

File No.: 2026-229

July 27, 2026

s.22(1)

Dear s.22(1)

Re: **Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")**

I am responding to your request of March 21, 2026 under the *Freedom of Information and Protection of Privacy Act* for:

The following records relating to NCS Fluid Management, NCS Horizons Fluid Management Inc., NCS Fluid Handling Systems, and Technosub Group:

- 1. Contracts, agreements, or purchase orders;**
- 2. Invoices or payment summary;**
- 3. Records identifying whether the above entities have been paid by the City of Vancouver in relation to subcontract work that was completed;**
- 4. Records related to sewer bypass, dewatering, water management, river diversion, or emergency pumping services involving the above entities;**
- 5. For any records located that relate to awarded projects involving the above entities, please include records showing whether Indigenous engagement, Indigenous participation, or Indigenous procurement requirements applied, including but not limited to:**
 - a. Procurement documents, tender documents, RFPs, RFQs, or bid specifications;**
 - b. Evaluation criteria, scoring matrices, or compliance checklists;**
 - c. Contract clauses or schedules addressing Indigenous engagement or reconciliation requirements; and**
 - d. Internal memoranda, policy references, or exemption records indicating whether Indigenous engagement was required, optional, waived, or deemed not applicable for each project.**

Date range: April 1, 2022 to March 20, 2026.

All responsive records are attached. Please note, Neighbourhood Energy Branch staff have advised that there is no Indigenous engagement in this project. Also, there are no responsive records that specifically identify payment to NCS (and any of their variants) as they were a subcontractor to the Mechanical Contractor (Division 15 Mechanical) which was hired by the

General Contractor (Scott Special Projects). The line item in the general contractor invoice only refers to "sewage system".

Under Part 5 of the Act, you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your FOI request by writing to: Office of the Information & Privacy Commissioner, info@oipc.bc.ca or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number (2026-229); 2) a copy of this letter; 3) a copy of your original request; and 4) detailed reasons why you are seeking the review.

Yours truly,

Kevin Tuerlings, FOI Case Manager, for

[Signed by Kevin Tuerlings]

Siân Madsen, MA, MAS
Acting Director, Access to Information & Privacy

If you have any questions, please email us at foi@vancouver.ca and we will respond to you as soon as possible. You may also contact 3-1-1 (604-873-7000) if you require accommodation or do not have access to email.

Encl. (Response Package)

:pm



Greater Vancouver
200 - 4185A Still Creek Drive
Burnaby, BC V5C 6G9
T 604 294 2088
F 604 294 2090

Date: September 1, 2023

Components: FCEC SSP Bypass Plan

KWL Comments:

-

 KERR WOOD LEIDAL consulting engineers		☐ 1 Reviewed without comments. Work may proceed ☒ 2 Reviewed with comments. Work may proceed as noted ☐ 3 Revise and resubmit. Work may proceed as noted ☐ 4 Revise and resubmit. Work may not proceed ☐ 5 Not reviewed ☐ 6 Cancelled Submittal was reviewed for general conformance to the contract documents only. Contractor is responsible for component design, confirming dimensions at jobsite, for confirming and correlating tolerances, clearances and quantities, for fabrication processes and techniques of construction and for compliance with contract documents.				
Client						
City of Vancouver						
Project						
FCEC Expansion						
Contractor / Vendor						
SSP/Div-15/NCS						
Submittal Description						
Bypass Plan						
Reviewed By						
DCL						
KWL Project #	KWL Shop Dwg #	Rev #	Pages	Date Received	Date Released	Signature
0042.139			44	2023-08-31	2023-09-01	DCL

Submittal #122.1 - Temporary By-pass Pumping Plan

Revision	1	Submittal Manager	Nachiketh Kharad (Scott Construction Ltd.)
Status	Open	Date Created	30 Aug, 2023
Issue Date	30 Aug, 2023	Spec Section	
Responsible Contractor	Division 15 Mechanical Ltd.	Received From	Cathal Crowley (Division 15 Mechanical Ltd.)
Received Date	29 Aug, 2023	Submit By	
Final Due Date	13 Sep, 2023	Lead Time	
		Cost Code	
Location	PHASE 2	Type	Plans
Approvers	Babak Amiri (Kerr Wood Leidal Consulting Engineers), Abby Dacho (Kerr Wood Leidal Consulting Engineers), David Lumb (Kerr Wood Leidal Consulting Engineers), Paige Ross (Kerr Wood Leidal Consulting Engineers)		
Ball in Court	Babak Amiri (Kerr Wood Leidal Consulting Engineers), Abby Dacho (Kerr Wood Leidal Consulting Engineers), David Lumb (Kerr Wood Leidal Consulting Engineers), Paige Ross (Kerr Wood Leidal Consulting Engineers)		
Distribution	Youni Kim (City of Vancouver), Trevor Ingelbeen (Celco Automation Ltd.), Steve Lacamell (Scott Construction Ltd.), Sreenath Prathapachandran (Division 15 Mechanical Ltd.), Scott Clarke (City of Vancouver), Ryan Willett (Scott Special Projects Ltd.), Patty Steiger (Western Pacific Enterprises (Vancouver)), Paige Ross (Kerr Wood Leidal Consulting Engineers), Neil Rivington (Western Pacific Enterprises (Vancouver)), Nachiketh Kharad (Scott Construction Ltd.), Mohammed Sheha (Kerr Wood Leidal Consulting Engineers), Marcus Kotierk (Division 15 Mechanical Ltd.), Jennifer Davis (City of Vancouver), David Lumb (Kerr Wood Leidal Consulting Engineers), Dan Ternoway (Western Pacific Enterprises (Vancouver)), Cathal Crowley (Division 15 Mechanical Ltd.), Carlo Sarmiento (Kerr Wood Leidal Consulting Engineers), Babak Amiri (Kerr Wood Leidal Consulting Engineers), Ali Bhangu (City of Vancouver), Alex Charpentier (City of Vancouver), Abby Dacho (Kerr Wood Leidal Consulting Engineers)		
Description	Hello, Please see the attached revised by-pass pumping plan addressing comments from KWL and COV for review. Thanks Nachiketh		

Submittal Workflow

Name	Sent Date	Due Date	Returned Date	Response	Attachments
General Information Attachments					Electric Pumps - Single Line Diagram.pdf 122 - FCEC Bypass Pumping Roles & Responsibilities.pdf 122 - FCEC Shutdown & Tie-in Markups - 20230726-SSP.pdf 122-19-1.PDF BYPASS-1.PDF 2023-08-23_BypassPlan_Review_Comment_Log.xlsx
Babak Amiri	30 Aug, 2023	13 Sep, 2023		Pending	
Abby Dacho	30 Aug, 2023	13 Sep, 2023		Pending	
David Lumb	30 Aug, 2023	13 Sep, 2023		Pending	

Name	Sent Date	Due Date	Returned Date	Response	Attachments
Paige Ross	30 Aug, 2023	13 Sep, 2023		Pending	

SCOTT SPECIAL PROJECTS LTD.

Review of this submittal is for compliance with the general intent of the contract. This review does not relieve the Sub-Contractor, Vendor, or Manufacturer of responsibility for errors or omissions in the submission or the responsibility for meeting all requirements of the contract documents. Any deviation from the contract documents initiated by the Sub-Contractor, Vendor, or Manufacturer shall be at its own sole risk. Quantities and detail dimensions are the sole responsibility of the Sub-Contractor, Vendor, or Manufacturer. Verify data with field dimensions

- ☐ Reviewed
- ☒ Reviewed as Noted
- ☐ Revise and Resubmit

**NCS**
FLUID SYSTEMS

TEMPORARY BYPASS PLAN

DIVISION 15 MECHANICAL – FALSE CREEK ENERGY CENTER

NCS FLUID SYSTEMS

23853 Fraser Highway

Langley, BC

Branch/Project Manager: Shawn Mitchell

Date: Aug 4, 2023

Phone: 778.846.4988

Email: smitchell@ncsfluidsystems.caPrepared by: Shawn Mitchell &
Meaghan Brown



NCS FLUID SYSTEMS BYPASS PLAN

1.0 TECHNICAL APPROACH

1.1 INTRODUCTION

The team at NCS is pleased to present the following bypass plan to Division 15 Mechanical. It has been determined that a temporary bypass of all flows from the FCEC Pump Station to discharge to existing force main tie in are required. This proposal has been prepared by NCS Fluid Handling Systems based on information received by Division 15 Mechanical and The City of Vancouver. This bypass plan is based on many years of field experience and successful prior project executions & engineered calculations to validate the execution strategy & technical approach.

1.2 SCOPE OF WORK

1.2.1 DESIGN PARAMETERS

This temporary bypass plan is based around the following parameters:

Bypass Route	Suction Depth ft (m)	Estimated Discharge Length from Manifold ft (m)	Peak Flows US GPM (lps)	Pump	Peak Flow per Pump US GPM	TDH @ Peak Capacity ft (m)
EX wet well chamber @ FCEC Lift Station (Primary Pumps)	14.04 ft (4.3m)	150.0ft (45.7 m)	8719 GPM (550 lps)	A	3800	99.4 ft (30.3m)
				B	3800	99.5 ft (30.3m)
EX wet well chamber @ FCEC Lift Station (Stand-by Pumps)	14.04 ft (4.3m)	150.0ft (45.7 m)	8719 GPM (550 lps)	C	4359	101.2 ft (30.9m)
				D	4359	101.2 ft (30.9m)

Table 1.2.1

The temporary sewer bypass will be required for the FCEC Pump Station. The anticipated peak capacity flow was provided by The City of Vancouver rated at 8,719 GPM (550 lps). As this flow is divided between two pumps, NCS suggests the following pump selections to provide optimum pump and fuel consumption efficiencies. With a divided flow rate to accommodate for both the peak wet weather flow (PWWF) and average flows provided by The City of Vancouver. Along with measurements gathered through communications and visits to the project, the number of primary & standby pumps, diameter and length of both suction & discharge piping have been specifically selected to achieve an efficient temporary bypass pumping system. Note - primary can only carry 3800GPM each. With both primary pumps in operation, this will carry 87% of the peak flow rate of 8,719 GPM. The standby pumps can achieve the full 8,719GPM, if required, or any residual flow the primary pumps cannot achieve if a peak weather event occurs.

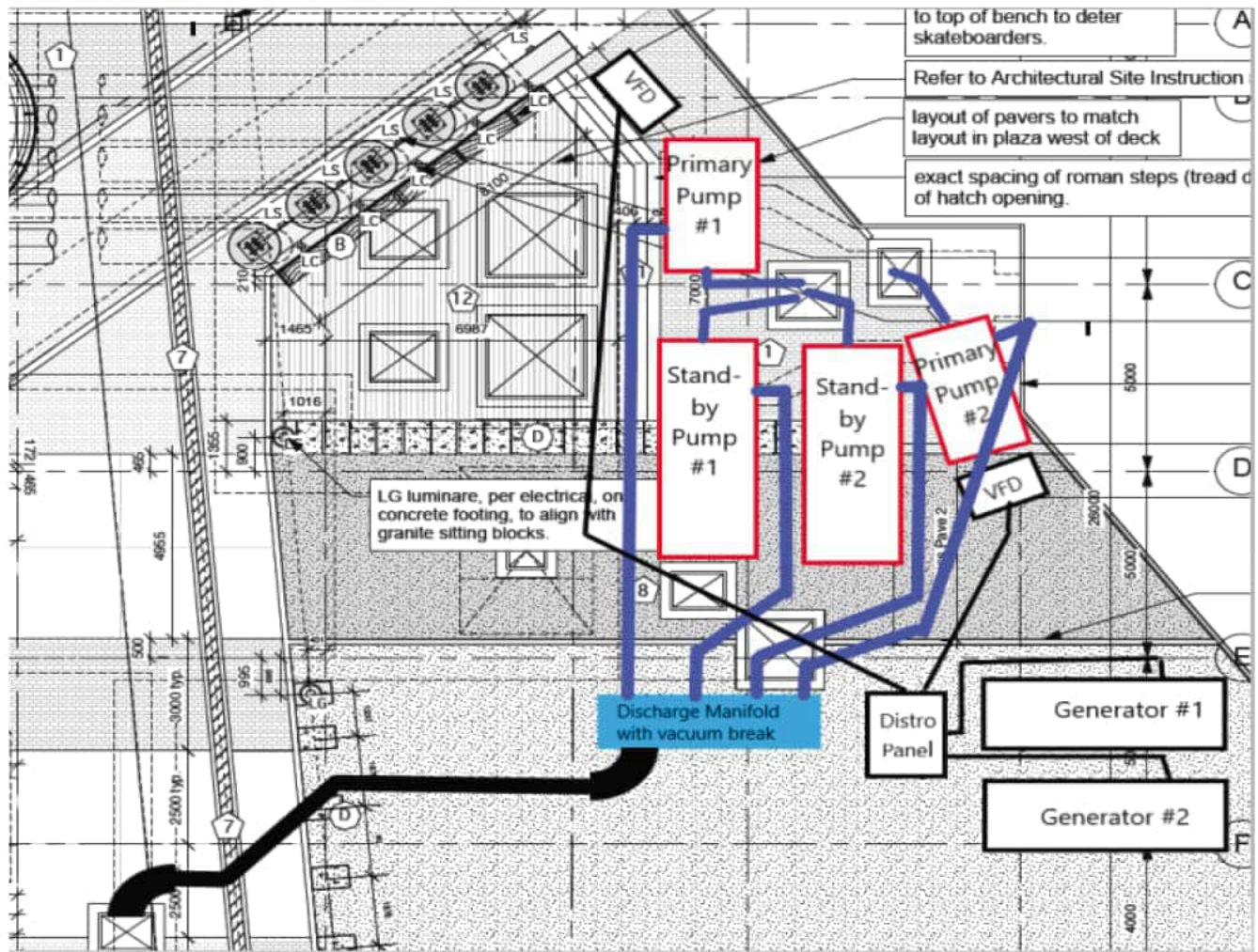


1.2.2 EQUIPMENT

NCS recommends the following models for the bypass system to manifold:

Stage	Suction/Discharge Lines (Ø)	Pump
EX wet well chamber @ FCEC Lift Station (Primary Pumps)	Suction - 20' x 16" Ø Discharge - 40' x 16" Ø	CORNELL 8NHTA (PRIMARY PWWF)
	Suction - 25' x 16" Ø Discharge - 40' x 16" Ø	CORNELL 8NHTA (PRIMARY PWWF)
EX wet well chamber @ FCEC Lift Station (Stand-by Pumps)	Suction - 20' x 16" Ø Discharge - 40' x 16" Ø	12" Global GST (STANDBY PWWF)
	Suction - 20' x 16" Ø Discharge - 40' x 16" Ø	12" Global GST (STANDBY PWWF)

1.2.3 PROJECT LAYOUT OVERVIEW



SSP to provide ladder for main hatch to address concern of blocking access hatch.

Fall protection to be in place around open hatches.

Figure 1.2.3.1 - False Creek Energy Centre Pump Station Bypass Layout - Aerial



2.0 SYSTEM OPERATION

For this bypass operation, there are two different primary running pumps:

1. Main Primary - Flow Rate: 3,800 GPM (239 lps)
2. Second Primary - Flow Rate: 3,800 GPM (239 lps)

Both pumps combined will achieve 87% of the peak wet weather flow (PWWF) rate of 8,719 GPM (550 lps) provided by the City of Vancouver.

2.1 SYSTEM DESIGN

Two (2) pumps will operate to meet 87% of the required peak wet weather flow (PWWF) rate of 8,719 GPM provided by CoV. These pumps will be set up with (2) diesel driven 12" x 12" stand-by pumps to provide a 100% redundancy rate in the event of peak wet weather flow being exceeded, or primary pump failure. As there will be two (2) primary pumps installed, the flow rate of 3,800 GPM will be delivered by each pump.

