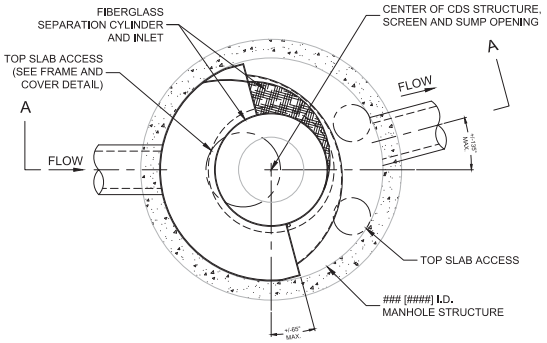
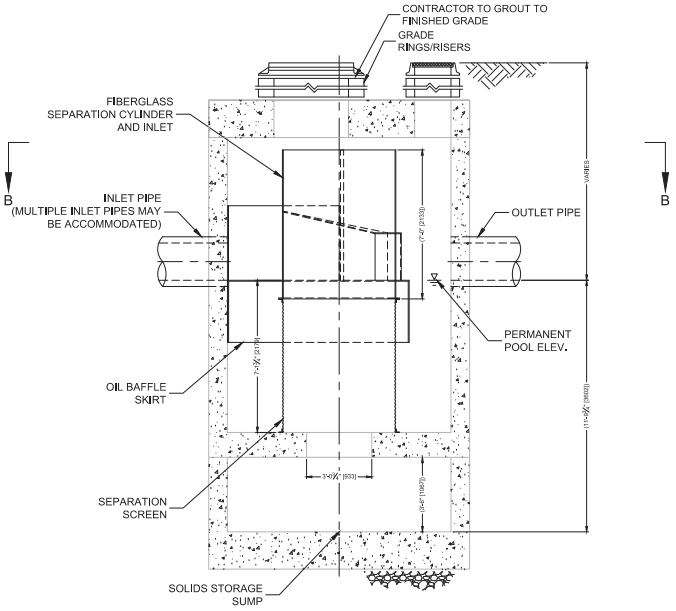


PLAN VIEW B-B
N.T.S.



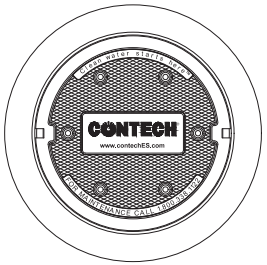
ELEVATION A-A
N.T.S.

CDS3035-6-C DESIGN NOTES

CDS3035-6-C RATED TREATMENT CAPACITY IS 3,8 CFS [107,6 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 20,0 CFS [566 L/s]. IF THE SITE CONDITIONS EXCEED 20,0 CFS [566 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS3035-6-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
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9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS3035-6-C
ONLINE CDS
STANDARD DETAIL

FOR INFORMATION ONLY
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Port of Tacoma
P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841

Parametrix
ENGINEERING PLANNING ENVIRONMENTAL SCIENCES

MARK:	REVISION:	BY:	APPR:	DATE:

APPROVED:

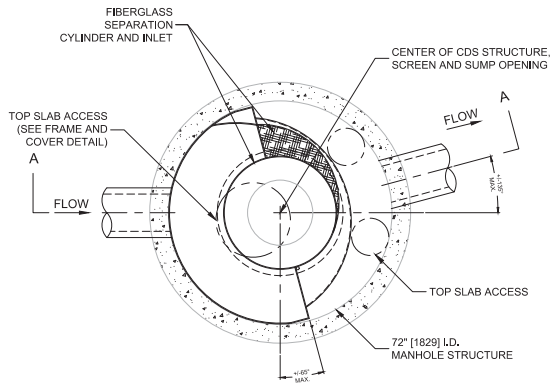
DIRECTOR ENG.	DATE	CHECKED BY	DATE
		PROJ. ENGR	DATE

PRINTED BY: anderbru Feb 01, 2018
PORT ADDRESS:ONE SITCUM PLAZA
TACOMA, WA 98401-1837

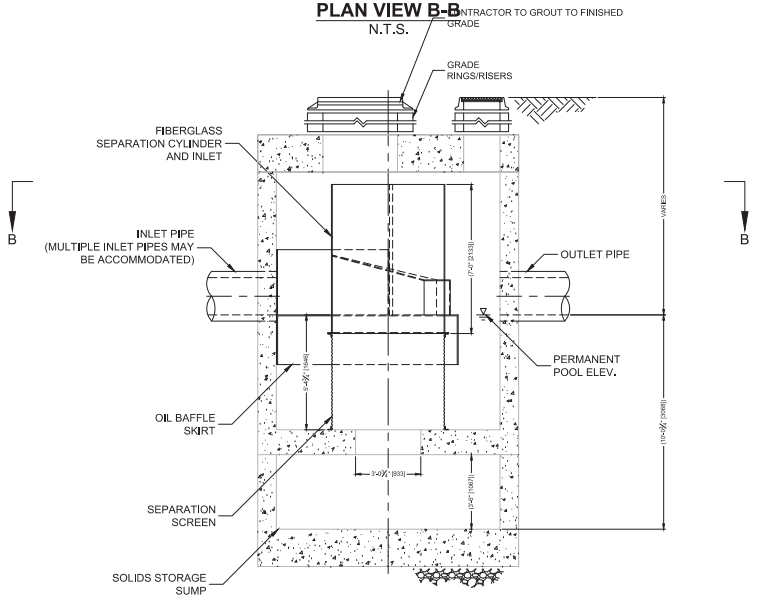
WEST SITCUM
STORMWATER TREATMENT
DETAILS - HYDRODYNAMIC SEPARATOR - BASIN A

6583
M10
SH 35 OF 42

CONT/CONS: 070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34
M. ID: 201024.01	DAT-HRZ: WA83-S	VERT: MLLW	
PHASE: 90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED	



PLAN VIEW B-B
N.T.S.



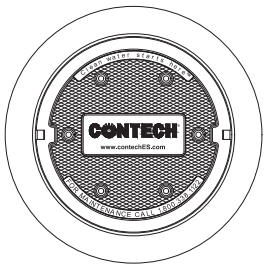
ELEVATION A-A
N.T.S.

CDS3025-6-C DESIGN NOTES

CDS3025-6-C RATED TREATMENT CAPACITY IS 2,5 CFS [70,8 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 20,0 CFS [566 L/s]. IF THE SITE CONDITIONS EXCEED 20,0 CFS [566 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS3025-6-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
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CDS3025-6-C
ONLINE CDS
STANDARD DETAIL

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		PROJ. ENGR	DATE

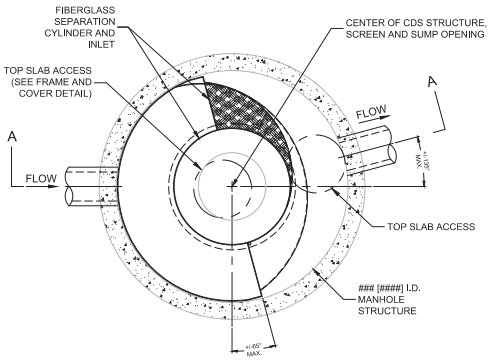
PRINTED BY: anderbru Feb 01, 2018
PORT ADDRESS: ONE SITCUM PLAZA
TACOMA, WA 98401-1837

WEST SITCUM
STORMWATER TREATMENT
DETAILS - HYDRODYNAMIC SEPARATOR - BASIN B

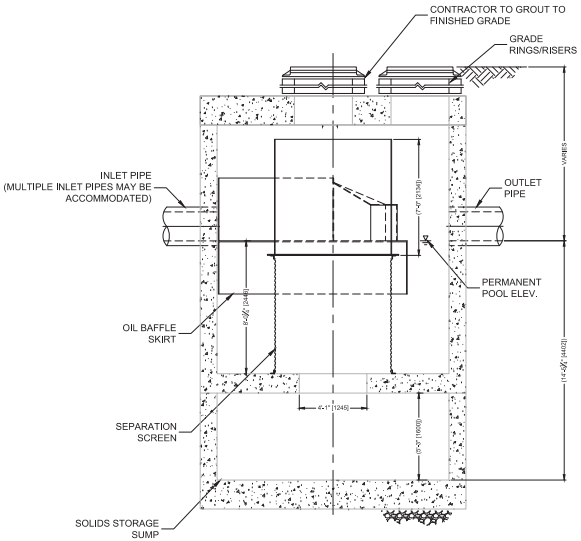
CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E
M. ID:	201024.01	DAT-HRZ: WA83-S	VERT: MLLW
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED

SECTIONS: 33 & 34

6583
M11
SH 36 OF 42



PLAN VIEW B-B
N.T.S.



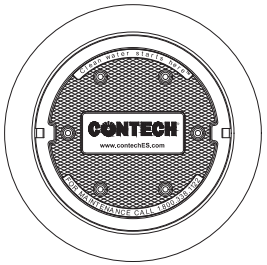
ELEVATION A-A
N.T.S.

CDS4040-8-C DESIGN NOTES

CDS4040-8-C RATED TREATMENT CAPACITY IS 6,0 CFS [169,9 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 30,0 CFS [850 L/s]. IF THE SITE CONDITIONS EXCEED 30,0 CFS [850 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS4040-8-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			*
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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CDS4040-8-C
ONLINE CDS
STANDARD DETAIL

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DIRECTOR ENG.	DATE	CHECKED BY	DATE
		PROJ. ENGR	DATE

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PORT ADDRESS: ONE SITCUM PLAZA
TACOMA, WA 98401-1837

WEST SITCUM
STORMWATER TREATMENT
DETAILS - HYDRODYNAMIC SEPARATOR - BASIN C

6583
M12
SH 37 OF 42

CONT/CONS: 070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34
M. ID: 201024.01	DAT-HRZ: WA83-S	VERT: MLLW	
PHASE: 90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED	

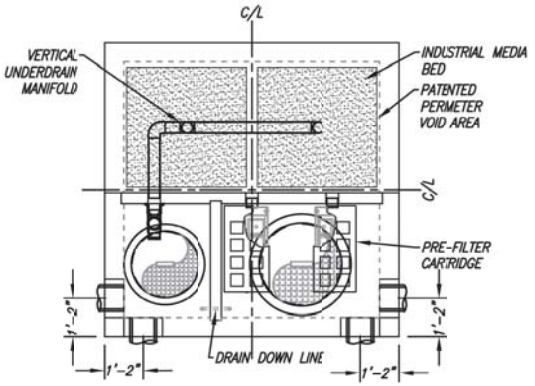
SITE SPECIFIC DATA			
PROJECT NUMBER		6543	
PROJECT NAME		NWSA – PORT OF TACOMA – WEST SITCUM	
PROJECT LOCATION		TACOMA, WA	
STRUCTURE ID		----	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			N/A
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	----	PVC	8"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	----	PVC	8"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	----	----	----
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	N/A	ø24"
INDUSTRIAL MEDIA VOLUME (CY)			5.63
INDUSTRIAL MEDIA DELIVERY METHOD			PER CONTRACT
ORIFICE SIZE (DIA. INCHES)			ø2.17"
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. INDUSTRIAL MEDIA MIX REQUIRED.			

INSTALLATION NOTES

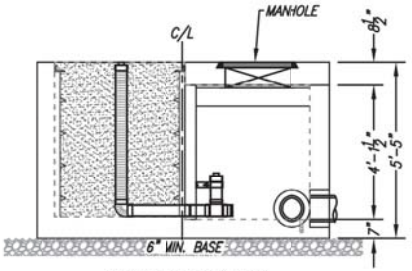
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING MODUAR WETLANDS FOR ACTIVATION OF UNIT. MANUFACTURES WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A MODULAR WETLANDS REPRESENTATIVE.

GENERAL NOTES

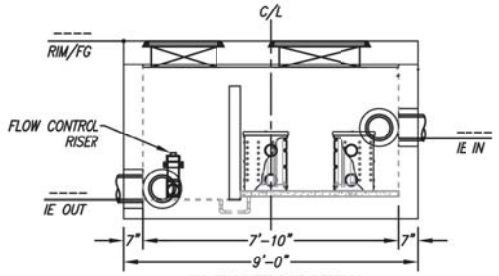
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.



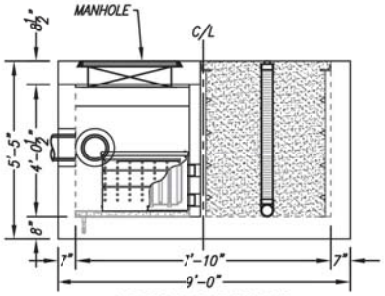
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.231
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
INDUSTRIAL MEDIA LOADING RATE (GPM/SF)	1.0

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MODULAR WETLANDS SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.

Bio Clean
A Forterra Company

MWS-L-8-8-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

Port of Tacoma
Parametrix

MARK:	REVISION:	BY:	APPR:	DATE:

APPROVED:

DIRECTOR ENG.	DATE	PROJ. ENGR	DATE
		CHECKED BY	DATE

PRINTED BY: anderbru Feb 01, 2018
PORT ADDRESS: ONE SITCUM PLAZA
TACOMA, WA 98401-1837

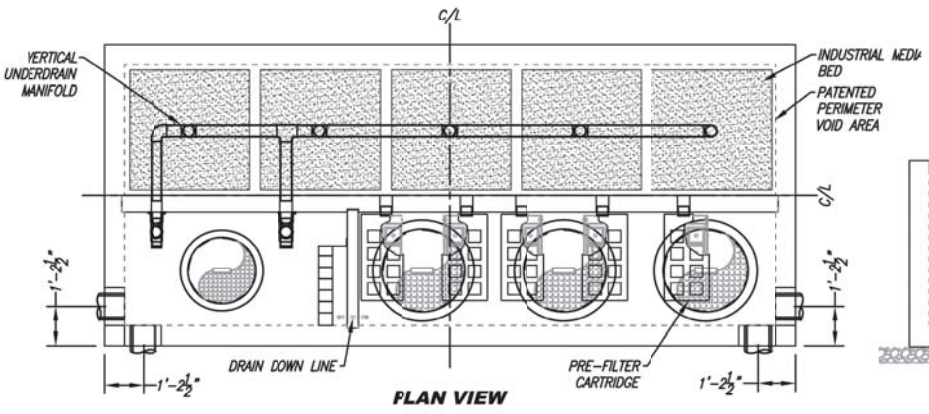
WEST SITCUM
STORMWATER TREATMENT
DETAIL - MWS-L-8-8-V-HC

6583
M13
SH 30 OF 42

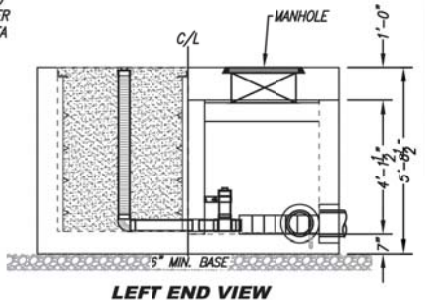
CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E
M. ID:	201024.01	DAT-HRZ: WA83-S	VERT: MLLW
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED

SECTIONS: 33 & 34

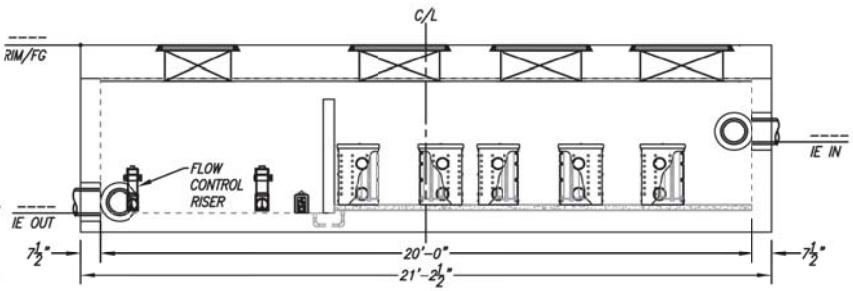
SITE SPECIFIC DATA			
PROJECT NUMBER		6543	
PROJECT NAME		NWSA – PORT OF TACOMA – WEST SITCUM	
PROJECT LOCATION		TACOMA, WA	
STRUCTURE ID		-----	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			N/A
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	-----	PVC	8"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	-----	PVC	8"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	-----	-----	-----
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	3 EA ø30"	N/A	ø24"
INDUSTRIAL MEDIA VOLUME (CY)			14.93
INDUSTRIAL MEDIA DELIVERY METHOD			PER CONTRACT
ORIFICE SIZE (DIA. INCHES)			2 EA ø2.43"
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. INDUSTRIAL MEDIA MIX REQUIRED.			



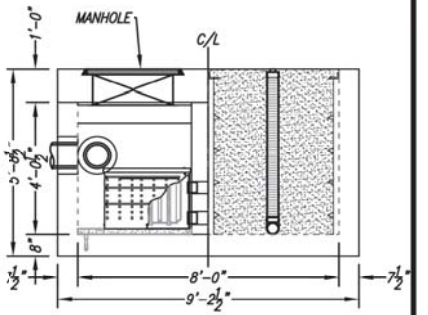
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

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2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
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4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING MODUAR WETLANDS FOR ACTIVATION OF UNIT. MANUFACTURES WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A MODULAR WETLANDS REPRESENTATIVE.

