NORTHWEST TERRITORIES POWER CORPORATION

Empowering Communities

TALTSON HYDRO - CONSTRUCTION OF REPLACEMENT FACILITIES AND OVERHAUL

CONSTRUCTION, WILDLIFE MANAGEMENT AND RECLAMATION PLAN

TALTSON HYDROELECTRIC FACILITY
TALTSON RIVER, NORTHWEST TERRITORIES

MAY 2020

DOCUMENT HISTORY				
Revision #	**Revised Sections**	**Description of Revision**	**Prepared by**	**Issue Date**
0	all	Initial Publication of Report	NTPC	April 2020
1	5.16	Addition of more detail on temporary overflow camp	NTPC	May 2020

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1. Introduction

The Taltson Hydroelectric Facility was built in 1965 and a refurbishment of key infrastructure at the facility is required to ensure the continued reliability of power generation for the South Slave Region. This includes refurbishment of the generating station, replacement of the camp for staff lodging, replacement of the garage for vehicle and equipment storage/maintenance, replacement of the substation and construction of additional storage facilities.

This plan is part of the application package to obtain a land-use permit with the Mackenzie Valley Land and Water Board (MVLWB) to regulate the construction of the replacement camp and support facilities for the overhaul of the Taltson Facility. This plan will be used in conjunction with the other management plans included in the land-use permit package.

This plan will outline the various steps and processes that will be undertaken at the Taltson Hydroelectric Facility to support the construction of replacement support facilities and decommissioning of existing facilities as part of the facility overhaul. This report will provide details on:

- Existing facility
- Proposed Facility
- Project Schedule
- Project Phases
- Waste Management
- Spill Response
- Wildlife Management
- Sediment and Erosion Control
- Reclamation

2. Existing Facility

The Taltson Hydroelectric Facility was built in 1965 to supply electricity to the Pine Point Mine. The mine site was decommissioned and closed in 1986. Following the mine closure, the Taltson Generating Station has continued to supply power to the South Slave Region and is the sole source of power, with the exception of back up diesel generators, to the South Slave communities of Hay River, K'atlodeeche First Nation, Fort Smith, Fort Resolution and Enterprise.

The Taltson Hydroelectric Facility is comprised of the Twin Gorges Generating Station, Twin Gorges Forebay Reservoir, South Valley Spillway, Trudel Creek and the Nonacho Lake Dam and is outlined in Figure 1. The Twin Gorges Generating Station is an 18 MW hydroelectric facility located within the Taltson River watershed 56 km northeast of Fort Smith in the Northwest Territories. The facility operates under the MVLWB Type A Water Licence MV2011L4-0002. The facility is a fly in access only using the airstrip or landing on the Twin Gorges Reservoir. In the winter of 2019/2020 a historical winter road from Fort Smith was reconstructed that will be operated for the duration of the overhaul under MVLWB Type B Water Licence MV2019L8-0008 and Type A Land Use Permit MV2019F0015.

The Taltson facility consists of a hydroelectric plant, substation and surge tower situated on the east side of the Taltson River 250m southwest of the main dam. The headgate house sits on the upstream side of the dam in the forebay.

Support facilities include two staff houses and a garage located east of the plant. The 800m airstrip is located 3km southeast of the plant with a storage shed and fuel storage building at its western end. The facility also includes a backup diesel generator, waste incinerator, septic field and fuel storage areas.

Figure 1- Existing Taltson Hydroelectric Facility

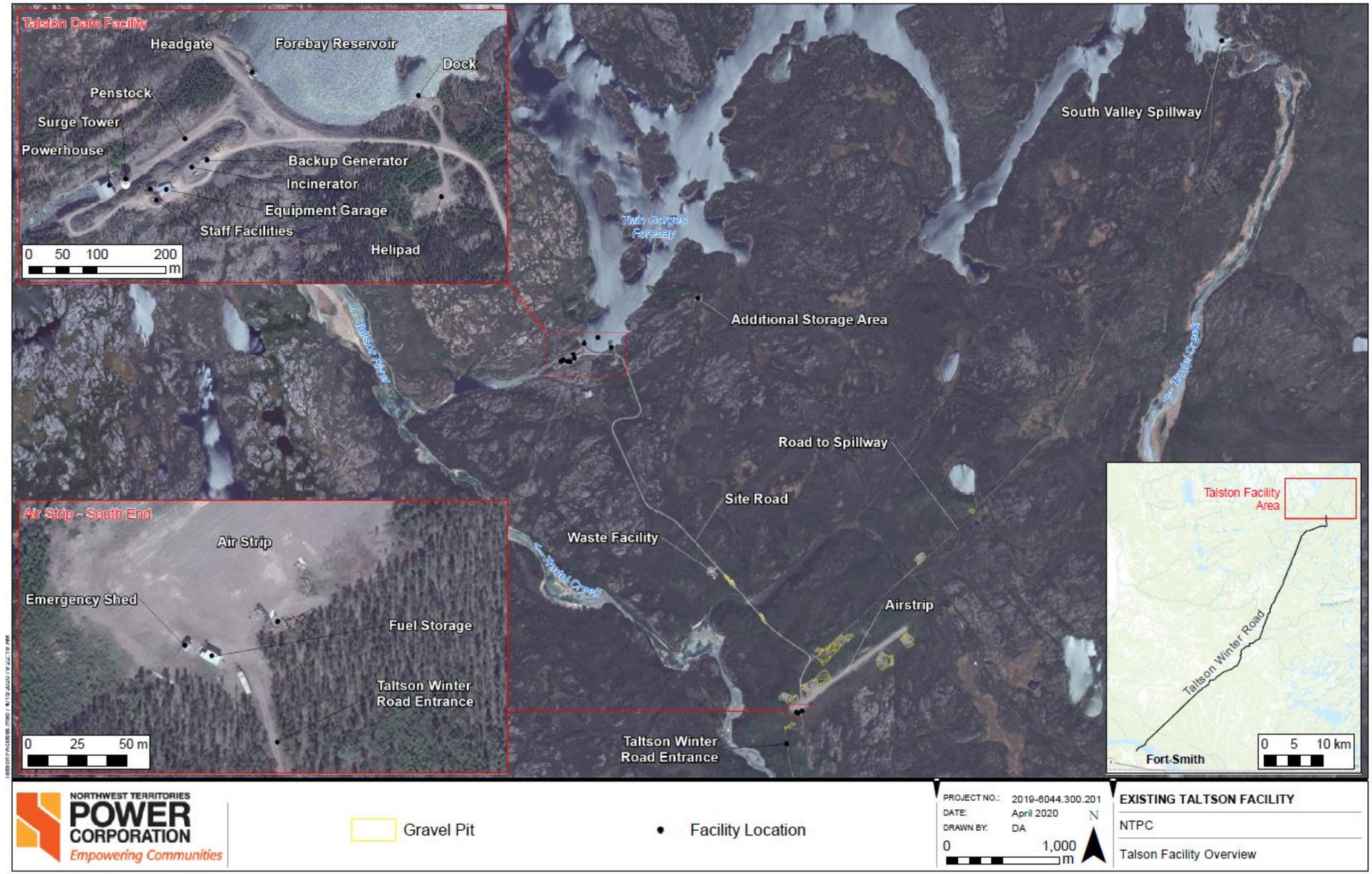
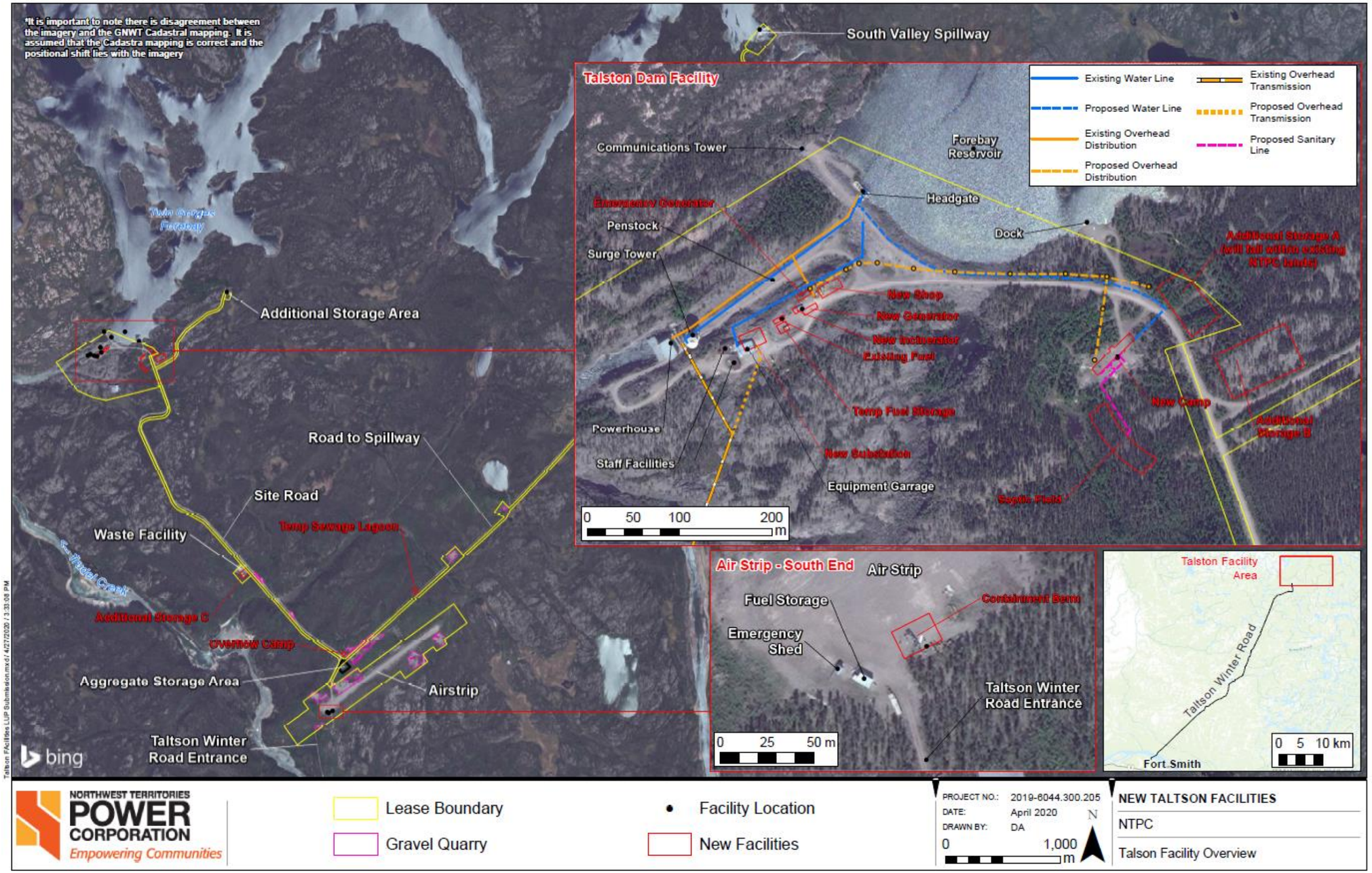


Figure 2- Proposed Taltson Hydroelectric Facility



3. Proposed Facility

The proposed facility is outlined in Figure 3.

3.1. Proposed Facility Capacity and Water Use

The maximum capacity of overnight staff for the existing facility is 11 people. Throughout the overhaul project the current staff accommodations will continue to operate. The maximum capacity for overnight occupancy of the new staff accommodation is 20 people. During peak shutdown periods staff are often flow in daily from Fort Smith on a Single Otter which can transport 9 people maximum. This would put the maximum occupancy at 31 overnight staff and 40 total during the workday. During peak staffing all cooking for the site will be completed in the new facility. The staff accommodations and related facilities are all located on NTPC owned lands and the land use permit is required for construction only.

Based on historical flow data in the Alberta Private SSTP and various sewer design resources the design daily flow (DDF) estimated for each of the camp residents is expected to be 300 L/p/d with 220 L/d/p generated by the dorms and 80 L/d/p generated by the kitchen facility. The maximum water use for each facility is presented in Table 1.

Table 1: Maximum Water Use for Main Facility

Facility	Description	Water Use (L/d)
New Facility	20 camp residents @ 220L/d/p DDF dorm waste	4400
	40 camp residents @ 80L/d/p DDF kitchen waste	3200
Existing Facility	11 camp residents @ 220L/d/p DDF dorm waste	2420
Total		10020

:

The maximum daily water use for the facility during the project is 10,020 L/day or 10.02m3/day which is well under the 50m3/day threshold for requiring a water licence.

Section 5.16 outlines the temporary overflow camp that could be employed as contingency if resourcing levels exceed the capacity of the main camp. The maximum capacity for the temporary overflow camp is 20 people for 4 months. If the camp were to be used the maximum occupancy at site would be at 51 overnight staff (31 at the main facility and 20 at the overflow camp) and 60 total during the workday. The water system would be a temporary self-sustaining water system in which water would be manually drawn from the forebay and stored in a water tank for use at the camp. Maximum water use for the temporary camp would be 250 L/p/day x 20 p= 5000L/day or 5m3/day which would make a total of 15,020 L/day or 15.02m3/day for potential max whole facility if overflow camp was in operation.

4. Project Schedule

The project schedule for the construction of replacement support facilities and decommissioning of existing facilities as part of the overhaul at the Taltson Hydroelectric Facility is presented in Table 2. **It should be noted that due to COVID-19 impacts on planned 2020 activities and resources some or all phases in the schedule may be delayed**.

Table 2: Project Schedule for Taltson Overhaul

Project Phase	Year				
	2020	2021	2022	2023	2024
Replacement Staff Lodging Facilities Construction	X				
Site Storage & Laydown Areas Construction Part 1	X				
Waste Facility Upgrades and Temporary Sewage Lagoon Installation	X				
Quarrying Operations	X	X	X		
Hazardous Waste Berm Construction		X			
Site Storage & Laydown Areas Construction Part 2		X			
Temporary Fuel Storage and Distribution System Installation		X			
Removal of Waste			X	X	X
Generator and Turbine Overhaul			X		
Communications Tower Replacement			X		
Maintenance Building Construction				X	
New Substation Construction and Existing Garage Demolition				X	
Penstock and Surge Tank Rehabilitation				X	
Existing Substation Decommissioning and Removal					X
Temporary Fuel Storage and Distribution System and Mobile Construction Equipment Removal					X
Existing Staff Lodging Facilities and Surge Tank Removal					X
Operation of Overflow Camp	Contingency (only if required)				

5. Project Phases

The various project phases are outlined below with any information that may relate the land use permit application. The locations of the proposed facilities are outlined in Figure 3.

5.1. Replacement Staff Lodging Facilities Construction

The existing staff lodging facilities are outdated and require replacement. The replacement staff lodging facilities will be constructed on NTPC titled land in the previously disturbed area where the helipad currently is located from modular units shipped to site on the winter road in 2020. The new facility will have 20-person capacity. The design for the staff accommodation facility is included in **Appendix A- Staff Accommodation Design Drawings**. The new facility will be serviced by an onsite raw water supply system and sewage treatment and disposal system. The design details for the onsite raw water supply system and sewage treatment and disposal system are presented in **Appendix B- NTPC Taltson River Work Camp- Onsite Sewage System & Raw Water System Supply Design Report**. The facility will be serviced by a new power line that will run along the existing site road. Earthworks will be undertaken as required for the

installation of the facility and sewage treatment system and will consist of both cut and fill (exact amounts of cut and fill still to be determined).

The staff lodging facilities are located on NTPC owned lands and the land use permit will be for camp construction only.

The design for the staff lodging facilities and related infrastructure was completed in accordance with:

- National Build Code of Canada- 2015
- Waters Act – S.N.W.T. 2014
- Public Health Act – General Sanitation Regulations – R.R.N.W.T. 1990
- Northern Land Use Guidelines – Camp and Support Facilities
- Interim Code of Practice: End-of-pipe fish protection screens for small
- water intakes in fresh water – Fisheries and Oceans Canada
- Alberta Private Sewage Systems Standard of Practice 2015 – Edition 3
- B.C. Sewerage System Standard Practice Manual - Version 3
- Municipal Wastewater Regulation of B.C. – 2012
- Wastewater Engineering Fifth Edition – Metcalf & Eddy

5.2. Site Storage & Laydown Areas Construction

Additional storage and laydown areas will be required as part of the project. A laydown of approximately 1000m^2 was constructed across from the existing helipad on NTPC owned lands with approval from the MVLWB in the winter of 2020 to store materials for 2020 construction season. This area will be expanded upon and two others created to store materials and equipment for the project. The three storage areas are:

- Additional Storage A
  - Across from new staff accommodation on NTPC owned lands
  - Previously cleared land, some minor second growth
  - Will be a combination of covered heated, covered unheated and open laydown area storage
  - Area of 4000-5000m^2
- Additional Storage B
  - At intersection to existing storage area
  - Will only be used for contingency if needed
  - Rock cap with sparse vegetation
  - Area of 1000-45000m^2
- Additional Storage C
  - Located beside waste facility in previously cleared area
  - Area of 2000-4000m^2

An aggregate stockpiling area of approximately 90m x 85m may also be constructed near the airstrip if required as outlined in the *Taltson Hydro Facility Aggregate and Borrow Locations- Quarry Operations and Reclamation Plan*.

5.3. Waste Facility Upgrades and Temporary Sewage Lagoon Installation

The waste facility at Taltson will be updated with signage for proper sorting of materials and waste for shipping off site, burning and/or burying. Materials will be sorted into the following categories:

- Untreated Lumber, Brush and Cardboard (burn pile)
- Plastics and Rubber
- Concrete, Bricks, Ceramics
- Pressure Treated Lumber
- Old Boilers and Appliances

- Scrap Metal
- General- Waste that does not fall into another category

A temporary sewage lagoon will be constructed on the site road to the South Valley Spillway. This lagoon will be used for the sewage from 4 portable toilets that will be placed outside the plant during the overhaul. The temporary sewage lagoon is proposed for the waste from the 4 portable toilets to minimize risk to the septic system for the accommodation buildings during the temporary staffing peaks. Portable toilet suppliers suggest that 10 workers can be serviced by a portable toilet (~200L storage) for a 40-hour workweek. Assuming 8 months of peak operation during the overhaul project this would result in approximately 44,800L or 44.8 co. of sewage. The temporary lagoon would be sized accordingly including a factor of safety for precipitation storage and marked for safety. Lime will be applied at the end of each construction season and before closure.

5.4. Quarrying Operations

There are 13 historical borrow locations at the Taltson Facility; Pits A, B, C, D, Lake, Middle, Gertrude, V, W, Y, Z, South Clay and North Clay. To support the various phases of the project 5000m^3 of gravel and sand material will be excavated from some of the 13 borrow locations. Pits will be chosen based on specific gradation requirements and not all pits will be used. A Quarry permit will be obtained that includes all pits on site for efficiency. The quarry permit application and all supporting material was submitted to GNWT Lands on March 27, 2020. Please refer to the *Taltson Hydro Facility Aggregate and Borrow Locations- Quarry Operations and Reclamation Plan* for more information. As per the quarry permit the quarrying will be completed over 3 years.

5.5. Hazardous Waste Berm Construction

To ensure proper capacity for increased amounts of hazardous waste a lined hazardous waste berm storage area will be constructed at the airstrip. The berm will be approximately 30m x 20m with a 0.75m berm around the storage around with a gate for trucks to drive in/out. Further detail on waste management is presented below.

5.6. Temporary Fuel Storage and Distribution System Installation

Additional fuel storage will be needed on site to run the facility on back-up diesel generation during the extended shutdowns and to account for the increased staffing on site. Six 63,000L double walled diesel storage tanks and one 1000L double walled gas tank will be installed on site for additional fuel storage for the project. The tanks will be installed on NTPC owned lands adjacent to the existing double walled fuel tank. The diesel tanks will be hard piped to the backup generator. The details for the fuel storage are provided in **Appendix C- Fuel Storage Details.**

5.7. Removal of Waste

Throughout the project waste from the facility and project may be removed from site annually on the winter road following standard procedures outlined below.

5.8. Generator and Turbine Overhaul

In 2022 the generator and turbine overhaul will be completed in the powerhouse.

5.9. Communications Tower Replacement

Existing communications tower will be replaced in the same location.

5.10. Maintenance Building Construction

A new maintenance building for equipment and vehicles will be constructed to replace the existing facility. The design will be completed in accordance with:

- National Build Code of Canada- 2015
- Public Health Act – General Sanitation Regulations – R.R.N.W.T. 1990
- Northern Land Use Guidelines – Camp and Support Facilities

The details of the maintenance building are provided in **Appendix D- Maintenance Building Design**. This building will have limited water systems for washing hands and possibly a composting toilet. Concrete production will be part of this phase for the floor of the building. Minimal earthworks will be completed as this area is currently an equipment storage area and graded.

5.11. New Substation Construction and Existing Garage Demolition

A new substation will be constructed in the current location of the existing maintenance garage. The garage will be demolished, and material stored in one of the storage areas for removal off site. The substation will be 30mx15m and meet all applicable design requirements. It will also have a new tie in powerline constructed to it which will require a short length of a 30m buffer to be cleared on each side of the line. Clearing and construction will take place on NTPC owned Lands. Earthworks will be completed with both cut and fill being required. Further details for the substation are provided in **Appendix E- Substation Details**.

5.12. Penstock and Surge Tank Rehabilitation

The penstock will be rehabilitated, and the surge tank will be assessed and rehabilitated or replaced which may involve some excavation and use of heavy equipment.

5.13. Existing Substation Decommissioning and Removal

The old substation will be decommissioned and removed from site on the winter road. The transformers on site should not have PCB's as in 1999 a PCB decontamination program was conducted at NTPC and all equipment containing PCBs in a concentration greater than 50 ppm were removed.

Before any decommissioning is completed the transformers will be tested and as per the *Hazardous Waste Management Plan* that recommends that pre-1989 transformer oil should be tested to determine proper management actions. If the oil contains PCB in a concentration greater than 2 ppm it will be dealt with as outlined in the *Hazardous Waste Management Plan* and sent to a registered disposal facility as outlined below.

5.14. Temporary Fuel Storage and Distribution System and Mobile Construction Equipment Removal

Once the overhaul is complete five of the six 63,000L diesel storage tanks will be removed from site. One 63,000L double walled diesel storage tank will remain on site hard piped to the backup generator and the 1000L double walled gas tank will remain as well; both on NTPC owned lands. Tanks will be removed via the winter road.

5.15. Existing Staff Lodging Facilities and Surge Tank Removal

Once the overhaul is complete the previously existing staff lodging facilities will be decommissioned and removed from site. If the existing surge tank is replaced with a new tank the old tank will also be removed from site, if it is replaced.

5.16. Operation of Overflow Camp

NTPC would like the option to operate a temporary overflow camp to accommodate additional personnel if required. The temporary camp would be used as contingency if resourcing levels exceed the capacity of the main camp. The temporary camp would be located at the intersection of the site road to the South Valley Spillway. Some details of the temporary camp that would be set up are outlined below

- Capacity
  - Maximum capacity of 20 people for 4 months.
- Water Usage
  - 250 L/p/day x 20 p= 5000L/day or 5m3/day which would make a total of 15,020 L/day or 15.02m3/day for potential max whole facility
  - This water system would be a temporary self-sustaining water system in which water would be manually drawn from the forebay and stored in a water tank for use at the camp
- Sewage
  - Sewage would be discharged into temporary sewage pit similar to a winter road camp
  - Maximum sewage waste would be 5m3/day but given that water would not be potable and main camp would do cooking this would likely be much less.
- Management Plans
  - All management plans and standard procedures for the Taltson Facility would also apply to the overflow camp.

6. Waste Management

NTPC has a detailed waste management plan in place for the Taltson Hydro facility and winter road that has been approved under existing permits and licences. The waste management practices outlined in the *Taltson Hydroelectric Facility and Winter Road- Waste Management Plan- April 2019* will be used in conjunction with the project specific waste management practices presented in Section 5 for this project.

7. Spill Response

NTPC has a detailed spill response plan in place for the Taltson Hydro facility and winter road that has been approved under existing permits and licences. The spill response practices outlined in the *Taltson Hydroelectric Facility and Winter Road- Spill Contingency Plan- April 2019* will be used in conjunction with the project specific waste management practices presented in Section 5 for this project.

8. Wildlife Management

The wildlife management practices for the project were developed in accordance with the following Federal and Territorial acts and regulations:

- *Migratory Birds Convention Act*
- *Species at Risk Act*
- *Northwest Territories Species at Risk Act*
- *Northwest Territories Wildlife Act*
- *Mackenzie Valley Resource Management Act*
- *Northwest Territories Lands Act*

The 2019 Statutory Requirements for Wildlife in the Northwest Territories provides a summary of pertinent sections of the legislation listed above, with interpretation guidelines.

8.1. Wildlife Species

The wildlife management practices for the project focus on wildlife species occurring in and near the project that are important harvestable species, have specific regulatory requirements, and/or are protected by legislation.

The project does not overlap with the boreal caribou (NT1 Herd) range to the west (J. Wilson, personal communication, 2019b), or the barren-ground caribou Beverly Herd winter range. The Beverly Herd is located approximately 30 km northeast of the northern terminus of the project (Species at Risk Committee 2017b). The project is within the historical range of the Beverly Herd; however, the herd has not been recorded in the area since the 1950s (Thomas et al., 1998 in Species at Risk Committee 2017b). The species considered are presented in Table 3.

Table 3: Wildlife Species Considered

Common Name	Scientific Name	SARA Listing[1]	COSEWIC Assessment[2]	NWT SARA Listing[3]	SARC Assessment[4]
Mammals					
American beaver	*Castor*	-	Not assessed	-	Secure

Common Name	Scientific Name	SARA Listing[1]	COSEWIC Assessment[2]	NWT SARA Listing[3]	SARC Assessment[4]
	canadensis				
American marten	*Martes americana*	-	-	-	-
Black bear	*Ursus americanus*	-	Not at Risk	-	Secure
Canada Lynx	*Lynx canadensis*	-	Not at Risk		Secure
Coyote	*Canis latrans*	-	Not assessed	-	-
Grey wolf	*Canis lupus*	-	Not at Risk	-	Secure
Little brown Myotis	*Myotis lucifugus*	Schedule 1 – Endangered	Endangered	Special Concern	Special Concern
Moose	*Alces*	-	Not assessed	-	Secure
Northern Myotis	*Myotis septentrionalis*	Schedule 1 – Endangered	Endangered	Special Concern	Special Concern
Snowshoe hare	*Lepus americanus*	-	-	-	-
Weasel	*Mustela spp.*	-	-	-	-
White-tailed deer	*Odocoileus virginianus*	-	Not assessed	-	-
Wolverine	*Gulo*	Schedule 1 – Special Concern	Special Concern	-	Not at Risk
Wood bison	*Bos bison athabascae*	Schedule 1 - Threatened	Special Concern	Threatened	Threatened
Birds					
Bank swallow	*Riparia riparia*	Schedule 1 - Threatened	Threatened	-	-
Barn swallow	*Hirundo rustica*	Schedule 1 - Threatened	Threatened	-	-
Common nighthawk	*Chordeiles minor*	Schedule 1 – Special Concern	Threatened	-	-
Olive-sided flycatcher	*Contopus cooperi*	Schedule 1 – Special Concern	Threatened	-	-
Peregrine falcon *anatum/tundrius* complex	*Falco peregrinus*	Schedule 1 – Special Concern	Not at Risk	-	Not assessed
Red-necked phalarope	*Phalaropus lobatus*	Under Consideration	Special Concern	-	-
Rusty blackbird	*Euphagus carolinus*	Schedule 1 – Special Concern	Special Concern	-	Not assessed
Short-eared owl	*Asio flammeus*	Schedule 1 – Special Concern	Special Concern	-	Not assessed
Yellow rail	*Coturnicops noveboracensis*	Schedule 1 – Special Concern	Special Concern	-	-
Fish					
Shortjaw cisco	*Coregonus zenithicus*	-	Threatened	-	-

Common Name	Scientific Name	SARA Listing[1]	COSEWIC Assessment[2]	NWT SARA Listing[3]	SARC Assessment[4]
Amphibians					
Northern leopard frog	*Lithobates pipiens*	Schedule 1 - Special Concern	Special Concern	Threatened	Threatened
Insects					
Gypsy cuckoo bumble bee	*Bombus bohemicus*	Schedule 1 - Endangered	Endangered	-	Not assessed
Yellow-banded bumble bee	*Bombus terricola*	Schedule 1 – Special Concern	Special Concern	-	Not assessed

1. *Species at Risk Act* (SARA) (SC 2002, c.29)
2. Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2016)
3. *Species at Risk (NWT) Act* (GNWT 2009, c.16)
4. Northwest Territories Species at Risk Committee (Species at Risk Committee 2017)

8.2. Potential Effects and Mitigation Measures

Minimal impact on wildlife habitat and/or disturbance to wildlife is expected throughout this project as:

- The project is replacing existing infrastructure and all proposed work is being completed on previously cleared/disturbed lands except for;
  - Portions of the new staff accommodation facility and septic system footprint,
  - Portions of the proposed storage areas footprint
  - Temporary sewage lagoon
  - Contingency overflow camp location.
- All borrow locations have minimal overburden and vegetation present as they are historical borrow locations that have been used at some point throughout the operation of the facility (except for the aggregate stockpiling area).
- No new roads will be created and all access will be via existing site roads
- The previously disturbed areas where most works are taking place have minimal habitat present for local species

Table 4 outlines the potential effects and proposed mitigation measures related to effects on wildlife habitat and/or disturbance to wildlife throughout the project.

Table 4: Potential Effects and Proposed Mitigation Measures

Potential Effect	Mitigation Measures
Removal of vegetation by heavy equipment and chainsaw when required	•Minimize amount of vegetation cleared by using areas that are already cleared from historic use when possible. •Stockpile for burning during the winter months. When possible merchantable timber (=> 5” in diameter) that is removed will be stacked for salvage/use. •Space sparse vegetation perpendicular into forest edge for proper decomposition when not stacking for burning
Destruction of valuable habitat from land clearing or operation of quarries	•Wildlife surveys will be completed before any major earthworks, land clearing or quarrying operations take place and submitted to

Potential Effect	Mitigation Measures
and borrow locations	Lands and ENR to ensure there are no adverse effects on local wildlife habitat such as disturbance to active dens or nesting sites. ○ If site is 100% previously disturbed wildlife survey will not take place ○ If a den or valuable habitat is located ENR will be contacted ○ Active Bank and Barn Swallow Nests will not be destroyed or disturbed during the nesting season. •Locations for temporary clearings for laydowns and other temporary facilities will be located on previously impacted areas as much as possible and no wetlands or valuable habitat will be disturbed. •All slopes from any excavations will be graded to have slopes less than 70 degrees to prevent Bank Swallows from nesting there between operation for quarries and excavations. Refer to **Appendix F- Bank Swallow Information Sheet.**
Disturbance to local wildlife due to project operations	•Enforce a no-chase policy. If wildlife is observed on the road or in the pits all vehicles will stop and wait until wildlife have left the area. •Follow the waste management practices outlined the *Taltson Hydroelectric Facility and Winter Road- Waste Management Plan- April 2019* to minimize the probability of attracting wildlife. These practice include: ○ Prohibit littering. ○ Prohibit feeding or interacting with wildlife. ○ Collect and store all food and food waste in a manner inaccessible to furbearers. Incinerate waste locally or take off site to an approved facility. •As is standard NTPC policy all hunting and trapping by all project staff and contractors is prohibited
Habitat alteration and loss due to spills, emissions of deleterious substances	•Follow standard operating procedures and mitigation measures presented in *Taltson Hydroelectric Facility and Winter Road- Spill Contingency Plan- April 2019* which include: ○ Using industry standards for fuel containment, storage, handling, and transport. ○ Equipping all equipment and trucks with industry-standard emission control systems and spill kits. ○ Training all staff in spill response procedures and use of spill kits as per plan. ○ Regularly maintaining all equipment and trucks to ensure all are in good working order and free of leaks. ○ Refuel equipment and vehicles with appropriate spill containment in place, and mitigation measures at hand in case of accidental spill as per plan.

8.3. Wildlife Incident Reporting

NTPC will be responsible for reporting the following wildlife incidents to the GNWT ENR officer without delay

- Any wildlife mortality as a result of defense of life and property;
- Injured and suspected diseased wildlife;

- Wildlife carcass (unrelated to trapping);
- Incidence of human-wildlife conflict and anytime property is damaged by wildlife; and
- Anytime deterrents are used.

Table 5: Wildlife Incident Contacts

Name	Company/Agency	Title	Phone Number	Email
Wildlife Emergency Line[1]	GNWT ENR (Ft. Smith)	-	1-867-872-0400	
Big Game Vehicle Collision	GNWT ENR	Renewable Resource Officer	1-866-762-2437	
Bison in the Bison Control Area[2]	GNWT ENR		1-866-629-6438	
Wildlife Violation	GNWT ENR	Renewable Resource Officer	1-866-762-2437	
Species at Risk Observation				wildlifeobs@gov.nt.ca

1. Includes general wildlife observations/sightings including bears.
2. Slave River lowlands.

9. Sediment and Erosion Control Management

The *Taltson Hydroelectric Project Sediment and Erosion Monitoring Program Updated Erosion Management Plan V3* was submitted to the MVLWB on December 6, 2019 and approved on February 13, 2020.

Mitigation measures outlined in the plan will be employed in this project to ensure no sediment or erosion issues occur during operation of heavy equipment for land clearing, grading and or quarrying. Some examples of measures that may be employed are:

- Proper grading of slopes to ensure slope stability and reduce probability of failure and/or washout
  - Ensuring working faces are 2:1 slope minimum
  - Ensuring that the bases of slopes are properly graded to avoid pooling of water
- Employing control measures when required such as installation of silt fence
- Directing runoff away from watercourses and bodies of water

During periods of precipitation and spring melt site staff will take extra caution to avoid sediment and erosion issues.

10. Reclamation

For infrastructure on private lands, such as the existing staff accommodation, maintenance garage and substation, reclamation will not take place.