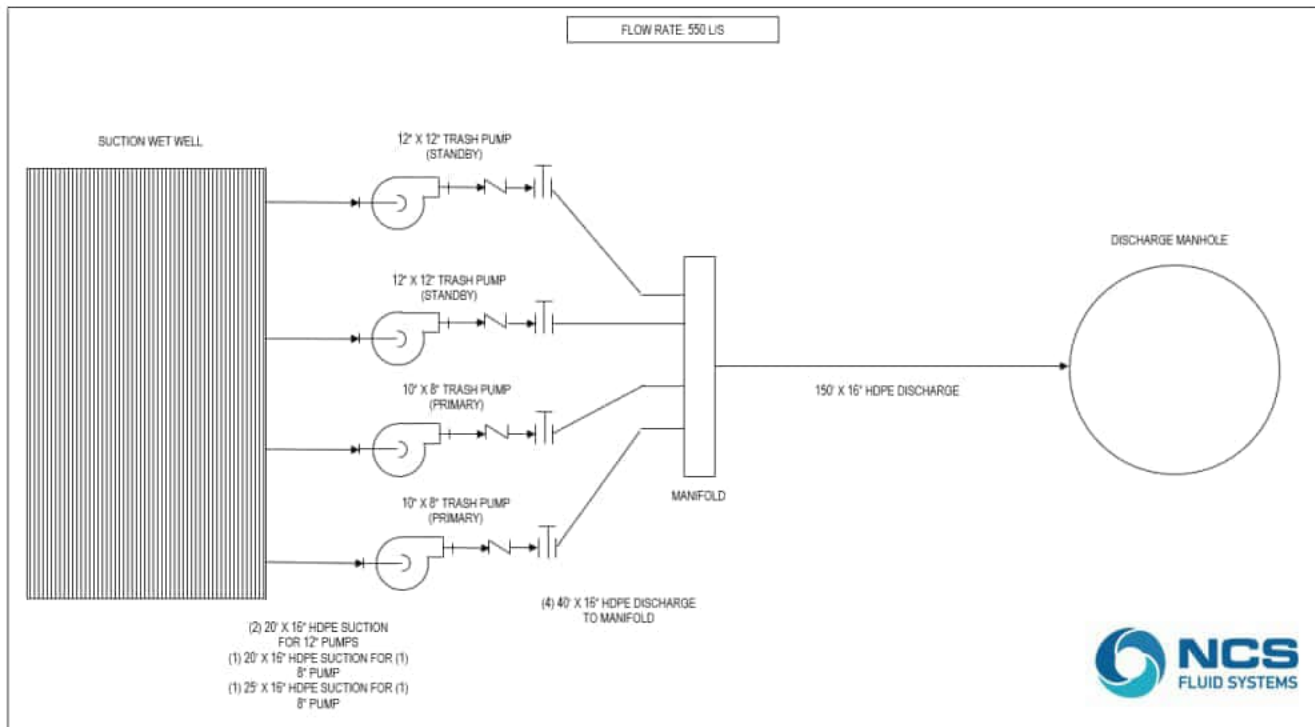


Figure 2.1.1 - False Creek Energy Centre Pump Station Bypass P&ID

One (1) 10" X 8" primary pump and (2) 12" X 12" standby pumps will be connected to individual 16" X 20' HDPE DR17 individual suction lines drawing from the wet well. The last 10" X 8" primary pump will be connected to individual 16" X 25' HDPE DR17 suction line to overcome footprint constraints, placing the second primary pump further back. The suction HDPE will exit out of the wet well elbowing into the pumps that will have a 16" X 40' HDPE DR 17 discharge that connects to a 24" discharge manifold. The discharge distance from the discharge manifold to the force main tie-in is 150' of 16" HDPE DR17. The pressure required at the force main tie in point has been provided at a maximum of 30 psi.

Concrete lock blocks can be used with strapping for restraining and support. SPP & Div 15 will provide the restraints for piping. NCS can provide ratchet straps for securing the HDPE pipe to the spools. HDPE pipe



spools will be fused to create each desired length with flanged connections to pumps, manifold and 24" force main tie in (8" camlock will not be used).

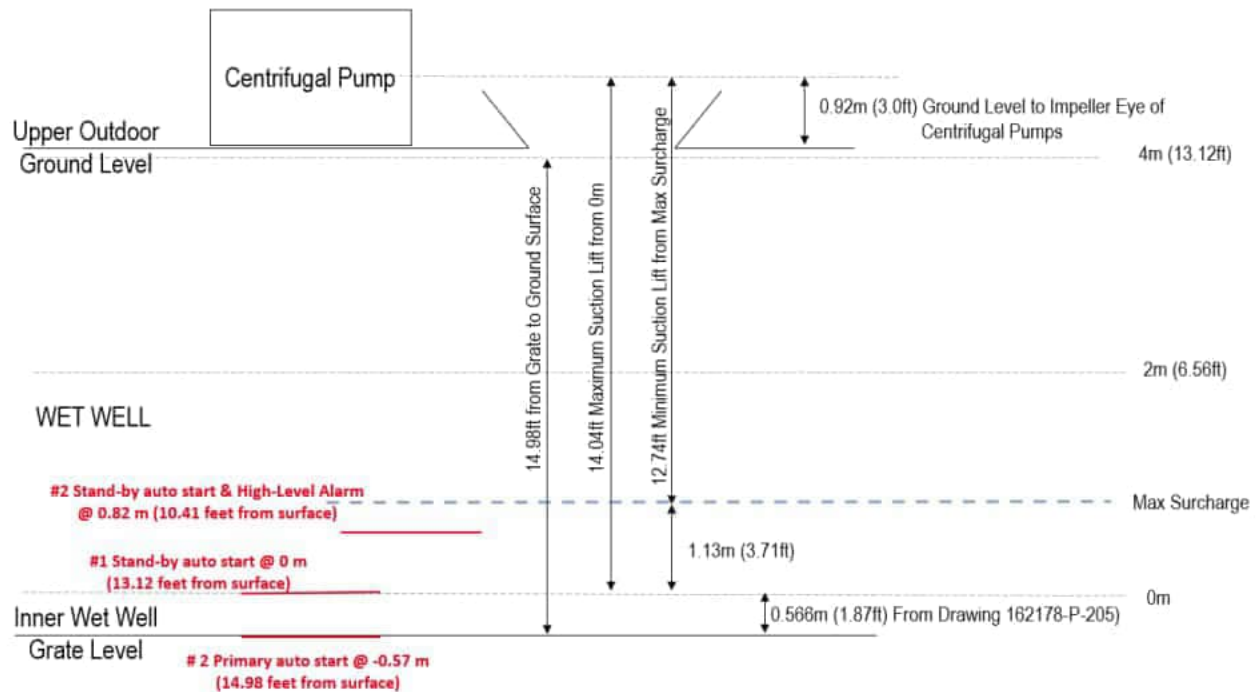
As the HDPE provided will be utilized out of NCS rental fleet, the 16" HDPE DR17 will either be 4710 Resin (125psi pressure rating) or 3408 Resin (100psi pressure rating), in which both are still within specs of pressures of provided pump operations.

12" x 12" Global Standard Trash Standby Pumps with diaphragm prime and semi open impeller wet ends will operate as outlined above to meet CoV's flowrate of 8,719 GPM in the event of a single pump failure. The suction pipe will be installed as low as possible for optimal flowrate on the standby pumps. The wet well depth to the grate level of 14.04 ft was identified from drawing # 162178-P-205, which has been taken into consideration through a review of the NPSH for the standby pumps in the proposed system.

2.4 PRIMARY PUMP ENGINEERING CALCULATIONS

2.4.1 SUMMARY

Peak Flow (GPM)	Pump Label	Pump	Flow Per Pump (GPM)	Discharge Pipe Diameter (in.)	Static Suction Lift (ft.)	Discharge Length (ft.)	Total Equivalent Length (ft.)	Friction Loss per 100ft	Total Dynamic Head (ft.)
8719	A	Cornell 8NHTA	3800	16	14.04	150.0	14.53	1.31 (Split Flow Rate) 6.74 (Full Flow Rate)	99.4
	B	Cornell 8NHTA	3800	16	14.04	150.0	14.53	1.87 (Split Flow Rate) 6.74 (Full Flow Rate)	99.5



Stop level for each pump will be set to the start to the previous pumps start level. Primary #2 will be set at 1 foot below its start level.

2.2.3 TOTAL DYNAMIC HEAD CALCULATIONS PUMP A - CORNELL 8NHTA - PRIMARY

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{c}\right)^{1.852} \times \frac{q^{1.852}}{d^{4.8655}}$$

where: c = pipe roughness coefficient (130 used for these calculations)
 q = flow rate (gpm)
 d = pipe diameter (inches)

16" HDPE SUCTION & DISCHARGE (TO MANIFOLD) (14" ID)

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{130}\right)^{1.852} \times \frac{3800^{1.852}}{14^{4.8655}}$$

$$= 1.44 \text{ ft}$$



16" HDPE DISCHARGE (AFTER MANIFOLD) (14" ID)

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{130}\right)^{1.852} \times \frac{8719^{1.852}}{14^{4.8655}}$$

$$= 6.74 \text{ ft}$$

16" Suction Side @ 3800 GPM			
Length	=	20.0	ft
(1) 16" 90 degree	= 43.2 x 1	=	43.2 ft
(1) 16" 45 degree	= 43.2 x 1	=	43.2 ft
Total	=	106.4	ft

16" Discharge Side @ 3800 GPM			
Length	=	40.0	ft
(1) 16" Check Valve	= 176.0 x 1	=	176.0 ft
(1) 16" Tee	= 91.2 x 1	=	91.2
Total	=	307.2	ft

16" Discharge Side @ 8719 GPM			
Length	=	150.0	ft
	=	150.0	ft

Friction Loss Calculator				
Friction Loss in Suction Pipe	=	$\frac{\text{Total Suction Friction Loss} \times \text{Friction Loss per 100ft at 3800 GPM}}{100}$	=	$\frac{106.4 \times 1.44}{100} = 1.53 \text{ ft}$
Friction Loss in Discharge Pipe	=	$\frac{\text{Total Discharge Friction Loss} \times \text{Friction Loss per 100ft at 3800 GPM}}{100}$	=	$\frac{307.2 \times 1.44}{100} = 4.42 \text{ ft}$
Friction Loss in Discharge Pipe	=	$\frac{\text{Total Discharge Friction Loss} \times \text{Friction Loss per 100ft at 8719 GPM}}{100}$	=	$\frac{150.0 \times 6.74}{100} = 10.11 \text{ ft}$
Force Main		= 69.3	=	69.3 ft
Suction Lift		= 14.04	=	14.04 ft
TDH				= 99.4 ft

Based on the above calculations, the duty point for the system required is **3800 GPM @ 99.4 FT.**



2.2.3.1 SYSTEM CURVE

Figure 2 displays the system curve for the primary pump, (1) one Cornell 8NHTA with 20' of 16" DR17 Suction and 40' 16" DR17 to manifold plus 150' of 16" DR17 HDPE piping to meet the peak flow of 3,800 GPM and calculated 99.4 ft TDH.

--- Duty Point ---	
Flow:	3802 US gpm
Head:	99.5 ft
Eff:	74.1%
Power:	127 hp
NPSHr:	14.5 ft
Speed:	1374 rpm
--- Design Curve ---	
Shutoff Head:	209 ft
Shutoff dP:	90.7 psi
Min Flow:	1139 US gpm
BEP:	82% @ 2849 US gpm
NOL Power:	127 hp @ 4102 US gpm
--- Max Curve ---	
Max Power:	397 hp @ 5782 US gpm

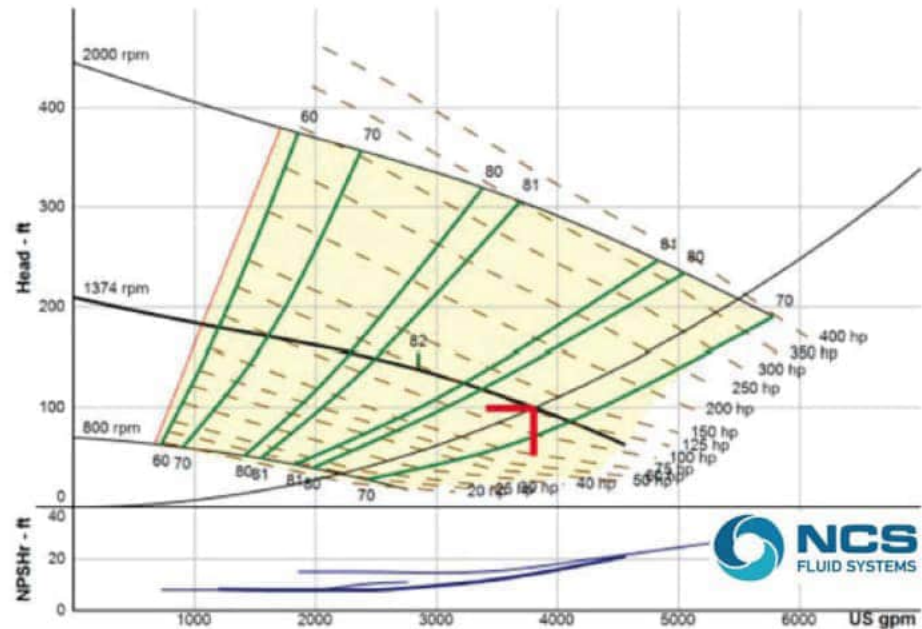


Figure 2.2.3.1 - System Curve PUMP A 3800 GPM @ 99.4 FT

2.2.3.4 NPSHA CALCULATIONS

Atmospheric Pressure (@ 2116 ft.)	Suction Lift	Suction Friction Loss	Vapour Pressure (@ 10 °C)
33.94 ft	14.04 ft	1.53 ft	0.41 ft



NPSHa Calculator

$$NPSHa = \text{Atmospheric Pressure} - \text{Suction Lift} - \text{Suction Friction Loss} - \text{Vapour Pressure}$$

$$NPSHa = 33.94 - 14.04 - 1.53 - 0.41$$

$$NPSHa = 18.0$$

$$NPSHa > NPSHr$$

$$18.0 \text{ ft} > 14.5 \text{ ft}$$

exceeds minimum of 3ft

2.2.3.5 PUMP SELECTION AND SPECIFICATIONS

2.2.3.5.1 PARAMETERS

With a duty point of 3800 GPM @ 99.4, NCS has selected the Cornell 8NHTA (or equivalent).

The 8NHTA has the following specifications:

Max Flow: 5,000 US GPM [315.5 LPS]

Max Head: 350 ft [106.7 m]

Solids Handling: 3.38" diameter [85.85 mm]

Driver: Electric Motor

Max Operating Speed: 1800 rpm

2.2.3.5.2 FUEL CONSUMPTION

The fuel consumption for the 8NHTA is determined by the associated generators. Generator data sheet provided to Division 15.



2.2.3 TOTAL DYNAMIC HEAD CALCULATIONS PUMP B - CORNELL 8NHTA - PRIMARY

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{c}\right)^{1.852} \times \frac{q^{1.852}}{d^{4.8655}}$$

where: c = pipe roughness coefficient (130 used for these calculations)
 q = flow rate (gpm)
 d = pipe diameter (inches)

16" HDPE SUCTION & DISCHARGE (TO MANIFOLD) (14" ID)

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{130}\right)^{1.852} \times \frac{3800^{1.852}}{14^{4.8655}}$$

$$= 1.44 \text{ ft}$$

16" HDPE DISCHARGE (AFTER MANIFOLD) (14" ID)

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{130}\right)^{1.852} \times \frac{8719^{1.852}}{14^{4.8655}}$$

$$= 6.74 \text{ ft}$$



16" Suction Side @ 3800 GPM			
Length	=	25.0	ft
(1) 16" 90 degree	= 43.2 x 1	=	43.2 ft
(1) 16" 45 degree	= 43.2 x 1	=	43.2 ft
Total	=	111.4	ft

16" Discharge Side @ 3800 GPM			
Length	=	40.0	ft
(1) 16" Check Valve	= 176.0 x 1	=	176.0 ft
(1) 16" Tee	= 91.2 x 1	=	91.2
Total	=	307.2	ft

16" Discharge Side @ 8719 GPM			
Length	=	150.0	ft
	=	150.0	ft

Friction Loss Calculator				
Friction Loss in Suction Pipe	=	$\frac{\text{Total Suction Friction Loss} \times \text{Friction Loss per 100ft at 3800 GPM}}{100}$	=	$\frac{111.4 \times 1.44}{100} = 1.60 \text{ ft}$
Friction Loss in Discharge Pipe	=	$\frac{\text{Total Discharge Friction Loss} \times \text{Friction Loss per 100ft at 3800 GPM}}{100}$	=	$\frac{307.2 \times 1.44}{100} = 4.42 \text{ ft}$
Friction Loss in Discharge Pipe	=	$\frac{\text{Total Discharge Friction Loss} \times \text{Friction Loss per 100ft at 8719 GPM}}{100}$	=	$\frac{150.0 \times 6.74}{100} = 10.11 \text{ ft}$
Force Main			= 69.3	= 69.3 ft
Suction Lift			= 14.04	= 14.04 ft
TDH			=	99.5 ft

Based on the above calculations, the duty point for the system required is **3800 GPM @ 99.5 FT.**



2.2.3.1 SYSTEM CURVE

Figure 2 displays the system curve for the primary pump, (1) one Corner 8NHTA with 25' of 16" DR17 Suction and 40' 16" DR17 to manifold plus 150' of 16" DR17 HDPE piping to meet the peak flow of 3800 GPM and calculated 99.5 ft TDH.

