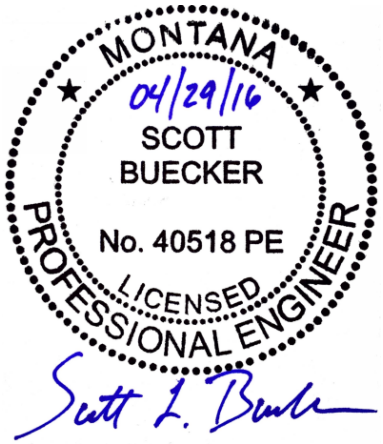
City of Livingston Water Reclamation Facility
Preliminary Engineering Report Amendment

To: Shannon Holmes
Public Works Director
City of Livingston

From: Scott Buecker, PE
AE2S

Date: April 29, 2016

Project No: P05613-2015-001 020



Contents

1. BACKGROUND AND PURPOSE

The City of Livingston is pursuing an upgrade to their Wastewater Treatment Plant, in order to comply with forthcoming more stringent discharge regulations for ammonia, total nitrogen and phosphorus, and to replace existing, deteriorated treatment equipment so that the City has a facility that will be sufficient for twenty to thirty years into the future. In 2014 the City procured a Wastewater Facility Plan that served as the Preliminary Engineering Report (PER) for the needed project. That document was submitted to the Department of Environmental Quality and Department of Natural Resources Conservation, to procure funding for the project.

Since the submission of the PER, the City has completed a more detailed Nutrient Removal Treatment Process Evaluation (2015) and solicited for Statements of Qualifications for final design of the project. During these efforts, additional project needs have been identified. The purpose of this PER Amendment is to describe significant changes and additions to the project since the PER was submitted, and to update the estimated construction cost, so that the City of Livingston can secure funding for construction.

2. CITY OF LIVINGSTON WASTEWATER FACILITY PLAN (2013)

A Facility Plan / Preliminary Engineering Report (PER) on the existing Livingston Wastewater Treatment Plant (WWTP) was prepared in 2013-14 and submitted to funding and regulatory agencies in 2014. The Facility Plan provided an analysis of the existing WWTP and provided recommendations for upgrading the WWTP to solve deficiencies, expand capacity, and meet future regulatory and permitting requirements. The PER also included the engineer's opinion of probable construction cost (EOPCC). The City issued a Request for Qualifications based on this document in 2015.

3. CITY OF LIVINGSTON NUTRIENT REMOVAL TREATMENT PROCESS EVALUATION (2015)

In October 2015, the City of Livingston was presented with an additional document detailing further study and analysis of the recommended secondary treatment alternatives from the 2014 PER, with a specific focus on nutrient removal. The

document provided a more in-depth discussion of the A2O (anaerobic-anoxic-aerobic activated sludge system) and the Intermittent Cycle Extended Aeration System (ICEAS) Sequencing Batch Reactor (SBR) treatment alternatives, including preliminary sizing, BIOWIN modeling, discussion of necessary improvements to implement the alternatives, an updated EOPCC, and a recommendation to proceed with the ICEAS SBR design. The updated study and EOPCC included the following items that were not included in the 2014 PER:

- Reuse of the existing primary or secondary clarifiers or construction of new tanks for the purpose of post-secondary treatment equalization. The selected ICEAS SBR process creates a cyclical discharge pattern from the secondary treatment process. This pulsing pattern is not feasible for operation and performance of the downstream disinfection process. Therefore, an equalization tank downstream of the SBR is required. The proposed equalization tank would serve to allow continuous flow with reduced variability to downstream processes.
- New emergency generator. Upon deeper consideration of the A2O and ICEAS SBR alternatives, it was realized that the existing generator at the facility is undersized and will need to be replaced by a larger generator to provide power to critical system components during outages of the primary power supply. A properly sized emergency generator is required by Montana Department of Environmental Quality (MTDEQ) design standards for reliability purposes.

The Nutrient Removal document was not submitted to the aforementioned agencies. It is included with this Amendment for documentation purposes.

