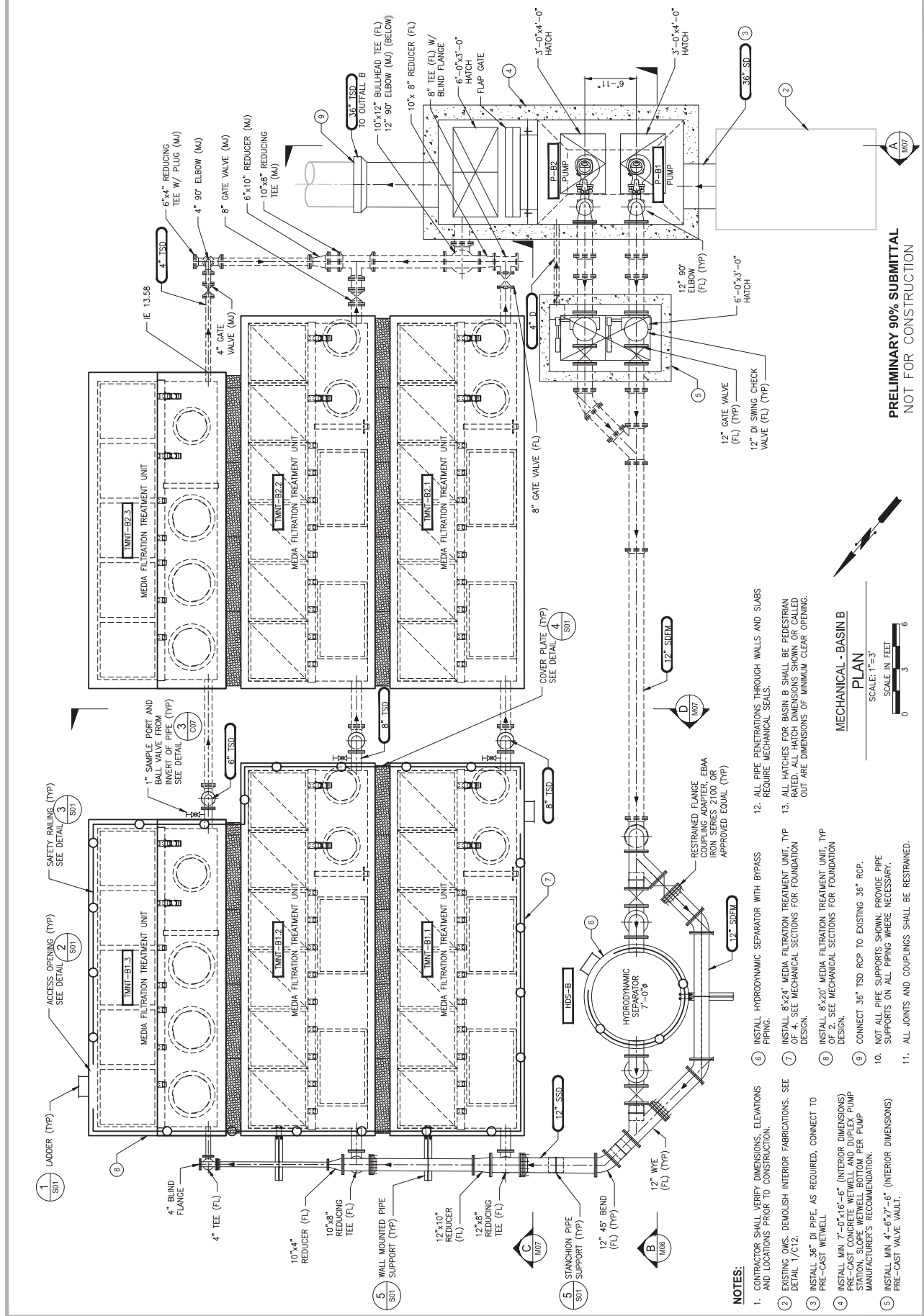




PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

MECHANICAL - BASIN B

PLAN

SCALE: 1"=3'

SCALE IN FEET

0 3 6

NOTES:

1. CONTRACT AND LOCAL
2. EXISTING DETAIL 1/
3. INSTALL 3 PRE-CAST
4. INSTALL 4 PRE-CAST STATION, MANUFACT
5. INSTALL 5 PRE-CAST

6. INSTALL HYDRODYNAMIC SEPARATOR WITH BYPASS PIPING.
7. INSTALL 8" x 24" MEDIA FILTRATION TREATMENT UNIT, TYPE 1. SEE MECHANICAL SECTIONS FOR FOUNDATION DESIGN.
8. INSTALL 8" x 20" MEDIA FILTRATION TREATMENT UNIT, TYPE 2. SEE MECHANICAL SECTIONS FOR FOUNDATION DESIGN.
9. CONNECT 36" TSD RCP TO EXISTING 36" RCP.
10. NOT ALL PIPE SUPPORTS SHOWN. PROVIDE PIPE SUPPORTS ON ALL PIPINGS WHEN NECESSARY.
11. ALL JOINTS AND COUPLINGS SHALL BE RESTRAINED.

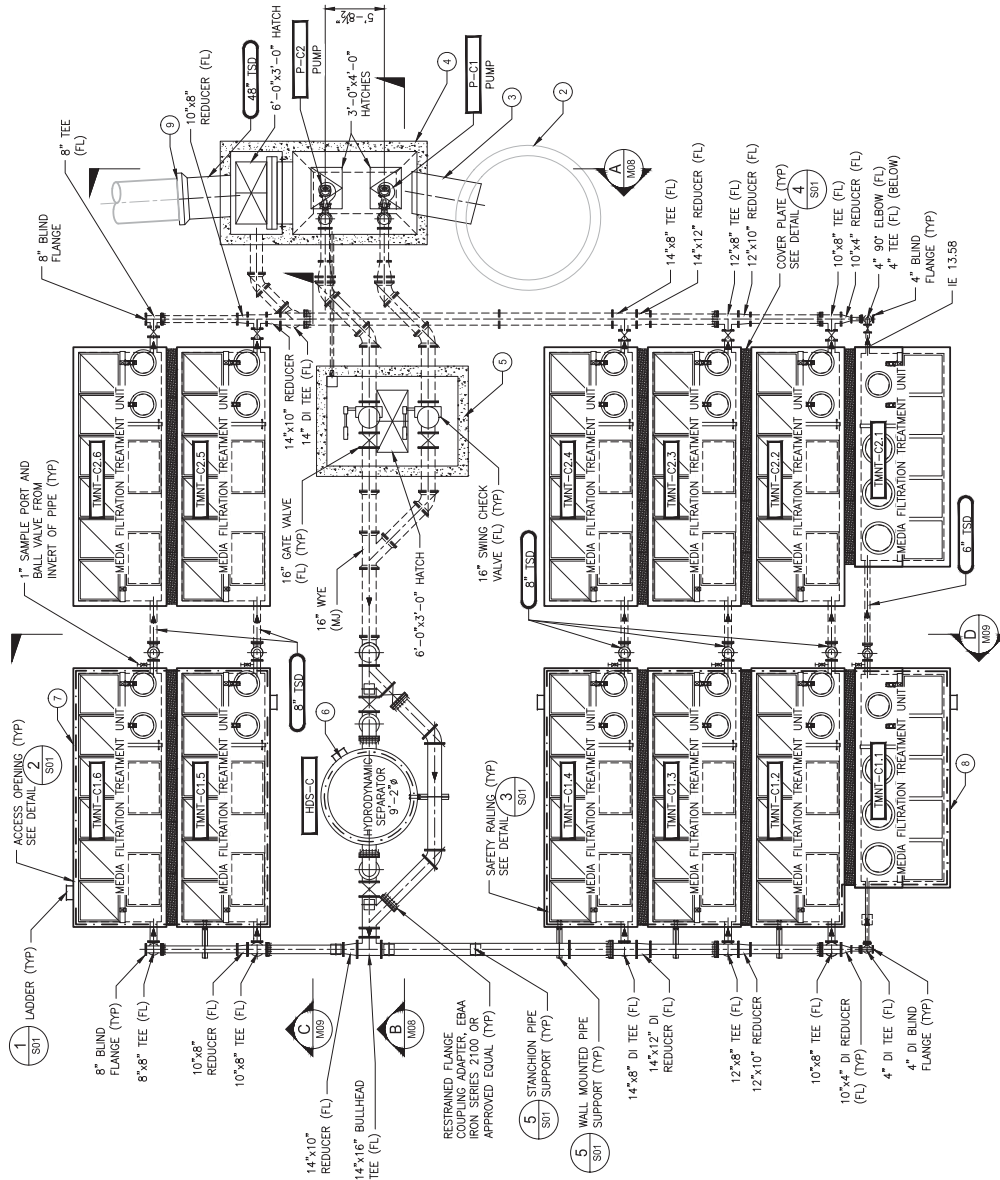
MECHANICAL - BASIN B

PLAN

SCALE: 1"=3'

0 3 6

6583 M02 SH 19 0F AC 8		CONT/CONS: 070664 DATE: 2010/24/01		PHASE: 90% MAP ID: 2010/24/01	
WEST SITCUM STORMWATER TREATMENT MECHANICAL PLANT BASIN B		TOWNSHIP: 21N RANGE: 3E SECTIONS: 33 & 34		DRAWING SCALE: AS NOTED DATE: 2010/24/01	
APPROVED:		PRINTED BY: andrew.bryant PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837		CHECKED BY: DATE PLOT ENGR DATE	
					
MARK: REVISION: BY: DATE:		APPR: DATE:		TACOMA CITY ENGINEERING DEPARTMENT 1000 WEST TACOMA WAY AND 12TH AVENUE TACOMA, WA 98401-1837	



- ② EXISTING OWS. DEMOLISH INTERIOR FABRICATIONS. SEE DETAIL 2/C12.
- ③ INSTALL 48" DI PIPE, AS REQUIRED, CONNECT TO PRE-CAST WETWELL.
- ④ INSTALL MIN 8'-0"x18'-0" (INTERIOR DIMENSIONS) PRE-CAST CONCRETE WETWELL AND DUPLEX PUMP STATION, SLOPE WETWELL BOTTOM PER PUMP MANUFACTURER'S RECOMMENDATION.
- ⑤ INSTALL MIN 8'-5"x12'-8" (INTERIOR DIMENSIONS) PRE-CAST VALVE VAULT.
- ⑥ INSTALL HYDRODYNAMIC SEPARATOR WITH BYPASS PIPING.
- ⑦ INSTALL 8'-2 1/4" MEDIA FILTRATION TREATMENT UNIT, TYP OF 10. SEE STRUCTURAL SHEETS FOR FOUNDATION DESIGN.
- ⑧ INSTALL 8'-0"X20" MEDIA FILTRATION TREATMENT UNIT, TYP OF 2. SEE STRUCTURAL SHEETS FOR FOUNDATION DESIGN.
- ⑨ CONNECT 48" TSD RCP TO EXISTING 48" RCP.
- ⑩ DO NOT ALI PIPE SUPPORTS SHOWN. PROVIDE PIPE SUPPORTS ON ALL PIPING WHERE NECESSARY.
1. ALL JOINTS AND COUPLINGS SHALL BE RESTRAINED.
2. ALL PIPE PENETRATIONS THROUGH WALLS AND SLABS REQUIRE MECHANICAL SEALS.
3. ALL HATCHES FOR BASIN C MUST BE AIRPORT FLAT FOR A 125KIP POINT LOAD. DIMENSIONS SHOWN OR CALLED OUT ARE DIMENSIONS FOR MINIMUM CLEAR OPENINGS.

SCALE: 1" = 6'

SCALE IN FEET

0 6 12

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

6583 303 SH 20 OFF 42		WEST SITCUM STORMWATER TREATMENT MECHANICAL PLAN - BASIN C		TOWNSHIP: 21N RANGE: 3E SECTIONS: 3, & 34 PRINTED BY: andrew.feb.01.2018 PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837		PHASE: 90% PARCEL: SEE 002 DATE: 2/10/2017 VERT: MTLW DRAWING SCALE: AS NOTED	
6583 303 SH 20 OFF 42		WEST SITCUM STORMWATER TREATMENT MECHANICAL PLAN - BASIN C		TOWNSHIP: 21N RANGE: 3E SECTIONS: 3, & 34 PRINTED BY: andrew.feb.01.2018 PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837		PHASE: 90% PARCEL: SEE 002 DATE: 2/10/2017 VERT: MTLW DRAWING SCALE: AS NOTED	
6583 303 SH 20 OFF 42		WEST SITCUM STORMWATER TREATMENT MECHANICAL PLAN - BASIN C		TOWNSHIP: 21N RANGE: 3E SECTIONS: 3, & 34 PRINTED BY: andrew.feb.01.2018 PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837		PHASE: 90% PARCEL: SEE 002 DATE: 2/10/2017 VERT: MTLW DRAWING SCALE: AS NOTED	

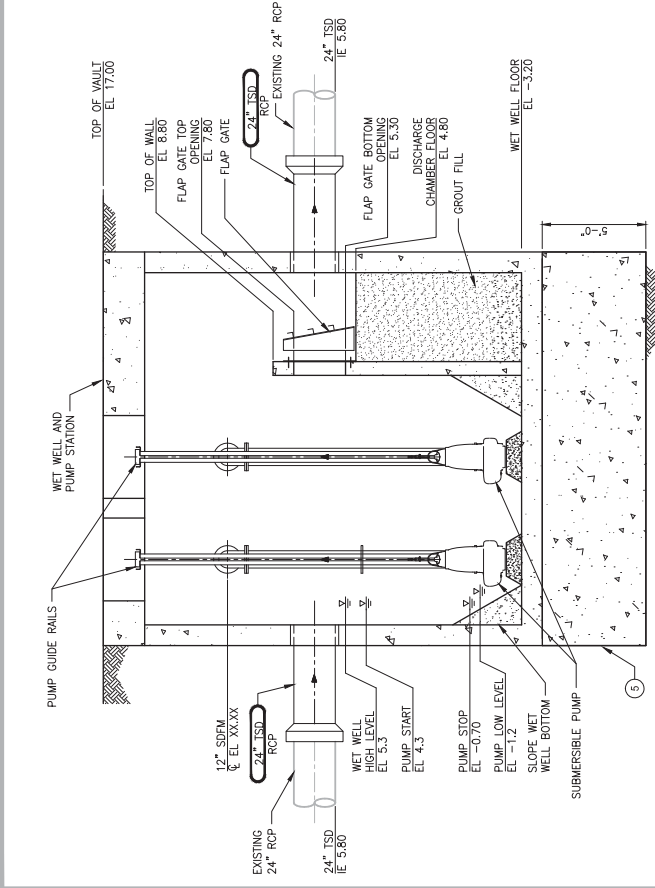
6583		SH 21 OF 42	M04
CONTRACT/CONS:	070664	M ID:	201024.01
PHASE:	90%	PARCEL:	SEE G02
TOWNSHIP:	21N	RANGE:	3E
SECTIONS:	33 & 34	VERT:	MLW
DRAWING SCALE:	AS NOTED	PRINTED BY:	andrew Feb 01, 2018
PORT ADDRESS:	ONE SITUUM PLAZA	TACOMA, WA	98401-1837
DIRECTOR ENG. DATE	PROJ. ENR DATE	CHECKED BY DATE	APPROVED:
MECHANICAL SECTION - BASIN A			
STORMWATER TREATMENT			
WEST SITUUM			