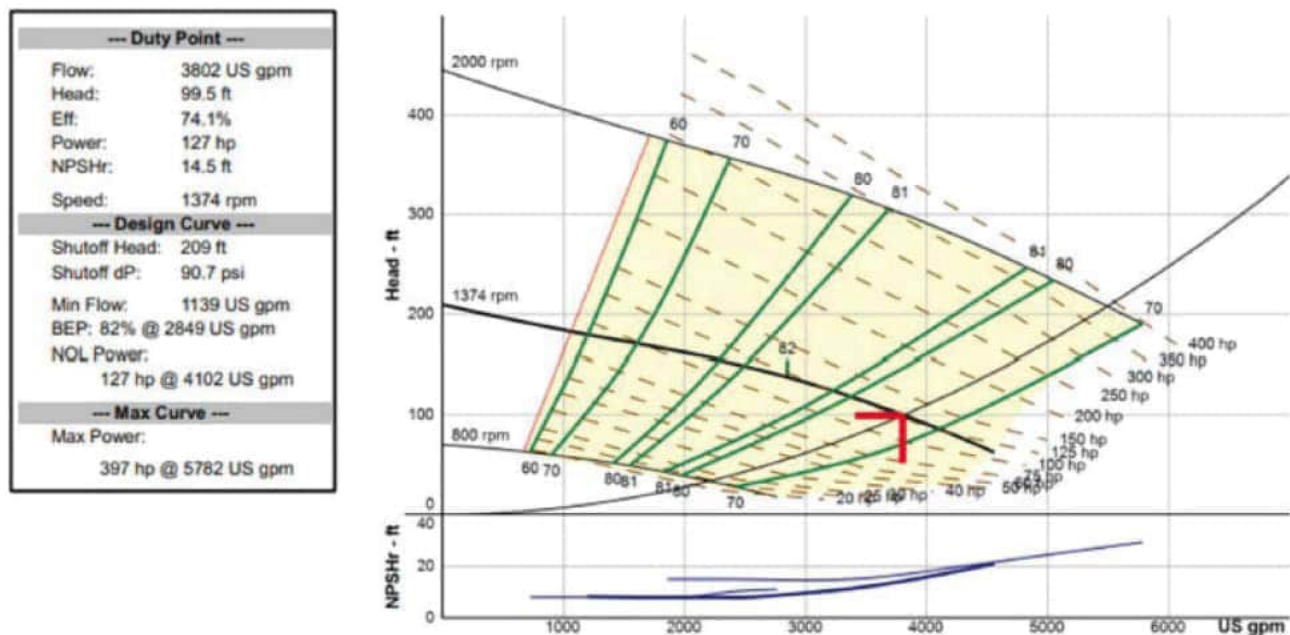


Figure 3.2.3.1 - System Curve PUMP B 3800 GPM @ 99.5 FT

2.2.3.4 NPSHA CALCULATIONS

Atmospheric Pressure (@ 2116 ft.)	Suction Lift	Suction Friction Loss	Vapour Pressure (@ 10 °C)
33.94 ft	14.04 ft	1.60 ft	0.41 ft

NPSHa Calculator

$$NPSHa = \text{Atmospheric Pressure} - \text{Suction Lift} - \text{Suction Friction Loss} - \text{Vapour Pressure}$$

$$NPSHa = 33.94 - 14.04 - 1.60 - 0.41$$

$$NPSHa = 17.9$$

$$NPSHa > NPSHr$$

$$17.9 \text{ ft} > 14.5 \text{ ft}$$

****exceeds minimum of 3ft**

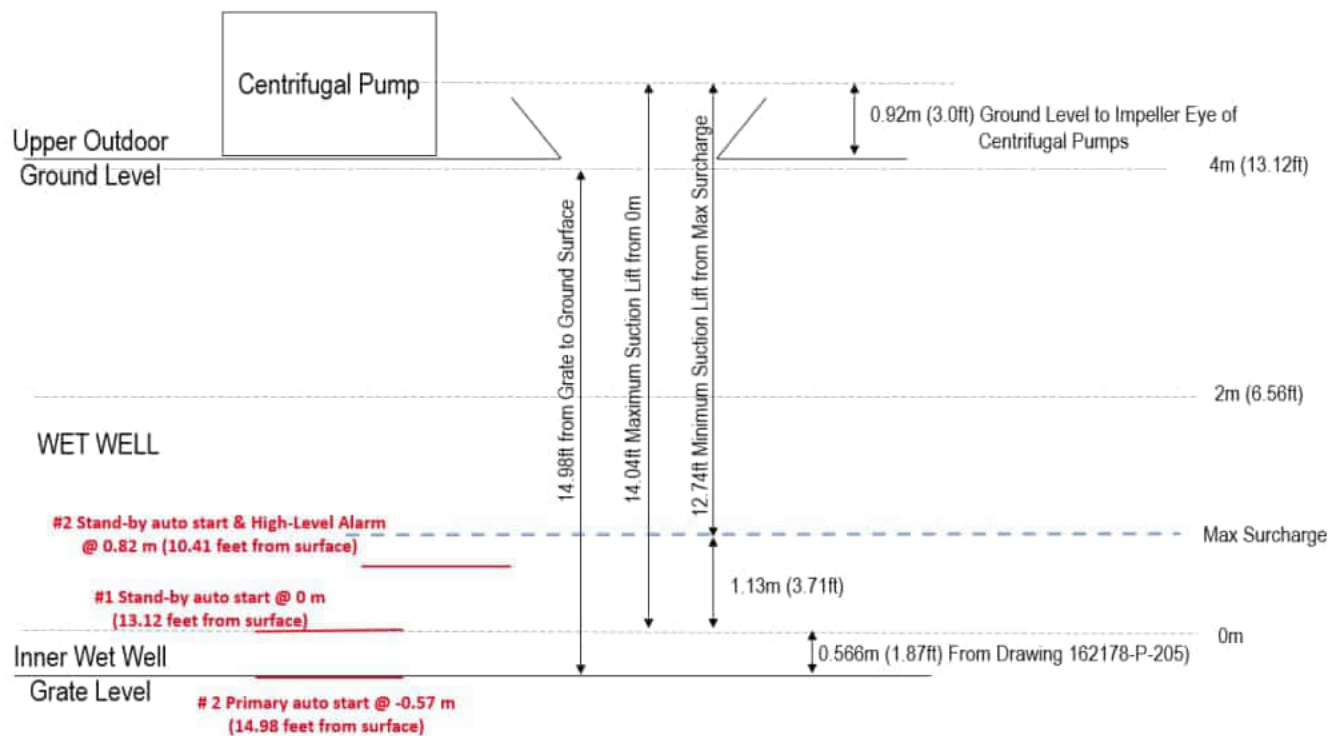




2.2 STANDBY PUMP ENGINEERING CALCULATIONS

2.4.1 SUMMARY

Peak Flow (GPM)	Pump Label	Pump	Flow Per Pump (GPM)	Discharge Pipe Diameter (in.)	Static Suction Lift (ft.)	Discharge Length (ft.)	Total Equivalent Length (ft.)	Friction Loss per 100ft	Total Dynamic Head (ft.)
8719	C	12" Global GST (Standby)	4359	16	14.04	150.0	15.86	1.87 (Split Flow Rate) 6.74 (Full Flow Rate)	101.2
	D	12" Global GST (Standby)	4359	16	14.04	150.0	15.86	1.87 (Split Flow Rate) 6.74 (Full Flow Rate)	101.2



Stop level for each pump will be set to the start to the previous pumps start level. Primary #2 will be set at 1 foot below its start level.



2.2.3 TOTAL DYNAMIC HEAD CALCULATIONS PUMP C & D - GLOBAL 12 GST - STANDBY

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{c}\right)^{1.852} \times \frac{q^{1.852}}{d^{4.8655}}$$

where: c = pipe roughness coefficient (130 used for these calculations)
 q = flow rate (gpm)
 d = pipe diameter (inches)

16" HDPE SUCTION & DISCHARGE (TO MANIFOLD) (14" ID)

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{130}\right)^{1.852} \times \frac{4359^{1.852}}{14^{4.8655}}$$

$$= 1.87 \text{ ft}$$

16" HDPE DISCHARGE (AFTER MANIFOLD) (14" ID)

$$f \text{ (ft of loss per 100ft)} = 0.2083 \times \left(\frac{100}{130}\right)^{1.852} \times \frac{8719^{1.852}}{14^{4.8655}}$$

$$= 6.74 \text{ ft}$$



16" Suction Side @ 4359 GPM			
Length	=	20.0	ft
(1) 16" 90 degree	= 43.2 x 1	=	43.2 ft
(1) 16" 45 degree	= 43.2 x 1	=	43.2 ft
Total	=	106.4	ft

16" Discharge Side @ 4359 GPM			
Length	=	40.0	ft
(1) 16" Check Valve	= 176.0 x 1	=	176.0 ft
(1) 16" Tee	= 91.2 x 1	=	91.2
Total	=	307.2	ft

16" Discharge Side @ 8719 GPM			
Length	=	150.0	ft
	=	150.0	ft

Friction Loss Calculator				
Friction Loss in Suction Pipe	=	$\frac{\text{Total Suction Friction Loss} \times \text{Friction Loss per 100ft at 4359 GPM}}{100}$	=	$\frac{106.4 \times 1.87}{100} = 1.99 \text{ ft}$
Friction Loss in Discharge Pipe	=	$\frac{\text{Total Discharge Friction Loss} \times \text{Friction Loss per 100ft at 4359 GPM}}{100}$	=	$\frac{307.2 \times 1.87}{100} = 5.75 \text{ ft}$
Friction Loss in Discharge Pipe	=	$\frac{\text{Total Discharge Friction Loss} \times \text{Friction Loss per 100ft at 8719 GPM}}{100}$	=	$\frac{150.0 \times 6.74}{100} = 10.11 \text{ ft}$
Suction Lift			= 14.04	= 14.04 ft
Force Main			= 69.3	= 69.3 ft
			TDH = 101.2ft	

Based on the above calculations, the duty point for the system required is **4359 GPM @ 101.2FT.**



2.2.3.1 SYSTEM CURVE

Figure 2 displays the system curve for the standby pumps, (2) two 12 GST with 20' of 16" DR17 Suction and 40' 16" DR17 to manifold plus 150' of 16" DR17 HDPE piping to meet the peak flow of 4,359 GPM and calculated 101.2 ft TDH.

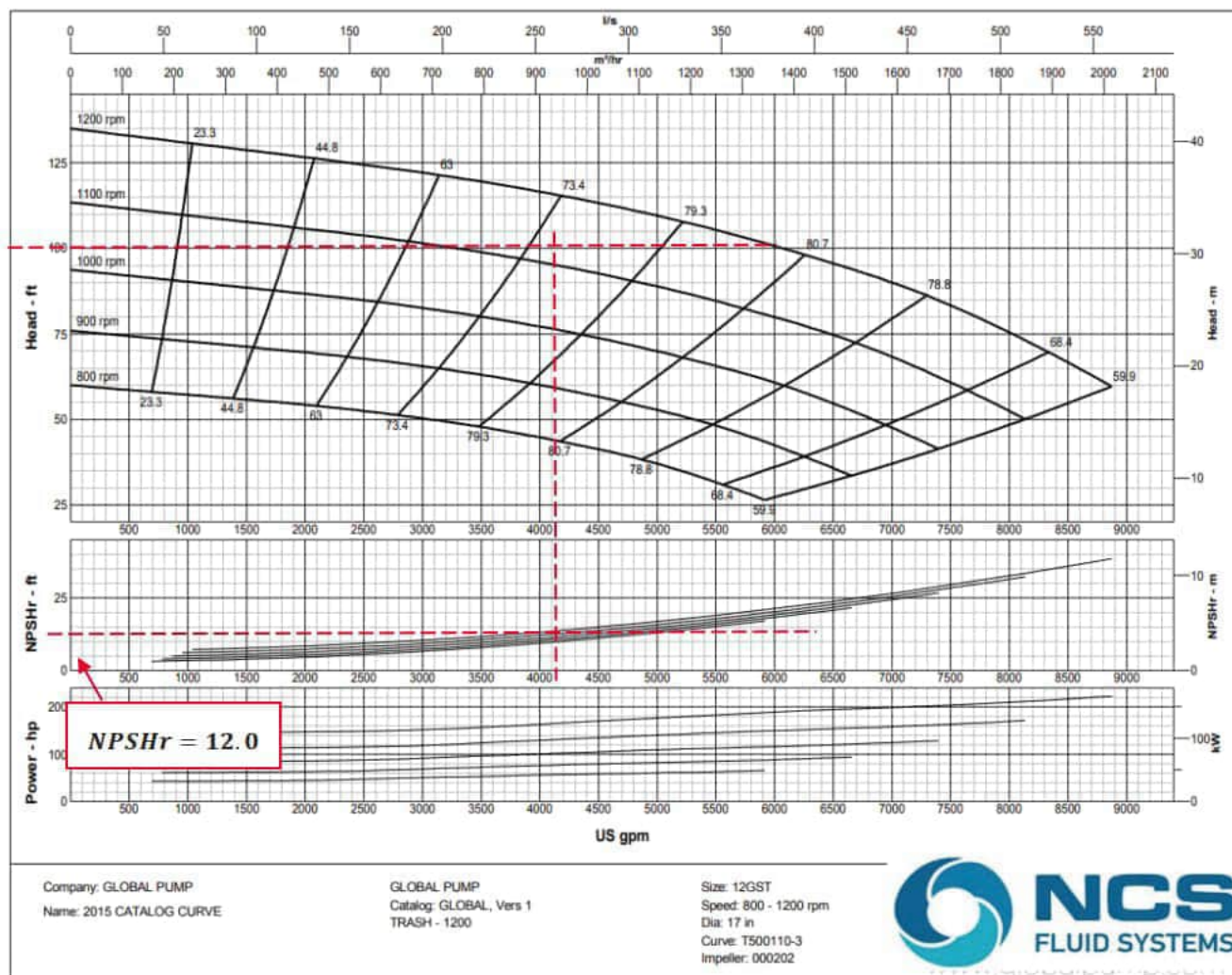


Figure 4.2.3.1 - System Curve PUMP C & D 4359 GPM @ 101.2 FT

2.2.3.4 NPSHA CALCULATIONS

Atmospheric Pressure (@ 2116 ft.)	Suction Lift	Suction Friction Loss	Vapour Pressure (@ 10 °C)
33.94 ft	14.04 ft	1.99 ft	0.41 ft



NPSHa Calculator

$$NPSHa = \text{Atmospheric Pressure} - \text{Suction Lift} - \text{Suction Friction Loss} - \text{Vapour Pressure}$$

$$NPSHa = 33.94 - 14.04 - 1.99 - 0.41$$

$$NPSHa = 17.5$$

$$NPSHa > NPSHr$$

$$17.5 \text{ ft} > 12.0 \text{ ft}$$

exceeds minimum of 3ft

2.2.3.5 PUMP SELECTION AND SPECIFICATIONS

2.2.3.5.1 PARAMETERS

With a duty point of 4359 GPM @ 101.2ft, NCS has selected the 12GST (12" x 12" Global Standard Trash Pump) (or equivalent).