For the borrow locations and other temporary facilities on territorial lands some reclamation will take place. The borrow locations will not be fully abandoned as they are useful reserves of valuable aggregate for the NTPC to maintain various infrastructure for the Taltson Hydro Facility in the future.

At the end of the current permit the following measures will be taken to ensure no adverse effects while the sites are decommissioned until future use:

Table 6: Temporary Reclamation Measures

Measure	Description
1. Dismantle and transport all fuel/chemical storage and handling infrastructure to an approved facility or for reuse where applicable	•Any fuel storage on site at the time of reclamation will be dismantled and moved to an approved facility or reused at another location on the Taltson site if possible.
2. Dismantle and remove all buildings and related infrastructure	•There are currently no buildings or infrastructure on any of the pits. Any buildings or infrastructure on site at time of reclamation will be dismantled and moved to an approved facility or reused at another location.
3. Remove all hazardous waste and explosives	•No hazardous waste or explosives are currently on site and it will be ensured that none are on site at the time of reclamation.
4. Regrading slopes to ensure stability	•All slopes from any excavations will be graded to ensure stability to avoid failure and erosion.
5. Regrading to ensure slopes are less than 70 degrees to deter migratory bird nesting	•All slopes from any excavations will be graded to have slopes less than 70 degrees to prevent Bank Swallows from nesting there. See **Appendix F**.
6. Regrading to ensure there are no drainage issues in the area	•There are no current drainage issues and it is not likely that this will be required but if there are drainage issues such as ponding water or washout areas regrading will be completed to ensure proper drainage is present throughout the site to minimize erosion.

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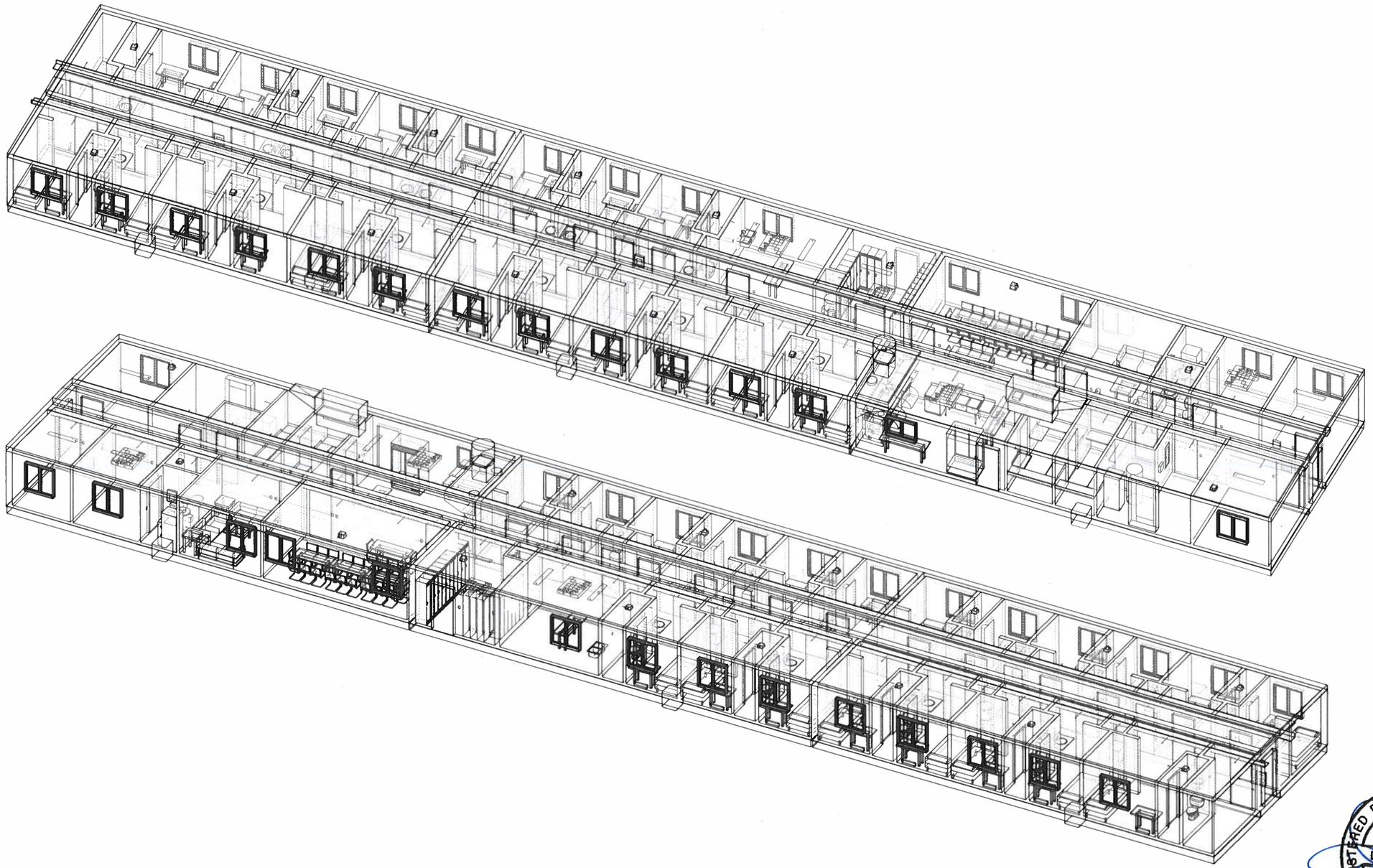
Appendix A- Staff Accommodation Design Drawings

TALTSON NEW STAFF ACOMODATION



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A0.0	TITLE PAGE
A0.1	CONSTRUCTION NOTES
A0.2	CODE REVIEW
A1.0	BUILDING LAYOUT
A1.1	BUILDING LAYOUT
A2.0	UNIT 1 LAYOUT
A2.1	UNIT 2 LAYOUT
A2.2	UNIT 3 LAYOUT
A2.3	UNIT 4 LAYOUT
A2.4	UNIT 5 LAYOUT
A2.5	UNIT 6 LAYOUT
A3.0	SECTIONS
A3.1	SECTIONS
A4.0	ELEVATIONS
A5.0	TYPICAL DETAILS
A5.1	TYPICAL DETAILS
A5.2	TYPICAL DETAILS
A5.3	TYPICAL DETAILS
A5.4	TYPICAL DETAILS
A5.5	TYPICAL DETAILS
A5.6	TYPICAL DETAILS
A6.0	SCHEDULES
S1.0	UNIT 1-2 FLOOR FRAMING
S1.1	UNIT 3-4 FLOOR FRAMING
S1.2	UNIT 5-6 FLOOR FRAMING
S2.0	UNIT 1-2 ROOF FRAMING
S2.1	UNIT 3-4 ROOF FRAMING
S2.2	UNIT 5-6 ROOF FRAMING

NOTES

ALL DOOR AND WINDOW LINTELS TO BE 2-2"X8"

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ISSUE	CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION	Owner	TALTSON NEW STAFF ACOMODATION	TITLE PAGE	FEB. 27/2020		A0.0

C O N S T R U C T I O N N O T E S

GENERAL CONSTRUCTION NOTES
Plywood Backing
Simpson LSTA12 straps at 32" o.c.
GRK Fastener RSS at 32" o.c.

DOOR AND WINDOW LINTELS
2-2"X8" ALL DOORS AND WINDOWS UP TO 7'-0" SPAN
SPF No. 2 OR BETTER

R1 - ROOF CONSTRUCTION
Full depth ROLUX EPDM roofing material
Termination bar around perimeter
Roof Edge Flashing (Drip Edge) - White
Chimney Flashing
Roof vent membrane
Sheathing, (5/8" Plywood T&G)
2x12 @ 16" Lumber Joist ripped down 4" at eaves SPF No. 2 or Better
2x12 Lumber Rim Board, 2 Ply @ Corridor Side
2x8 Lumber Rim Board, 2 Ply @ Exterior Side
Joist Hanger - Simpson Strong Tie LU26
Poly, 6mil Vapor barrier
1/2" vinyl prefinished gypsum board c/w matching battens

W1 - EXTERIOR WALL CONSTRUCTION
Window & Door weather barrier (NovaFlash)
Building wrap weather barrier (Tyvek, etc.)
Sheathing, (3/8" OSB)
Window and Door Lintels (2-2x8 SPF No. 2 or Better)
2x6 @ 16 o.c, Single Bottom & Double Top Plate, (8ft Wall Height)
ROLUX R22 insulation, 2"x6", 16" O.C.
Poly, 6mil Vapor barrier
Sheathing, (3/8" OSB), on inside of wall
1/2" Drywall - Color: TBD
End Walls & Mech.: 5/8" vinyl prefinished gypsum board c/w matching battens

W2 - EXTERIOR WALL CONSTRUCTION (1 HR)
Window & Door weather barrier (NovaFlash)
Building wrap weather barrier (Tyvek, etc.)
Sheathing, (3/8" OSB)
Window and Door Lintels (2-2x8 SPF No. 2 or Better)
2x6 @ 16 o.c, Single Bottom & Double Top Plate, (8ft Wall Height) SPF No. 2 or Better
ROLUX R22 insulation, 2"x6", 16" O.C.
Poly, 6mil Vapor barrier
Sheathing, (3/8" OSB), on inside of wall
5/8" TYPE X Drywall Color: TBD
End Walls & Mech.: 5/8" vinyl prefinished gypsum board c/w matching battens

W3 - INTERIOR WALL 2"X4"
1/2" Drywall
2x4 @ 16 o.c, Single Bottom & Double Top Plate
1/2" Drywall
Color: TBD

W4 - INTERIOR WALL 2"X4" (1 HR FIRE RATING)
5/8" TYPE X Drywall
2x4 @ 16 o.c, Single Bottom & Double Top Plate
Safe'n Sound Insulation, 2x4, 16" O.C.
5/8" TYPE X Drywall
Color: TBD

W5 - INTERIOR WALL 2"X4" 45 MIN. (SOUND WALL)
5/8" TYPE X Drywall
2x4 @ 16 o.c, Single Bottom & Double Top Plate
Safe'n Sound Insulation, 2x4, 16" O.C.
Resilient Metal Channels @ 600 o.c.
2-Layers 5/8" TYPE X Drywall
Color: TBD

W6 - INTERIOR WALL 2"X6"
1/2" Drywall
2x6 @ 16 o.c, Single Bottom & Double Top Plate
1/2" Drywall
Color: TBD

W7 - INTERIOR WALL 2"X6" 45 MIN. (SOUND WALL)
5/8" TYPE X Drywall
2x6 @ 16 o.c, Single Bottom & Double Top Plate
Safe'n Sound Insulation, 2x4, 16" O.C.
Resilient Metal Channels @ 600 o.c.
2-Layers 5/8" TYPE X Drywall
Color: TBD

W8 - COORIDOR WALL 2"X4" (45 MIN. FIRE RATING)
5/8" TYPE X Drywall
2x4 @ 16 o.c, Single Bottom & Double Top Plate
Safe'n Sound Insulation, 2x4, 16" O.C.
5/8" TYPE X Drywall
Color: TBD

W9 - COORIDOR WALL 2"X4" (1 HR FIRE RATING)
5/8" TYPE X Drywall
2x4 @ 16 o.c, Single Bottom & Double Top Plate
Safe'n Sound Insulation, 2x4, 16" O.C.
5/8" TYPE X Drywall
Color: TBD

EXTERIOR SIDING NOTES
Mesa Deluxe Profile Prefinished Metal Cladding (26ga)
Rain Screen: 1/2" air space (PWF plywood spacers, 12" apart)
1 1/2" Foam Insulation
Under sill trim, Color: TBD
Drip cap, aluminum, Color: TBD
Outside corner (Painted angle iron)
Top Fascia flashing
Divider flashing (Black)
Bottom Flashing

F1 - FLOOR ASSEMBLY
Sheathing, (3/4" Plywood T&G)
R-31 Fiberglass Batt Insulation
Joist Hanger - Simpson Strong Tie LU26
2x12 Lumber joist
2x12 Lumber Rim Board, 3 Ply
3/8" Pressure treated plywood on bottom
Blackjack Sealing for Joints

FLOOR SHEATHING NOTES
Sheathing, (5/8" Plywood T&G)
Floor Patch
Vinyl Sheet, (Medium Budget)
Raised 2"x6" Floor (Bathrooms)

WINDOWS AND EXTEIOR DOORS
8 - Door knob/handle, exterior door
2 - 30in Steel Door, slab, painted
6 - 36in Steel Door, painted
6 - Check Chain door stop
6 - Window (48"W x 36"H), dual pane, white PVC
6 - Window Coverings, horizontal aluminum Venetian blinds light gray in color

PLUMBING NOTES

PLUMBING ROUGH-IN
Drains & Venting: 1-1/2" ABS Drains and Venting, 3" ABS Main Stack
Water Supply: 3/4" PEX Main Branch Line, 1/2" PEX Distribution Water Lines,
Shut Off Valves by each fixture
50 Ft. - Heat tracing (per unit)
50 Ft. - Bubble wrap insulation (per unit)
Electric Water Heater (Rheem 40G)

FIXTURES
Bathroom Sink: American Standard Marina Colony Lav, White
Toilets, standard
36"x36" shower (36SS)

FACETS
Bath sink faucet: Waltec 82234, Chrome
Shower control: Symmons Shower Valve & Trim

INTERIOR FINISH

INTERIOR DOORS
(24in) Interior Doors, Hardboard Slab, painted
Door hardware, Weiser Belmont Lever set

TRIMMING AND MILLWORK
Baseboard Trim, Vinyl Wrap
Door & Window Casings, Vinyl Wrap

BATHTROOM CABINETS
18ft - Bath cabinets, includes finished toekick, pulls (Thermofoil)
18ft - Bath counters: Laminate
Bath backsplash: 3"x3/4" Laminate

OTHER BCABINETS
Straight TV cabinets
Desk Counters
Desklamp
Dresser c/w Counter
Countertop Trim
Wardrobe
Bed Frame
Drawers for Bed

FURNISHINGS (as shown)
Mirror Frame
Bath hardware: Hand towel, bath towel, toilet paper, hook (Taymar, Ultra)
Shower rod with curtain
Toilet Brush
Garbages
Coat Hook Board, 4 Hooks
Fire Extinguisher, 5lb c/w bracket
Whiteboard
Plumbing floor/wall bulkhead

FURNITURE
Bed wattress
Table & Chair
Linens for all bedrooms
(1 fitted sheet, 1 flat sheet, pillow cases, and comforter)
32" TV & Blu-Ray player

METAL FABRICATION
Metal Skid

OTHER
Insulation packs for joining units
Lighting: Lay In Troffer, 2'x4', LED with Prismatic Lens (Lithonia - 2GTL4 A12 120 LP840)

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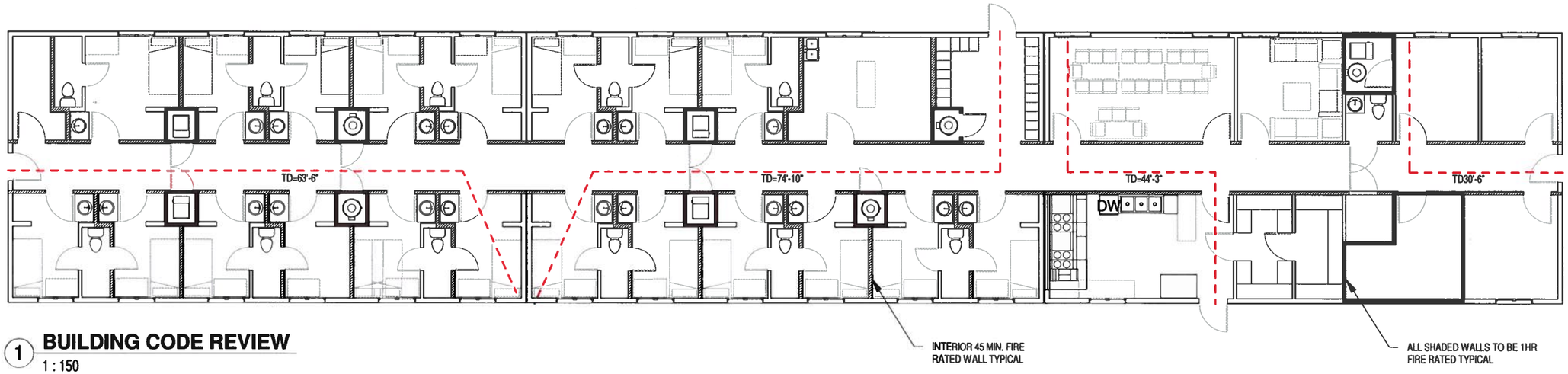
LEGEND:

45 MIN. FIRE RATED SOUND WALL

1 HR. FIRE RATED WALL



1 BUILDING CODE REVIEW

1 : 150

CODE REVIEW		
CODE REVIEW	RESULT	NBC 2015 REFERENCE
Occupancy:	Group C -Residential PART 9	1.3.3.3
Construction	Wood	
Fire Alarm System	Yes	
Sprinkler System	Yes	
Facing Streets	Three	
Maximum Building Area	600 sq. m.	1.3.3.3
Building Area	456 sq. m.	
Building Height	1 Storey	
Maximum Suite Area	100 sq. m.	9.1.2.1
Maximum Suite Travel Distance	15m	9.9.74
Maximum Suite Fire Separation	45 min.	9.9.4.2/9.10.21.2/9.10.9.15
Maximum Travel Distance	45m	9.9.8.2
Floor Assemblies	No Rating	9.10.8.1/9.10.9.4
Supporting Structures	As required for the supported assembly	9.10.8.3
Roof Assemblies	No Rating	
Storage Rooms		9.10.10.6
Services Rooms	1 Hour	9.10.10.3

DESIGN LOADS
ENVIROMENTAL LOADS (FORT SMITH NWT):
Ss = 2.3 kPa
Sr = 0.2 kPa
ROOF SNOW = 2.04 kPa
WIND q50 = 0.39 kPa

FLOOR LOADING:
BEDROOM = 1.9 kPa
HALL = 4.8 kPa
ALL OTHERS = 4.8 kPa

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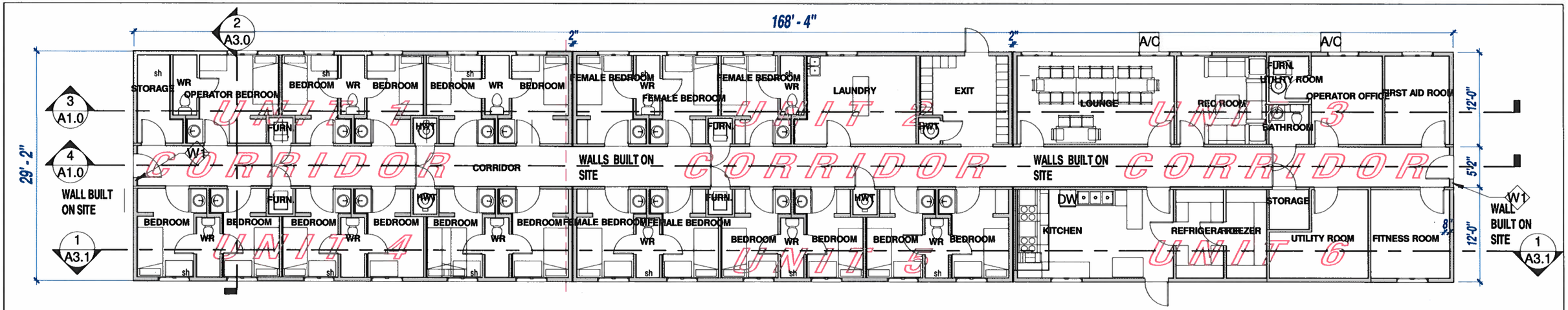
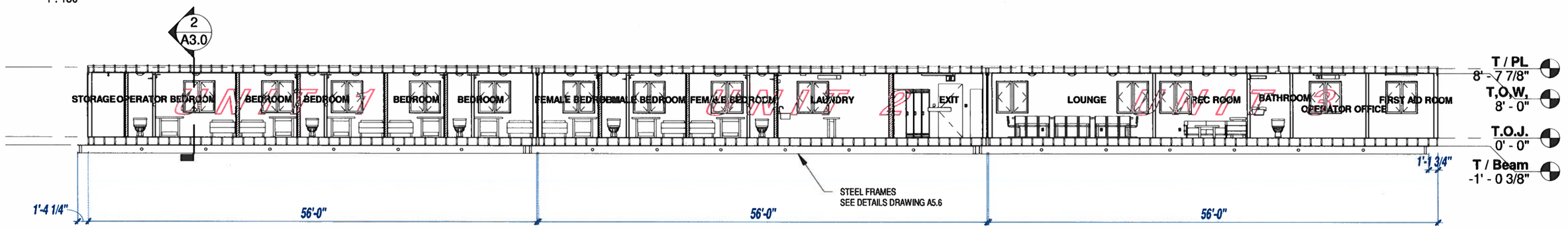


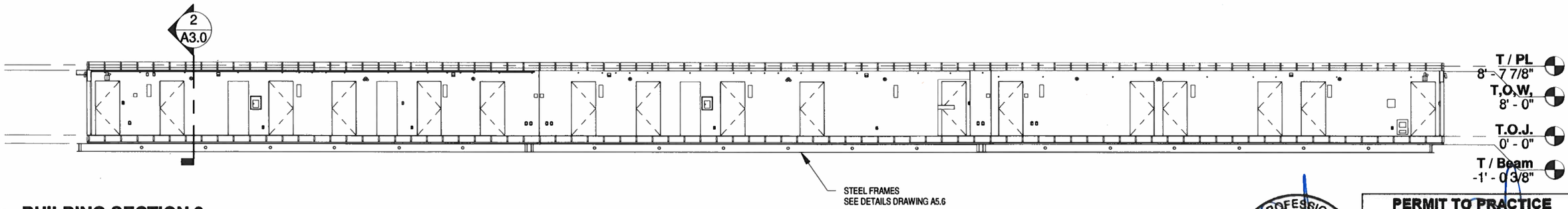
2 BUILDING PLAN LAYOUT

1 : 150



3 BUILDING SECTION 1

1 : 150



4 BUILDING SECTION 2

1 : 150

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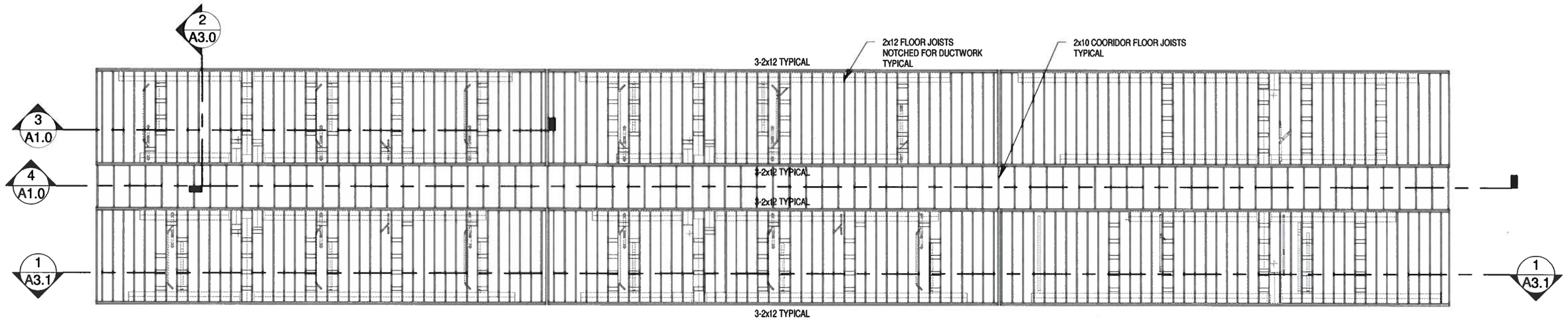
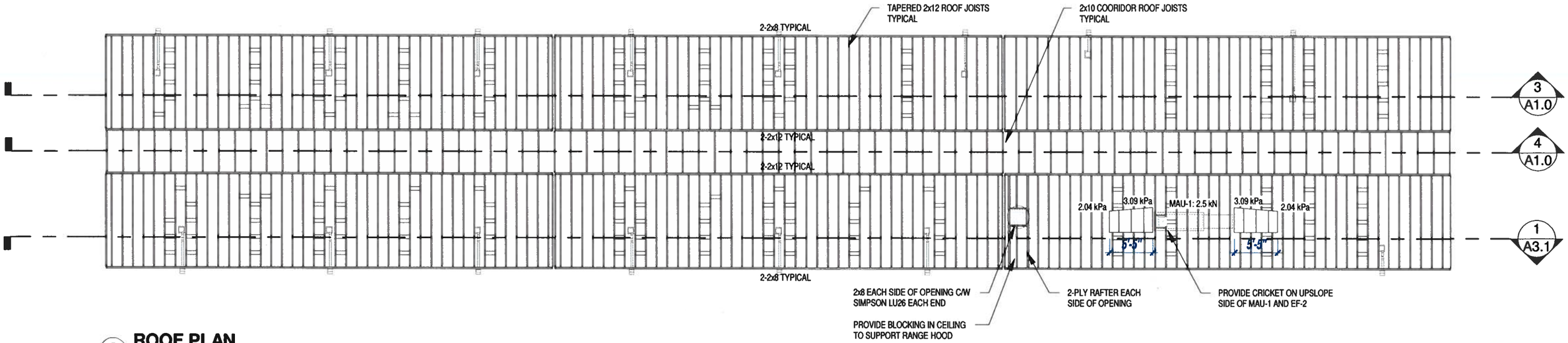


1 FLOOR FRAMING PLAN

1 : 150



2 ROOF PLAN

1 : 150

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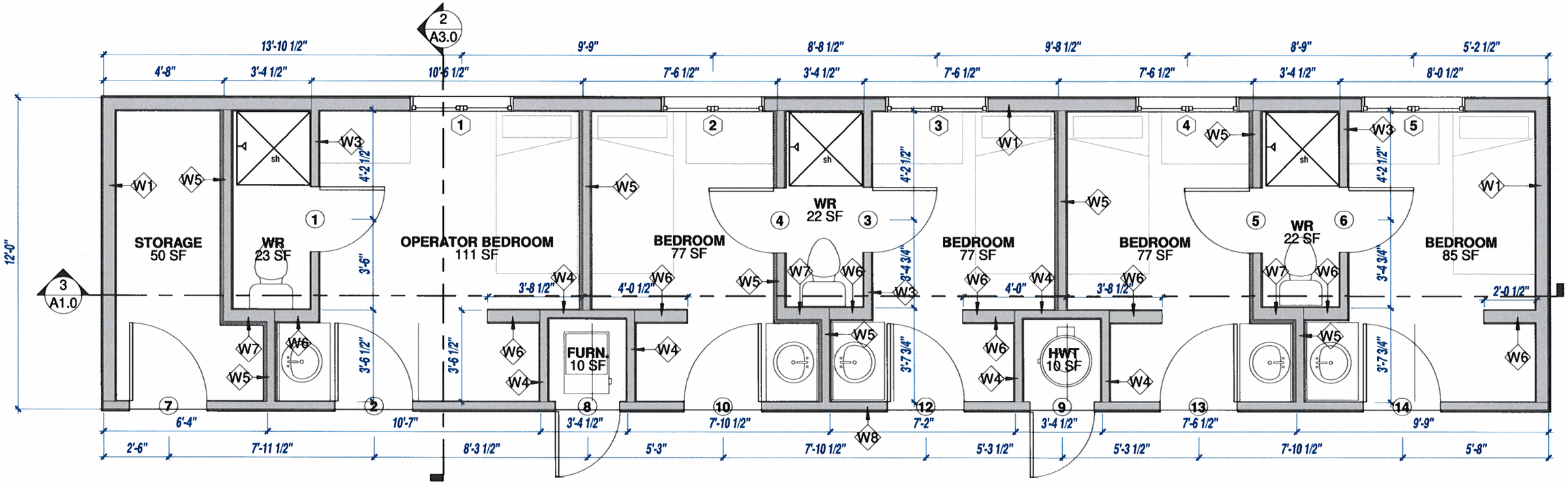

1 UNIT 1 LAYOUT

1/4" = 1'-0"

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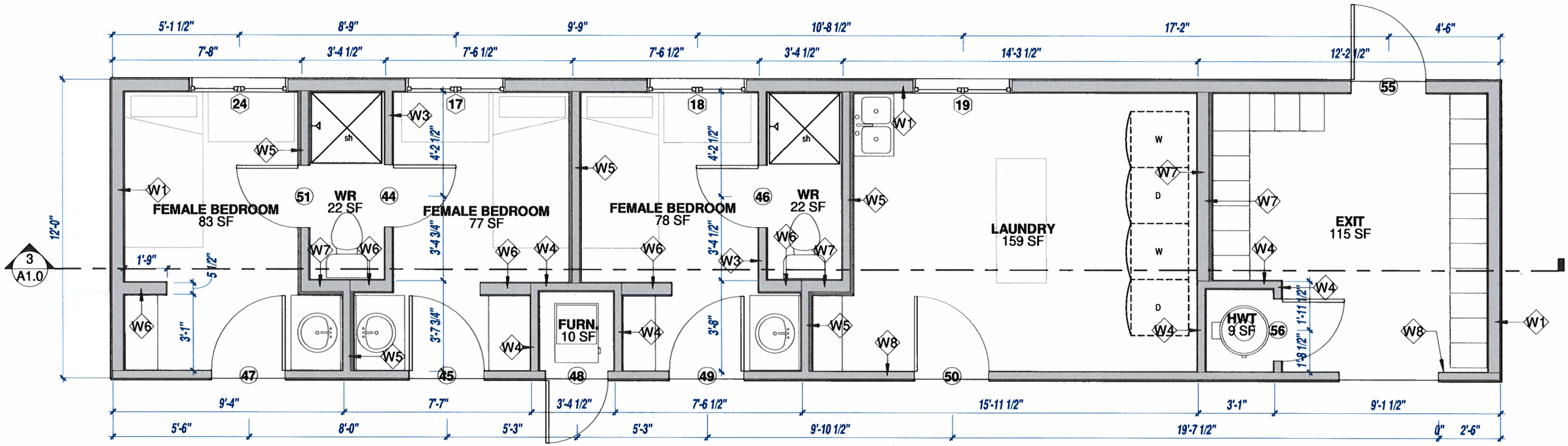

1 UNIT 2 LAYOUT

1/4" = 1'-0"

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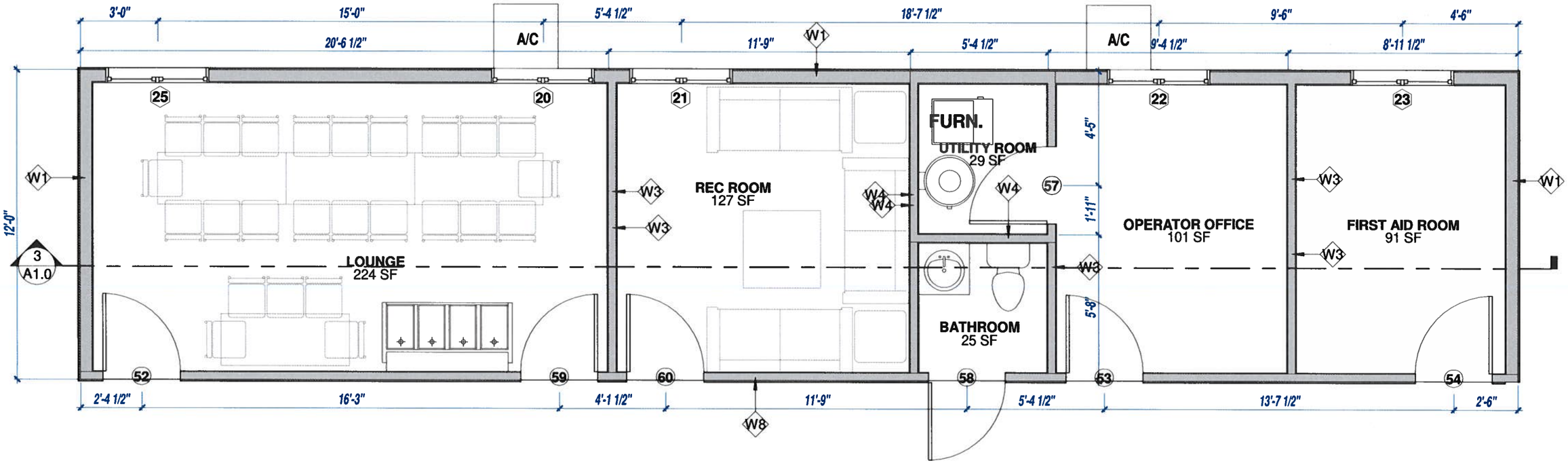

1 **UNIT 3 LAYOUT**
1/4" = 1'-0"