GENERAL NOTES

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TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
INDUSTRIAL MEDIA LOADING RATE (GPM/SF)	1.0

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

Bio Clean
A Forterra Company

MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

Port of Tacoma
Parametrix

MARK:	REVISION:	BY:	APPR:	DATE:

APPROVED:

DIRECTOR ENG.	DATE	CHECKED BY	DATE
PROJ. ENGR	DATE		

WEST SITCUM
STORMWATER TREATMENT
DETAIL - MWS-L-8-20-V-HC

PRINTED BY: anderbru Feb 01, 2018
PORT ADDRESS: ONE SITCUM PLAZA
TACOMA, WA 98401-1837

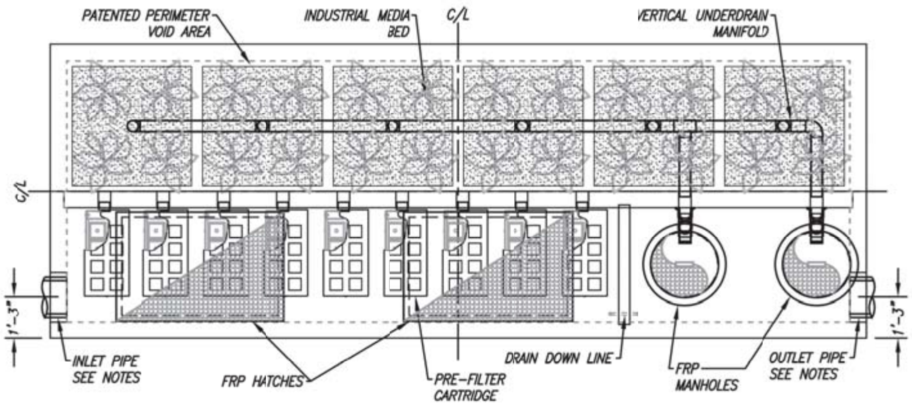
6583
M14
SH 31 OF 42

CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E
M. ID:	201024.01	DAT-HRZ: WA83-S	VERT: MLLW
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED

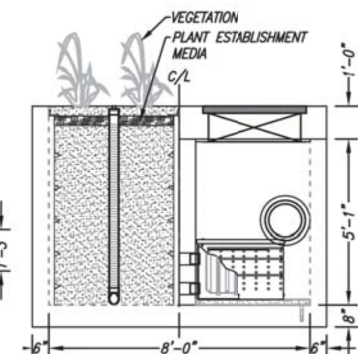
SECTIONS: 33 & 34

SITE SPECIFIC DATA

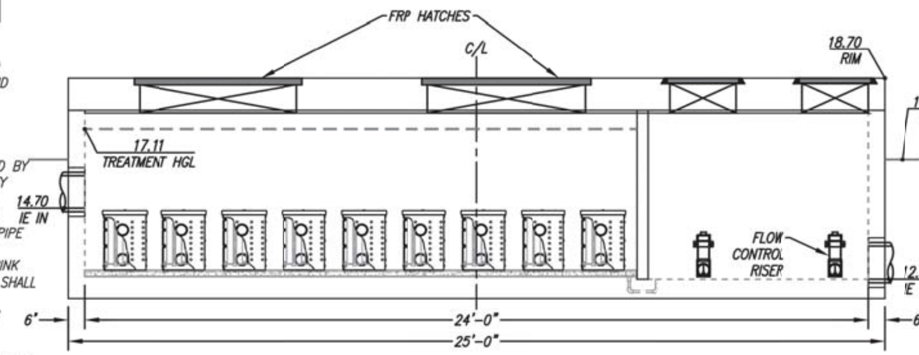
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			N/A
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1		N/K	N/K
INLET PIPE 2		N/A	N/A
OUTLET PIPE		N/K	N/K
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD			
FRAME & COVER			
INDUSTRIAL MEDIA VOLUME (CY)			
INDUSTRIAL MEDIA DELIVERY METHOD			PER CONTRACT
ORIFICE SIZE (DIA. INCHES)			
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. INDUSTRIAL MEDIA MIX REQUIRED.			



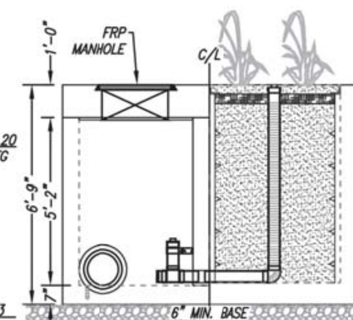
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



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TREATMENT FLOW (CFS)	1.0
OPERATING HEAD (FT)	4.9
PRETREATMENT LOADING RATE (GPM/SF)	1.9
INDUSTRIAL MEDIA LOADING RATE (GPM/SF)	1.0

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PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MODULAR WETLANDS SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.

Bio Clean
A Forterra Company

MWS-L-8-24-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

10/4/17ASPLAR

Port of Tacoma
P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841

Parametrix

MARK:	REVISION:	BY:	APPR:	DATE:

APPROVED:

CHECKED BY DATE

DIRECTOR ENG. DATE | PROJ. ENGR DATE

PRINTED BY: anderbru Feb 01, 2018

PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837

WEST SITCUM
STORMWATER TREATMENT
DETAIL - MWS-L-8-24-V-HC

TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34	
DAT-HRZ: WA83-S	VERT: MLLW	DRAWING SCALE: AS NOTED	
PARCEL: SEE G02			

6583
M15
SH 32 OF 42

CONT/CONS: 070664
M. ID: 201024.01
PHASE: 90%

PORT OF TACOMA FILE: \\parametrix.com\pmx\PSO\Projects\Clients\8001-NW Seaport Alliance\553-8001-001 West Sitcum\99Svcs\CADD\DWG\PS8001001M-15

BINDING EDGE

BINDING EDGE

ABBREVIATIONS

a	CIRCUIT BREAKER AUX. CONTACT, CLOSED WHEN BREAKER IS CLOSED	GRS	GALVANIZED RIGID STEEL	PWR	POWER
		O2H2	HYDROGEN PEROXIDE	(R)	RELOCATED
A	AMMETER, AMPERES	HH	HANDHOLE	RCPT	RECEPTACLE
AC	ALTERNATING CURRENT	HOA	HAND–OFF–AUTOMATIC	RCT	REPEAT CYCLE TIMER
A/D	ANALOG TO DIGITAL	HOR	HAND–OFF–REMOTE	REF	REFERENCE
ADJ	ADJUSTABLE	HPS	HIGH PRESSURE SODIUM	RT	RESET TIMER
AF	AMPERE FRAME	HT	HEAT TAPE, HEAT TRACE	SCCR	SHORT CIRCUIT CURRENT RATING
AFD	ADJUSTABLE FREQUENCY DRIVE	HTR	HEATER	SCR	SILICON CONTROLLED RECTIFIER
		HV	HIGH VOLTAGE	SD	SMOKE DETECTOR
AIC	AMPERES INTERRUPTING CAPACITY	HZ	HERTZ (CYCLES PER SECOND)	SIG	SIGNAL
AMP	AMPERES	IND LT	INDICATING LIGHT	SN	SOLID NEUTRAL
ANN	ANNUNICATOR	INCAND	INCANDESCENT	SPD	SURGE PROTECTION DEVICE
AS	AMMETER SWITCH	INSTR	INSTRUMENT, INSTRUMENTATION		
AT	AMPERE TRIP	I/O	INPUT/OUTPUT	SPDT	SINGLE POLE, DOUBLE THROW
ATS	AUTOMATIC TRANSFER SWITCH	ISB	INTRINSICALLY SAFE BARRIER	SPST	SINGLE POLE, SINGLE THROW
AUTO	AUTOMATIC	ISR	INTRINSICALLY SAFE RELAY	SST	STAINLESS STEEL
AWG	AMERICAN WIRE GAGE	JB	JUNCTION BOX	SV	SOLENOID VALVE
b	CIRCUIT BREAKER AUX. CONTACT, CLOSED WHEN BREAKER IS OPEN	KA	KILOAMPERES	SW	SWITCH
		KCMIL	THOUSANDS OF CIRCULAR MILS	SWBD	SWITCHBOARD
		KV	KILOVOLTS	SWGR	SWITCHGEAR
BCG	BARE COPPER GROUND	KVA	kILOVOLT AMPERES	SYNC	SYNCHRONIZING
C	CONDUIT	KVAR	KILOVOLT AMPERES REACTIVE	TB	TERMINAL BLOCK
CAB	CABINET	KVARH	KILOVOLT AMPERES REACTIVE HOURS	TC	TELEPHONE CABINET
CAP	CAPACITOR	KWH	KILOWATT HOURS	TEL	TELEPHONE
CB	CIRCUIT BREAKER	LCS	LOCAL CONTROL STATION	TER	TERMINAL
CC	CONTROL CABLE, CLOSING COIL	LTG	LIGHTING	TO	TIMED OPENING
CHH	COMMUNICATION HANDHOLE	LTS	LIGHTS	TOA	TEST–OFF–AUTOMATIC
CC	CLARIFIER CONSOLE	LP	LIGHTING PANEL	TSP	TWISTED SHIELDED PAIR
CKT	CIRCUIT	LR	LINE REACTOR	TST	TWISTED SHIELDED TRIAD
CMH	COMMUNICATION MANHOLE	(M)	MODIFIED	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
CO	CONDUIT ONLY	mA	MILLIAMPERES	UGND	UNDERGROUND
COMM	COMMUNICATION	MCC	MOTOR CONTROL CENTER	UPS	UNINTERRUPTIBLE POWER SUPPLY
COND	CONDUCTOR	MCP	MOTOR CIRCUIT PROTECTION OR MAIN CONTROL PANEL	VA	VOLT–AMPERES
CPT	CONTROL POWER TRANSFORMER			VAR	VOLT AMPERES REACTIVE
CP	CONTROL PANEL	MCM	THOUSAND CIRCULAR MILS (KCMIL)	VFD	VARIABLE FREQUENCY DRIVE
CR	CONTROL RELAY	MFR	MANUFACTURER	VH	VAR–HOUR
CS	CONTROL STATION	MLO	MAIN LUGS ONLY	VS	VOLTMETER SWITCH
CT	CURRENT TRANSFORMER	MON	MONITOR	W	WIRE, WATTS
DB	DIRECT BURIAL	MOV	MOTOR OPERATED VALVE	WH	WATTHOUR METER
DC	DIRECT CURRENT	MS	MOTOR STARTER	WHDM	WATTHOUR DEMAND METER
DIAG	DIAGRAM	MTD	MOUNTED	WP	WEATHERPROOF
DISC	DISCONNECT	MTG	MOUNTING	WR	WEATHER RESISTANT
DISTR	DISTRIBUTION	MTS	MANUAL TRANSFER SWITCH	WT	WATERTIGHT
DIV	DIVISION	MV	MEDIUM VOLTAGE	WWR	WASHWATER RECOVERY
DP	DISTRIBUTION PANEL	(N)	NEW	XFMR	TRANSFORMER
DPDT	DOUBLE POLE, DOUBLE THROW	NC	NORMALLY CLOSED		
DPST	DOUBLE POLE, SINGLE THROW	NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOC.		
(E)	EXISTING	NEUT	NEUTRAL		
EE	ELECTRICAL ENCLOSURE	NO	NORMALLY OPEN, NUMBER		
EHH	ELECTRICAL HANDHOLE	OC	ON CENTER		
ELEM	ELEMENTARY	OCP	OZONE CONTROL PANEL		
EMERG	EMERGENCY	OL	OVERLOAD		
ENCL	ENCLOSURE	OT	OVER TEMPERATURE		
EFFL	EFFLUENT	OVLD	THERMAL OVERLOAD RELAY		
EGC	EQUIPMENT GROUND CONDUCTOR	OIT	OPERATOR INTERFACE TERMINAL		
EMT	ELECTRICAL METALLIC TUBING	P	POLE, PUMP		
EQPT	EQUIPMENT	PB	PULLBOX		
ETM	ELAPSED TIME METER	PBSW	PUSHBUTTON SWITCH		
FCV	FLOW CONTROL VALVE	PC	PHOTO CELL		
FDR	FEEDER	PEC	PHOTOELECTRIC CELL		
FE	FLOW ELEMENT	PF	POWER FACTOR		
FIT	FLOW INDICATING TRANSMITTER	pH	MEASURE OF ACIDITY OR ALKALINITY		
FLEX	FLEXIBLE	PH	PHASE		
FLUOR	FLUORESCENT	PIOP	PLC I/O PANEL		
FREQ	FREQUENCY	PLC	PROGRAMMABLE LOGIC CONTROLLER		
FSH	FLOAT SWITCH HIGH	PNL	PANEL		
FSO	FLOAT SWITCH OVERFLOW	PNLBD	PANELBOARD		
FU	FUSE	POSN	POSITION		
(F)	FUTURE FUT,	POT	POTENTIOMETER		
FVNR	FULL VOLTAGE, NON REVERSING	PPS	PACKAGED POWER SUPPLY		
FVR	FULL VOLTAGE, REVERSING	PRI	PRIMARY		
FWD	FORWARD	PSH	PRESSURE SWITCH HIGH		
GEN	GENERATOR				
GFI	GROUND FAULT INTERRUPTER				
GND	GROUND				

PLAN SYMBOLS

- OVERHEAD POWER LINE
- P — UNDERGROUND POWER
- UNDERGROUND DUCT LINE (CONC. ENCASEMENT)
- UNDERGROUND DIRECT BURIAL CONDUITS
- CONDUIT CONCEALED IN FLOOR, WALL OR CEILING
- EXPOSED CONDUIT
- ¾"C–3#12 — CALLOUT INDICATING CONDUIT SIZE, NUMBER OF WIRES AND WIRE SIZE
- P2005 — CALLOUT INDICATING CONDUIT PER SCHEDULE
- CONDUIT RUN, HATCH MARKS INDICATE NUMBER OF #12 CONDUCTORS, NO HATCH MARKS IS (2) #12 AND (1) #12 GND
- HOME RUN TO PANELBOARD OR AS INDICATED
- FLEXIBLE CONDUIT
- CONDUIT RUN, BROKEN AND CONTINUED SAME SHEET OR AS NOTED
- CONDUIT WITH SEAL FITTING
- CAP ON CONDUIT STUB
- OPEN CIRCLE DENOTES UPWARD CONDUIT RISER
- SOLID CIRCLE DENOTES DOWNWARD CONDUIT RISER
- INDICATES REMOVAL
- CABLE TRAY
- SURFACE MOUNTED PANELBOARD
- FLUSH MOUNTED PANELBOARD
- LOCAL CONTROL STATION
- 30A(F–20A) — CONTROL STATION W/SAFETY SWITCH (SEE NOTE P4)
- EQUIPMENT MOUNTING STAND
- M — MOTOR
- 30A(F–20A) — SAFETY SWITCH (SEE NOTE P4)
- 30A(F–20A) — COMBINATION MOTOR STARTER AND SAFETY SWITCH (SEE NOTE P4)
- S MS — MANUAL MOTOR STARTER
- GROUND ROD AND BOX
- GROUNDING BRANCH CONNECTION
- # — CONDUIT NUMBER P–POWER C–CONTROL S–SIGNAL
- $ (a,b) — SINGLE POLE SWITCH *(SEE NOTES P2 & P3) 2 = 2 POLE, 3 = 3 WAY, 4 = 4 WAY, K = KEY OPERATED WP = WEATHERPROOF D = DIMMER P = SWITCH WITH PILOT LIGHT M = HP RATED, LOCKABLE OS = OCCUPANCY SENSOR
- (a,b) — FLUORESCENT FIXTURE (SEE NOTES P2 & P3)
- WALL/CEILING MOUNTED FIXTURE
- POLE MOUNTED FIXTURE
- WALL/CEILING MOUNTED EXIT LIGHT – DIRECTIONAL ARROW WHERE INDICATED, SHADED AREA INDICATES ILLUMINATED FACE
- WALL/CEILING MOUNTED EMERGENCY LIGHT WITH REMOTE BATTERY
- PE — PHOTO ELECTRIC CELL
- EMERGENCY LIGHT WITH SELF CONTAINED BATTERY
- A — LIGHT FIXTURE IDENTIFICATION
- SINGLE RECEPTACLE, 120V
- SINGLE RECEPTACLE, 208V/240V
- CKT TYPE — DUPLEX WALL RECEPTACLE, 120V WP = WEATHERPROOF G = GROUNDED IG = ISOLATED GROUND GF = GROUND FAULT INTERRUPTER
- DOUBLE DUPLEX, 120V
- DUPLEX FLOOR RECEPTACLE, 120V
- X IN. — MULTI–OUTLET ASSEMBLY WITH SINGLE RECEPTACLE, 120V SPACING (X INCHES) AS NOTED MOUNTING HEIGHT AS NOTED
- SPECIAL PURPOSE WALL RECEPTACLE, RATING AS NOTED
- J — FLOOR, WALL AND CEILING JUNCTION BOXES
- WALL TELEPHONE OUTLET (+12")
- WALL TELEPHONE OUTLET (+60")
- FLOOR TELEPHONE OUTLET
- BELL/BUZZER
- ELECTRIC METER SOCKET
- MH HH — MANHOLE OR HANDHOLE
- EQUIPMENT CONNECTION
- INSTRUMENT
- MCC–D — EQUIPMENT ID #
- T — THERMOSTAT

FIRE ALARM

- FACP — FIRE ALARM CONTROL PANEL
- F — MANUAL PULL STATION
- F — HORN AND STROBE

PLAN SYMBOL NOTES

P1 CONDUIT SIZE AND FILL SHALL BE AS INDICATED. WHERE NO SIZE IS SHOWN, THE CONDUIT SHALL BE SIZED IN ACCORDANCE WITH THE EDITION OF THE NATIONAL ELECTRICAL CODE ADOPTED BY THE AUTHORITY HAVING CODE ENFORCEMENT JURISDICTION. WHERE NO FILL IS INDICATED, PROVIDE (3) #12 WIRES. PROVIDE 3/16 INCH NYLON PULL ROPE IN EACH EMPTY CONDUIT.

P2 LOWER CASE LETTERS IN PARENTHESIS ADJACENT TO A SWITCH OR LIGHT FIXTURE INDICATE A SWITCHED CIRCUIT AND IDENTIFY THE FIXTURE/SWITCH COMBINATIONS. FOR FOUR LAMP FLUORESCENT FIXTURES WIRED IN PAIRS WITHIN EACH FIXTURE, THE "a" SWITCH CONTROLS THE OUTER LAMPS AND THE "b" SWITCH CONTROLS THE INNER LAMPS. WIRE 3 LAMP FIXTURES SIMILARLY.

P3 NUMBERS IN PARENTHESIS ADJACENT TO A LIGHT FIXTURE OR RECEPTACLE INDICATE THE LIGHTING PANEL BRANCH CIRCUIT FEEDING THE DEVICE.

P4 NUMBER INDICATES THE AMPERAGE RATING OF THE SWITCH. IDENTIFIERS IN PARENTHESIS INDICATE THAT THE SWITCH IS PROVIDED WITH FUSES AND THE AMPERAGE RATING OF THE FUSE(S).

