SEWER PROTECTION STUDY – OPTION ANALYSIS RESULTS

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SIGN-OFF SHEET

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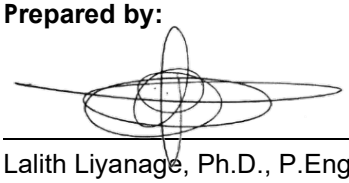

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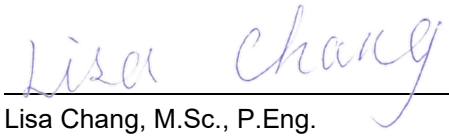

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1 INTRODUCTION

The City of Iqaluit faces several challenges in handling solids and deleterious materials at the WWTP and Lift Station No. 01 and is looking to improve the reliability of the systems. The impacts of the solids and debris to both Lift Station No. 01 (LS No. 1) and the Wastewater Treatment Plant (WWTP) have not only created challenges with maintaining consistent operations, but regularly interrupt normal operations requiring diversion of the flows. In July 2019, the City of Iqaluit retained Nunami Stantec to investigate options to resolve the current solids handling issues.

The overarching requirement for this project is to establish a technology that is both robust and economically viable. Interwoven in this requirement are a number of significant factors that are critical to the success of this project. These factors include:

- Solve maintenance issues at the Lift Station #1 and Dump Station including plugging and debris management;
- Solve the plugging and other operational issues at the wet well of WWTP;
- Creating a solution that will be straight forward to operate and maintain;
- Designing the highest degree of redundancy that is reasonably possible;
- Maximizing the infrastructure investment already made by the City;
- Developing a design solution that will provide minimal disruption to the existing systems (both Lift Station and WWTP); and,
- A system that meets the regulatory demands.

Technical Memorandum #1 “List of Scenarios to be Analyzed” dated 16th September 2019 listed the scenarios that were analyzed during this project. This report describes the methodology for the evaluation of the options, results and recommendations.

2 DESIGN BASIS

The year 2041 was selected as the design year for this option analysis, as previously published projections are for the year 2041 and also it is acceptable to have a 20-year design horizon for lift station design, septage receiving station design and grit removal facilities. To estimate the design flows for LS NO.1, Dump Station and at the WWTP, information from the following reports were used:

- Civil Engineering Services for Sanitary Relocation, Iqaluit, NU – Feasibility Memorandum _ Rev 1 (Nunami, April 2019),
- Draft Design Basis, Earth Tech, May 2005, and;
- Iqaluit WWTP Upgrade City of Iqaluit Redesign Development Report (Nunami, November 2017).

2.1 Lift Station #1 (LS No.1)

Based on the data from the previous reports (draft design brief, drawings, recently collected flow data and feasibility report). The current (2019) wastewater flow is estimated to be 34.5 L/s and design peak flow rate for the future (2041) obtained from Civil Engineering Services for Sanitary Relocation is 72 L/s. However estimated design pipe capacity is 80 L/s. Therefore, theoretically, the pump station should be designed for minimum 72 L/s, ideally 80 L/s. Based on above considerations, 80 L/s flow rates for the LS No.1 upgrades were selected for this options analysis.

2.2 Dump Station

Based on the reported frequency of sewage trucks and to provide required redundancy, 2 septage receiving station receptacles (6” each) were considered sufficient. The truck volume was estimated to be 3,000 US gallons (11,356 Liters) and the acceptable time to discharge a full truck load was considered 5 minutes. Considering the proximity of the Dump Station to the existing WWTP, the total wastewater flow rate at the dump station is considered 151 L/s (peak hour flow) which is same as for the WWTP estimated flows. This is considered acceptable for the purpose of options analysis as specific flow rates at the Dump Station is not available. The grit removal facility is designed to handle the peak hour flow of 151 L/s with average capacity of 80 L/s.

2.3 Wastewater Treatment Plant

Iqaluit WWTP Upgrade City of Iqaluit Redesign Development Report (Nunami, November 2017), projected the average and peak hour flows in the design year (2041) at the WWTP will be 50 L/s and 151 L/s respectively. Similar to at the Dump Station, grit removal facility is designed to handle the peak hour flow of 151 L/s. For the septage receiving station, same design basis as for the Dump Station is selected.

3 OPTIONS CONSIDERED

Details of the options are given in the Tech Memorandum #1 and are listed here.

3.1 Options Being Considered at LS No. 01

Option #A1: Construct a new automatic screening facility (with sufficient redundancy and manual by-pass) prior to sending the screened wastewater into the existing wet well. This will be a separate building adjacent to the existing lift station No.01 building. This option will continue to utilize the existing wet well and the lift station pumps and the building. Analysis will include comment on the existing wet well capacity. This option will require removal of the existing grinder.

Option #A2: Construct a new grinder station with sufficient redundancy ahead of the existing wet well and the pumps with proper access for service operation and maintenance. This will be a separate building adjacent to the existing lift station building. This option will continue to utilize the existing wet well and the lift station pumps and the building. Analysis will include comment on the existing wet well capacity. This option will require removal of the existing grinder.

Option #A3: Construct a brand-new lift station with sufficient wet well size, access for operation and maintenance with an automatic screening facility. The existing building may be re-purposed for storage, as a generator building or other usages.

The City has also expressed their consideration of providing grit handling at Lift Station No.01. It is Nunami Stantec's professional opinion that it is more efficient and cost effective to manage the grit at the WWTP, where grit from all the City's flow can be processed in one location.

3.2 Options Being Considered at Dump Station

Option #B1: Construction of a new septage receiving station with grinding and/or screening facilities and grit removal. These facilities will be housed in a heated building. There are large number of options available for septage receiving station configurations and two applicable options were reviewed with input from all stakeholders. If this option is selected, septage receiving and grit removal upgrades are not required at the WWTP.

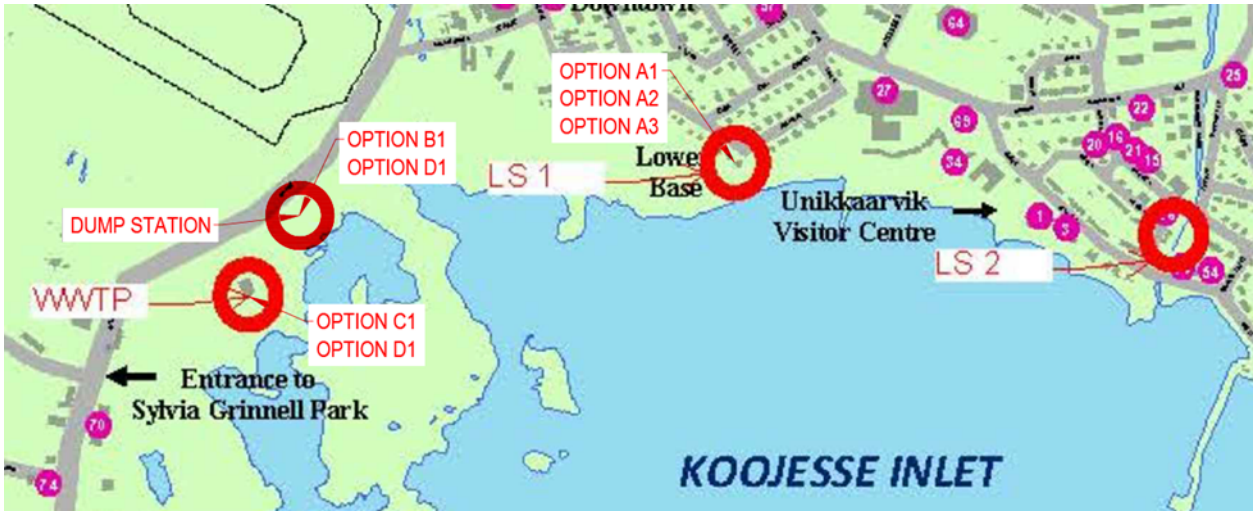
3.3 Options Being Considered at WWTP

Option #C1: This option investigated the addition of septage receiving station (with grinder, screens) and grit removal (for total wastewater flow) adjacent to the existing WWTP. If this option is selected, Option #B1 will not be required. All septage delivery will be at the WWTP and the current septage discharge location can serve as a backup.

3.4 Combined Option

Option #D1: This option investigated the addition of septage receiving station (with grinder) at the dump station. Grit removal will be located at the WWTP. Existing filter will be re-located to the downstream of the proposed grit removal facility.

The locations of the proposed treatment options above are shown in the Map below.



4 EVALUATION METHODOLOGY

A summary of options and the evaluation objectives are summarized in the Table below (**Table 4.1**).

Table 4.1: Options and Evaluation Objectives

Location	Option	Design	Comments
Lift Station #1	A1: New screen facility ahead of the LS NO.1	New screen facility (with heated enclosure) for the capacity of 80 L/s upstream of the existing LS NO.1. Estimated LS NO.1 capacity with increased pump speed is 64 L/s	Only one option will be selected out of these three concepts
	A2: New Grinder station ahead of LS NO.1	New grinder facility (with heated enclosure) for the capacity of 80 L/s upstream of the existing LS NO.1. Estimated LS NO.1 capacity with increased pump speed is 64 L/s	
	A3: Brand new lift station	New lift station with screen or grinder with 80 L/s average and 151 L/s peak flow pumping firm capacity and appropriate wet well size with operator access and other amenities/accessories.	
Dump Station	B1: New Septage* receiving station with Grit removal	New standard septage receiving station comes with an on-line grinder with two septage receiving connections. Enclosed in a heated enclosure. Downstream grit removal for the main wastewater stream with 80 L/s average and 151 L/s peak flow capacity. Grit removal facility will be housed with a heated grit collection and processing facility.	Only one option will be selected out of these three concepts
WWTP	C1: New Septage receiving station with Grit removal	New standard septage receiving station comes with an on-line grinder with two septage receiving connections. Enclosed in a heated enclosure. Downstream grit removal for the main wastewater stream with 80 L/s capacity. Grit removal facility will be housed with a heated grit collection and processing facility.	
Combined	D1: New Septage receiving station at Dump Station with Grit removal at the WWTP	New standard septage receiving station comes with an on-line grinder with two septage receiving connections. Enclosed in a heated enclosure located at the dump station. Grit removal facility will be located at the WWTP.	

* Another possible variation of the Option B1 is to add a screening facility ahead of the grit removal to the Option B1 at the dump station (referred to as Option B2). This option was included after the draft analysis and hence not included in the TBL analysis presented in this report.