The 12GST has the following specifications:

Max Flow: 8800 US GPM [555.21 L/S]
 Max Head: 135ft [41.1 m]
 Solids Handling: 4" diameter [101.6mm]
 Driver: Diesel Engine
 Max Operating Speed: 1200rpm

2.2.3.5.2 FUEL CONSUMPTION

The fuel consumption below is calculated utilizing a 50% (worst case scenario) the selected 12GST.

$$\text{fuel consumption (gph)} = \text{flow} \times \frac{TDH}{\text{efficiency} \times 3960} \times 0.055$$

$$\text{fuel consumption (gph)} = 4359 \text{ GPM} \times \frac{101.2 \text{ ft}}{50\% \times 3960} \times 0.055$$

$$= 12.25 \text{ gph}$$



3.0 OPERATING PROCEDURE

1. Primary pumps using diaphragm priming system will operate to expedite air evacuation of the suction manifold & piping.
2. Once primed, the primary pump # 1 will always operate. If lower than anticipated flows are encountered, the primary pump will be controlled manually by the operator by the VFD to try to ensure there is minimal loss of prime. On low flows, loss of prime can and probably will happen, operators will have to continually monitor and let primary #1 run and pump when it again has sufficient effluent to prime itself. Pumps all have mechanical oil bath seal, which is designed to be able to run dry without the seal overheating. All other pumps, including the 2nd primary will be started by float control switches.
3. Primary pump # 2 as well as both stand-by pumps will be started automatically by float switches. The 2nd stand-by pump will start within 1 foot below the maximum surcharge level, at this point alerts will also be sent out to let everyone on the notification list that there is a problem with the primary system and the back-ups should both be running.

4.0 SYSTEM TEST COMPLETION

The below testing procedure will be conducted on both systems prior to full-service operation.

1. A preliminary job walk will be conducted down the length of lines to assess possible hazards.
2. It is recommended that client provide clean water for testing of pipe & or hoses used in bypass system. NCS will support the freshwater test.
3. Test will be completed for any leaks in discharge piping. Div 15 has confirmed there is a clean water in the facility for the clean water testing before the live sewage test. It is considered Division 15's responsibility to obtain all permits and affiliated equipment once freshwater test is passed, NCS will move to a live sewage test.
4. A float control system will be setup to work with the primary pump # 2 and the standby pumps as a safeguard to excessive surcharge in the wet well. A technician will ensure it is set in a way to avoid suction of the floats into the suction line once operation has commenced. The operator shall ensure the lines do not have excess slack in them that can be sucked into the suction lines. All excess slack or cable shall be coiled up on surface and secured to the pump, or top of the manhole with appropriate wire or straps. The floats themselves shall be secured to either a large stake or piece of pipe within the manhole that cannot be tangled or pulled into the suction. Float control system will be tested by manually tripping the float control sensor, transducer level controls on primary #2 tested by reading the level on the pumps panel and the database. For testing transducers to work, wet well will need to be surcharged to start set levels.
5. For the duration of the sewage test, a technician will monitor the suction wet well effluent level while another technician walks the length of the discharge line. All pumps will run in manual mode for the sewage test.
6. The sewage test will commence as follows:
 - a. Starting with primary pump # 1, each pump will be turned on manually one at a time.
 - b. As the discharge line is walked by a technician, a visual inspection will occur for any leaks in pipe, hoses, fittings, and all connection points.



- c. As each pump has been run and all lines have been inspected, that pump will be set to off while the next pump in the system is run and tested. This will follow the sequence primary #1, primary #2, stand-by #1 and end with stand-by #2.
 - d. A technician will be staged at the primary pump, ready to turn the pump on manually if required.
7. Once satisfied, the system will be run again, shutting down primary pump #1 and letting the system start & stop via the level control system. Each pump being shut off for the next to be able to start.
 8. The system is ready for the 48 hour live test, uninterrupted.
FCEC plant operators will be on site during the 48 hour test to operate the Gate Valves if required.

5.0 TIMELINE

The proposed start date for the FCEC temporary bypass installation is Sept 5, 2023.

This is conditional to site preparation work to be completed prior to bypass system setup.

6.0 SYSTEM OPERATIONS

The system will be monitored and operated 24 hours per day until the system is ready to be shut down, by NCS Fluid Handling trained Technicians, as well as a GEM's Database with a level transducer. There will be one (1) pump technician on day shift and one (1) pump technician on night shift for both pump systems. As part of NCS standard operation procedure, technicians will record system data on a Sewer Bypass Monitoring Checklist at minimum increments of one (1) hour. The Checklist will be sent to Division 15 & CoV daily. All suction and discharge manholes will be monitored continuously. The day shift and night shift will have a shift changeover meeting to review the system operation and discuss any system requirements such as fueling, maintenance, etc.

The GEM's Database high level alert will be set up to alarm at the same level as the 2nd stand-by pump starting point. This unit has one outlet, which can relay information and alarms to NCS's online platform which will notify NCS. Another float level will be provided to CoV for them to tie into their SCADA system which will be set the same as NCS's alarm, at the 2nd stand-by pump starting point, CoV's high-level alarms will alert who they set to have notified.

7.0 NOISE CONTROL

The diesel pumps and 2 generators running the electric centrifugal pumps within the system will all be Sound Attenuated. NCS can provide additional sound attenuated echo barriers at an additional cost. The sound guard barrier is made of 12-gauge galvanized-steel (or optional stainless steel), double-sided galvanized sheet panels are insulated with a 1.00" thick acoustical foam barrier fire retardant composite to reduce noise level to no more than 68 dBA at 30' (9 m).

8.0 TRAFFIC CONTROL

As per Division 15.

9.0 SUBCONTRACTORS

NCS does not intend to utilize any subcontractors on the project and will self-perform the bypass scope of work.



10.0 HEALTH, SAFETY & ENVIRONMENT

A site-specific Job Hazard Analysis, specific to the bypass procedure, will be completed at the start of each shift. The site-specific assessment will comply with all local, provincial, and federal safety regulations and will consider any factors that would contribute to changing conditions on the jobsite. The daily analysis addresses specific hazards identified with all procedures related to the installation, commissioning, operation & dismantling of the temporary bypass system.

10.1 SITE SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

As a dedicated fluid management contractor, the team at NCS has identified the appropriate levels of personal protective equipment required for employees during their specific scopes of work. These include, but are not limited to, coveralls or an applicable safety vest with reflective stripes, hard hat, safety glasses, gloves & steel toed boots. Also fall protection for working around open hatches where it's possible to fall into the wet well.

10.2 ALARMS

PER SPEC "The temporary pumping facility shall be provided with level/failure monitoring with an emergency high level float switch, a low-level alarm, and a pump failure alarm. These shall all be connected to the contractor's monitoring agent and to an input to the

Owner's SCADA RTU in the existing facility. NCS will supply a float switch normally closed, CoV will have their technician wire to their system.

10.3 EMERGENCY RESPONSE

1. In the event flows are abnormally high, an NCS employee will turn on the standby pump and bring the engine speed to maximum rpms of the system design as shown in the plotted curve. As stated, alarms may not be triggered if all pumps are turned on manually because the NCS technician monitoring the system notices before the high-level alarms are triggered. A Division 15 foreman will be contacted so Division 15's emergency response plan can also be initialized and can clear the work area for possible breach. An NCS employee will call NCS emergency contacts. If the stand-by pumps are turned on manually, the high-level alarms may not be triggered. In this situation it will be assumed that if manually turned on by an NCS employee, they are aware of the potential of being overwhelmed, and emergency procedures are being followed. Pumps will run at their highest efficiency to handle flows. If all running pumps are still unable to maintain the flow, **CoV Sewer Operations will be contacted for the next course of action.**
2. To ensure there is no accidental spillage, all pumps will have individual spill containment. An NCS fluid technician will periodically check and tighten fittings so leaking does not occur throughout the shift.
3. Although unlikely, if a leak or spill occurs during any stage of the project, NCS' trained fluid technicians will take immediate action to contain the release and regain control. An Emergency Spill Response Plan has been developed in accordance with NCS best practices. NCS personnel will immediately notify the project manager and client representative, to determine next steps. The on-site supervisor will be accountable to follow the response steps as outlined within the Emergency Spill Response Plan and NCS' HSE manual. The project manager will work with the HSE manager, client representatives and others to respond to the situation. Emergency spill response kits (containing absorbent pad and socks) will be placed on site by each pump to ensure quick & readily available access to spill containment resources. Additionally, each diesel driven pump will be placed inside of a containment berm to help mitigate any spill infiltrating the nearby ground or environment.
4. NCS recommends a vacuum truck service on notice with site details and contacts. Vacuum truck services are, but not limited to, Emergency spill response, pipe draining, flushing lines, draining lines, emptying containments, and assistance in high flows.



5. NCS site rigged trucks used for monitoring will be outfitted with basic hand tools including, but not limited to, electric impact, wrenches, sockets, and a screwdriver set.
6. If the Division 15 Site Supervisor/Project Manager deems the bypass system needing to be removed in an emergency, **along with City of Vancouver sewers operations team (who must make the decision to shut down)**, The onsite NCS Fluid Technician will contact NCS emergency contacts. The NCS Fluid Technician will shut down all equipment. Equipment will be required for the removal of pumps & piping and will be supplied by Division 15. If proper equipment or an operator is not available, then NCS emergency contact will get an emergency crane truck to assist with the emergency removal of equipment. NCS emergency contact will coordinate all of this information with Division 15's emergency contacts or Project Manager, as well as dispatching more technicians if required.

Once the station is on Bypass, the bypass will not be removed without prior authorization by sewers operations (except in case of life safety).

11.0 ASSUMPTIONS

1. Assumptions have been made that flows provided by Division 15 & City of Vancouver are accurate but have the potential to vary.
2. Discharge distances are taken from those provided by Division 15 in the drawings provided, while also being confirmed by NCS personnel during a site walk.
3. Suction lift values are taken from those provided by Division 15 in the drawings provided, while also being confirmed by NCS personnel during a site walk.



12.0 CONTACT LIST

JC Jenson (24 Hour Emergency Contact)
Operations Manager
jcjenson@ncsfuidsystems.ca
306.292.7867



Adrian Gallant (24 Hour Emergency Contact)
Operations Manager
agallant@ncsfuidsystems.ca
587.990.3664



Shawn Mitchell (24 Hour Emergency Contact)
Branch Manager
smitchell@ncsfuidsystems.ca
778.846.4988



Marcus Kotierc
Div15 Site Superintendent
604-834-5587

Cathal Crowley
Div15 Project Manager
604-825-5281

Sreenath Prathapachandran
Div15 Project Coordinator
604-313-9008

Amanda Lambert
Div15 Safety Manager
604-214-8790

Ryan Willett
SSP Project Manager
604-835-5835



Steve Lacamell
SSP Site Superintendent
604-880-7675

Nachiketh Kharad
SSP Project Coordinator
778-928-9482

City of Vancouver - Sewers Dispatch - contact in case of sewerage emergencies. Ask for the "On-Duty Pump Mechanic"

604-326-4681 Mon-Fri, 7:00am to 3:30pm

604-673-8200 Any other time

Emergency Management BC - Southwest region

Tel: 604-586-4390

Email: EMBC.SWEAdmin@gov.bc.ca

NEU Operations Contacts:

David Jones
NEU Chief Operator
604-551-4130

Erle Deligero
NEU Operator
778-839-8607

12" GST GLOBAL PUMP

Vacuum Assisted



Product Description

Rugged, heavy-duty centrifugal pumps engineered specifically for portable application. Available with a variety of priming systems, including Global's Auto Prime• automatic priming system (compressor-fed venturi priming) or a diaphragm priming system. Dry running mechanical seal. Hydrostatically tested pump casings to 50 psig (345 kPa) above the peak casing pressure. Preset emergency shutdown protection and automatic level control through standard engine control.

Applications

- Sanitary/Storm Bypass
- De-Watering
- Solids/Sludge Handling
- Construction

Technical Data

Operating Parameters

Min. / Max Flow:	8800 gpm (1999 m ³ /h)
Min. / Max Shutoff Head:	135' (41.1 m)
Max. Casing Pressure:	125 psig (862 kPa)
Max. Temp:	160° F (70° C)
Max. Solid Size:	4" (101.6 mm)
Min. / Max. Pump Speed:	Max: 1200 rpm

Engine Specifications

Driver Type:	Diesel Engine - In-line, 4-Cycle
Driver Make:	John Deere
Model:	6068HF485
Max. Continuous Rating:	275hp
Total Displacement:	6.8 (415) L (cu in)
Aspiration:	Turbocharged and air-to-air aftercooled
Number of Cylinders:	6
Safety Shutdowns:	Control panel regulated
Fuel Consumption:	9.5 gph
Run Time:	27 Hours
Fuel Type:	Diesel
Fuel Capacity:	260 gallons (964 liters)

Pump & Accessory Specifications

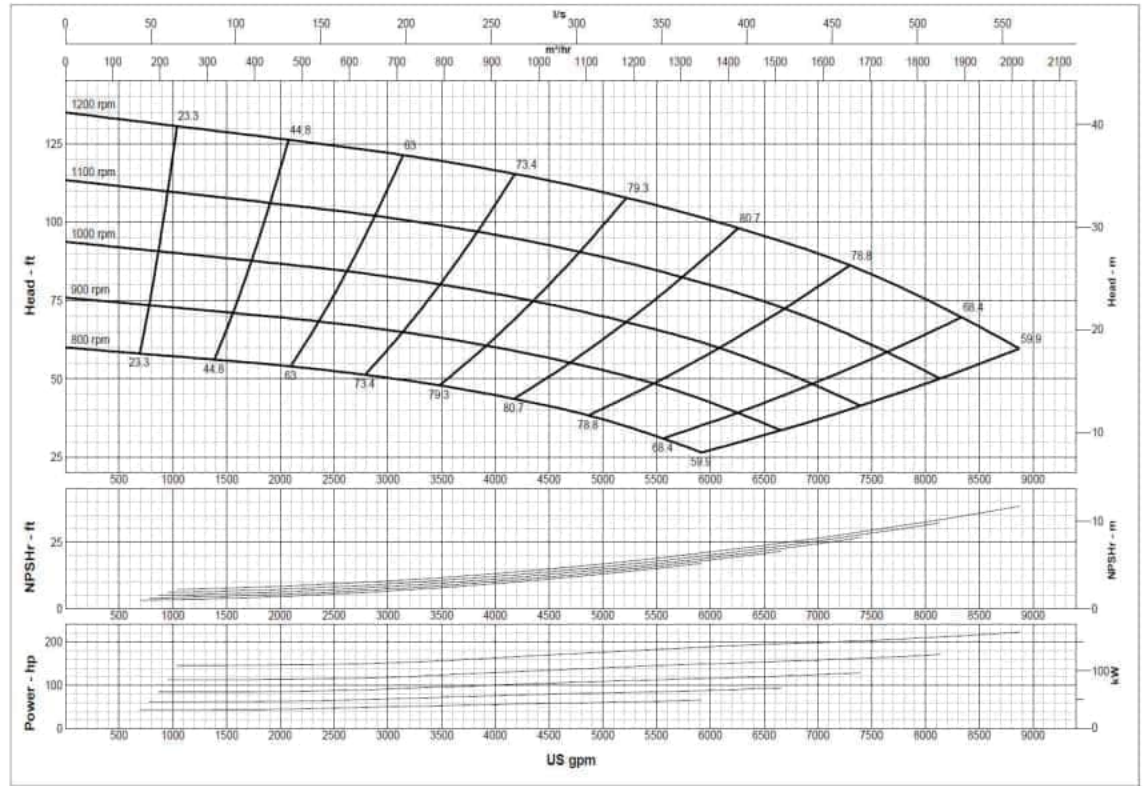
Suction / Discharge Size:	12" x 12" (300 mm) ANSI Flanges
Impeller Diameter:	17"
Vacuum System - Type / Capacity:	Air Diaphragm
Casing:	Cast Iron
Impeller:	Cast Iron
Wear Ring:	Cast Iron
Shaft:	Stainless Steel
Mechanical Seal Faces:	Silicon Carbide on Silicon Carbide
Mechanical Seal Lubrication:	Glycol
O-rings & Gaskets:	Nitrile rubber and paper
Check Valve Body:	Cast Iron
Check Valve Flapper:	Nitrile Fitted
Check Valve Type:	Flapper