SINGLE LINE SYMBOLS

- GROUND CONNECTION
- SWITCH, 3 POLE EXCEPT WHERE NOTED. RATING IN AMPERES AS NOTED (NOTE 1)
- TEST SWITCH WITH SHORTING BLOCK
- AUTOMATIC TRANSFER SWITCH 3 POLE, RATING AS NOTED
- SV — SHUNT TRIP
- FUSE
- FUSE CUTOUT
- 20A 3P / 000AF 000AT — CIRCUIT BREAKER, 3 POLE EXCEPT WHERE NOTED. RATING IN AMPERES AS NOTED.
- POWER CIRCUIT BREAKER DRAWOUT ABOVE 1500V RATING AS NOTED
- SURGE ARRESTER
- CURRENT TRANSFORMER
- VOLTAGE TRANSFORMER
- POWER OR DISTRIBUTION TRANSFORMER RATING AS NOTED
- 7.5 / EQUIPMENT NAME / EQUIPMENT ID # — MOTOR. NUMBER INDICATES HORSEPOWER
- G — GENERATOR
- LINE REACTOR
- BUS STAB ON MCC OR SWITCHGEAR, CORD & PLUG CONNECTION FOR MOTORS
- THERMAL OVERLOAD
- A – AMMETER, V – VOLTMETER, WH – WATTHOUR METER, GS – GROUND FAULT SENSOR
- AS — AMMETER SWITCH
- VS — VOLTMETER SWITCH
- 3 — ELEMENTARY DIAGRAM NUMBER
- KIRK KEY INTERLOCK
- POWER RECEPTACLE FOR PORTABLE EQUIPMENT
- TERMINATOR/POTHEAD
- SPLICE, TERMINATION
- 1* — MOTOR STARTER. NUMBER INDICATES NEMA SIZE (NONE) FULL VOLTAGE NONREVERSING A = AUTOTRANSFORMER REDUCED VOLTAGE SS = SOLID STATE –2S = TWO SPEED CAPACITOR – KVAR INDICATED
- VACUUM BREAK SWITCH
- M — UTILITY REVENUE METER
- VFD ### — VARIABLE FREQUENCY DRIVE
- 1* — SOLID STATE SOFT START MOTOR CONTROLLER
- P200 — CALLOUT INDICATING CONDUIT AND WIRE PER SCHEDULE

LOOP WIRING/ELEMENTARY DIAGRAM SYMBOLS

- FUSE. RATING IN AMPERES
- M — MOTOR
- ETM — ELAPSED TIME METER
- CR1 — CONTROL DEVICE COIL. NUMBER, WHEN USED, DISTINGUISHES BETWEEN DEVICES OF THE SAME TYPE. ALT – ALTERNATOR, CR – CONTROL RELAY, GR – GENERAL RELAY, ISR – INTRINSICALLY SAFE RELAY, LR – LATCH RELAY, SV – SOLENOID VALVE, PR – PROBE RELAY, TR – TIMING RELAY, TOF – TIMING OFF RELAY, MPR – MODE PRIORITY RELAY
- W — PUSH–TO–TEST
- W — INDICATING LIGHT

INDICATING LIGHT COLORS: A – AMBER, B – BLUE, C – CLEAR, G – GREEN, R – RED, N – NEON, W – WHITE, Y – YELLOW

- BUS STAB ON MCC, CORD & PLUG CONNECTION FOR MOTORS
- THERMAL OVERLOAD
- BUZZER
- HORN
- BELL
- 20A 3P — CIRCUIT BREAKER
- SOLENOID VALVE

SENSING SWITCHES		
CLOSE ON		SENSED VARIABLE
RISING	FALLING	
		FLOW
		LEVEL
		PRESSURE
		TEMPERATURE
LIMIT SWITCHES		
LS		CLOSE ON REACHING LIMIT
LS		CLOSE ON LEAVING LIMIT
TIMED CONTACTS		
SYMBOL	NORMAL	OPEN TO CLOSED / CLOSED TO OPEN
	OPEN	DELAYED / INSTANTANEOUS
	CLOSED	INSTANTANEOUS / DELAYED
	OPEN	INSTANTANEOUS / DELAYED
	CLOSED	DELAYED / INSTANTANEOUS

- TERMINAL
- OPEN CLOSED — SWITCH
- OPEN CLOSED — PUSHBUTTON,
- SWITCH, 3–POLE
- MULTI–POSITION SELECTOR SWITCH
- H A O — HAND–OFF–AUTOMATIC SWITCH
- H R O — HAND–OFF–REMOTE SWITCH
- WIRING INSIDE ENCLOSURE
- FIELD WIRING
- MOTOR HTR — MOTOR HEATER

ELEMENTARY DIAGRAMS

E1 "NORMAL" STATUS OF SWITCHES OR CONTACTS IS THE SHELF POSITION.

E2 NUMBERS AND LETTERS IDENTIFY DEVICE.

- REACTOR
- PLC OUTPUT — PLC OUTPUT CONTACT
- OPEN CLOSED — CONTACT
- PLC INPUT — PLC INPUT CONTACT
- CONTROL POWER TRANSFORMER
- 120 VAC

GENERAL NOTES

G1 THE INSTALLATION OF ALL EQUIPMENT SHOWN ON THESE DRAWINGS OR DESCRIBED IN THE SPECIFICATIONS SHALL CONFORM TO THE REQUIREMENTS SET FORTH IN THE LATEST EDITIONS OF ALL APPLICABLE CODES AND UTILITY COMPANY STANDARDS. CONTACT THE UTILITY COMPANY REPRESENTATIVES AND VERIFY THEIR REQUIREMENTS.

G2 THIS IS A GENERALIZED LEGEND SHEET. THIS CONTRACT MAY NOT USE ALL INFORMATION SHOWN.

G3 NOTIFY THE ENGINEER IMMEDIATELY IF CONFLICTS IN EQUIPMENT LOCATIONS ARE DISCOVERED OR IF PROBLEMS ARISE DUE TO FIELD CONDITIONS, LACK OF INFORMATION OR ANY OTHER REASON.

G4 INFORMATION SHOWN MAY NOT BE ALL INCLUSIVE. SEE ALSO ANSI C37.2, Y1.1, Y32.2, AND Y32.9.

G5 REFER TO THE MECHANICAL DRAWINGS FOR EXACT LOCATIONS OF MECHANICAL EQUIPMENT AND FOR CERTAIN CONNECTIONS TO BE MADE TO ELECTRICAL CIRCUITS.

G6 EQUIPMENT SHOWN IN ½ TONE OR GREY TONE ARE EXISTING OR BY OTHERS.

G7 VERIFY ALL COLOR REQUIREMENTS BEFORE ORDERING MATERIALS.

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TACOMA, WA 98401-1837

WEST SITCUM

STORMWATER TREATMENT

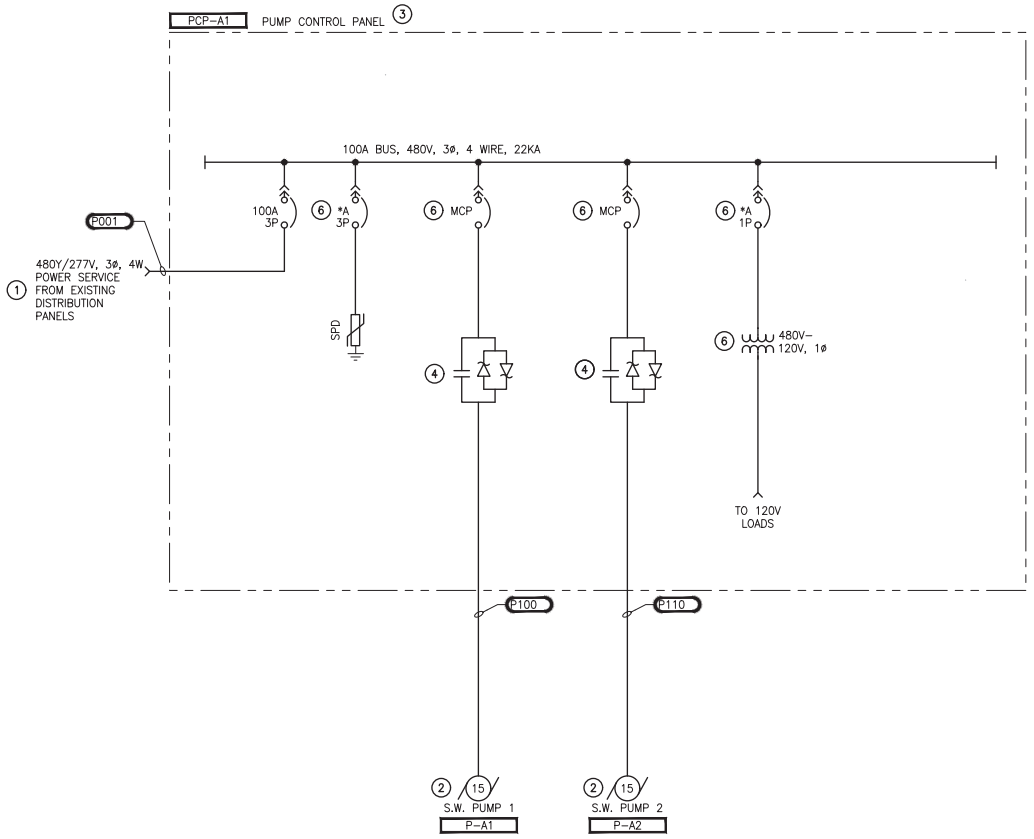
ELECTRICAL LEGEND AND ABBREVIATIONS

CONT/CONS: 0706664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34
M. ID: 201024.01	DAT–HRZ: WA83–S	VERT: MLLW	
PHASE: 90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED	

6583

E01

SH 32 OF 42



② ONE-LINE DIAGRAM & LOAD CALCULATIONS

SCALE: NTS

NOTES:

1. SEE DRAWINGS C1–C3 FOR EXISTING DISTRIBUTION PANEL LOCATIONS. PROVIDE NEW CIRCUIT BREAKERS AS FOLLOWS:
   - BASIN A – 70 AMPS
   - BASIN B – 60 AMPS
   - BASIN C – 100 AMPS
2. BASIN "A" ONE LINE DIAGRAM SHOWN. PUMP MOTOR HPs VARY PER BASIN. SEE SCHEDULES. LABEL EQUIPMENT AT BASINS "B" AND "C" USING THE ASSOCIATED ALPHABETIC IDENTIFIER.
3. PROVIDE WITH H–O–A AND ALL INDICATIONS AS REQUIRED. SEE SPECIFICATIONS AND DRAWINGS E03, E09, AND E10.
4. ELECTRONIC SOFT STARTER WITH INTERNAL BYPASS CONTACTOR AND OVERLOAD PROTECTION.
6. SIZE PER MANUFACTURER REQUIREMENTS.
7. AS–BUILT DRAWINGS OF THE ELECTRICAL DISTRUBUTION SYSTEM AT THE WEST SITCUM FACILITY WERE NOT AVAILABLE DURING DESIGN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL EXISTING DISTRIBUTION PANEL LOCATIONS AND PERFORM A 30–DAY LOAD TEST ON EACH PANEL PER NEC REQUIREMENTS. IN ADDITION, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A RECOGNIZED TESTING LABORATORY/ COORDINATION ANALYSIS CONSULTATNT TO PERFORM A SHORT–CIRCUIT, COORDINATION, AND ARC–FLASH STUDY AT THE FACILITY PRIOR TO BEGINNING WORK. SEE SPECIFICATIONS FOR REQUIREMENTS.

PCP-A1 LOAD CALCULATIONS	
15 HP MOTOR	21.0 AMPS X 1.25 = 26.3 AMPS
15 HP MOTOR	21.0 AMPS X 1.00 = 21.0 AMPS
MISC. PS LOAD (2KVA)	2.5 AMPS X 1.00 = 2.5 AMPS
TOTAL	50.8 AMPS

PCP-B1 LOAD CALCULATIONS	
12 HP MOTOR	17.0 AMPS X 1.25 = 21.3 AMPS
12 HP MOTOR	17.0 AMPS X 1.00 = 17.0 AMPS
MISC. PS LOAD (2KVA)	2.5 AMPS X 1.00 = 2.5 AMPS
TOTAL	40.8 AMPS

PCP-C1 LOAD CALCULATIONS	
25 HP MOTOR	34.0 AMPS X 1.25 = 42.5 AMPS
25 HP MOTOR	34.0 AMPS X 1.00 = 34.0 AMPS
MISC. PS LOAD (2KVA)	2.5 AMPS X 1.00 = 2.5 AMPS
TOTAL	79.0 AMPS

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WEST SITCUM
STORMWATER TREATMENT
ONE-LINE DIAGRAM AND LOAD CALCULATIONS

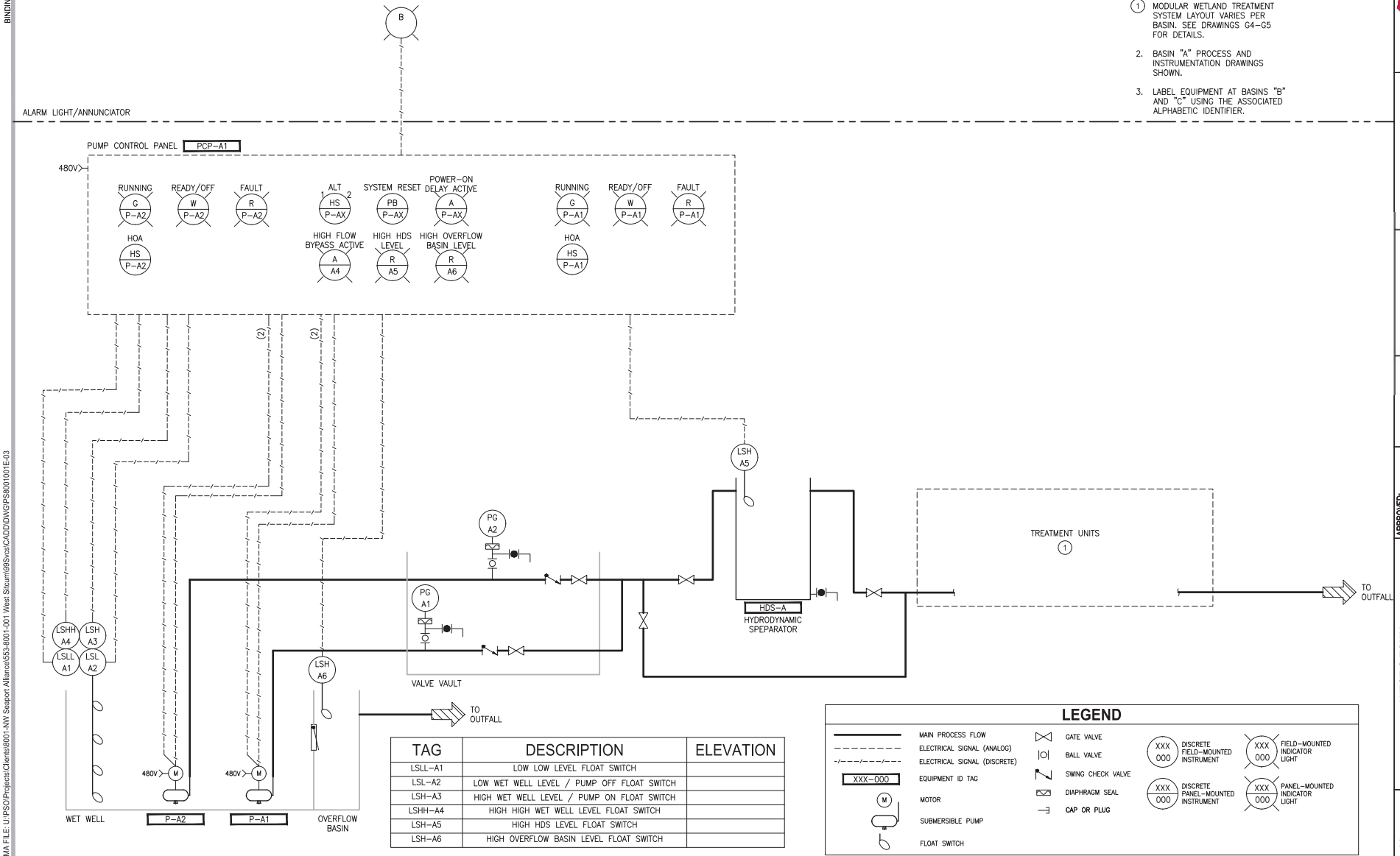
6583
E02
SH 33 OF 42

CONT/CONS: 070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34
M. ID: 201024.01	DAT–HRZ: WA83–S	VERT: MLLW	
PHASE: 90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED	

BINDING EDGE

NOTES:

1. MODULAR WETLAND TREATMENT SYSTEM LAYOUT VARIES PER BASIN. SEE DRAWINGS C4–C5 FOR DETAILS.
2. BASIN "A" PROCESS AND INSTRUMENTATION DRAWINGS SHOWN.
3. LABEL EQUIPMENT AT BASINS "B" AND "C" USING THE ASSOCIATED ALPHABETIC IDENTIFIER.



