE PLACEMENT.

WALL PIPE 15601

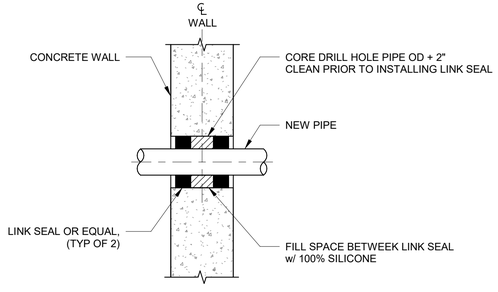
N.T.S.



NOTE:
HOT DIP GALVANIZE AFTER FABRICATION WHERE NOTED. LINE AND COAT WALL PIPE w/ SPECIFIED PAINT SYSTEM PRIOR TO CONCRETE PLACEMENT.

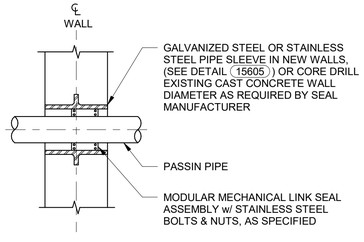
STEEL WALL PIPE 15605

N.T.S.



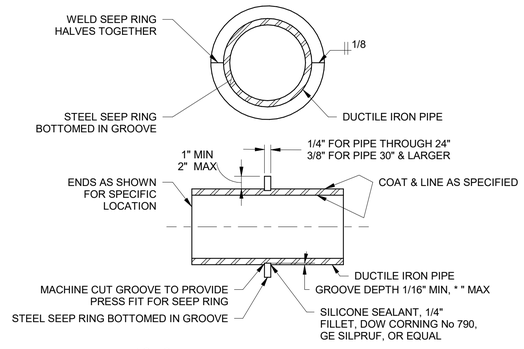
WALL PENETRATION SEAL DETAIL 15606

N.T.S.



TYPE 'A' WALL PENETRATION SEAL DETAIL 15607

N.T.S.



NOTES:
1. DO NOT WELD SEEP RING TO PIPE.
2. * = AS RECOMMENDED BY PIPE MANUFACTURER.

DUCTILE IRON PIPE SEEP RING 15610

N.T.S.

Morrison Maierle
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1 Engineering Place Helena, MT 59602
406.442.3050
www.m-m.net

CITY OF BULLHEAD CITY

CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STANADARD DETAILS

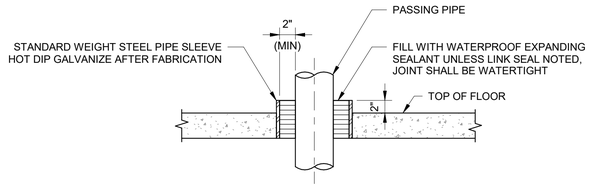
DESIGN: RL	DRAWN: DAH	CHECKED: JCM
DATE: 08/2025		

REVISION	DATE	DESCRIPTION

Registered Professional Engineer (Civil) CERTIFICATE 67132 ULRIKE LASHLEY Date Signed 08.21.25 ARIZONA, U.S.A. Expires: Sept 30, 2027

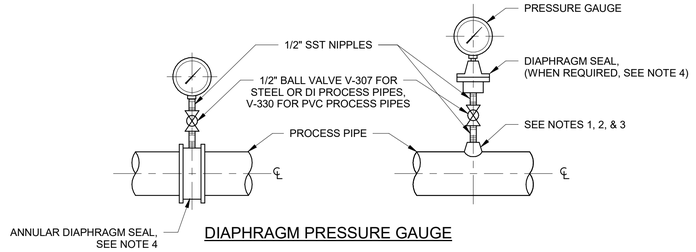
DWG. NO. SD-8

SHEET NO. 59 OF 60

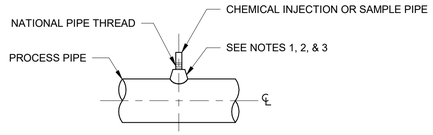


FLOOR SLEEVE DETAIL 15620

N.T.S.



DIAPHRAGM PRESSURE GAUGE

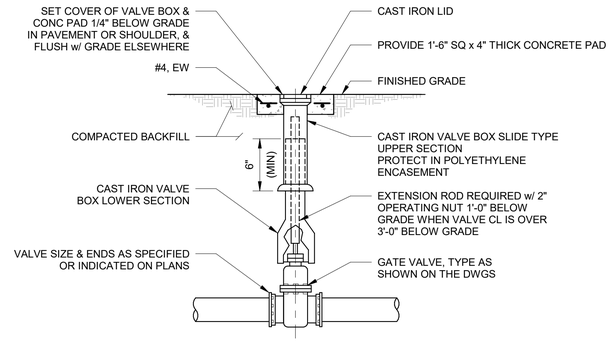


PIPE TAPS

NOTES:
1. FOR STEEL, GALVANIZED STEEL AND PVC 2 1/2" AND SMALLER USE A BUSHING IN A TEE.
2. FOR DUCTILE IRON, ALL SIZES, USE PIPE SADDLE WITH BUSHING.
3. FOR STEEL AND STAINLESS STEEL PIPES 3" AND LARGER, AND PRESSURE VESSELS, USE THRED-O-LET AS SHOWN.
4. USE DIAPHRAGM SEAL ON ALL SERVICES EXCEPT AIR, POTABLE WATER, & NONPOTABLE WATER. USE ANNULAR DIAPHRAGM FOR SLUDGE SERVICES.
5. PROVIDE SNUBBER FOR POSITIVE DISPOLACEMENT PUMP APPLICATIONS.

PRESSURE GAUGE OR PIPE TAP DETAILS 15680

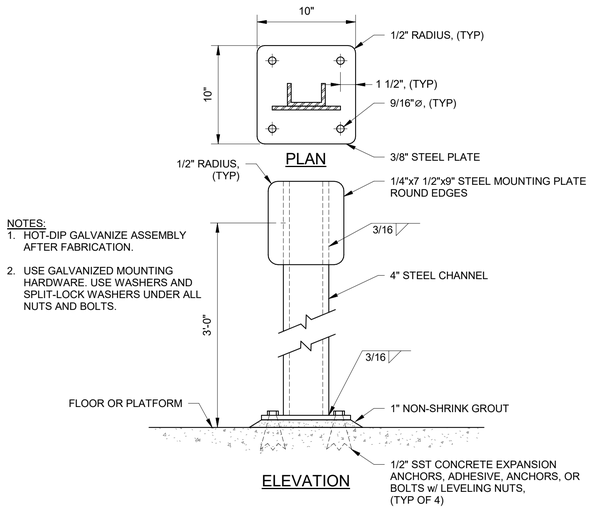
N.T.S.



NOTE:
PROTECT BURIED VALVES WITH GALVANIC ANODES OR OTHER CORROSION PROTECTION, AS SPECIFIED. ALSO SEE 13930.

BURIED GATE VALVE BOX 15955

N.T.S.



NOTES:
1. HOT-DIP GALVANIZE ASSEMBLY AFTER FABRICATION.
2. USE GALVANIZED MOUNTING HARDWARE. USE WASHERS AND SPLIT-LOCK WASHERS UNDER ALL NUTS AND BOLTS.

EQUIPMENT MOUNTING PEDESTAL DETAIL 16110

N.T.S.

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CLARIFIER 3 & RAS/WAS PUMP STATION IMPROVEMENTS

STANADARD DETAILS

DWG. NO. SD-9

SHEET NO. 60 OF 60