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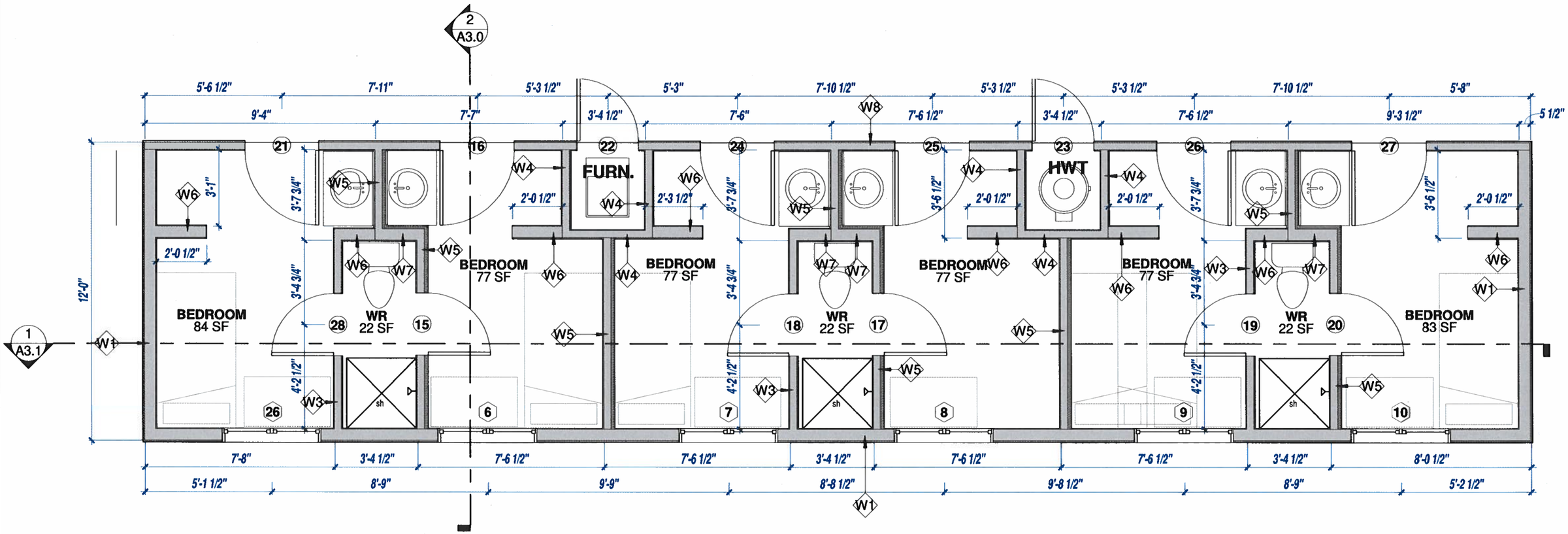

1 UNIT 4 LAYOUT

1/4" = 1'-0"

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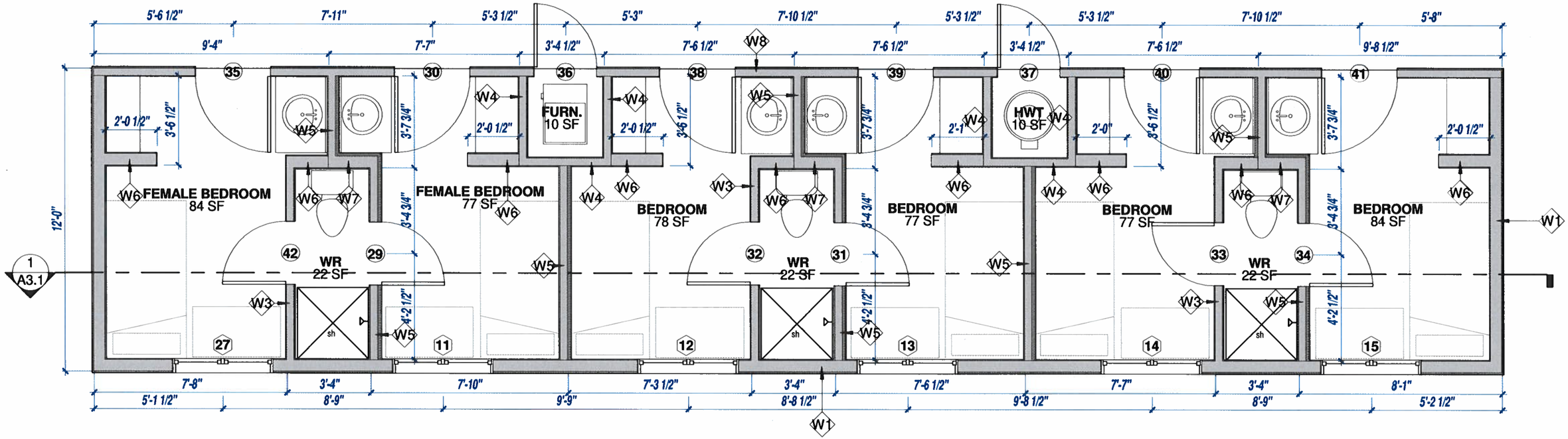

1 UNIT 5 LAYOUT

1/4" = 1'-0"

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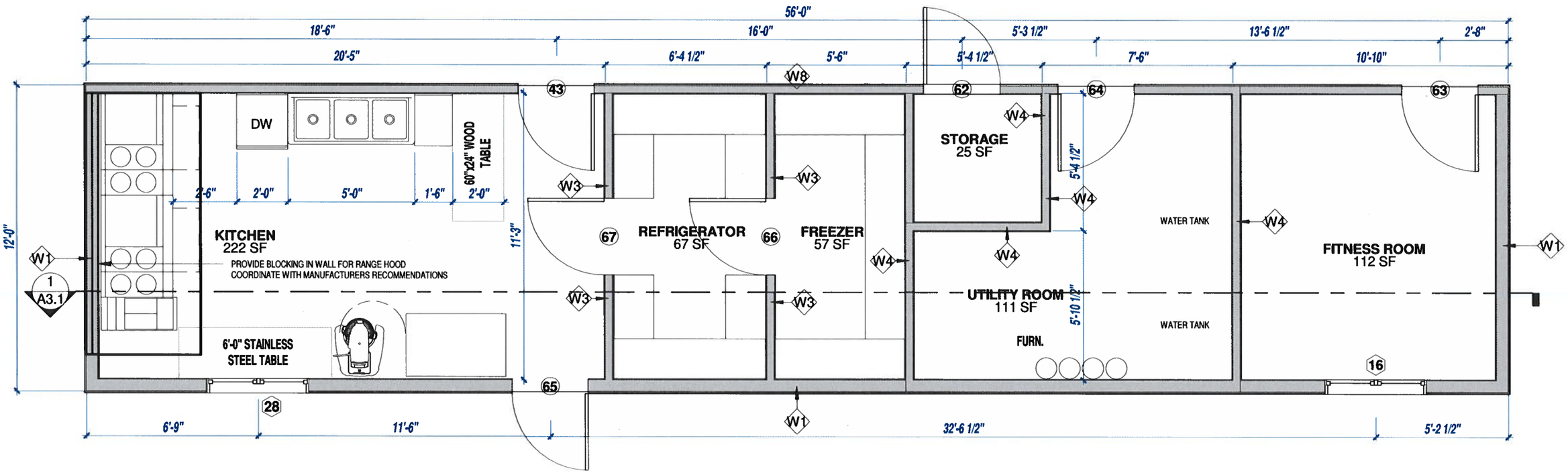

1 **UNIT 6 LAYOUT**
1/4" = 1'-0"

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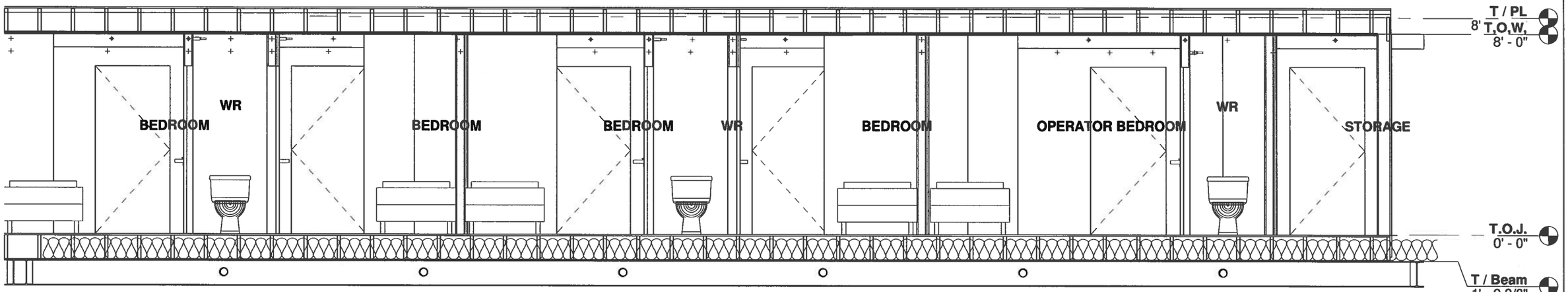
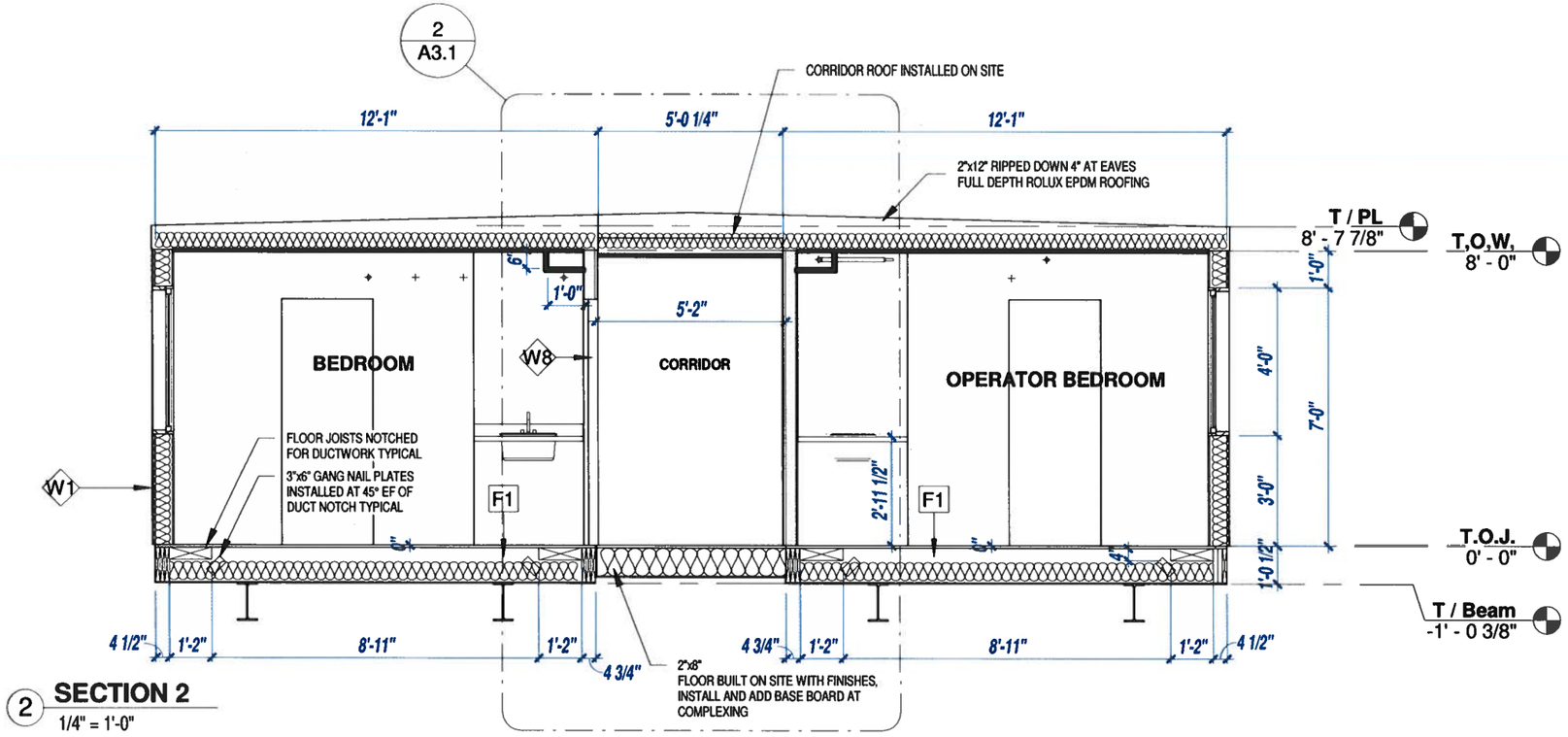


1 **SECTION 1**
1/4" = 1'-0"



2 **SECTION 2**
1/4" = 1'-0"

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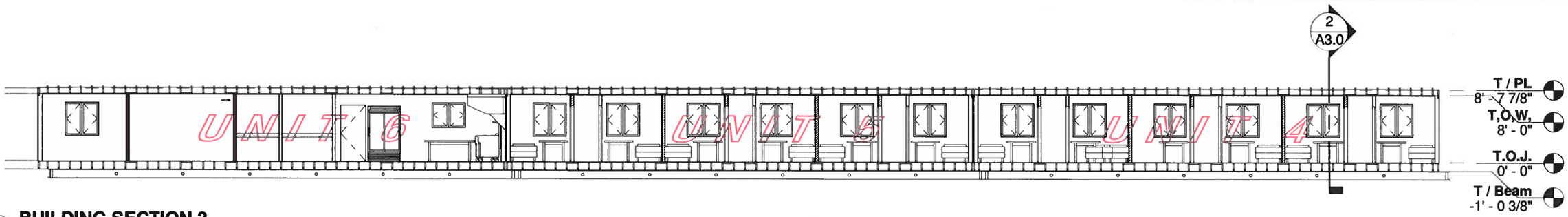
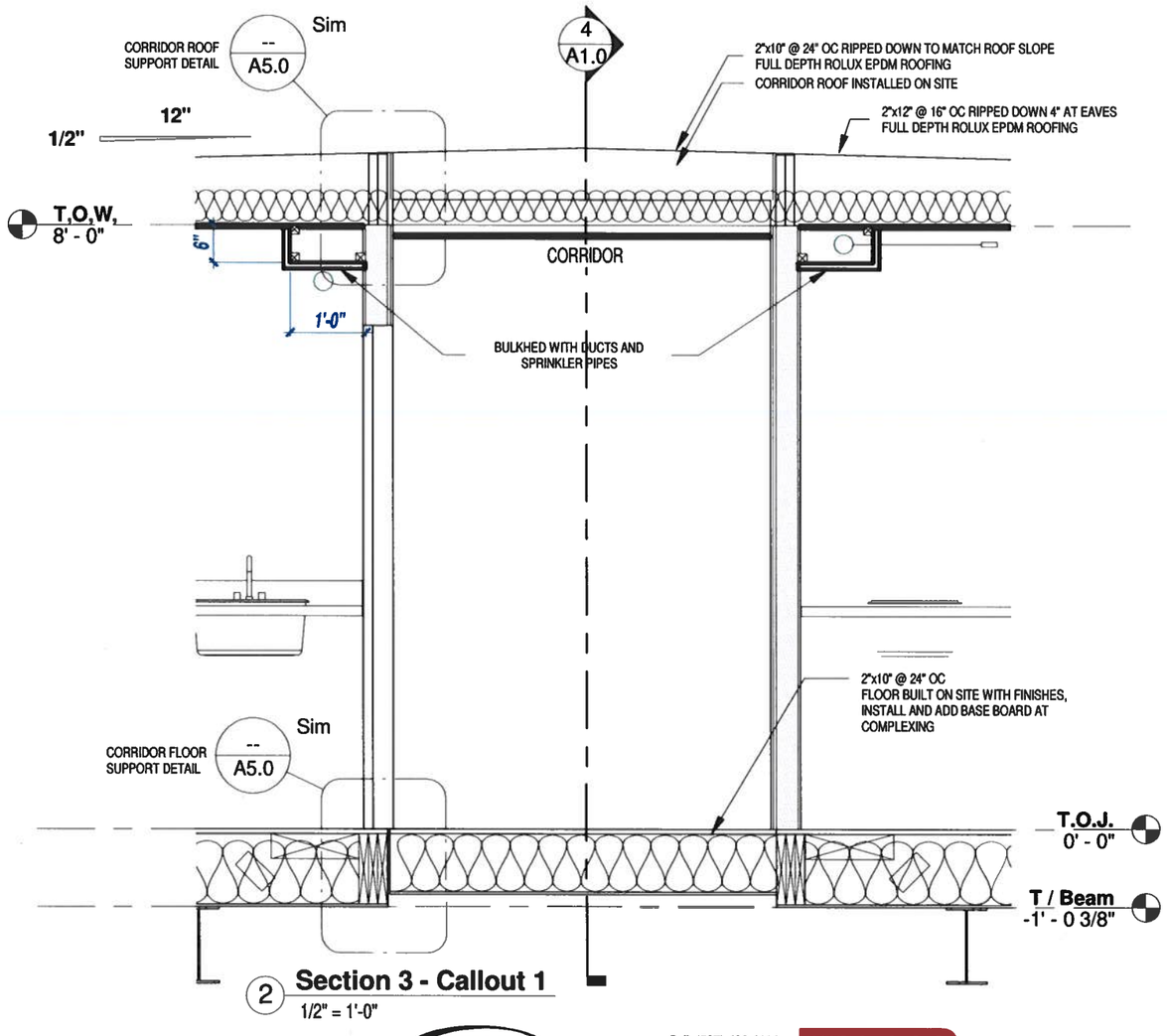


1 BUILDING SECTION 3

1 : 150



2 Section 3 - Callout 1

1/2" = 1'-0"

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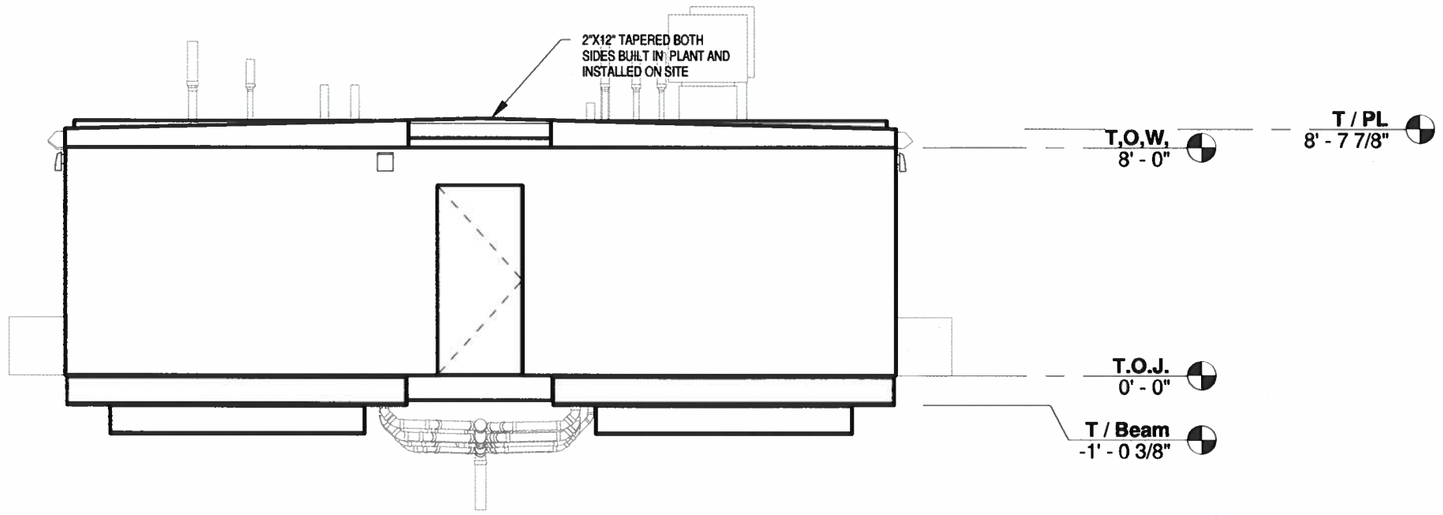
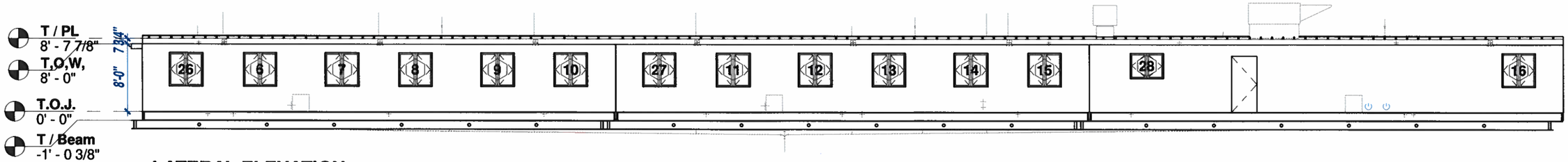


2 FRONTAL ELEVATION

3/16" = 1'-0"



3 LATERAL ELEVATION

1 : 150

REGISTERED PROFESSIONAL ENGINEER
D.P. GRONIK
LICENSEE
NT/NU

PERMIT TO PRACTICE
MPE ENGINEERING LTD.
Signature
Date *February 27/20*
PERMIT NUMBER: P 1024
NT/NU Association of Professional Engineers and Geoscientists

ISSUE								
FOR CONSTRUCTION	CLIENT: Owner	PROJECT: TALTSON NEW STAFF ACOMODATION	DRAWING TITLE: ELEVATIONS 27/02/20	Date: FEB. 27/2020	Scale: As indicated	No.: A4.0

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Cell: (587) 438 4114
Email: devin@rocmodular.com
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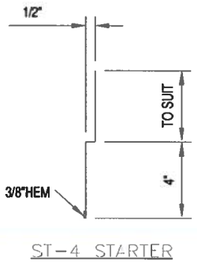
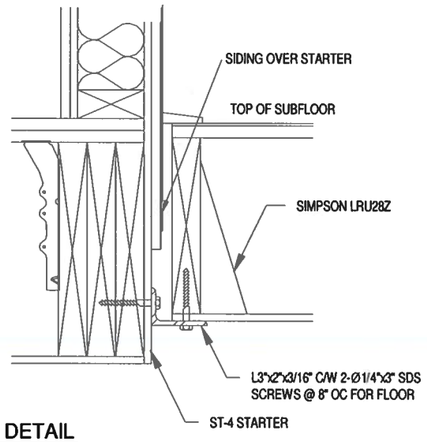
NOTES:
1. TYPICAL STANDARD DETAILS ONLY. TYPICAL DETAILS SHOW STRUCTURAL INTENT RATHER THAN ACTUAL CONDITIONS FOR THIS PROJECT. SEE CONSTRUCTION NOTES, ELEVATIONS, PLANS AND SECTIONS FOR SPECIFIC PROJECT CONDITIONS.

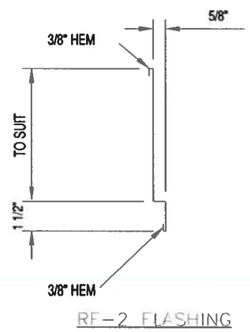


ST-4 STARTER

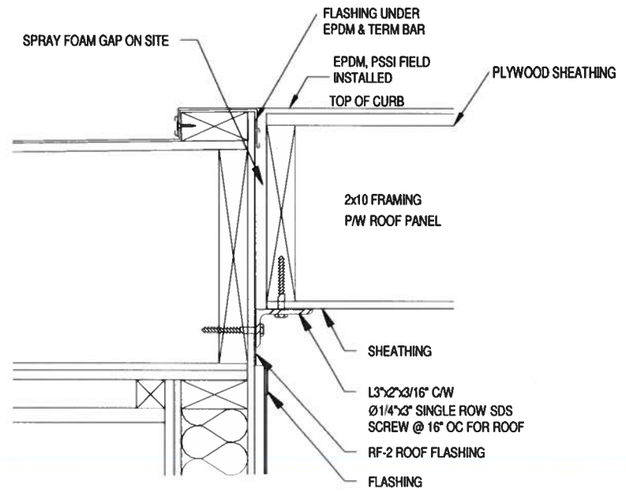


CORRIDOR FLOOR SUPPORT DETAIL

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



RF-2 FLASHING



CORRIDOR ROOF SUPPORT DETAIL

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

REGISTERED PROFESSIONAL ENGINEER
D.R. CHERNIK
LICENSEE
NT/NU

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MPE ENGINEERING LTD.
Signature
Date *February 27/20*
PERMIT NUMBER: P 1024
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27 FEB 20

ISSUE	CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION	Owner	TALTSON NEW STAFF ACOMODATION	TYPICAL DETAILS	FEB. 27/2020	1 1/2" = 1'-0"	A5.0

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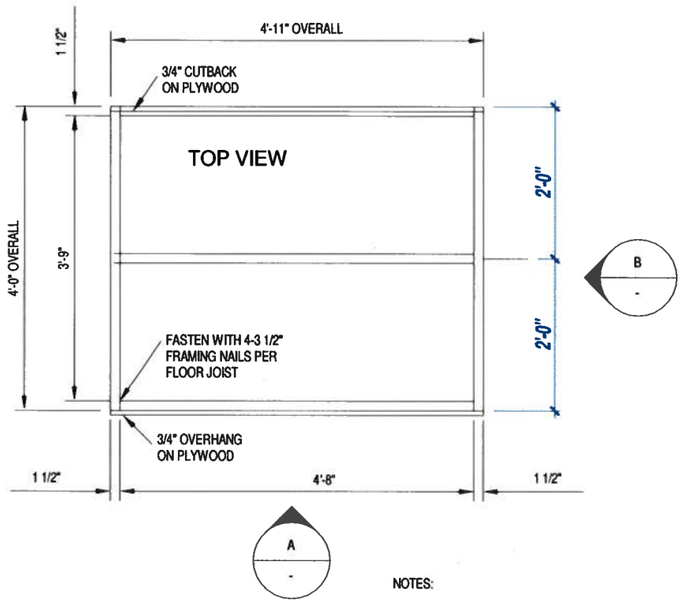
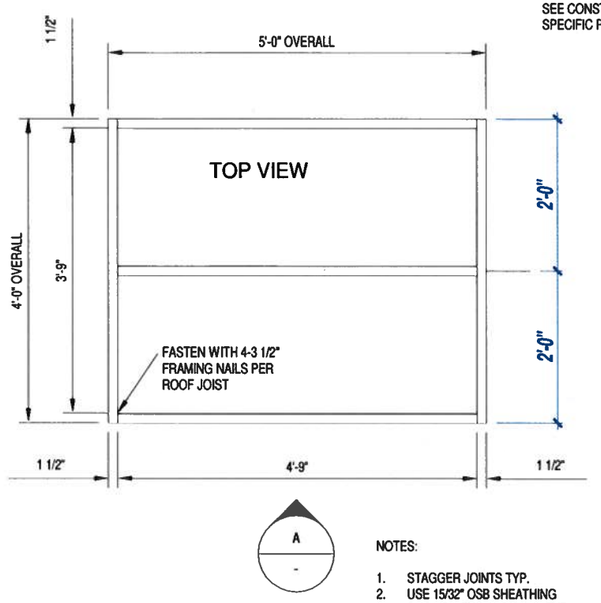


NOTES:

1. STAGGER JOINTS TYP.
2. USE 5/8" SELECT GRADE PLYWOOD
3. 2x10 FRAMING @ 24" O.C. TYP (FASTENED WITH 4 3 1/2" FRAMING NAILS OVER ROOF JOIST)
4. 20oz CARPET PSSI

NOTES:
1. TYPICAL STANDARD DETAILS ONLY. TYPICAL DETAILS SHOW STRUCTURAL INTENT RATHER THAN ACTUAL CONDITIONS FOR THIS PROJECT. SEE CONSTRUCTION NOTES, ELEVATIONS, PLANS AND SECTIONS FOR SPECIFIC PROJECT CONDITIONS.

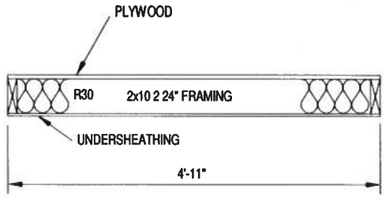


NOTES:

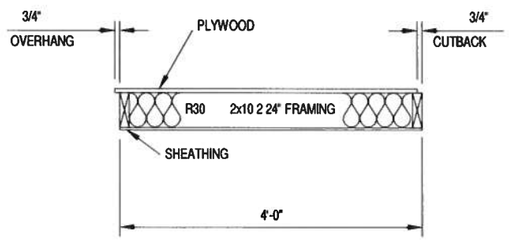
1. STAGGER JOINTS TYP.
2. USE 15/32" OSB SHEATHING
3. 2x10 FRAMING @ 24" O.C. TYP (FASTENED WITH 4 3 1/2" FRAMING NAILS OER ROOF JOIST)
4. EPDM IS PSSI
5 2"x6" EMBOSSED WHITE JOINER FLASHING, WITH 1/2" HEM EACH SIDE FOR SITE INSTALLATION, PSSI

FLOOR PANEL FRAMING DETAILS

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



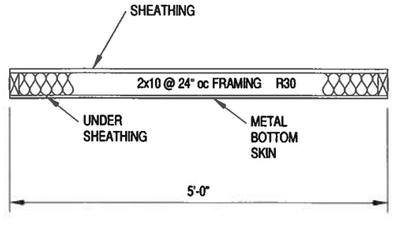
"A" FRONT VIEW



"B" SIDE VIEW

ROOF PANEL FRAMING DETAILS

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



"A" FRONT VIEW

REGISTERED PROFESSIONAL ENGINEER
D.A. CHRONIK
LICENSEE
NT/NU

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MPE ENGINEERING LTD.
Signature
Date *February 27/20*
PERMIT NUMBER: P 1024
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ISSUE		CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
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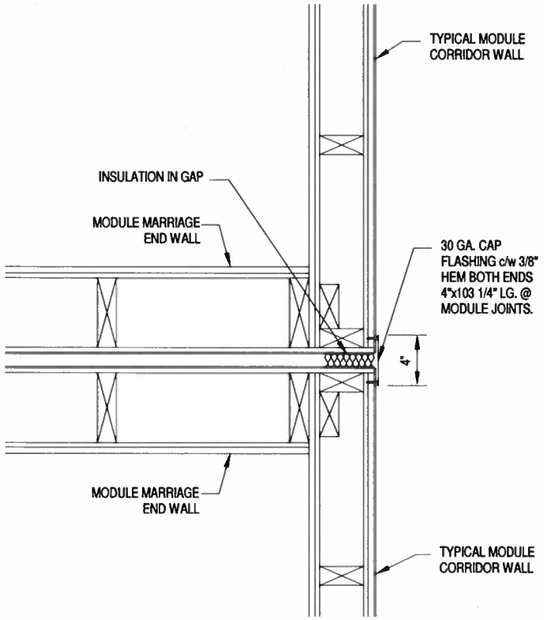
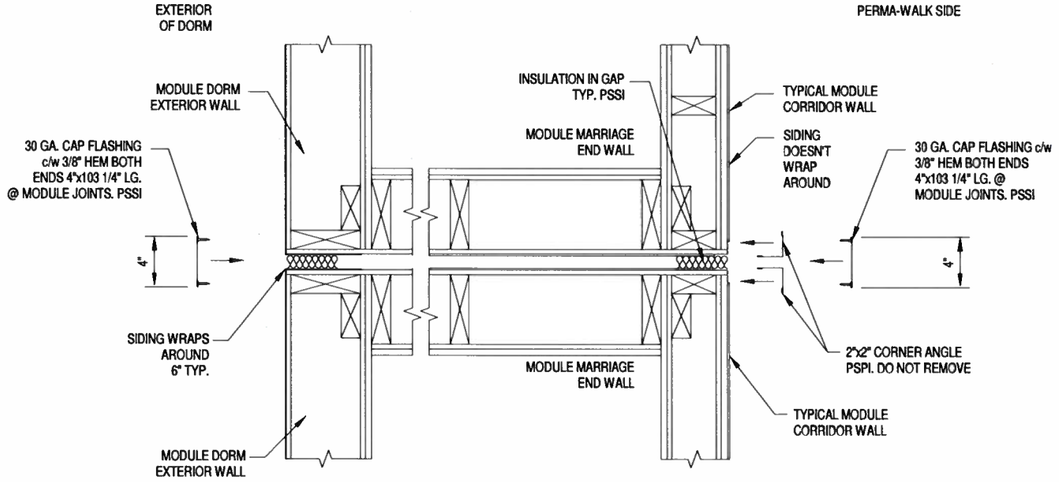


PLAN VIEW - TYPICAL MOD JOINTS

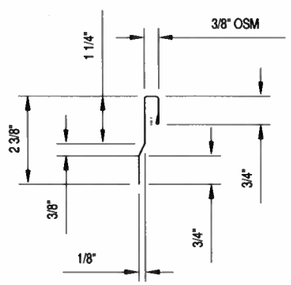
SCALE: 1"=1'-0"



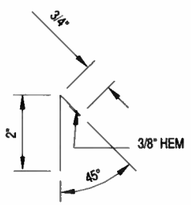
PLAN VIEW - TYPICAL DORM MOD JOINTS AT END WALLS

SCALE: 1"=1'-0"

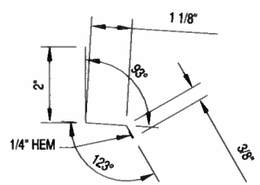
NOTES:
1. TYPICAL STANDARD DETAILS ONLY. TYPICAL DETAILS SHOW STRUCTURAL INTENT RATHER THAN ACTUAL CONDITIONS FOR THIS PROJECT. SEE CONSTRUCTION NOTES, ELEVATIONS, PLANS AND SECTIONS FOR SPECIFIC PROJECT CONDITIONS.