MARK:	REVISION:	BY:	APPR:	DATE:
Parametrix				
TACOMA				

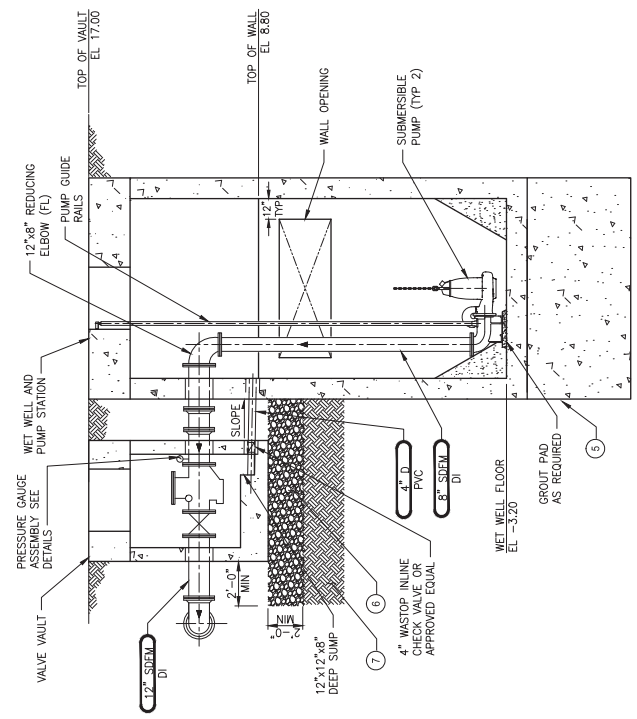


NOTES:

1. CONTRACTOR SHALL VERIFY DIMENSIONS, ELEVATIONS AND LOCATIONS PRIOR TO CONSTRUCTION.
2. PIPE SUPPORTS NOT SHOWN. PROVIDE PIPE SUPPORTS ON ALL PIPING WHERE NECESSARY.
3. ALL JOINTS AND COUPLINGS SHALL BE RESTRAINED.
4. ALL PIPE PENETRATIONS THROUGH WALLS AND SLABS REQUIRE MECHANICAL SEALS.
5. MUD SLAB, SEE SPECIFICATIONS FOR MATERIAL AND INSTALLATION REQUIREMENTS.
6. CSFG. SEE SPECIFICATIONS FOR MATERIAL AND INSTALLATION REQUIREMENTS.
7. SCARIFY 2' OF EXISTING MATERIAL AND RECOMPACT TO 95% MAX DRY DENSITY.



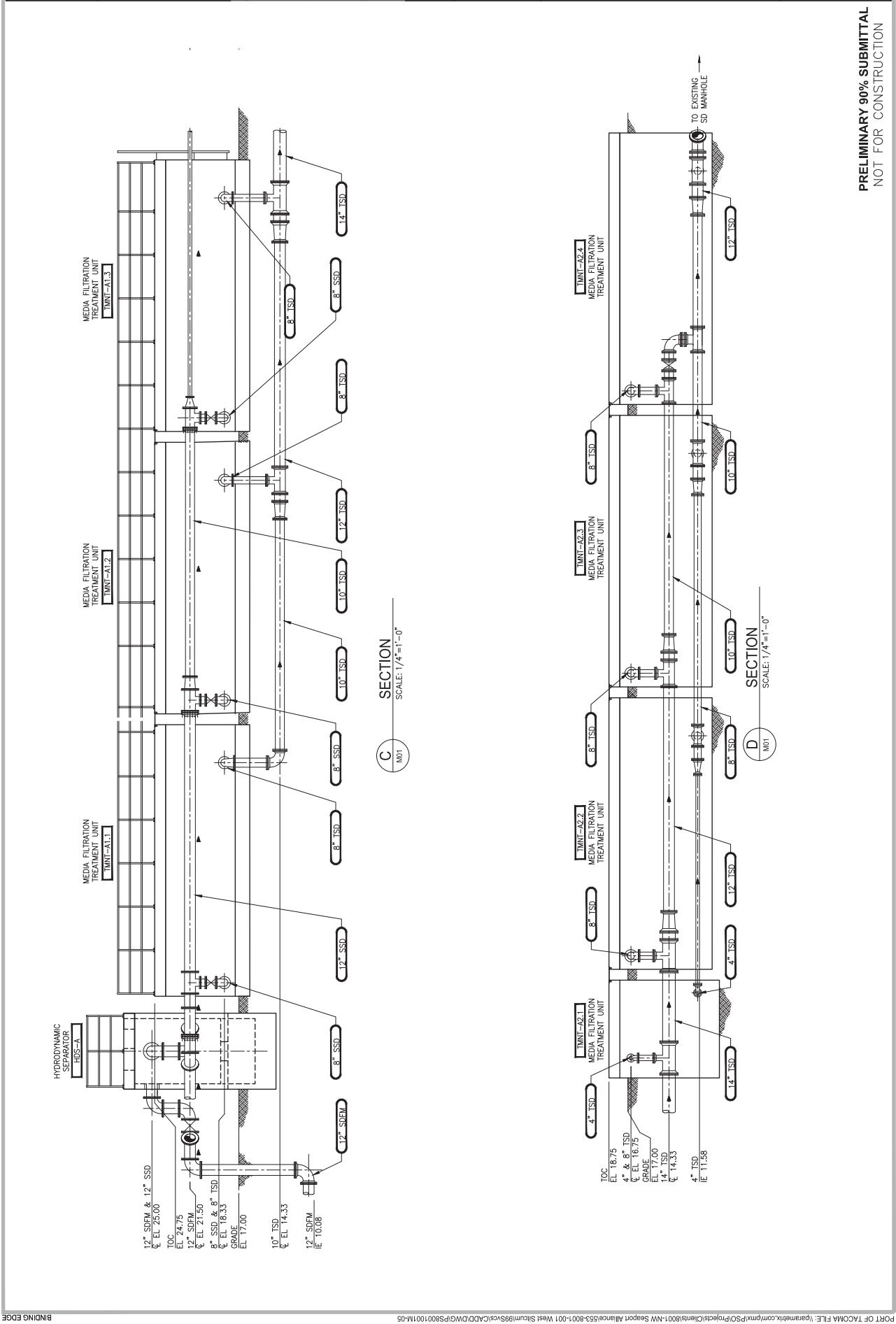
A SECTION
SCALE: 1"=3'



B SECTION
SCALE: 1"=3'

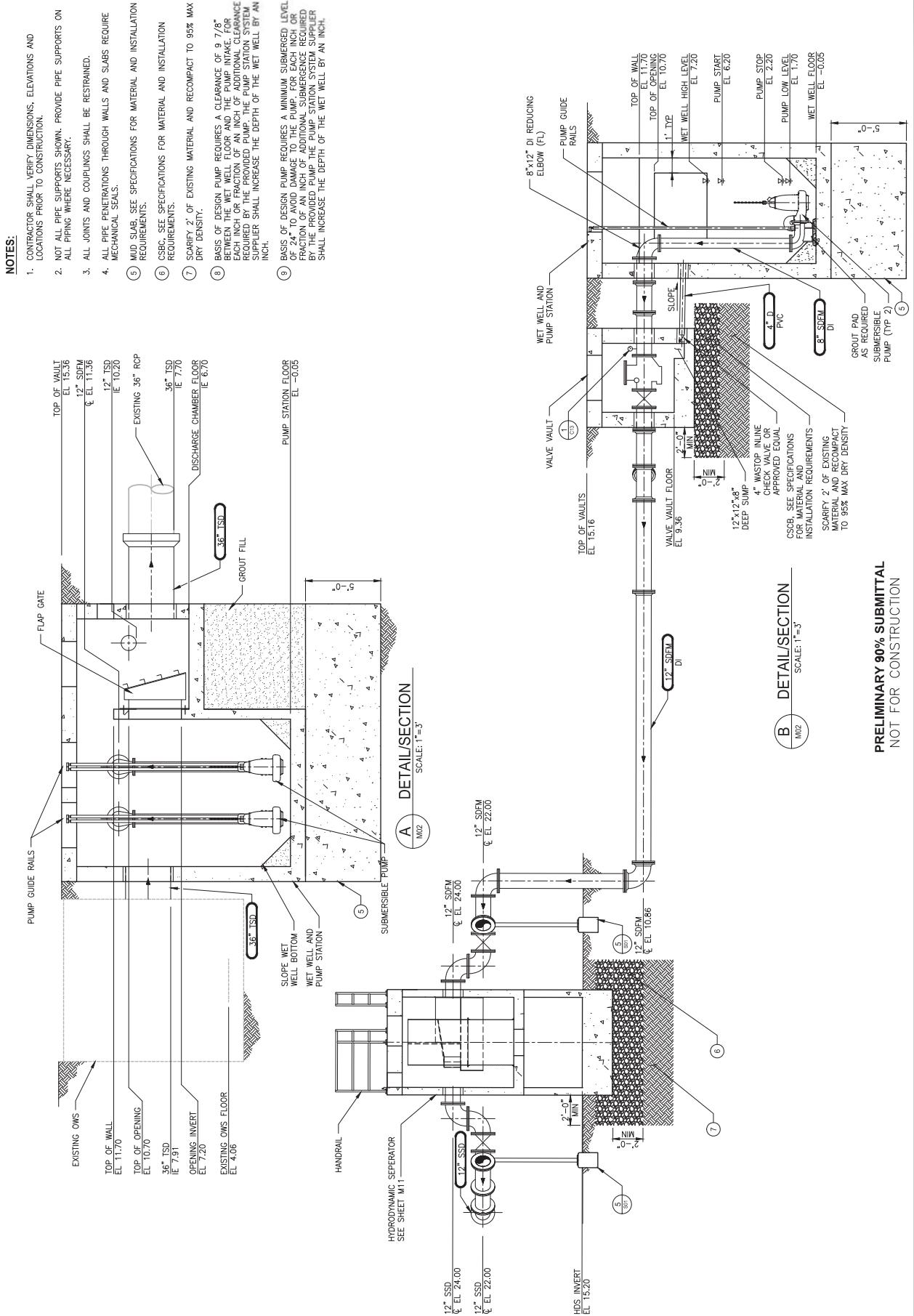
PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

6583		SH 22 OF 42	M05
CONTRACT/CONS: 070664		TOWNSHIP: 21N	RANGE: 3E
M. ID: 201024.01		DATE-HRZ: WA83-S	VERT: MLW
PHASE: 90%		PARCEL: SEE 002	DRAWING SCALE: AS NOTED
THIS DRAWING IS THE PROPERTY OF THE PORT OF TACOMA AND SHALL NOT BE USED ON OTHER WORK, DISCLOSED, COPIED, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION			
TACOMA, WA 98401-1837			
PORT ADDRESS: ONE SITCUM PLAZA			
PRINTED BY: andrew Feb 01, 2018			
DIRECTOR ENG. DATE			
PROJ. ENGR DATE			
CHECKED BY DATE			
APPROVED:			
WEST SITCUM			
STORMWATER TREATMENT			
MECHANICAL SECTION - BASIN A			
MARK: REVISION: BY: APPR: DATE:			
Parametrix			
Tacoma			