More technical details of the options are given in the **Table 4.2** Refer to Figures A1, A2, A3, B1, C1 and D1 for details of the options

Table 4.2: Equipment Descriptions for All Options

Location	Option	Major Equipment	Power (hp)	Flush water	Qty.	Enclosure/house	Footprint
Lift Station #1	A1: New screen facility ahead of the LS NO.1	Huber Rotamat Rok4-500-6	2 HP, 575 VAC, 3ph, 60 Hz, S.F. 1.15, Class 1 Division 1	Yes	2	Not included	10m x 6m
	A2: New Grinder station ahead of LS NO.1	Netzsch inline grinder N.mac 3501	5.5HP, 600/3/60	Yes	2	Not included	4m x 4m
	A3: Brand new lift station c/w FRPTank and Grinder	2 Flygt Model NP-3171 Submersible Pump	25HP, 600/3/60	Yes	1	Not included	D=3.3M, Depth=6.6m
Dump Station	B1: New Septage receiving station with A in-line grinder *	Flowpoint 2 (6") septage receiving station			1	Included	3m x 5m X 2m
		Control Panel 2		Yes	2		
		In-line Grinder 2			2		
	B1: Grit removal Station	Grit removal +Gouman-Rupppump+ Dewatering screw system	7.5HP + 1 HP, 575/3/60	Yes	1	Included	6m x 12m
WWTP	C1: New Septage receiving station with Grit removal	Flowpoint 2 (6") septage receiving station			1	Included	3m x 5m X 2m
		Control Panel 2	4HP, 600/3/60	Yes	2		
		In-line Grinder 2			2		
	C1: Grit removal station	Grit removal +Gouman-Rupp pump+ Dewatering screw system	7.5HP + 1 HP, 575/3/60	Yes	1	Not included	20m x 8m x 8m
Combined	D1: New Septage receiving station at Dump Station	Flowpoint 2 (6") septage receiving station			1	Included	3m x 5m X 2m
		Control Panel 2	4HP, 600/3/60	Yes	2		
		In-line Grinder 2			2		
	D1: Grit removal at the WWTP	Grit removal +Gouman-Rupp pump+ Dewatering screw system	7.5HP + 1 HP, 575/3/60	Yes	1	Not included	20m x 8m x 8m

* Option B2 will have additional screening facility to the Option B1

4.1 Key Pros and Cons

Key pros and cons for each of the option is listed in **Table 4.3.**

Table 4.3: Key Pros and Cons of the Options

Option	Advantages	Disadvantages
A1	Minimal disruption to the current operation, except for connection	Lift station still will have limited capacity and operator access issues. Screenings have to be collected and transported Higher odor potential
A2	Minimal disruption to the current operation, except for connection	Lift station still will have limited capacity and operator access issues.
A3	Minimal disruption to the current operation, except for connection Will meet capacity and operator access/safety requirements	Minimum usage of the existing lift station facility
B1	Easy user access Possible use of existing overflow to the lagoon	Additional facility to operate and maintain Future connections from West or South to the WWTP will not be serviced
C1	Better operability One facility to operate Easily expandable	Difficult truck access Unavailability of the overflow for septage facility
D1	Easy user access Possible use of existing overflow to the lagoon Most easily expandable	Two locations to maintain

As can be seen from the above tables, functional requirements are different for the options at the lift station and (A1, A2 and A3) the options of septage receiving station (B1, C1 and D1).

Therefore, it is proposed to utilize two sets of criteria for option selection.

4.2 Selection Criteria for Lift Station #1 Options

Proposed selection criteria for the options at the lift station are:

Economic

- Capital cost
- Operating and maintenance cost
- Meeting 2041 capacity requirements
- Utilization of existing facilities
- Expandability

Environmental

- Energy reliance

- Disruption to the normal operation
- Odor potential

Social

- Operability
- Operator safety

Proposed selection criteria for the options at the current septage receiving station (Dump Station) and grit facility are:

Economic

- Capital cost
- Utilization of existing facilities
- Expandability

Environmental

- Disruption to the normal operation

Social

- User access
- Operability

Definitions for these criteria are given in the **Table 4.4.**

Table 4.4: Selection Criteria Definition

Criteria	Definition
Capital cost	Budget level capital cost estimate based on the conceptual design. Highest capital cost will be assigned a value of 1 and the lowest 10.
Operating and maintenance cost	Budget level operational and maintenance cost estimate based on the conceptual design. Highest O&M cost will be assigned a value of 1 and the lowest 10.
Long term expandability	If the current estimated quantities to be doubled, the required expansion to accommodate.
Disruption to the normal operation	Shut down periods required during construction, tie-ins etc. for each option. Longest shut down period was given 1 and the option with the shortest shut down period was given 10.
Odor sensitivity	Odor generation potential from each technology will be evaluated and estimated. Technology with the highest potential to create odor will be given the lowest score of 1.
Capacity requirements	Meeting current and 2041 design capacity requirements.
Energy Reliance/Usage	Estimated electricity, water, gas and/or fuel usage. The estimates will be based on the vendor supplied information and estimated based on experience with similar facilities.
Utilization of existing facilities	Use of existing facilities as part of the options.
Operability	The access to the facilities, closeness of the sanitary/resting facilities for the operator personnel.
Operator safety	Likelihood of safe access to all the equipment.
User access	User accessibility such as for trucks.

Based on our experience with similar systems, the following weighting was assigned for each category of criteria, however, it is recommended that weighting criteria be developed with the input from all the stakeholders (**Table 4.5**).

Table 4.5: Evaluation Criteria Group Weights

Criteria Group	Weight (%)
Economic	30
Environmental	50
Social	20

Capital Costs

Capital cost comparison between different options are detailed in the table below (**Table 4.6**):

4.3 Lift Station #1 Options Evaluation

Estimated capital costs for each of the options are given in **Table 4.6**.

Table 4.6: Capital Costs

Capital Items	A1	A2	A3
Process Equipment	426,000	267,000	462,600
Installation	400,000	200,000	600,000
Building	600,000	192,000	688,000
Civil	40,000	180,000	900,000
Estimated total capital Costs	1,253,000	1,106,000	2,650,600
Rank	9.1	10	1

* Utilities supply cost such as water and power supply is not included and considered similar for all options.

Operating and Maintenance Cost

Operating and maintenance cost comparison between different options are detailed in the table below (**Table 4.7**):

Table 4.7: Operating and Maintenance Cost*

Parameter	A1	A2	A3
Operation	75,000	75,000	225,000
Utilities	9,198	25,141	9,198**
Maintenance	5,680	7,120	12,337
Estimated Costs	89,878	107,261	246,535
Rank	10	9	1

* Water supply costs are not included, as it is considered by the City supply

** pump operation costs were not included as it will be similar to current power usage

Long Term Expandability

Long term expandability comparison between different options are detailed in the table below (**Table 4.8**)

Table 4.8: Long Term Expandability

Parameter	A1	A2	A3
Discussion	Straight forward expandability	Straight forward expandability	Easiest to expand*
Rank	8	8	10

* New lift station will have room to add new pumps and equipment if required

Disruption to the Normal Operation

Comparison of disruption to the normal operation between different options are detailed in the table below (**Table 4.9**)

Table 4.9: Disruption to the Normal Operation

Parameter	A1	A2	A3
Discussion	Some disruption is required to connect the incoming sewer line to the new facility and new facility to the existing LS NO.1	Some disruption is required to connect the incoming sewer line to the new facility and new facility to the existing LS NO.1	Minimum disruption as the new lift station can be built entirely without any interruption. Some disruption during hook-up
Rank	6	6	10

Odor Sensitivity

Odor sensitivity comparison between different options are detailed in the table below (**Table 4.10**)

Table 4.10: Odor Sensitivity

Parameter	A1	A2	A3
Discussion	Odor probability is relatively higher	Odor probability Low	Odor probability is lowest
Rank	6	8	10

Capacity Requirements

Capacity requirements comparison between different options are detailed in the table below (**Table 4.11**)

Table 4.11: Capacity Requirements

Parameter	A1	A2	A3
Discussion	Current lift station capacity will be a bottleneck	Current lift station capacity will be a bottleneck	Will meet the capacity requirements
Rank	6	6	10

Energy Reliance/Usage

Energy reliance/usage comparison between different options are detailed in the table below (**Table 4.12**).

Table 4.12: Energy Reliance/Usage

Parameter	A1	A2	A3
Electricity, KW-h/year	13,140	35,916	13,140
Power for Water Usage	109.5	0	54.75
Total	13,250	35,916	13,195
Rank	10	1	10

Utilization of Existing Facilities

Utilization of existing facilities comparison between different options are detailed in the table below (**Table 4.13**)

Table 4.13: Utilization of Existing Facilities

Parameter	A1	A2	A3
Discussion	This option will utilize the existing LS #1	This option will utilize the existing LS #1	This option will utilize the existing LS #1 only as possible storage and Generator room
Rank	10	10	8

Operability

Operability requirements comparison between different options are detailed in the table below (**Table 4.14**)

Table 4.14: Operability

Parameter	A1	A2	A3
Discussion	Relatively complex with screen*	Simpler to operate*	Simplest to operate
Rank	4	8	10

* Considering the need to continue operating the existing LS NO.1

Operator Safety

Operator safety requirements comparison between different options are detailed in the table below (**Table 4.15**)

Table 4.15: Operator Safety

Parameter	A1	A2	A3
Discussion	Operating the existing LS NO.1 create more potential safety hazards	Operating the existing LS NO.1 create more potential safety hazards	New Facility that will meet all safety requirements
Rank	8	8	10

4.4 Options Evaluation at Dump Station and at WWTP

Capital costs for each option at Dump Station options are given in **Table 4.16**.

Table 4.16: Capital Costs

Capital Items	B1*	C1	D1
Process Equipment	940,000	940,000	940,000
Installation	900,000	1,100,000	900,000
Building	864,000	1,920,000	1,440,000
Estimated total capital Costs	2,704,000	3,960,000	3,760,000
Rank	10	1	5.9

* Option B2 Estimated capital cost is $4,430,000 (this include septage receiving station, grit removal and screening at the current Dump Station location with an additional building extension of 8m x 8m)

Long Term Expandability

Long term expandability comparison between different options are detailed in the table below (**Table 4.17**)

Table 4.17: Long Term Expandability

Parameter	B1	C1	D1
Discussion	Significant construction is required for expansion of Grit facilities	Easy Expansion for Grit but not for septage receiving	Easiest Expansion
Rank	6	8	10

Disruption to the Normal Operation

Comparison of disruption to the normal operation between different options are detailed in the table below (**Table 4.18**).