F-109



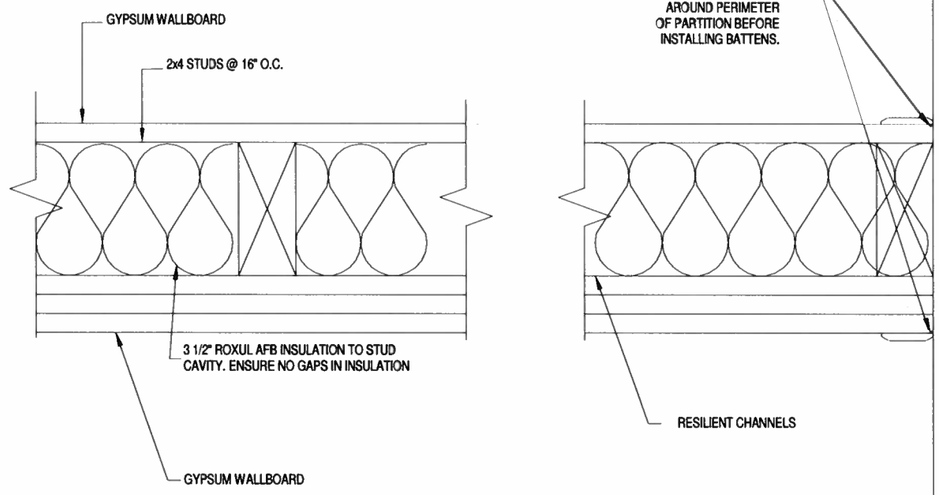
F-6



DRIPCAP

WINDOW/OPENING FLASHINGS

SCALE: 3"=1'-0"



TYPICAL SOUND ATTENUATION DETAILS FOR ALL SOUND WALLS

SCALE: 3"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
DR. DUHONIK
LICENSEE
NT/NU

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MPE ENGINEERING LTD.
Signature
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ISSUE		CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION		Owner	TALTSON NEW STAFF ACOMODATION	TYPICAL DETAILS 27 FEB 20	FEB. 27/2020	As indicated	A5.2

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NOTES:
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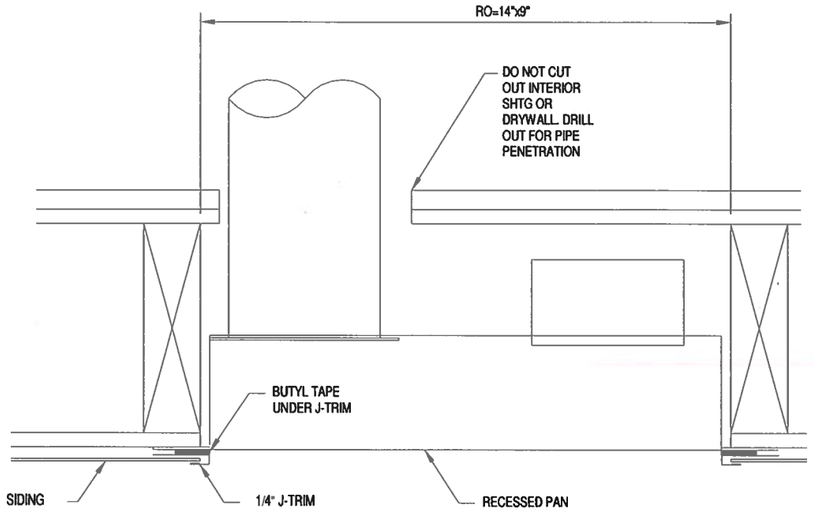
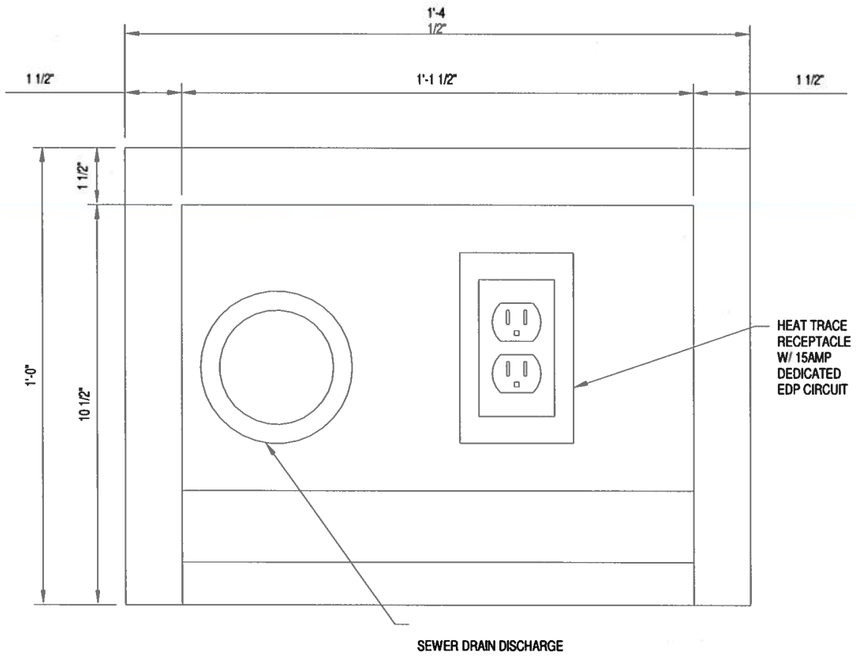
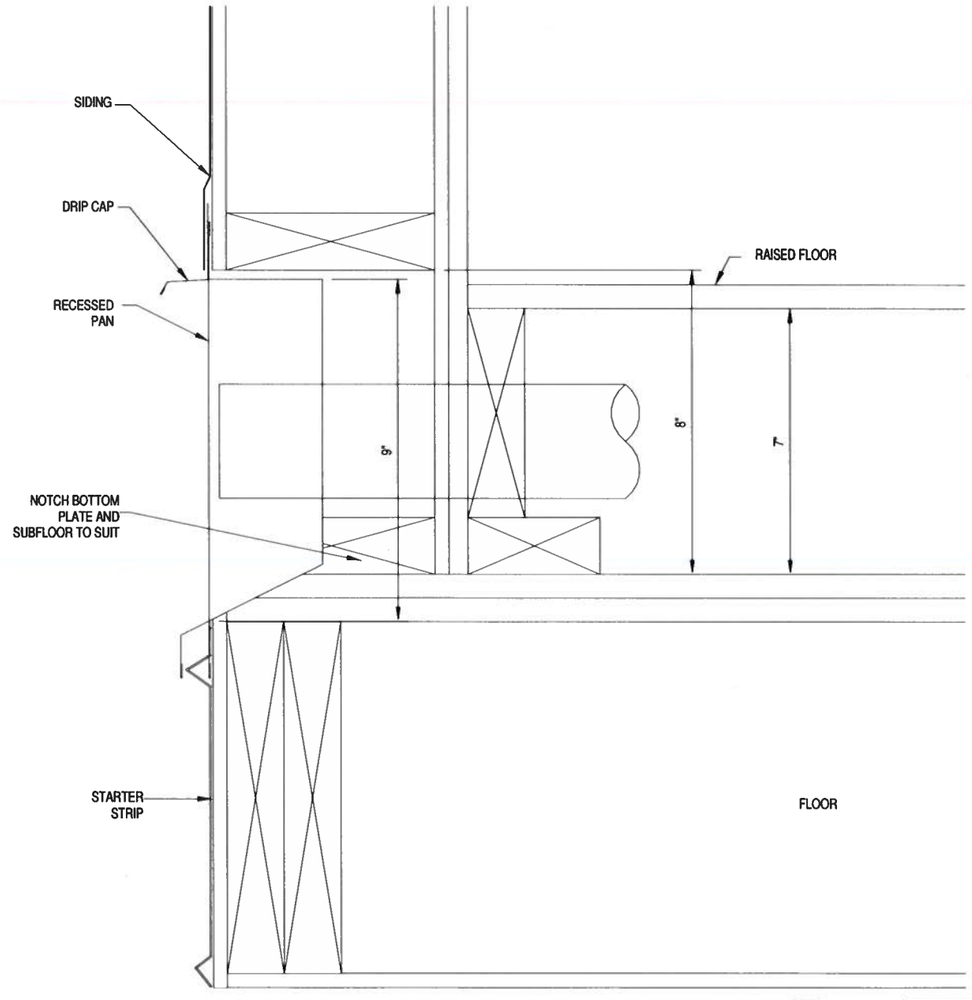


PLAN VIEW



FRONT ELEVATION - PAN ONLY



SECTION

RECESSED DRAIN PAN W/ DBL HEAT TRACE

SCALE: 3"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
D.R. CHRONIK
LICENSEE
NT/NU
27 Feb 20

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Signature
Date *February 27/20*
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ISSUE	CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION	Owner	TALTSON NEW STAFF ACOMODATION	TYPICAL DETAILS	FEB. 27/2020	3" = 1'-0"	A5.3

NOTES:
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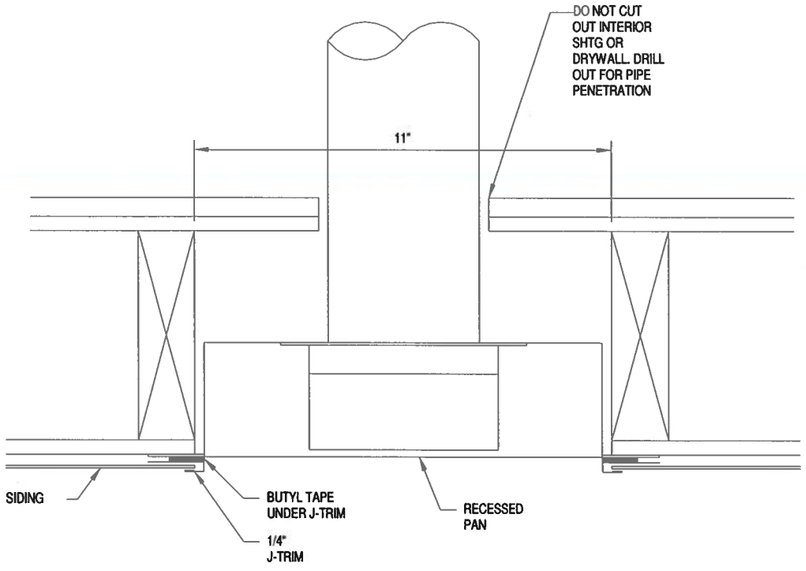
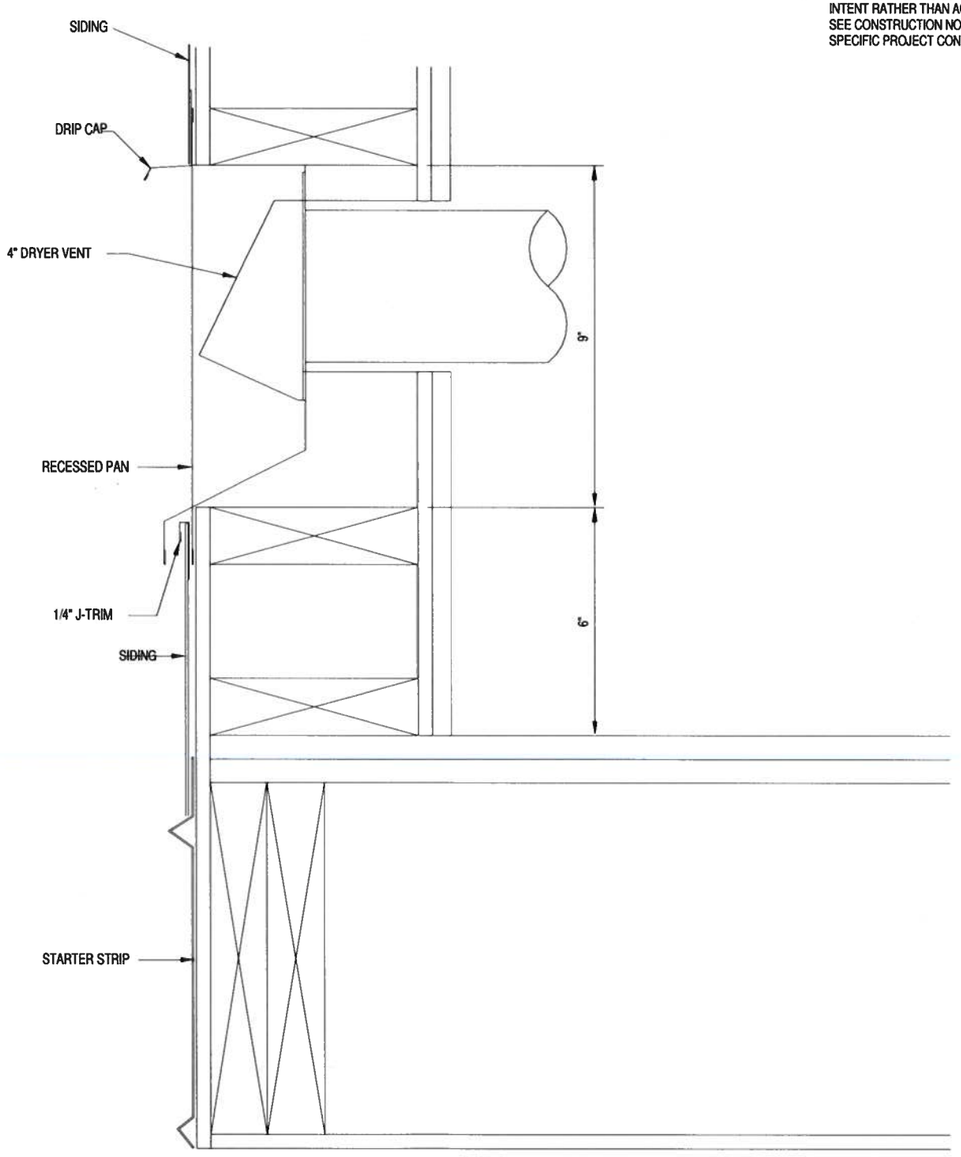


PLAN VIEW



SECTION

TYPICAL DRYER VENT PAN
SCALE: 3"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
B.R. CHRONIK
LICENSEE
NT/NU

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MPE ENGINEERING LTD.
Signature:
Date: *February 27/20*
PERMIT NUMBER: P 1024
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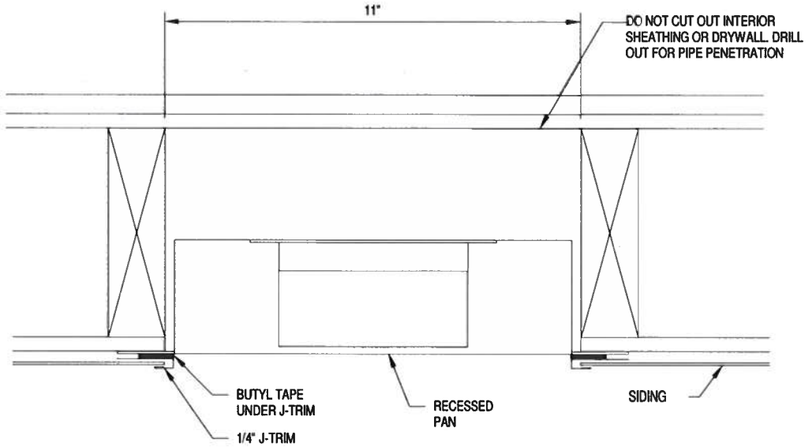
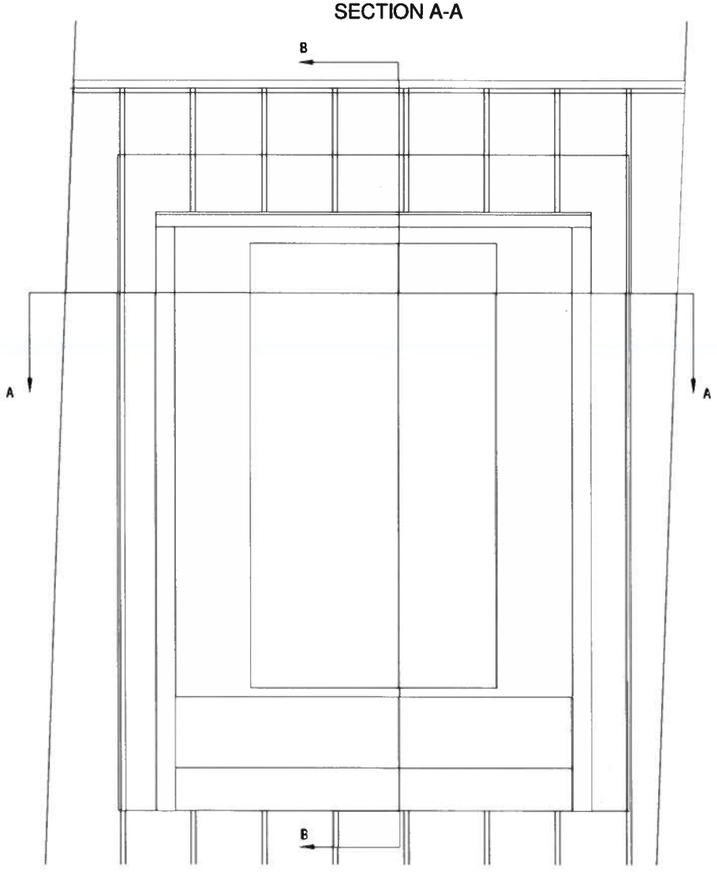
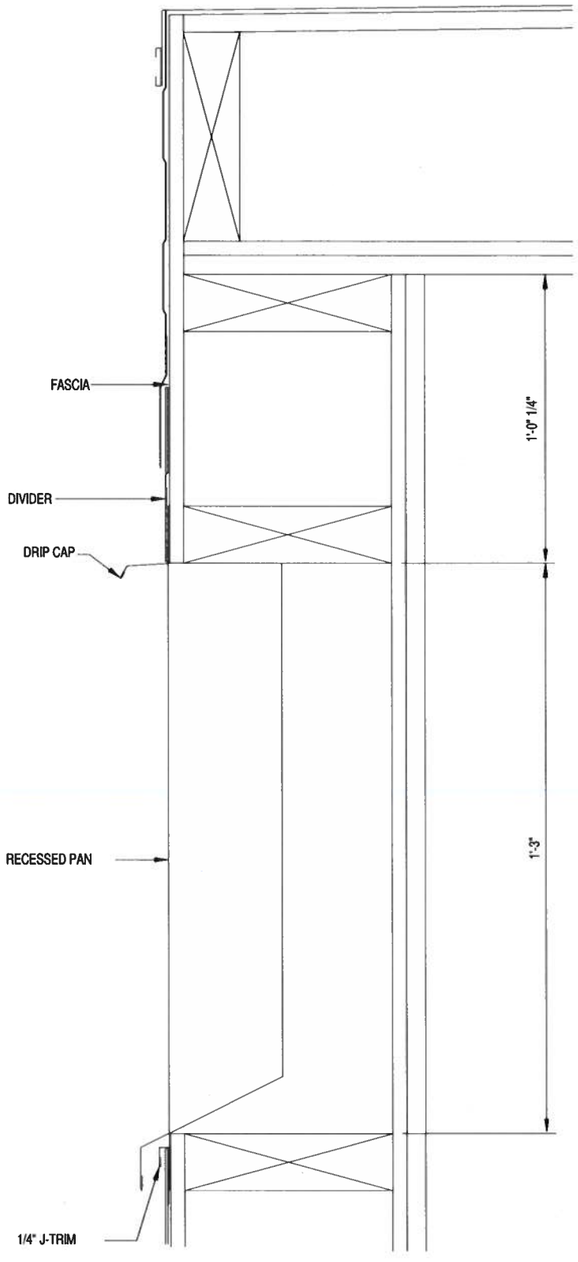
ISSUE			CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION	MPE Engineering Ltd.	Cell: (587) 438 4114 Email: devin@rocmodular.com 504 – 8 AVE E. Bow Island, AB T0K 0G0	Owner	TALTSON NEW STAFF ACOMODATION	TYPICAL DETAILS 27 FEB 20	FEB. 27/2020	3" = 1'-0"	A5.4



SECTION A-A

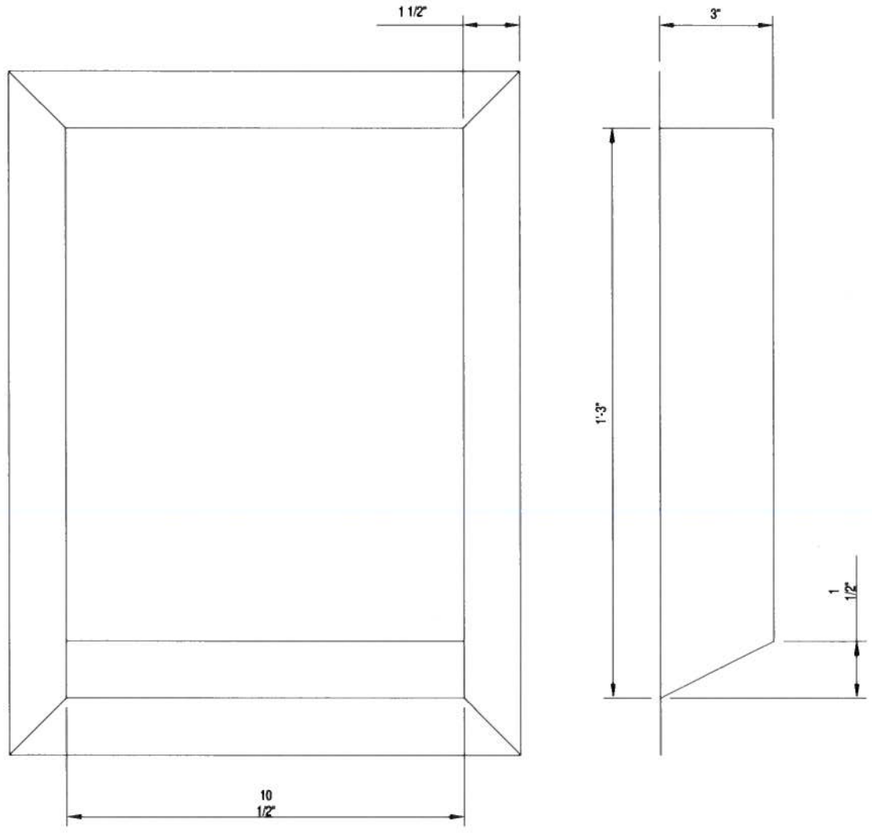


ELEVATION



SECTION B-B

NOTES:
1. TYPICAL STANDARD DETAILS ONLY. TYPICAL DETAILS SHOW STRUCTURAL INTENT RATHER THAN ACTUAL CONDITIONS FOR THIS PROJECT. SEE CONSTRUCTION NOTES, ELEVATIONS, PLANS AND SECTIONS FOR SPECIFIC PROJECT CONDITIONS.



RECESSED LIGHT PAN DETAILS

SCALE: 3"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
DAVID CARONIK
LICENSEE
NT/NU
27 FEB 20

PERMIT TO PRACTICE
MPE ENGINEERING LTD.
Signature
Date February 27/20
PERMIT NUMBER: P 1024
NT/NU Association of Professional Engineers and Geoscientists

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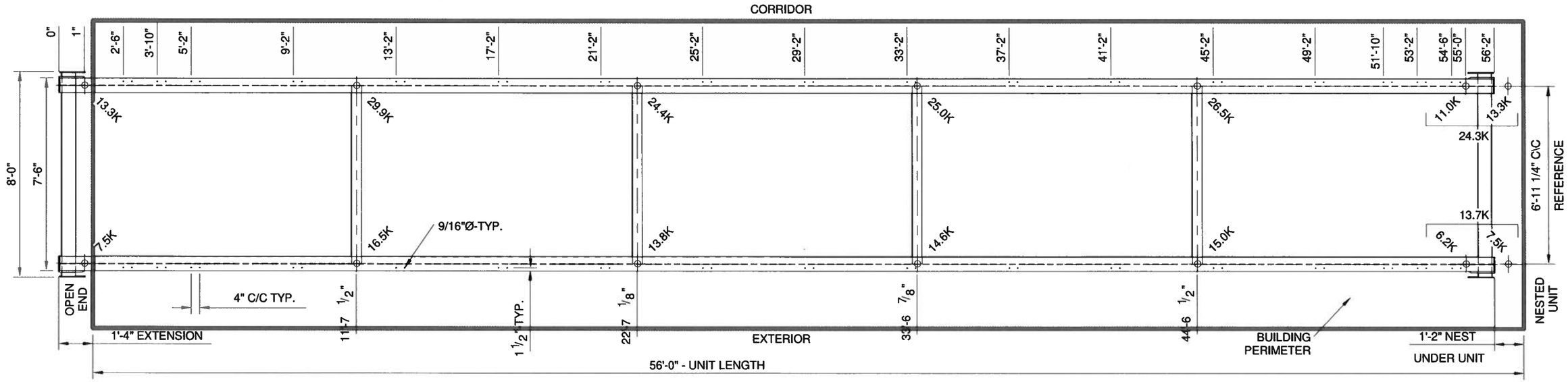
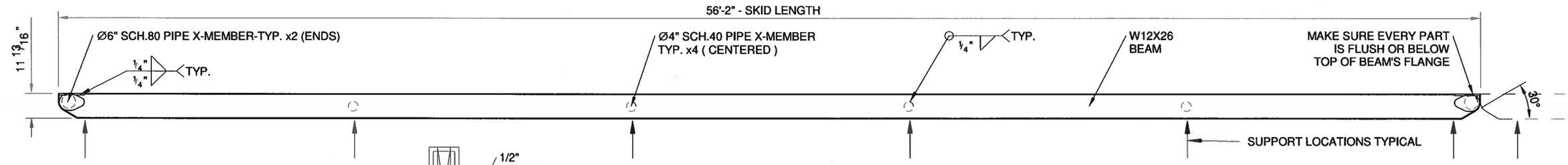
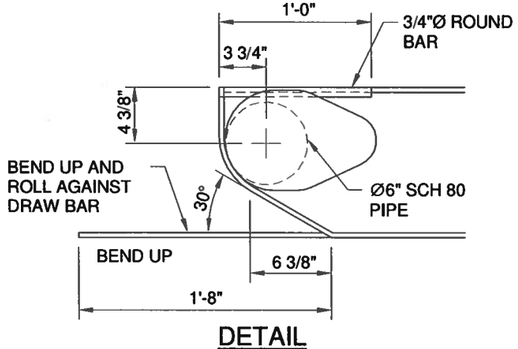
ISSUE	CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION	Owner	TALTSON NEW STAFF ACOMODATION	TYPICAL DETAILS	FEB. 27/2020	3" = 1'-0"	A5.5



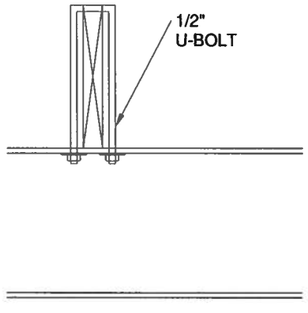
PLAN VIEW



2 MEMBER W12X26 SKID FRAME ELEVATION



DETAIL



CONNECTION

NOTES

- ALL FABRICATION TO BE IN ACCORDANCE WITH CSA W59-M
- ALL MATERIALS TO BE AS FOLLOWS:
  - BEAM AND SECTIONS 300W MIN.
  - PIPE A53 OR EQUAL
  - PLATE 300W
- SUPPORT LOADS SHOWN ARE FACTORED IN KIPS (1K=1000 lbs)
- FOUNDATION DESIGN BY OTHERS.
- FRAME TO HAVE SUFFICIENT SEPARATION FROM GROUND TO PROVIDE ADEQUATE VENTILATION TO THE UNDERSIDE OF MODULAR UNIT.

REGISTERED PROFESSIONAL ENGINEER
D.R. CHISONIK
LICENSEE
NT/NU

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MPE ENGINEERING LTD.
Signature
Date *February 27/20*
PERMIT NUMBER: P 1024
NT/NU Association of Professional Engineers and Geoscientists

ISSUE		CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
FOR CONSTRUCTION		Owner	TALTSON NEW STAFF ACOMODATION	TYPICAL DETAILS	FEB. 27/2020	1/4" = 1'-0"	A5.6

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504 – 8 AVE E. Bow Island, AB T0K 0G0
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Door Schedule

Mark	Width	Height	Comments
1	30"	80"	
2	36"	80"	
3	30"	80"	
4	30"	80"	
5	30"	80"	
6	30"	80"	
7	36"	80"	
8	30"	80"	
9	30"	80"	
10	36"	80"	
12	36"	80"	
13	36"	80"	
14	36"	80"	
15	30"	80"	
16	36"	80"	
17	30"	80"	
18	30"	80"	
19	30"	80"	
20	30"	80"	
21	36"	80"	
22	30"	80"	
23	30"	80"	
24	36"	80"	
25	36"	80"	
26	36"	80"	
27	36"	80"	
28	30"	80"	
29	30"	80"	
30	36"	80"	
31	30"	80"	
32	30"	80"	
33	30"	80"	
34	30"	80"	
35	36"	80"	

Door Schedule

Mark	Width	Height	Comments
36	30"	80"	
37	30"	80"	
38	36"	80"	
39	36"	80"	
40	36"	80"	
41	36"	80"	
42	30"	80"	
43	36"	80"	
44	30"	80"	
45	36"	80"	
46	30"	80"	
47	36"	80"	
48	30"	80"	
49	36"	80"	
50	36"	80"	
51	30"	80"	
52	36"	80"	
53	36"	80"	
54	36"	80"	
55	36"	80"	
56	30"	80"	
57	36"	80"	
58	36"	80"	
59	36"	80"	
60	36"	80"	
62	36"	80"	
63	36"	80"	
64	36"	80"	
65	36"	80"	
66	36"	80"	
67	36"	80"	
68	36"	80"	
69	36"	80"	

Window Schedule

Mark	Width	Height	Head Height	Sill Height
1	48"	48"	7' - 0"	3' - 0"
2	48"	48"	7' - 0"	3' - 0"
3	48"	48"	7' - 0"	3' - 0"
4	48"	48"	7' - 0"	3' - 0"
5	48"	48"	7' - 0"	3' - 0"
6	48"	48"	7' - 0"	3' - 0"
7	48"	48"	7' - 0"	3' - 0"
8	48"	48"	7' - 0"	3' - 0"
9	48"	48"	7' - 0"	3' - 0"
10	48"	48"	7' - 0"	3' - 0"
11	48"	48"	7' - 0"	3' - 0"
12	48"	48"	7' - 0"	3' - 0"
13	48"	48"	7' - 0"	3' - 0"
14	48"	48"	7' - 0"	3' - 0"

Window Schedule

Mark	Width	Height	Head Height	Sill Height
15	48"	48"	7' - 0"	3' - 0"
16	48"	48"	7' - 0"	3' - 0"
17	48"	48"	7' - 0"	3' - 0"
18	48"	48"	7' - 0"	3' - 0"
19	48"	48"	7' - 0"	3' - 0"
20	48"	48"	7' - 0"	3' - 0"
21	48"	48"	7' - 0"	3' - 0"
22	48"	48"	7' - 0"	3' - 0"
23	48"	48"	7' - 0"	3' - 0"
24	48"	48"	7' - 0"	3' - 0"
25	48"	48"	7' - 0"	3' - 0"
26	48"	48"	7' - 0"	3' - 0"
27	48"	48"	7' - 0"	3' - 0"
28	48"	36"	7' - 0"	4' - 0"

REGISTERED PROFESSIONAL ENGINEER
D.A. CHRONIK
LICENSEE
NT/NU

PERMIT TO PRACTICE
MPE ENGINEERING LTD.
Signature
Date February 27/20
PERMIT NUMBER: P 1024
NT/NU Association of Professional Engineers and Geoscientists

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ISSUE	CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
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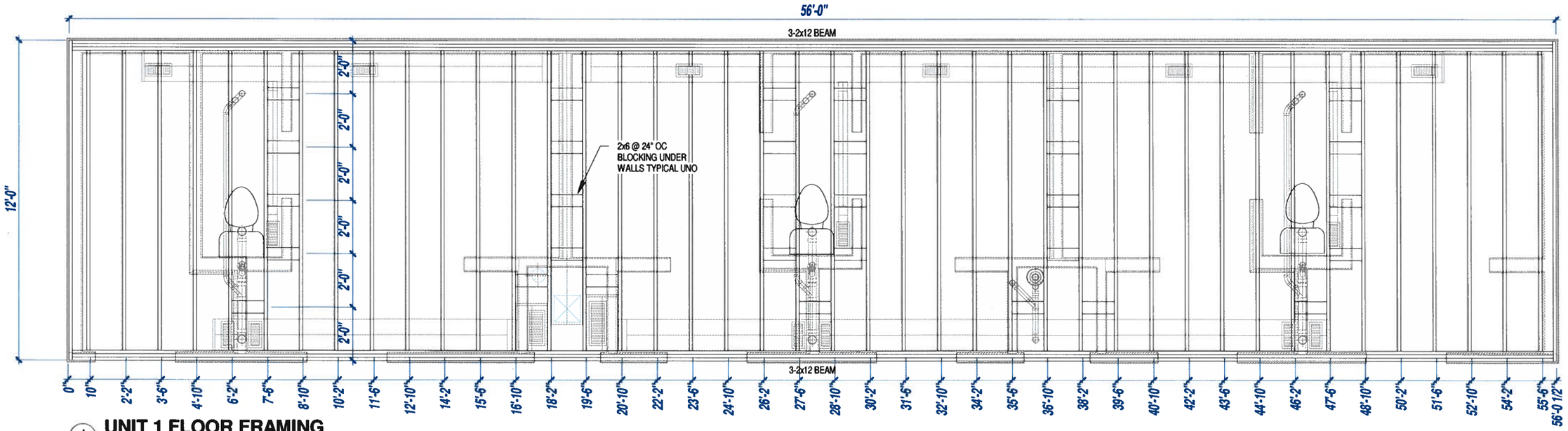

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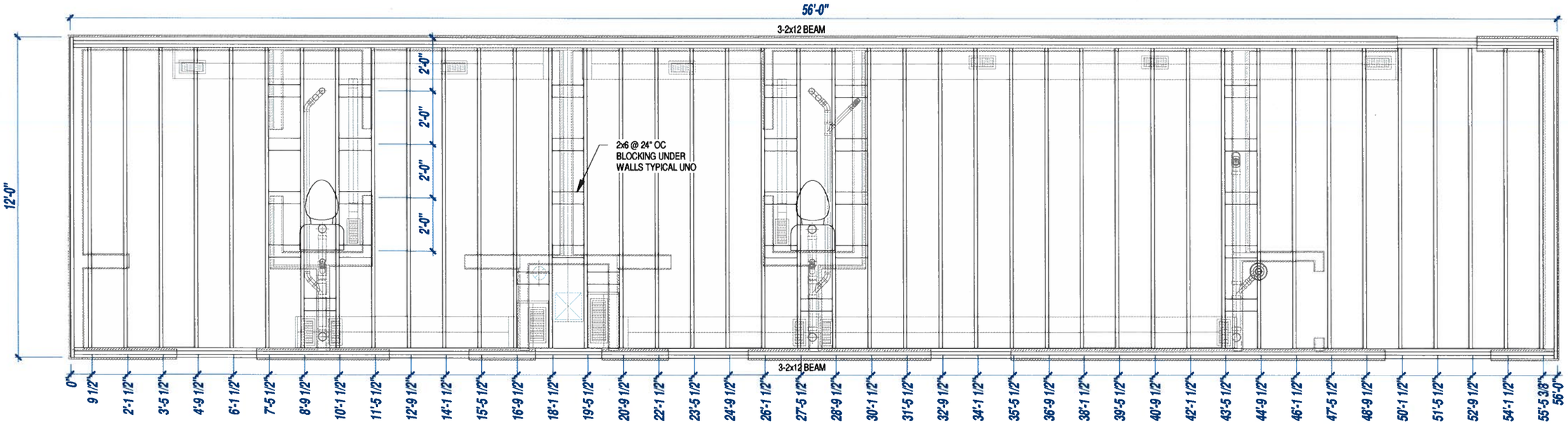