TAG	DESCRIPTION	ELEVATION
LSLL–A1	LOW LOW LEVEL FLOAT SWITCH	
LSL–A2	LOW WET WELL LEVEL / PUMP OFF FLOAT SWITCH	
LSH–A3	HIGH WET WELL LEVEL / PUMP ON FLOAT SWITCH	
LSHH–A4	HIGH HIGH WET WELL LEVEL FLOAT SWITCH	
LSH–A5	HIGH HDS LEVEL FLOAT SWITCH	
LSH–A6	HIGH OVERFLOW BASIN LEVEL FLOAT SWITCH	

LEGEND

- MAIN PROCESS FLOW
- ELECTRICAL SIGNAL (ANALOG)
- ELECTRICAL SIGNAL (DISCRETE)
- XXX–000 EQUIPMENT ID TAG
- M MOTOR
- SUBMERSIBLE PUMP
- FLOAT SWITCH
- GATE VALVE
- BALL VALVE
- SWING CHECK VALVE
- DIAPHRAGM SEAL
- CAP OR PLUG
- XXX 000 DISCRETE FIELD–MOUNTED INSTRUMENT
- XXX 000 DISCRETE PANEL–MOUNTED INSTRUMENT
- XXX 000 FIELD–MOUNTED INDICATOR LIGHT
- XXX 000 PANEL–MOUNTED INDICATOR LIGHT

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WEST SITCUM
STORMWATER TREATMENT
PIPING & INSTRUMENTATION DIAGRAM - BASIN A

6583
E03
SH 34 OF 42

CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E
M. ID:	201024.01	DAT–HRZ: WA83–S	VERT: MLLW
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED

SECTIONS: 33 & 34

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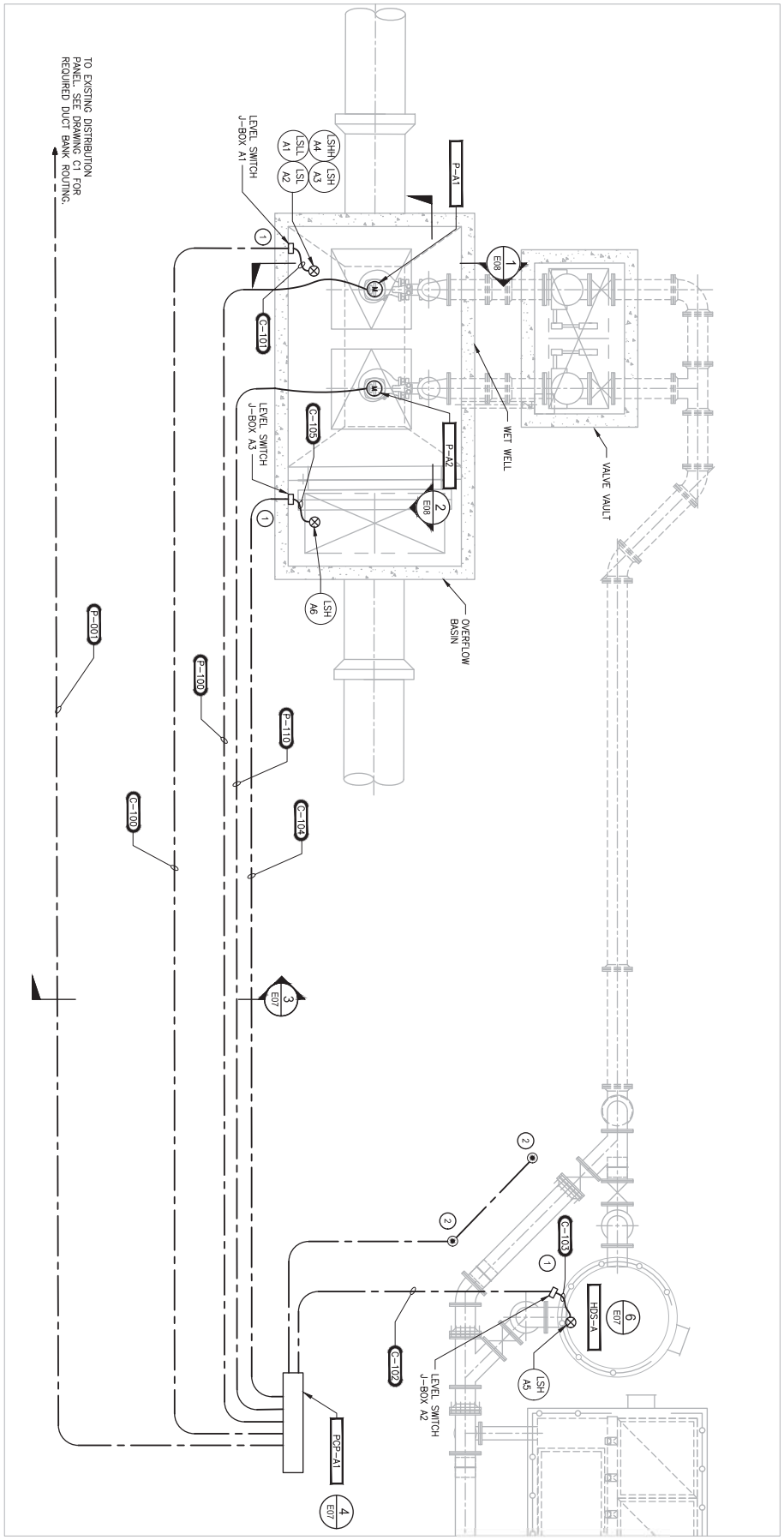

ELECTRICAL SITE PLAN - BASIN A

SCALE: 3/8" = 1'

NOTES:

1. NATIONAL ELECTRIC CODE CLASS 1, DIVISION 2, GROUP D HAZARDOUS AREA. ALL EQUIPMENT SHALL BE RATED ACCORDINGLY.
2. PROVIDE #2/0 BARE COPPER GROUNDING CONDUCTOR. ATTACH TO GROUND RODS PER DETAIL 1/E07

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6583 **E04** SH 35 OF 42	WEST SITCUM STORMWATER TREATMENT ELECTRICAL SITE PLAN - BASIN A			APPROVED:	CHECKED BY DATE	Parametrix ENGINEERING · PLANNING · ENVIRONMENTAL SCIENCES	Port of Tacoma P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841		
CONT/CONS: 070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34	DIRECTOR ENG. DATE	PROJ. ENGR DATE		MARK:	REVISION:	BY: APPR: DATE:
M. ID: 201024.01	DAT-HRZ: WA83-S	VERT: MLLW		PRINTED BY: vondejam Feb 01, 2018					
PHASE: 90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED		PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837					

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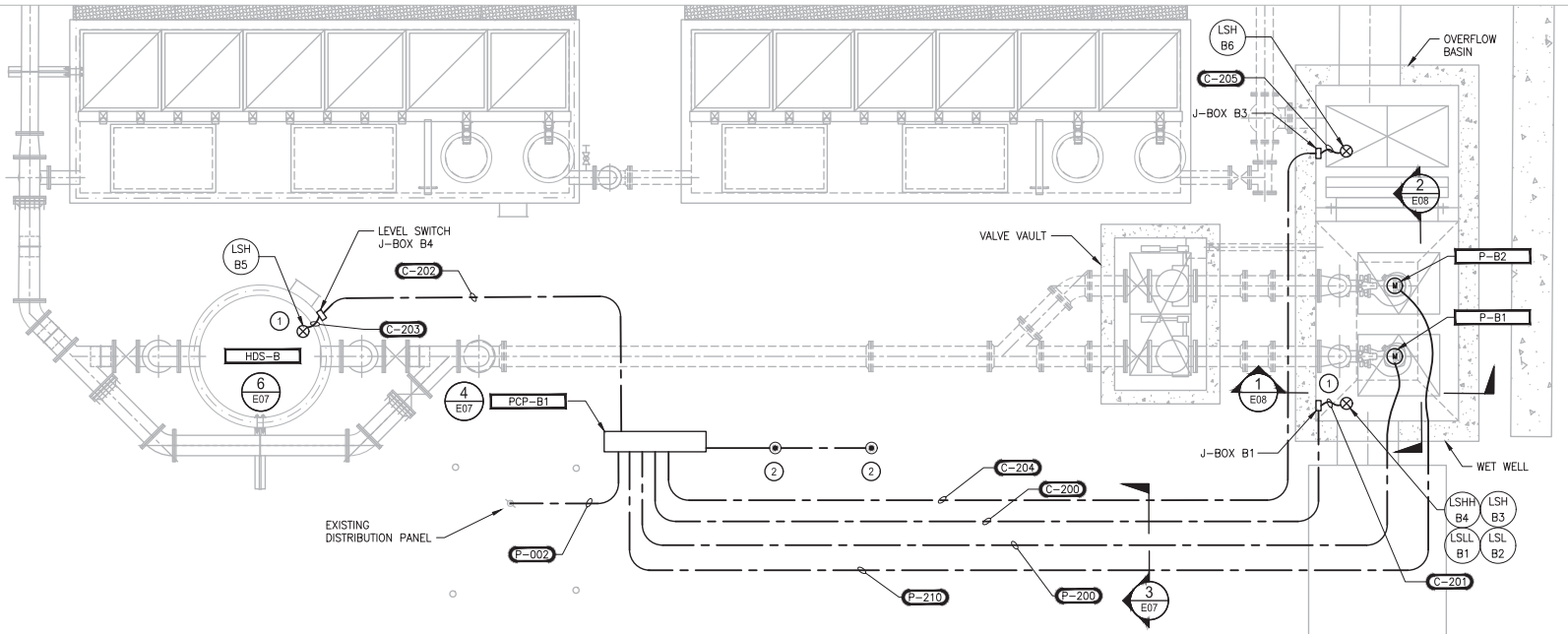
NOTES:

1. NATIONAL ELECTRIC CODE CLASS 1, DIVISION 2, GROUP D HAZARDOUS AREA. ALL EQUIPMENT SHALL BE RATED ACCORDINGLY.
2. PROVIDE #2/0 BARE COPPER GROUNDING CONDUCTOR. ATTACH TO GROUND RODS PER DETAIL 1/E07



ELECTRICAL SITE PLAN - BASIN B
SCALE: 1" = 3'

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WEST SITCUM
STORMWATER TREATMENT
ELECTRICAL SITE PLAN - BASIN B

6583
E05
SH --- OF 42

CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E
M. ID:	201024.01	DAT-HRZ: WA83-S	VERT: MLLW
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED

SECTIONS: 33 & 34

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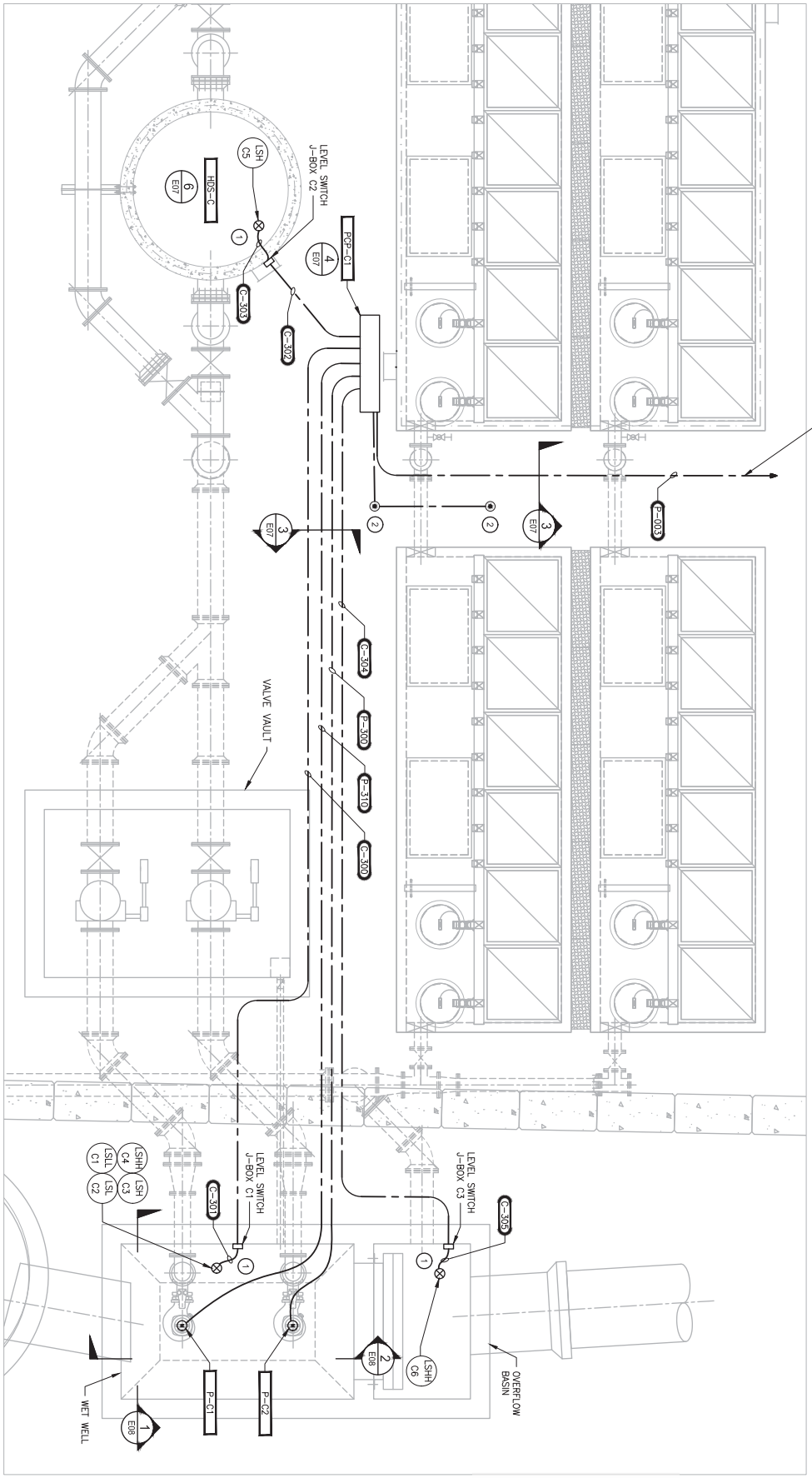

ELECTRICAL SITE PLAN - BASIN C

SCALE: 3/8" = 1'

NOTES:

1. NATIONAL ELECTRIC CODE CLASS 1, DIVISION 2, GROUP D HAZARDOUS AREA. ALL EQUIPMENT SHALL BE RATED ACCORDINGLY.
2. PROVIDE #2/0 BARE COPPER GROUNDING CONDUCTOR. ATTACH TO GROUND RODS PER DETAIL 1 E07

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6583 **E06** SH — OF 42	WEST SITCUM STORMWATER TREATMENT ELECTRICAL SITE PLAN - BASIN C			APPROVED:	CHECKED BY DATE	Parametrix ENGINEERING · PLANNING · ENVIRONMENTAL SCIENCES	Port of Tacoma P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841
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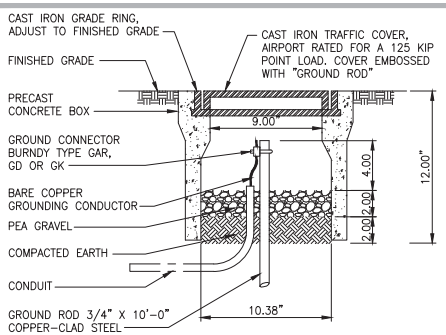
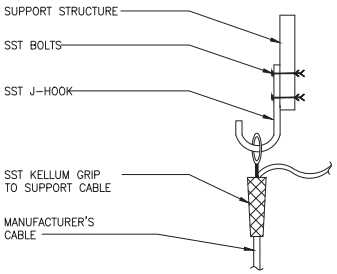
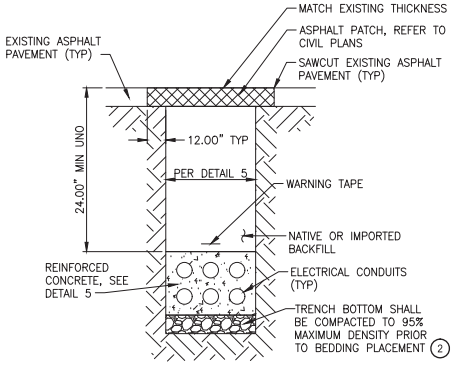
M. ID: 201024.01	DAT-HRZ: WA83-S	VERT: MLLW		PRINTED BY: vondejam Feb 01, 2018			
PHASE: 90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED		PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837			



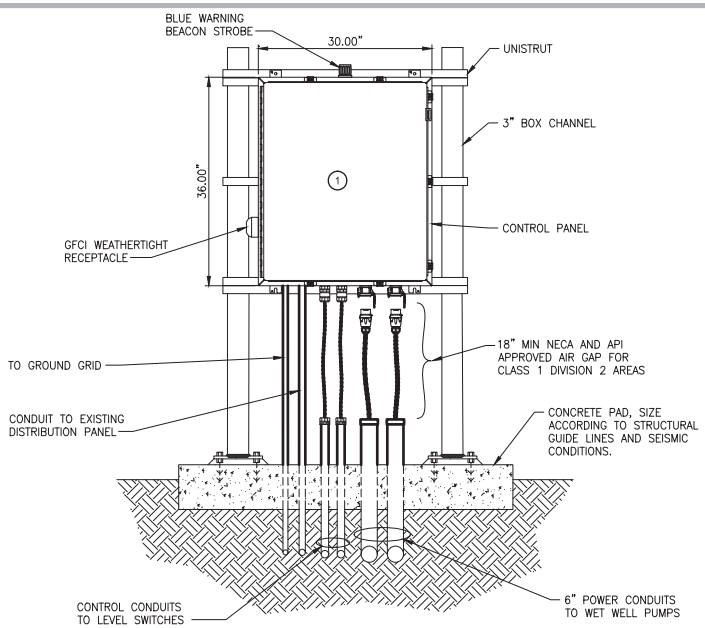
1 - GROUND ROD BOX DETAIL
SCALE: NTS



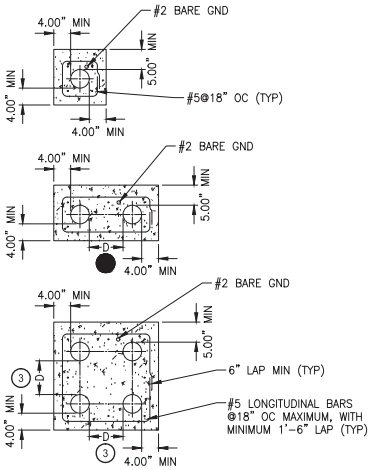
2 - KELLUM GRIP CABLE SUPPORT DETAIL
SCALE: NTS



3 - TYPICAL DUCTBANK DETAIL
SCALE: NTS



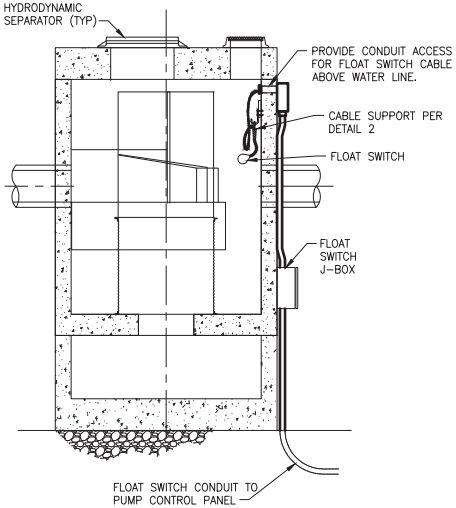
4 - PUMP CONTROL PANEL DETAIL
SCALE: NTS



5 - TYPICAL TRENCH DETAIL
SCALE: NTS

NOTES:

1. CONTENTS OF CONTROL PANEL COORDINATED WITH AND SUPPLIED BY PUMP MANUFACTURER.
2. PROVIDE 6" MINIMUM COMPACTED GRAVEL, 1/2" MINUS, UNDER ALL CONCRETE ENCASED DUCT RUNS.
3. D = 3" FOR 2" AND LARGER CONDUITS
   D = 2" FOR CONDUITS SMALLER THAN 2"