Table 4.18: Disruption to the Normal Operation

Parameter	C1	B1	D1
Discussion	Some disruption to the sewers during grit chamber installation and possibly during septage receiving station installation	Minimum interruption to the services	Some disruption during septage receiving station installation at Dump Station
Rank	6	10	6

Utilization of Existing Facilities

Utilization of existing facilities comparison between different options are detailed in the table below **(Table 4.19**)

Table 4.19: Utilization of Existing Facilities

Parameter	B1	C1	D1
Discussion	This option will utilize the existing overflow at the current septage station, with possible emergency use of the existing lagoon	Minimum use of existing facilities. Existing DS can be used as backup	This option will utilize the existing overflow at the current septage station, with possible emergency use of the existing lagoon
Rank	8	2	10

Operability

Operability requirements comparison between different options are detailed in the table below (**Table 4.20**)

Table 4.20: Operability

Parameter	B1	C1	D1
Discussion	Two locations to operate, not easy access to operator personnel facilities such as washrooms etc.	Easiest to operate as housed in WWTP	Two locations to operate
Rank	6	10	8

User Access

User Access requirements comparison between different options are detailed in the table below (**Table 4.21**)

Table 4.21: User Access

Parameter	B1	C1	D1
Discussion	Best for truck access	Truck access will be difficult at the WWTP	Best for truck access
Rank	10	4	10

Ranking and the final total weightings received for each option at the Lift Station #1 and Dum Station are given in the **Table 4.22** and **Table 4.23** respectively

Table 4.22: TBL Summary for Options at LS NO.1

	Option No.	A1	A2	A3
Criteria Categories	Options	A1	A2	A3
	Economical (30%)			
A	Capital Costs	9.1	10	1
B	O&M Costs	10	9	1
C	Meeting 2041 Capacity Requirements	6	6	10
D	Utilization of Existing Facilities	10	10	8
E	Expandability	8	8	10
	Economic sub total	43.1	43	30
	Environmental (50%)			
A	Energy Reliance	10	1	10
B	Disruption to the Normal Operation	6	6	10
C	Odor Potential	6	8	10
	Environmental sub total	37	25	50
		10	1	10
	Social (20%)			
A	Operability	4	8	10
B	Operator Safety	8	8	10
	Social sub total	30	40	50
	Total weighted score	**37.3**	**33.4**	**44.0**

Table 4.23: TBL Summary for Options at Dump Station

	Option No.	B1	C1	D1
Criteria Categories	Options	B1	C1	D1
	Economical (30%)			
A	Capital Costs	10	1	5.9
B	Utilization of Existing Facilities	8	2	10
C	Expandability	6	8	10
	Economic sub total	24	11	25.9
	Environmental (50%)			
A	Disruption to the Normal Operation	6	10	6
	Environmental sub total	18	30	18
	Social (20%)			
A	User Access	10	4	10
B	Operability	6	10	8
	Social sub total	24	21	27
	Total weighted score	**21.0**	**22.5**	**22.2**

5 RECOMMENDED OPTIONS

Based on the TBL analysis, following recommendations are made:

1. Implement a new lift station at the LS No.1 that will have proper safety and capacity requirements (Option A3)
2. Implement Septage receiving and grit removal at the WWTP (Option C1). Or alternatively to the Option C1, implement Option B2 (screening and grit removal at Dump Station).

To evaluate the sensitivity of the TBL analysis, an additional analysis was conducted with following weighting:

1. Economical – 40%
2. Environmental – 40%
3. Social – 20%

The final scores are given in the **Table 5.1** and **Table 5.2.**

Table 5.1: Revised Score Comparison at Lift Station #1

Table 5.1: Sensitivity Analysis at LS NO.1

Option	Original	Revised
A1 – Screen	37.3	39.2
A2 – Grinder	33.4	33.9
A3 – New Lift Station	44.0	42.0

As can be seen, if a higher weight is given to economic criteria, Option A1 becomes slightly favorable. If funding is limited, the Option A1 should be considered. However, considering the long-term capacity and operator safety, option A3 (new lift station) is recommended at this stage.

Table 5.2: Sensitivity Analysis at Dump Station

Option	Original	Revised
B1 – Dump station location	21.0	21.6
C1 – WWTP	22.5	21.4
D1 – Combined Locations	22.2	23.0

In this case, the Option D1 become the preferred option under revised criteria.

6 IMPLEMENTATION PLAN

6.1 Schedule

Based on the schematic design established, Nunami Stantec have developed an overall project implementation schedule. Key milestones are included in **Table 6.1**:

Table 6.1: Key Schedule Milestones

Milestone Event	Estimated Date
Project Approved to Proceed	February 2020
Design Commences	February 2020
Detailed Design Complete	January 2021
Tender Award	March 2021
Construction Complete	September 2022
Project Complete	November 2022

See the following page for a detailed schedule of tasks.

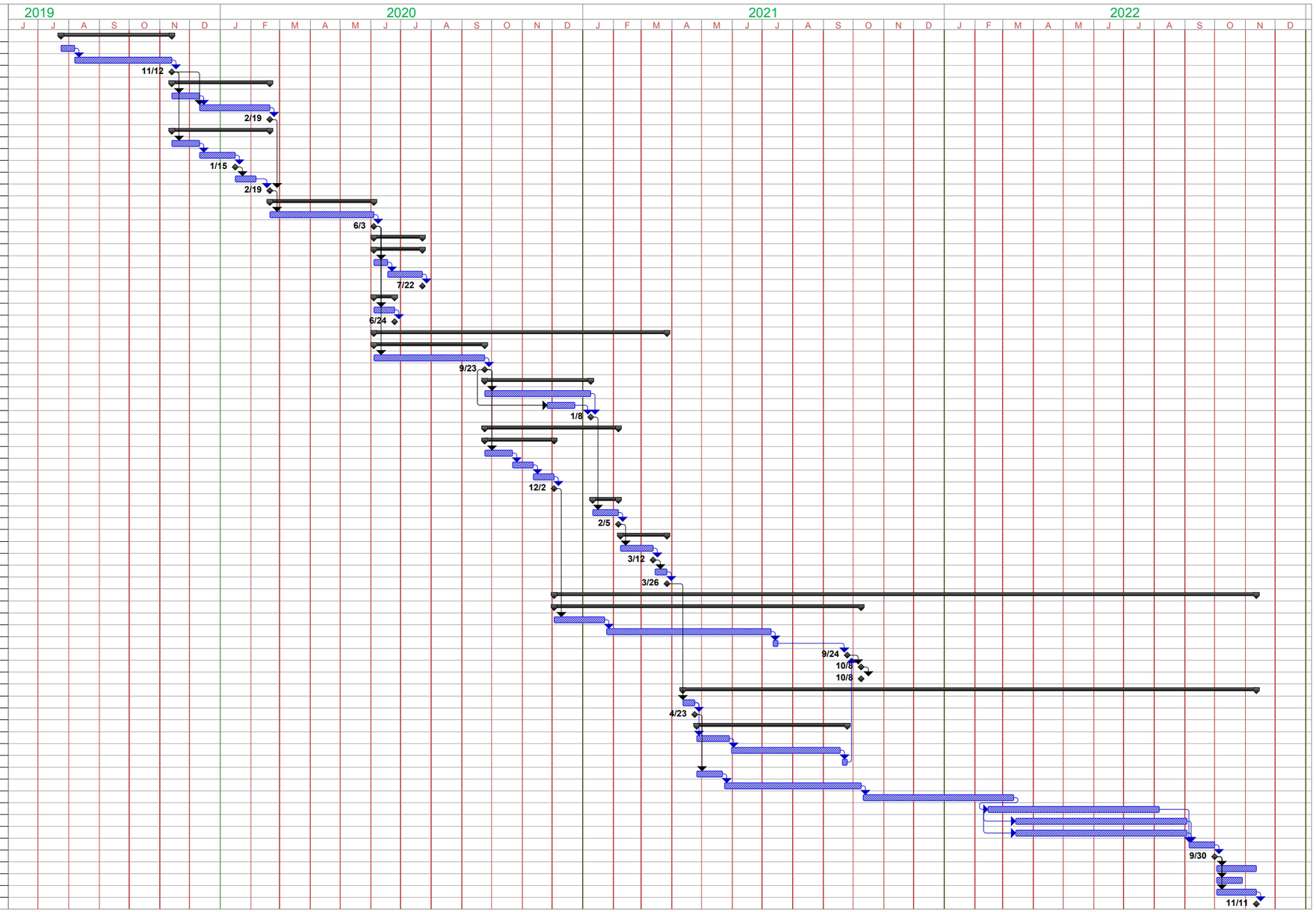
Note that the schedule is preliminary only and numerous factors could affect the estimated dates. Major influences include:

- Funding availability and approvals
- Final facility configuration and construction complexity
- Population growth and flow influences
- Stakeholder input
- Regulatory approvals
- Labour force availability
- Sealift dates
- Existing facility operational needs