4. CURRENT STATE OF PROJECT

In October of 2015 the City of Livingston issued a Request for Qualifications (RFQ) for final design services for their Wastewater Treatment Plant upgrade. The RFQ was based on the 2014 PER and 2015 Nutrient Removal Treatment Process Evaluation. The City received a total of eight Statements of Qualifications, and short-listed three teams for interviews. AE2S was selected and subsequently contracted to complete the design of the WWTP upgrades. As part of the City's RFQ process and early preliminary design portion of the Project, AE2S has thoroughly reviewed the 2014 PER, 2015 Nutrient Removal Treatment Process Evaluation, and other previous work as available. Through this review, AE2S has identified additional project components that will be required to successfully complete the intended project.

This document serves as an amendment to the 2014 PER, providing an update to the original scope of work, and resulting estimated project costs. The updates include some items outlined by the 2015 Nutrient Removal Treatment Process Evaluation document, as well as components identified during the proposal process.

The facility has been referred to as a WWTP for many years. The proposed upgrades will be a meaningful step forward for the facility, and the system will hereafter be referred to as the Livingston Water Reclamation Facility (WRF), in order to recognize the significant improvements and to better align with current terminology.

Design Flows and Loads

The maximum observed flow and loading conditions must be utilized for the upgrades. These must be projected out to the future design flows and loads using population estimates and design target year. It should be noted that the 2014 PER utilized a 2035 planning year and population projection of 10,600. Based on a desire to design the upgrades for a design year of 2040, the engineer increased this to 11,500 for the 2015 NRTFPE, which continues to be the basis of the current design work.

However, the flows and loads for the WRF Upgrade were last evaluated in the 2014 PER. In order to ensure that the final design is based on the most accurate and up-to-date flows and loads, the analysis was updated in March of 2016. This update captured a more recent peak period flow and loading event from the summer of 2014 that now drives future design flows and loads. The results of projecting this period out for a population equivalent of 11,500 are provided in Table 1 on the following page.

Table 1. Updated City of Livingston Wastewater Flows and Loads

Parameter	Existing Population (7,245 ppl)		Design Population Equiv. (11,500 ppl)	
Annual Average Daily				
Flow	0.78	MGD	1.15	MGD
BOD	1924	lb/day	2775	lb/day
TSS	2135	lb/day	3071	lb/day
TKN	261	lb/day	415	lb/day
TP	65	lb/day	104	lb/day
Peak Month				
Flow	1.49	MGD	2.18	MGD
BOD	2482	lb/day	3580	lb/day
TSS	3088	lb/day	4441	lb/day
TKN	337	lb/day	535	lb/day
TP	84	lb/day	134	lb/day
Peak Day				
Flow	1.75	MGD	2.57	MGD
BOD	4639	lb/day	6691	lb/day
TSS	4948	lb/day	7118	lb/day
TKN	630	lb/day	1000	lb/day
TP	157	lb/day	250	lb/day
Peak Hour				
Flow	2.42	MGD	3.33	MGD
Instantaneous				
Flow	2.49	MGD	3.42	MGD
OTHER DESIGN PARAMETERS				
Site Elevation:			4755	ft MSL
Minimum Alkalinity:			100	mg/L
Effluent Temperature Ranges:				
7-Day Average:				
Max $Week_{avg}$			20.7	°C
Min $Week_{avg}$			8.0	°C
Design Population Equivalence			11500	ppl

Effluent Discharge Limits

The City's current MPDES permit expired October 31st, 2014 and the new permit has not been received. Effluent discharge limits were projected using current knowledge of Montana Department of Environmental Quality (DEQ) surface water discharge permitting requirements and flows and water quality in the receiving water (Yellowstone River). Table 2 lists the results of the projections.

The new ammonia, total nitrogen and total phosphorus limits are one of the primary drivers for the new project.

These results are being presented to DEQ, with the intent of receiving verification prior to initiating final design (June 2016).

Table 2. City of Livingston Effluent Discharge Limit Projections for Future Permit Cycle.

