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PARAMOUNT GOLD
Nevada

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Paramount Gold Nevada Corp. Grassy Mountain Gold Project, Malheur County, Oregon, USA

Mill Design Report October 2022

24 October 2022

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
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Renews: 06/30/2024

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Abbreviations

ACDP	Air Contaminant Discharge Permit
Ag	silver
Au	gold
BV	bed volume
CIL	carbon-in-leach
CN_{WAD}	Weak Acid Dissociable cyanide
CPA	Consolidated Permit Application
Cu	copper
d	day
DOE	Department of Energy
EGL	effective grinding length
EPA	Environmental Protection Agency
FEL	front-end loader
h/y	hours/year
HCl	hydrochloric
HCN	hydrogen cyanide
HDPE	high density polyethylene
LOM	life of mine
OCN^-	cyanate
O/F	overflow
ORP	oxidation reduction potential
PFD	Process Flow Diagram
PM	particulate matter
PPE	personal protective equipment
ppm	parts per million
ROM	Run-of-Mine
SCN-	Thiocyanate
SMBS	sodium metabisulphite
TSF	tailings storage facility
TSDF	tailings storage disposal facility
U/F	underflow
UV	ultraviolet
WAD	Weak Acid Dissociable
y	year

Units of Measurement

gal	US gallon
lb	pound
hp	horsepower
kWh	kilowatt-hour
oz	troy ounce
sqft	square foot

1 Introduction

Paramount Gold Nevada Corporation (Paramount), a gold mining company based in Nevada, USA, is continuing to develop the Grassy Mountain Project in Malheur County, Oregon. The site is located in eastern Oregon, approximately 70 miles west of Boise, Idaho and 22 miles south of Vale, Oregon.

The project includes an underground mine, process plant, and associated infrastructure, with a capacity to process 750 short tons of ore per day resulting in approximately 46,600 ounces of gold annually. The process plant will produce gold doré bars to be sold to local gold refiners.

The crushing plant consists of primary and secondary crushing producing a crushed ore product, then ground in a ball mill which feeds the process plant. The leach and carbon-in-leach (CIL) circuit cyanide is used to recover gold from the ore and activated carbon is used to adsorb the extracted gold from solution. Following the leach-CIL circuit, the carbon is collected and treated in the elution circuit which separates the gold from the carbon. The carbon is regenerated and reused in the CIL circuit, while the gold is removed from solution in the integrated electrowinning plant. The stripped gold is then smelted in a gold room to produce gold doré bars. Leached tailings are detoxified in an SO_2/Air cyanide destruction circuit. Detoxified tailings are then lime treated to increase their neutralization potential and pumped to a tailings storage facility (TSF) for final deposition and recovery of decant water.

The crushing and process plant consists of:

- Two-stage crushing and screening circuit;
- Ball mill grinding circuit;
- Hybrid leach-CIL circuit with pre-aeration;
- Elution circuit;
- Gold room;
- Carbon regeneration;
- Mercury removal circuit;
- Cyanide detoxification;
- Reagent and air services;
- Water services (raw water, process water, potable water).

A depiction of the key unit operations involved in the process is shown in Figure 1-1.