City of Iqaluit - Sewer Protection

Project Implementation Schedule

ID	Task Name	Duration	Start	Finish
1	**Schematic Design**	**80 days**	**Jul 24**	**Nov 12**
2	Gather Background Information	2 wks	Jul 24	Aug 6
3	Schematic Report	14 wks	Aug 7	Nov 12
4	Schematic Complete	0 wks	Nov 12	Nov 12
5	**Capital Funding**	**70 days**	**Nov 13**	**Feb 19**
6	Apply for Eligible Funding	4 wks	Nov 13	Dec 10
7	Funding Review	10 wks	Dec 11	Feb 19
8	Project Approved	0 wks	Feb 19	Feb 19
9	**Request for Proposals**	**70 days**	**Nov 13**	**Feb 19**
10	Prepare RFP	4 wks	Nov 13	Dec 10
11	Issue RFP	5 wks	Dec 11	Jan 15
12	RFP Closes	0 days	Jan 15	Jan 15
13	Evaluate RFP	3 wks	Jan 16	Feb 5
14	Award RFP	0 wks	Feb 19	Feb 19
15	**Design Development**	**75 days**	**Feb 20**	**Jun 3**
16	Prepare Design Development Report	15 wks	Feb 20	Jun 3
17	Design Development Complete	0 days	Jun 3	Jun 3
18	**Detailed Site Investigations**	**35 days**	**Jun 4**	**Jul 22**
19	**Geotechnical Investigation**	**35 days**	**Jun 4**	**Jul 22**
20	Field Investigation	2 wks	Jun 4	Jun 17
21	Prepare Report	5 wks	Jun 18	Jul 22
22	Geotechnical Complete	0 days	Jul 22	Jul 22
23	**Topographic Survey**	**15 days**	**Jun 4**	**Jun 24**
24	Perform Topographic Survey and Prepare Drawing	3 wks	Jun 4	Jun 24
25	Survey Complete	0 days	Jun 24	Jun 24
26	**Contract Documents**	**205 days**	**Jun 4**	**Mar 26**
27	**75% Design**	**80 days**	**Jun 4**	**Sep 23**
28	Detailed Design to 75%	16 wks	Jun 4	Sep 23
29	75% submission Complete	0 days	Sep 23	Sep 23
30	**99% Design Drawings Complete**	**70 days**	**Sep 24**	**Jan 8**
31	Detailed Design Drawings	14 wks	Sep 24	Jan 8
32	Design Specifications	4 wks	Nov 26	Dec 23
33	99% submission Complete	0 days	Jan 8	Jan 8
34	**Tender Documents**	**90 days**	**Sep 24**	**Feb 5**
35	**Pre-purchase Equipment Packages**	**50 days**	**Sep 24**	**Dec 2**
36	Prepare Pre-purchase Equipment Package	4 wks	Sep 24	Oct 21
37	Issue for Quotations (IFQ)	3 wks	Oct 22	Nov 11
38	Review Quotations/Negotiation	3 wks	Nov 12	Dec 2
39	Issue PO for Shop Drawings	0 days	Dec 2	Dec 2
40	**Tender Package**	**20 days**	**Jan 11**	**Feb 5**
41	Complete Drawings & Specifications	4 wks	Jan 11	Feb 5
42	Issue for Tender	0 wks	Feb 5	Feb 5
43	**Tendering Assistance**	**35 days**	**Feb 8**	**Mar 26**
44	Tender Inquiries / Addendum	5 wks	Feb 8	Mar 12
45	Tender Close	0 days	Mar 12	Mar 12
46	Review Tenders/Negotiation	2 wks	Mar 15	Mar 26
47	Contract Award	0 days	Mar 26	Mar 26
48	**Lift Station & Septage Construction**	**500 days**	**Dec 3**	**Nov 11**
49	**Pre-purchase Equipment Fabrication**	**215 days**	**Dec 3**	**Oct 8**
50	Shop Drawing Prep & Review	6 wks	Dec 3	Jan 22
51	Equipment Fabrication	24 wks	Jan 25	Jul 9
52	Deliver Equipment to Terminal	1 wk	Jul 12	Jul 16
53	2021 Sealift Staging (Estimated)	0 days	Sep 24	Sep 24
54	2021 Sealift Arrives (Estimated)	0 days	Oct 8	Oct 8
55	Store Equipment	0 days	Oct 8	Oct 8
56	**LS#1 & Septage Station Construction**	**415 days**	**Apr 12**	**Nov 11**
57	Contractor Mobilizes/Prep Work	2 wks	Apr 12	Apr 23
58	Main Construction Commences	0 days	Apr 23	Apr 23
59	**Contractor Supplied Equipment & Materials**	**110 days**	**Apr 26**	**Sep 24**
60	Shop Drawing Prep & Review	5 wks	Apr 26	May 28
61	Equipment Fabrication	16 wks	May 31	Sep 17
62	Deliver Equipment to Terminal	1 wk	Sep 20	Sep 24
63	Site & Existing Building Preparation	4 wks	Apr 26	May 21
64	Foundations	20 wks	May 24	Oct 8
65	Superstructure	22 wks	Oct 11	Mar 11
66	Process Equipment Installation	25 wks	Feb 14	Aug 5
67	Electrical/I & C	25 wks	Mar 14	Sep 2
68	HVAC Mechanical	25 wks	Mar 14	Sep 2
69	Commissioning	4 wks	Sep 5	Sep 30
70	Substantial Completion	0 days	Sep 30	Sep 30
71	Deficiencies	6 wks	Oct 3	Nov 11
72	Demolish Existing Lift Station (if applicable)	4 wks	Oct 3	Oct 28
73	Prepare Record Drawings	6 wks	Oct 3	Nov 11
74	Project Complete	0 days	Nov 11	Nov 11



6.2 Priorities

As the proposed components are of significant value, the City may need to prioritize the implementation of the various items. Although each item is crucial to the improved performance of the overall system, Nunami Stantec suggest, if necessary, that the project proceed as follows:

1. Septage Receiving

   It is very unusual for a wastewater collection system to not have a method to process and handle the influx of septage. As witnessed in Iqaluit, the septage being received contains significant deleterious materials such as sheets, shoes, diapers, etc. that severely impact the operation of the downstream pumping systems. Processing this waste separately would greatly improve the operation of the system.

2. Lift Station No. 01 Screening

   Essentially equal to the processing of septage is making improvements at Lift Station. No. 01. To a somewhat smaller extent, the wastewater received at this station (and also likely at Lift Station. No. 02) is high in deleterious materials with the unfortunate occurrence that residents do not understand the impact to the system of flushing waste materials.

3. Grit Handling

   The grit encountered within the system impacts the system to a lesser extent. The current WWTP configuration of screening then primary filters is capable of handling the grit. The impact however is more wear and tear on the filter belts, thus creating additional maintenance requirements. It could be considered the third priority, but its implementation will be more economical to provide with a common system at the Septage dump.

We trust that the above options analysis is satisfactory and provide a basis to proceed with next steps. If you have any questions, please feel free to contact us at your convenience.

Sincerely,

NUNAMI STANTEC LIMITED

Original signed by

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c. Eric Marko, Colliers

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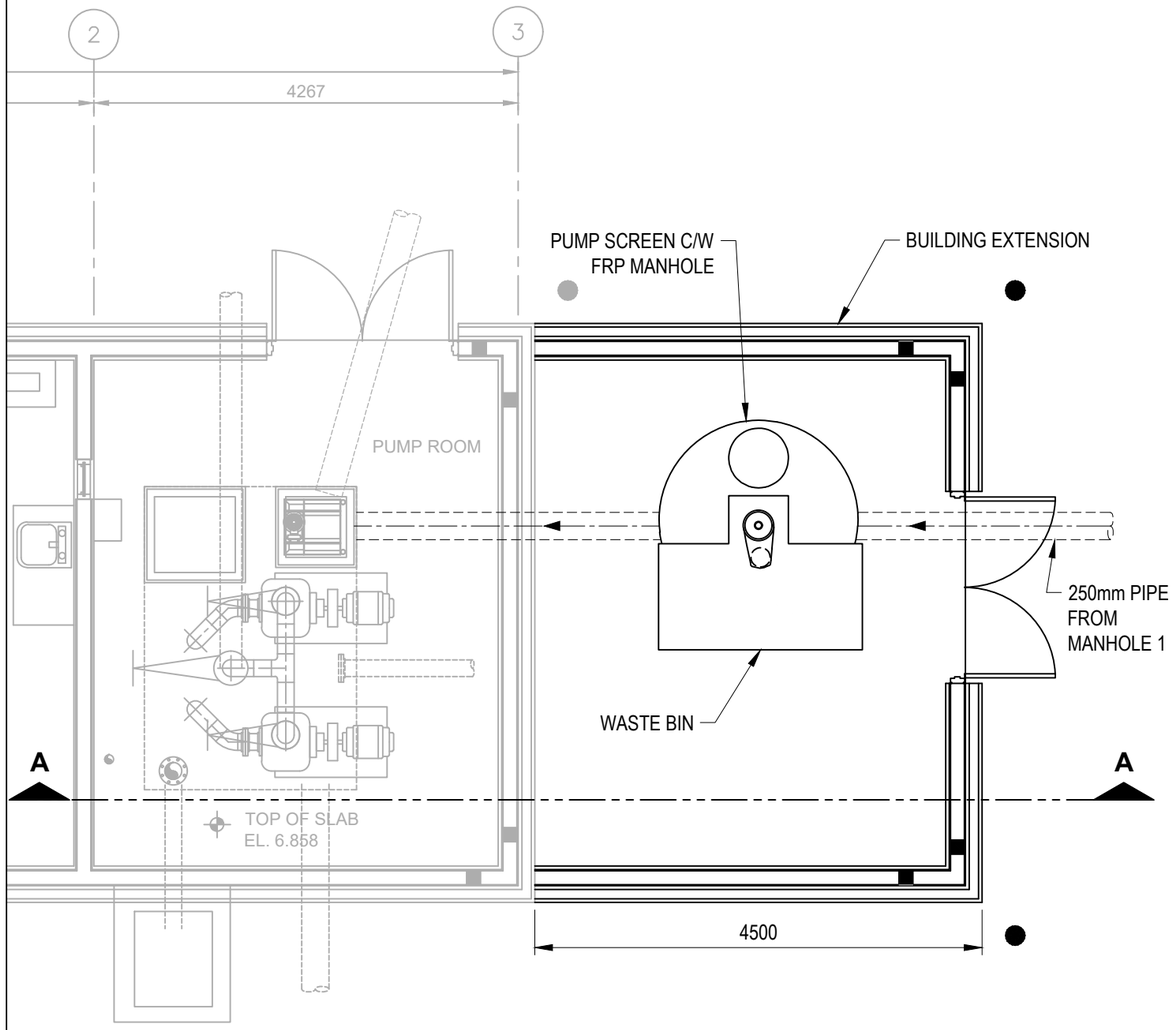
APPENDICES



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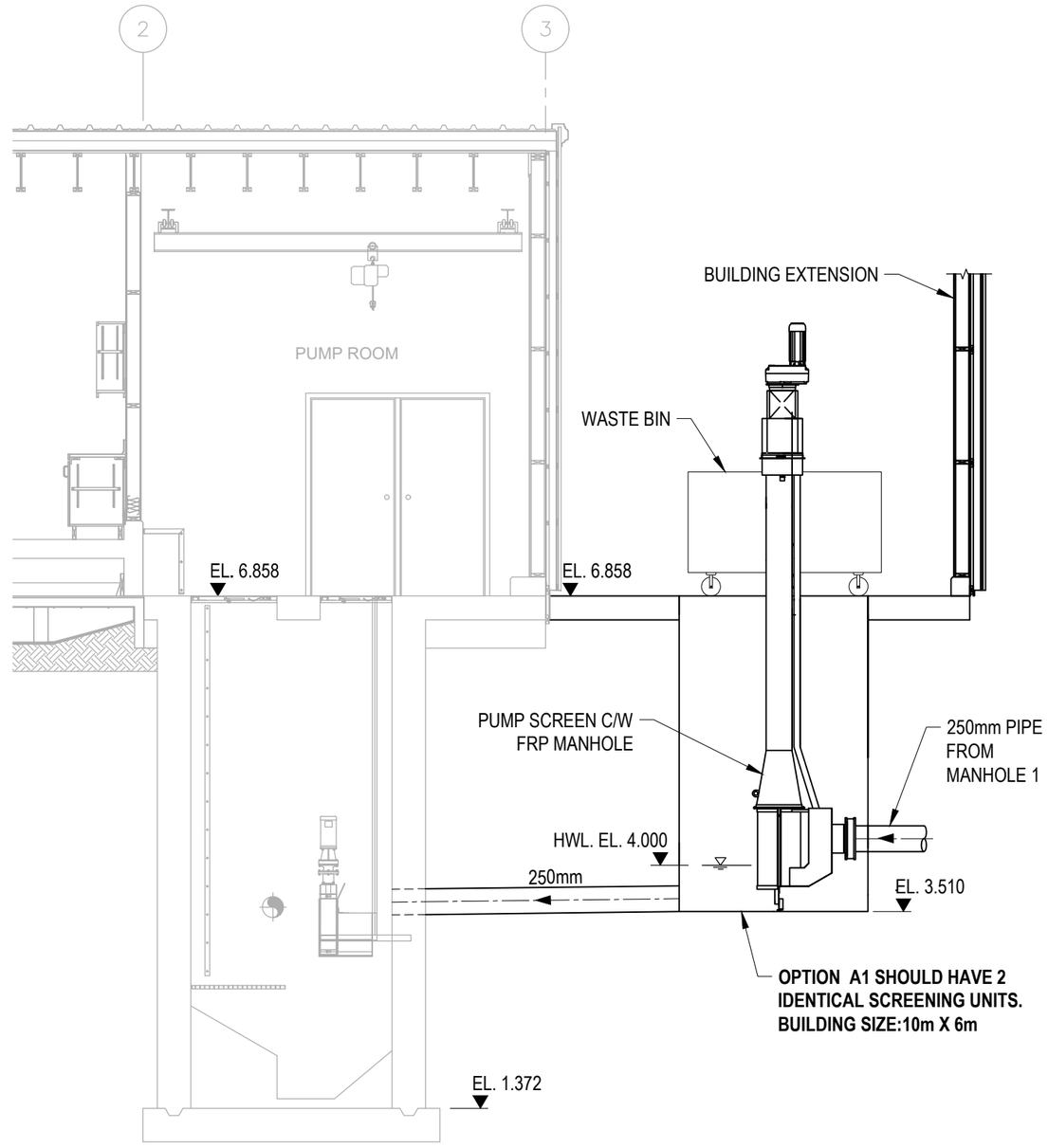