12" GST GLOBAL PUMP

12x12 Solids Handling

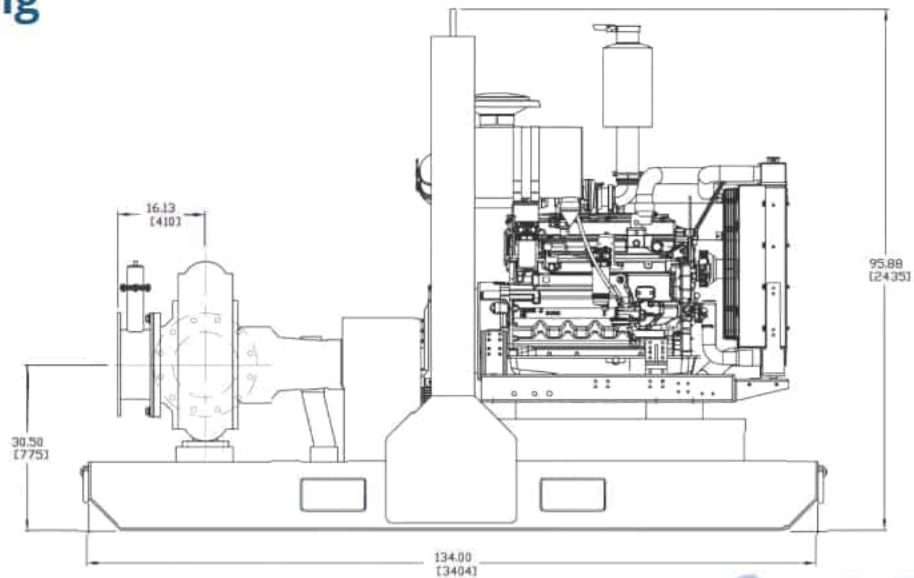
Performance Curve



Dimensional Drawing

Dimensional Details

Total Weight wo/Fuel	10250 lbs
Total Weight w/Fuel	12070 lbs
Overall Height	96 inch
Overall Width	48.5 Inch
Overall Length	134 Inch



Company: NCS FLUID HANDLING SYSTEMS
 Name: False Creek Energy Centre
 Date: 07/28/2023



Pump:

Size:	8NHTA	Dimensions:	Suction: 10 in
Type:	Encl Solids Handling		Discharge: 8 in
Synch Speed:	Adjustable		
Dia:	17.5 in		
Curve:	8NHTAVA		

Fluid:

Name:	Water	Vapor Pressure:	0.256 psi a
SG:	1	Atm Pressure:	14.7 psi a
Density:	62.4 lb/ft ³	NPSHa:	19.8 ft
Viscosity:	1.1 cP	Margin Ratio:	1
Temperature:	60 °F		

Search Criteria:

Flow:	3800 US gpm	Near Miss:	--
Head:	98 ft	Static Head:	70 ft

Pump Selection Warnings:

None

Pump Limits:

Temperature:	--	Sphere Size:	3.38 in
Wkg Pressure:	--		

Motor:

Consult Cornell to select a motor for this pump.

--- Duty Point ---

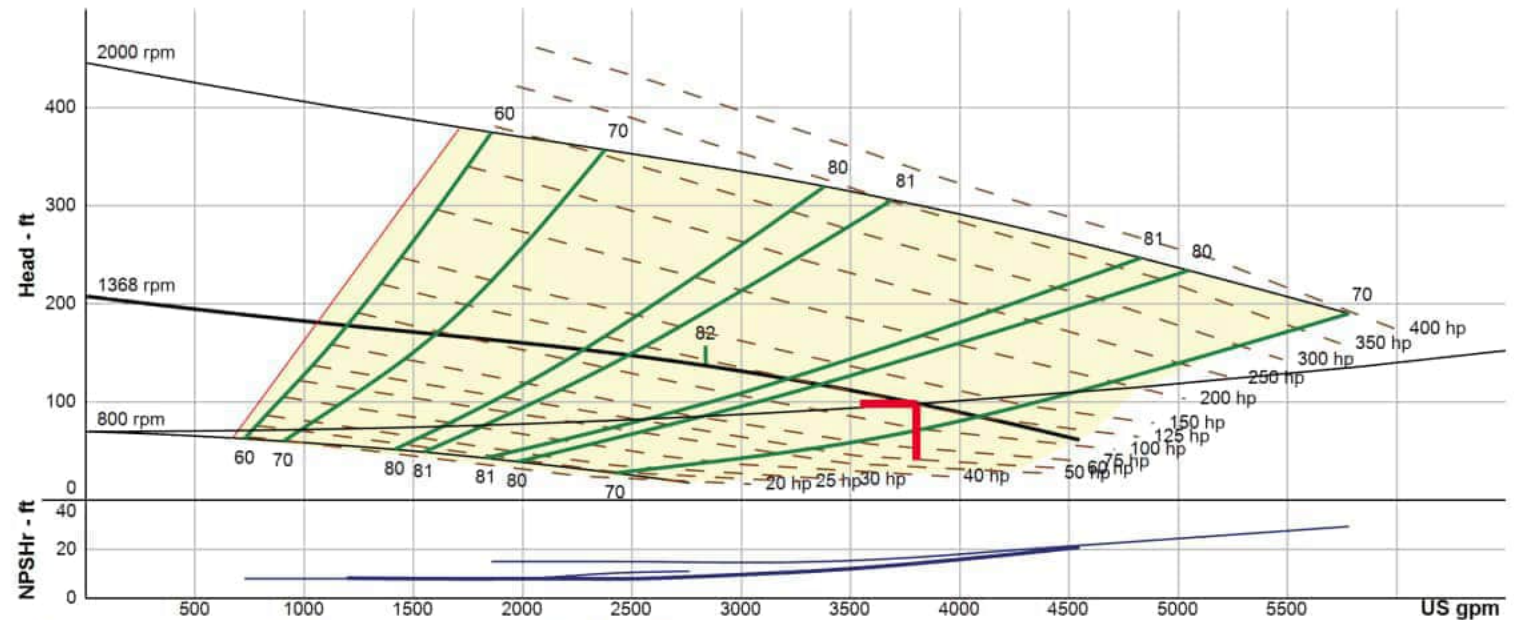
Flow:	3801 US gpm
Head:	98 ft
Eff:	73.9%
Power:	125 hp
NPSHr:	14.5 ft
Speed:	1368 rpm

--- Design Curve ---

Shutoff Head:	208 ft
Shutoff dP:	90 psi
Min Flow:	1135 US gpm
BEP:	82% @ 2837 US gpm
NOL Power:	126 hp @ 4087 US gpm

--- Max Curve ---

Max Power:	397 hp @ 5782 US gpm
------------	----------------------



Min flow line represents the absolute lowest flow pump can operate. For flow rates to the left of the first efficiency line on the curve, consult your Cornell Sales representative. Actual efficiency and HP may vary depending on mounting configuration. Refer to Catalog curve.

Company: NCS FLUID HANDLING SYSTEMS
 Name: False Creek Energy Centre
 Date: 07/28/2023



Performance Evaluation:

Flow	Speed	Head	Efficiency	Power	NPSHr
	rpm		%		
4560	1368	---	---	---	---
3800	1368	98.1	74	125	14.5
3040	1368	130	81	122	9.86
2280	1368	153	80	110	8
1520	1368	171	68	96.1	8.04



DCA400SSI4F3PB

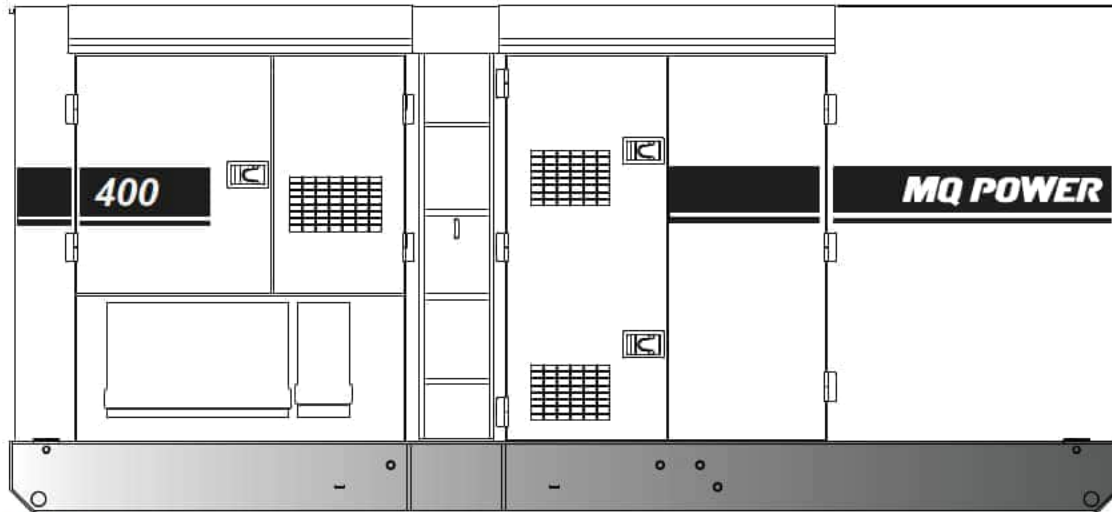
Generator

WhisperWatt™

Prime Rating — 320 kW (400 kVA)

Standby Rating — 336 kW (420 kVA)

3-Phase, 60 Hertz, 0.8 PF



STANDARD FEATURES

- Heavy duty, 4-cycle, direct injection, turbocharged, charge air cooled diesel engine provides maximum reliability.
- EPA emissions certified — Tier 4 Final emissions compliant.
- Microprocessor engine control system maintains frequency to $\pm 0.25\%$.
- Full load acceptance of standby nameplate rating in a single step.
- Fuel/water separator removes condensation from fuel for extended engine life. Panel mounted alarm light included.
- Sound attenuated, weather resistant, steel housing provides operation at 69 dB(A) at 23 feet. Fully lockable enclosure allows safe unattended operation.
- E-coat with polyurethane enamel finish coat.
- Internal fuel tank with direct reading fuel gauges are standard.
- Brushless alternator reduces service and maintenance requirements and meets temperature rise standards for Class F insulation systems.
 - Open delta alternator design provides virtually unlimited excitation for maximum motor starting capability.
 - Automatic voltage regulator (AVR) provides precise regulation.
- Fully covered power panel. Three-phase terminals and single phase receptacles allow fast and convenient hookup for most applications including temporary power boxes, tools and lighting equipment. All are NEMA standard.
- Basler DGC2020HD microprocessor-based digital generator controller with integrated genset-to-genset (isolated bus) paralleling.
 - Onboard Synchronization and kW/kVAR load sharing. Dual Ethernet ports for Inter-Genset communication.
 - High visibility backlit LCD display.
 - Operational temperature range of -40° to 70° C (-40° to 158° F).
 - Remote 2-wire start/stop control.
 - Metered power output parameters include:
 - Voltage ▪ Amperage ▪ Kilowatts
 - Kilovolt amps ▪ Power Factor ▪ Hertz
 - Modbus interface for gauge panel and expansion options.
 - Engine monitoring data over J1939. Modbus over RS485 for SCADA Interface.
- Digital engine gauges including oil pressure, water temperature, battery volts, engine speed, engine load, fuel level and DEF level.
- Analog generator instrumentation including AC ammeter, AC voltmeter, frequency meter, ammeter phase selector switch, voltmeter phase selector switch, and voltage regulator adjustment potentiometer.
- Automatic safety shutdown system monitors the water temperature, engine oil pressure, low coolant, low DEF, overspeed, and overcrank. Warning lights indicate abnormal conditions.
- Emergency stop switch — when manually activated, shuts down generator in the event of an emergency.



DCA400SSI4F3PB

Generator

SPECIFICATIONS

Generator Specifications

Design	Revolving field, Self-ventilated Drip-proof, Single bearing
No. of Poles	4-pole
Excitation	Brushless with AVR
Standby Output	336 KW (420 kVA)
Prime Output	320 KW (400 kVA)
Generator RPM	1800
Voltage — 3Ø	208, 220, 240, 416, 440, 480V Reconnectable
Voltage — 1Ø	120, 127, 139, 240, 254, 277V Adjustable
Armature Connection	Star with neutral
Voltage Regulation (No load to full load)	±0.5%
Power Factor	0.8
Frequency	60 Hz
Winding Pitch	2/3
Frequency Regulation: No Load to Full Load	Isochronous under varying loads from no load to 100% rated load
Frequency Regulation: Steady State	±0.25% of mean value for constant loads from no load to full load.
Insulation	Class F
Sound Level dB(A) Full load at 23 feet	69

Engine Specifications

Make / Model	Isuzu / BQ-6WG1X
Emissions	EPA Tier 4 Final Certified
Starting System	Electric
Design	4-cycle, water cooled, direct injection, turbocharged, charge air cooled, EGR, DOC, and SCR.
Displacement	15681 cc
No. cylinders	6
Bore x Stroke	147 x 154 mm
Gross Engine Power Output	512.3 hp (382 kWm)
BMEP	236 psi (1624 kPa)
Piston Speed	1819 ft/min (9.24 m/s)
Compression Ratio	16.5 : 1
Engine Speed	1800 rpm
Overspeed Limit	2070 rpm
Oil Capacity	15.1 gallons (57 liters)
Battery	12V 200Ah x 2 (24 V Systems)

Fuel System

Recommended Fuel	ASTM-D975-No.1 & No.2-D*	
Maximum Fuel Flow (per hour)	98.8 gallons (374 liters)	
Maximum Inlet Restriction (Hg)	8.86 in (225 mm)	
Fuel Tank Capacity	55.5 gallons (210 liters)	
Fuel Consumption	gph	lph
At full load	27.63	104.58
At 3/4 load	20.35	77.04
At 1/2 load	13.4	50.76
At 1/4 load	8.35	31.62
DEF Tank Capacity	14.8 gallons (56 liters)	

* - Use ultra-low sulfur diesel fuel.

Cooling System

Fan Load	17.8 hp (13.3 kW)
Coolant Capacity (with radiator)	19.4 gallons (73.6 liters)
Coolant Flow Rate (per minute)	111 gallons (420 liters)
Heat Rejection to Coolant (per minute)	12,606 Btu (13.3 MJ)
Maximum Coolant Friction Head	20.3 psi (140 kPa)
Maximum Coolant Static Head	29.5 feet (9.0 meters)
Ambient Temperature Rating	104°F (40°C)

Air

Combustion Air	872 cfm (24.7 m³/min)
Maximum Air Cleaner Restriction	25 in. H ₂ O (6.2 kPa)
Alternator Cooling Air	2790 cfm (79.0 m³/min)
Radiator Cooling Air	14129 cfm (400 m³/min)

Exhaust System

Gas Flow (full load)	1635 cfm (46.3 m³/min)
Gas Temperature	968°F (520°C)
Maximum Back Pressure	180.7 in. H ₂ O (45 kPa)

Amperage

Rated Voltage	Maximum Amps
1Ø 120 Volt	888.9 Amps (4 wire)
1Ø 240 Volt	444.4 Amps (4 wire)
3Ø 208 Volt	962.3 Amps
3Ø 240 Volt	962.3 Amps
3Ø 480 Volt	481.1 Amps
Main Line Circuit Breaker Rating	1000 Amps
Over Current Relay Trip Set Point	480 Amps

WARRANTY*

Isuzu Engine**

12 months from date of purchase with unlimited hours or 36 months from date of purchase with 3,000 hours (whichever comes first).

Generator

24 months from date of purchase or 2,000 hours (whichever occurs first).

Trailer

12 months excluding normal wear items.

*Refer to the express written, one-year limited warranty sheet for additional information.

**Refer to Isuzu Diesel Engine Limited Warranty for details.

NOTICE

Specifications sheet is subject to change and is not intended for use in installation design.