6 - HYDRODYNAMIC SEPARATOR FLOAT SWITCH MOUNTING DETAIL
SCALE: NTS

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WEST SITCUM
STORMWATER TREATMENT
ELECTRICAL DETAILS - GENERAL

6583
E07
SH ... OF 42

CONT/CONS: 070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34
M. ID: 201024.01	DAT-HRZ: WA83-S	VERT: MLLW	
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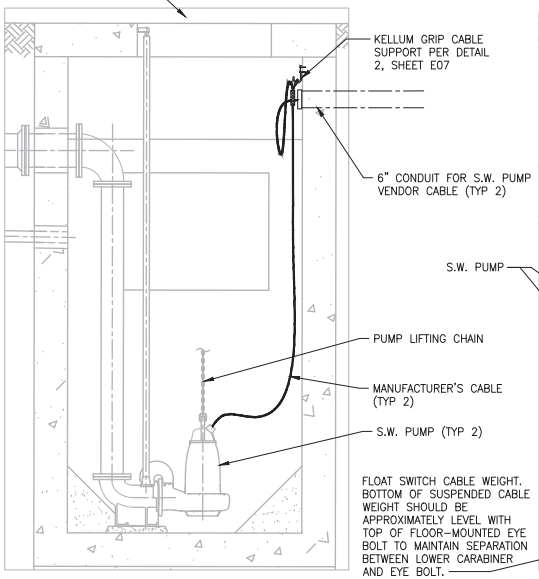
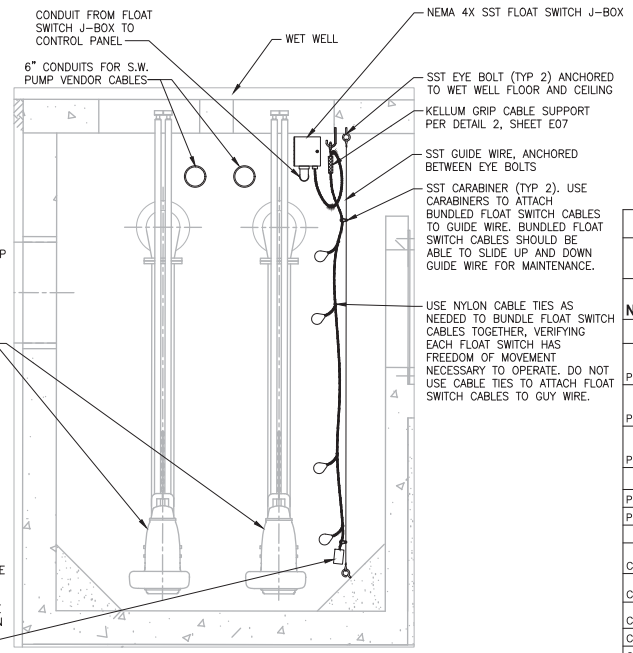


1 - PUMP CABLE INSTALLATION DETAIL (1)
SCALE: NTS



2 - FLOAT SWITCH INSTALLATION DETAIL (1)
SCALE: NTS

NOTES:

(1) DETAIL IS A TYPICAL ARRANGEMENT. USE THE BASIN ELECTRICAL SITE PLANS TO DETERMINE ACTUAL LOCATIONS OF ELECTRICAL EQUIPMENT.

CONDUIT AND WIRE SCHEDULE

NUMBER	FROM	TO	CONDUIT SIZE (")	CABLE SIZE & QUANTITY: POWER	CONTROL	SIGNAL	COMMENTS
	MAIN FEEDS						
P-001	EXISTING DISTRIBUTION PANEL	PCP-A1	1-1/4"	3#3,1#8G			
P-002	EXISTING DISTRIBUTION PANEL	PCP-B1	1-1/4"	3#3,1#8G			
P-003	EXISTING DISTRIBUTION PANEL	PCP-C1	1-1/4"	3#3,1#8G			
	BASIN - A						
P-100	PCP-A1	S.W.PUMP 1 (P-A1)	6"	PUMP PLUG			VENDOR CABLE
P-110	PCP-A1	S.W.PUMP 2 (P-A2)	6"	PUMP PLUG			VENDOR CABLE
C-100	PCP-A1	J-BOX A1 (FOR LEVEL SWITCHES)	3/4"		8#14, 1#14G		
C-101	J-BOX-A1	LSLL-A1, LSL-A2, LSH-A3, LSHH-A4	3/4"		(4) MFR CABLE		VENDOR CABLE
C-102	PCP-A1	J-BOX A2	3/4"		2#14, 1#14G		
C-103	J-BOX-A2	LSH-A5	3/4"		(1) MFR CABLE		VENDOR CABLE
C-104	PCP-A1	J-BOX-A3	3/4"		2#14, 1#14G		
C-105	J-BOX-A3	LSH-A6	3/4"		(1) MFR CABLE		VENDOR CABLE
	BASIN - B						
P-200	PCP-B1	S.W.PUMP 1 (P-B1)	6"	PUMP PLUG			VENDOR CABLE
P-210	PCP-B1	S.W.PUMP 2 (P-B2)	6"	PUMP PLUG			VENDOR CABLE
C-200	PCP-B1	J-BOX-B1 (FOR LEVEL SWITCHES)	3/4"		8#14, 1#14G		
C-201	J-BOX-B1	LSLL-B1, LSL-B2, LSH-B3, LSHH-B4	3/4"		(4) MFR CABLE		VENDOR CABLE
C-202	PCP-B1	J-BOX B2	3/4"		2#14, 1#14G		
C-203	J-BOX-B2	LSH-B5	3/4"		(1) MFR CABLE		VENDOR CABLE
C-204	PCP-B1	J-BOX-B3	3/4"		2#14, 1#14G		
C-205	J-BOX-B3	LSH-B6	3/4"		(1) MFR CABLE		VENDOR CABLE
	BASIN - C						
P-300	PCP-C1	S.W.PUMP 1 (P-C1)	6"	PUMP PLUG			VENDOR CABLE
P-310	PCP-C1	S.W.PUMP 2 (P-C2)	6"	PUMP PLUG			VENDOR CABLE
C-300	PCP-C1	J-BOX-C1 (FOR LEVEL SWITCHES)	3/4"		8#14, 1#14G		
C-301	J-BOX-C1	LSLL-C1, LSL-C2, LSH-C3, LSHH-C4	3/4"		(4) MFR CABLE		VENDOR CABLE
C-302	PCP-C1	J-BOX-C2	3/4"		2#14, 1#14G		
C-303	J-BOX-C2	LSH-C5	3/4"		(1) MFR CABLE		VENDOR CABLE
C-304	PCP-C1	J-BOX-C3	3/4"		2#14, 1#14G		
C-305	J-BOX-C3	LSH-C6	3/4"		(1) MFR CABLE		VENDOR CABLE

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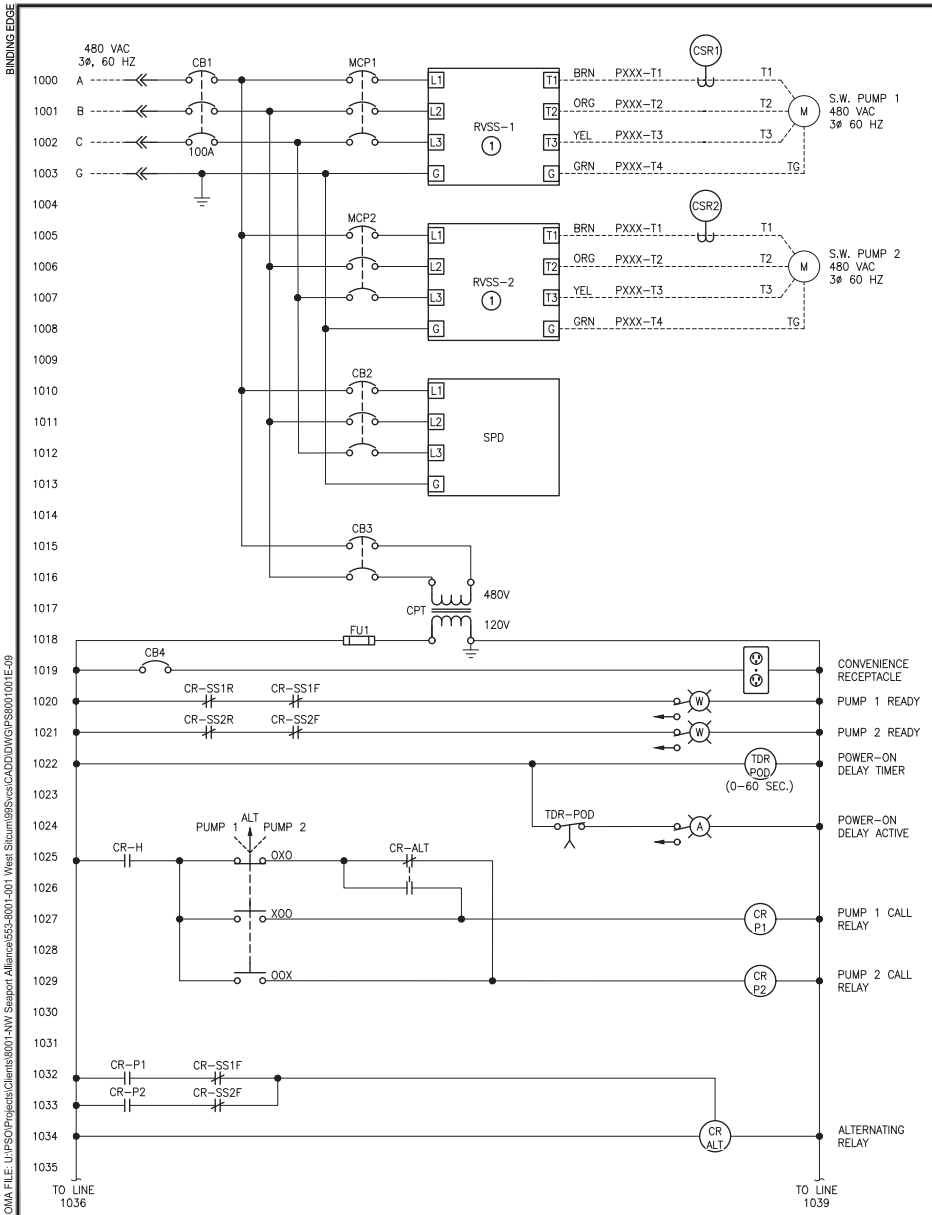
PORT ADDRESS:ONE SITCUM PLAZA
TACOMA, WA 98401-1837

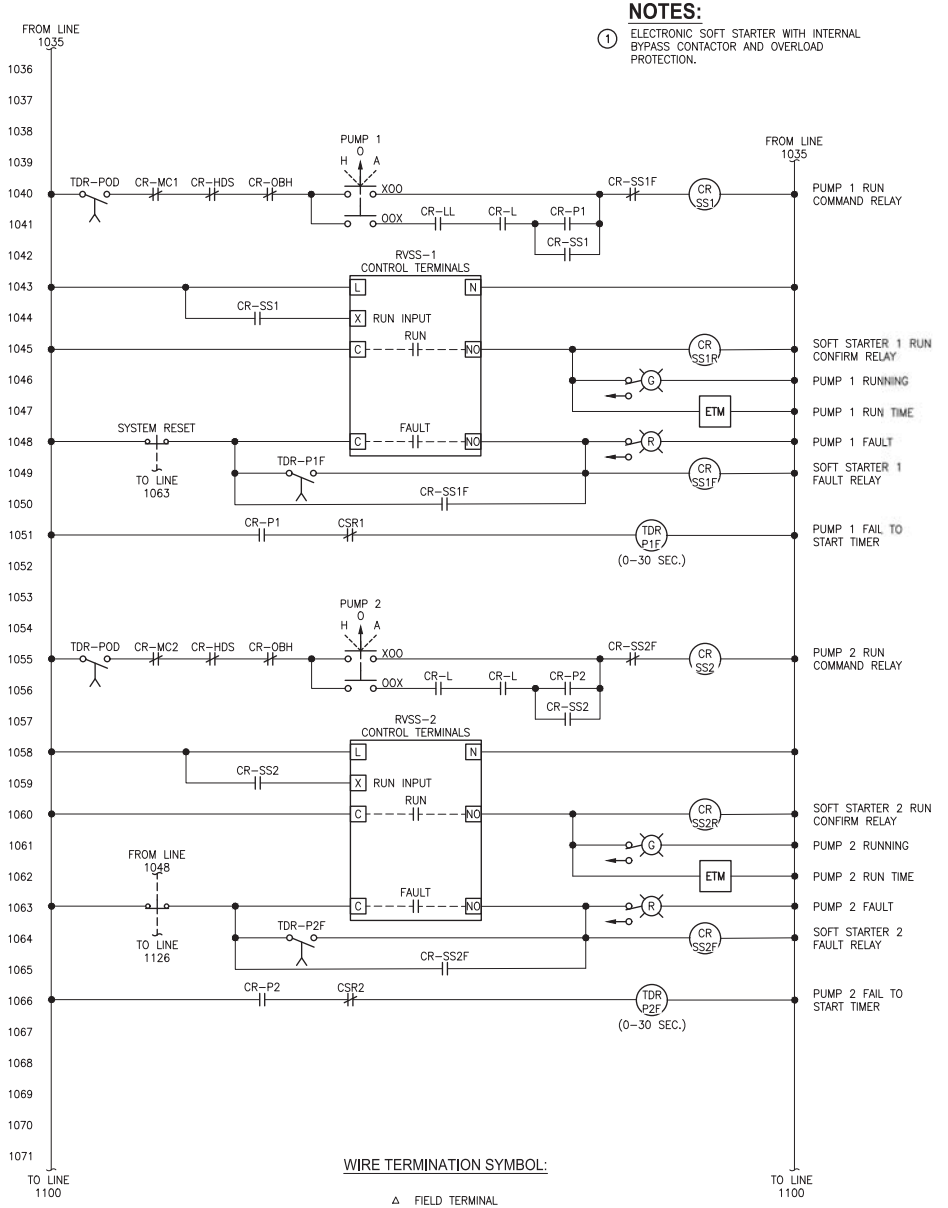
WEST SITCUM
STORMWATER TREATMENT
ELECTRICAL DETAILS, CONDUIT AND WIRE SCHEDULE

6583
E08
SH --- OF 42

CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E
M. ID:	201024.01	DAT-HRZ: WA83-S	VERT: MLLW
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED

SECTIONS: 33 & 34





NOTES:

1. ELECTRONIC SOFT STARTER WITH INTERNAL BYPASS CONTACTOR AND OVERLOAD PROTECTION.

WIRE TERMINATION SYMBOL:

△ FIELD TERMINAL

----- FIELD WIRING

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WEST SITCUM
STORMWATER TREATMENT
ELEMENTARY DIAGRAMS

6583
E09
SH ... OF 42

CONT/CONS: 070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34
M. ID: 201024.01	DAT-HRZ: WA83-S	VERT: MLLW	
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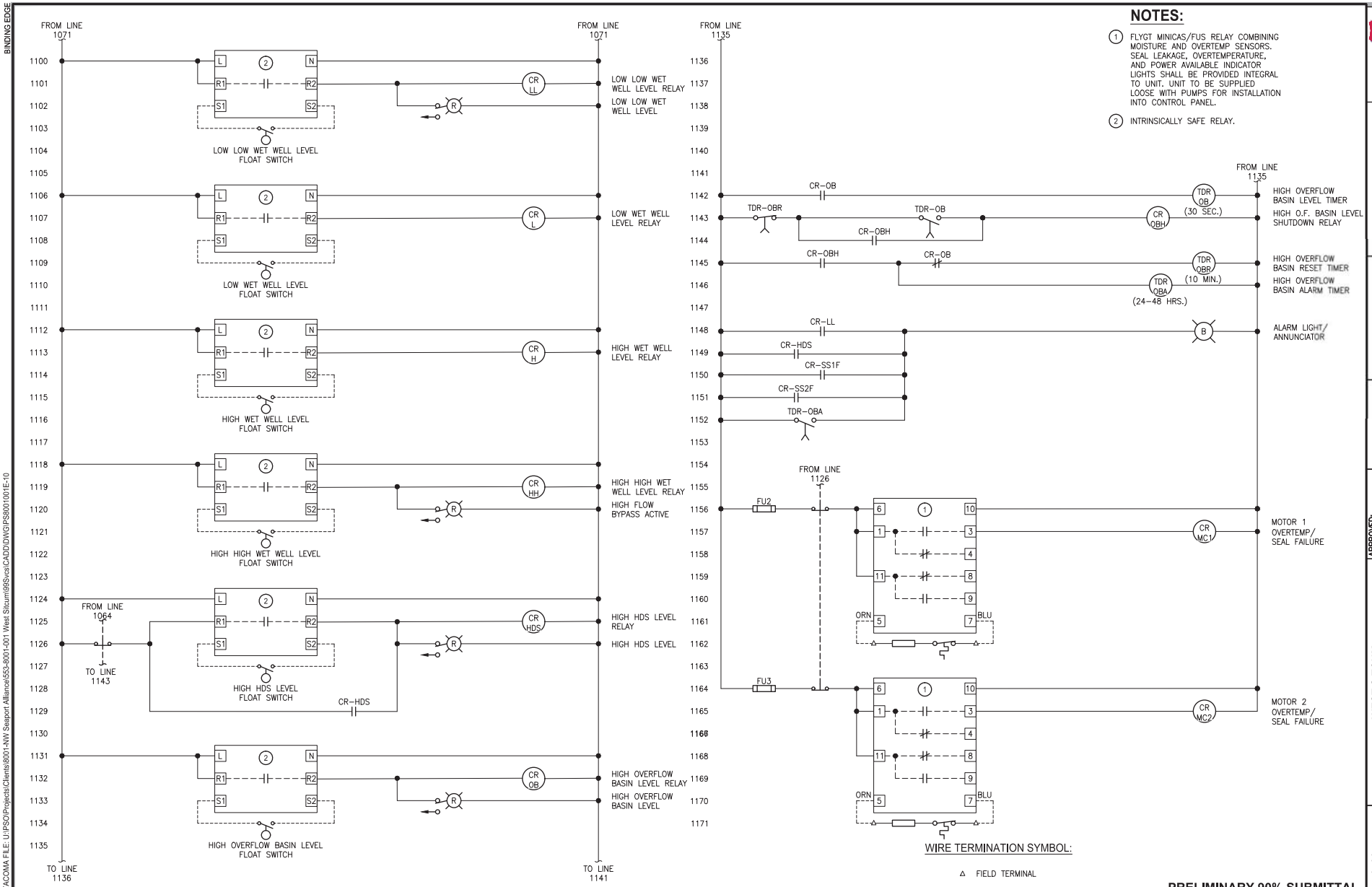
BINDING EDGE

PORT OF TACOMA FILE: U:\PSO\Projects\Clients\8001-NW Seaport Alliance\553-8001-001 West Sitcum\99Svcs\CADD\DWG\PS8001001E-09



NOTES:

1. FLYGT MINICAS/FUS RELAY COMBINING MOISTURE AND OVERTEMP SENSORS. SEAL LEAKAGE, OVERTEMPERATURE, AND POWER AVAILABLE INDICATOR LIGHTS SHALL BE PROVIDED INTEGRAL TO UNIT. UNIT TO BE SUPPLIED LOOSE WITH PUMPS FOR INSTALLATION INTO CONTROL PANEL.
2. INTRINSICALLY SAFE RELAY.