Parameter	Units	Existing Permit			Projected Permit		
		30 Consecutive Day Average	7 Consecutive Day Average	Daily Maximum	30 Consecutive Day Average	7 Consecutive Day Average	Daily Maximum
Design Flow Basis	**MGD**	2.0	N/A	N/A	2.18	N/A	N/A
BOD - 5 day	**mg/L**	30	45	N/A	25	45	N/A
	lb/day	450	675	N/A	450	675	N/A
Total Suspended Solids	**mg/L**	45	65	N/A	30	45	N/A
	lb/day	450	675	N/A	450	675	N/A
E. Coli, summer	**(number/100ml)**	126	252	N/A	126	252	N/A
E. Coli, winter	**(number/100ml)**	630	1,260	N/A	630	1,260	N/A
Oil & Grease	**mg/L**	N/A	N/A	10	N/A	N/A	10
Ammonia as N, current WQS*	**mg/L as N**	4.4	N/A	6.0	4.4	N/A	6.0
Ammonia as N, 2013 EPA Basis	**mg/L as N**	N/A	N/A	N/A	3.10	N/A	4.26
Total Residual Chlorine	**mg/L**	0.011	N/A	0.019**	0.011	N/A	0.019**
Total Nitrogen* **	**mg/L**	N/A	N/A	N/A	**16.17** to 174.3	N/A	N/A
	lb/day	294	N/A	N/A	294	N/A	N/A
Total Phosphorus* **	**mg/L**	N/A	N/A	N/A	**4.07** to 17.43	N/A	N/A
	lb/day	74	N/A	N/A	74	N/A	N/A
Nitrate as N** **	**mg/L**	N/A	N/A	N/A	188	N/A	N/A
pH	**standard units**	Shall remain within the range 7.0 to 9.0					
Percent Removal	**%**	BOD and TSS shall be greater than 85% removal in a 30 consecutive day period.					
Whole Effluent Toxicity		Pass/Fail Testing					

*From "Final Effluent Limit" in the 2009 Statement of Basis

**Maximum instantaneous

***Existing "Permit" limits based on non-degradation load basis from Statement of Basis. Potential range of calculated future effluent limits based upon DEQ preliminary Yellowstone in-stream standards and a range of assumptions.

****Will not actually be a limit because the high value will result in a determination of No Reasonable Potential to exceed the WQS

Septage Receiving Station

Due to its rural setting and proximity to Yellowstone National Park, the City of Livingston processes a significant volume of septage.

Currently, RV septage is received year-round and discharged to the City's collection system at TJ's Gas Station. The Park County Fairgrounds also has a septage station, but it is currently only utilized during the annual county fair.

At one time, the WRF had a septage receiving station, but it was removed several years ago. Local haulers have expressed interest in having a receiving station at the WRF. Currently septage is disposed of at land application sites, which are reportedly becoming more difficult to retain, and it is difficult to obtain new sites. There is the potential that septage may also be reaching the WRF via unauthorized discharges.

For all of these reasons, the City is evaluating inclusion of a septage receiving station in the WRF Upgrade design, so that septage disposal can be done in a controlled and environmentally sound manner.

At minimum, this station would consist of a concrete pit with a coarse manual screen and an isolation valve on the pipeline connecting it to a holding tank and the WRF headworks. Operations staff would visually check the septage and measure its pH prior to opening the isolation valve and allowing the septage into the holding tank. From the holding tank it would be slowly metered into the treatment plant.

At maximum, an automated receiving station will be utilized. These stations have a cardlock system to prevent unauthorized use, along with a grinding and screening system. A holding tank would still be included to allow metering of the septage into the treatment plant.

Once the cost-benefit of septage receiving has been completed the City will decide whether or not to include it in the final project. If it is decided that it should be included, a detailed loading analysis will be completed and the results will be added to the current loads shown in Table 1.

Redundant Grinder and Auger Screen

It is recommended that a second grinder and screen system be installed at the WRF. There is a channel in the Headworks Building for the second train.

The current headworks at the Livingston WRF includes a single grinder and auger screen. A bypass channel with manual screen is in place for instances when the existing grinder or screen must be removed from service. The grinder and screen remove debris that could otherwise have adverse impact or damage downstream processes and/or equipment. The existing rotating biological contactors (RBCs) in use

at the plant are not sensitive to screenings. However, the continuous flow SBR systems under final consideration have equipment that is susceptible to damage from screenings. Stringy materials can wind around submersible mixing impellers and cause them to fail. Debris can also damage fine bubble diffuser equipment.

Installation of a second grinder and auger screen in the bypass channel is recommended to allow the WRF to have a fully redundant screening to protect downstream processes at all times, in the event that one grinder and screen train is out of service.