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1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
D.R. CHRONIK
LICENSEE
NT/NU

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Date *February 27/20*
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FOR CONSTRUCTION	Owner	TALTSON NEW STAFF ACOMODATION	UNIT 1-2 FLOOR FRAMING 27 FEB 20	FEB. 27/2020	1/4" = 1'-0"	S1.0

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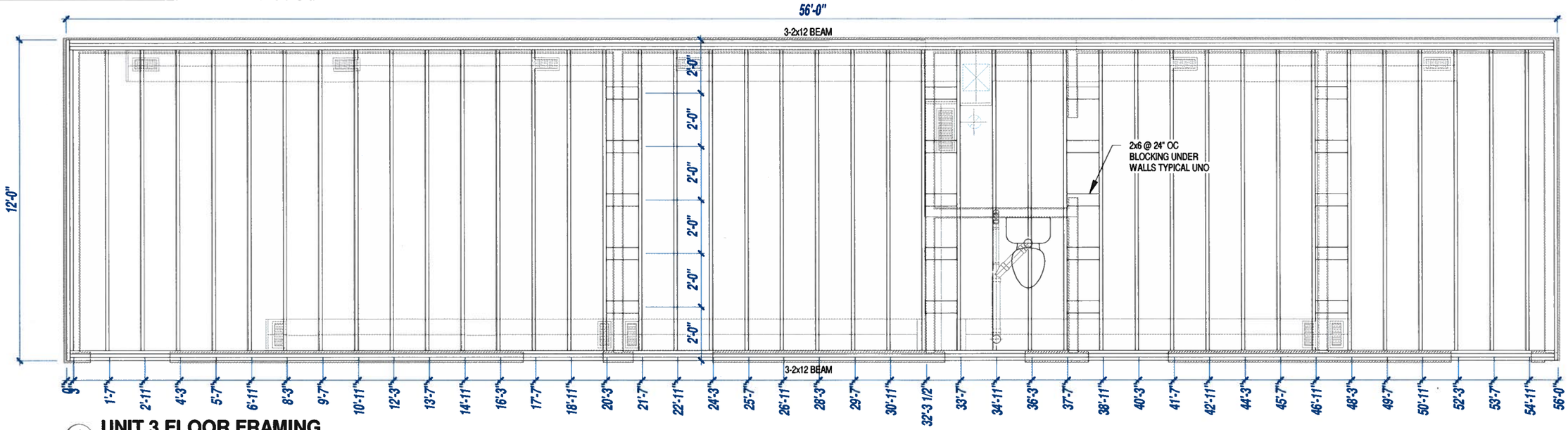

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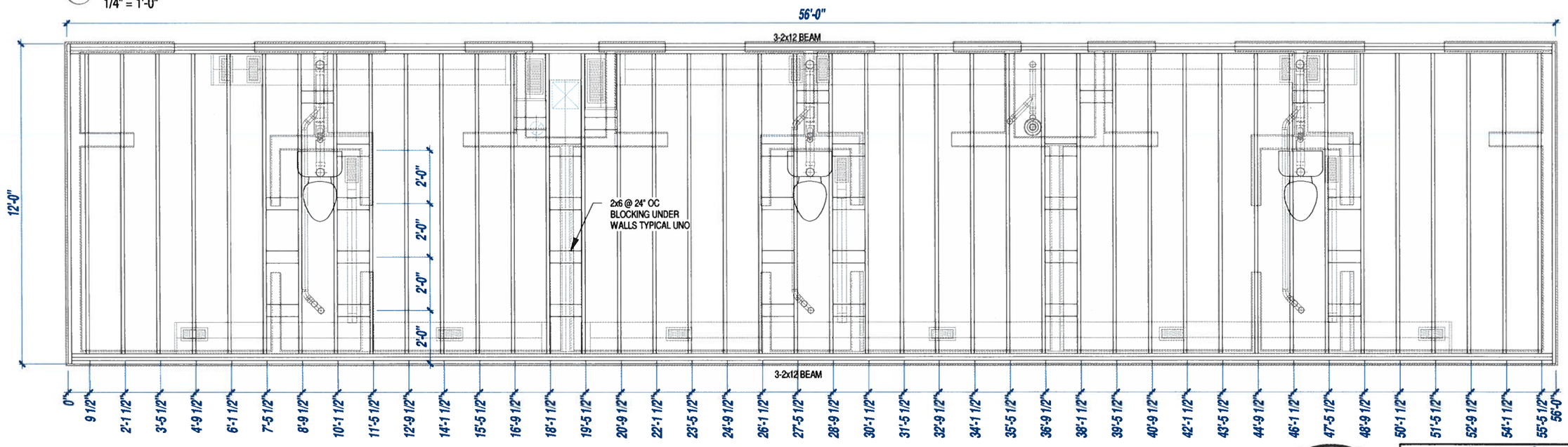

2 UNIT 4 FLOOR FRAMING

1/4" = 1'-0"

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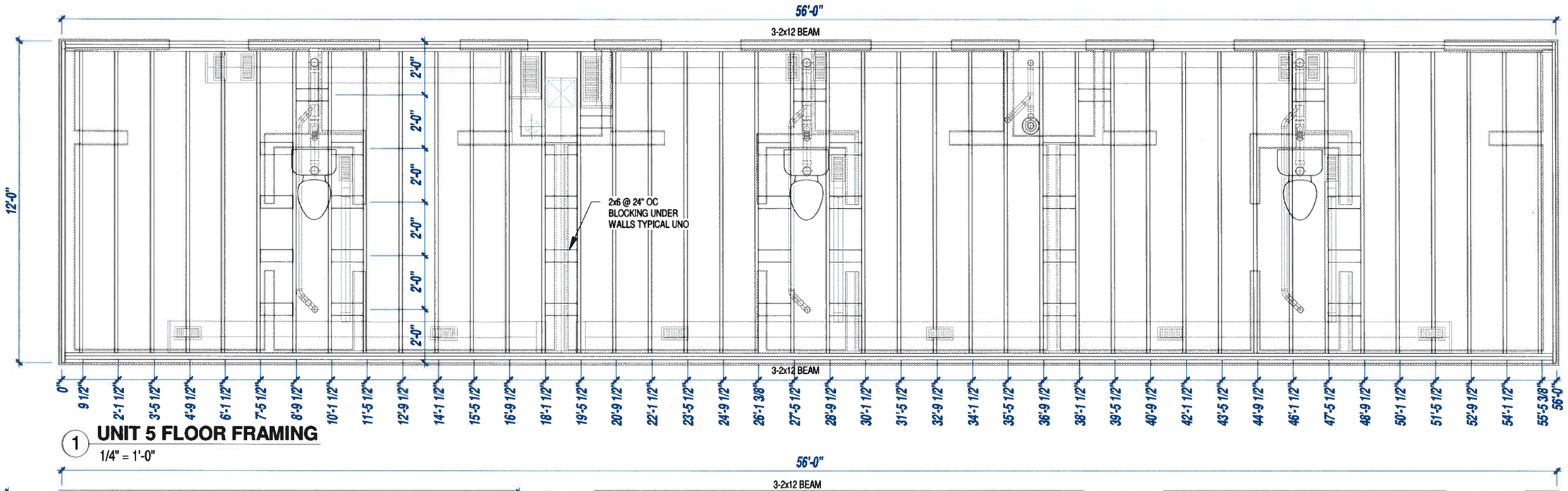

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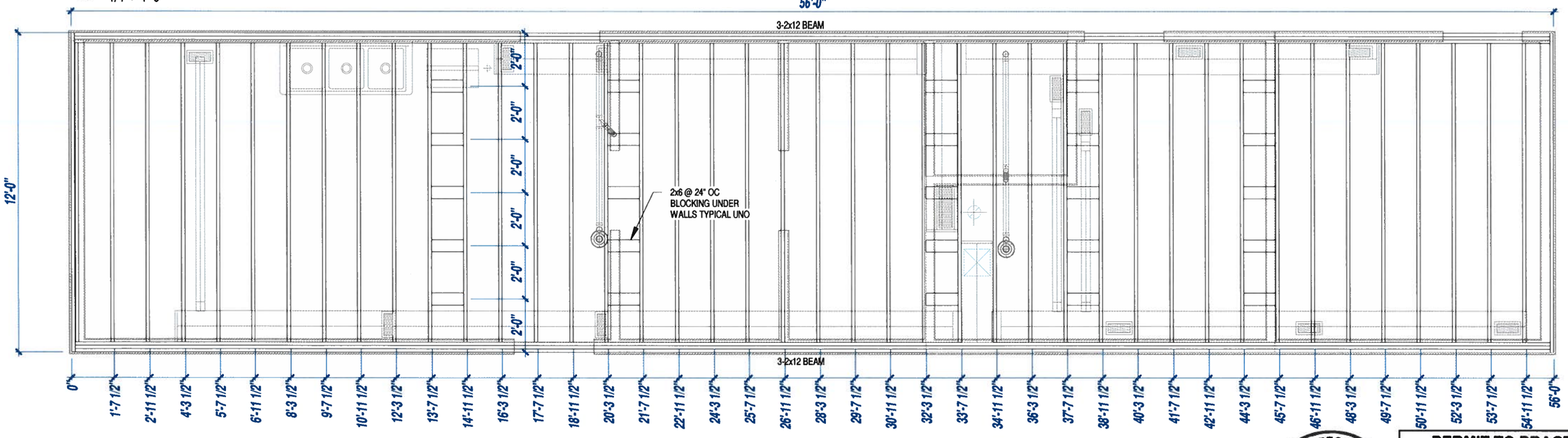

2 UNIT 6 FLOOR FRAMING

1/4" = 1'-0"

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27 FEB 20

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FOR CONSTRUCTION		Owner	TALTSON NEW STAFF ACOMODATION	UNIT 5-6 FLOOR FRAMING	FEB. 27/2020	1/4" = 1'-0"	S1.2

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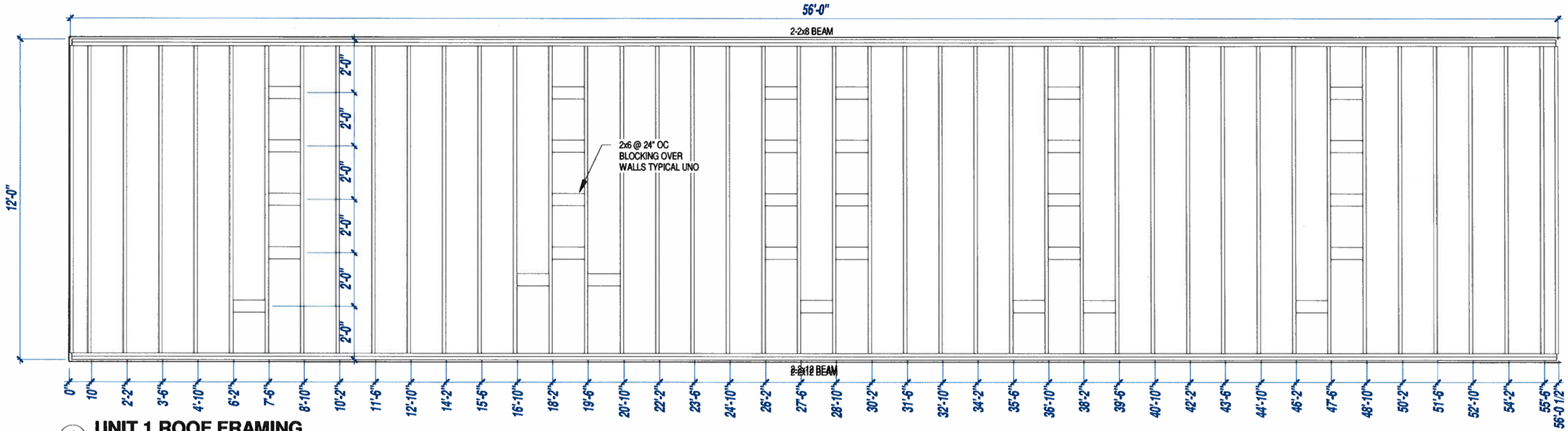

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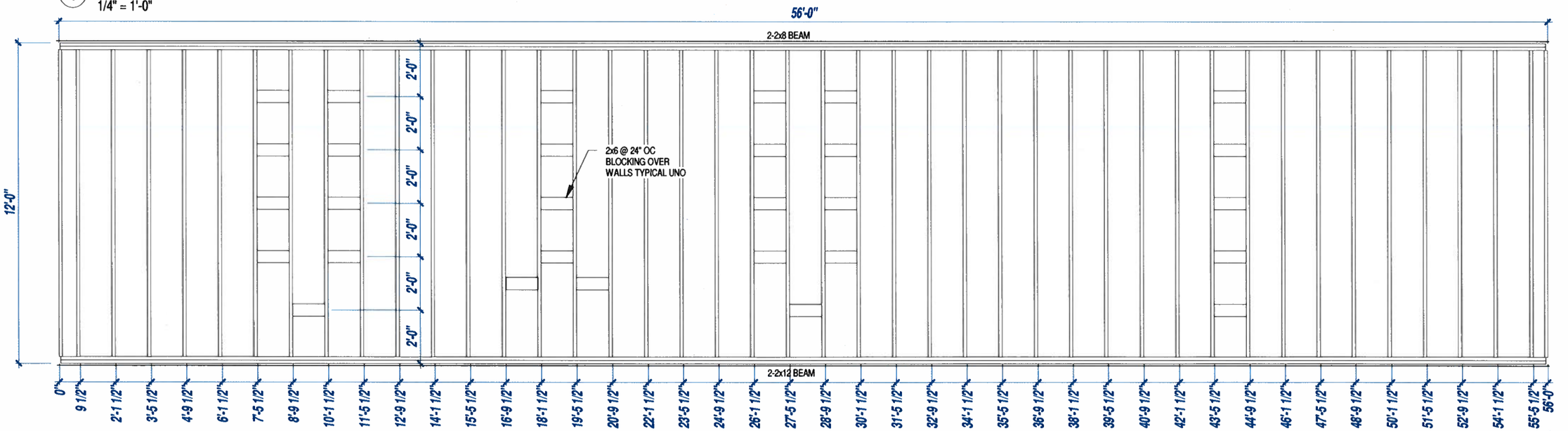

2 UNIT 2 ROOF FRAMING

1/4" = 1'-0"

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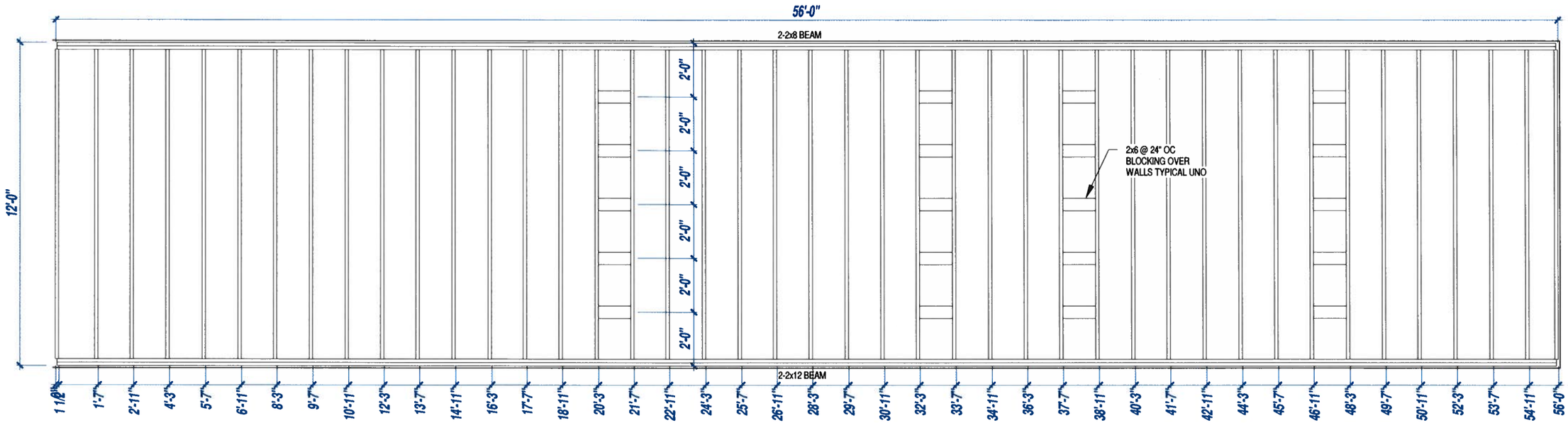

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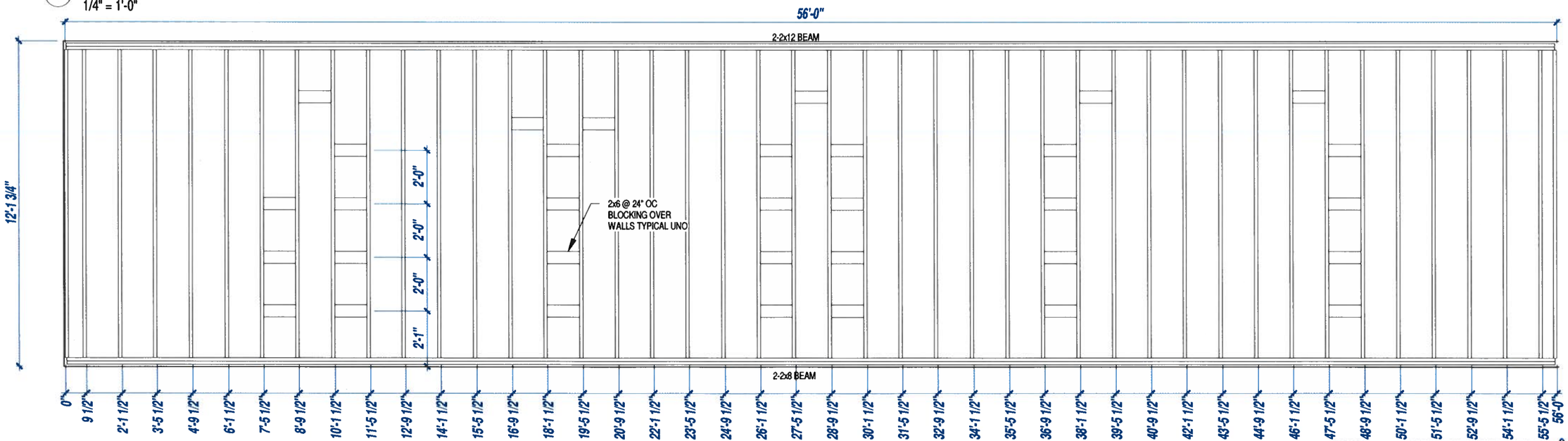

2 UNIT 4 ROOF FRAMING

1/4" = 1'-0"

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27668

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ISSUE	CLIENT	PROJECT	DRAWING TITLE	Date	Scale	No.
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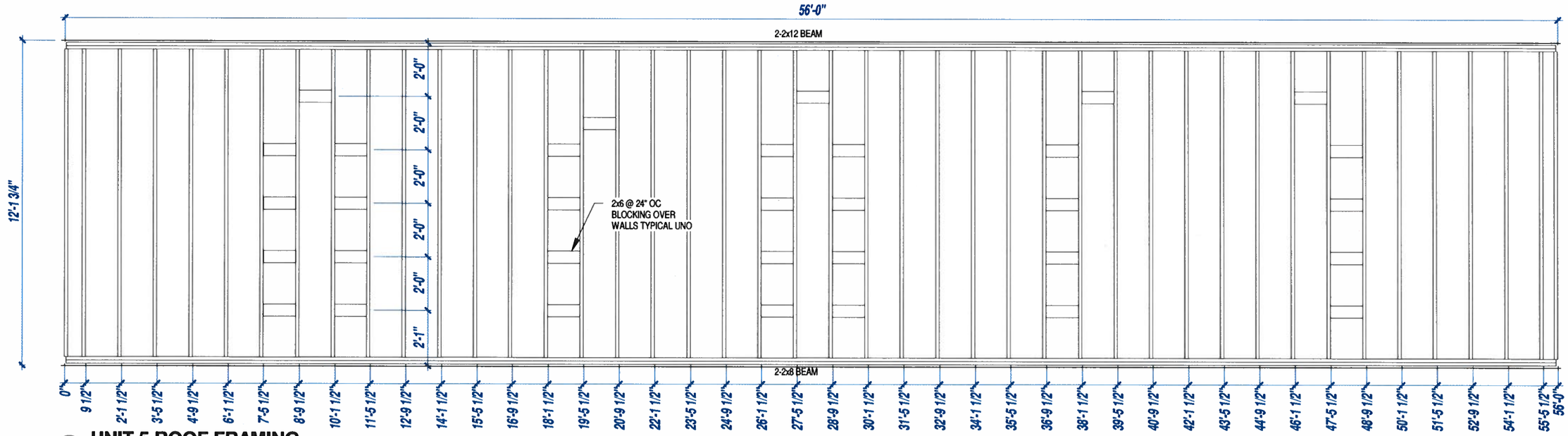

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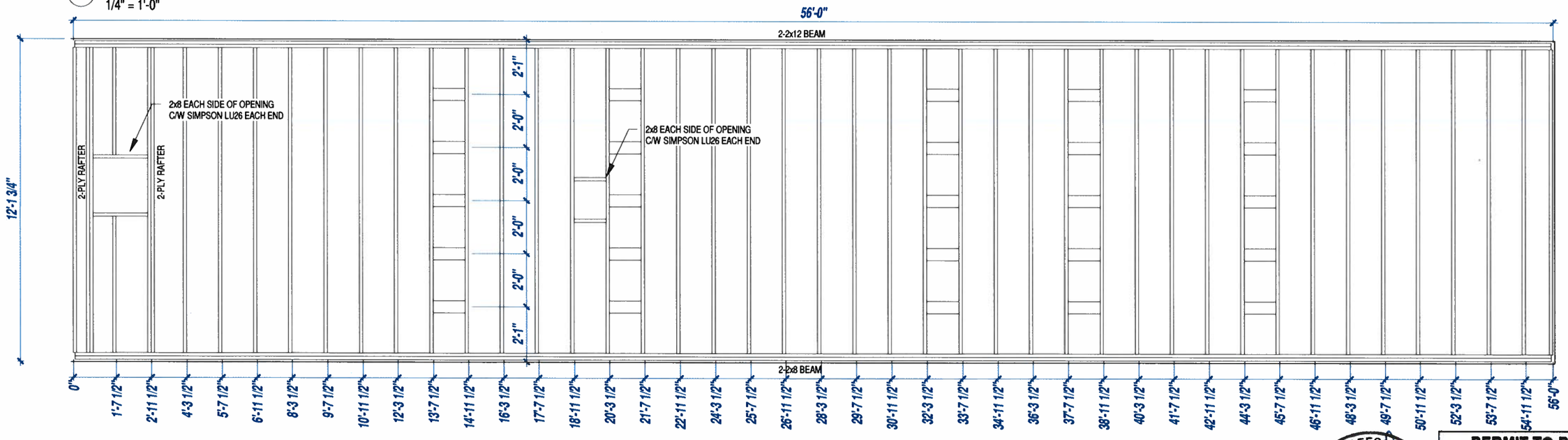

2 UNIT 6 ROOF FRAMING

1/4" = 1'-0"

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LICENSEE
NT/NU
2 FEB 20

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FOR CONSTRUCTION	Owner	TALTSON NEW STAFF ACOMODATION	UNIT 5-6 ROOF FRAMING	FEB. 27/2020	1/4" = 1'-0"	S2.2

Appendix B- NTPC Taltson River Work Camp- Onsite Sewage System & Raw Water System Supply Design Report

April 17, 2020

NTPC TALTSON RIVER WORK CAMP

ONSITE SEWAGE SYSTEM & RAW WATER SYSTEM SUPPLY DESIGN REPORT

BLOCK 75 D/6, LOT 1003, NORTHWEST TERRITORIES

Client: Northwest Territories Power Corporation

L&M Project No.: 1702-01

L&M ENGINEERING LIMITED

1210 Fourth Avenue, Prince George, BC V2L 3J4

Phone: (250) 562-1977

Table of Contents

1.0 INTRODUCTION

L&M Engineering Limited (L&M) has been engaged to complete the design for the civil works associated with a new 25 person work camp including domestic water servicing, onsite sewerage system and related earthwork and site grading. The camp is intended to be used to its full capacity for the operating season (approximately 8 months) for the first couple of years and moves to significantly reduced occupancy outside of scheduled shutdowns for the remainder of its operation.

1.1. Project Site Description

The property owned by Northwest Territories Power Corporation (NTPC) is located on the south-end of Taltson River, Northwest Territories. The property has existing infrastructure including accommodation, workshop, and generation plant. The proposed work camp site is proposed to be located near the existing active site off of access road from Taltson Airport. Much of the topography surrounding the project site has exposed rock with significant or vertical slopes with soils conditions consisting of either silty and clay over bedrock or peat over bedrock. This poses significant constraints for onsite sewage disposal from an environmental and public health perspective.

The closest permanent flowing body of water is the Taltson River/Reservoir, approximately 80m north from the proposed work camp. The general topography of the site slopes at 1-2% from east to the west with significant slopes at the west and south boundaries of the site development area.

The existing infrastructure is serviced by an existing septic treatment tank and subsurface disposal system and raw water intake for the domestic water supply off of the existing penstock servicing the generation facility.

1.2. Regulatory Requirements

Land development in the Northwest Territories is regulated by The Mackenzie Valley Land and Water Boards (MVLWB) through the issuance of land use permits (LUPs) in accordance with the Mackenzie Valley Resource Management Act (MVRMA), the Mackenzie Valley Land Use Regulations (MVLUR), and various Territorial Acts. This report addresses the method of onsite sewage management and raw water supply for the proposed 25 person work camp. This report and design will be included in an application for a land-use permit from the MVLWB that will regulate the construction of the camp and other replacement facilities.

1.2.1. Design Standards and Resources

The design methodology, principles, and standards for the water supply and onsite sewage treatment and disposal system are based on the following resources and our extensive experience with remote work camp infrastructure:

- Waters Act – S.N.W.T. 2014
- Public Health Act – General Sanitation Regulations – R.R.N.W.T. 1990
- Northern Land Use Guidelines – Camp and Support Facilities
- Interim Code of Practice: End-of-pipe fish protection screens for small water intakes in fresh water – Fisheries and Oceans Canada
- Alberta Private Sewage Systems Standard of Practice 2015 – Edition 3
- B.C. Sewerage System Standard Practice Manual - Version 3
- Municipal Wastewater Regulation of B.C. – 2012
- Wastewater Engineering Fifth Edition – Metcalf & Eddy

2.0 SITE INVESTIGATION

L&M completed a limited topographic survey and onsite soil assessment of the property on November 19, 2019. A total of two test pits were excavated at the proposed work camp location to a depth of approximately 1.5m below the existing ground. Two permeameter tests were also completed at varying depth to establish the hydraulic conductivity of the native soil. Refer to Drawing C001 in Appendix A for the location of the test pits and permeameter tests. After completing the onsite investigation and moving through design options, the client has decided to relocate the field further from the camp to establish more distance between the active facilities and sewage disposal. Further evaluation of the soils in the new proposed disposal area will be required before moving to construction to verify the suitability and rate for disposal.

2.1. Soil Profile Characteristics

Each of the test pits and drill holes performed onsite demonstrated a similar soil profile, structure, and consistence. The soil observed is primarily silty clay with a moist/friable structure. The top 0.4m of both test pits was comprised of silty clay with a fair structure. A massive layer of clay was noted from both test pits at depths below 0.4m. No groundwater seepage or indication of mottles was present in any of the test pits, suggesting that the water table would not rise to within 1.5m of the surface. Table 2 demonstrates the soil profile observed onsite in further detail and Figure 1 and Figure 2 provide visual representations.

Table 2 – Soil Profile Summary						
Test Pit Number	**Total Depth (m)**	**Soil Profile (m)**				**Groundwater Conditions**
		0-0.4	**0.4-1.5m**	**Below 1.5m**	**-**	
1	1.5	Blocky Silty Clay	Massive Clay	Massive Clay	-	none
2	1.5	Blocky Silty Clay	Massive Clay	Massive Clay	-	none
The soil at the proposed infiltrative surface is blocky with moderate structure and in friable consistence						

Figure 1_Test Pit #1

Figure 2_Test Pit #2

2.2. Soil Permeability

Permeability testing was performed on the site at depths ranging from 0.3m to 0.6m using 7.5cm diameter Edelman auger to assess the hydraulic capacity of the soil for sewage disposal. The infiltration rates selected based on the permeameter tests resulted in an average field saturated of 148 mm/day.

Table 3 – Soil Permeability Summary

Permeameter Test Number	Depth of Auger Hole (m)	Stable Rate of Fall (mm/min)	Soil Factor	KFS Value (mm/day)
1	0.3	4.8	34.9	167
2	0.6	3.7	34.9	129

2.3. Set Backs

The minimum setbacks for onsite sewerage systems vary between sewerage regulations. Most regulations are similar and require that all sewage collection, treatment, and disposal systems maintain minimum setbacks from various constraints. Applicable setbacks are summarized in Table 4 based on the SPM V3.

Table 4– Set Back Requirements (m)				
Constraint	**Requirement**		**Provision**	
	Tanks	**Field**	**Tanks**	**Field**
Water Supply Source	15	30	>300	>300
Water Well	30	30	n/a	n/a
Pressurized Water Main	3	3	>3	>3
Water Body	10	30	>100	>100
Intermittent Water Body	10	15	>15	>15
Water Cistern (Above Ground)	1	1	>15	>15
Structure or Dwelling	1	1	>5	>30
Another Disposal Field	3	6	n/a	n/a
Slope Breakout Point	-	7.5	>7.5	>7.5
Buried utility Services	1	1	>1	>1
Property Lines	1	3	n/a	n/a

2.4 Site Investigation Summary

Table 5 provides a summary of the site constraints identified and evaluated in the field along with a classification indicating the severity of the constraint.

Table 5– Site Investigation Summary		
Constraint	**Description**	**Classification**
Soil Structure/Consistency	Blocky/Firm	Slight
Soil Texture	Silty Clay	Severe
Field Saturated Soil Permeability (kfs)	<75 to <150 mm/day	Severe
Depth of Native Soil Above Restrictive Layer or High Water Table	<0.3m	Severe
Land Slope	1 – 2%	Slight
Setback Requirements	Breakout Slope	Moderate
Coarse Gavel Content	< 10%	Slight

3.0 SEWAGE SYSTEM DESIGN CRITERIA

Based on the identified constraints and the operational requirements provided for the work camp, a Type 1 wastewater treatment system with disposal to a sand mound pressure distribution with timed micro-dosing is recommended. This method of treatment will minimize the field area required for in-ground disposal and the application of timed micro-dosing will take better advantage of soil conditions for in-ground treatment and infiltration capacity. A minimum of 600 mm of approved mound sand will provide a higher quality of treatment prior to effluent contact with the native silt and clay soils. A sand mantel will be installed as part of each mound section to mitigate potential breakout and seasonal ground saturation conditions which may be prevalent in this region.

The recommended treatment and disposal system is supported by the Standard Practice Manual Version 3 (SPM.V3) as indicated in Table II-7 on page II-17. This sewage system has been designed to collect, treat, and dispose of sewage waste for up to 7,600 L/day.

3.1. Sewage Flows

The sewage flows for the Taltson Camp have been established based on historical flow data, Table 2.2.2.2.B. of the Alberta Private SSTP, and various sewer design resources such as Metcalf and Eddy. The design daily flow (DDF) estimated for the camp residents is expected to be 300 L/p/d with 220 L/d/p generated by the dorms and 80 L/d/p generated by the kitchen facility assuming two warm meals and a bag lunch. The peak occupancy for the camp's maximum operating window each year is expected to be 20 people staying in the dorms and a total of 40 people using the kitchen services. This results in a maximum expected DDF of 7,600L/d and an average daily flow (ADF) of 3,800 L/d (DDF/2) expected at the disposal field for any given 30-day window. The field loading is based on the average daily flow being delivered to the field for any 30-day window as supported by the SPM.V3.

- 20 camp residents @ 220L/d/p DDF dorm waste 4,400L/d
- 40 camp residents @ 80L/d/p DDF kitchen waste 3,200L/d

  Total Daily Design Flow 7,600L/d
- 20 camp residents @ 110L/d/p ADF dorm waste 2,200L/d
- 40 camp residents @ 40L/d/p ADF kitchen waste 1,600L/d

  Total Average Daily Flow *Over a 30-day window 3,800L/d

3.2. Wastewater Quality

The quality of a sewage treatment system is defined by the type of effluent achieved after treatment. The effluent types are established by the regulatory body. The required treatment type for a system is primarily based on site constraints and disposal methods. The pertinent wastewater quality parameters are the five-day Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS). For these parameters, typical domestic levels are 290 to 560 mg/L and 175 – 500 mg/L for BOD_5 and TSS respectively. Typically camps tend to generate sewage with elevated BOD_5 and TSS levels as a result of commercial kitchen/cafeteria services and therefore a combination of kitchen waste pre-treatment and increased primary treatment capacity is recommended to facilitate higher concentration waste from the kitchen during peak operation.