WIRE TERMINATION SYMBOL:

△ FIELD TERMINAL

----- FIELD WIRING

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

BINDING EDGE

PORT OF TACOMA FILE: U:\PSO\Projects\Clients\8001-NW Seaport Alliance\553-8001-001 West Sitcum\99Svcs\CADD\DWG\PS80010001E-10

CONT/CONS:	070664	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34	PRINTED BY: vondejpm Feb 01, 2018	DIRECTOR ENG. DATE	PROJ. ENGR DATE
M. ID:	201024.01	DAT-HRZ: WA83-S	VERT: MLLW		PORT ADDRESS: ONE SITCUM PLAZA		CHECKED BY DATE
PHASE:	90%	PARCEL: SEE G02	DRAWING SCALE: AS NOTED		TACOMA, WA 98401-1837	APPROVED:	

WEST SITCUM
STORMWATER TREATMENT
ELEMENTARY DIAGRAMS

6583
E10
SH ... OF 42

MARK:	REVISION:	BY:	APPR:	DATE:

Port of Tacoma
P.O. BOX 1837 TACOMA, WA 98401 (253)383-5841

Parametrix
ENGINEERING PLANNING ENVIRONMENTAL SCIENCES

Geotechnical Report

HWA GeoSciences Inc.
Geotechnical & Pavement Engineering • Hydrogeology • Geoenvironmental • Inspection & Testing

January 24, 2018
HWA Project No. 2017-148-21

Parametrix, Inc.
60 Washington Avenue, Suite 390
Bremerton, Washington 98337

Attention: Ms. Cedar Simmons, P.E.

SUBJECT: GEOTECHNICAL REPORT
West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, Washington

Dear Cedar:

This report presents geotechnical recommendations for three stormwater treatment pump stations in Basins A, B, and C within the West Sitcum terminal of the Port of Tacoma in Tacoma, Washington. The purpose of this work was to evaluate the soil and ground water conditions at each site and provide geotechnical recommendations for design and construction of the proposed facilities.

PROJECT SCOPE AND AUTHORIZATION

Our scope of work was performed in general accordance with our scope email dated December 13, 2017 and per the subconsultant agreement executed December 22, 2017. Our work consisted of advancing three borings to depths of 40 feet, performing engineering analyses for temporary shoring, buoyancy, and seismic liquefaction, and preparation of this report.

PROJECT & SITE DESCRIPTION

The West Sitcum terminal is located in the Port of Tacoma between the Puyallup River and the Sitcum Waterway (see Vicinity Map, Figure 1). The terminal consists of a paved container yard, with cranes along the Sitcum Waterway on the northeastern shore. Stormwater is presently collected from three drainage basins and piped to the Sound. We understand the Northwest Seaport Alliance plans to build a stormwater treatment plant (SWTP) at each of the three locations (Basins A, B, and C) shown on the Site and Exploration Plan, Figure 2. We understand that each SWTP will include a precast concrete wet well (up to 19 feet deep) and a pump station, with adjacent precast concrete boxes for modular wetlands, and connected with mechanical piping.

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Bothell, WA 98021.7010

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The terminal was built upon tide-flats of the Puyallup River delta, which formed where the river empties into Commencement Bay. Prior to its use as a container terminal, the land was used for timber milling and shipping via railroad, and the Milwaukie Waterway extended southeast nearly to 11th Street. Container terminal use began in the 1970s. Much of the Milwaukie Waterway was remediated and filled in the 1990s, with a remaining small area open to the Sound at the northwest end.

FIELD INVESTIGATION

Three boreholes were drilled on January 4, 2018 by Holocene Drilling, Inc. of Puyallup, Washington under subcontract to HWA. The boreholes, designated BH-1 through BH-3, were drilled to depths of 41.5 to 46.5 feet with a Diedrich D-90 truck-mounted drill rig using a hollow-stem auger. Soil samples were collected at 2½- to 5-foot depth intervals per Standard Penetration Test (SPT) sampling methods, which consisted of using a 2-inch outside diameter, split-spoon sampler driven with a 140-pound autohammer. During the test, each sample was obtained by driving the sampler up to 18 inches into the soil with the hammer free-falling 30 inches per stroke. The number of blows required for each 6 inches of penetration was recorded. The standard penetration resistance of the soil was calculated as the number of blows required for the final 12 inches of penetration. If a total of 50 blows was recorded within a single 6-inch interval, the test was terminated, and the blow count was recorded as 50 blows/number of inches of penetration. This resistance provides an indication of the relative density of granular soils and the relative consistency of cohesive soils.

All explorations were advanced under the full-time supervision and observation of an HWA geologist. Soil samples obtained from the explorations were classified in the field and representative portions were placed in plastic bags. Samples were field-screened for potential contaminants using a Photo Ionization (PID) meter. The soil samples were then taken to our Bothell, Washington, laboratory for further examination.

Pertinent information including soil sample depths, stratigraphy, geotechnical engineering characteristics, and ground water occurrence was recorded and used to develop logs of each of the explorations. A legend of the terms and symbols used on the borehole logs is presented on Figure A-1, and the logs are presented on Figures A-2 through A-4.

The stratigraphic contacts shown on the borehole logs represent the approximate boundaries between soil types. Actual transitions may be more gradual. The ground water conditions depicted are only for the specific date and locations reported, and therefore, are not necessarily representative of other locations and times.

GENERAL GEOLOGIC CONDITIONS

The Puget Lowland has repeatedly been occupied by a portion of the continental glaciers that developed during the ice ages of the Quaternary period. During at least four episodes, portions of the ice sheet advanced south from British Columbia into the lowlands of Western Washington. The southern extent of these glacial advances was south of Olympia, Washington. Each major advance included numerous local advances and retreats, and each advance and retreat resulted in its own sequence of deposition and erosion of glacial lacustrine, outwash, till, and drift deposits. Between and following these glacial advances, sediments from the Olympic and Cascade Mountains accumulated in the Puget Lowland in lakes, valleys, and river deltas.

Geologic information for the project area was obtained from the *Geologic Map of Washington - Northwest Quadrant* (Dragovich et al, 2002). According to this map, surface deposits in the vicinity consist of "modified land" (fill) over deltaic soils deposited from the Puyallup River into Commencement Bay. Glacial deposits, and glacially over-consolidated non-glacial deposits, although expected below the deltaic deposits are not typically observed within 100 feet below the ground surface at the Port site.

SUBSURFACE CONDITIONS

Each of the borings encountered approximately 8 inches of asphalt pavement at the surface, over loose fill extending to depths of 12 to 15 feet, above deltaic deposits to the full depths explored. Specific soil units are described in detail below:

- **Fill:** This unit consisted of loose, slightly silty to silty SAND, moist to wet. Traces of gravel, organics, and clumps of silt were observed in some of the samples. This material was evidently placed for construction of the terminal. It is likely that this soil was dredged from the river and/or waterway channels.

- **Marine Delta Sediments:** Native soils consisting of alluvial SILT, PEAT, sandy SILT, and silty SAND was encountered beneath the Fill. The peat was encountered only in borehole BH-2 at Basin B. The deltaic deposits were very soft or loose to a depth of 20 feet, where they became medium dense or stiff to very stiff to the full depths explored for this project. These soils were deposited by the Puyallup River in its estuarine delta in Commencement Bay. Marine shell fragments were encountered in this unit.

Ground water was observed during drilling at depths of approximately 11 to 11.5 feet. Because the drilling was performed using hollow stem drilling techniques, accurate measurement of ground water levels was not possible, however, ground water level is expected to rise above the level witnessed during drilling which is at 11 feet. Due to proximity to tidal water influence, it

will fluctuate with tide level and rainfall. For construction shoring design, the ground water is assumed to be at 8 feet.

CONCLUSIONS & RECOMMENDATIONS

GENERAL

The proposed improvements will consist of underground vaults and piping. These structures can be supported by the existing materials provided the subgrade is undisturbed during excavation. The pump station wet wells will be subject to large buoyancy forces. Extended bases and tremie concrete slabs attached to the precast vaults can provide resistance to these forces.

Excavations for the vault structures will require sheet pile support. Temporary shoring design for the excavation should be the responsibility of the contractor. The design should support the lateral earth pressures of the soils above the base of the excavation. The sheet piles should be extended a sufficient distance below the excavation to prevent heave of the soils at the base of the excavation during placement of the tremie concrete slab.

The following sections provide additional recommendations for design and construction of the proposed stormwater facilities.

BUOYANCY AND UPLIFT

The proposed pump station wet wells and treatment vaults will consist of precast concrete vaults that will be placed within temporary excavations and backfilled up to the existing grade. Because the design ground water level outside many of the proposed structures will be higher than the bottom of the structure, the structures will be subjected to hydrostatic uplift forces. Consequently, structures should be designed to resist such forces. Because the wet well will be installed below ground water, it is necessary to design it to resist buoyancy uplift forces. This can be accomplished using expanded bases, with compacted structural fill placed over the expanded base and adding the weight of tremie concrete slab. The size of the extended bases and the tremie slab weight should be designed assuming empty conditions and with the design ground water at the ground surface. We recommend that the side friction forces within the backfill soils be ignored for buoyancy resistance calculations.

SHALLOW FOUNDATION SUPPORT

The new wet-well underground vaults and modular wetlands will be below the ground surface, which means that the weight of soil to be removed for the underground structures will be greater than the weight of the proposed structures. As a result, the existing soils will be adequate to provide foundation support, provided they are not disturbed during construction. The foundations for these structures should be designed for allowable bearing pressures no greater

than 2,000 pounds per square foot (psf). Their maximum allowable pressure may be increased by 30 percent for seismic loadings.

Footings should have a minimum depth of embedment of 18 inches below the lowest adjacent finished grade. Continuous footings should be at least 24 inches wide and column footings should have a minimum width of 30 inches.

Below are our recommendations for foundation subgrade preparation.

- For constructability of the wet wells, we recommend a 5-foot thick-mud slab be placed by tremie methods at the base of the excavation prior to dewatering for installation of the precast vaults. The vaults can then be placed and structurally tied to the top of the tremie slab.

- For the modular wetland foundation construction, we recommend that a pad comprised of crushed rock be constructed. Prior to placing the crushed rock fill, a geotextile separator fabric be placed over the exposed subgrade and a 2-foot-thick (minimum) pad of Crushed Surfacing Base Course (WSDOT specification 9-03.9(3)), be placed and compacted in lifts over the geotextile.

    - The initial lift of crushed rock should be approximately 12 inches in thickness and tamped in place with a large excavator bucket or large hoe pack in static mode.

    - Following the initial lift, the remainder of the pad should be built up in 8-inch thick lifts compacted to at least 92 percent of the maximum dry density as determined using ASTM D1557 (Modified Proctor).

    - Construction of the pad should be performed after the ground water level is lowered at least by 5 feet below the base of the excavation.

    - The crushed rock pads should extend at least 2 feet outside the perimeters of the footings.

LATERAL EARTH PRESSURES

At-Rest Earth Pressures

Below-grade vault structures, with walls that will be backfilled with compacted structural fill, may be designed for an equivalent at-rest fluid pressure of 60 pounds per cubic foot (pcf) above the water table, and 92 pcf below the water table. Unless perimeter footing drains are installed around structures, we recommend assuming the design ground water level is at the ground

surface. If footing drains are provided, the design ground water level should be taken to be the highest tide that is expected to occur at the site.

Lateral Earth Pressures from Heavy Vehicles

Based on the layout of the SWTP sites, it is likely that the walls of these below-grade structures will be subjected to surcharge loading from vehicles and or equipment such as straddle carriers, cargo stackers, dockyard cranes and trucks. **For the permanent underground vault structures, vehicular traffic surcharge load due to equipment traffic should be added to the design equivalent fluid pressure 92 pcf.**

Seismic Earth Pressures

Because the walls will be designed for at-rest earth pressures with a traffic surcharge, incremental seismic surcharges need not be included.

Passive Pressures

Resistance to lateral forces from wind, seismic loads and deadman anchors will be developed by passive pressures against the buried portion of the structure. The allowable passive earth pressure should be estimated as an equivalent pressure of 150 pcf.

SEISMIC DESIGN CONSIDERATIONS

The Port of Tacoma is within an area of moderate to severe seismic hazard. The site will be subject to large ground motions caused by movement along faults such as the Tacoma Fault and the Cascadia Subduction Zone. These events will impact the pump station wet wells by triggering liquefaction, a phenomenon in which loose to medium dense sands and silts below the water table temporary lose strength and behave as a liquid in response to moderate to strong earthquake shaking. Our analyses indicate that there is potential for liquefaction in the silty sand layers encountered in all borings.

Soil liquefaction is likely to result in upward vertical displacement of the below grade vaults due to increased buoyancy forces since the buoyant unit weight during liquefaction equals the saturated unit weight of liquefied soils. Lateral displacement of the vaults is also anticipated due to lateral spreading that will occur as the non-liquefied soils above the water table move toward the shore on top of the liquefied soils below.

To reduce the potential for liquefaction, these layers can be densified by rock columns or sand compaction piles. Densification of the soils lowers their susceptibility to liquefy and will significantly reduce lateral or vertical movements of the proposed structures that could occur as a result of liquefaction. If the owner desires to implement soil improvement and densification to

reduce the potential for liquefaction during a seismic event, we will be available to assist in liquefaction mitigation design.

SEISMIC DESIGN CRITERIA

We assume the structures will be designed in accordance with the *2018 International Building Code* (ICC, 2017). For seismic design in accordance with Section 1613 of the IBC, the Seismic Site Class is required. The Seismic Site Class is determined based on the average properties of soils in the upper 100 feet. Based on the presence of soft, compressible soils, the treatment plant qualifies as Site Class E. Accordingly, the design maximum spectral response acceleration at short periods, S_{DS}, is 0.778 g. The design maximum spectral response acceleration at a period of 1-second, S_{D1}, is 0.806 g. For evaluation of liquefaction and seismic lateral earth pressures, we obtained the design mean peak ground acceleration (PGA_M) associated with an event having a 2 percent probability of being exceeded in a 50-year period (i.e., a 2,475-year event) is 0.45 g.

Note that the site has soils that are susceptible to liquefaction. According to the *IBC*, these soils classify as Site Class F, which would require a site-specific evaluation. The *IBC* provides an exception that site specific analyses are not required if the structural period of the proposed structures is less than 0.5 seconds. As the structures are underground and have total heights of less than 20 feet, we conclude that structural periods are less than 0.5 seconds and site-specific analyses are not required.

TEMPORARY SHORING

Excavation for each of the wet-well vaults can be shored by means of either sheet piles or caissons, but we recommend sheet piles considering that large mechanical inlet and outlet pipe connections will be made to the vaults. The design, installation and maintenance of temporary shoring should be the responsibility of the contractor.

However, we recommend that the minimum sheet pile penetration be 40 feet, for an excavation invert of approximately 20 feet deep plus 5 feet for a concrete tremie slab at the bottom of the excavation.

To avoid the potential for boiling during the excavation, the sheet pile cell should be filled with water until the design excavation level is reached and the tremie concrete pour is completed. The water in the sheet pile cell should be pumped out following curing of the tremie concrete.

Given the soft soils below the site, internal bracing of the sheet piles is likely to be required to provide adequate support for the resulting lateral loads.

If deadman anchors are to be adopted for sheet pile shoring walls in lieu of internal bracing, the allowable passive earth pressure, an equivalent fluid weight of 150 pcf, should be used.

DEWATERING

Ground water levels at the site are likely related to sea level, such that ground water should be anticipated within 8 feet of the ground surface. We recommend a minimum 5-foot thick tremie seal at the base of the excavation prior to pumping out the water within each sheet-piled-cell.

Design and implementation of any dewatering system should be the responsibility of the contractor.

VAULT BACKFILL AND COMPACTION

All backfill around completed structures should be considered structural fill. Backfill around the wet wells and modular wetland vaults should consist of 1¼ inch minus gravel backfill for walls as is specified in Section 9-03.12(2) of WSDOT Standard Specifications.

It should be compacted to a dense and unyielding condition, i.e., 92 percent of laboratory maximum dry density of ASTM D1557 (Modified Proctor). Moderate compaction effort is intentionally specified herein because over compaction may contribute damages to the precast tank walls. A small hand compactor such as a jumping jack should be used near the walls.

However, the upper 2 feet at the ground surface should be compacted to 95 percent of Modified Proctor. Despite the backfill compaction as specified above, 'bird bath' type post construction settlement may appear after few years.

Trench backfill around the mechanical pipes should consist of sand and gravel backfill meeting the requirements for Bank Run Gravel for Trench Backfill, specified in Section 9-03.19 of the *Standard Specifications* (WSDOT, 2018) and should be compacted to 92% of Modified Proctor up to the level 2 feet below the ground surface, and 95 percent of Modified Proctor for the upper 2 feet.

Native materials will not be suitable for trench backfill and should be removed from the site.

PIPE BEDDING & TRENCH BACKFILL RECOMMENDATIONS

General recommendations relative to pipe bedding and utility trench backfill are presented below:

- Pipe bedding material, placement, compaction, and shaping should be in accordance with the project specifications and the pipe manufacturer's recommendations. Pipe bedding should meet the gradation requirements for Gravel Backfill for Pipe Zone Bedding, Section 9-03.12(3) of the *Standard Specifications* (WSDOT, 2018). Native soils will not be suitable for pipe bedding.

- Pipe bedding should provide a firm, uniform cradle for the pipe. We recommend that a minimum 8-inch thickness of bedding material beneath the pipe be provided.

- Pipe bedding material and/or backfill around the pipe should be placed in layers and tamped to obtain complete contact with the pipe.