Continuous Flow Sequencing Batch Reactor Process

The 2015 Nutrient Removal Treatment Process Evaluation work recommended the Intermittent Cyclical Extended Aeration System (ICEAS) process, which is Xylem Sanitaire's (continuous flow, or flow-through) Sequencing Batch Reactor (SBR) packaged equipment system. This process was utilized for the recent Glendive, MT wastewater treatment plant upgrade. AE2S is in agreement with preliminary selection of this continuous flow SBR technology and it is being used as the basis of initial preliminary design engineering.

However, it is understood that an evaluated bid (pre-selection) process is required for the public funding sources being pursued. This process must be used to evaluate alternative continuous SBR technologies and the decision criteria must be clearly explained prior to identification of the selected vendor. Therefore, there is the potential that an alternative sequencing batch reactor technology could be selected. This preselection approach will be developed during the preliminary design process, for release in May of 2016.

Secondary Effluent Equalization

The 2015 Nutrient Removal Treatment Process Evaluation indicated that a secondary effluent equalization tank would be required for the project.

Secondary effluent equalization could allow a continuous discharge flow to the disinfection process and eliminate the UV system having to treat pulsing flows. Potentially the existing primary or secondary clarifier unit processes could be repurposed for post-SBR equalization, eliminating the need for the construction of new tanks.

Additional evaluation has been done to date on the need for and potential benefit of post-SBR equalization, with the following outcomes:

1. Full equalization (where secondary effluent flows essentially match plant influent flows) would require "fill and drawdown" operation of equalization volume.

2. The existing primary clarifiers or secondary clarifiers could provide full equalization if flow was pumped to the UV disinfection system. This would prohibit the dual use of the equalization volume for potential chemical phosphorus removal.
3. Reuse of existing infrastructure would require post-equalization pump station, as the structures are not high enough to enable gravity flow for the full equalization volume.
    a. The existing secondary clarifiers are not suitable for post-SBR flow equalization. The existing volume does not provide substantial equalization capacity, and the walls cannot be raised without expensive strengthening/support measures.
    b. The existing primary clarifiers could be utilized for significant, but partial flow equalization. They would not provide full flow equalization without significant and expensive strengthening/support measures.
4. The two primary UV equipment manufacturers being considered have indicated that pulse flows are not an issue in terms of performance. The higher peak flow that will be incurred will require more UV equipment, and the reactors will have to remain on, in a reduced power "standby" mode. The net present value of this alternative will be considered against all equalization alternatives.
5. Construction of new equalization tanks that would provide full equalization and gravity flow from the new SBRs to the UV disinfection facility will be cost-prohibitive.

As a result, the current plan for post-SBR equalization is to evaluate alternatives on a net present worth basis and use the results to identify the preferred solution. The results will be included in the preliminary design report (May 2016).

UV Disinfection

The existing UV disinfection system is problematic from a performance and operation and maintenance perspective. The system is not sized appropriately for the effluent quality produced by rotating biological contactors, the lamp sleeves are fouling more rapidly than the typical installation, and the system is not within a structure and exposed to the harsh environment of Livingston (high winds, extreme cold).

The existing installation may be appropriately sized for the better effluent quality that will be realized with the WRF upgrades. The ability of the existing UV installation to work with the future facility hydraulic profile, perform sufficiently with a conservative SBR effluent quality, and requirements for any flow control upgrades will all be evaluated further during preliminary design. Even if the existing system appears sufficient,

preliminary design will include providing an enclosed structure around the installation. If the existing installation is deficient, the existing UV system will need to be upgraded. The following alternatives will be evaluated:

1. Expand UV through additional UV equipment within the existing channel and/or in an adjacent channel. Construct a structure around the channels and equipment. If the facility and equipment hydraulics allow for the addition of new equipment to satisfy disinfection needs, it may be possible to expand the disinfection process at its current location. Based on the current assumption that additional pumping may be required after the secondary equalization tanks, it is currently assumed that the hydraulics will not be cause for concern and the existing location may be used; however, to remain conservative it has also been assumed that an additional channel with disinfection equipment is required for additional capacity/redundancy. A structure (e.g., precast panels, concrete masonry units (CMUs), etc.) would be constructed around the area. This is the approach that has currently been assumed in the opinion of cost.