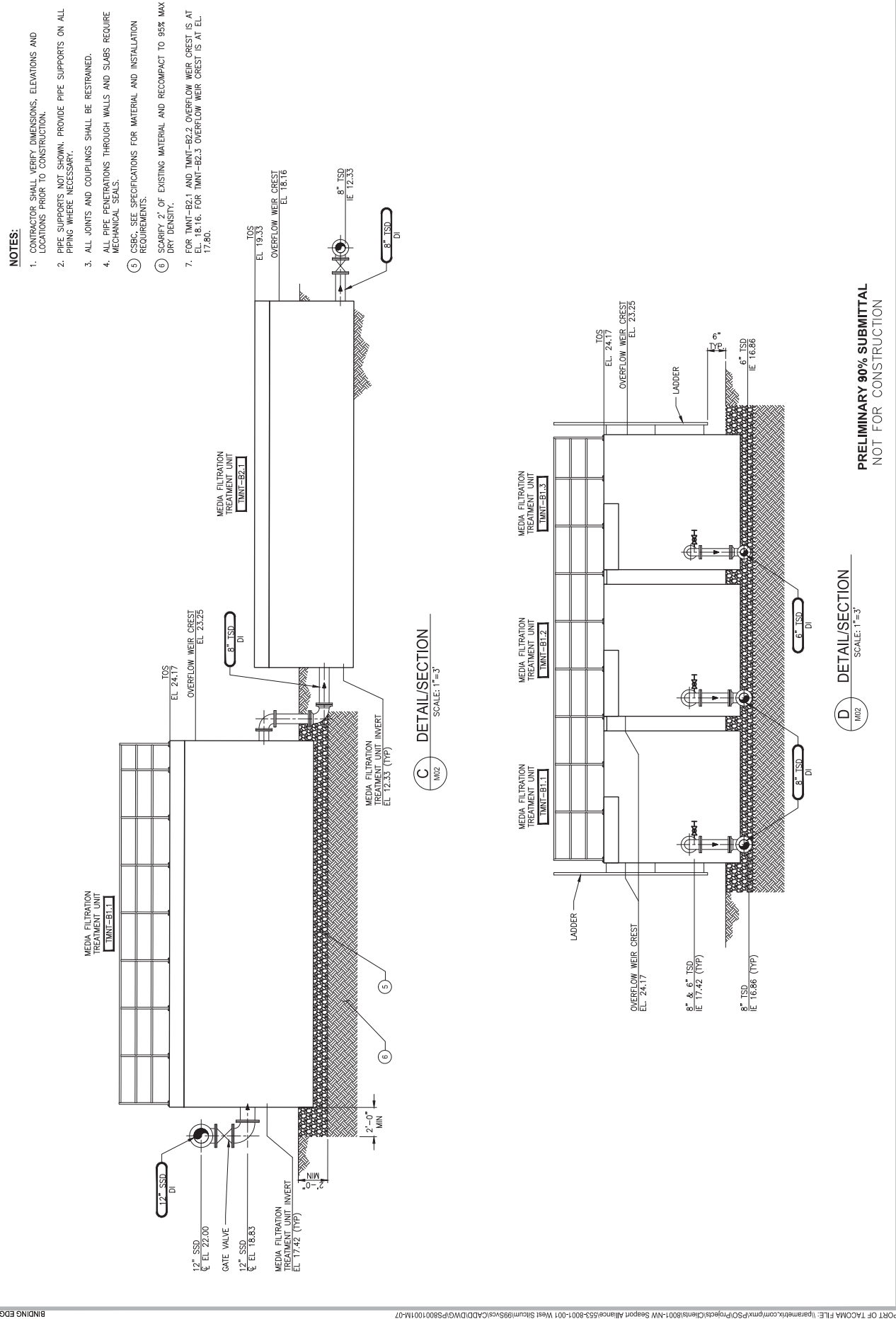


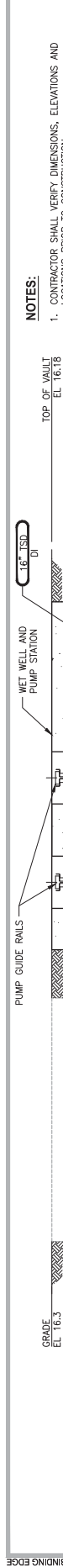
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TOWNSHIP: 21N RANGE: 3E SECTIONS: 33 & 34					
VERT: MLLW					
DRAWING SCALE: AS NOTED					
TACOMA, WA 98401-1837					
PORT ADDRESS: ONE SITUUM PLAZA					
PRINTED BY: andrew Feb 01, 2018					
DIRECTOR ENG. DATE					
PROJ. ENGR DATE					
CHECKED BY DATE					
APPROVED:					

- NOTES:**
1. CONTRACTOR SHALL VERIFY DIMENSIONS, ELEVATIONS AND LOCATIONS PRIOR TO CONSTRUCTION.
 2. NOT ALL PIPE SUPPORTS SHOWN. PROVIDE PIPE SUPPORTS ON ALL PIPING WHERE NECESSARY.
 3. ALL JOINTS AND COUPLINGS SHALL BE RESTRAINED.
 4. ALL PIPE PENETRATIONS THROUGH WALLS AND SLABS REQUIRE MECHANICAL SEALS.
 5. MUD SLAB, SEE SPECIFICATIONS FOR MATERIAL AND INSTALLATION REQUIREMENTS.
 6. CSBG. SEE SPECIFICATIONS FOR MATERIAL AND INSTALLATION REQUIREMENTS.
 7. SCARIFY 2" OF EXISTING MATERIAL AND RECOMPACT TO 95% MAX DRY DENSITY.
 8. BASIS OF DESIGN PUMP REQUIRES A CLEARANCE OF 9' 7/8" BETWEEN THE WET WELL FLOOR AND THE PUMP INTAKE. FOR EACH INCH OR FRACTION OF AN INCH OF ADDITIONAL CLEARANCE REQUIRED BY THE PROVIDED PUMP, THE PUMP STATION SYSTEM SUPPLIER SHALL INCREASE THE DEPTH OF THE WET WELL BY AN INCH.
 9. BASIS OF DESIGN PUMP REQUIRES A MINIMUM SUBMERGED LEVEL OF 24" TO AVOID DAMAGE TO THE PUMP. FOR EACH INCH OR FRACTION OF AN INCH OF ADDITIONAL CLEARANCE REQUIRED BY THE PROVIDED PUMP, THE PUMP STATION SYSTEM SUPPLIER SHALL INCREASE THE DEPTH OF THE WET WELL BY AN INCH.



PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION





1. CONTRACTOR SHALL VERIFY DIMENSIONS, ELEVATIONS AND LOCATIONS PRIOR TO CONSTRUCTION.
2. NOT ALL PIPE SUPPORTS SHOWN. PROVIDE PIPE SUPPORTS ON ALL PIPING WHERE NECESSARY.
3. ALL JOINTS AND COUPLINGS SHALL BE RESTRAINED.
4. ALL PIPE PENETRATIONS THROUGH WALLS AND SLABS REQUIRE MECHANICAL SEALS.
5. MUD SLAB, SEE SPECIFICATIONS FOR MATERIAL AND INSTALLATION REQUIREMENTS.
6. CSRC, SEE SPECIFICATIONS FOR MATERIAL AND INSTALLATION REQUIREMENTS.
7. SCARIFY 2' OF EXISTING MATERIAL AND RECOMPACT TO 95% MAXIMUM DENSITY.
8. BASIS OF DESIGN PUMP REQUIRES A CLEARANCE OF 9' 7/8" BETWEEN THE WET FLOOR AND THE PUMP INTAKE. FOR EACH INCH OR FRACTION OF AN INCH OF ADDITIONAL CLEARANCE BETWEEN THE PUMP INTAKE AND THE PUMP STATION SYSTEM SUPPLIER SHALL INCREASE THE DEPTH OF THE WET WELL BY AN INCH.
9. BASIS OF DESIGN PUMP REQUIRES A MINIMUM SUBMERGED LEVEL OF 1' BETWEEN THE PUMP INTAKE AND THE PUMP STATION SYSTEM SUPPLIER. FOR EACH INCH OF ADDITIONAL SUBMERGENCE REQUIRED BY THE PROVIDED PUMP THE PUMP STATION SYSTEM SUPPLIER SHALL INCREASE THE DEPTH OF THE WET WELL BY AN INCH.

[illegible]

GRADE EL. 16.3	EXISTING 10" SDI @ EL. 1 TOP OF IE 8.90 TOP OF IE 7.90	EXISTING IE 3.90 BOTTOM IE 3.40 BOTTOM EL. 0.81	DYNAMIC SEPARATOR ET. M1?
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BINDING ED

SCALE: 1"=3'

LE: 1"=3'

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

SCALE: 1"=3'

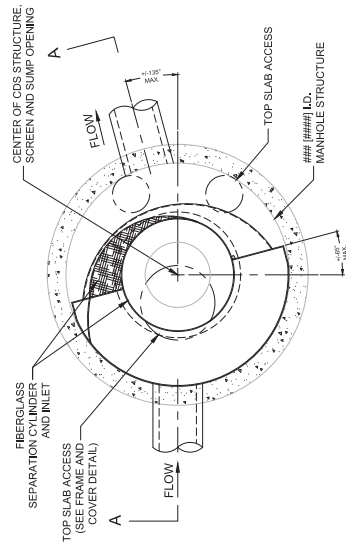
SH # OF 42
M08
0000

WEST SITCUM
STORMWATER TREATMENT

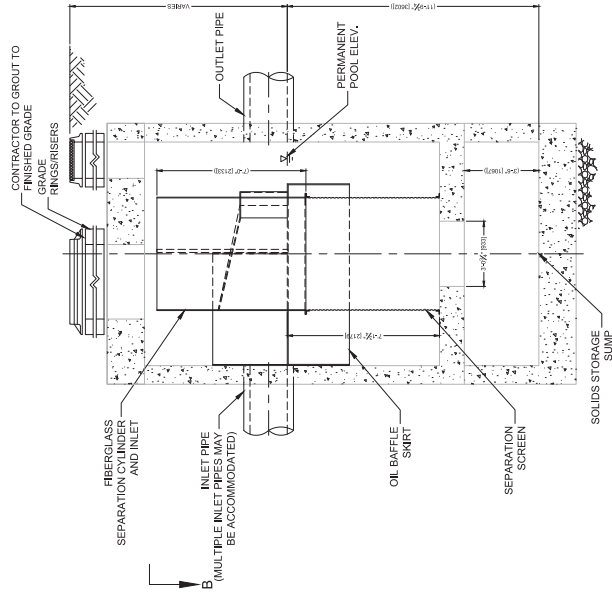
6883 M08 SH # 02		WEST SITUUM STORMWATER TREATMENT MECHANICAL SECTION - BASIN C		APPPROVED:		CHECKED BY: DATE		DIRECTOR ENG. DATE		PROJ. ENGR. DATE		PRINTED BY: 04/09/2018 PORT ADDRESS ONE: STIGUM PLAZA TACOMA, WA 98401-1837		TOWNSHIP: 21N RANGE: 3E SECTIONS: 33 & 34		VERT: MTLW DRAWING SCALE: AS NOTED		DATE: 2019/04/01 PLOT: HNZ: W083-S PAPER: SEC 002		PHASE: 90% M08	
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B DETAIL/SECTION
M03 SCALE: 1"=3'



PLAN VIEW B-B
N.T.S.



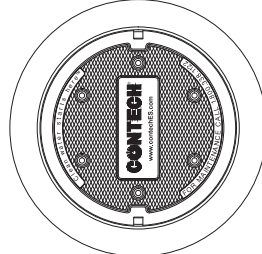
ELEVATION A-A
N.T.S.

CDS3035-6-C DESIGN NOTES

CDS3035-6-C RATED TREATMENT CAPACITY IS 3.8 CFS [107.6 U/s], OR PER LOCAL REGULATIONS, MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 20.0 CFS [566 U/s]. IF THE SITE CONDITIONS EXCEED 20.0 CFS [566 U/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 INDEP / NJCAT CONFORMING UNITS



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

SITE SPECIFIC
DATA REQUIREMENTS

STRUCTURE ID	WATER QUALITY FLOW RATE (CFS OR U/s)	PEAK FLOW RATE (CFS OR U/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
- CONTECH SHALL PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 - DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
 - FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEER.
 - SOLUTIONS LLC REPRESENTATIVE: www.contechsolutions.com
 - CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
 - CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS PRIOR TO CONSTRUCTION.
 - AT OR BELOW THE OUTLET PIPE INVERT ELEVATION, ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION, MAINTENANCE CLEANING.
- INSTALLATION NOTES
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
 - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
 - CONTRACTOR TO PROVIDE ANTI-FLOTATION BALLAST BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
 - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES, WATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
 - 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.

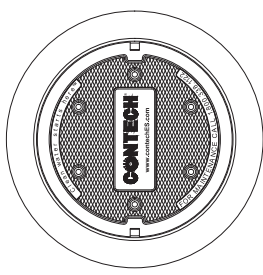
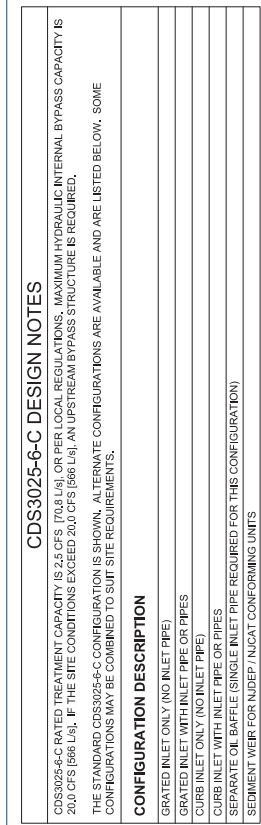
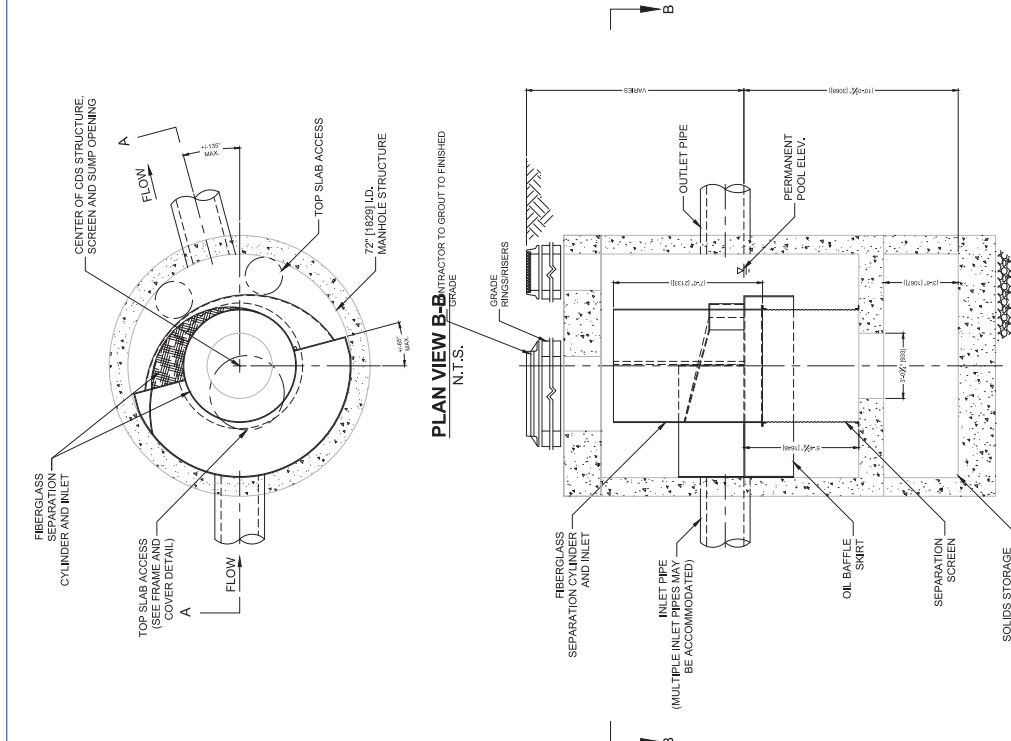
CONTECH
SOLUTIONS LLC
www.contechsolutions.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45389
610-332-1122 610-665-7000 610-665-7803 FAX