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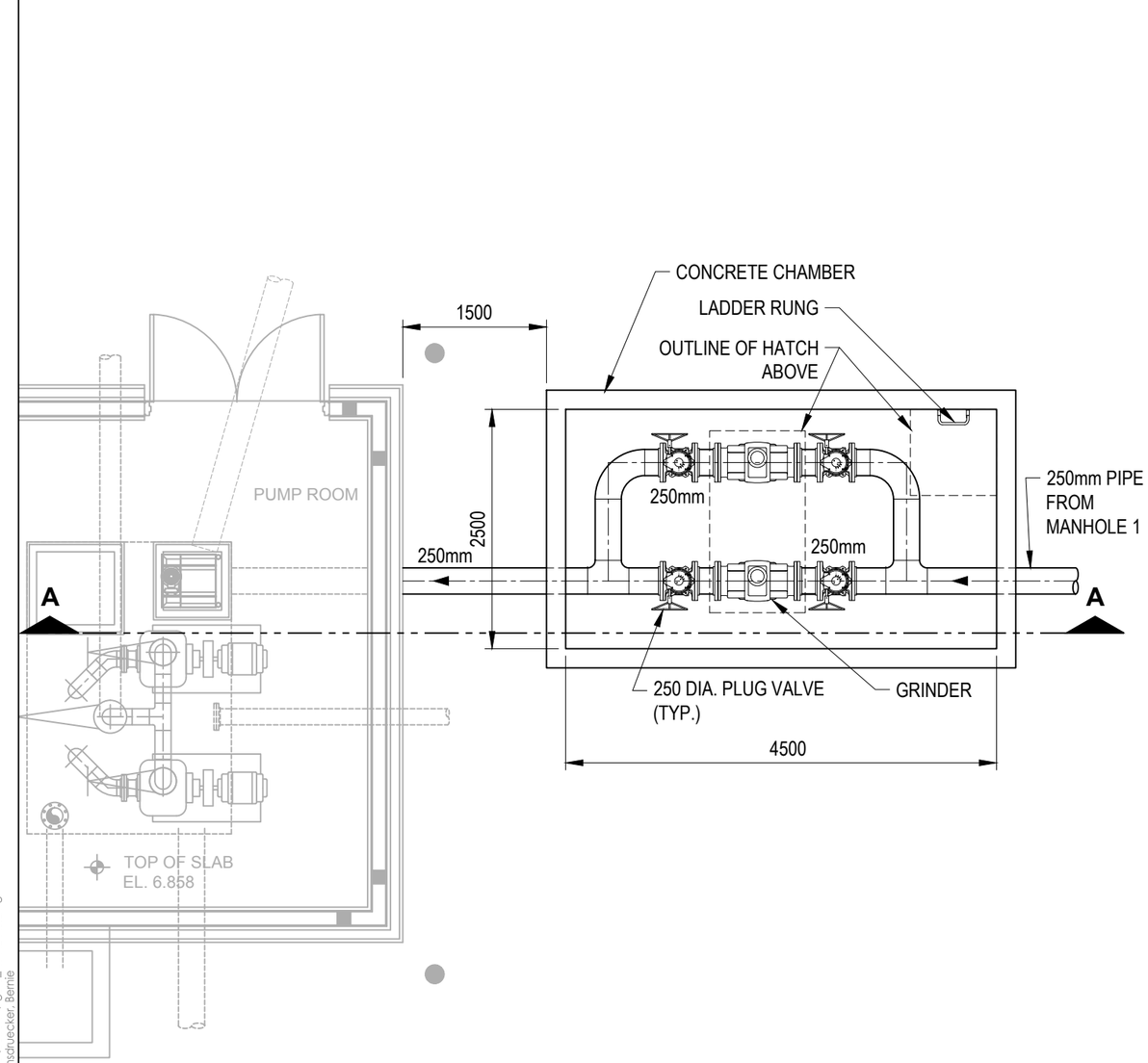
Figure No.
Option A1

Title
Lift Station No. 1
Pump Screen



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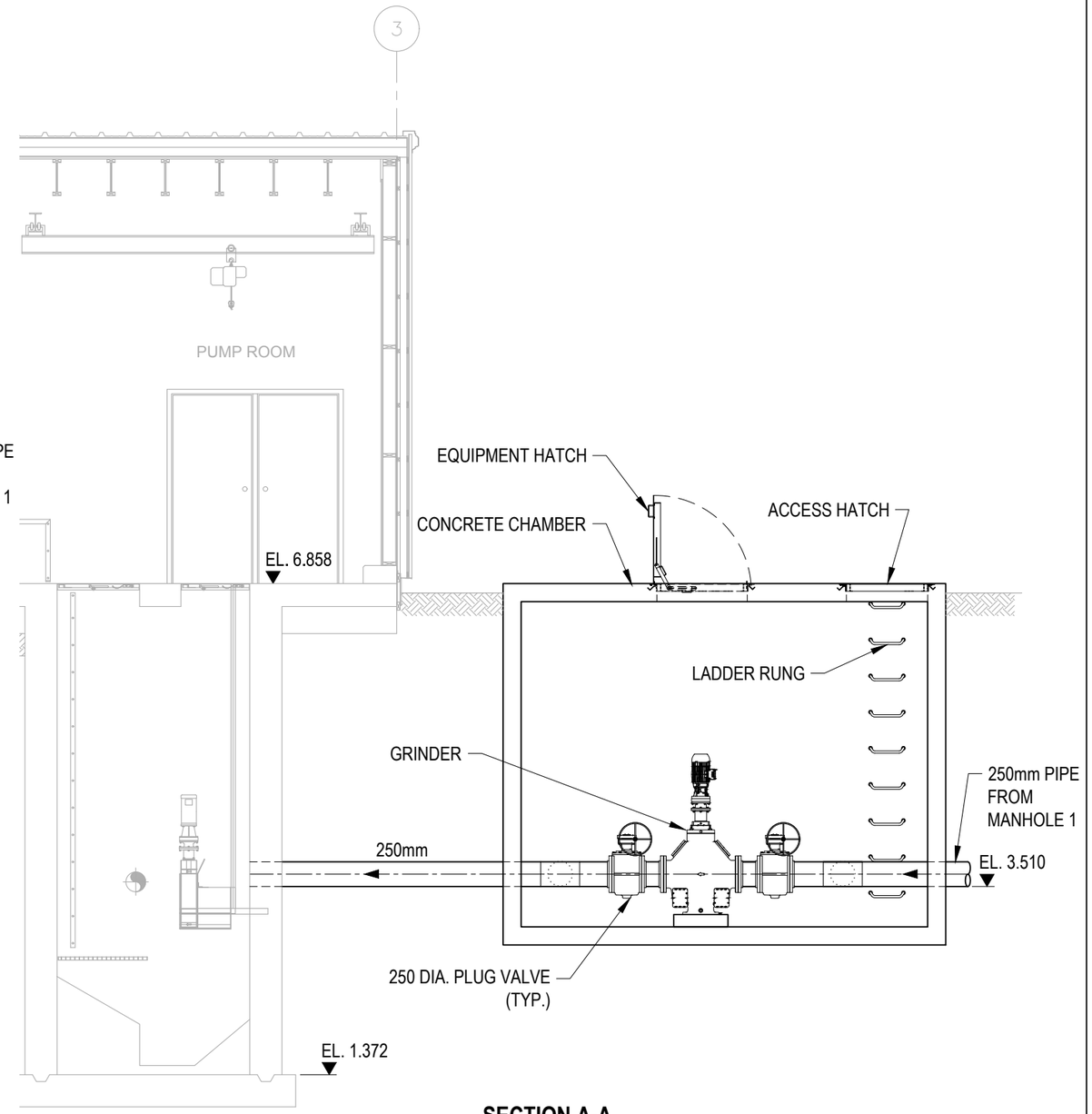