The Ministry of Health classifies effluent quality from treatment as Type 1, Type 2, and Type 3. The different treatment classes are defined as follows:

- **Type 1**: Septic holding treatment resulting in an effluent quality of 150-300 mg/L BOD5 and 50-80 mg/L TSS. Further reduction to 100-150 mg/L BOD5 and 20-55 mg/L TSS is possible with and added septic tank effluent filter;
- **Type 2**: Septic holding and activated sludge (MBR) treatment or disposal to sand filter resulting in an effluent quality of <45/45 mg/L for BOD5 and TSS respectively;
- **Type 3**: Septic holding, activated sludge, and disinfection resulting in an effluent quality of <10/10 mg/L for BOD5 and TSS respectively as well as a significant reduction in pathogens prior to disposal.

3.3. Wastewater Loading Rate

3.3.1. Hydraulic Loading Rate (HLR)

The effluent loading rate is the amount of effluent that can be applied each day over a basal (bottom) area of the infiltrative surface without compromising the permeability or conductive capacity of the soil. The SPM.V3 indicates that the soil texture and structure must be used to evaluate the conductive capacity of the soil along with the standard percolation test or a hydraulic conductivity test using a permeameter.

Based on the soil profile and characteristics identified in the field and the average soil conductivity of the native soils the loading rate identified in Table II-22 of the SPM.V3 is a maximum of 12 L/d/m^2. With the addition of

a minimum 600mm thick sand filter mound, the loading rate can be applied to the top surface of the sand mound is 50 L/d/m^2 which produces a Type 2 effluent at the native soils resulting in a permitted basal loading rate of 15 L/d/m^2. Due to the significant site constraints, this design reduces the basal loading rate to the native soils to approximately 10 L/d/m^2 to mitigate risk associated to effluent breakout.

3.3.2. Lineal Loading Rate (LLR)

Based on the identified site constraints and soil characteristics, the SPM.V3 Table II-27 (Pg. II-39) recommends a maximum linear loading rate of 35 L/d/m. As site area and length are restricted on this site, the use of a sand mantel downslope of the sand mound disposal system will be implemented to manage potential breakout risk, provide additional treatment, and allow an LLR of 50L/d/m to be applied. The minimum lineal length recommended is therefore 152m (7,600 L/d ÷ 50L/d/m = 152m). The total proposed design lateral length is 160m which results in an actual lineal loading rate of 47.5 L/d/m. To further mitigate the risk of breakout associated with the site constraints the system is being designed to load the native soils at less than 10% of the water holding capacity and micro-dosing application.

3.3.3. Sand Loading Rate

The SPM.V3 Table II-24, Page II-37 indicates that the maximum loading rate for Type 1 effluent to sand filter coarse sand is 50 L/d/m^2. Existing reports and field sampling suggest a suitable source is available at the landing strip. The selected sand should meet the sieve specifications shown below. A material sieve should be provided prior to use in this application.

Sieve Size	Percent Passing
9.5mm	100
4.75mm	95-100
2.36mm	80-100
1.18mm	45-85
0.600mm	15-60
0.300mm	3-15
0.150mm	< 2
0.075	< 1

4.0 SEWAGE TREATMENT

Treatment of sewage from a commercial kitchen typically requires pre-treatment which consists of grease catchment and potentially pre-treatment to lower the BOD_5 and TSS to that of typical residential waste concentrations prior to entering primary treatment facilities. As this system will not sustain peak capacity consistently for long term operations, oversized grease trap and dedicated kitchen treatment with dual filtration combined with an increase in the primary treatment tank has been recommended to provide better treatment under periods of higher loading. This has also been implemented to provide additional solids waste storage within the tanks as the site is very isolated and maintenance during peak operation will be limited to once annually and during long term operation, it will be very limited.

The recommended treatment design for the camp facility consists of the following:

- Dedicated Kitchen Treatment
    - 4,000L (1,100 USGal) single chamber grease trap tank
    - Zable A-100 1.5 mm (1/16") effluent filter
    - 1,800L (475 USGal) single chamber pre-filtration tank
    - Zable A-100 1.5 mm (1/16") effluent filter

*This treatment provides treatment for kitchen waste only

- Primary Treatment
    - 19,000 Liter (5,000 USgal) two-chamber septic tank
    - Zabel A-100 1.5 mm (1/16") effluent filter

*This provides treatment for combined kitchen and dorm waste

4.1. Grease Trap Tank, Filtration Tank, Effluent Filter, and Smart Alarm

The grease trap tank, filtration tank, and effluent filtration function as a dedicated treatment process to reduce commercial kitchen waste concentrations to that of typical residential waste before entering the primary treatment tank. For a camp application of this nature, we would typically provide a minimum grease treatment volume of three times the average daily flow or approximately 4,800L. Due to the reduced maintenance capacity at this remote site, we have recommended the minimum treatment size to be 5,800L (3.6*ADF). This increase in size across two tanks will help facilitate a higher level of treatment during peak operations and provide greater storage volume of solids to reduce maintenance requirements to every year during peak operation and every 5 years during long term operations depending on kitchen usage.

Most sewage regulation recommends that an effluent filter be installed at the outlet tee that filters particles greater than 3mm. For this application, we recommended the use of a Zabel A-100 effluent filter with 1.5mm (1/16") filtration to further improve effluent quality on both the grease trap tank and the filtration tank. Additionally, a high-level alarm panel for both filters is also recommended and must meet the flowing specifications:

- Rhombus Tank Alert XT liquid level alarm or approved equivalent
- Must be CSA approved
- Power LED display indicator
- Installation on a separate circuit from pumps or other infrastructure
- NEMA 3X enclosure for indoor/outdoor mounting
- Audible & visual alarm, automatic alarm reset, silence switch, and test switch

4.2. Septic Tank, Effluent Filter, and Smart Alarm

The septic tank functions as a primary treatment process and produces a Type 1 effluent. The minimum septic tank size varies across different design standards. For a camp application of this nature, we would typically provide a minimum tank volume of two times the daily design flow or approximately 15,200L. Due to the commercial kitchen application and reduce maintenance capacity we have recommended the minimum tank size to be 19,000L (2.5*DDF). This increase in size will help facilitate a higher level of treatment during peak operations and provide greater storage volume of solids to reduce maintenance requirements to every 3 years during peak operation and every 15 years during long term operations.

Most sewage regulation recommends that an effluent filter be installed at the outlet tee that filters particles greater than 3mm. For this application, we recommended the use of a Zabel A-100 effluent filter with 1.5mm (1/16") filtration to further improve effluent quality. Additionally, a septic tank high-level alarm panel is also recommended and must meet the flowing specifications:

- Rhombus Tank Alert XT liquid level alarm or approved equivalent
- Must be CSA approved
- Power LED display indicator
- Installation on a separate circuit from pumps or other infrastructure
- NEMA 3X enclosure for indoor/outdoor mounting
- Audible & visual alarm, automatic alarm reset, silence switch, and test switch

5.0 SEWAGE DISPOSAL

Sewage treatment and disposal for this design requires pressure distribution as a result of the site constraints and facility operations. Refer to Appendix B for the pressure distribution design spreadsheet and to Appendix A for the detailed design drawings.

The proposed disposal system has been designed for a maximum daily design flow of 7,600 L/d at a maximum hydraulic loading rate (HLR) of 15 L/d/m^2 at the basal surface. This results in a required minimum total basal area of 507m^2. With a maximum LLR of 50 L/d/m (supported by sand mantle) the required minimum contour length is 160m.

Based on the above loading constraints, the use of two hydraulically separate sand filter coarse sand mound disposal fields is recommended. The two separate fields can be alternated or used together depending on the camps specific operating conditions. Due to length restrictions, two separate mounds will be constructed, each with a length of 80m and 10m horizontal speration to establish an overall lineal length of 160m. Each sand filter mound consists of of four header supply pipes from a dedicated effluent pump servicing eight perforated disposal laterals.

This arrangement results in a total sand mound loading area of 160m^2 and a total basal loading area of 640m^2. As a result, the actual HLR for the disposal fields is 11.8 L/d/m^2 and an actual LLR is 47.5 L/d/m. The sand mantle will be positioned downslope of each sand filter mound for a minimum distance of 7.5m to manage risk of lineal mounding and breakout

5.1. Dosing Frequency and Instantaneous Loading

Reducing both the daily and instantaneous hydraulic loading rates and providing uniform distribution over the infiltration surface can help maintain lower soil moisture levels. Lower soil moisture results in longer wastewater restoration times in the soil and causes the wastewater to flow through the smaller soil pores in the unsaturated zone, both of which enhance treatment and mitigate risk of breakout or excessive organic loading under unexpected increased daily flows.

It is optimum when the instantaneous volume per does is between 1/24th and 1/8th of the average daily wastewater volume. Frequent and uniform dosing (12 times or more per day) in coarser soil (or sand filter) maximizes the effects of biological, chemical, and physical treatment mechanisms. Micro dosing has been applied to this design with a maximum of 24 doses per field per day or an approximate instantaneous loading of approximately 1/48th of the daily design flow.

The detailed pressure design considers the orifice placement, volume of effluent delivered under pressure, and the hydraulic application rate (HAR) at the disposal surface. Given the nature of the native soils, this system has been design with a maximum HAR of 2.0 mm/dose which is equivalent to less than 10% of the estimated water holding capacity of the native soil with 72% of the effluent delivered to the field under pressure each dose.

In order to achieve uniform distribution across each of the disposal fields the density of orifices should be as high as possible without generating excessive pumping requirements. Typical orifice spacing varies between 0.6m and 1.2 m depending on the field arrangement with a maximum dose area per orifice of 0.56 m^2. For this type of system, small 3 mm (1/8”) diameter orifices spaced at a maximum of 0.625m is recommended resulting in a dose area per orifice of 0.56 m^2.

5.2. Pump Chamber, Pump and Control

Following the septic tank treatment system, effluent flows into a pump chamber that is designed to provide the necessary dosing volume to the field with adequate distribution, surge volume, and emergency storage volume after pump alarm sounds. The recommended 8,500L (2,250 USgal) tank provides volume in excess of the daily design flow for the camp to allow for unexpected peak flows or emergency storage as required.

The proposed pump for each field is a MYERS ME100 1.0HP effluent pump (or approved equivalent) complete with 4 floats, weather-proof sealed junction box, and simplex timed dose control panel. Each pump shall include the following:

- 6m of power cord
- 50mm dia. (2in) SCH 80 discharge
- 50mm (2in) SCH 80 check valve
- 50mm (2in) PVC union.

The floats shall have 6m of cord and shall include:

- FS#1 Pump redundant off
- FS#2 Timer activate
- FS#3 High level alarm
- FS#4 Timer override
- FS#5 High level filter alarm (located in septic tank)

Each pump requires its own pump control panel shall be CSA Approved and supplied with the following features:

- Simplex Control Panel
- NEMA 4X enclosure rated for indoor or outdoor mounting
- Power LED display indicator
- Pump disconnect circuit breaker
- Pump run light
- Pump run time meter
- Pump run counter
- Hand-off-automatic selector switch (H.O.A.)
- Float level indication lights
- High level alarm light and beeper with reset
- Dosing timer

5.3. Timed Dosing and Distribution

For the design of this system, the two MYERS ME100 1.0HP pumps will each dose 3,800 L/d over 24 doses to their respective field. This results in a total volume per dose to each field of 158L. The system laterals will drain out into the field after each dose and the pressurized supply line and headers should drain back to the pump tank in less than 1 hour to prevent freezing.

This dosing schedule results in a pump flow rate of 66.7 Igal/min to each field. Each pump will operate for 57 seconds and have an off time of 59 minutes each dose cycle before dosing the field again.

The design pump operating flow rate is 85USgpm with an expected operating head and squirt height of 11.9m (39ft) and 3.2m (10.4ft) respectively.

5.4. Sewage Collection System

The sewage collection system for the camp should consist of 100mm diameter SDR 28 PVC for all underground installation between the camp infrastructure and the septic treatment tank. Cleanouts are to be provided every 15m, change in horizontal alignment, or vertical grade as required. The minimum pipe slope is to be 1.0% but is preferred at a minimum 2.0% slope.

5.5. Disposal Field Supply Pipe

The disposal field supply pipes consist of 50mm diameter SCH.40 PVC pipe from the pump tank outlets to the disposal field headers. The supply pipes are intended to

drain back to the pump tank after each dose and require a minimum 0.5% pipe slope towards the pump tank discharge. The configuration chosen for the field has resulted in no need for distribution valves. Refer to Appendix A for the pressure field details.

5.6. Header Pipe

The header pipe delivers flow from the supply pipe to the disposal laterals and consists of 50mm diameter SCH.40 PVC. The header pipe is to be sloped such that it drains back to the pump tank or out into the disposal laterals. Headers are to be complete with cleanouts and insulated covers at finished grade.

5.7. Disposal Laterals

Each header distributes flow through two perforated 10m long 25mm diameter SCH.40 PVC lateral pipes. Perforations are to be 1/8" in diameter and set at a maximum distance of 0.625m on center with the first and last being 0.3m from the ends of the lateral. Each lateral is to be equipped with a cleanout at the end of the lateral run c/w insulated cover to the finished grade of the mound. Ensure all orifices are facing down except for the first and last orifice. Provide orifice shields for all downward facing laterals. See drawing details in Appendix A for field lateral details.

5.8. Infiltrator Chambers

Quick4 Equalizer Standard infiltrators have been recommended (34"W x 48"L x 12"H). A potential alternative to infiltrators would be a minimum of 150mm of drain rock base and filter fabric over the installed distribution pipe. Provide perforated inspection pipes inside of the chambers to allow monitoring from the surface. Refer to Appendix A for infiltrator and alternative infiltration trench installation details.

6.0 SEWAGE SYSTEM CONSTRUCTION PROCEDURE

6.1. Septic Tank and Pump Chamber

Install level as per the manufacturer's guidelines for the approved depth range. Before the septic system is approved, a leakage test must be performed on the tank. The tank shall be completed filled with a minimum of 50mm of water into all tank risers. This is to ensure that a watertight connection has been made between the riser and the tank. A leakage test must be performed by the system's installer prior to the engineer's construction inspection. Once the test has been passed by the installer, the leakage test will be witnessed for one hour on the day of the construction inspection by the engineer.

6.2. Disposal Field Supply Pipe

Install the disposal field infrastructure in accordance with the manufacturer's guidelines at a minimum 0.5% grade towards the pump tank. Insulated pipe cover is recommended for areas where snow clearing and vehicle traffic are expected over the supply pipe. A minimum of 0.9m of cover is recommended where vehicle loading is expected.

6.3. Header Pipe

Install header pipe in accordance with manufacturer's guidelines at a minimum 0.5% slope back to the force main supply pipe or into the disposal field laterals.

6.4. Disposal Field Construction

1. The field area shall be cleared with any stumps removed. Any organics are to be removed but as much of the native mineral soil profile is to be left in place as possible. If fill is required beneath the proposed sand mound disposal field, utilize a material meeting the sand mound specification or approved alternative import fill.
2. Prior to placing sand mound media, scarify the native soil surface to a depth of 150mm to create a binding layer between the treatment media and the native soils. The basal area for the sand mound should be sloped at a minimum of 0.5% towards the boundary of the site development.
3. A minimum 600mm thick layer of sand treatment media is be placed un-compacted on the scarified native soil. The top of the sand mound is to be installed level with less than 0.5% slope. The site is designed with a 1% grade along the length of the fields. In order to avoid excessive sand placement, step the field down for each header zone as required given site conditions. It is important to ensure sand treatment media remains clean and free of native soil contaminants.
4. The laterals piping shall be placed level with no more than 0.5% slope back towards the supply header and force main. Each lateral is to be equipped with a lateral inspection pipe inserted into the infiltrator and a lateral cleanout at the end of each lateral section. All cleanout riser sleeves are to be filled with insulation chips and provided with an insulated cover.
5. Prior to the pressure testing procedure open up all lateral and header cleanouts to flush the system of debris. Orifice shields are required on all downwards

facing orifices. The infiltrators shall be placed over the pressure laterals with the laterals strapped to the top of the chambers using nylon tie straps.

6. The trenches shall be backfilled with un-compacted sandy loam backfill or a material meeting the sand mound soils specification.
7. The top of the field area surface shall be sloped at a minimum 2% grade to encourage surface water shedding. The entire area shall be seeded with grass and small shrubs or decorative landscaping.

7.0 RAW WATER SUPPLY SYSTEM DESIGN

The water demand for the work camp supply system considers the same peak daily design flow as the onsite sewerage system as it is not expected that a considerable volume of water will be used for outside of the domestic potable use. The maximum daily demand for the work camp is estimated at 7,600 L/d and the associated methodology for that estimate is provided in earlier sections. As described in the earlier sections of this report, the site poses significant subsurface soil restrictions such as bedrock for deep utility installation. The selected method for water supply to the work camp will be above grade insulation jacketed water supply line from a submersible pump in the Talston River/Reservoir with an automatic recirculation system to mitigate freezing.

7.1. Proposed Camp Facility Water System

The proposed camp facility water system is being provided by the camp manufacturer but is understood to consist of a UV disinfection system and approximately 6,000L (1,600 USgal) in treated potable water storage followed by a booster pump distribution system. To meet the estimated maximum daily demand for the work camp the raw water supply must be able to provide a minimum of 1 USgpm (3.9 L/min). We have recommended a minimum raw water supply rate for this system of 6 USgpm.

7.2. Water Intake Design

Due to ground conditions, concerns for environmental impact, and seasonal temperatures the chosen water intake methodology for this site will be a submersible pump encased in an exposed stainless steel casing mounted to the concrete inlet structure of the penstock feed to the hydroelectric facility. The submersible pump is to be set approximately 4.5m below the service platform of the inlet structure such that the pump discharge is a minimum of 1m below the low water level for the reservoir. The steel casing is to be provided with a screened

intake for the submersible pump that ensures that water intake moves across the motor. The minimum effective screen area to be provided is 0.02m^2 with a maximum design opening of not more than 2.5mm as indicated by the Fisheries and Oceans Canada Interim Code of Practice for end-of-pipe fish protection screens for small water intakes in freshwater. The base of the casing is to be perforated with maximum 2.5mm diameter perforations.

7.3. Raw Water Supply Pump Design

The estimated length of water supply service from the water intake to the proposed camp facility is 450m with approximately 14m of elevation difference. Based on the selected supply service being a 25mm diameter PEX pipe we have recommended a Grundfos 10S05-6 0.5hp 230V 60hz submersible pump with an expected supply rate of approximately 8USgpm at 140ft of head. This pump should achieve the maximum daily demand with a total daily pump run time of approximately 200 minutes.

7.4. Raw Water Supply Service

The chosen material of water supply conveyance for this work camp is Urecon Dual PEX-Flex 2 x 1” insulation jacketed supply and return pipe. This system allows for the recirculation of the supply water to mitigate freezing for the exposed pipe in colder temperatures. The insulation jacket houses two 26.2mm inside diameter PEX pipes for the supply and return. This pipe network will work with the submersible raw water supply pump and dual recirculating pumps to maintain a constant flow in the service line while domestic water is in use and when it is not. This service will be installed above grade and within culvert sleeves at road crossings from the submersible pump at the reservoir intake to the work camp facilities potable water and recirculating system.

7.5. Raw Water Recirculating System

To reduce the risk of freezing for the above-grade raw water supply system, recirculating pumps and a recirculation line will continuously move water from the camp to the submersible raw water supply pump and back to the work camp. Recirculation will remain operational during the supply pump operation. This will utilize dual Grundfos CR 3-6 A-FGJ-A-E-HQQE 1.5hp 230V 60Hz vertical multistage centrifugal pumps. The pumps will be in duplex for redundancy to further mitigate the risk of freezing of the water supply line to the facility. Each pump connection to the raw water supply/recirculation system will require a check valve out the discharge end along with isolation valves and unions on the inlet and outlet for full isolation and maintenance as indicated on the design drawings.

7.6. Water Supply Operating Logic

The operating logic for the water supply and recirculation system will utilize a pressure switch, float controlled electrically actuated valve, and flow switch. When the potable water cistern calls for water the electronically actuated valve will open, dropping water pressure in the system causing the submersible raw water supply pump to deliver flows. When the potable water cistern is full the float will activate the electronic valve to close, resulting in increased pressure in the supply system and the raw water supply pump to shut down. The recirculating pumps will be turned on and off manually as required by the seasonal temperatures. A flow switch on the incoming feed to the pumps will be provided as a redundant off control to ensure they do not operate without water in the system.

8.0 WATER SYSTEM CONSTRUCTION PROCEDURE

8.1. Proposed Camp Facility Water System

The connection of the raw water supply to the camp facility water system should occur directly after the recirculating pumps. Manual and electrical isolation valves are required at this connection to control the delivery of water to the potable water cistern. The camp facility water treatment and distribution system are provided by others.

8.2. Water Intake Structure

The casing for the submersible water supply pump should be 4.6m in length and installed level with the elevation of the service platform of the inlet structure for the penstock supply to the hydroelectric facility. This casing is recommended as a 200mm diameter galvanized stainless steel spool piece complete with perforated endcap for the pump to rest on and an intake screen with an effective screen area of $0.02m^2$. The intake screen openings should have a maximum dimension of 2.5mm. A torque arrestor is recommended to secure the pump from rotating during start-up. The casing is to be fixed to the concrete inlet structure between the high water level and the top of the concrete structure. Engineered shop drawings are to be submitted for approval prior to construction for the mounting methodology. The casing will contain the dual PEX-Flex piping complete with jacket to within 150mm of the submersible pump discharge along with a redundant off float for the submersible pump and submersible electrical and pump communication wiring.

8.3. Raw Water Supply Pump

The raw water supply pump is to be a submersible Grundfos 10S05-6 0.5hp 230V 60hz installed within the proposed casing. The pump is to be equipped with a check valve at the discharge prior to connection to the insulation jacketed Dual PEX-Flex water supply and recirculation loop. The submersible pump will be controlled by a pressure switch at the work camp facility domestic supply system and a redundant shut off float set at the top of the pump discharge. It is important to maintain the recirculation loop and insulated jacket too as close to the pump discharge as possible.

8.4. Raw Water Supply Pump

The raw water supply pump is to be a submersible Grundfos 10S05-6 0.5hp 230V 60hz installed within the proposed casing. The pump is to be equipped with a check valve at the discharge prior to connection to the insulation jacketed Dual PEX-Flex water supply and recirculation loop. The submersible pump will be controlled by a pressure switch at the work camp facility domestic supply system and a redundant shut off float set at the top of the pump discharge. It is important to maintain the recirculation loop and insulated jacket too as close to the pump discharge as possible.

8.5. Raw Water Supply Service

The raw water supply/recirculation system piping is to be installed as per the manufacturer's guidelines for the jacketed Dual PEX-Flex 2 x 1 system. It is critical that the integrity of the insulated jacket is maintained across the length of the system including fittings between the connection to the raw water supply pump and the camp facility. Minimum 300mm diameter CSP culverts are to be provided at all road crossings to ensure pipe protection. Due to the extreme temperatures at this location, heat tracing is recommended for the length of the supply run to assist the recirculation system to mitigate freezing. The line is to be installed such that high/low points are eliminated wherever possible. An air release valve is recommended as the services enter the work camp facility.

8.6. Raw Water Recirculating System

The raw water recirculating system is to be installed with full redundancy (duplex pumps installed in parallel). The pumps are to be Grundfos CR 3-6 A-FGJ-A-E-HQQE 1.5hp 230V 60Hz or approved equivalent. Each pump is to be equipped with discharge check valves completed with isolation valves and unions on the supply and

discharge line to allow isolation and maintenance as required. The pumps are to be equipped with independent controls including flow switch activated redundant off and audible alarm indicating pump failure. An air release valve is recommended on the recirculating line prior to exiting the work camp facility.

9.0 EARTHWORKS

The proposed earthworks are based on a combination of digital elevation model data (assumed at UTM) and GPS site survey completed at a local coordinate system. These surfaces were combined and used as the basis for the grading design and volume analysis.

9.1. Site Grading

The site grading plan intends to achieve a minimum 0.5% slope across the entire site, with the primary grading occurring from the existing access to the proposed site to the south at the end of the sewage disposal fields. Grading beneath the sewage sand mound disposal fields should achieve a 0.5% slope across the basal width of the sand mound towards the boundary of the site development to promote drainage. Grading in areas that will support the camp and accessory buildings shall be completed in such a way as to minimize fill under the structures. Grading in areas that have the sand mound should be completed in such a way as to minimize cut in the basal area of the sand mound. The subgrade must have no low points or areas for water to become trapped beneath the capping structure.

9.2. Site Access

The existing access to the proposed work camp location is to be graded such that is transitions into the proposed site grading with a maximum 8% grade and a minimum vertical curve transition length of 8m. The site access and all areas of the proposed site, excluding the basal area of the sewage disposal fields, are to be capped with a minimum 150mm thick layer of SGSB gravels or approved equivalent granular soils.

9.3. Volume Analysis

The depth and consistency of the native clay soils in the proposed development area is relatively unknown, with soils in the area consisting of both clay and rock. The analysis assumes that all cut volumes can be used as fill. If the cut material is deemed unusable as fill, approved imported fill is to be used in place of unsuitable material. Import or embankment fill shall be placed and compacted in lifts not exceeding 300mm. Any import fill that is to be placed beneath the sand mound

disposal field shall match the sand mound specification or approved equivalent granular soil. The approximate earthwork volumes are:

- Native Soil Cut: 600 cu.m Source: onsite
- Native Soil Embankment Fill: 600 cu.m Source: onsite
- Surfacing Aggregate Import: 420 cu.m Source: Pit V or Pit W
- Sand Mound Import: 220 cu.m Source: Pit C
- Sand Mound Cover Import: 300 cu.m Source: Organics or Pit C

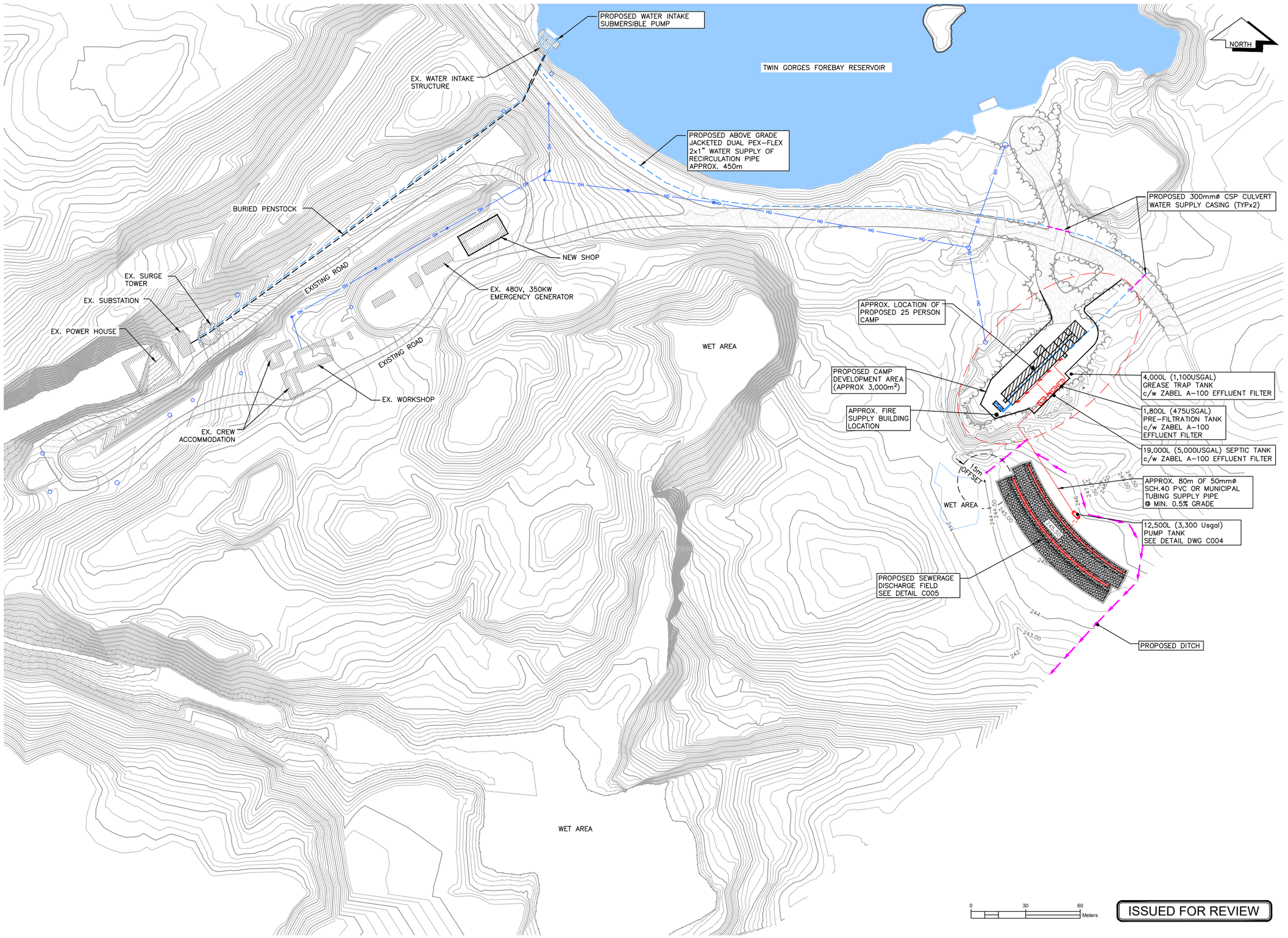
If you have any questions regarding the contents of this report, please feel free to contact the undersigned directly.

L&M ENGINEERING LIMITED

Prepared by:

Jamie Schenkeveld, P.Eng

Associate



LEGEND

EXISTING

- EX. TEST PIT & DRILL HOLE
- EX. BENCHMARK & SURVEY HUBS
- EX. IP's & ISM's
- EX. LEGAL LINE
- EX. LEGAL R.O.W. & EASEMENT
- EX. SANITARY & MANHOLE
- EX. SANITARY FORCE MAIN
- EX. STORM & MANHOLE
- EX. SINGLE & DOUBLE CATCHBASIN c/w CB LEADS
- EX. CATCHBASIN MANHOLE
- EX. CULVERT
- EX. FIRE HYDRANT & VALVE ASSEMBLY
- EX. WATERMAIN & VALVE
- EX. BLOW-OFF ASSEMBLY
- EX. CURB STOP
- EX. ROAD & SIDEWALK
- EX. ROAD SIGN(s)
- EX. SHOULDER
- EX. TOP OF SLOPE
- EX. TOE OF SLOPE
- EX. DITCH or SWALE
- EX. FENCE
- EX. OVERHEAD LINES
- EX. UNDERGROUND LINES
- EX. POWER POLE & ANCHOR
- EX. GAS MAIN

PROPOSED

- PR. LEGAL LINE
- PR. LEGAL R.O.W. & EASEMENT
- PR. SANITARY & MANHOLE
- PR. STORM & MANHOLE
- PR. SINGLE & DOUBLE CATCHBASIN c/w CB LEADS
- PR. CATCHBASIN MANHOLE
- PR. CULVERT
- PR. DITCH or SWALE
- PR. FIRE HYDRANT & VALVE ASSEMBLY
- PR. WATERMAIN & VALVE
- PR. GRAVEL SHOULDER
- PR. ASPHALT
- PR. CURB & SIDEWALK
- PR. ROAD SIGN(s)

NO.	DATE	REVISION	DR.