2. If the existing equipment and location will not work long-term, re-use of existing items will be abandoned, and a new UV disinfection system will be designed. Design of a new disinfection system outside of the current location will include an analysis of the existing chlorine contact channel as a potential location for a new installation. This analysis would extend to the feasibility of not only installing UV equipment in the channel, but retrofitting the area to provide an enclosed structure over the channel.

Process Control Building

Discussion of an expanded and refurbished process control (administration) building was discussed and included in the cost estimate for the 2013 Facility Plan. The 2015 Nutrient Removal document again discussed a process control building but with a revised recommendation to provide new building construction that would include housing of motor control centers, process blowers, locker rooms, control room, and offices.

This amendment confirms that a new building will be designed, in order to avoid costly retrofit of the existing control building, which is problematic due to its common wall construction and integration with the circular anaerobic digester tanks. The new building will be located to the south of the existing control building, across the plant access road.

The new control building will house new equipment, including blowers for the SBR and aerobic digesters, thickening equipment, and waste activated sludge (WAS) pumps and thickened WAS pumps. If the existing digested sludge pump station cannot be reused, the building may also house new digested sludge pumps.

WAS Thickening

WAS will be thickened prior to the aerobic digestion process in order to reduce the aerobic digester volume, which will reduce construction and aeration costs. WAS will be pumped from the new SBR process during the decant cycles, resulting in a similar pattern to the secondary effluent flow (pulsed). This will likely favor equalization of WAS flows, in addition to thickening. The potential to combine the two functions into one equalization and thickening process will be evaluated.

Thickening methods that will be considered include gravity, rotary drum, gravity belt and dissolved air floatation. Any of the thickening processes will include a polymer feed and conditioning system, as well as pumps to convey thickened WAS to the aerobic digestion process.

Aerobic Digesters

The 2013 Facility Plan provided a recommendation to repurpose the two existing circular anaerobic digesters to aerobic digesters. The 2015 Nutrient Removal Treatment Process Evaluation document estimated that the two existing anaerobic digesters would not provide enough volume for long-term aerobic digestion and provided a new recommendation to construct new circular aerobic digesters independent of all other structures, near the existing digesters and administration building.

AE2S began evaluating reuse of the existing primary and secondary clarifiers, as well as the anaerobic digesters, for possible conversion to aerobic digesters, with the following results:

1. The secondary clarifiers have proven too small.
2. The existing primary clarifiers have volumes that are more appropriate for aerobic digestion, but are shallower than preferred for this purpose. The aerobic digestion process would also need to be covered, and to cover the existing primary clarifiers aluminum domes would be required.
3. The existing anaerobic digesters appear to provide just barely enough volume, with thickened WAS, to provide digestion at the future peak month condition.

Therefore, reuse of the anaerobic digesters is being evaluated further in 2016, alongside construction of new aerobic digesters. However, rather than construct new,

stand-alone, circular digesters, the tanks would be constructed adjacent to the new SBR process so that common wall construction can be utilized.

Common wall construction would reduce capital costs and yard piping requirements by placing the structures nearby related process equipment including pumps, blowers, and thickening equipment. Refined volume requirements for aerobic digestion will be based on calculations for sludge wasting from the continuous flow SBR process. Based on the required volume, footprint, and selected technology, length, width, and height dimensions will be determined to provide for design effective in both cost and treatment.

A thorough comparison of the reuse of rehabilitated anaerobic digesters, versus common wall construction of new tanks, will be finished in May of 2016.

If new aerobic digesters are utilized, one of the existing anaerobic digesters will be re-purposed into digested sludge storage. This will enable reuse of the existing digested sludge pumps to convey digested sludge to the existing screw press. If the anaerobic digesters are selected for rehabilitation for aerobic digestion, then a digested solids storage tank will be constructed as part of the project. The current construction cost estimate assumes construction of new aerobic digesters, in order to remain conservative.

Standby Power Generation

This amendment document concurs with recommendation of the 2015 Nutrient Removal Treatment Process Evaluation that a new generator is needed, due to the critical electrical load for the upgraded facility. Sizing of the new standby generator will be based on powering the existing and new facility components that are deemed critical to effluent quality and operator safety. Based on recent experience with wastewater treatment standby power installations, the cost of this work will likely be higher than that considered in the 2015 document.