CDS3035-6-C
ONLINE CDS
STANDARD DETAIL

FOR INFORMATION ONLY
PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

6583 M10 SH 55 OF 42	CONT./CONS: 070664.01	TOWNSHIP: 21N	RANGE: 3E	SECTIONS: 33 & 34	VERT: M.L.W.	PRINTED BY: andrewb	DATE: Feb 01, 2018	PROJ. ENR	DATE
	M. ID: 201024.01	DATE: HRZ: WA83-S	DRAMA SCALE: AS NOTED	PHASE: 90%	APPROVED:				
	STORMWATER TREATMENT WEST SITCUM								
	DETAILS - HYDRODYNAMIC SEPARATOR - BASIN A								

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SITE SPECIFIC DATA REQUIREMENTS					
STRUCTURE ID _____					
WATER QUALITY FLOW RATE (CFS OR L/S) *					
PEAK FLOW RATE (CFS OR L/S) *					
PEAK FLOW RATE OF PEAK FLOW (YRS) *					
SCREEN APERTURE (2400 OR 4700) *					
Pipe Data:	I.E.	MATERIAL	DIAMETER		
INLET PIPE 1	*	*	*		
INLET PIPE 2	*	*	*		
OUTLET PIPE	*	*	*		
RM ELEVATION			*		
ANTI-FLOTATION BALLAST			WIDTH	HEIGHT	
			*	*	
NOTES/SPECIAL REQUIREMENTS:					
* PER ENGINEER OF RECORD					

1. CONTRACTOR TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITES Lacking DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERING SOLUTIONS LLC REPRESENTATIVE, www.contech-es.com
3. CONTRACTOR TO MEET STRUCTURE WEIGHT REQUIREMENTS OF PROJECT.
4. CONTRACTOR TO MEET STRUCTURE LIFTING REQUIREMENTS OF PROJECT.
5. STRUCTURE SHALL MEET ASHTO H20.40 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 THE FOLLOWING REQUIREMENTS:
 - a. ALL CASTINGS SHALL BE CAST IN PLACE.
 - b. IF REQUIRED, PNEUMATIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NEEDED DURING MAINTENANCE CLEANING.
 - c. ALL STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-479 AND ASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOUTING PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE, AND TO PROVIDE THE NECESSARY LIFTING AND SETTING CAPABILITY TO INSTALL THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO PROVIDE INSTALL AND GROUT INLET AND OUTLET PIPES(S), MATCH PIPE INVERTS WITH ELEVATIONS SHOWN, ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- 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.

ELEVATION A-A

N.T.S.

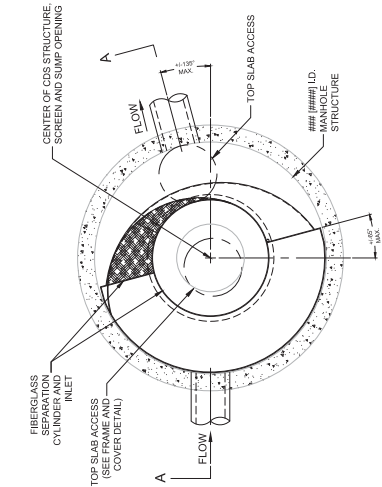
GDS

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,796,446; 5,811,447; 5,811,448; 5,811,449; 5,811,450; 5,811,451; 5,811,452; 5,811,453; 5,811,454; 5,811,455; 5,811,456; 5,811,457; 5,811,458; 5,811,459; 5,811,460; 5,811,461; 5,811,462; 5,811,463; 5,811,464; 5,811,465; 5,811,466; 5,811,467; 5,811,468; 5,811,469; 5,811,470; 5,811,471; 5,811,472; 5,811,473; 5,811,474; 5,811,475; 5,811,476; 5,811,477; 5,811,478; 5,811,479; 5,811,480; 5,811,481; 5,811,482; 5,811,483; 5,811,484; 5,811,485; 5,811,486; 5,811,487; 5,811,488; 5,811,489; 5,811,490; 5,811,491; 5,811,492; 5,811,493; 5,811,494; 5,811,495; 5,811,496; 5,811,497; 5,811,498; 5,811,499; 5,811,500; 5,811,501; 5,811,502; 5,811,503; 5,811,504; 5,811,505; 5,811,506; 5,811,507; 5,811,508; 5,811,509; 5,811,510; 5,811,511; 5,811,512; 5,811,513; 5,811,514; 5,811,515; 5,811,516; 5,811,517; 5,811,518; 5,811,519; 5,811,520; 5,811,521; 5,811,522; 5,811,523; 5,811,524; 5,811,525; 5,811,526; 5,811,527; 5,811,528; 5,811,529; 5,811,530; 5,811,531; 5,811,532; 5,811,533; 5,811,534; 5,811,535; 5,811,536; 5,811,537; 5,811,538; 5,811,539; 5,811,540; 5,811,541; 5,811,542; 5,811,543; 5,811,544; 5,811,545; 5,811,546; 5,811,547; 5,811,548; 5,811,549; 5,811,550; 5,811,551; 5,811,552; 5,811,553; 5,811,554; 5,811,555; 5,811,556; 5,811,557; 5,811,558; 5,811,559; 5,811,560; 5,811,561; 5,811,562; 5,811,563; 5,811,564; 5,811,565; 5,811,566; 5,811,567; 5,811,568; 5,811,569; 5,811,570; 5,811,571; 5,811,572; 5,811,573; 5,811,574; 5,811,575; 5,811,576; 5,811,577; 5,811,578; 5,811,579; 5,811,580; 5,811,581; 5,811,582; 5,811,583; 5,811,584; 5,811,585; 5,811,586; 5,811,587; 5,811,588; 5,811,589; 5,811,590; 5,811,591; 5,811,592; 5,811,593; 5,811,594; 5,811,595; 5,811,596; 5,811,597; 5,811,598; 5,811,599; 5,811,600; 5,811,601; 5,811,602; 5,811,603; 5,811,604; 5,811,605; 5,811,606; 5,811,607; 5,811,608; 5,811,609; 5,811,610; 5,811,611; 5,811,612; 5,811,613; 5,811,614; 5,811,615; 5,811,616; 5,811,617; 5,811,618; 5,811,619; 5,811,620; 5,811,621; 5,811,622; 5,811,623; 5,811,624; 5,811,625; 5,811,626; 5,811,627; 5,811,628; 5,811,629; 5,811,630; 5,811,631; 5,811,632; 5,811,633; 5,811,634; 5,811,635; 5,811,636; 5,811,637; 5,811,638; 5,811,639; 5,811,640; 5,811,641; 5,811,642; 5,811,643; 5,811,644; 5,811,645; 5,811,646; 5,811,647; 5,811,648; 5,811,649; 5,811,650; 5,811,651; 5,811,652; 5,811,653; 5,811,654; 5,811,655; 5,811,656; 5,811,657; 5,811,658; 5,811,659; 5,811,660; 5,811,661; 5,811,662; 5,811,663; 5,811,664; 5,811,665; 5,811,666; 5,811,667; 5,811,668; 5,811,669; 5,811,670; 5,811,671; 5,811,672; 5,811,673; 5,811,674; 5,811,675; 5,811,676; 5,811,677; 5,811,678; 5,811,679; 5,811,680; 5,811,681; 5,811,682; 5,811,683; 5,811,684; 5,811,685; 5,811,686; 5,811,687; 5,811,688; 5,811,689; 5,811,690; 5,811,691; 5,811,692; 5,811,693; 5,811,694; 5,811,695; 5,811,696; 5,811,697; 5,811,698; 5,811,699; 5,811,700; 5,811,701; 5,811,702; 5,811,703; 5,811,704; 5,811,705; 5,811,706; 5,811,707; 5,811,708; 5,811,709; 5,811,710; 5,811,711; 5,811,712; 5,811,713; 5,811,714; 5,811,715; 5,811,716; 5,811,717; 5,811,718; 5,811,719; 5,811,720; 5,811,721; 5,811,722; 5,811,723; 5,811,724; 5,811,725; 5,811,726; 5,811,727; 5,811,728; 5,811,729; 5,811,730; 5,811,731; 5,811,732; 5,811,733; 5,811,734; 5,811,735; 5,811,736; 5,811,737; 5,811,738; 5,811,739; 5,811,740; 5,811,741; 5,811,742; 5,811,743; 5,811,744; 5,811,745; 5,811,746; 5,811,747; 5,811,748; 5,811,749; 5,811,750; 5,811,751; 5,811,752; 5,811,753; 5,811,754; 5,811,755; 5,811,756; 5,811,757; 5,811,758; 5,811,759; 5,811,760; 5,811,761; 5,811,762; 5,811,763; 5,811,764; 5,811,765; 5,811,766; 5,811,767; 5,811,768; 5,811,769; 5,811,770; 5,811,771; 5,811,772; 5,811,773; 5,811,774; 5,811,775; 5,811,776; 5,811,777; 5,811,778; 5,811,779; 5,811,780; 5,811,781; 5,811,782; 5,811,783; 5,811,784; 5,811,785; 5,811,786; 5,811,787; 5,811,788; 5,811,789; 5,811,790; 5,811,791; 5,811,792; 5,811,793; 5,811,794; 5,811,795; 5,811,796; 5,811,797; 5,811,798; 5,811,799; 5,811,800; 5,811,801; 5,811,802; 5,811,803; 5,811,804; 5,811,805; 5,811,806; 5,811,807; 5,811,808; 5,811,809; 5,811,810; 5,811,811; 5,811,812;

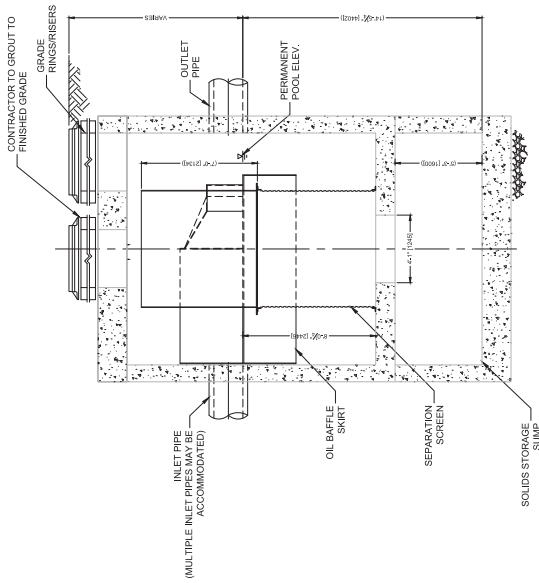
CDS3025-6-C
ONLINE CDS
STANDARD DETAIL

FOR INFORMATION ONLY
PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

6583 M11 SH 36 OF 42 CONT/CONS: 070664 DATE: 201204.01		TOWNSHIP: 21N RANGE: 3E SECTION: 33 & 34 PRINTED BY: andrea@feb 01, 2018 PORT ADDRESS: SITUUM PLAZA TACOMA, WA 98401-1837		PHASE: 90% FACILITY: SEE 502 DATE-HRZ: WA83-S VERT: MLTW DRAWING SCALE: AS NOTED	
WEST SITUUM STORMWATER TREATMENT DETAILS - HYDRODYNAMIC SEPARATOR - BASIN B		DIRECTOR ENG. DATE PROJ. ENGR DATE CHECKED BY DATE		MARK: REVISION: BY: APPR: DATE:	
 CONSULTING ENGINEERS 1000 1st Avenue, Suite 1000 Tacoma, WA 98401		 Port of Tacoma 1000 1st Avenue, Suite 1000 Tacoma, WA 98401			



PLAN VIEW B-B
N.T.S.



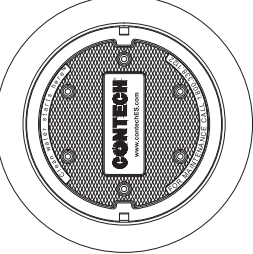
ELEVATION A-A
N.T.S.

CDS4040-8-C DESIGN NOTES

CDS4040-8-C RATED TREATMENT CAPACITY IS 6.0 CFS [166.9 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 INDEP / 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
INLET PIPE 1	*
INLET PIPE 2	*
OUTLET PIPE	*
RIM ELEVATION	
ANTI-FLOTATION BALLAST	*
NOTES/SPECIAL REQUIREMENTS:	
* PER ENGINEER OF RECORD	

- GENERAL NOTES
- CONTECH PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
 - DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
 - FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEER.
 - SOLUTIONS LLC REPRESENTATIVE. www.conteches.com
 - CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
 - CONTRACTOR TO PROVIDE SUFFICIENT LIFTING CAPACITY TO LIFT AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
 - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES, WATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
 - 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.
- INSTALLATION NOTES
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
 - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
 - CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES, WATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
 - 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
www.conteches.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-332-1122 513-845-7000 513-845-7803 FAX

CDS4040-8-C
ONLINE CDS
STANDARD DETAIL

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6583	M12	SH 37 OF 42	CONTR/CONS: 070664	M ID: 201024.01	PHASE: 90%
TOWNSHIP: 21N			DRAWING SCALE: AS NOTED		
RANGE: 3E			VERT: M.L.W.		
SECTIONS: 33 & 34			PORT ADDRESS: ONE SITUUM PLAZA		
TACOMA, WA 98401-1837			PRINTED BY: andrew Feb 01, 2018		
DIRECTOR ENG. DATE			PROJ. ENR DATE		
CHECKED BY DATE			APPROVED:		
STORMWATER TREATMENT					
DETAILS - HYDRODYNAMIC SEPARATOR - BASIN C					
PARAMETRIX ENGINEERING PLANNING DESIGN ENVIRONMENTAL SCIENCES					
TACOMA, WA 98401-1837					
MARK: REVISION: BY: APPR: DATE:					

INSTALLATION NOTES

- ## GENERAL NOTES

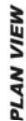
- THE PRODUCT DESCRIBED MAY BE
PROTECTED BY ONE OR MORE OF
THE FOLLOWING US PATENTS:
7,425,262; 7,470,362; 7,674,378
& 10,816, RELATED FOREIGN

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
CONSENT OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.