DCA400SSI4F3PB

Generator

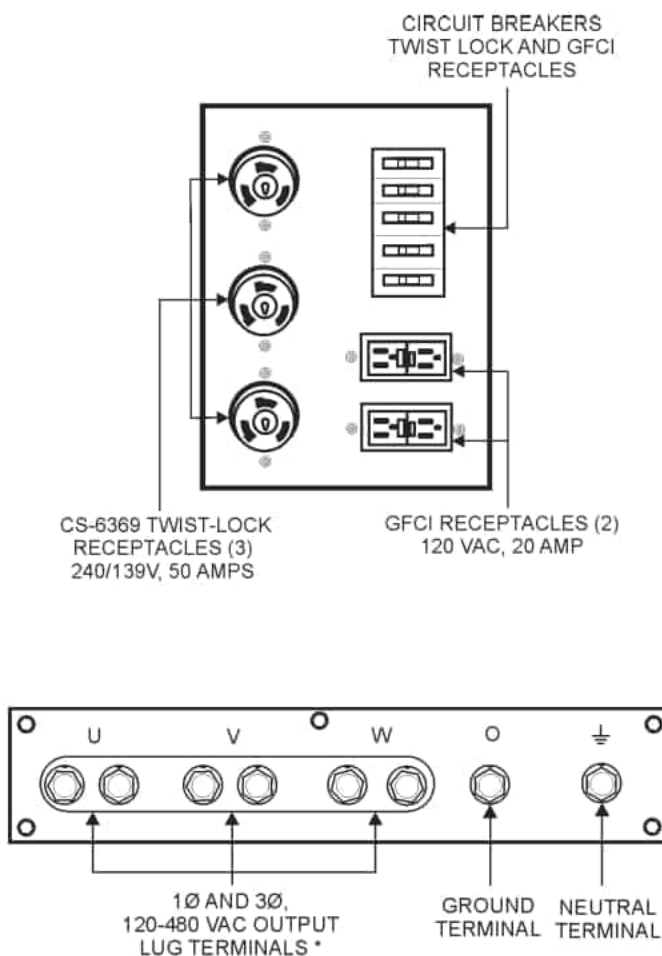
MQ POWER DECIBEL LEVELS

Our soundproof housing allows substantially lower operating noise levels than competitive designs. WhisperWatts are at home on construction sites, in residential neighborhoods, and at hospitals — just about anywhere.

- 90 — Subway / truck traffic
- 80 — Average city traffic
- 70 — Inside car at 60 mph
- 60 — Air conditioner at 20 feet
- 50 — Normal conversation

69.0
DECIBELS

GENERATOR OUTPUT PANELS



OPTIONAL GENERATOR FEATURES

- **PowerBalance™** — designed to assist generators when operating under low temperature and/or low load conditions to insure peak performance.
- **Battery Charger** — provides fully automatic and self-adjusting charging to the generator's battery system.
- **Jacket Water Heater** — for easy starting in cold weather climates.
- **Trailer Mounted Package** — highway legal trailer with electronic or surge brakes with double or triple axle configuration. Extra capacity fuel tanks are also available.

OPTIONAL CONTROL FEATURES

- **Audible Alarm** — alerts operator of abnormal conditions.

OPTIONAL FUEL CELL FEATURES

- **Trailer Fuel Tank** — a second fuel cell located in the trailer allows for extended run time.
- **Sub-base Fuel Cells (double wall)** — additional fuel cell for extended runtime operation. Contains a leak sensor, low fuel level switch, and a secondary containment tank. UL142 listed.
- 12 hours of minimum run time.
- 24 hours of minimum run time.

OPTIONAL OUTPUT CONNECTIONS

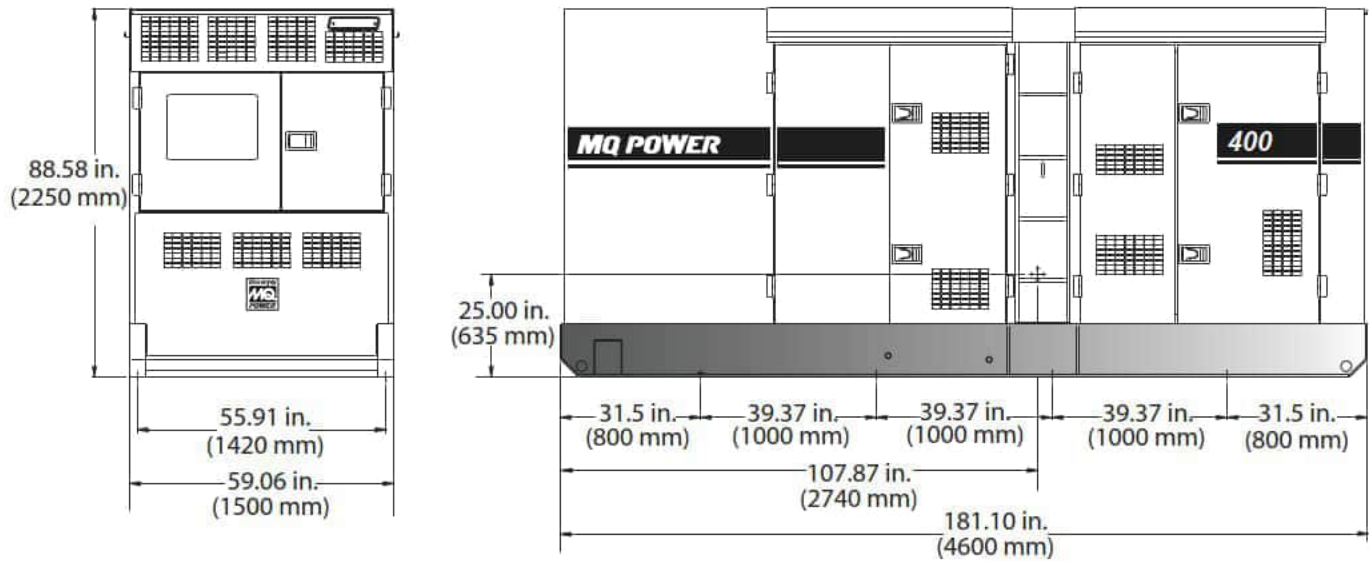
- **Cam-Lok Connectors** — provides quick disconnect alternative to bolt-on connectors.
- **Pin and Sleeve Connectors** — provides industry standard connectors for all voltage requirements.
- **Output Cable** — available in any custom length and size configuration.



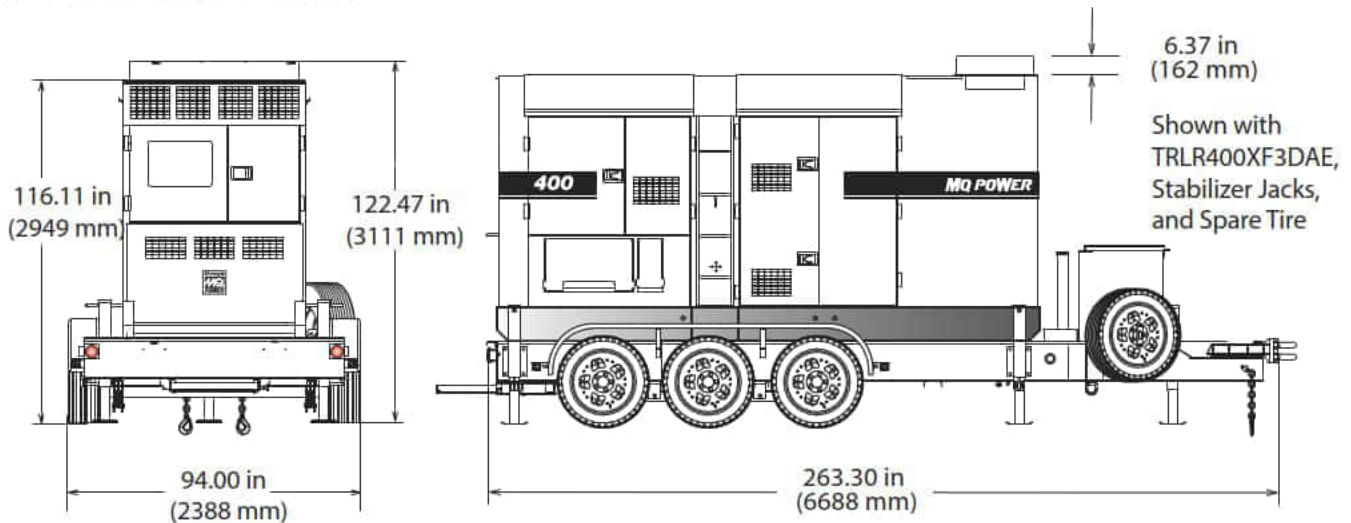
DCA400SSI4F3PB

Generator

SKID-MOUNT DIMENSIONS



TRAILER-MOUNT DIMENSIONS



DCA400SSI4F3PB Weights*

Dry Weight	12,280 lbs. (5,570 kg)
Wet Weight	13,184 lbs. (5,980 kg)
Max. Lifting Point Capacity	21,000 lbs (9525.44 kg)

* Weights do not include options.

DCA400SSI4F3PB and TRLR400XF3DAE Weights*

Dry Weight (with TRLR400XF3)	16,290 lbs. (7,389 kg)
Wet Weight (with TRLR400XF3)	17,194 lbs. (7,799 kg)

Generator can be placed on MQ Trailer
Model TRLR400XF3DAE.

NOTICE

Features and Specifications are
subject to change without notice.



MULTIQUIP
6141 Katella Avenue Suite 200
Cypress, CA 90630
310-537-3700
E-MAIL: mq@multiquip.com
WEBSITE: www.multiquip.com



Sewer Bypass Monitoring Checklist

Client : _____

Site Address: _____

Pump Tech: _____

Foreman: _____

Date: _____

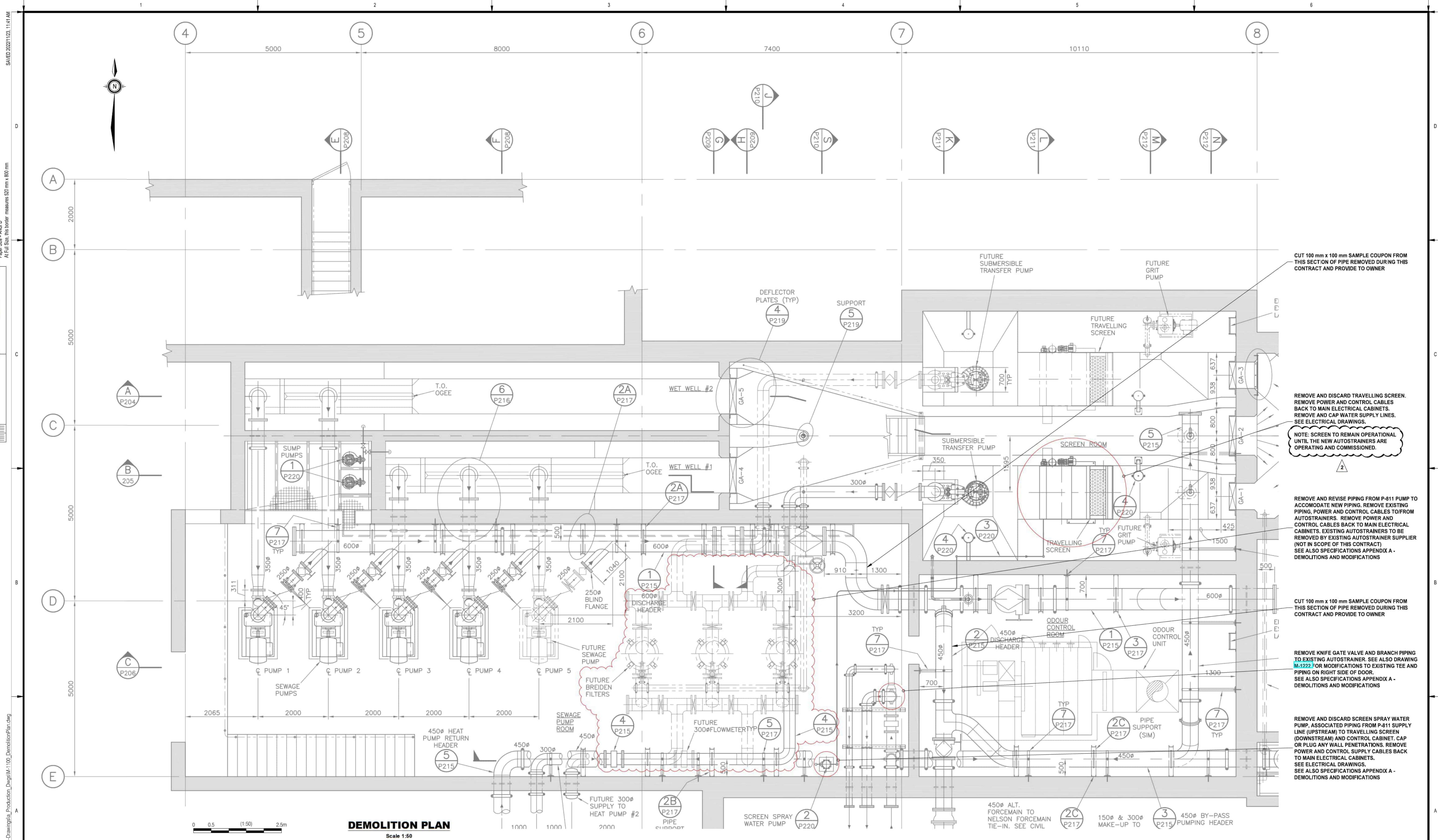
Emergency Contact No.: _____

Time	Suction Gauge (Hg)	Discharge Gauge (PSI)	Pump Seal (Oil)	Any Pipe / Joint Leak	Engine RPM	Fuel Tank (% Full)	Engine Temp	Sewer Plug Pressure	Engine Hours	Back up Pump Test

Any Unusual Observation:

Pump Tech (Sign)

Forman (Sign)



CUT 100 mm x 100 mm SAMPLE COUPON FROM THIS SECTION OF PIPE REMOVED DURING THIS CONTRACT AND PROVIDE TO OWNER

REMOVE AND DISCARD TRAVELLING SCREEN. REMOVE POWER AND CONTROL CABLES BACK TO MAIN ELECTRICAL CABINETS. REMOVE AND CAP WATER SUPPLY LINES. SEE ELECTRICAL DRAWINGS.
NOTE: SCREEN TO REMAIN OPERATIONAL UNTIL THE NEW AUTO TRAINERS ARE OPERATING AND COMMISSIONED.