Process Flow Diagram

Updated 11” x 17” Process Flow Diagrams (PFD) for liquids and solids process streams are attached to this Amendment. The PFD shows the more conservative project alternatives described herein. The PFD will be updated as design progresses. Specifically, the reuse of some structures will be shown if this proves feasible.

Revised Construction Cost Estimate

A new cost estimate was prepared to incorporate each of the aforementioned revisions. The cost estimate is presented on a per structure basis in Table 3.

Table 3. Updated Livingston WRF Upgrade Opinion of Probable Construction Cost

Opinion of Probable Costs	Subtotal Construction Costs with Adders
Description	
Mobilization, Bonds, Insurance (7%)	$731,000
Site Work	$549,000
Septage Receiving Station	$100,000
Headworks	$237,000
ICEAS SBR (Basis of Design at this time)	$3,156,000
Aerobic Digesters	$2,045,000
Process Control Building	$2,822,000
Post EQ Pump Station	$304,000
Ultraviolet Disinfection	$799,000
Back-up Generator	$425,000
Subtotal Construction Costs	**$11,168,000**
Construction Contingencies (20%)	$2,234,000
Opinion of Probable Construction Costs (Excluding Engineering, Legal, and Administration)	**$13,402,000**

EXISTING INLET STRUCTURE

INFLUENT

EMERGENCY BYPASS (NOT IN USE)

EXISTING HEADWORKS BUILDING

EXISTING MECHANICAL FINE SCREEN

EXISTING CHANNEL GRINDER

NEW CHANNEL GRINDER

NEW MECHANICAL FINE SCREEN

EXISTING GRIT/SLURRY PUMPS

EXISTING GRIT WASH

EXISTING GRIT DEWATERING

DUMPSTER

GRIT REMOVAL BYPASS

EXISTING GRIT REMOVAL

FROM DEWATERING UNIT SEE SHEET GEN/P2

EXISTING INFLUENT PUMP STATION

SECONDARY TREATMENT INFLUENT

EXISTING PRIMARY CLARIFIER SLUDGE

EXISTING PRIMARY CLARIFIER SCUM

TO SOLIDS SEE SHEET GEN/P2

EXISTING PRIMARY CLARIFIER (POTENTIAL REPURPOSED POST SECONDARY EQUALIZATION) ALTERNATE No. 2

EXISTING PRIMARY CLARIFIER (POTENTIAL REPURPOSED POST SECONDARY EQUALIZATION) ALTERNATE No. 2

SECONDARY TREATMENT INFLUENT

NEW ICEAS SBR No. 1

NEW ICEAS SBR No. 2

FLOATING DECANTER

WAS PUMP

SECONDARY TREATMENT EFFLUENT

EQUALIZATION EFFLUENT (ALTERNATE No. 2)

PROCESS AIR FROM BLOWERS SEE SHEET GEN/P2

TO SOLIDS SEE SHEET GEN/P2

EXISTING EMERGENCY POND (NOT IN USE)

EXISTING ROTATING BIOLOGICAL CONTACTORS

EXISTING SECONDARY CLARIFIERS

(POTENTIAL REPURPOSED POST SECONDARY EQUALIZATION) ALTERNATE No. 1

EXISTING SECONDARY CLARIFIER SLUDGE

TO SOLIDS SEE SHEET GEN/P2

EXISTING CHLORINE CONTACT BASIN

NEW DISINFECTION BUILDING

EXISTING UV DISINFECTION MODULE

EXISTING UV DISINFECTION MODULE

NEW UV DISINFECTION MODULE

NEW UV DISINFECTION MODULE

NEW SECONDARY EQUALIZATION PUMP STATION

EXISTING OUTFALL STRUCTURE

TO YELLOWSTONE RIVER

EFFLUENT

DISINFECTION EFFLUENT

DISINFECTION INFLUENT

PROCESS LIQUID FLOW SCHEMATIC LEGEND

- PROCESS FLOW (EXISTING)
- PROCESS FLOW
- PROCESS FLOW (FUTURE)
- PROCESS FLOW EQUALIZATION (ALTERNATE 1)
- PROCESS FLOW EQUALIZATION (ALTERNATE 2)
- PROCESS FLOW ABANDONED
- GRIT FLOW (EXISTING)
- RECYCLE FLOW (EXISTING)
- RECYCLE FLOW (EXISTING)
- SOLIDS WASTE FLOW
- PROCESS AIR FLOW
- PROCESS EQUIPMENT
- PROCESS EQUIPMENT (EXISTING)
- PROCESS EQUIPMENT (FUTURE)
- STRUCTURE
- STRUCTURE (EXISTING)