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

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



PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

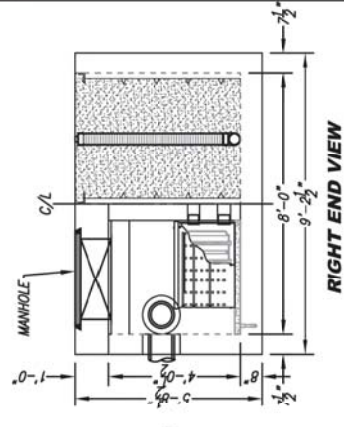
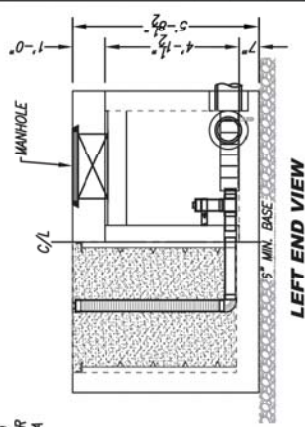
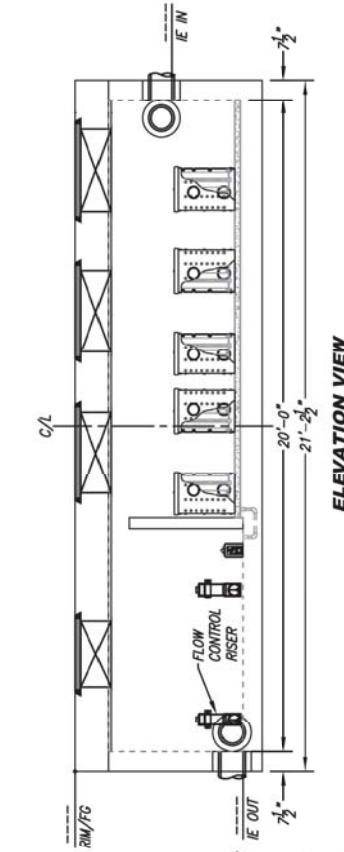
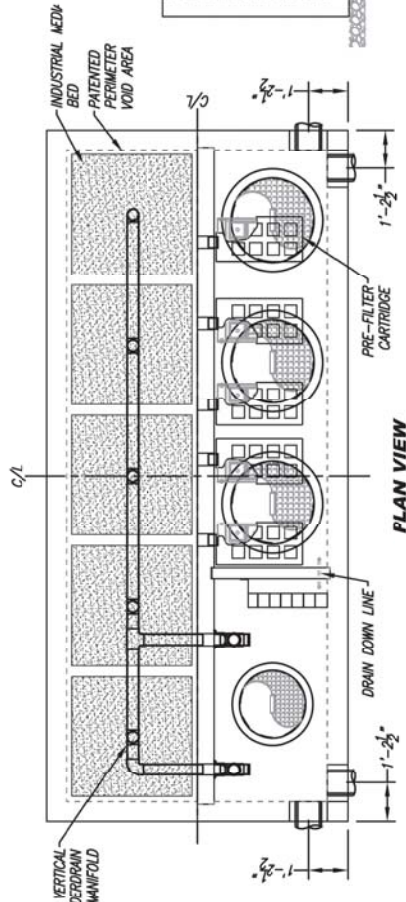
SITE SPECIFIC DATA			
PROJECT NUMBER	6543		
PROJECT NAME	NW5A - PORT OF TACOMA - WEST SITUM		
PROJECT LOCATION	TACOMA, WA		
STRUCTURE ID	-----		
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (GFS)		
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (GFS) - IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	
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
FRAME & COVER		3 EA #30"	N/A
INDUSTRIAL MEDIA VOLUME (CY)			14.93
INDUSTRIAL MEDIA DELIVERY METHOD			FSR CONTRACT
ORIFICE SIZE (DIA. INCHES)			3 EA #2.43"
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION. INDUSTRIAL MEDIA MIX REQUIRED.			

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND ACCESSORIES REQUIRED TO OUTFLOOD 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. PET 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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.
6. CONTRACTOR RESPONSIBLE FOR CONTACTING MODULAR WETLANDS FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A MODULAR WETLANDS REPRESENTATIVE.
- 7.

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.



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

BioClean
A Forterra Company

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 REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN
 PERMISSION OF MODULAR METALLOS SYSTEMS IS PROHIBITED.

THE PRODUCT DESCRIBED MAY BE
PROTECTED BY ONE OR MORE OF
THE FOLLOWING US PATENTS:
7,053,962; 7,470,362; 7,674,378
& 10,181,616. RELATED FOREIGN
PATENTS OR OTHER PATENTS PENDING

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 AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

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NOT FOR CONSTRUCTION

[illegible]

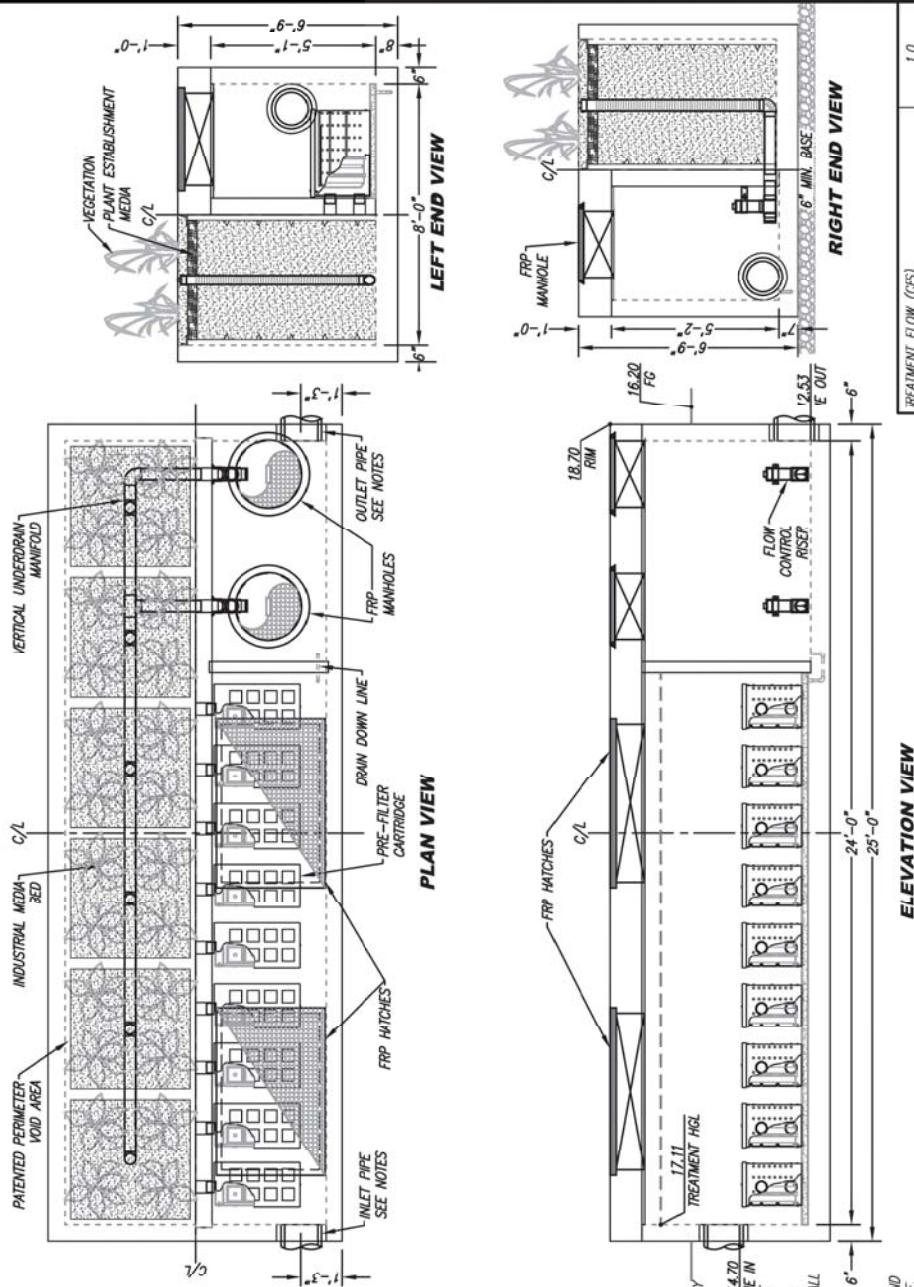
SITE SPECIFIC DATA				
PROJECT NUMBER				
PROJECT NAME				
PROJECT LOCATION				
STRUCTURE ID				
	TREATMENT REQUIRED			
	VOLUME BASED (CF)		FLOW BASED (CFS)	
	TREATMENT HOL AVAILABLE (FT)			N/A
	PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
	PIPE DATA		MATERIAL	DIAMETER
	INLET PIPE 1		N/K	N/K
	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			FFR CONTRACT
	ORifice SIZE (DIA. INCHES)			
	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 PIPES AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT. PEP MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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6. CONTRACTOR RESPONSIBLE FOR CONTACTING MODULAR WETLANDS FOR PRODUCTION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A MODULAR WETLANDS REPRESENTATIVE.

GENERAL NOTES

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



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

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



BioClean
A Forterra Company

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THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 7,025,262; 7,470,362; 7,674,378 & 10,318,116; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING.

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NOT FOR CONSTRUCTION

[illegible][illegible][illegible]



- NOTES:

PCP-A1 LOAD CALCULATIONS

PCP-B1 LOAD CALCULATIONSCP-C1 LOAD CALCULATIONS:

② ONE-LINE DIAGRAM
& LOAD CALCULATIONS

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6583	WEST SITCOM	APPROVED:	CHECKED BY DATE	DIRECTOR ENG. DATE	PROJ. ENGR DATE	PRINTED BY: wstcom01 01/2018	PORT ADDRESS: ONE SITCOM PLAZA TACOMA, WA 98401-1837				PHASE: 9024 M. ID: 201024.01 CONT./CONS: 070664 SHEET 48 OF 48 E02 TOWNSHIP: 21N RANGE: 33 & 34 DAT-HRZ: WA83-S PARCEL: SEE 502 DRAWING SCALE: AS NOTED	THIS DRAWING IS THE PROPERTY OF THE CITY OF TACOMA AND SHALL NOT BE USED ON OTHER WORK, DISCLOSED, COPIED, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION.
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6583

E04

SH 35 OF 42

CONTRACT NO. 070664

M. ID. 201024.01

PHASE: 90%

TOWNSHIP: 21N

RANGE: 3E

SECTIONS: 33 & 34

DATE: HRZ: WA83-S

PARCEL: SEE 002

DRAWING SCALE: AS NOTED

PRINTED BY: vandeplan feb 01, 2018

PORT ADDRESS: ONE SITCUM PLAZA

TACOMA, WA 98401-1837

APPROVED:

DIRECTOR ENG. DATE

PROJ. ENGR DATE

CHECKED BY DATE

MARK: REVISION:

BY:

APPR. DATE:

Parametrix

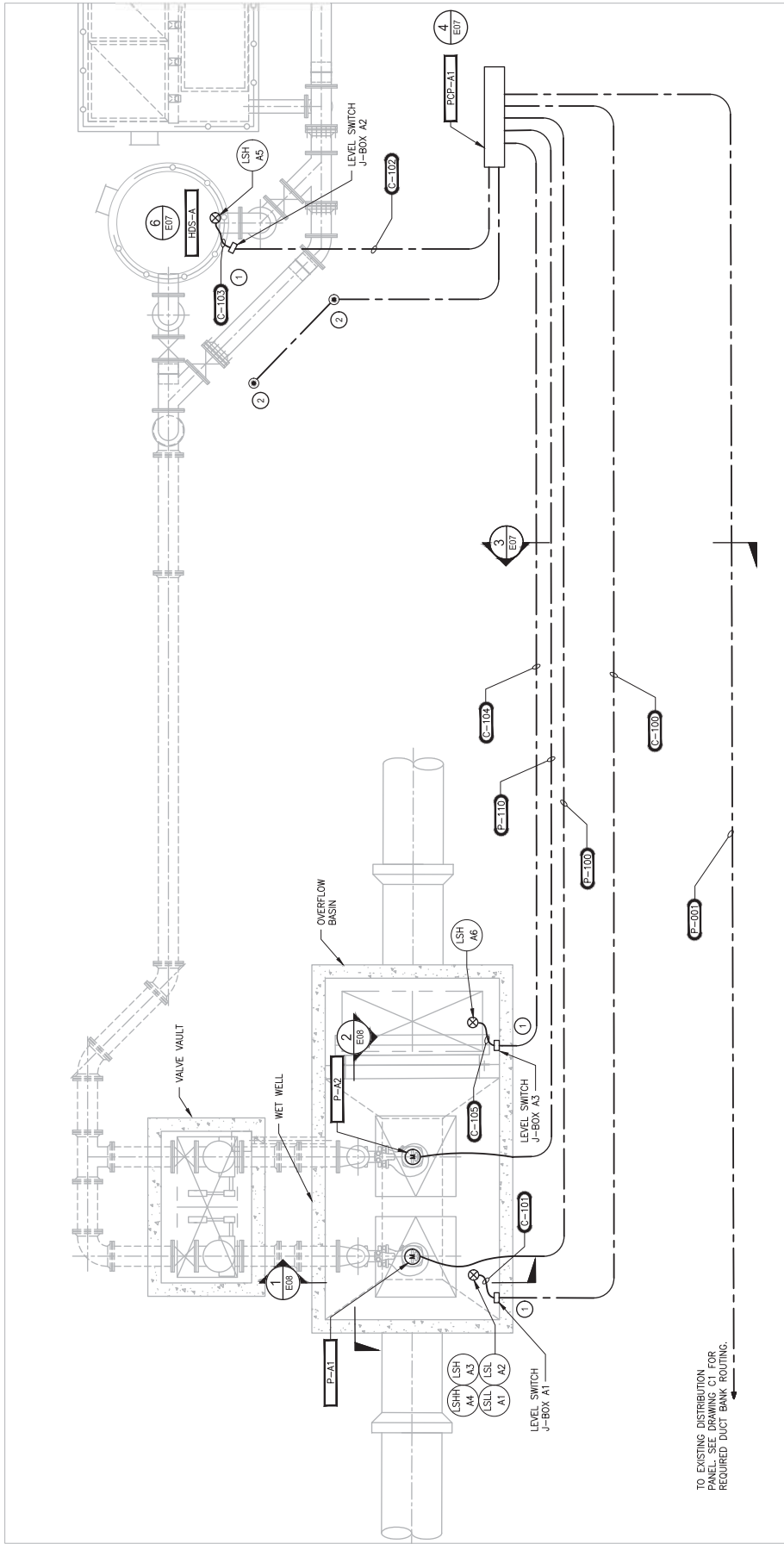
PROJECTING PLANNING ENVIRONMENTAL SCIENCES