REMOVE AND REVISE PIPING FROM P-411 PUMP TO ACCOMMODATE NEW PIPING. REMOVE EXISTING PIPING, POWER AND CONTROL CABLES TO/FROM AUTO TRAINERS. REMOVE POWER AND CONTROL CABLES BACK TO MAIN ELECTRICAL CABINETS. EXISTING AUTO TRAINERS TO BE REMOVED BY EXISTING AUTO TRAINER SUPPLIER (NOT IN SCOPE OF THIS CONTRACT) SEE ALSO SPECIFICATIONS APPENDIX A - DEMOLITIONS AND MODIFICATIONS

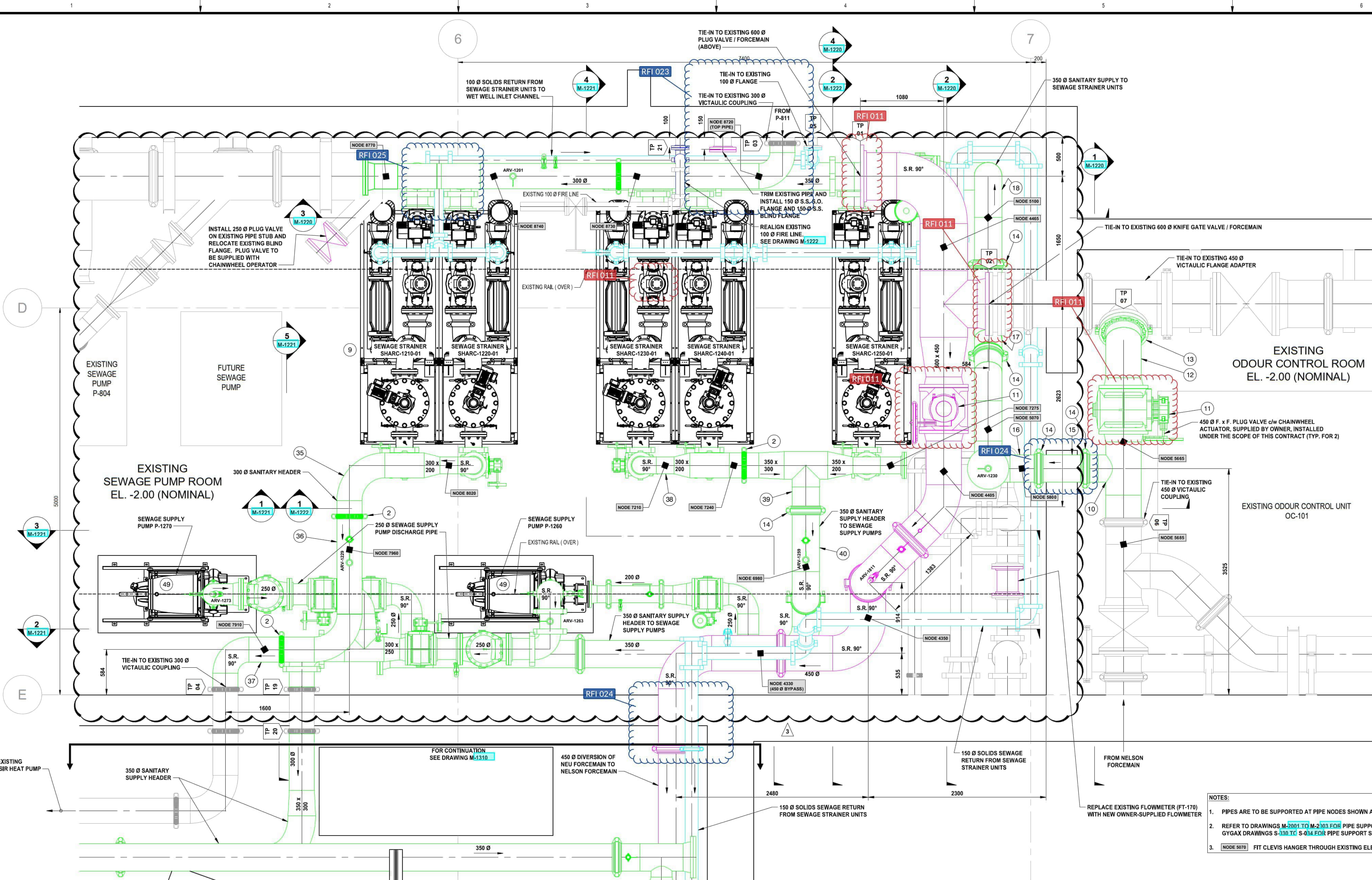
CUT 100 mm x 100 mm SAMPLE COUPON FROM THIS SECTION OF PIPE REMOVED DURING THIS CONTRACT AND PROVIDE TO OWNER

REMOVE KNIFE GATE VALVE AND BRANCH PIPING TO EXISTING AUTO TRAINER. SEE ALSO DRAWING M-1222 FOR MODIFICATIONS TO EXISTING TEE AND PIPING ON RIGHT SIDE OF DOOR. SEE ALSO SPECIFICATIONS APPENDIX A - DEMOLITIONS AND MODIFICATIONS

REMOVE AND DISCARD SCREEN SPRAY WATER PUMP, ASSOCIATED PIPING FROM P-411 SUPPLY LINE (UPSTREAM) TO TRAVELLING SCREEN (DOWNSTREAM) AND CONTROL CABINET. CAP OR PLUG ANY WALL PENETRATIONS. REMOVE POWER AND CONTROL SUPPLY CABLES BACK TO MAIN ELECTRICAL CABINETS. SEE ELECTRICAL DRAWINGS. SEE ALSO SPECIFICATIONS APPENDIX A - DEMOLITIONS AND MODIFICATIONS

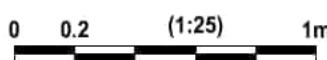
 KERR WOOD LEIDAL consulting engineers	Info:	Seal:	Rev	Date	Des	Dwn	Chk	Description	Rev	Date	Des	Dwn	Chk	Description	CITY OF VANCOUVER FCEC LOW CARBON EXPANSION SEWAGE PUMP ROOM AND SCREEN ROOM DEMOLITION PLAN Project No. 42.139 Group MECHANICAL Drawing No. M-1100 Rev. 2	
			0	2021-12-01	DCL	AU	AMF	ISSUED FOR TENDER								
			1	2022-06-17	DCL	AU	AMF	RE-ISSUED FOR TENDER								
			2	2022-12-02	DCL	AU	AMF	ISSUED FOR CONSTRUCTION								

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SEWAGE PUMP ROOM & ODOUR CONTROL ROOM - PLAN AT EL. -2.00

Scale 1:25



- NOTES:
- PIPES ARE TO BE SUPPORTED AT PIPE NODES SHOWN AS SUCH: **NODE 5100**
 - REFER TO DRAWINGS **M-2001 TO M-2103 FOR** PIPE SUPPORT INFORMATION. REFER ALSO TO GYGAX DRAWINGS **S-130 TO S-134 FOR** PIPE SUPPORT STRUCTURES.
 - NODE 5070** FIT CLEVIS HANGER THROUGH EXISTING ELECTRICAL CABLE TRAY AS REQUIRED.



Rev	Date	Des	Dwn	Chk	Description
0	2021-12-01	DCL	AU	AMF	ISSUED FOR TENDER
1	2022-06-17	DCL	AU	AMF	RE-ISSUED FOR TENDER
2	2022-12-02	DCL	AU	AMF	ISSUED FOR CONSTRUCTION
3	2023-03-10	DCL	AU	AMF	UPDATED SHARC PIPING LAYOUTS

CITY OF VANCOUVER FCEC LOW CARBON EXPANSION SEWAGE PUMP ROOM & ODOUR CONTROL ROOM PLAN				
Project No.	42.139	Drawing No.	M-1210	Rev.
Group	MECHANICAL			3

PLAN 19688



104
PLAN 19688

SPYGLASS PLACE

COMMODORE ROAD

WEST 1ST AVENUE

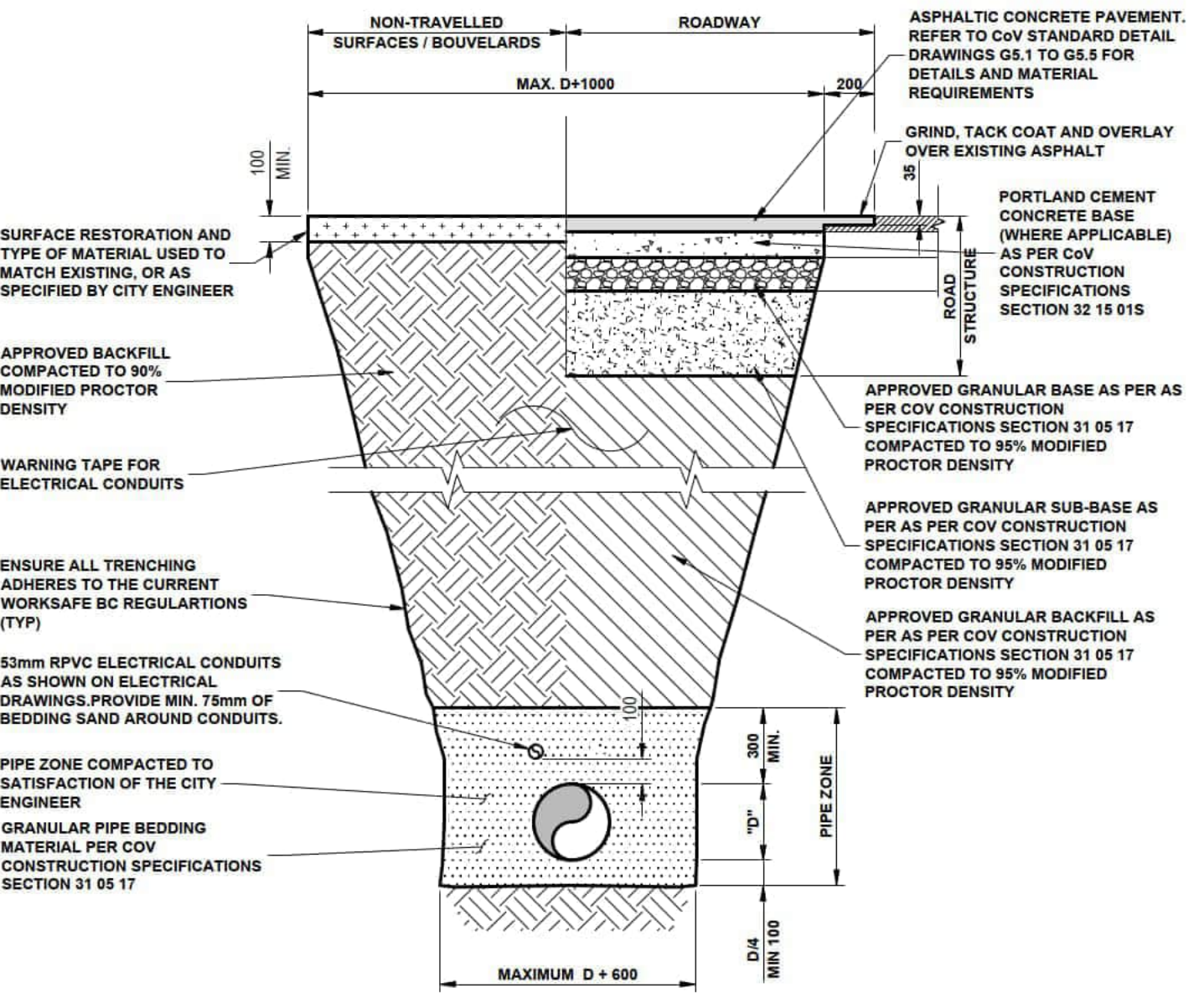
WYLIE STREET

PLAN
Scale 1:250

PROFILE
Scale H 1:250, V 1:50

GENERAL NOTES

- ALL CONSTRUCTION WORKS LOCATED WITHIN THE SITE TO CONFORM TO CURRENT EDITIONS OF THE CITY OF VANCOUVER STANDARD AND SPECIFICATIONS AND TO THE CURRENT EDITIONS OF THE MASTER MUNICIPAL STANDARDS AND SPECIFICATIONS WHERE THERE IS NOT A CITY OF VANCOUVER STANDARD OR SUPPLEMENTARY SPECIFICATIONS.
- ALL CONSTRUCTION WORKS LOCATED WITHIN EASEMENTS AND STATUTORY RIGHT-OF-WAYS TO CONFORM TO APPLICABLE AUTHORITY'S STANDARDS AND SPECIFICATIONS.
- THE LOCATION AND ELEVATION OF ALL EXISTING UTILITIES AND AMENITIES ARE BASED UPON OR INFERRED FROM INFORMATION OBTAINED FROM RECORD DRAWINGS AND FIELD SURVEYS. PRIOR TO START OF CONSTRUCTION, IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION AND ELEVATION OF EXISTING UTILITIES, ESPECIALLY AT PROPOSED CROSSINGS OR CONNECTIONS AND TO REPORT ANY CONFLICT, OMISSIONS OR DISCREPANCIES TO THE CONTRACT ADMINISTRATOR.
- CONTRACTOR SHALL CONSTRUCT OR RESTORE LANDSCAPE AND COMMUNITY GARDENS TO ORIGINAL CONDITIONS.
- CONTRACTOR SHALL FULLY RESTORE ALL EXISTING WORKS AND FEATURES AFFECTED BY CONSTRUCTION, INCLUDING CONCRETED AREAS, ASPHALT CONCRETE PAVED AREAS. RESTORE USING MATCHING MATERIALS, THICKNESS, AND PROPERTIES.
- CONCRETE PANELS THAT ARE IMPACTED BY THE CONSTRUCTION (E.G. DAMAGED, CUT, ETC.) SHALL BE REPLACED WITH NEW CONCRETE SIDEWALK PER THE ORIGINAL CONSTRUCTION DRAWING AND SPECIFICATIONS AND TO CITY OF VANCOUVER STANDARD DETAIL DRAWING C2.2. FINISH CONCRETE TO MATCH ADJACENT FINISH. REINSTATE CONTROL JOINTS; LINE UP WITH ADJACENT CONTROL JOINTS TO THE NORTH, SOUTH AND EAST. NO NEW CONSTRUCTION JOINTS SHALL BE ALLOWED (I.E. DAMAGED PANELS SHALL BE REMOVED UP TO THE NEXT CONTROL JOINT AND A NEW PANEL CAST). DAMAGED PAVERS AND STONE SHALL BE REPLACED WITH LIKE MATERIAL (SEE LANDSCAPE RECORD DRAWINGS FOR SUPPLIER AND MATERIAL INFORMATION).
- CONTRACTOR SHALL ERECT SECURITY FENCING BETWEEN THE COMMUNITY GARDENS AND THE WORK SITE. CONTRACTOR SHALL MINIMIZE ANY DISRUPTION TO THE COMMUNITY GARDENS AND SHALL REACH TO THE CITY PRIOR TO ANY DISRUPTIVE WORK FOR APPROVAL AND COORDINATION.
- CONTRACTOR TO SUBMIT SEDIMENT AND EROSION CONTROL PLAN IN CONFORMANCE WITH THE CITY OF VANCOUVER STANDARDS. SEE SPECIFICATION SECTION 1500.



NOTES:

- FOR UTILITY SPECIFIC TRENCH DETAILS, REFER TO COV STANDARD DETAIL DRAWINGS G4.2 TO G4.7.
- PAVEMENT STRUCTURE (ASPHALT PAVEMENT, GRANULAR BASE, AND GRANULAR SUB-BASE) DEPENDENT ON TYPE OF ROAD; REFER TO COV STANDARD DETAIL DRAWINGS G5.1 THROUGH DWG G.5
- D = OUTSIDE DIAMETER OF PIPE
- ALL DIMENSIONS IN MILLIMETERS UNLESS STATED OTHERWISE.

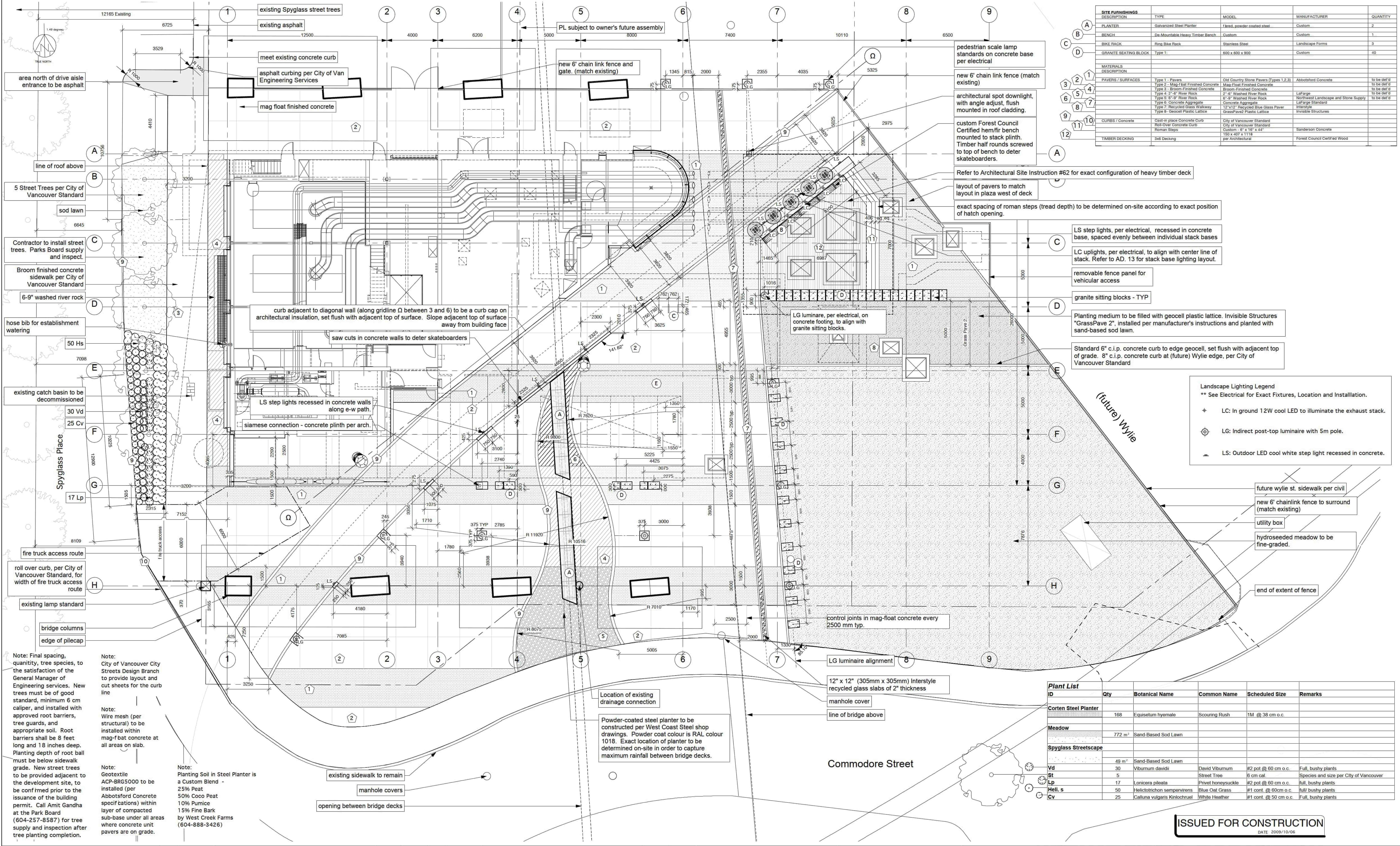
TYPICAL TRENCH DETAIL

Scale: 1:25

NOTE:
EXISTING UTILITIES AND INVERTS SHOWN ARE BASED ON CITY OF VANCOUVER RECORD DRAWINGS (2011). COMPLETENESS AND ACCURACY CANNOT BE GUARANTEED.