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Figure No.
Option A2

Title
Lift Station No. 1
Grinder

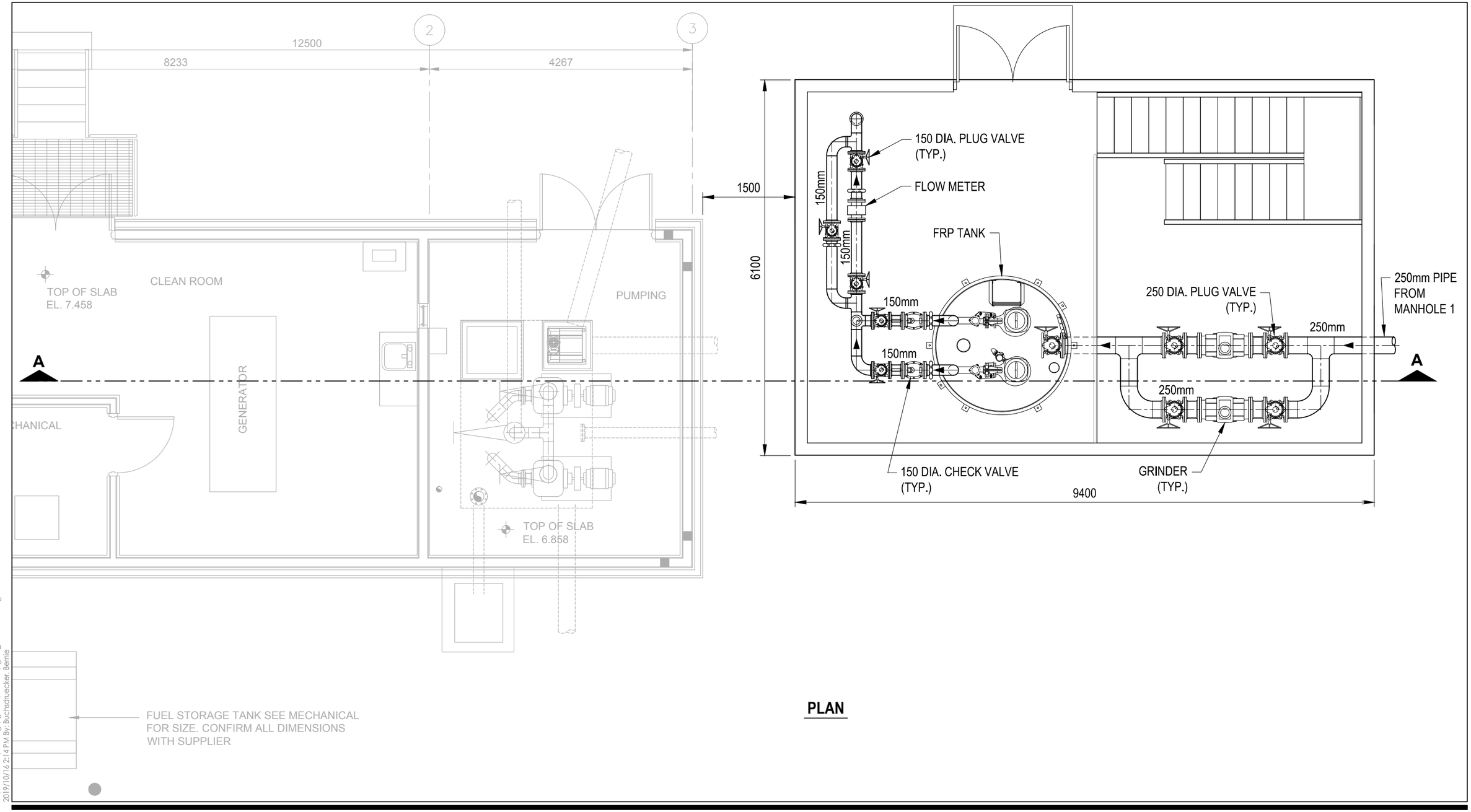

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Figure No.
Option A3 Plan View

Title
Lift Station No. 1
New Lift Station C/W
FRP Tank and Grinder

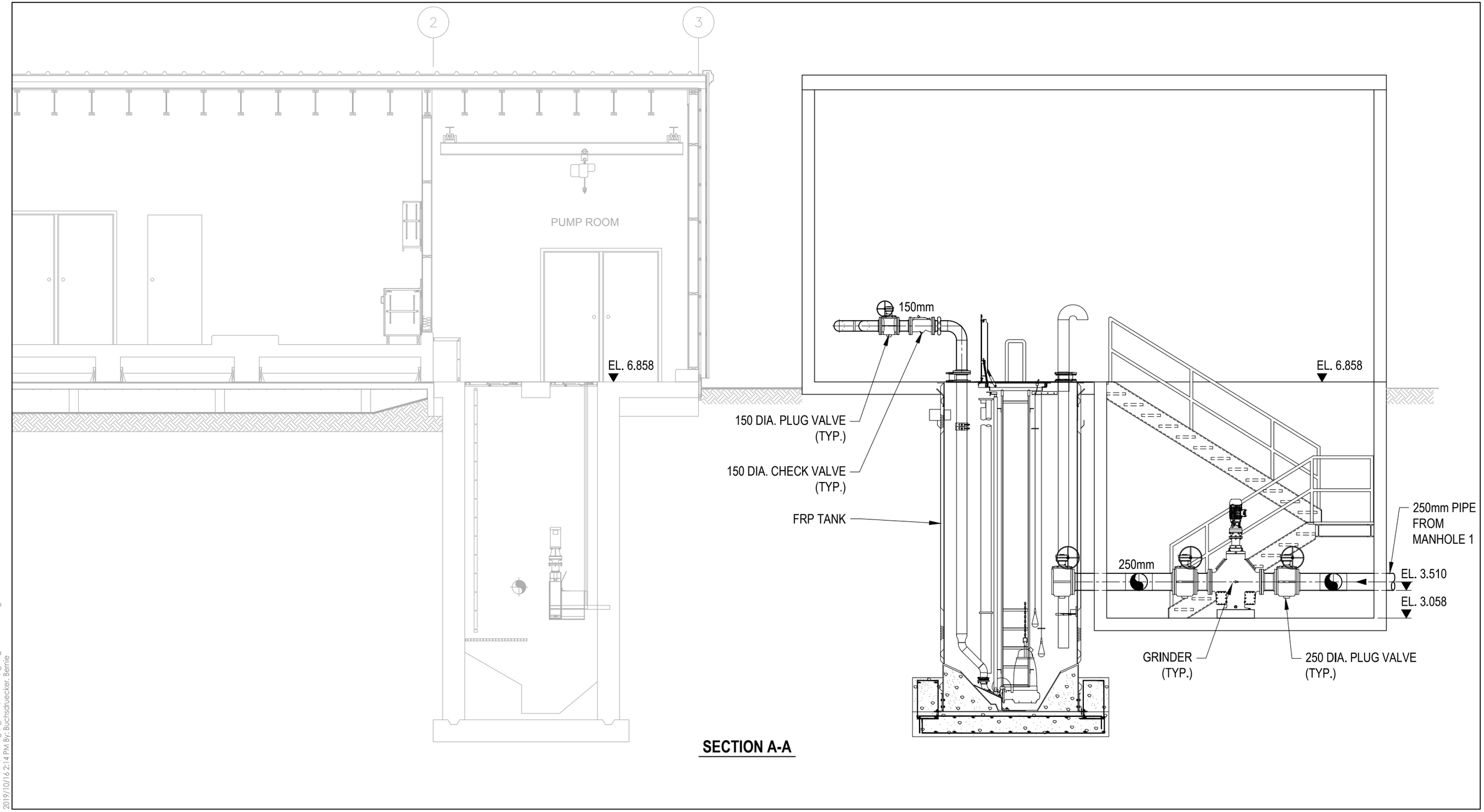

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Figure No.
Option A3 Section View

Title
Lift Station No. 1
New Lift Station C/W
FRP Tank and Grinder

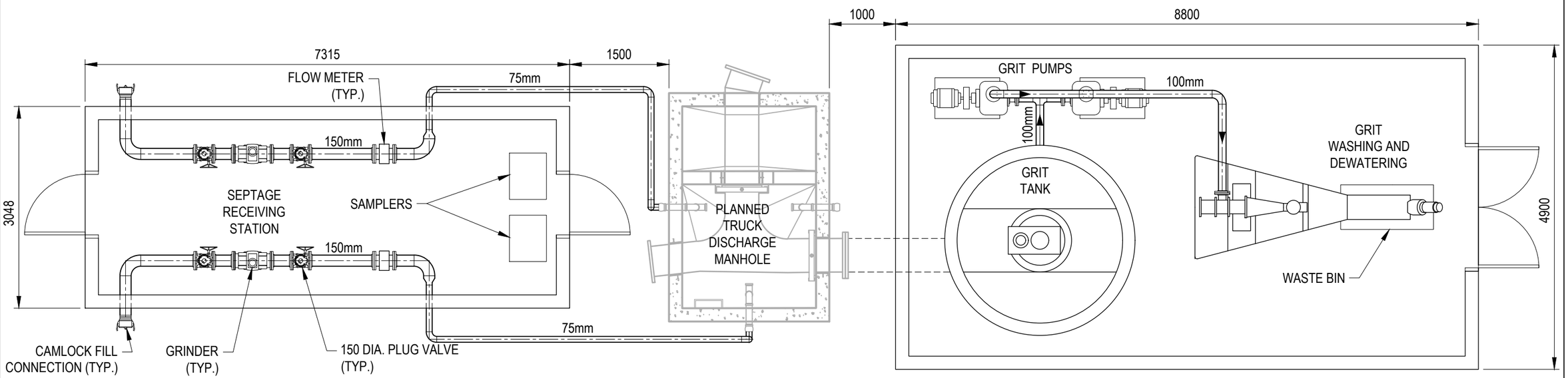

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Figure No.
Option B1 Plan View

Title
Truck Discharge Manhole
New Septage Receiving Station
and Grit Removal System

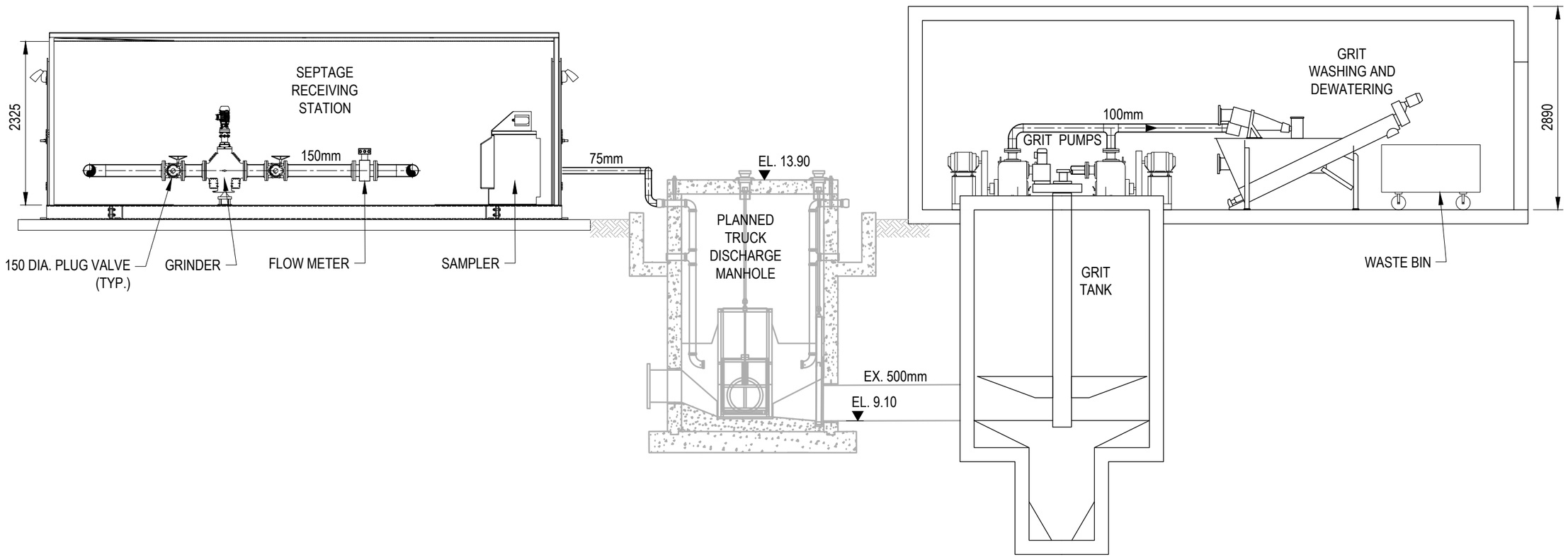

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Figure No.
Option B1 Section view