Tacoma

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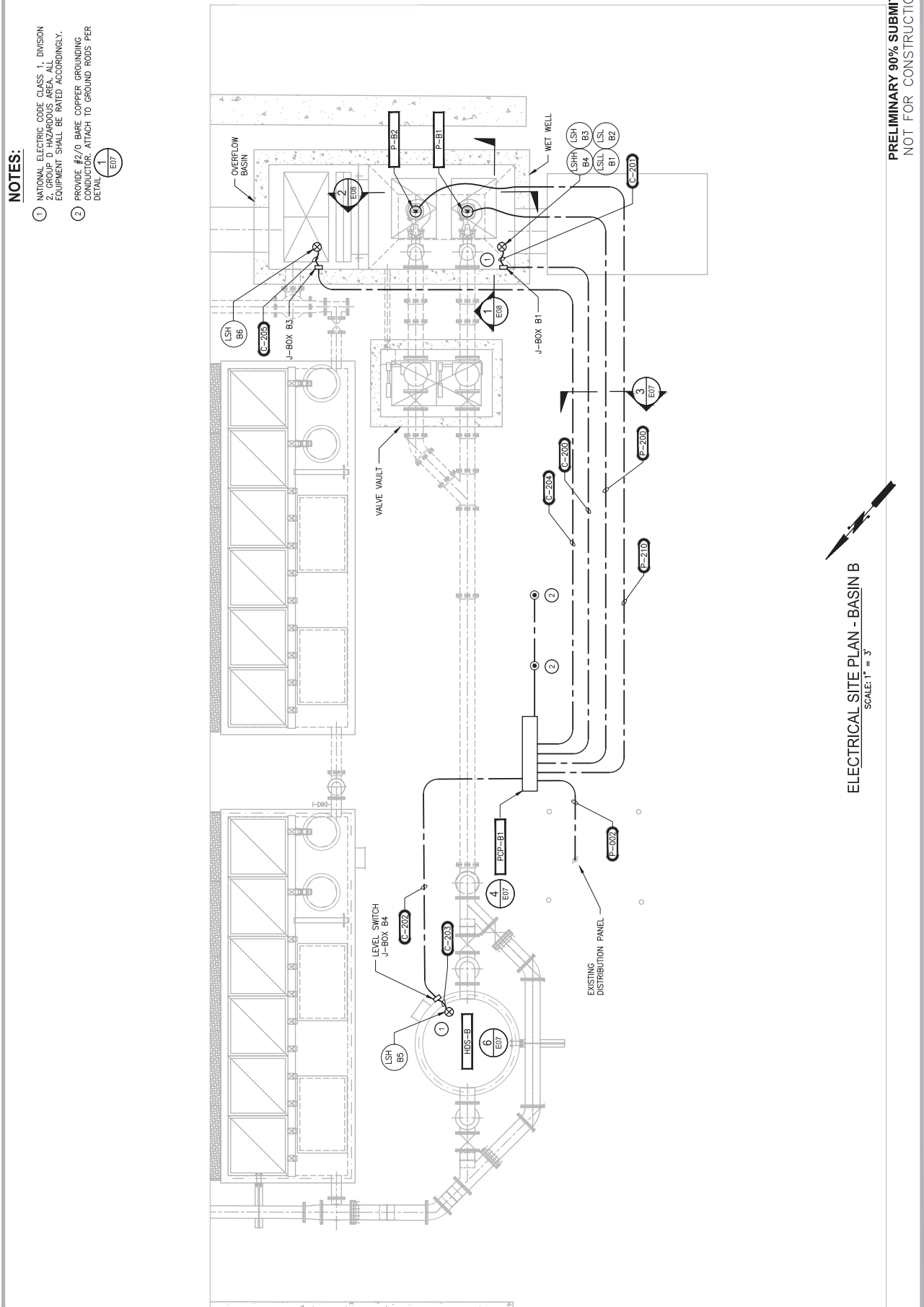
NOTES:

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



ELECTRICAL SITE PLAN - BASIN A
SCALE: 3/8" = 1'

PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION



6583		E05		SH OF 42	
CONTR/CONS: 070664		TOWNSHIP: 21N		RANGE: 3E	
M. ID: 201024.01		DATE-HRZ: WA83-S		VERT: MLW	
PHASE: 90%		DRAWING SCALE: AS NOTED		TACOMA, WA 98401-1837	
PRINTED BY: vandeplan Feb 01, 2018		PORT ADDRESS: ONE SITCUM PLAZA		DIRECTOR ENG. DATE	
CHECKED BY DATE		PROJ. ENGR DATE		APPROVED:	
MARK: REVISION:		BY:		APPR: DATE:	
PARAMETRIX		TACOMA		TACOMA	
TACOMA		TACOMA		TACOMA	



- PRELIMINARY 90% SUBMITTAL**
NOT FOR CONSTRUCTION

6583 E07 SH --- OF 42		CONT/CONS: 070664 DATE: 2010/04/01		PHASE: 90% MAPID:	
WEST SITCUM STORMWATER TREATMENT ELECTRICAL DETAILS - GENERAL		TOWNSHIP: 21N RANGE: 3E SECTIONS: 33 & 34		PORT ADDRESS: ONE SITCUM PLAZA TACOMA, WA 98401-1837	
APPROVED:		PRINTED BY: wondanah Feb 01, 2018 PLOT ENGR DATE		MARK: REVISION:	
CHECKED BY DATE		BY:		APPR: DATE:	
					



PUMP CABLE
INSTALLATION DETAIL ①

2

1

FLOAT SWITCH
INSTALLATION DETAIL

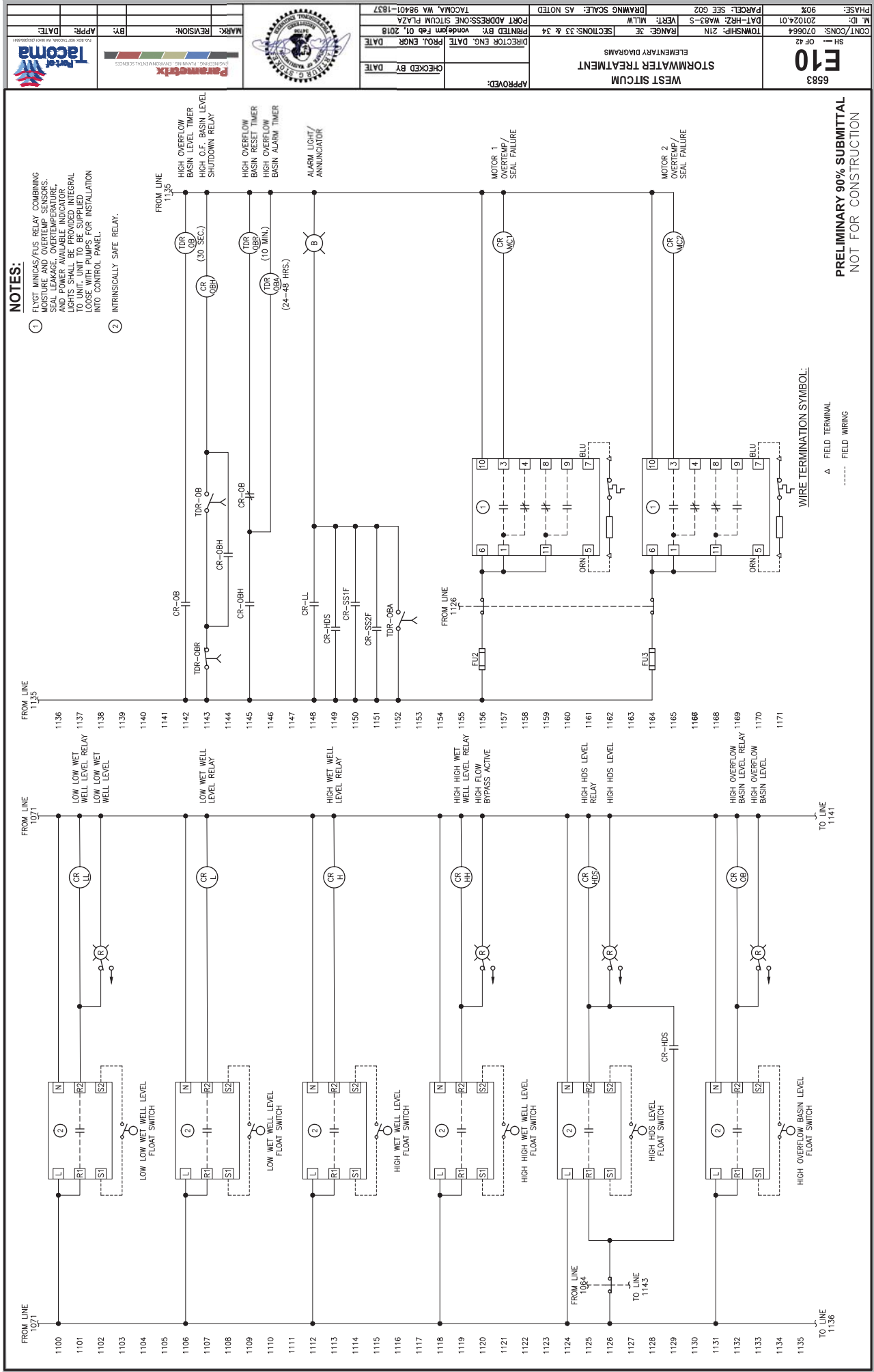
SCALE: NTS

NOTES:

1. DETAIL IS A TYPE
BASIN ELECTRICAL
ACTUAL LOCATION

CONDUIT AND WIRE SCHEDULE						
			CONDUIT	CABLE SIZE & QUANTITY		
NUMBER	FROM	TO	SIZE (")	POWER	CONTROL	SIGN AL
MAIN FEEDS						
P-001	EXISTING DISTRIBUTION PANEL	PCP-A1	1-1/4"	3#3, 1#63		
P-002	EXISTING DISTRIBUTION PANEL	PCP-B1	1-1/4"	3#3, 1#63		
P-003	EXISTING DISTRIBUTION PANEL	PCP-C1	1-1/4"	3#3, 1#63		
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
P-120						
C-100	PCP-A1	J-BOX A1 (FOR LEVEL SWITCHES)	3/4"		8#14, 1#14G	
C-101	J-BOX-A1	LSL-A1, LSL-A2, LSH-A3, LSH-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
P-220						
C-200	PCP-B1	J-BOX B1 (FOR LEVEL SWITCHES)	3/4"		8#14, 1#14G	
C-201	J-BOX-B1	LSL-B1, LSL-B2, LSH-B3, LSH-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
P-320						
C-300	PCP-C1	J-BOX C1 (FOR LEVEL SWITCHES)	3/4"		8#14, 1#14G	
C-301	J-BOX-C1	LSL-C1, LSL-C2, LSH-C3, LSH-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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NOT FOR CONSTRUCTION



PRELIMINARY 90% SUBMITTAL
NOT FOR CONSTRUCTION

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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Suite 110
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 temporarily 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.

— ○ • ○ —

DRAFT

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

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



MAP NOT TO SCALE

BASE MAP FROM NWSA / MAPBOX OPENSTREETMAP © 2018



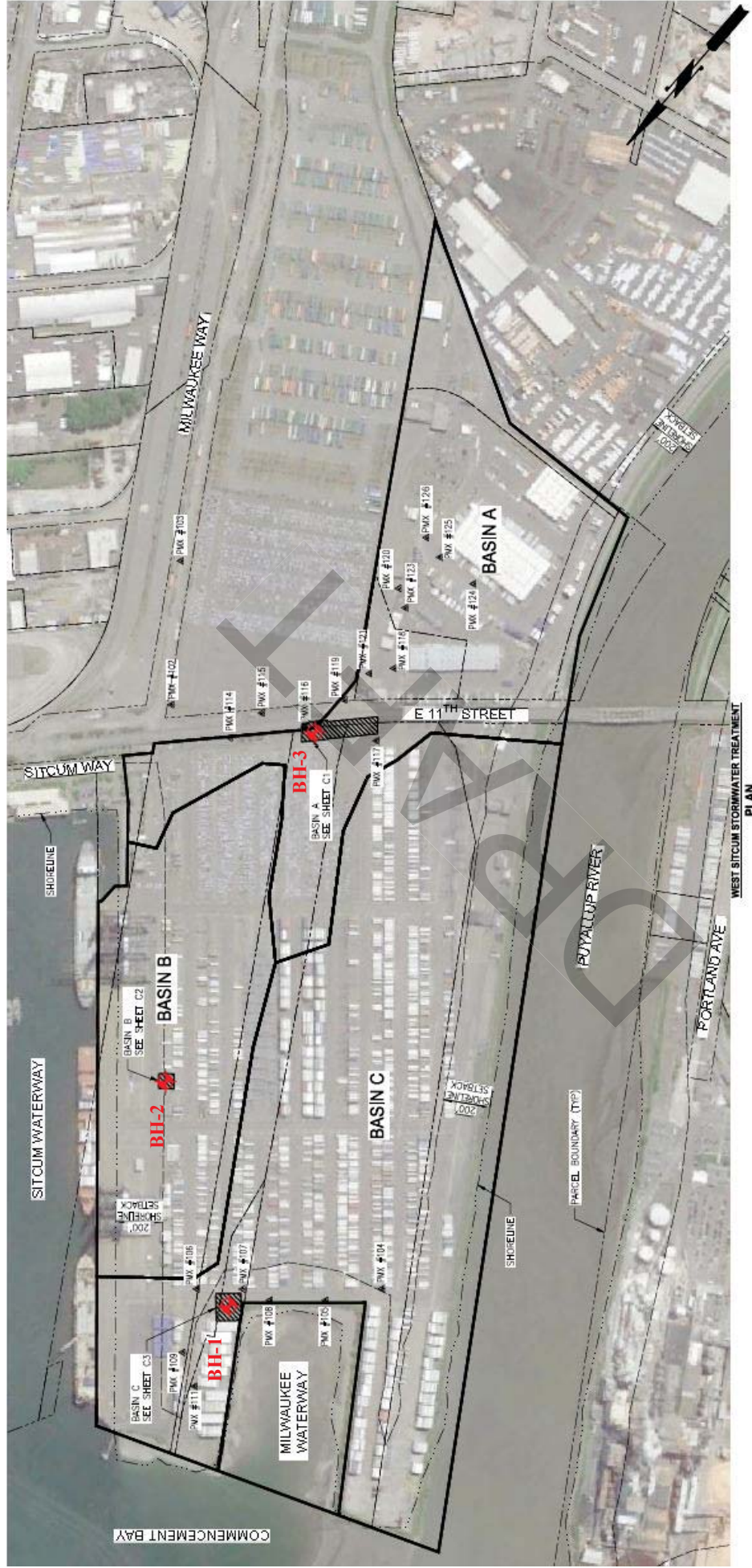
HWA GEOSCIENCES INC.