1 GEN P1 **LIQUID FLOW SCHEMATIC**
SCALE: NONE

PRELIMINARY

SYM	DATE	DESCRIPTION	APPR

MILESTONE - 30%

WASTEWATER RECLAMATION FACILITY UPGRADE
CITY OF LIVINGSTON
LIVINGSTON, MONTANA
PROCESS LIQUID FLOW SCHEMATIC

DRAWING TYPE	REPORT
PREPARED BY	RCL
CHECKED / APPROVED	MAM / SB
DATE	MARCH 2016
PROJECT NUMBER	P05613-2015-001
SHEET	1 of 2
FACILITY or AREA	GEN
DRAWING	P1

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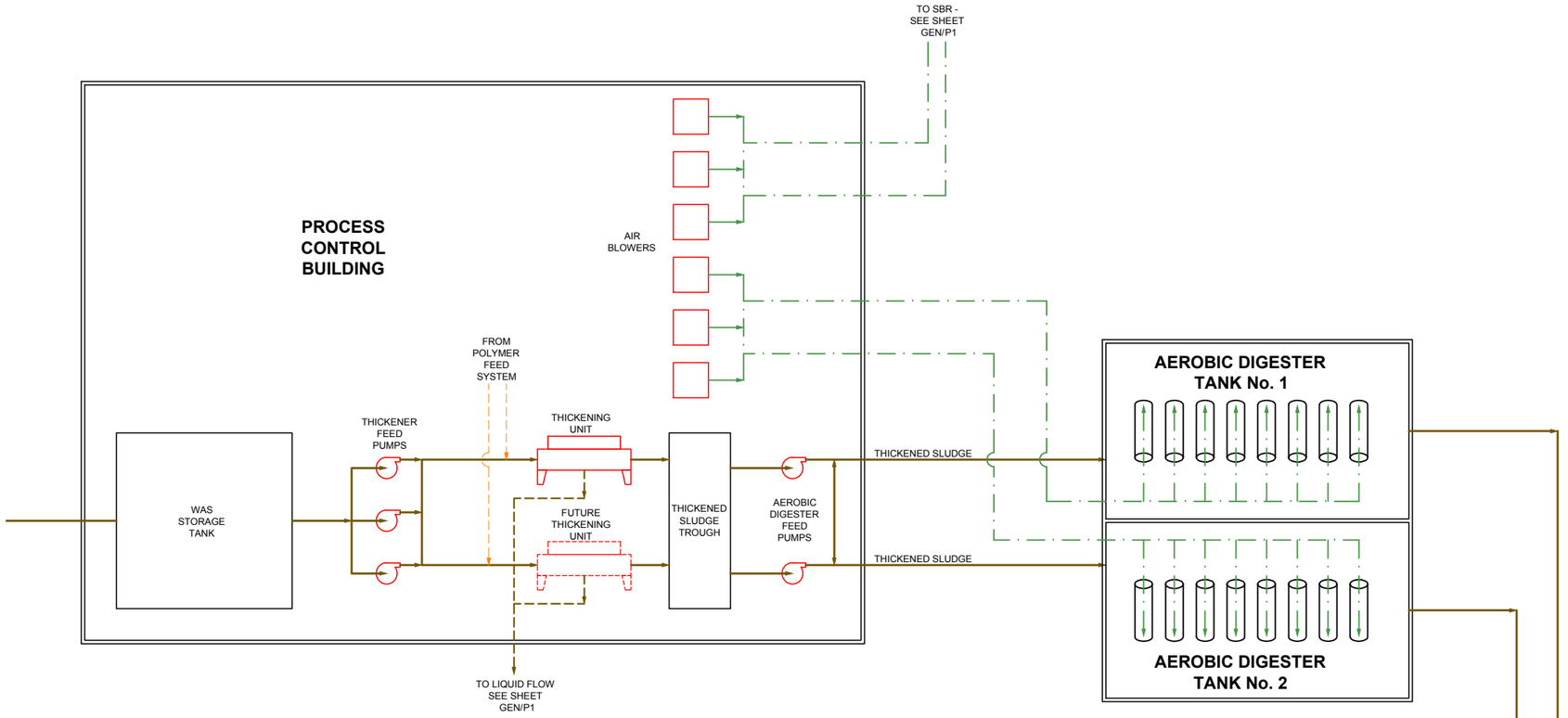