Title
Section - Truck Discharge Manhole
New Septage Receiving Station
and Grit Removal System

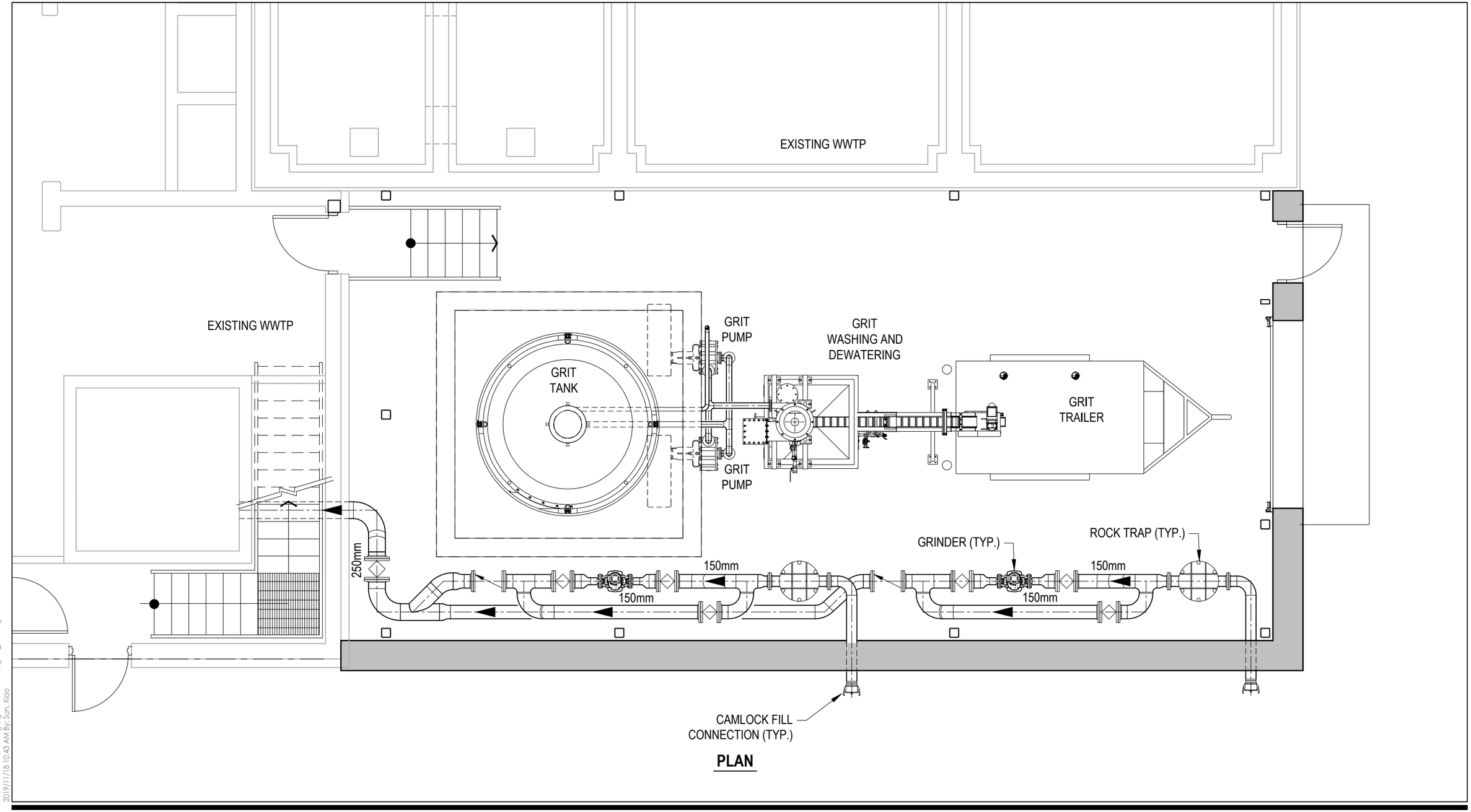

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Figure No.
Option C1 Lower Plan 1 of 3

Title
Waste Water Treatment Plant
New Septage Receiving Station
and Grit Removal System

GRIT CHAMBER

750mm

150mm AIR

PRIMARY FILTER

PRIMARY FILTER

400 SRS

100mm AIR

EL. 12.88

100mm

100mm

100mm

GRIT WASHING AND DEWATERING

750mm

750mm

750mm

GRIT PUMP

GRIT TRAILER

250mm

EL. 9.00

SECTION

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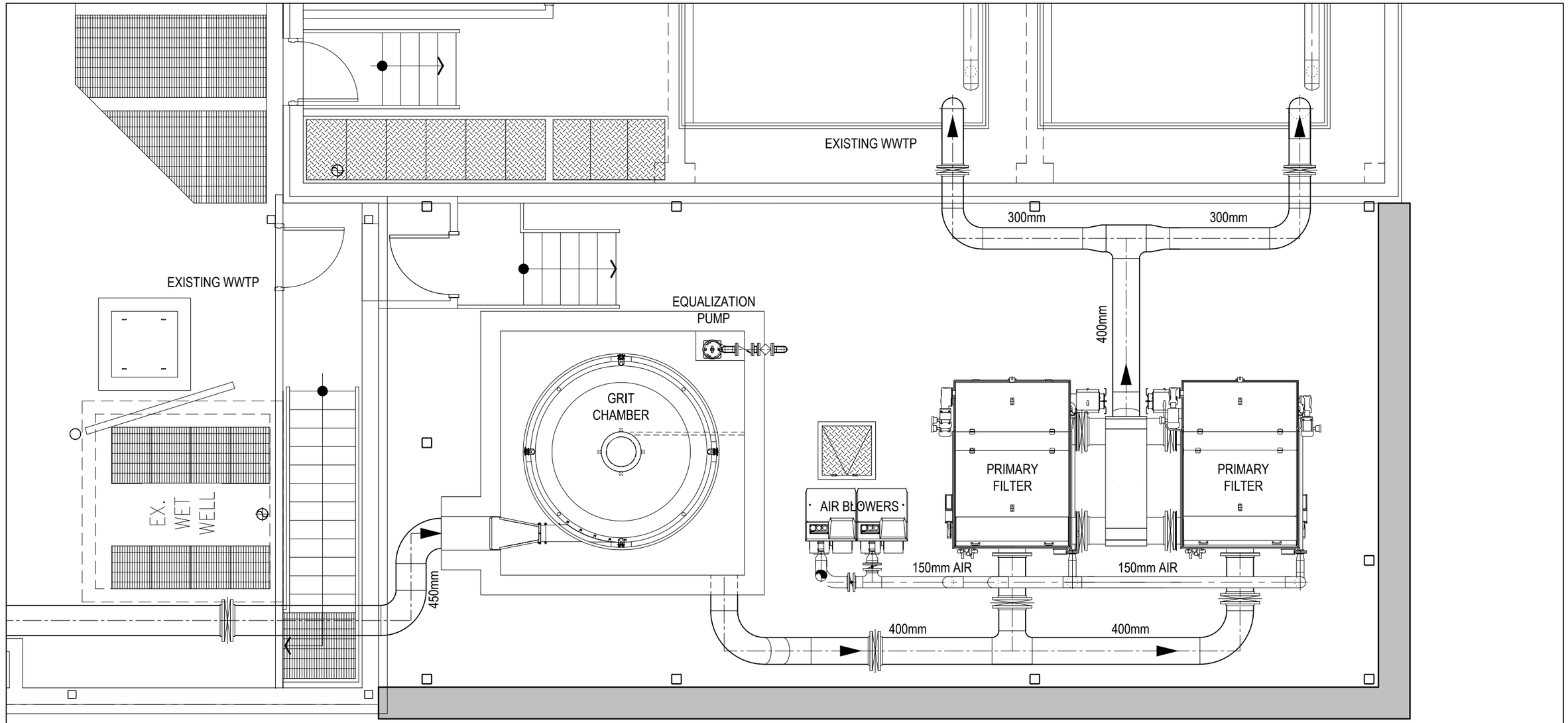
Figure No.

Option C1 Section View 2 of 3

Title

Waste Water Treatment Plant
New Septage Receiving Station
and Grit Removal System



PLAN

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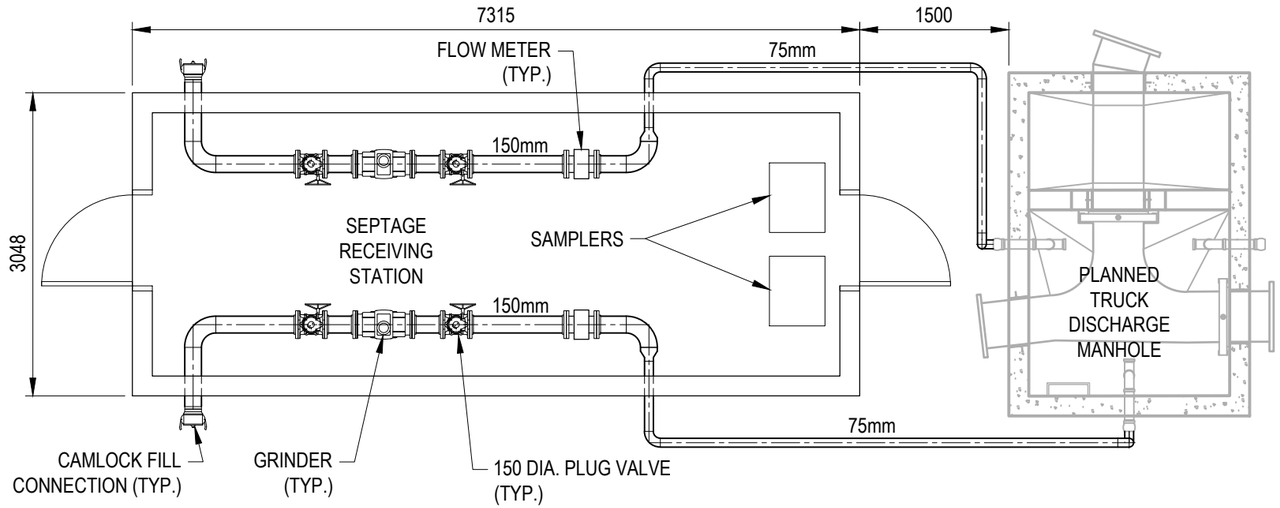
Figure No.
Option C1 Upper Plan 3 of 3

Title
Waste Water Treatment Plant
New Septage Receiving Station
and Grit Removal System