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DRAWING FILE:	C3D20 1702-01.dwg
CORRESPONDENCE:	
GRID:	
DATE:	JAN 2020
SCALES:	FULL: 1:1000 HALF 1:2000

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
OVERALL SITE PLAN

CONSULTANTS PROJECT No.
1702-01

DRAWING No.
C000

SHEET No.	REV. No.
1 OF 8	0

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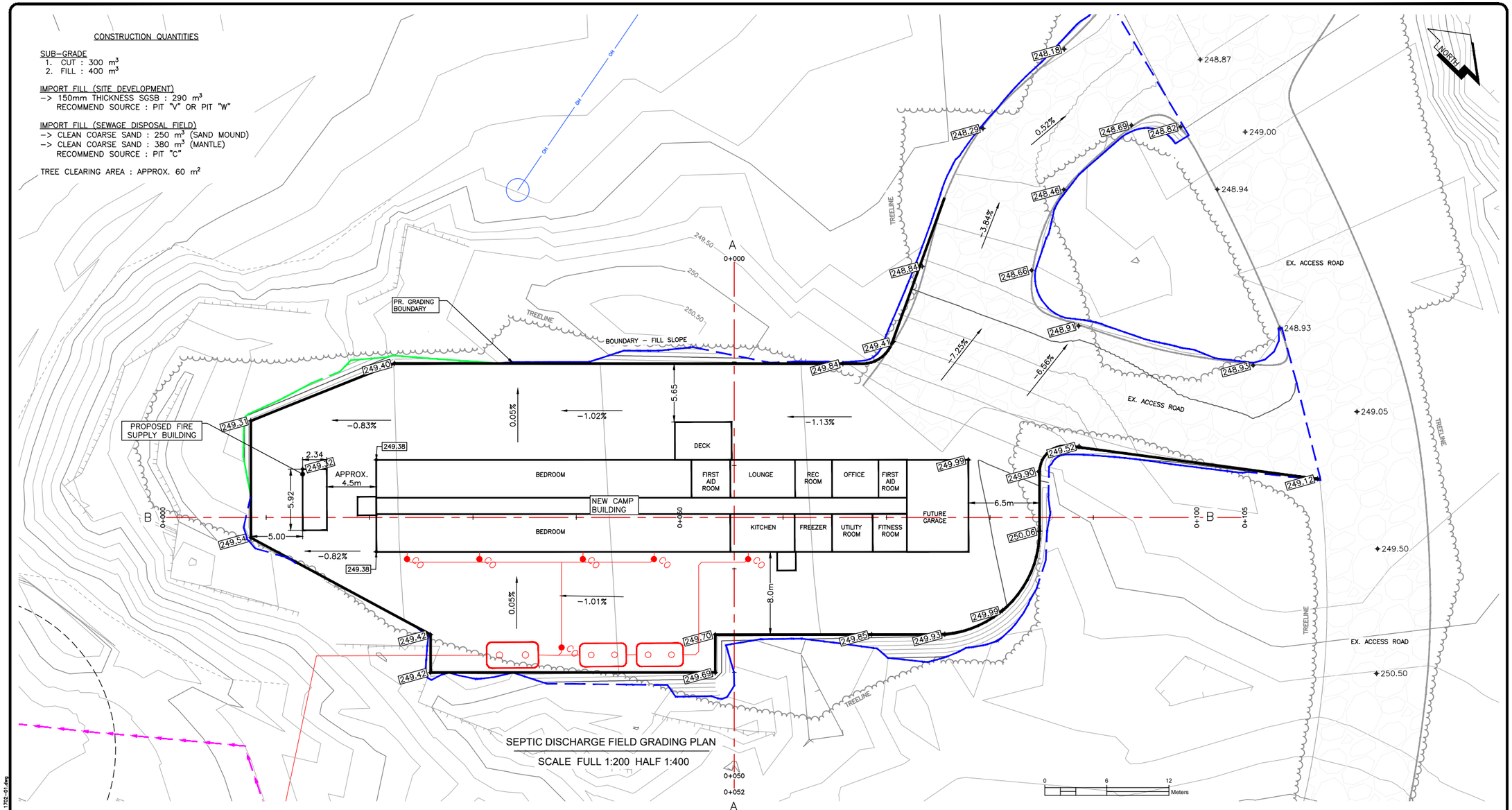
CONSTRUCTION QUANTITIES

SUB-GRADE
1. CUT : 300 m^3
2. FILL : 400 m^3

IMPORT FILL (SITE DEVELOPMENT)
-> 150mm THICKNESS SGSB : 290 m^3
RECOMMEND SOURCE : PIT "V" OR PIT "W"

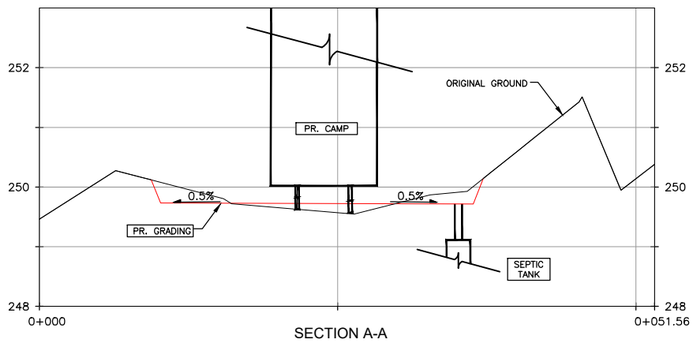
IMPORT FILL (SEWAGE DISPOSAL FIELD)
-> CLEAN COARSE SAND : 250 m^3 (SAND MOUND)
-> CLEAN COARSE SAND : 380 m^3 (MANTLE)
RECOMMEND SOURCE : PIT "C"

TREE CLEARING AREA : APPROX. 60 m^2

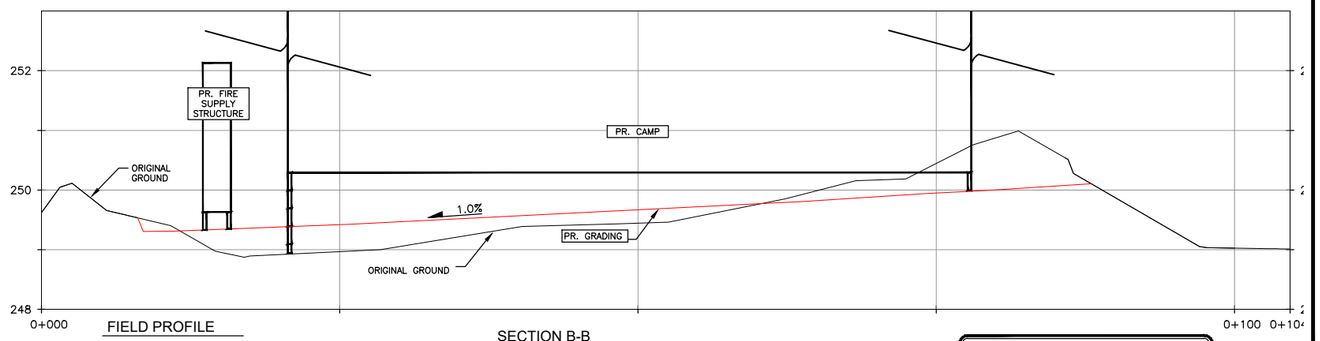


SEPTIC DISCHARGE FIELD GRADING PLAN

SCALE FULL 1:200 HALF 1:400



SECTION A-A



FIELD PROFILE

HORZ 1:250 VERT:5:1

SECTION B-B

ISSUED FOR REVIEW

XXX.XX PR. ELEVATION

XXX.XX EX. ELEVATION

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DRAWING FILE:	C3D20 1702-01.dwg
CORRESPONDENCE:	
GRID:	
DATE:	27/FEB/2020
SCALES:	AS NOTED

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
SITE GRADING PLAN

CONSULTANTS PROJECT No.
1702-01
DRAWING No.
C001

SHEET No.	REV. No.
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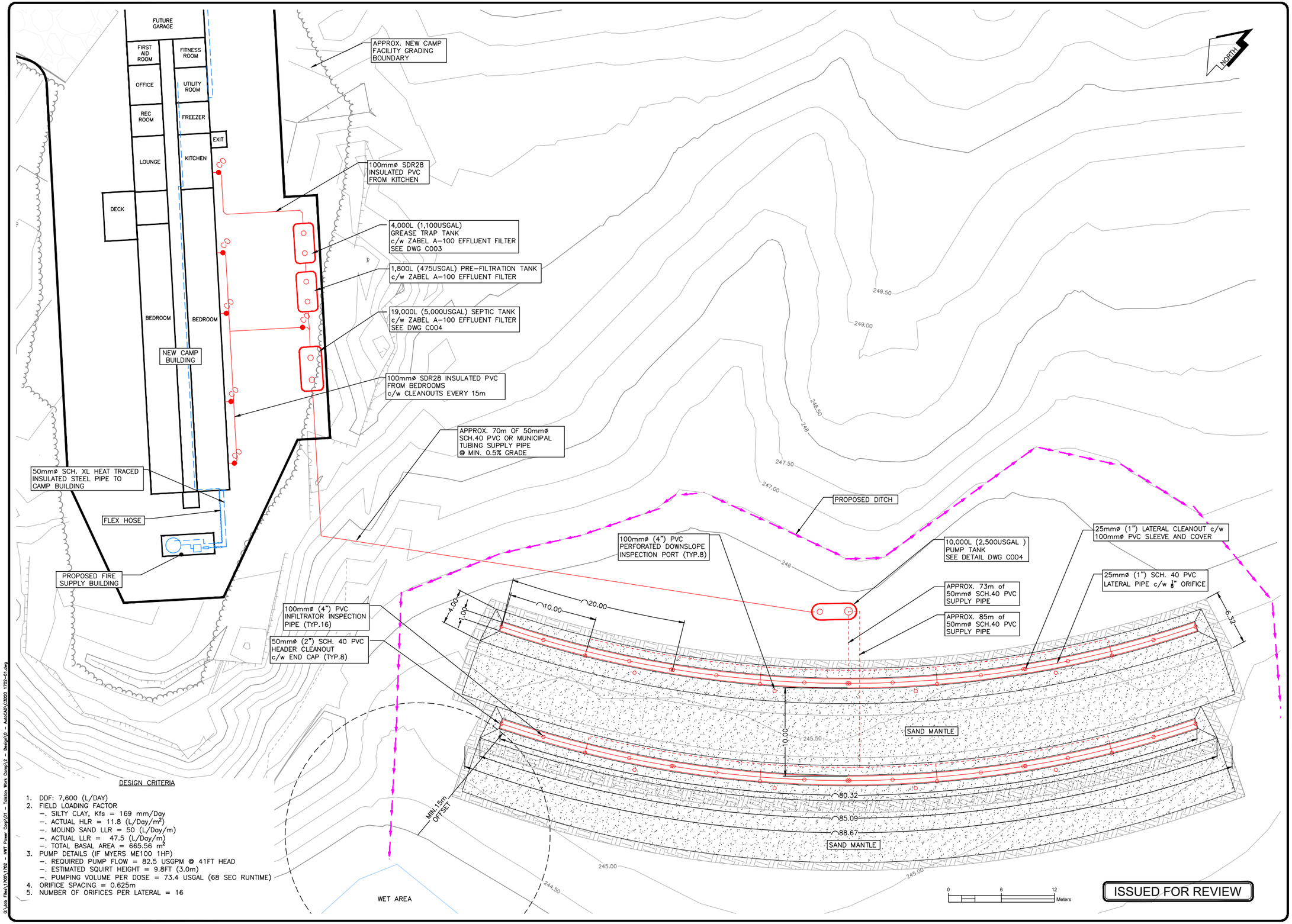

DESIGN CRITERIA

1. DDF: 7,600 (L/DAY)
2. FIELD LOADING FACTOR
   - -. SILTY CLAY, Kfs = 169 mm/Day
   - -. ACTUAL HLR = 11.8 (L/Day/m^2)
   - -. MOUND SAND LLR = 50 (L/Day/m)
   - -. ACTUAL LLR = 47.5 (L/Day/m)
   - -. TOTAL BASAL AREA = 665.56 m^2
3. PUMP DETAILS (IF MYERS ME100 1HP)
   - -. REQUIRED PUMP FLOW = 82.5 USGPM @ 41FT HEAD
   - -. ESTIMATED SQUIRT HEIGHT = 9.8FT (3.0m)
   - -. PUMPING VOLUME PER DOSE = 73.4 USGAL (68 SEC RUNTIME)
4. ORIFICE SPACING = 0.625m
5. NUMBER OF ORIFICES PER LATERAL = 16

ISSUED FOR REVIEW

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GRID:	
DATE:	JAN 2020
SCALES:	FULL 1:200 HALF 1:400

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
DETAILED DISCHARGE SITE PLAN

CONSULTANTS PROJECT No.
1702-01
DRAWING No.
C002

SHEET No.	REV. No.
3 OF 8	0

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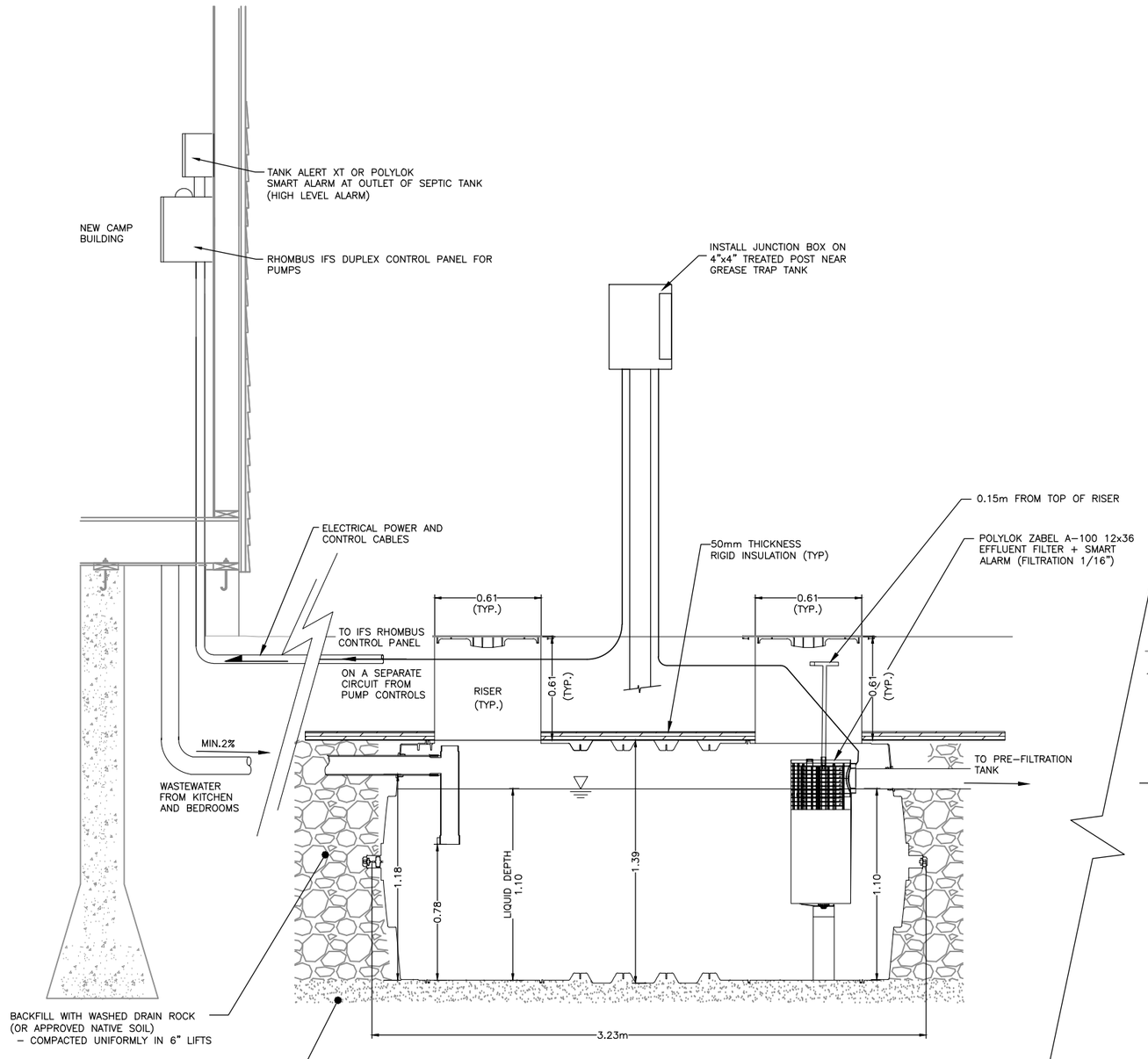

SINGLE-CHAMBER GREASE TRAP TANK 4,000L (1,100Usgal)
SCALE: NTS

SINGLE-CHAMBER PRE-FILTRATION TANK 1,800L (475 Usgal)
SCALE: NTS

ISSUED FOR REVIEW

NO.	DATE	REVISION	DR.

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SCALES:	AS NOTED

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
SEPTIC & PUMP TANK DETAIL

CONSULTANTS PROJECT No.
1702–01
DRAWING No.
C003

SHEET No.	REV. No.
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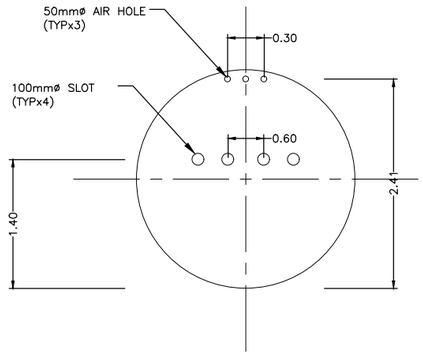
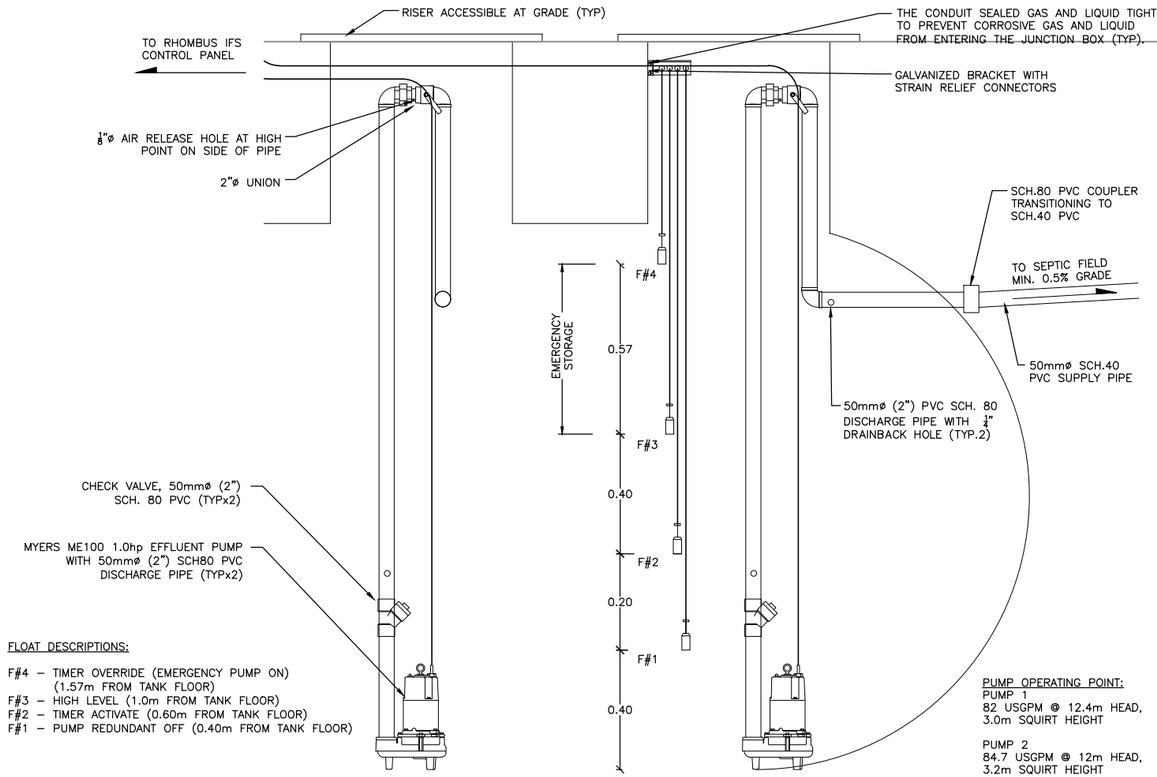


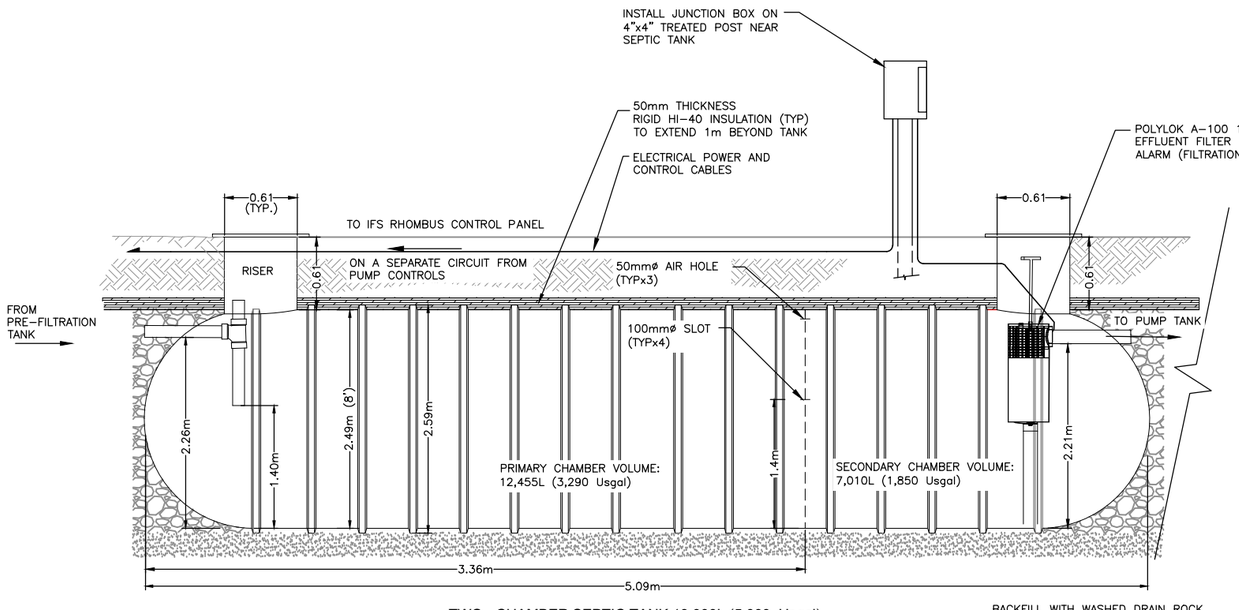
SEPTIC TANK BAFFLE DETAIL

SCALE: N.T.S.



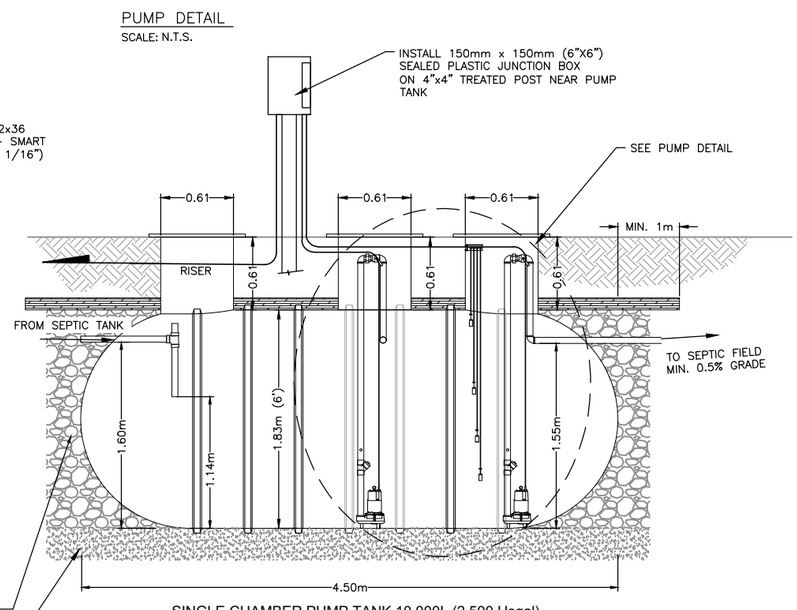
PUMP DETAIL

SCALE: N.T.S.



TWO - CHAMBER SEPTIC TANK 19,000L (5,000 Usgal)

SCALE: NTS



SINGLE CHAMBER PUMP TANK 10,000L (2,500 Usgal)

SCALE: NTS

ISSUED FOR REVIEW

NO.	DATE	REVISION	DR.

L&M ENGINEERING LIMITED

1210 FOURTH AVENUE
PRINCE GEORGE, B.C.
V2L 3J4
TEL. (250) 562-1977
FAX (250) 562-1967

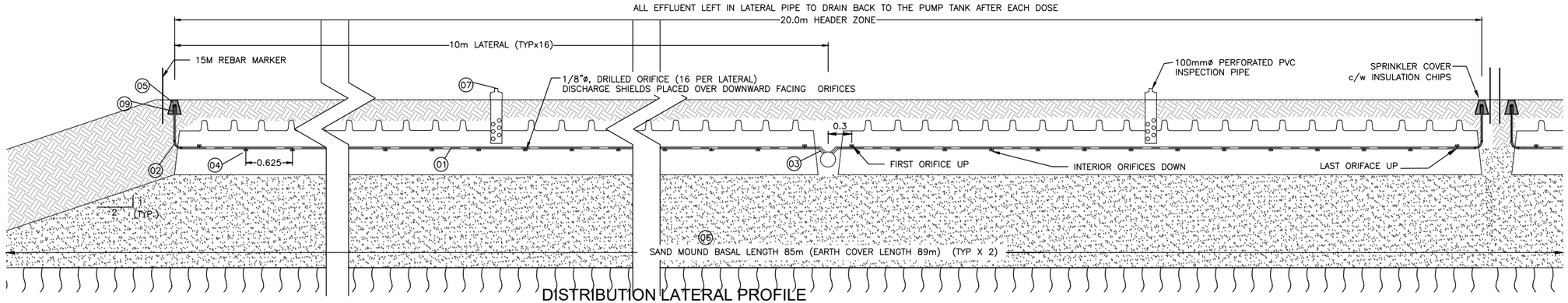
DRAWN:	SJ
CHECKED:	JSS
ENGINEER:	JSS
SURVEY FILE:	
DRAWING FILE:	C3D20 1702-01.dwg
CORRESPONDENCE:	
GRID:	
DATE:	JAN 2020
SCALES:	AS NOTED

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
SEPTIC & PUMP TANK DETAIL

CONSULTANTS PROJECT No.
1702-01
DRAWING No.
C004

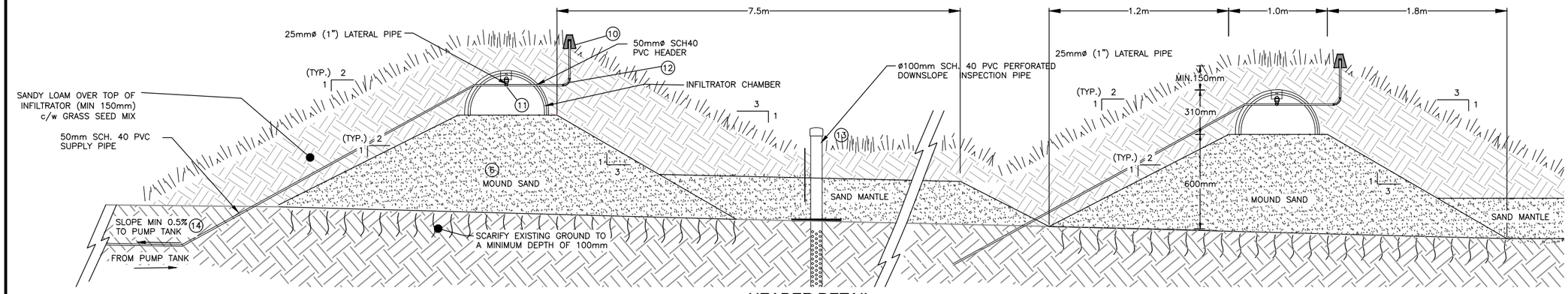
SHEET No.	REV. No.
5 OF 8	0

G:\Job Files\1700\1702 - NWT Power Corp\01 - Tolston Work Camp\2 - Design\0 - AutoCAD\C3D20 1702-01.dwg



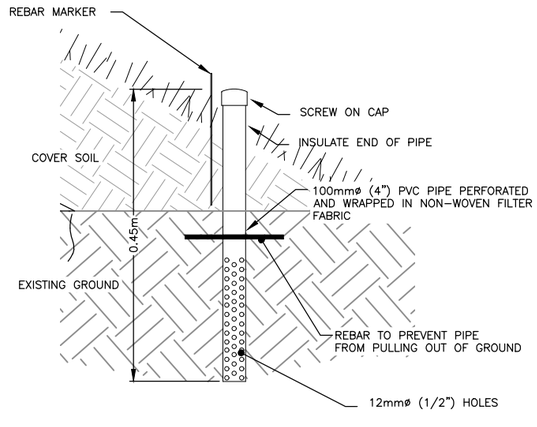
DISTRIBUTION LATERAL PROFILE

SCALE : NTS



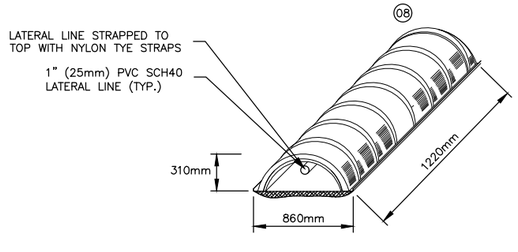
HEADER DETAIL

N.T.S.



DOWNSLOPE INSPECTION PIPE DETAIL

N.T.S.



QUICK4 STANDARD INFILTRATION CHAMBER DETAILS

N.T.S.

ESTIMATE OF MATERIALS (TOTAL)			
ITEM	QTY.	SIZE	DESCRIPTION
01	160m	1"	PIPE, SCH. 40 PVC
02	16	1"	90° L.R. ELBOW, SCH. 40 PVC
03	8	1.0"x1.0"x1.0"	CROSS OR TEE, SCH. 40 PVC
04	256	N/A	ORIFICE SHIELDS
05	16	4"	SPRINKLER COVERS FOR END CAPS
06	250m³	FINE	MOUND SAND
07	16	4"	PERFORATED PVC LATERAL INSPECTION PIPE
08	160m	STANDARD	INFILTRATOR CHAMBER
09	16	1"	SCH.40 LATERAL CLEANOUTS W/ ENDCAP
10	8	2"	SCH.40 HEADER CLEANOUTS W/ ENDCAP
11	8	2"x1"x1"	CROSS OR TEE, SCH. 40 PVC
12	8	2"	90° L.R. ELBOW, SCH. 40 PVC
13	8	4"	PERFORATED PVC DOWNSLOPE INSPECTION PIPE
14	160m	2"	SCH 40. PVC SUPPLY PIPE

ISSUED FOR REVIEW

NO.	DATE	REVISION	DR.

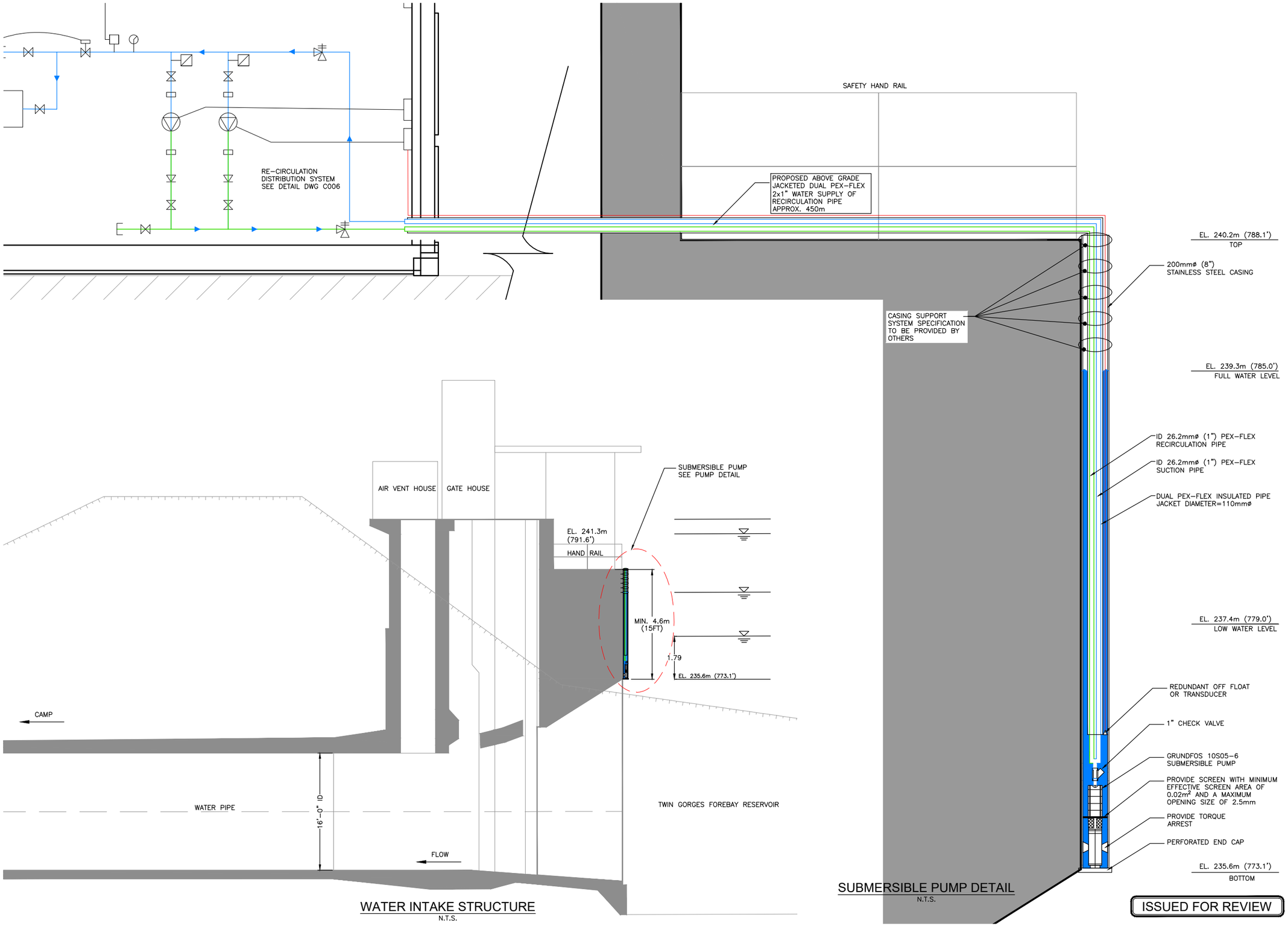
L&M ENGINEERING LIMITED
1210 FOURTH AVENUE
PRINCE GEORGE, B.C.
V2L 3J4
TEL. (250) 562-1977
FAX (250) 562-1967

DRAWN:	SJ
CHECKED:	JSS
ENGINEER:	JSS
SURVEY FILE:	
DRAWING FILE:	C3D20 1702-01.dwg
CORRESPONDENCE:	
GRID:	
DATE:	JAN 2020
SCALES:	

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
DETAILED DISCHARGE SITE PLAN

CONSULTANTS PROJECT No.
1702-01
DRAWING No.
C005

SHEET No.	REV. No.
6 OF 8	0



WATER INTAKE STRUCTURE
N.T.S.

SUBMERSIBLE PUMP DETAIL
N.T.S.

ISSUED FOR REVIEW

NO.	DATE	REVISION	DR.