We recommend that trench backfill meet the specifications for structural fill, as described in this report. During placement of the initial lifts, the trench backfill material should not be bulldozed into the trench or dropped directly on the pipe. Furthermore, heavy equipment should not be permitted to operate directly over the pipe until a minimum of 2 feet of backfill has been placed. Trench backfill should be placed in 8-inch (maximum) lifts and compacted using mechanical equipment to at least 92 percent of Modified Proctor up to 2 feet below the surface and 95 percent of Modified Proctor for the upper 2 foot layer.

CONDITIONS AND LIMITATIONS

We have prepared this report for Parametrix, Inc. and the Northwest Seaport Alliance for use in design and construction of this project. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented herein should not be construed as a warranty of the pavement and subsurface conditions. Experience has shown that pavement, soil, and ground water conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HWA should be notified for review of the recommendations of this report, and revision of such if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations, it is recommended that this report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

This report is issued with the understanding that it is the responsibility of the owner, or the owners' representative, to ensure that the information and recommendations contained herein are brought to the attention of the appropriate design team personnel and incorporated into the project plans and specifications, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field. HWA is available to monitor construction to evaluate soil and ground water conditions as they are exposed and verify that construction is accomplished in accordance with the specifications.

Within the limitations of scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, express or implied, is made. The scope of our work did not include environmental

assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or ground water at this site.

HWA does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and cannot be responsible for the safety of personnel other than our own on the site. As such, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein unsafe.

We appreciate the opportunity to be of service. Should you have any questions regarding this report, or require additional services, please contact us.

Sincerely,

HWA GEOSCIENCES INC.

Sa H. Hong, P.E.
Geotechnical Engineer

Brad W. Thurber, L.G., L.E.G.
Senior Engineering Geologist

Attachments:

Figure 1	Vicinity Map
Figure 2	Site and Exploration Plan
Appendix A	Subsurface Explorations

References:

Dragovich, J.D., Logan, R.L., Schasse, H.W., Walsh, T.J., Lingley, W.S., Jr, Norman, D.K., Gerstel, W.J., Lapen, T.J., Schuster, J.E., and Meyers, K.D., 2002, *Geologic Map of Washington – Northwest Quadrant:* WA Div. of Geology & Earth Resources Map GM-50, scale 1:250,000.

International Code Council, 2018, International Building Code.

WEST SITCUM TERMINAL

N

MAP NOT TO SCALE

BASE MAP FROM NWSA / MAPBOX OPENSTREETMAP © 2018

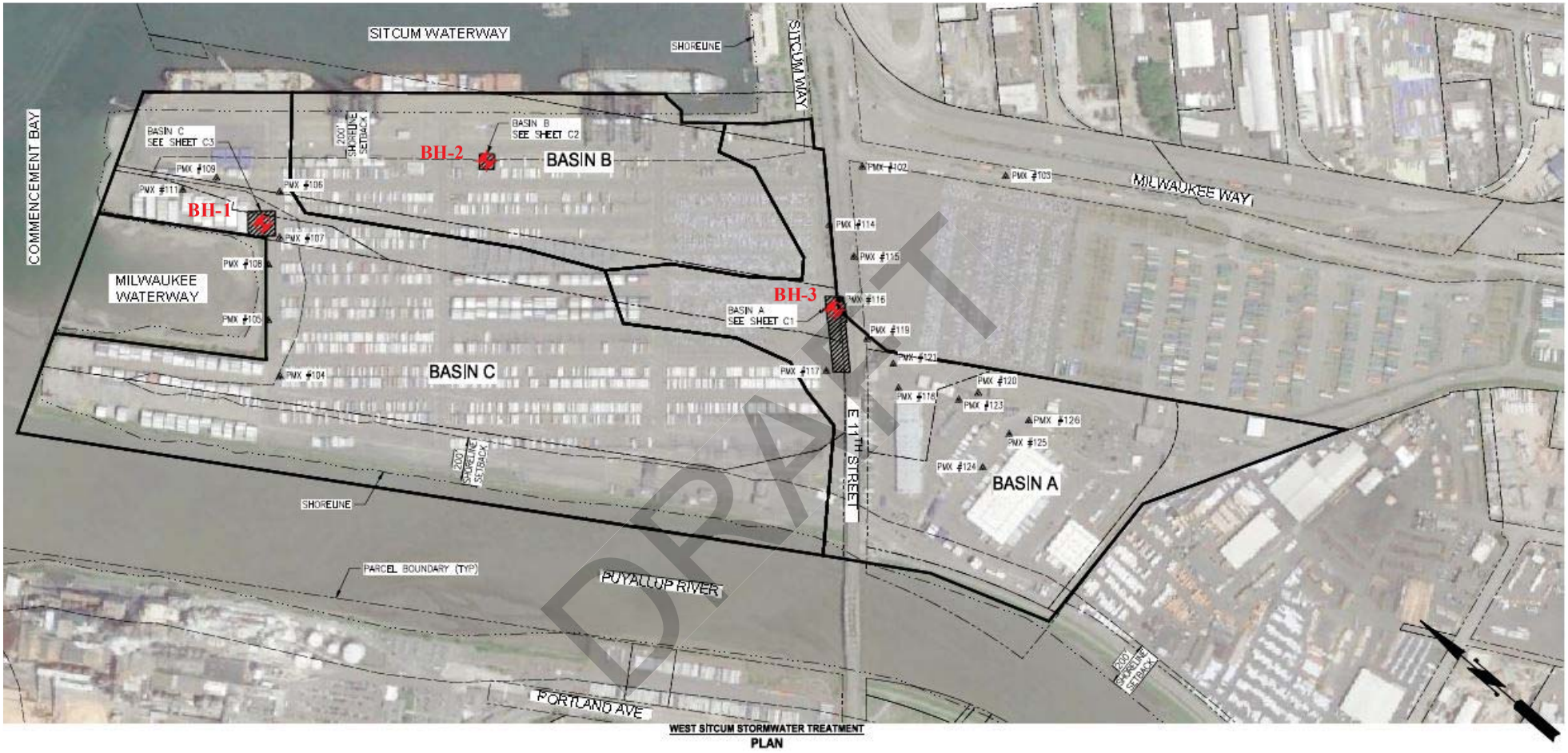
HWA GEOSCIENCES INC.

VICINITY MAP

WEST SITCUM STORMWATER TREATMENT
TACOMA, WASHINGTON

FIGURE NO. 1

PROJECT NO. 2017-148-21



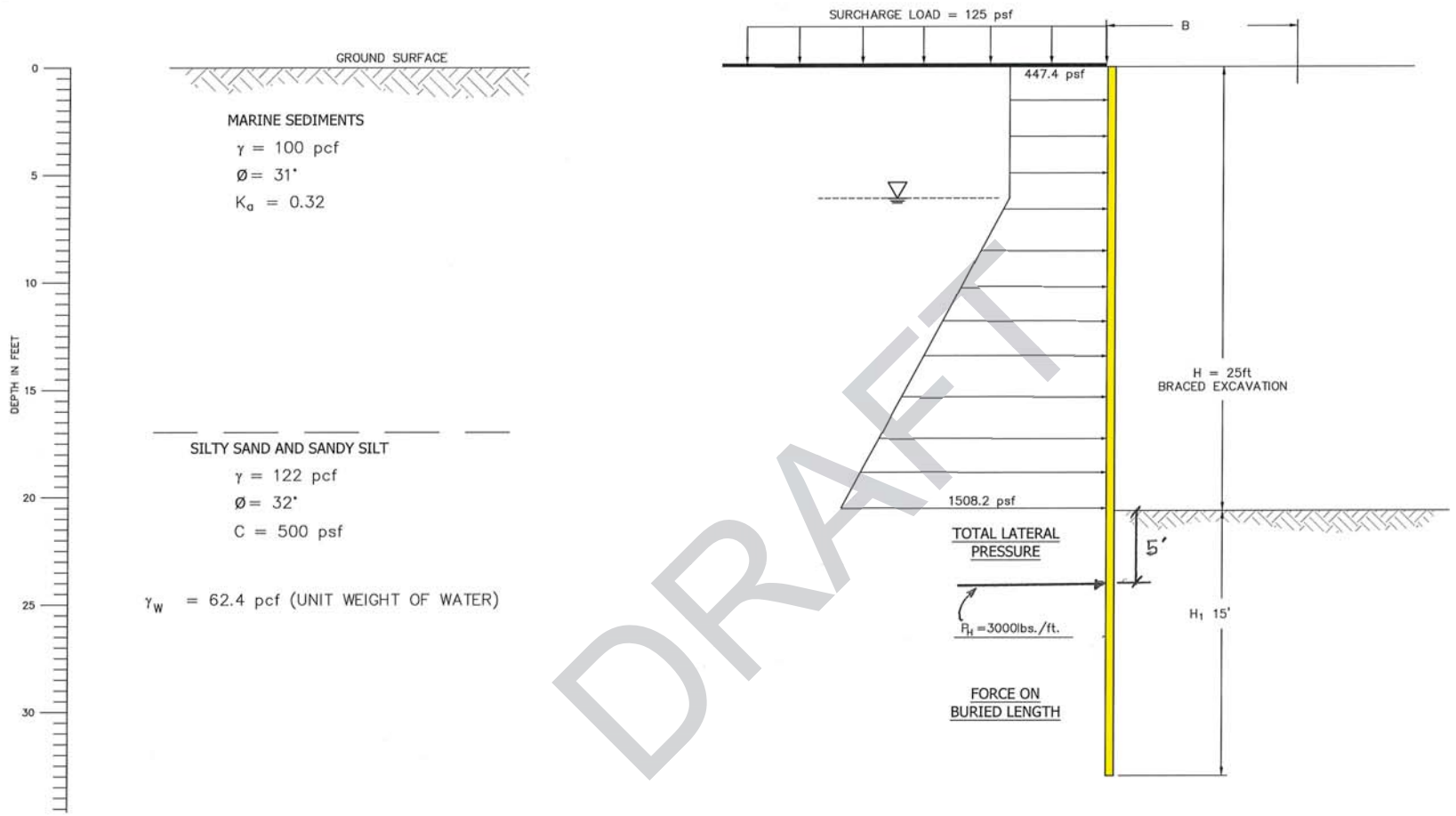
NOT TO SCALE

Legend

BH-3 **Borehole Designation and Approximate Location**

HWA GeoSciences Inc.

SITE AND EXPLORATION PLAN	FIGURE NO. 2
WEST SITCUM WASTEWATER TREATMENT TACOMA, WASHINGTON	PROJECT NO. 2017-148-21



HWA GeoSciences Inc.

West Sitcum Stormwater Treatment
Port of Tacoma

LATERAL PRESSURE
DIAGRAM FOR
SHORING

DRAWN BY	BFM
CHECK BY	DS
DATE:	01.23.2018
FIGURE #	3
PROJECT #	2017-148-21

S:\2017 PROJECTS\2017-148-21 WEST SITCUM STORMWATER TREATMENT PORT OF TACOMA\CAD\HWA 2017-148-21 EP.DWG <FIG x> Plotted: 1/23/2018 5:43 PM

APPENDIX A

EXPLORATION LOGS

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

USCS SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
	More than 50% of Coarse Fraction Retained on No. 4 Sieve		GP	Poorly-graded GRAVEL
		Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
More than 50% Retained on No. 200 Sieve Size	Sand and Sandy Soils	Clean Sand (little or no fines)	SW	Well-graded SAND
	50% or More of Coarse Fraction Passing No. 4 Sieve		SP	Poorly-graded SAND
		Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
PID	Photoionization Device Reading
PP	Pocket Penetrometer Approx. Compressive Strength (tsf)
SG	Specific Gravity
TC	Triaxial Compression
TV	Torvane Approx. Shear Strength (tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

- 2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
- Shelby Tube
- 3-1/4" OD Split Spoon with Brass Rings
- Small Bag Sample
- Large Bag (Bulk) Sample
- Core Run
- Non-standard Penetration Test (3.0" OD split spoon)

GROUNDWATER SYMBOLS

- Groundwater Level (measured at time of drilling)
- Groundwater Level (measured in well or open hole after water level stabilized)

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

COMPONENT PROPORTIONS

PROPORTION RANGE	DESCRIPTIVE TERMS
< 5%	Clean
5 - 12%	Slightly (Clayey, Silty, Sandy)
12 - 30%	Clayey, Silty, Sandy, Gravelly
30 - 50%	Very (Clayey, Silty, Sandy, Gravelly)
Components are arranged in order of increasing quantities.	

NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation.
Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

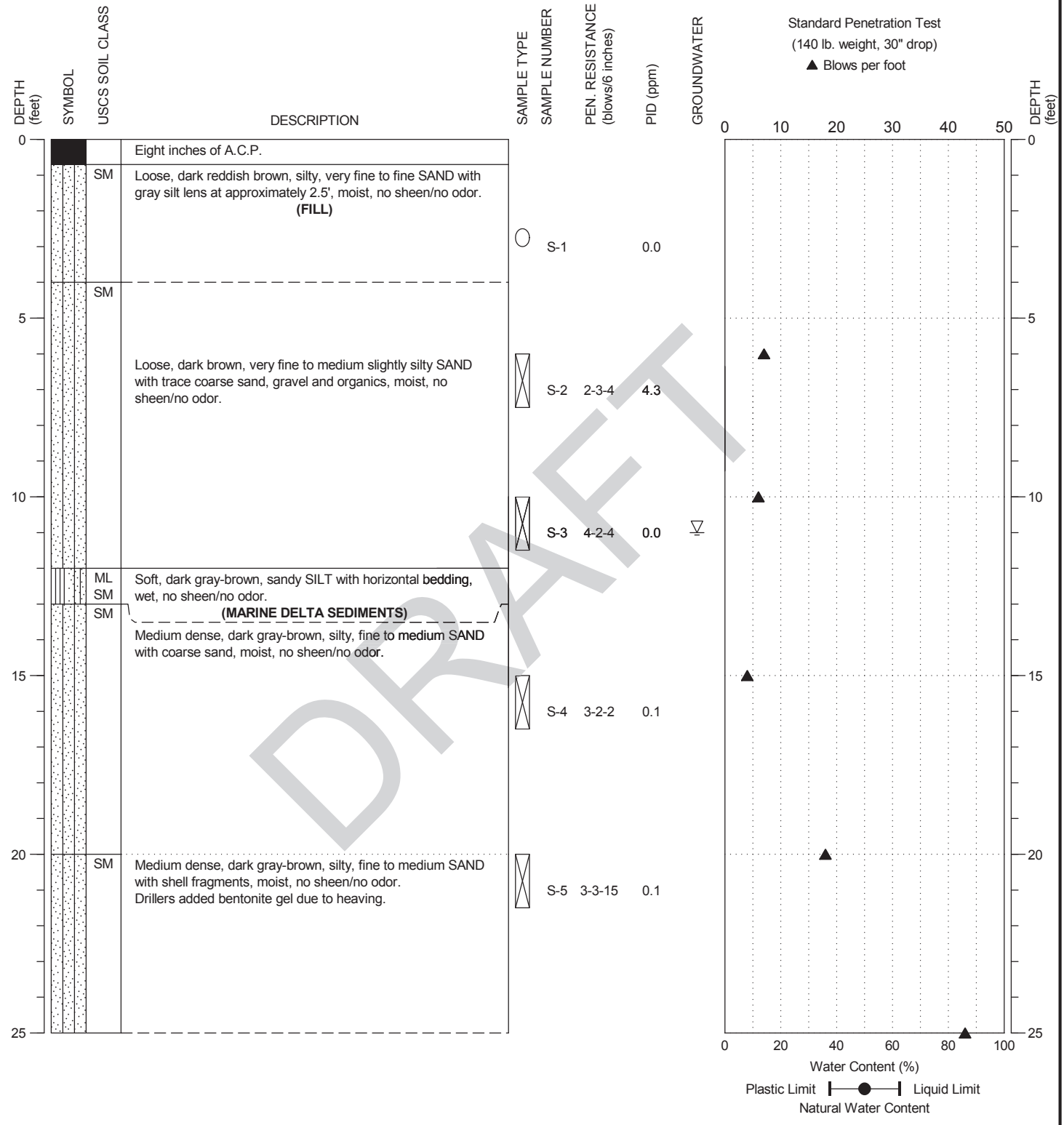
LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

PROJECT NO.: 2017-148-21 FIGURE: A-1

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: HSA, Diedrich D-90 Truck Rig
SAMPLING METHOD: SPT
LOCATION: Basin C

SURFACE ELEVATION: 12.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 1/4/2018
DATE COMPLETED: 1/4/2018
LOGGED BY: NK



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HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

BORING:
BH-1

PROJECT NO.: 2017-148-21 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: HSA, Diedrich D-90 Truck Rig
SAMPLING METHOD: SPT
LOCATION: Basin C

SURFACE ELEVATION: 12.00 ± feet
CASING ELEVATION ± feet

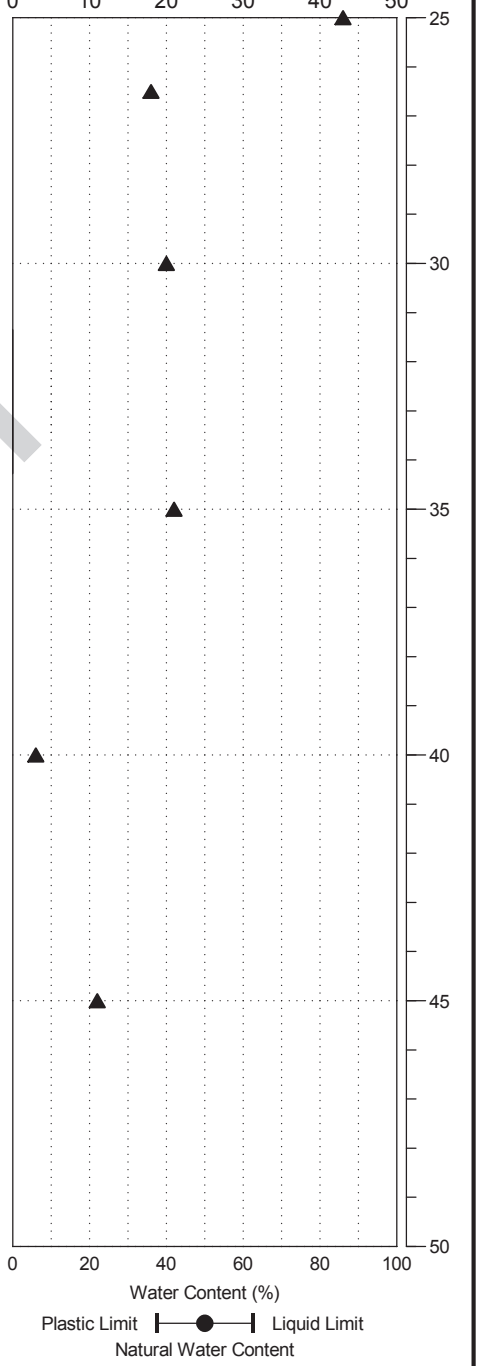
DATE STARTED: 1/4/2018
DATE COMPLETED: 1/4/2018
LOGGED BY: NK

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	PID (ppm)
25		SM	(Same)		S-6A	1-1-2	0.1
					S-6B	3-9-9	0.1
30		ML SM	Stiff, dark gray-brown, sandy SILT, moist, no sheen/no odor.		S-7	4-9-11	0.1
35		SM	Very loose to loose, dark gray-brown, silty, very fine to fine SAND with wood fragments at 40', moist to wet, no sheen/no odor.		S-8	3-9-12	0.0
40		ML	Stiff, dark gray SILT, moist to wet, no sheen/no odor.		S-9	1-1-2	0.0
45		SM	Medium dense, dark gray, silty, very fine to fine SAND, moist to wet, no sheen/no odor.		S-10	5-6-5	0.0
50							

Borehole terminated at 46.5 feet below ground surface.
Ground water encountered at 11 feet.
Borehole abandoned with bentonite chips.