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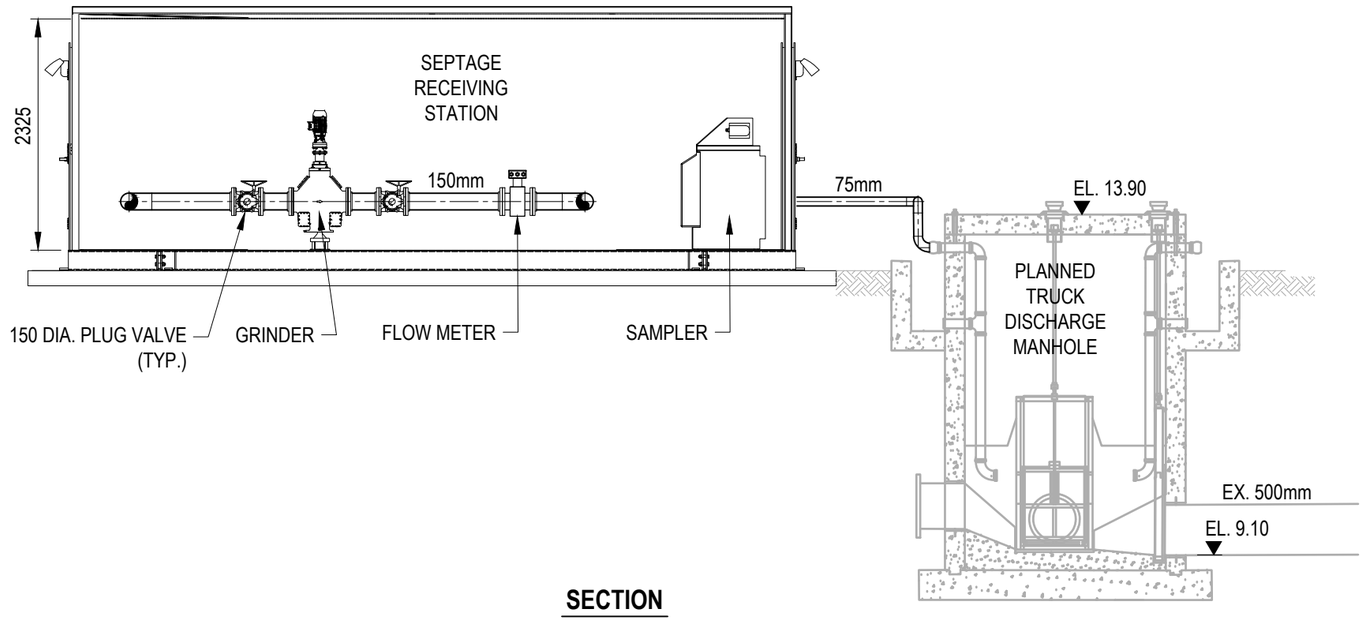

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Figure No.
Option D1 (Dump Station Location)

Title
Truck Discharge Manhole
New Septage Receiving Station
c/w Grinder

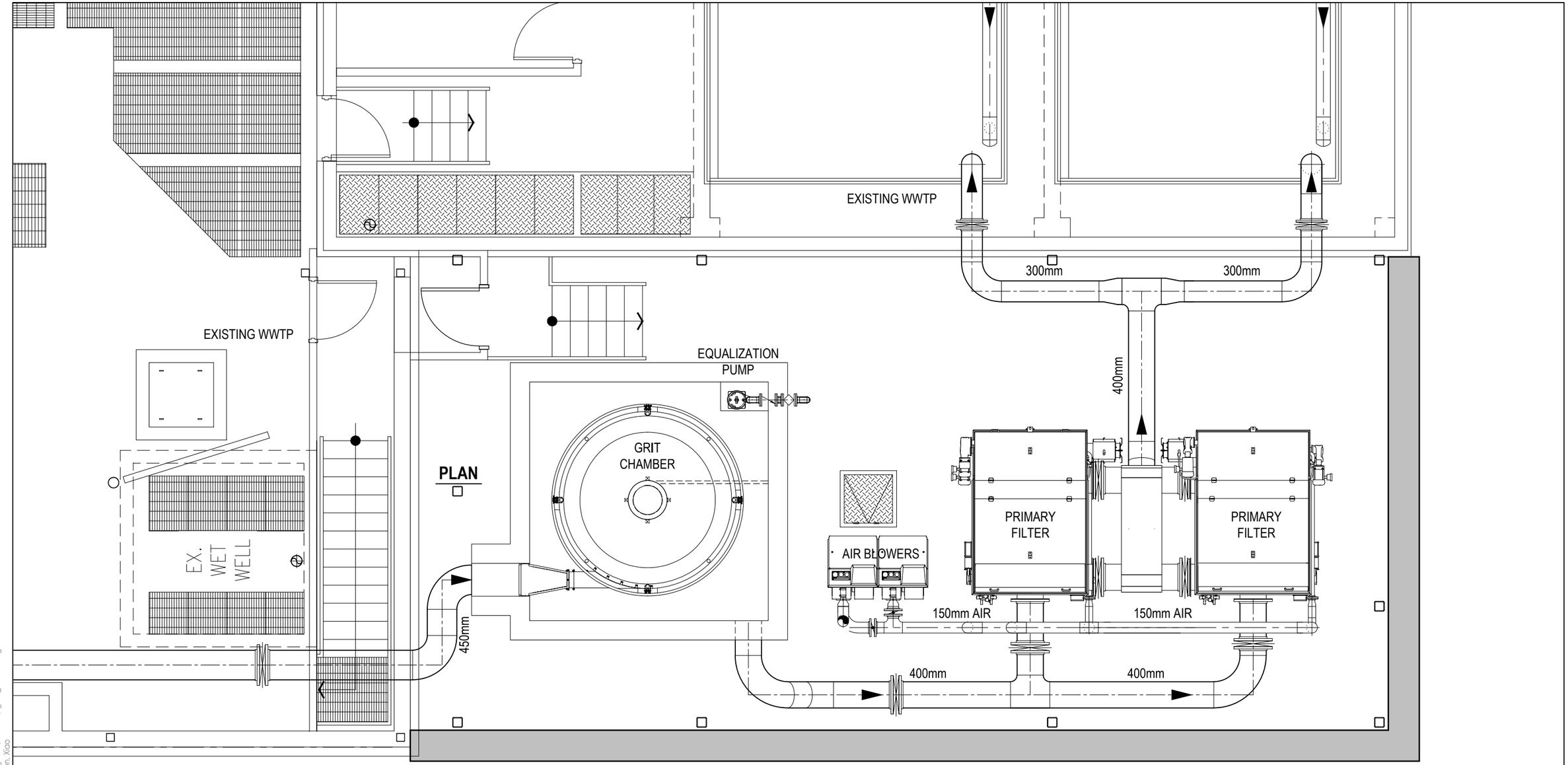

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Figure No.
Option D1 (WWTP Location) **1 of 2**

Title
Truck Discharge Manhole
Grit Removal System

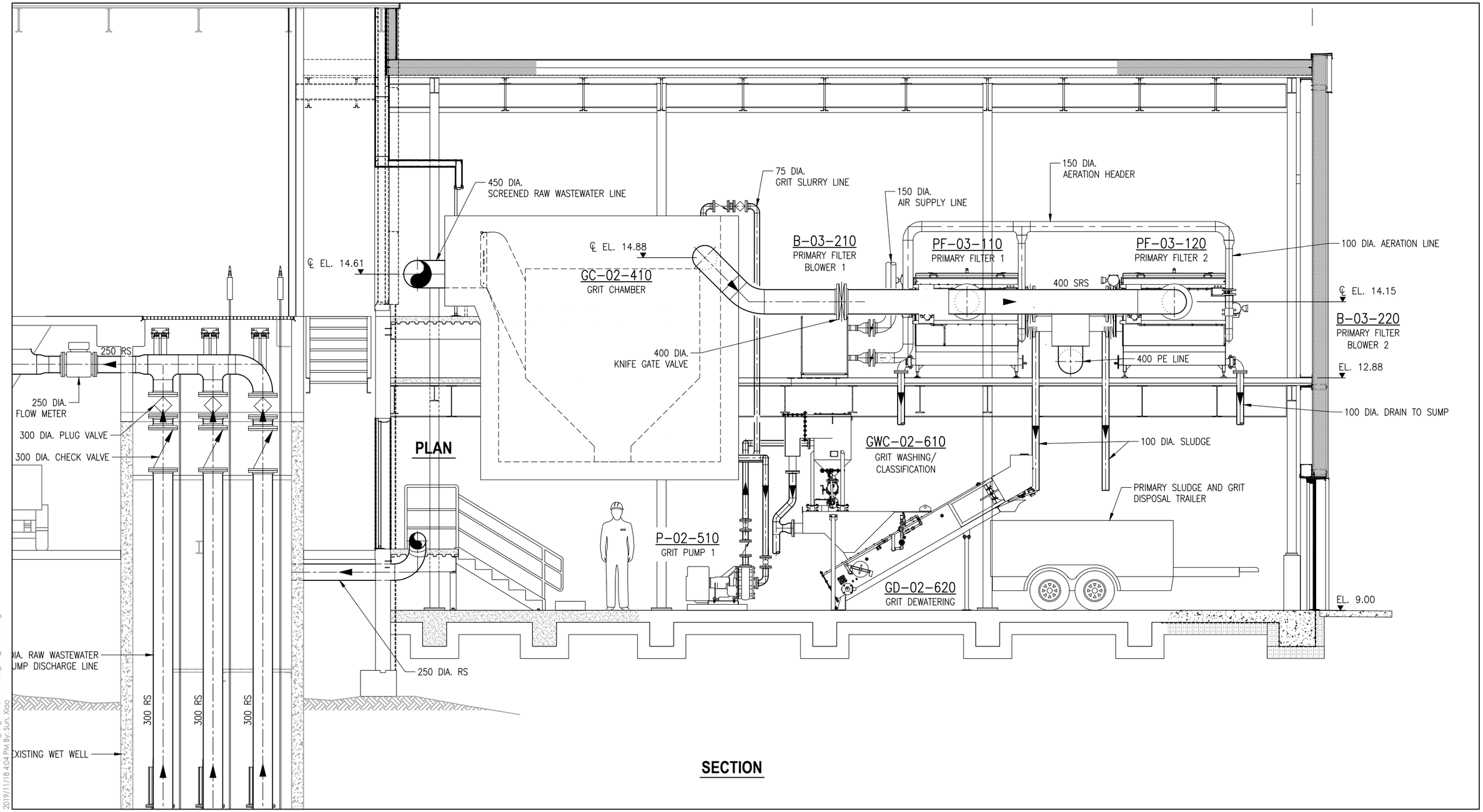

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Figure No.
Option D1 (WWTP Location) **2 of 2**

Title
Truck Discharge Manhole
Grit Removal System