VICINITY MAP

**WEST SITCUM STORMWATER TREATMENT
TACOMA, WASHINGTON**

FIGURE NO. **1**

PROJECT NO.
2017-148-21



NOT TO SCALE

Legend

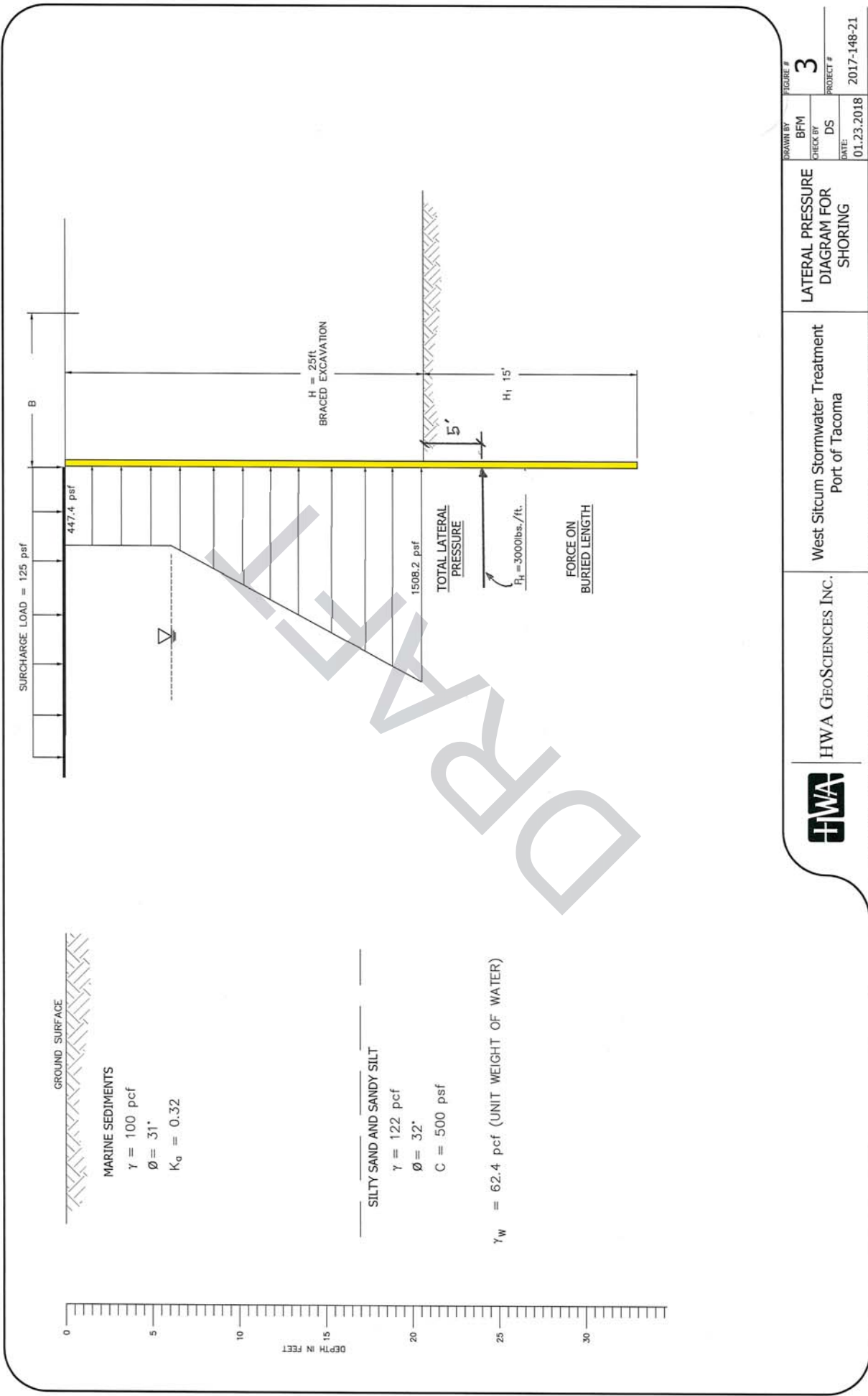


BH-3 Borehole Designation and Approximate Location

HWA HWA GEOSCIENCES INC.

SITE AND EXPLORATION PLAN
WEST SITCUM WASTEWATER
TREATMENT
TACOMA, WASHINGTON

FIGURE NO. **2**
PROJECT NO. 2017-148-21



APPENDIX A

EXPLORATION LOGS

DRAFT

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
				GP	Poorly-graded GRAVEL
		Gravel with Fines (appreciable amount of fines)		GM	Silty GRAVEL
				GC	Clayey GRAVEL
	Sand and Sandy Soils	Clean Sand (little or no fines)		SW	Well-graded SAND
				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
	Silt and Clay	Liquid Limit 50% or More		MH	Elastic SILT
				CH	Fat CLAY
				OH	Organic SILT/Organic CLAY
				PT	PEAT
Highly Organic Soils					

%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

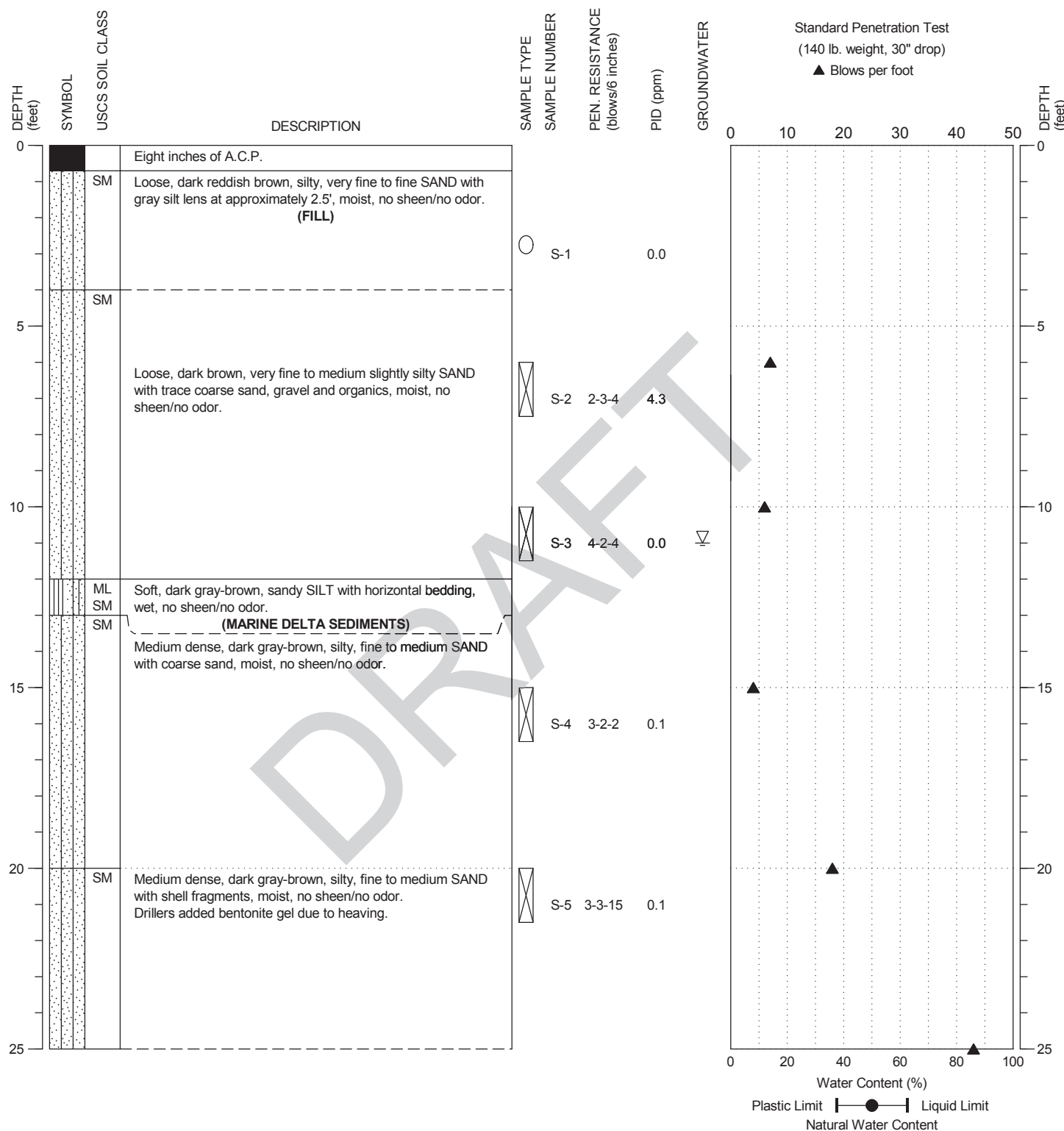
DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

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

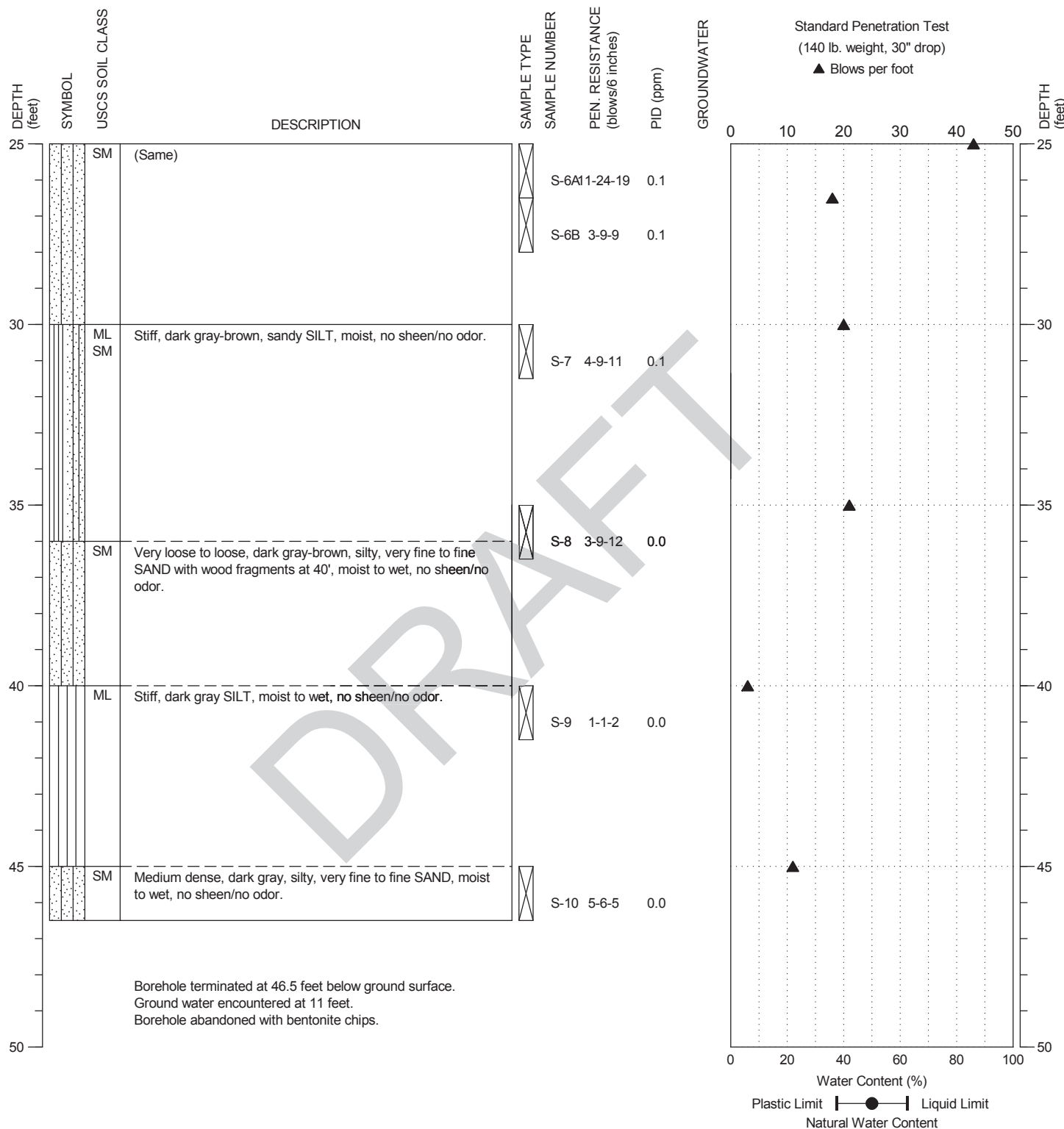


NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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