L&M ENGINEERING LIMITED
1210 FOURTH AVENUE
PRINCE GEORGE, B.C.
V2L 3J4
TEL. (250) 562-1977
FAX (250) 562-1967

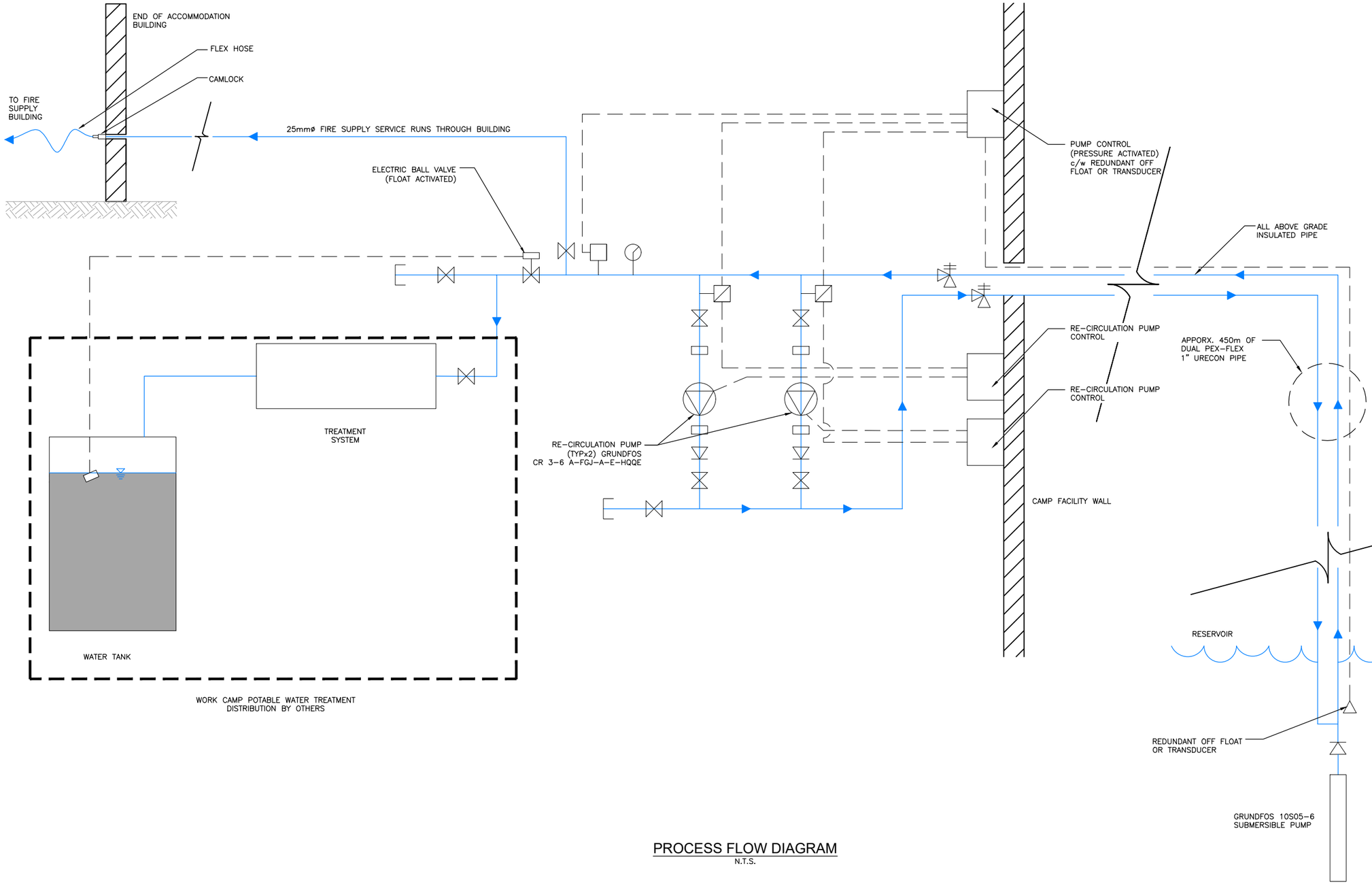
DRAWN:	SJ
CHECKED:	JSS
ENGINEER:	JSS
SURVEY FILE:	
DRAWING FILE:	C3D20 1702-01.dwg
CORRESPONDENCE:	
GRID:	
DATE:	JAN 2020
SCALES:	

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
WATER INTAKE SYSTEM

CONSULTANTS PROJECT No.
1702-01
DRAWING No.
C006

SHEET No.	REV. No.
7 OF 8	0

G:\Job Files\1700\1702 - NWT Power Corp\01 - Taiston Work Camp\2 - Design\10 - AutoCAD\C3D20 1702-01.dwg



PROCESS FLOW DIAGRAM
N.T.S.

ISSUED FOR REVIEW

BALL VALVE
ELECTRIC VALVE
RE-CIRCULATION PUMP
CHECK VALVE
UNION
PRESSURE SWITCH
FLOW SWITCH
PRESSURE GAUGE
AIR RELEASE VALVE
ELECTRIC LINE
WATER LINE

NO.	DATE	REVISION	DR.

L&M ENGINEERING LIMITED
1210 FOURTH AVENUE
PRINCE GEORGE, B.C.
V2L 3J4
TEL. (250) 562-1977
FAX (250) 562-1967

DRAWN:	SJ
CHECKED:	JSS
ENGINEER:	JSS
SURVEY FILE:	
DRAWING FILE:	C3020 1702-01.dwg
CORRESPONDENCE:	
GRID:	
DATE:	JAN 2020
SCALES:	

NWT POWER CORPORATION
WORK CAMP
ONSITE SEWERAGE SYSTEM
WATER INTAKE SYSTEM
SCHEMATIC DIAGRAM

CONSULTANTS PROJECT No.
1702-01
DRAWING No.
C007

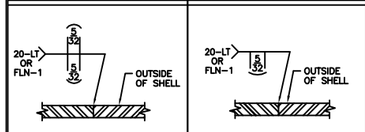
SHEET No.	REV. No.
8 OF 8	0

G:\Job Files\1700\1702 - NWT Power Corp\01 - Tolston Work Camp\2 - Design\0 - AutoCAD\C3020 1702-01.dwg

Appendix C- Fuel Storage Details

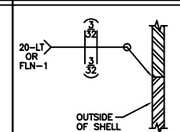
FOREMOST STANDARD TANK WELD DETAILS (N.T.S.)

PRIMARY TANK SHELL JOINT – VERTICAL

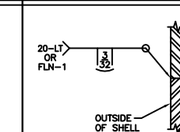


SECONDARY TANK SHELL JOINT – VERTICAL

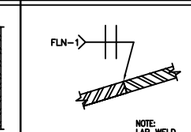
PRIMARY TANK SHELL JOINT – HORIZONTAL



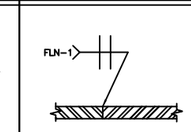
SECONDARY TANK SHELL JOINT – HORIZONTAL



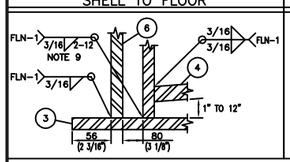
ROOF JOINT



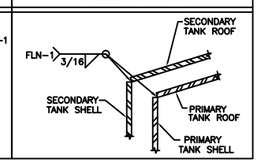
FLOOR JOINT



PRIMARY TANK & SECONDARY TANK SHELL TO FLOOR



SHELL TO ROOF



CUSTOMER SPECIFICATIONS

DESIGN CODE: API–12F (MODIFIED)
SERIAL NO.: 060638–1 TO 4
DESIGN PRESSURE: 16 oz. / 0.4 oz. VAC.
DESIGN TEMPERATURE: –13°C(8.6°F) TO 93°C(200°F)
OPERATING TEMPERATURE: –
SERVICE: WATER, OIL, GAS
OPERATING LEVEL: –
CORROSION ALLOWANCE: NONE
OTHER:

FINISHING

EXTERNAL: SHELL AND ROOF
BLAST: SSPC–SP6
FINISH: APPLY ONE COAT OF INDUSTRIAL ENAMEL. THE COLOR IS MIST GREY (TOTAL GREY) WITH A THREE FOOT WIDE BLUE STRIPE THAT STARTS TWO FEET FROM THE TOP OF THE TANK.
INTERNAL: NONE
TESTING: AIR TEST INTERSTITIAL TO 16 oz.
INSULATION: NONE

NOZZLE SCHEDULE

MK	NO	SIZE	SCH	RATE	TYPE	PROJECTION INT.	PROJECTION EXT.	REPAD YES	REPAD NO	DESCRIPTION
N1	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	TRUCK IN
N2	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	OUTLET
N3	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	INLET
N4	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	SPARE
N5	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	SPARE
N6	1	3"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	VENT LINE C/W EXT. DOWNCOMER
N7 a,b	2	2"	STD	CLASS 150	RFSO	AS SHOWN	64 / 2 1/2"		✓	HEAT COIL (S.S.)
N8	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	VENT C/W BLIND
N9	1	4"	STD	CLASS 150	RFSO	25 / 1"	102 / 4"		✓	DRAIN C/W BLIND
C1	1	3/4"	–	3000#	FULL CPLG	–	HALF		✓	LEVEL GAUGE
C2	1	1"	–	3000#	FULL CPLG	–	HALF		✓	INTERSTITIAL DRAIN C/W PLUG
C3	1	1 1/2"	–	3000#	FULL CPLG	–	HALF		✓	LEAK DETECTION
C4	1	3/4"	–	3000#	FULL CPLG	–	HALF		✓	INTERSTITIAL VENT C/W PLUG
T1	1	8"	STD	–	FAB'D	25 / 1"	82 / 3 1/4"		✓	THIEF HATCH NOZZLE
M1	1	610x914	–	API–12F	FAB'D	25 / 1"	70 / 2 3/4"		✓	ROOF MANWAY C/W HINGED COVER

MATERIAL LIST

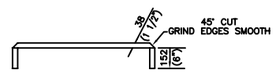
MATERIAL REQUIREMENTS

M (MTR's): NONE
I (IMPACT TESTING): NONE
C (CHEMISTRY): NONE

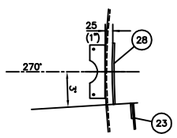
MK	QTY	PART NO.	DESCRIPTION	REF. DWG.	MATERIAL	WT	MAT REQ
1	2	5972	PRIMARY HALF ROOF PLATE 3/16" THK. x 11'–6" FLAT DIA.	–	A–36/44W/38W	796	–
2	2	1003	SECONDARY ROOF PLATE 3/16" THK. x 12'–0 1/4" FLAT DIA.	–	A–36/44W/38W	2206	–
3	2	5426	SECONDARY HALF FLOOR PLATE 1/4" THK. x 12'–4" DIA.	–	A–36/44W/38W	1060	–
4	1	–	SLOPED FLOOR (PRIMARY) 1/4" THK. C/W SHELL	B103	A–36/44W/38W	2852	–
5	3	5046	PRIMARY SHELL PLATE 3/16" THK. x 5'–0" x 35'–9 3/8" LG. (CUT DOWN TOP COURSE TO 4'–8")	–	A–36/44W/38W	5482	–
6	4	2960	SECONDARY SHELL PLATE 3/16" THK. x 5'–0" x 37'–6 3/8" LG.	–	A–36/44W/38W	5750	–
7	1	4273	LIFTING LUG 1/2" THK. x 7" x 1'–3 1/2"	–	G40.21–44W	30	–
8	1	15555	STANDARD LADDER (NO TOP HOOP)	–	–	138	–
9	1	2896	TANK NAMEPLATE BRACKET	–	–	5	–
10	1	5699 5701	"L" SHAPED SKID (THREE SADDLE DESIGN)	EDS–5014	–	2020	–
11	2	2533	TANK ROOF SAFETY HARNESS LUG	–	–	1	–
12	1	–	NOZZLE DETAILS	D102	–	406	–
13	1	–	HAWKEYE THIEF HATCH 8" API SET @ 16oz PRESS./0.4oz VAC. STD SEAL (TVTH–300–16–1)	–	–	70	–
14							
15	1	–	AM–GAS PULLEY SYSTEM	–	–	50	–
16	2	5714	HEAT COIL BRACKET	–	–	12	–
17	1	6525	HEAT COIL (S.S.)	–	–	68	–
18							
19	1	–	NAMEPLATE DETAIL	A105	–	1	–
20	1	6527	ROOF MANWAY – 2'–0" x 3'–0" C/W HINGED COVER	A104	–	96	–
21							
22	1	2110	FLATBAR 1/4" x 1 1/2" x 3'–11 1/2" LG.	–	G40.21–44W	5	–
23	1	2110	FLATBAR 1/4" x 1 1/2" x 3'–6" LG.	–	G40.21–44W	4	–
24							
25	1	–	DBI SALA FALL ARREST SYSTEM	–	–	–	–
26	1	–	TOTAL OILFIELD RENTALS LEVEL INDICATOR C/W CABLE BRACKET SET	D102	–	–	–
27							
28	1	2129	FLATBAR 3/16" x 2" x 8" LG.	–	G40.21–44W	2	–
29	1	6152	INTERSTITIAL MONITOR	–	–	5	–
30							
					SUBTOTAL	21059	
					x 1.06		
					TOTAL (lbs.)	22323	

NOTE:

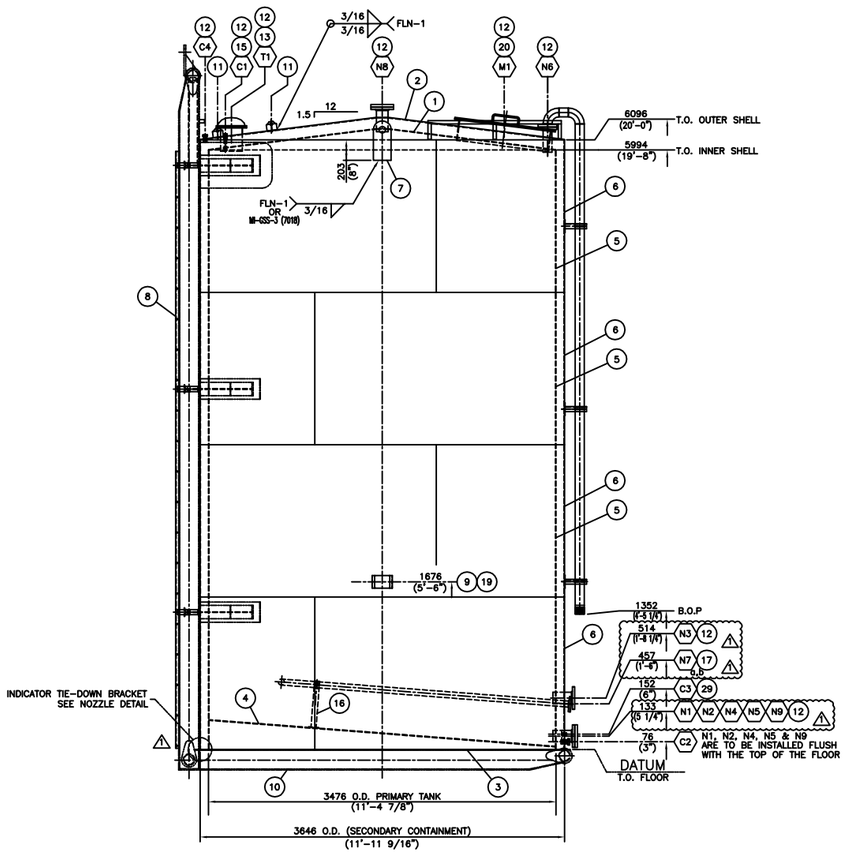
1. ALL DIMENSIONS ARE IN S.I. & IMPERIAL UNITS. DIMENSIONS IN BRACKETS ARE IMPERIAL HARD CONVERSIONS FOR SHOP REFERENCE ONLY.
2. FLANGE AND BOLT HOLES TO STRADDLE PRINCIPAL CENTERLINES OF TANK.
3. ALL NOZZLE PROJECTIONS GIVEN ARE ALONG THE NOZZLE CENTERLINE. EXCEPT FOR THE 25(1") INTERNAL PROJECTION WHICH IS AT THE SHORT SIDE.
4. ALL FLANGE RATINGS TO BE ASME B16.5–2013.
5. SEQUENCE OF FABRICATION:
   1). BUILD ENTIRE PRIMARY TANK.
   2). WELD PRIMARY TANK TO SECONDARY FLOOR.
   3). BUILD SECONDARY SHELL AND ROOF.
   4). ATTACH SECONDARY SHELL AND ROOF TO SECONDARY FLOOR.
6. HEAT COIL IN THIS TANK IS DESIGNED FOR A MAX. PRESSURE OF 14.9 psi.
7. TANK FABRICATOR INSPECTION LEVEL 1.
8. TANK FLOOR TO BE STITCH WELDED TO L–SKID.
9. BOTTOM PRIMARY SHELL TO HAVE TWO NOTCHES AT THE SECONDARY FLOOR.



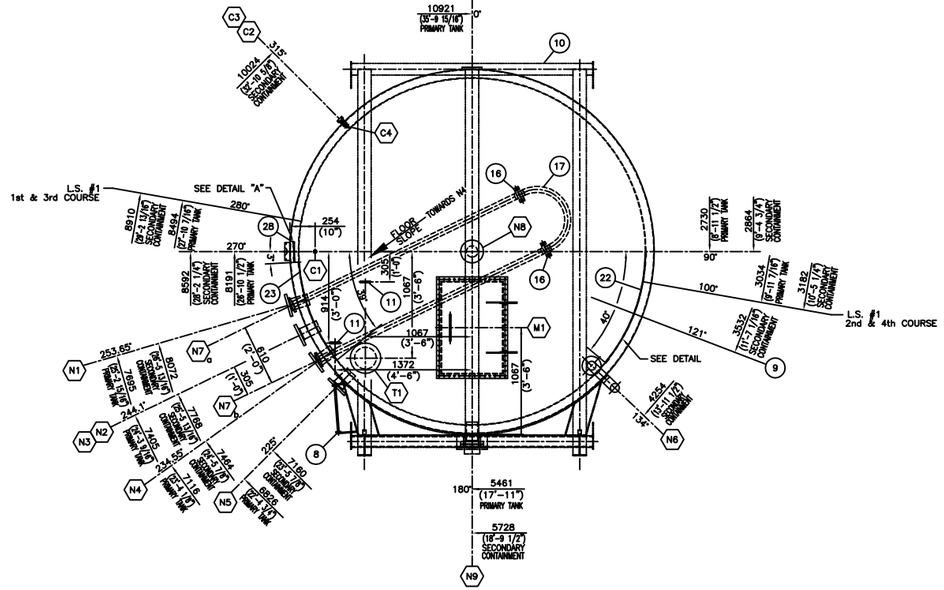
TYPICAL TOE RAIL DETAIL
SCALE: N.T.S.



DETAIL "A"
SCALE: N.T.S.



ELEVATION



ORIENTATION

NO.	DATE (d/m/y)	REVISIONS	BY	APPD
1	15/10/14	AS–BUILT, REMOVED MK#18 & UPDATED ELEVATIONS FOR N3, N7, N1, N2, N4, N5 & N9	HS	JK
2	07/08/14	ISSUED FOR CONSTRUCTION; REVISED EXT. PROJ. TO 102(4")	RMG	JK
1	10/07/14	ISSUED FOR CUSTOMER APPROVAL	RMG	JK

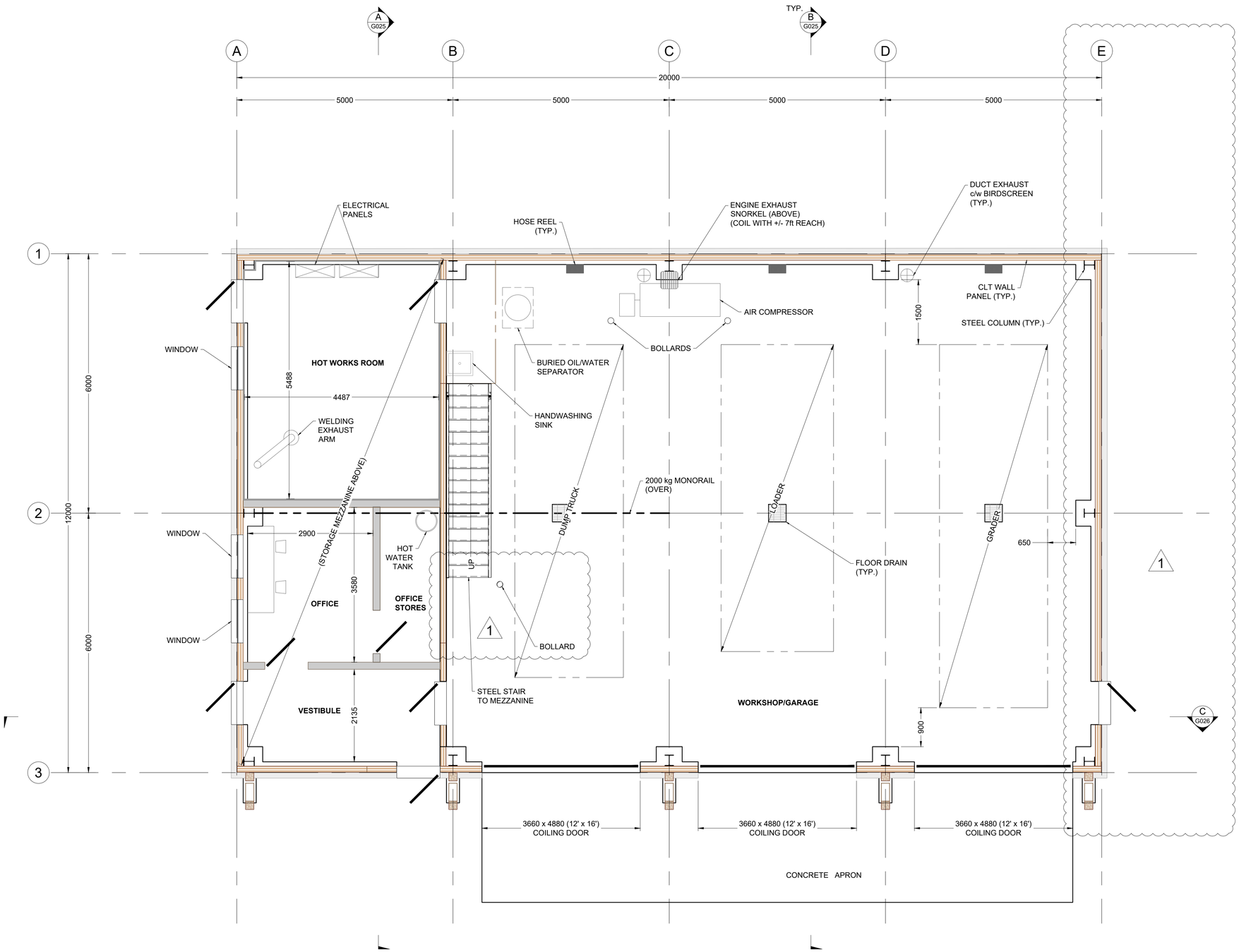
FOREMOST

CLIENT: TOTAL OILFIELD RENTALS
P.O.# C00–14–041

DWG TITLE: 400 BBL DBL WALL (UNHEATED) RENTAL STYLE (SLOPED FLOOR) GENERAL ARRANGEMENT

NO. REQ'D	VOLUME	SIZE	WO NO.	LEG NO.
4	PRIMARY TANK 58.4 CUBIC METERS (367 bbl)	PRIMARY TANK 3476mm O.D. x 5994mm HIGH (11'–4 7/8" O.D. x 19'–8" HIGH)	060638	
SCALE: 1:30	DWN BY: R.M. GONZALES	DWG NO.: W06–060638–D101	SHEET NO.: 1 of 1	REV. NO.: 1
DATE (d/m/y): 06/07/14	CHKD: TWA 15/10/14	APPD: JK 15/10/14		

Appendix D- Maintenance Building Design



PLAN - INTERIOR

SCALE: 1:50

ISSUED FOR TENDER
NOT FOR CONSTRUCTION

DRAWING NO.	TITLE	REVISION LETTER	REVISION	WORK ORDER	NAME	DRAWN BY DATE	CHECKED BY	DESIGNED BY	CIVIL	MECH	ELEC	T & D	P & C	STATUS OF DRAWING	DATE
		1	RE-ISSUED FOR TENDER-MODIFICATION AS NOTED		PB	23JAN'20	AW	PB						ISSUED FOR TENDER	23JAN'20
		0	ISSUED FOR TENDER		PB	03DEC'19	AW	PB						ISSUED FOR TENDER	03 DEC'19
REFERENCE DRAWINGS									APPROVED FOR CONSTRUCTION BY						

Gygax Engineering Associates Ltd.
103 - 1718 Commercial Drive
Vancouver B.C., Canada V5K 2Y2
Tel: (1 604) 254 3914
Fax: (1 604) 254 3928
E-mail: mail@gea.ca
in association with:
StruthersTECH
3 - 1101 Main Street, Penticton, BC, Canada V2A 5E6
www.strutherstech.com
FALCON ENGINEERING
MECHANICAL ELECTRICAL ENVIRONMENTAL

GRAPHIC SCALE 1:50
0 4.0 m

LOCATION
TALTSON HYDRO
NWT

NORTHWEST TERRITORIES POWER CORPORATION

TITLE
TALTSON HYDROPOWER STATION
2019 GARAGE AND WORKSHOP
GENERAL ARRANGEMENT
INTERIOR PLAN

SCALE	SHEET	DRAWING NO.	REV.
1:50	1 OF 1	P109-NNNN-G011	1

AUTOCAD FILE: PLOT SCALE:

Appendix E- Substation Details

DETAIL 'A'

EXISTING SUBSTATION (TO BE SALVAGED)

TANK

11.9m

17.4m

POWER STATION

FIRE HYDRANT

SATELLITE DISH

HOUSE

SHOP

HOUSE

EXISTING SHOP (TO BE SALVAGED)

15m

30m

30m

LAKE

BEGINNING OF C/L DAM

C/L PENSTOCK

WINDSOCK

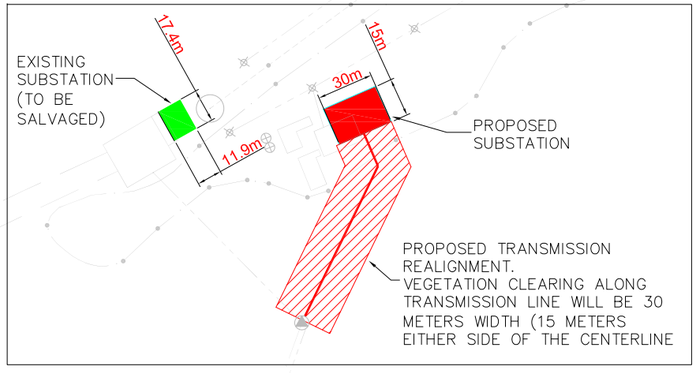
WATERS EDGE

C/L ROAD

END OF C/L DAM

TOWER

SEE DETAIL 'A'



TWIN GORGES
LOT 1003
QUAD 75D/6

POWERLINE

DRAWING NO.	TITLE	REVISION LETTER	REVISION	WORK ORDER	NAME	DATE	CHECKED BY	DESIGNED BY	STATUS OF DRAWING	DATE
		A								
		0	ORIGINAL	51886	RL	2020.04.02	DK	–	REVIEW	2020.04.02

REFERENCE DRAWINGS

DRAWN BY

PROFESSIONAL STAMP

PERMIT STAMP

LOCATION: TALTSON NWT

NORTHWEST TERRITORIES POWER CORPORATION

TITLE: SITE PLAN BOUNDARY

SCALE: NTS | SHEET 1 OF 1 | DRAWING NO. P109–XXX | REV. 0

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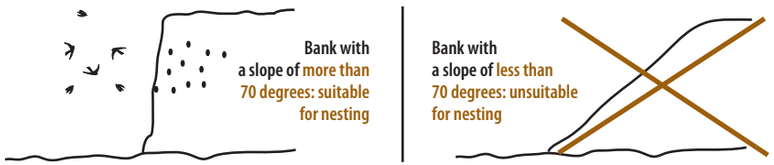
PLOT SCALE: 1 : 1

Appendix F- Bank Swallow Information Sheet

Did you know?

The Bank Swallow is a declining migratory bird species that has lost 98% of its Canadian population over the last 40 years.

This insectivorous bird is particularly drawn to sandpits, quarries, stock piles of sand and soil, and sandy banks along water bodies and roads. **Bank Swallows generally dig their burrows in near-vertical banks (slopes of at least 70 degrees) that are more than 2 metres high.** In Quebec, Bank Swallows typically use their nesting sites from mid-April to late August. This is the sensitive period during which the risk of harming the birds is especially high. The absence of the birds in August is a good indicator that the breeding season is over.



The best way to minimize the possibility of contravening the *Migratory Birds Convention Act, 1994* and its regulations is to fully understand the impact that your activities could have on migratory birds and their nests and eggs and to take reasonable precautions and appropriate avoidance measures. In fact, under the Act and its regulations, it is an offence for anyone to kill, hunt, capture, injure or harass a migratory bird or to damage, destroy, remove or disturb its nest or eggs without a permit.

The sand and gravel industry can play a major role in the conservation of Bank Swallows by adopting operating practices that do not harm the species.

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What you can do

Before the breeding season
(generally before mid-April)

- Prevent Bank Swallows from nesting in areas where operations will be carried out during the breeding season by contouring your piles to have a slope of less than 70 degrees and by creating suitable nesting habitat in inactive areas with vertical faces of at least 70 degrees.
- Install scaring devices to deter Bank Swallows from establishing colonies in active areas.

During the breeding season
(generally from mid-April to late August)

- Avoid intense activity near the colony. You can prevent disturbance by marking off a protective buffer zone around the colony and notifying all employees of its existence.
- Generally speaking, there is a particularly high risk of disturbing nesting when noisy activities or vibrations occur within 50 metres of the bird colony. This protective radius is only a rough guideline and must be adjusted after an assessment of the risk factors. In some cases, where operating activities are intense, a larger protective radius may be needed to minimize the risk of disturbance.
- Spend a few minutes flattening vertical faces in active areas at the end of the day to prevent Bank Swallows from digging burrows in them overnight or on weekends.
- Stop excavation work if Bank Swallows colonize a bank in an active area. Activities cannot resume until the birds leave at the end of the breeding period.
- Do not use scaring devices once the colony is established as they may interfere with ongoing Bank Swallow breeding activities.

After the breeding season
(generally after late August)

- If a nesting site needs to be excavated after the birds leave, compensate by providing an alternate site that can support nesting in the following year. To be suitable for nesting, the bank must have a slope of at least 70 degrees.

Notify your employees of the restrictions and techniques that can be implemented to prevent detrimental effects on the species.

Thank you for participating in the conservation of Bank Swallows.

Environnement Canada Environment Canada

L'HIRONDELLE DE RIVAGE

(Riparia riparia)

dans les sablières et les gravières

Canada

Le saviez-vous ?

L'Hirondelle de rivage est un oiseau migrateur en déclin dont la population canadienne a chuté de 98 % au cours des 40 dernières années.

Cet oiseau insectivore est très attiré par les sablières et les gravières, les amas de sable et de terre, et les talus sablonneux en bordure des plans d'eau et des chemins. **En général, les Hirondelles de rivage creusent leur terrier dans des fronts de talus presque verticaux (pente d'au moins 70 degrés) à plus de 2 m de hauteur**. Au Québec, les Hirondelles de rivage utilisent généralement les sites de nidification de la mi-avril à la fin d'août. Il s'agit de la période sensible durant laquelle le risque de nuire aux oiseaux est particulièrement élevé. L'absence des oiseaux en août est un bon indicateur de la fin de la nidification.

La meilleure approche afin de réduire au minimum la possibilité d'enfreindre la *Loi de 1994 sur la convention concernant les oiseaux migrateurs* et ses règlements consiste à bien comprendre le risque d'incidence potentiel de vos activités sur les oiseaux migrateurs, leurs nids et leurs œufs, et à prendre des précautions raisonnables et des mesures d'évitement appropriées. En effet, selon la Loi et ses règlements, quiconque tue, chasse, capture, blesse ou harcèle un oiseau migrateur ou endommage, détruit, enlève ou dérange leurs nids ou leurs œufs sans permis commet un délit.

L'industrie des sablières et des gravières peut jouer un rôle important dans la conservation de l'Hirondelle de rivage en adoptant des pratiques d'exploitation qui ne nuisent pas à l'espèce.

www.ec.gc.ca/paom-itmb

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Ce que vous pouvez faire

Avant la période de nidification
(en général avant la mi-avril)

- Évitez que des Hirondelles de rivage nichent dans les zones qui seront exploitées durant la période de nidification en profilant vos talus avec une pente inférieure à 70 degrés, et en créant des zones propices à la nidification dans des zones non exploitées, avec des talus dont la pente est d'au moins 70 degrés.
- Installez des dispositifs d'effarouchement pour dissuader les Hirondelles de rivage d'établir une colonie dans les zones exploitées.

Pendant la période de nidification
(en général de la mi-avril à la fin d'août)

- Évitez les activités intenses à proximité de la colonie. Vous pouvez empêcher le dérangement en délimitant une zone de protection autour de la colonie et en informant tous les employés de l'existence de cette zone.
- En général, le risque de déranger la nidification est particulièrement élevé si des activités bruyantes ou des vibrations ont lieu à moins de 50 m de la colonie d'oiseaux. Cette distance de protection ne constitue qu'un ordre de grandeur et doit être ajustée après évaluation des facteurs de risque. Dans certains cas, lorsque les activités d'exploitation sont intenses, une plus grande distance de protection peut être nécessaire afin de réduire au minimum le risque de dérangement.
- Prendre quelques minutes à la fin de la journée pour supprimer les talus verticaux afin d'éviter que des Hirondelles de rivage ne commencent à creuser des nids durant la nuit ou durant les fins de semaine.
- Cessez toute activité d'excavation si des Hirondelles de rivage colonisent un talus dans une zone exploitée, et ce jusqu'au départ des hirondelles à la fin de la période de nidification.
- N'utilisez pas de dispositifs d'effarouchement une fois la colonie établie, tant et aussi longtemps que cela peut interférer avec les activités courantes de nidification des Hirondelles de rivage.

Après la période de nidification
(en général après la fin d'août)

- Si un site de nidification doit être exploité après le départ des oiseaux, en guise de compensation, voyez à fournir un site de remplacement pouvant soutenir la nidification l'année suivante. Pour être propice à la nidification, le talus doit avoir une pente d'au moins 70 degrés.

Informez vos employés des interdictions et des techniques qui peuvent être mises en œuvre pour éviter les effets néfastes sur l'espèce.

Merci de participer à la conservation de l'Hirondelle de rivage.

Environment Canada Environnement Canada

BANK SWALLOW

(Riparia riparia)

in sandpits and quarries

Canada