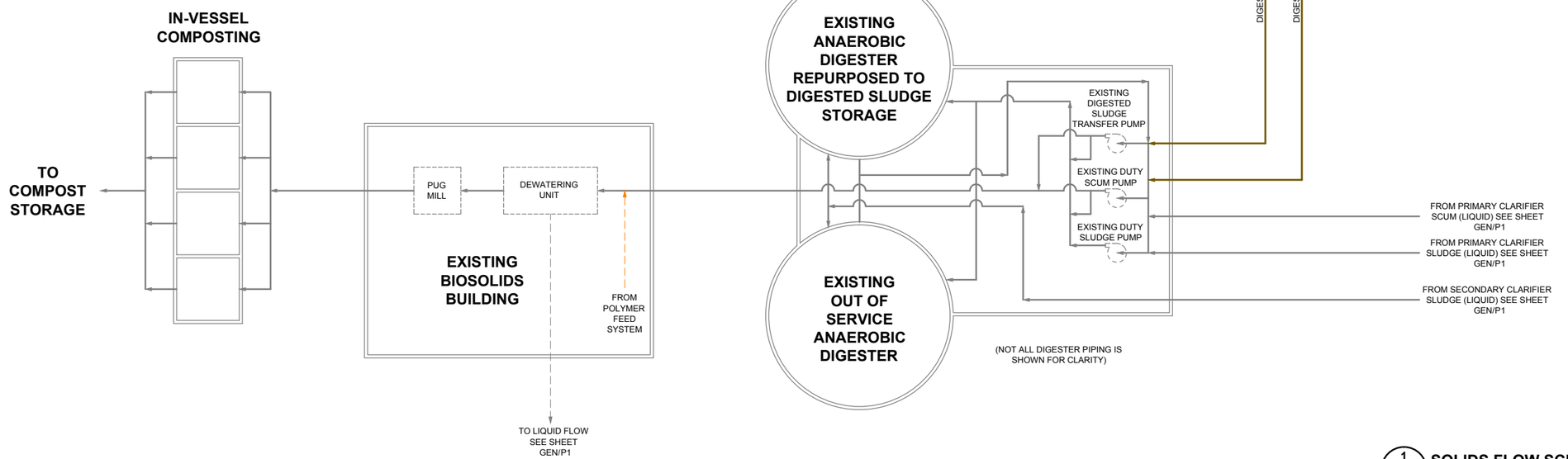

BIOSOLIDS SCHEMATIC LEGEND

PROCESS SOLID FLOW SCHEMATIC LEGEND

- SOLIDS FLOW
- SOLIDS FLOW (EXISTING)
- RECYCLE FLOW
- RECYCLE FLOW (EXISTING)
- PROCESS AIR FLOW
- CHEMICAL FEED
- PROCESS EQUIPMENT
- PROCESS EQUIPMENT (FUTURE)
- PROCESS EQUIPMENT (EXISTING)
- STRUCTURE
- STRUCTURE (EXISTING)

SYM	DATE	DESCRIPTION	APPR

MILESTONE - 30%

WASTEWATER RECLAMATION FACILITY UPGRADE
CITY OF LIVINGSTON
LIVINGSTON, MONTANA

PROCESS SOLID FLOW SCHEMATIC

DRAWING TYPE: REPORT
PREPARED BY: RCL
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DATE: MARCH 2016
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SHEET: 2 of 2
FACILITY or AREA: GEN
DRAWING: P2

1 GEN P2 **SOLIDS FLOW SCHEMATIC**
SCALE: NONE

PRELIMINARY