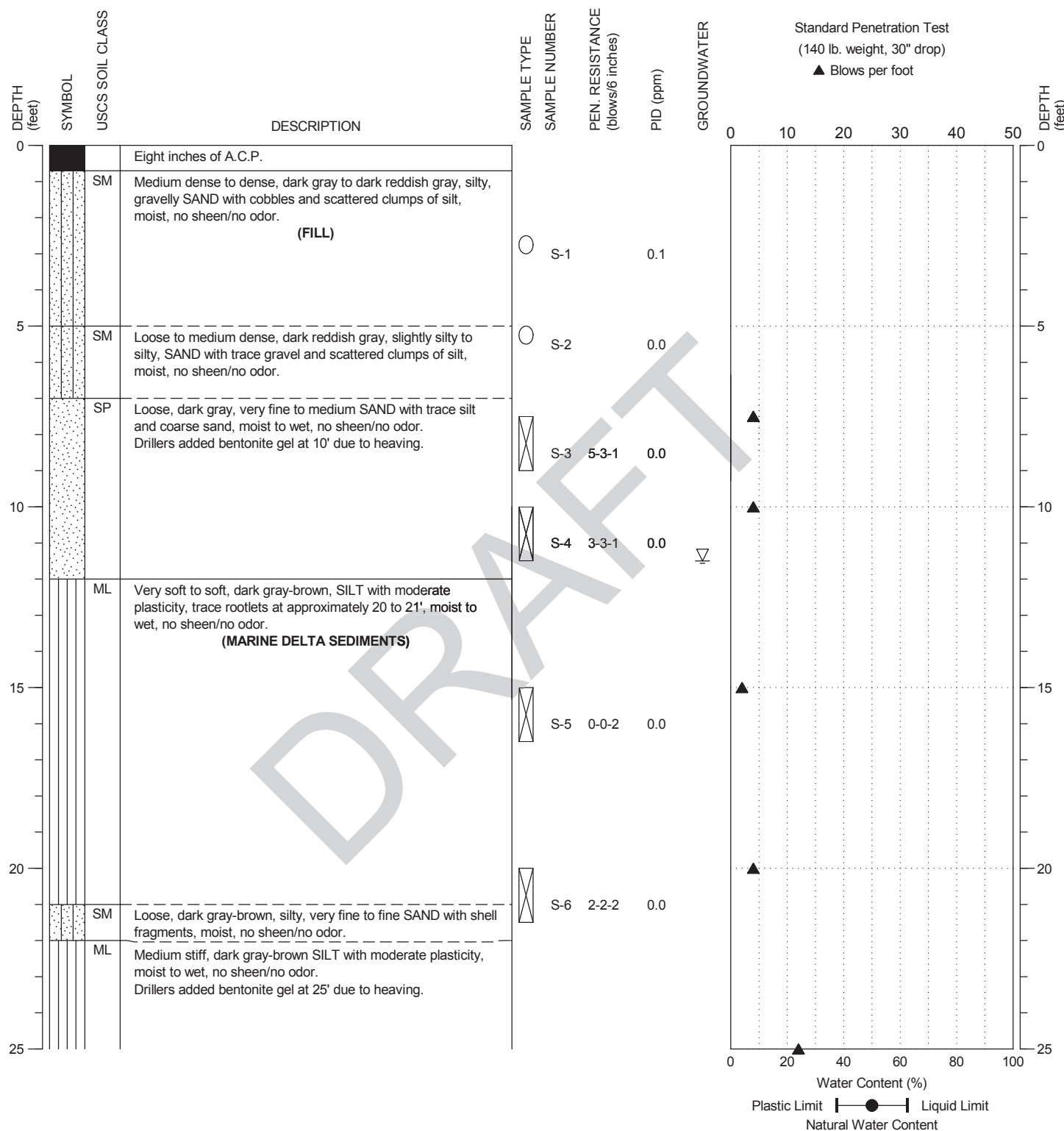


NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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

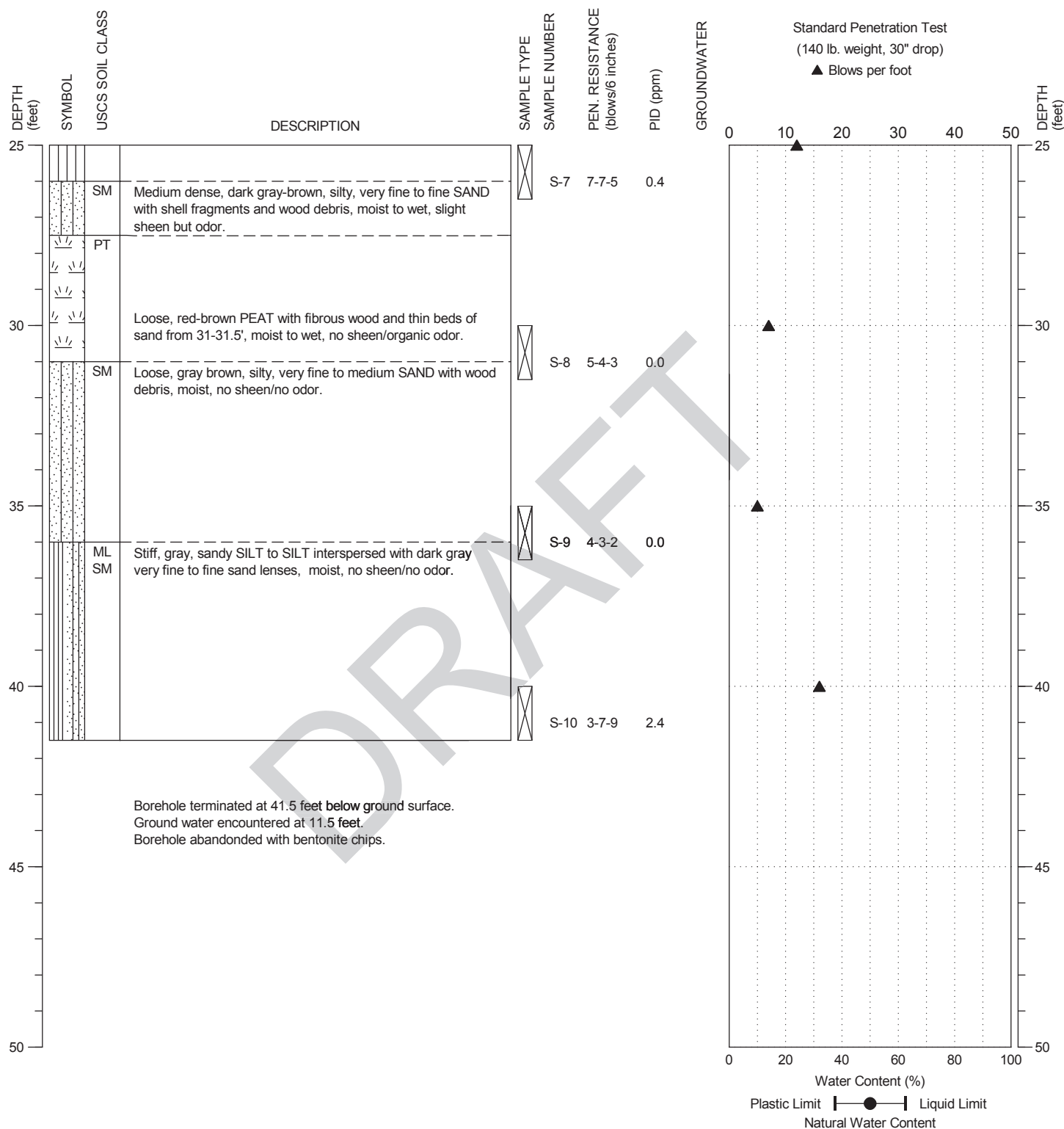
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 DATE COMPLETED: 1/4/2018
 LOGGED BY: NK



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

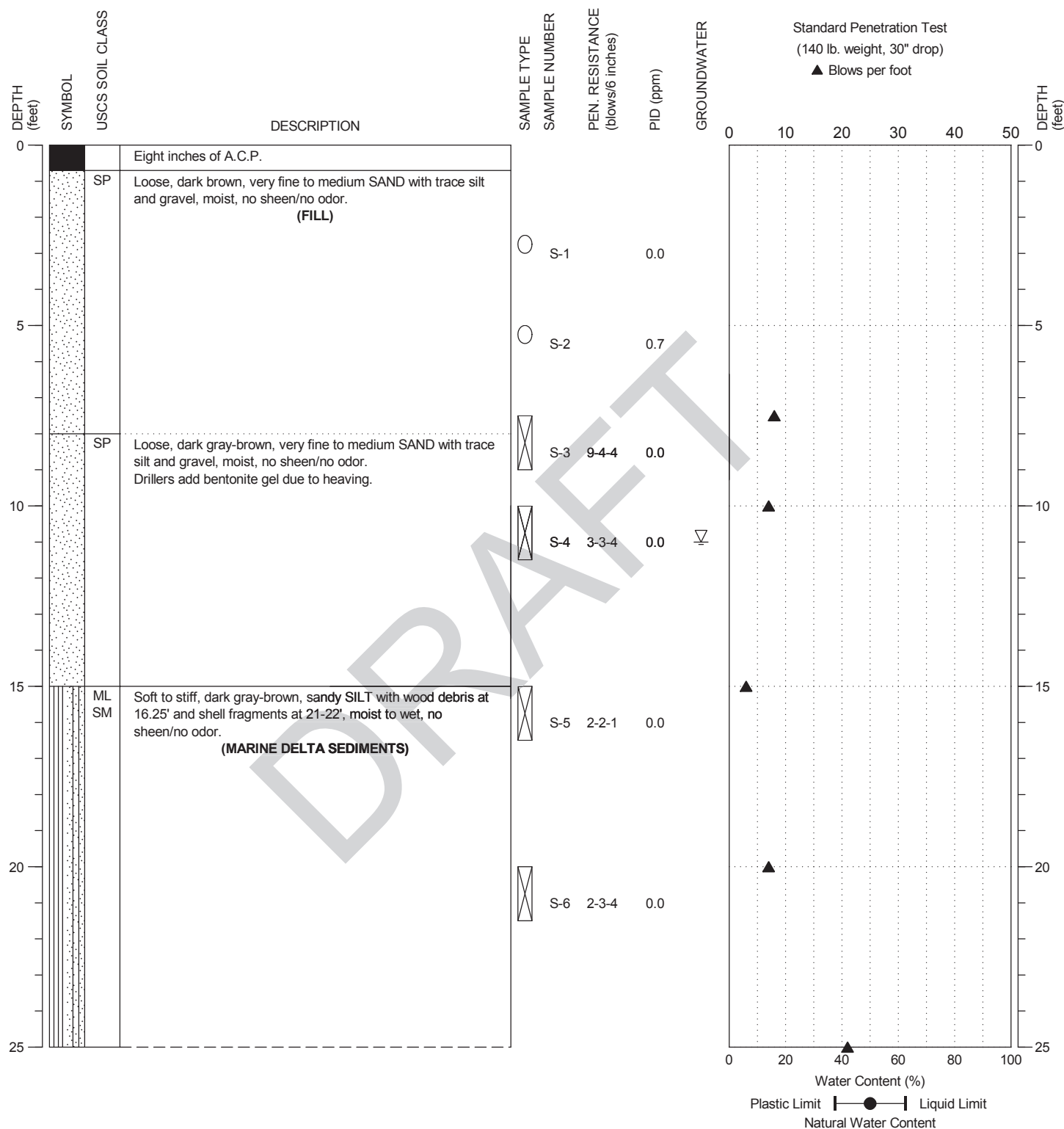


NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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

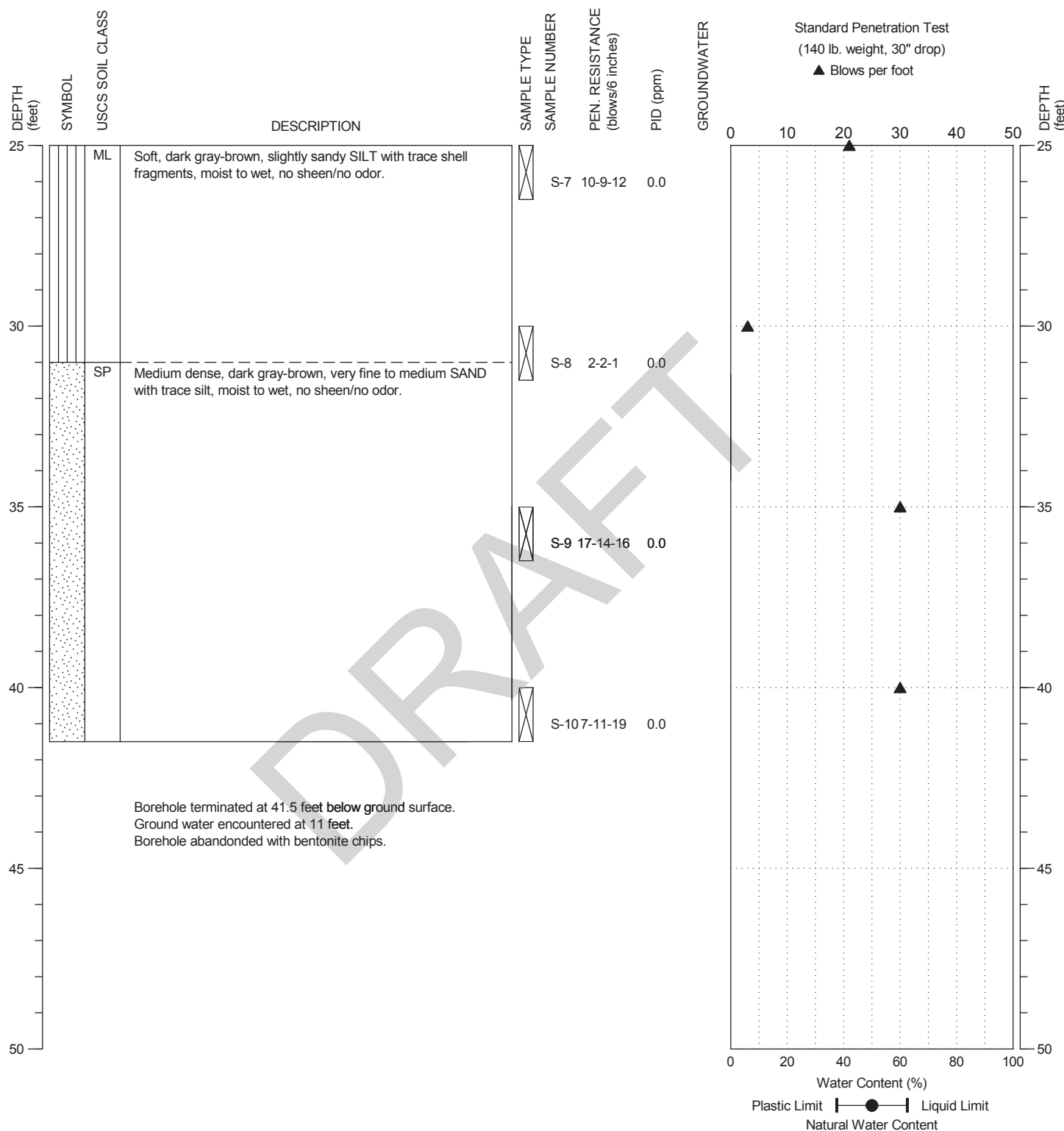


NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.