* CONTRACTOR TO VERIFY THE LOCATION AND ELEVATION OF EXISTING UTILITIES, ESPECIALLY AT PROPOSED CROSSINGS OR CONNECTIONS AND TO REPORT ANY CONFLICT, OMISSIONS OR DISCREPANCIES TO THE CONTRACT ADMINISTRATOR.

Rev	Date	Des	Dwn	Chk	Description	Rev	Date	Des	Dwn	Chk	Description
0	2022-05-13	YS	DHA	KM	ISSUED FOR TENDER						
1	2022-08-03	PIC	DHA	KM	ISSUED FOR CONSTRUCTION						

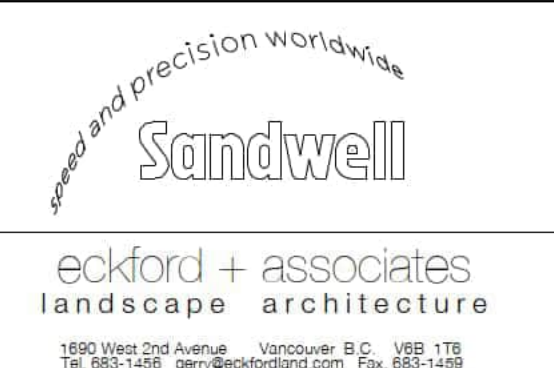


SITE FURNISHINGS				
DESCRIPTION	TYPE	MODEL	MANUFACTURER	QUANTITY
PLANTER	Galvanized Steel Planter	Flared, powder coated steel	Custom	2
BENCH	De-Mountable Heavy Timber Bench	Custom	Custom	1
BIKE RACK	Ring Bike Rack	Stainless Steel	Landscape Forms	3
GRANITE SEATING BLOCK	Type 1:	600 x 600 x 900	Custom	40
MATERIALS				
DESCRIPTION				
PAVERS / SURFACES	Type 1 - Pavers	Old Country Stone Pavers (Types 1,2,3)	Abbotsford Concrete	to be det'd
	Type 2 - Mag-Float Finished Concrete	Mag-Float Finished Concrete		to be det'd
	Type 3 - Brown-Finished Concrete	Brown-Finished Concrete		to be det'd
	Type 4 - 2'-6" River Rock	2'-6" Washed River Rock	LaFarge	to be det'd
	Type 5 - 8'-0" River Rock	8'-0" Washed River Rock	Northwest Landscape and Stone Supply	to be det'd
	Type 6 - Concrete Aggregate	Concrete Aggregate	LaFarge Standard	to be det'd
	Type 7 - Recycled Glass Walkway	12" x 12" Recycled Glass Paver	Interstyle	to be det'd
	Type 8 - Geocell Plastic Lattice	GrassPave Plastic Lattice	Invisible Structures	to be det'd
CURBS / Concrete	Cast-in place Concrete Curb	City of Vancouver Standard		
	Roll-Over Concrete curb	City of Vancouver Standard		
	Roman Steps	Custom - 8" x 16" x 44"	Sanderson Concrete	
TIMBER DECKING	3x6 Decking	185 x 407 x 1118 per Architectural	Forest Council Certif ed Wood	

Plant List					
ID	Qty	Botanical Name	Common Name	Scheduled Size	Remarks
Corten Steel Planter					
	168	Equisetum hyemale	Scouring Rush	1M @ 38 cm o.c.	
Meadow					
	772 m ²	Sand-Based Sod Lawn			
Spyglass Streetscape					
	49 m ²	Sand-Based Sod Lawn			
Vd	30	Viburnum davidii	David Viburnum	#2 pot @ 60 cm o.c.	Full, bushy plants
St	5	Street Tree	Species and size per City of Vancouver		
Lp	17	Lonicera pileata	Privet honeysuckle	#2 pot @ 60 cm o.c.	Full, bushy plants
Hell. s	50	Helictotrichon sempervirens	Blue Oat Grass	#1 cont. @ 60cm o.c.	Full, bushy plants
Cv	25	Calluna vulgaris Kintochruel	White Heather	#1 cont. @ 50 cm o.c.	Full, bushy plants



NO.	DATE	REVISION	DWG	DESIGN	NO.	DATE	REVISION	DWG	DESIGN
0	2008.09.05	ISSUED FOR CONSTRUCTION	GE	GE					
P8	2008.09.05	ISSUED FOR CONTEMPLATED CHANGE NOTICE No.1	GE	GE					
P7	2008.07.25	ISSUED FOR TENDER ADDENDUM NO. 3	GE	GE					
P6	2008.07.15	ISSUED FOR TENDER ADDENDUM NO. 2	GE	GE					
P5	2008.07.02	ISSUED FOR BUILDING PERMIT	GE	GE	4	2010.08.11	RECORD DRAWING	VW	GE
P4	2008.06.19	ISSUED FOR TENDER	GE	GE	3	2010.03.10	FINAL DESIGN DRAWING	VW	GE
P3	2008.06.11	ISSUED FOR PRE-TENDER REVIEW	GE	GE	2	2009.10.06	RE-ISSUED FOR CONSTRUCTION	VW	GE
P1	2008.06.05	ISSUED FOR 90% DESIGN REVIEW	GE	GE	1	2009.03.20	ISSUED FOR BUILDING PERMIT 100%	GE	GE



BRANCH INITIALS DATE

CHECKED

CHECKED

COV BRANCH

DRAWN BY: GE DESIGN BY: GE

DRAWING CHECKED: GE DESIGN CHECKED:

REFERENCES:

ENGINEERING SERVICES - CITY OF VANCOUVER

SEFC-NEU-COMMUNITY ENERGY CENTRE (CEC)

1890 SPYGLASS PLACE, VANCOUVER

LANDSCAPE LAYOUT PLAN

SCALE: 1:125

DATE: OCTOBER 6, 2009

DRAWING NUMBER: 162178-A-901

SHEET 1...OF 2... REVISION: 4...

Review of this submittal is for compliance with the general intent of the contract. This review does not relieve the Sub-Contractor, Vendor, or Manufacturer of responsibility for errors or omissions in the submission or the responsibility for meeting all requirements of the contract documents. Any deviation from the contract documents initiated by the Sub-Contractor, Vendor, or Manufacturer shall be at its own sole risk. Quantities and detail dimensions are the sole responsibility of the Sub-Contractor, Vendor, or Manufacturer. Verify data with field dimensions

[] Reviewed
☒ Reviewed as Noted
 [] Revise and Resubmit

FCEC Bypass Pumping Roles & Responsibilities

Responsible parties include:

- City of Vancouver (CoV Sewers, NEU operators, CoV project team)
- Scott Special Projects (SSP)
- Division 15 Mechanical (Div15)
- Pumping Contractor (NCS)
- Mechanical Consultant (KWL)

Urgent Action Items

- NCS to provide revised bypass pumping plan addressing comments from KWL & CoV. Due EOD Thursday July 27, 2023.
- Div15/SSP to provide shutdown plan identifying pumps & valves that needs to be isolated and identifying tie-ins and pipework to be installed as part of the shutdown.
- CoV to provide wiring diagram and/or connection point to their SCADA system for NCS to tie into (NCS Control panel data sheet & wiring diagrams to be provided in revised plan). CoV plant operator to coordinate and assist with SCADA tie-in with NCS. *SSP suggests going with NCS notification system, for the 2 days of pumping bypass in lieu of connection to the SKADA system*
- Site meeting between all relevant parties to go through procedures, plans & responsibilities to ensure everyone is on the same page (Friday 28th 11am).
- KWL & CoV to review pumping plan for approval.

Mobilization

- SSP to remove granite blocks and grade and level area for setting of bypass pumps. Granite blocks to be reinstated and gravel re-graded post shutdown as required. *complete*
- NCS mobilizes to site (refer to 3-week lookahead for current schedule) and starts installation of bypass pipe and pumps in coordination with CoV to gain access to sensitive spaces as needed.
- Water test of system with NCS and Div15 assisting (refer to 3-week lookahead for current schedule).
- NCS is ready for 48hr sewage pump test (refer to 3-week lookahead for current schedule).

Commencing Pumping

- CoV to coordinate the onsite equipment shutdown with the commencement of bypass pumping to ensure no damage to their facility by inadvertently running the system dry (Pumps, Heat pumps, etc.). Once bypass pumping commences there will be no sewage running through the system downstream of the gate valves.
- NCS to perform 48 hour test of system (refer to 3-week lookahead for current schedule), CoV to have their pumps on standby for duration of test as required.
- CoV to operate their valves, e.g. close knife gate valves in the wet well, operate valve at Nelson Force main hatch (Bypass discharge Tie-in point), and 450mm bypass gate valve for force main (see attached markups for reference).
- NCS to walk the bypass pipework & tie-in to force main, and monitor pumps and sewage levels in the wet well continuously to ensure bypass is operating as required.
- NCS to demonstrate alarms and Auto start stop of pumps as required.

- CoV and Div15/SSP to coordinate shutdowns, drain and flushing of system within the facility. CoV responsible for de-energizing pumps, locking out valves and draining & flushing system as required.

Work within facility

- Div15 to review and place locks on CoV lock-outs prior to commencing work in the facility.
- Div15 to perform work on the new bypass piping, 10" plug valve installation, 24" spool swap, 18" spool swap. Refer to Div15 safe work procedure and Div15 shutdown plan.
- Div15 to fill the system with water from flush line to ensure no leaks once new spools are installed.

Reinstate System

- New system is put back into service, coordinated between Div15/SSP and CoV.
- Div15 removes locks.
- CoV removes locks and opens knife valves to allow flow of sewage back to facility while NCS is on standby.
- CoV resumes normal operation. If no issues arise, then NCS can start demobilizing.
- SSP to reinstate granite blocks and reinstate the gravel road.

Safe Job Procedure 1902 – Removal of Piping During By-Pass of Wet Well

General Safety Requirements and Instructions

****Prior removal the bypass has been running and monitored for 48 hours minimum to ensure minimum levels in the wet well are maintained.**

Step-by-Step:

1. The following PPE must be worn during the task: Hard hat, CSA-approved boots, safety glasses, gloves, and ear plugs if the area noise is above 85 dBA, respirator with organic cartridge (while initial rodding is done and until safe atmosphere levels are confirmed. For comfort and additional safety, it is recommended the respirator is worn once valves are being opened). (Tyvec suit is recommended)
2. Double check the pumps are shut off and add a Div 15 supervisors lock to complete the lockout if not previously done. The Div 15 lock should be the first lock that is required to be removed prior to restarting the system with CoV locks following as they start the system.
3. Confirm the main pipe that is being disconnected from has been flushed out and is fully locked out.
4. Confirm the valves upstream of TP-01 in the main room, upstream of TP-06 and downstream of TP-07 in the odor control room are closed.
5. Perform a pre-use inspection of any ladders being used.
6. Perform an equipment inspection on the rigging components including anchors, pull mechanisms and eye bolts when being used.
7. Double check:
 - a. Are the tools/equipment right for the task and do they have the right capacity?
 - b. Is the equipment in good working condition?
 - c. What is the center of gravity on the item being lifted?
 - d. Are the ladders in the appropriate position for disassembly and lifting?
 - e. Hazards in the environment ie: adequate lighting, distractions, noise
8. Create a Control Zone/room with a sign on the door Hazardous material, active workers only.
9. Before unbolting the pipe in the main room, open the 2" drain valve in the pipe and do a rodding to check no blockages are present and all liquid has been drained from the pipe.
10. Wrap and store the contaminated rod in cloth to be hosed off later.
11. Test the immediate area around the drain hole for off gas readings and closer to the floor. Continue if readings remain in normal range and no alarm sounds.
12. Once the pipe is confirmed drained, removal of both pipes may begin. Each pipe has a team working to remove the 2 pipes simultaneously. (1 x main room, 1 x odor control room)
13. Rig the pipes prior to removing any bolts or supports.
14. Do a pre-lift meeting. Discuss C.O.G. and how the load will possibly react.
15. Agree on an acceptable set of hand signals between workers performing the task.
16. Agree on equal pulls on the chain falls if two systems are required.
17. Re-Check the equipment capacity to make sure the working load limits of all rigging and equipment (slings, hooks, chain fall, etc.) are not exceeded.
18. Check for complications such as workers creating a visual obstruction, and check for pinch points or anything potentially hazardous.
19. Unbolt the 24" knife valve and the 24" plug valves for the pipe in the main room.
20. Unbolt the flange at TP-07 and TP-06 in the odor control room.
21. When the pipes have been unbolted, remove the bolts on the supports for the plug valve.
22. Lift the pipe off the supports until free from support and pause to ensure all rigging supports the pipe.
23. Use a load line to control the lift when above the torso.
24. Using one or a combination of chains with a total rating high enough to handle the weight safely.

lift the load one foot off the stand to test stability of the load. Push the load around, does it move or shift to one side? If no, proceed with the lifting the pipe out of the support and moving it to where it will be placed on the floor.

25. Be careful that no worker is standing where the pipe could fall if a fall were to occur.
26. Once the pipe has been removed proceed with the installation of the new pipe including, blind flanges and capping the T installed for future connections.
27. Plan certain points in the lift at which you can pause to reassess whether the task is going safely.
28. Remember to lift the pipe off the ground and check for stability before proceeding.
29. Once in the correct spot a comealong can be used to pull the pipe horizontally into position on the support when required.
30. Replace and bolt the vertical bar for the support.
31. Bolt the 24" plug valve and knife valve pipe in place.
32. Double check all bolts and supports are intact.
33. Fill the system with water to verify the new system is sealed.
34. Once all work is complete let all workers know Div 15's lock is going to be removed.
35. Notify CoV and NCS Fluid Systems all work is complete.

Emergency Preparedness

1. Prior to starting work communicate with technicians doing the Pumping Bypass to confirm no issues overnight or in the last 48 hours.
2. Confirm Immediate notification will occur if the Pumping Bypass should fail.
3. If word is received the Bypass is failing, all workers are to leave the FCEC building notifying any workers to leave on the way out.
4. Workers will gather at the muster point and ensure all are accounted for.
5. Ensure the GC SSP and CoV have been notified of failure and are on standby as backup pumps are started.
 - a. Steve Lacamell – 604-880-7675
 - b. Travis Legasse – 604-787-5025
6. NCS Pumping Bypass emergency procedures and communication calls will start
7. If backup pumps are unable to maintain bypass CoV Sewage Operations will be notified to start their emergency calls and plan.