GROUNDWATER

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot



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HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

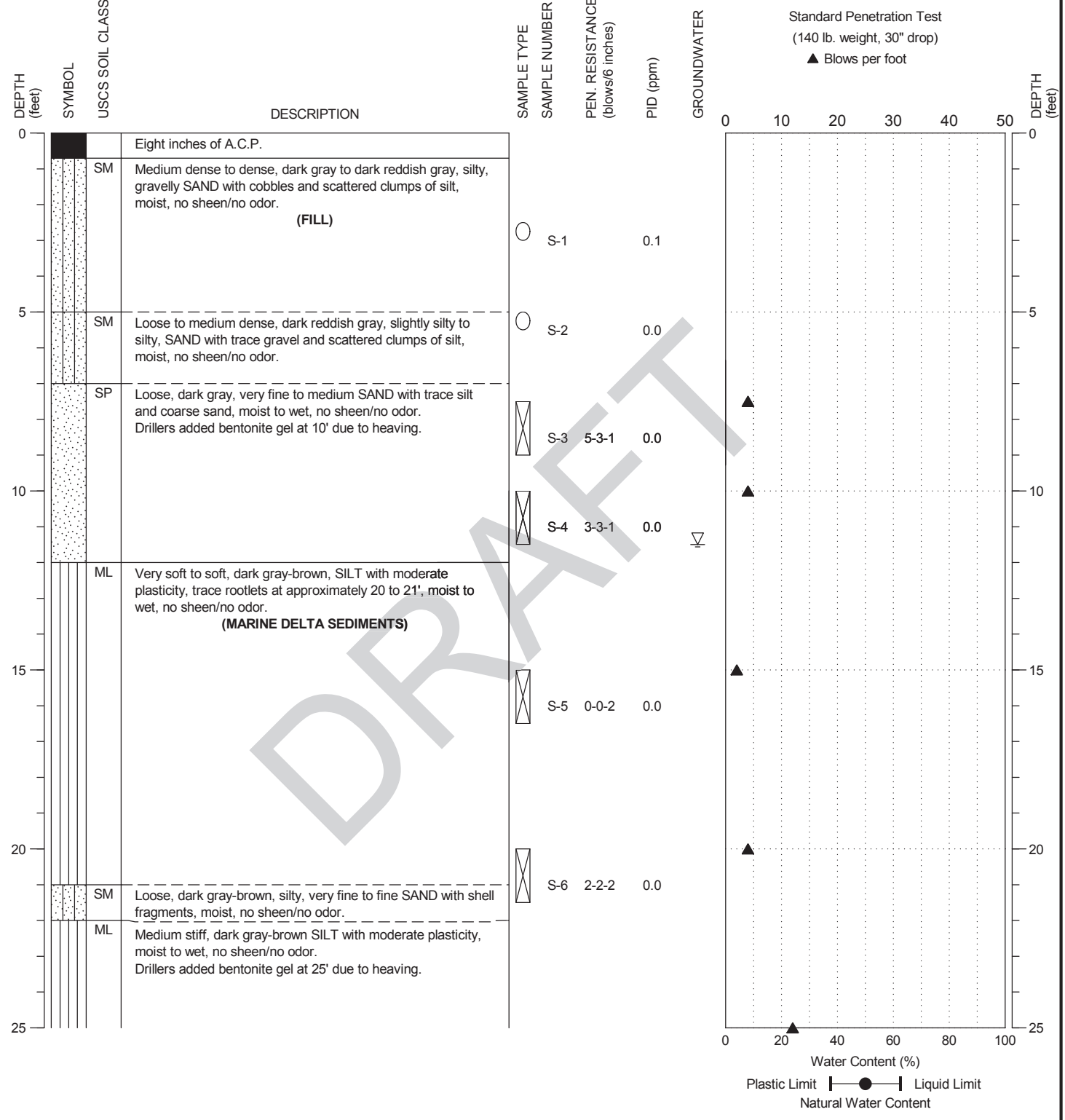
BORING:
BH-1

PROJECT NO.: 2017-148-21 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: HSA, Diedrich D-90 Truck Rig
SAMPLING METHOD: SPT
LOCATION: Basin B

SURFACE ELEVATION: 14.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 1/4/2018
DATE COMPLETED: 1/4/2018
LOGGED BY: NK



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HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

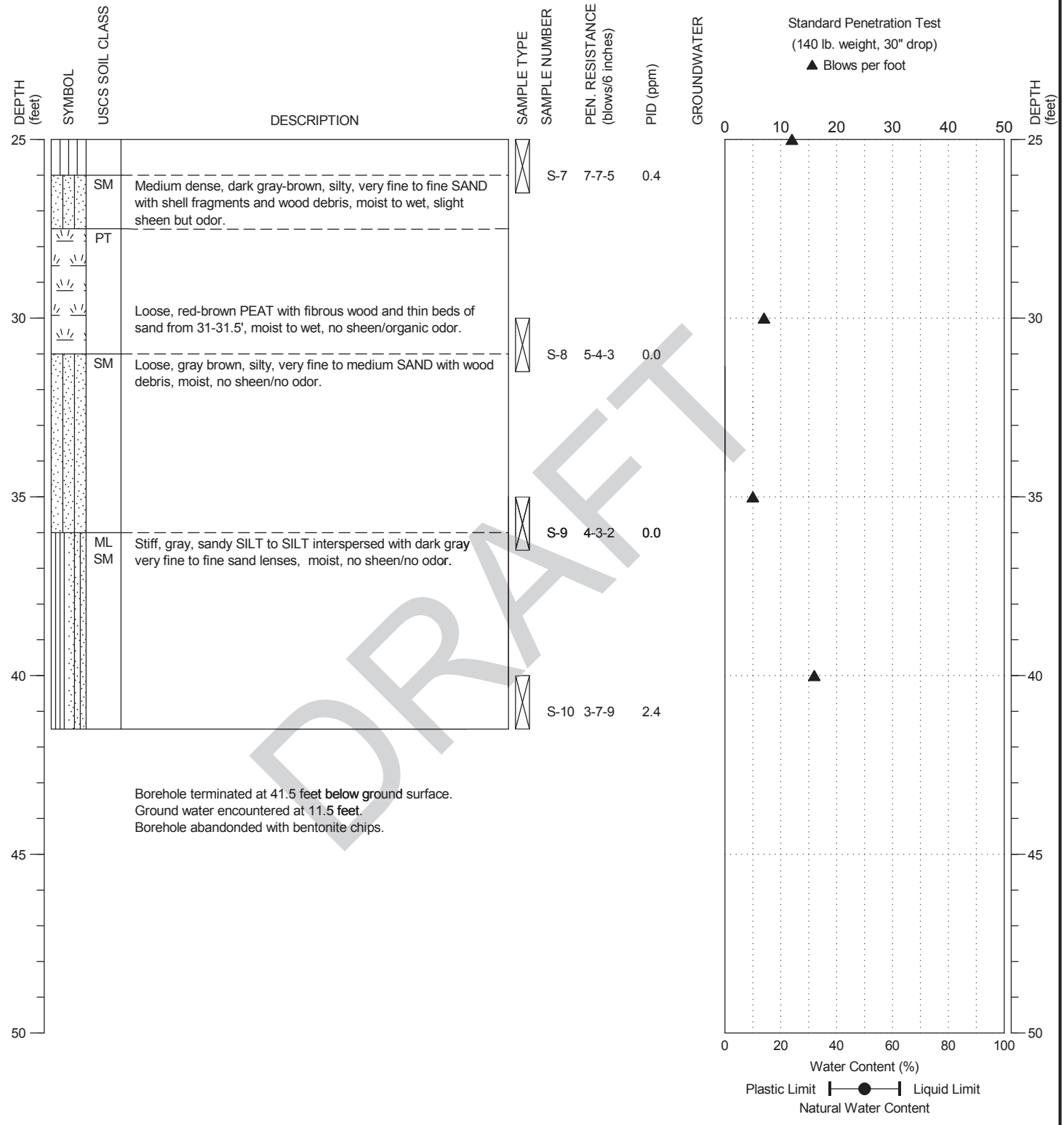
BORING:
BH-2

PROJECT NO.: 2017-148-21 FIGURE: A-3

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: HSA, Diedrich D-90 Truck Rig
SAMPLING METHOD: SPT
LOCATION: Basin B

SURFACE ELEVATION: 14.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 1/4/2018
DATE COMPLETED: 1/4/2018
LOGGED BY: NK



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HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

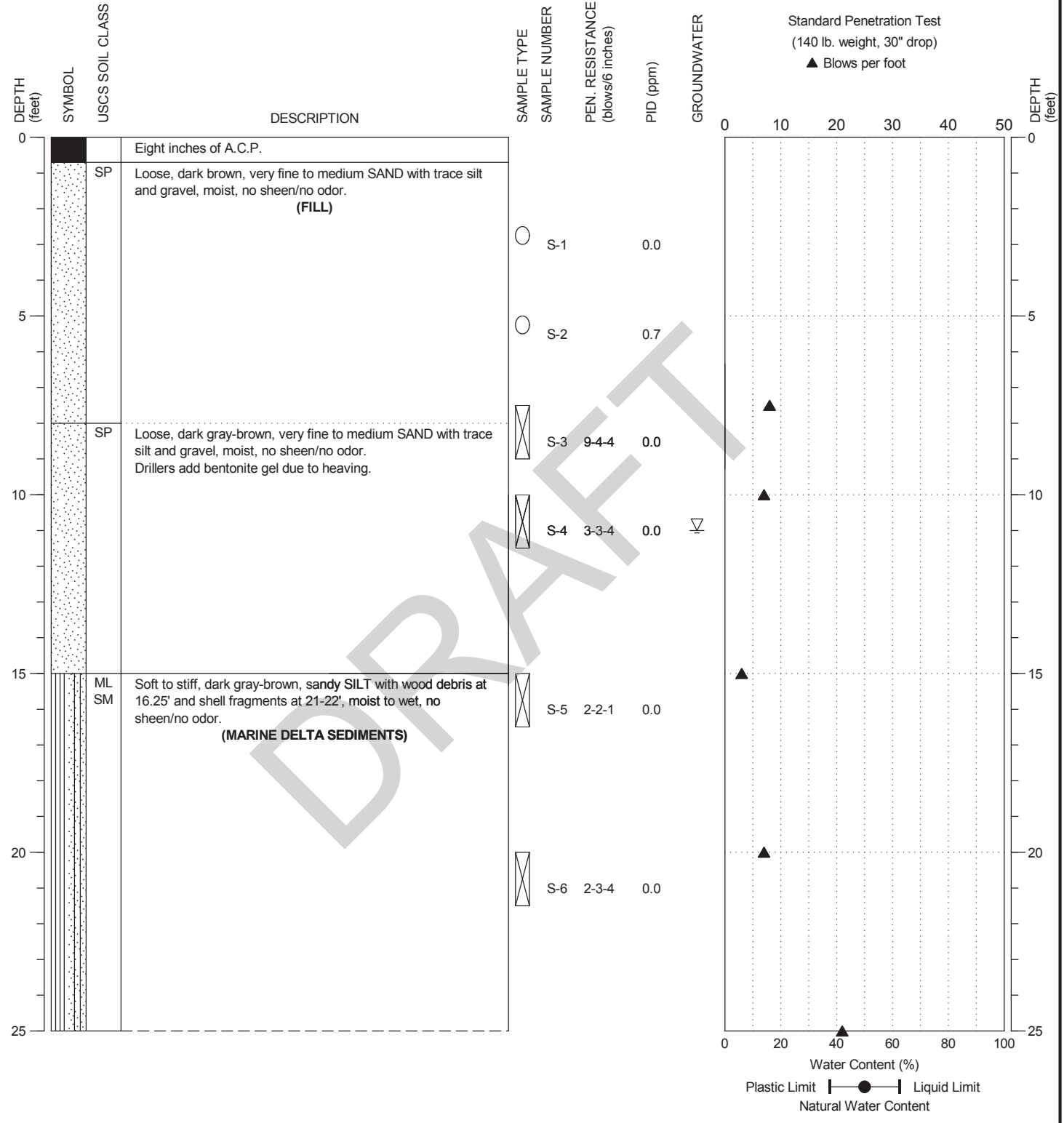
BORING:
BH-2

PROJECT NO.: 2017-148-21 FIGURE: A-3

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: HSA, Diedrich D-90 Truck Rig
SAMPLING METHOD: SPT
LOCATION: Basin A

SURFACE ELEVATION: 14.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 1/4/2018
DATE COMPLETED: 1/4/2018
LOGGED BY: NK



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HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

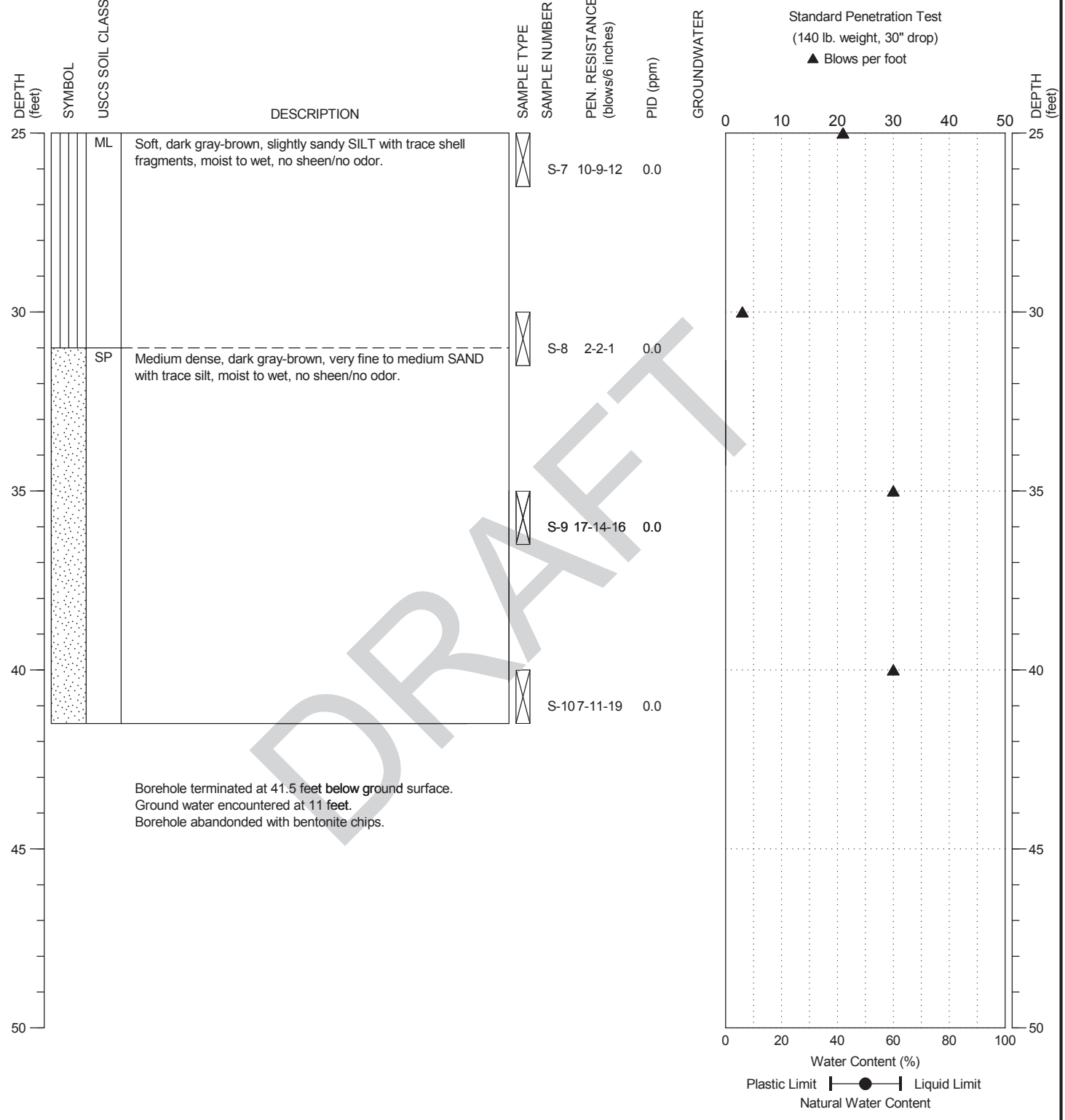
BORING:
BH-3

PROJECT NO.: 2017-148-21 FIGURE: A-4

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: HSA, Diedrich D-90 Truck Rig
SAMPLING METHOD: SPT
LOCATION: Basin A

SURFACE ELEVATION: 14.00 ± feet
CASING ELEVATION ± feet

DATE STARTED: 1/4/2018
DATE COMPLETED: 1/4/2018
LOGGED BY: NK



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HWA GEOSCIENCES INC.

West Sitcum Stormwater Treatment
Port of Tacoma
Tacoma, WA

BORING:
BH-3

PROJECT NO.: 2017-148-21 FIGURE: A-4