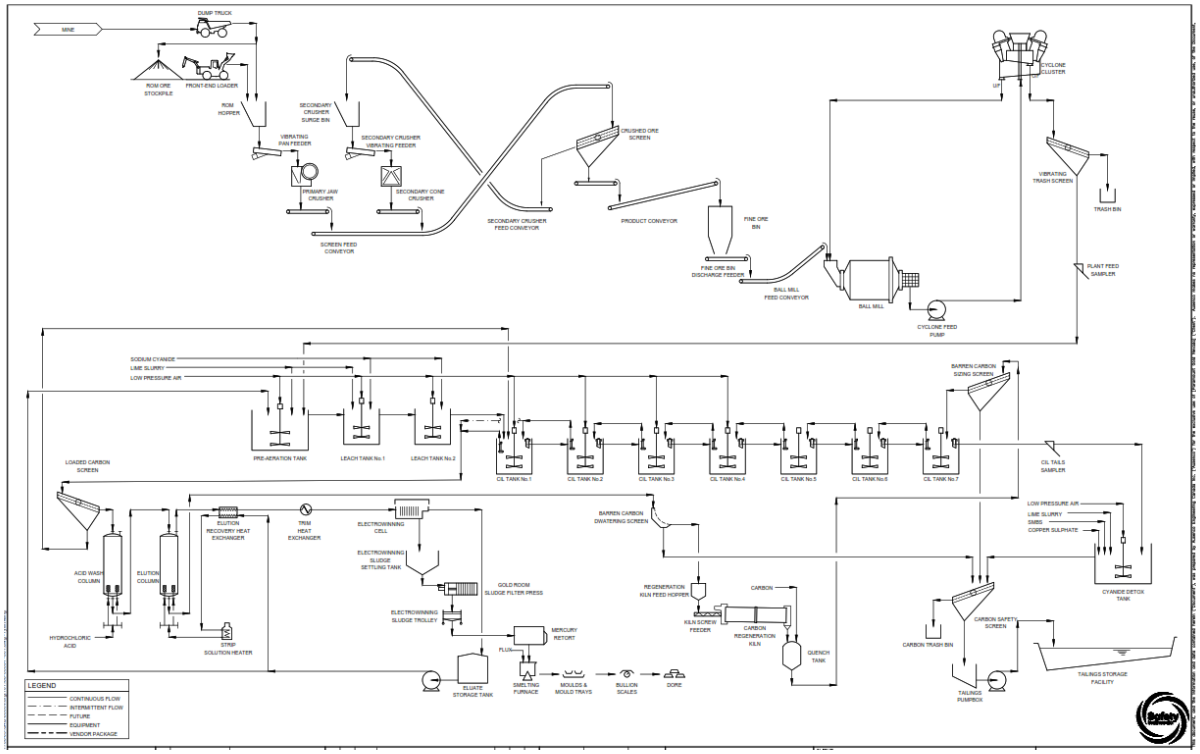


Figure 1-1: Grassy Mountain Process Flowsheet

The intent of the Mill Design Report is to address the following items from Chapter 340, Division 43 - Chemical Mining by the Department of Environmental Quality of the State of Oregon:

- Description of the facilities to be constructed, including tanks, pipes and other storage and conveyance means for processing chemicals, solutions, and wastewaters;
- Description of all chemical process and facilities for mixing, distribution, and application of chemicals associated with on-site mining operations, ore preparation, and beneficiation facilities;
- Description of all chemical conveyances (ditches, troughs, pipes, etc.) and the requisite equipment with secondary containment and leak detection means for preventing and detecting release of chemicals to surface water, groundwater and soils.

1.1 Plant Design Basis

The key criteria selected for the plant design are:

- Plant treatment rate of 750 short tons/day on a dry solids basis;
- Design crushing plant operating time of 70% (crushing / screening / conveying);
- Design process plant operating time of 91.3% (milling / leaching & adsorption / detoxification / elution / refining).

1.2 Throughput & Availability

An overall crushing plant availability of 70% and a process plant availability of 91.3% over the course of the year yield a total crushing plant operating time of 6,132 h/y and a total process plant operating time of 7,998 h/y.

1.3 Key Design Criteria

The major process design criteria developed for the Grassy Mountain Project are outlined in Table 1-1.

Table 1-1: Grassy Mountain Process Design Criteria

Description	Units	Value
Ore Throughput, LOM average	short tons/y	248,365
Design Grade - Au	oz/short ton	0.266
Design Grade - Ag	oz/short ton	0.280
Operating Schedule		
Crusher Plant Availability	%	70
Plant Availability	%	91.3
Throughput, Daily	short ton/d	750
Plant capacity, Hourly	short ton/h	34.2
Crushing (Two Stage)		
Primary Crusher	type	Single Toggle Jaw Crusher
Secondary Crusher	type	Cone Crusher
Fine Ore Bin Residence Time - Live	h	8
Grinding		
Circuit Type		Ball mill
Bond Ball Mill Work Index	kWh/short ton	26.9
Ball Mill, Dimensions	ft x ft	12 x 16
Ball Mill Required Power	hp	1,021
Ball Mill Installed Power	hp	1,341
Feed Particle Size, F80	in	0.26
Product Particle Size, P80	U.S. mesh	150
Carbon-in-Leach		
Total Leach Time Required	h	24
Number of Tanks	#	1 pre-aeration + 2 leaching + 7 adsorption
Cyanide Addition	lb/short ton	0.68
Lime Addition	lb/short ton	2.1

Description	Units	Value
Carbon Concentration	lb/gal	0.21
Carbon Loading (Au + Ag)	oz/short ton	187
Carbon consumption	lb/short ton	0.06
Desorption		
Carbon batch size	short ton	2.2
Elution CIL strips per week	#	7
Furnace capacity, Au + Ag	lb/smelt	57.5
Cyanide Destruction		
Method	-	SO_2 / Air
Residence time, max for design	min	90
CN_{WAD} in feed, max for design	ppm	200
CN_{WAD} not-to-exceed value	ppm	30
CN_{WAD} discharge target for design	ppm	15
SO_2 addition	lb/lb CN_{WAD}	6.4
Hydrated lime addition	lb/lb CN_{WAD}	10.8
Cu addition	lb/lb CN_{WAD}	0.11
Tailings Neutralization Potential Augmentation		
Hydrated lime addition	lb $Ca(OH)_2$/lb	0.019

1.4 Overall Site Process Flow Diagram

Drawing Overall Site Process Flow Diagram (101768-0000-F-001) shows the basic process design circuits and the selection of major equipment for the process plant. This drawing can be found in Figure 1-1 and is included in Appendix A.

The descriptions in the following sections include references to Process Flow Diagrams (PFDs) which are included in Appendix B.

2 Area 3110 – Crushing

Overview:

Run-of-mine (ROM) ore is transported by haul truck from the underground mining operation to the crushing plant area and fed either directly to the ROM hopper or onto the outdoor ROM ore stockpile. The ROM ore stockpile (which is designed by others) will have a lined base pad, with containment berms along each edge of the stockpile, and a sump to collect the contact run-off. The liner is specified as a geocomposite, Geosynthetic Clay Liner (GCL) and a 80-mil HDPE geomembrane covered with 300 mm surfacing gravel. The over liner provides protection for operation of heavy equipment such as ordinary front end loader and road traffic trucks. The pad will be nominally sloped towards the sump to promote drainage. The sump level will be continuously monitored and emptied to the process water tank using a portable submersible pump as required.

It is understood that the ROM ore stockpile has a nominal design capacity of 3,000 short ton. The geocomposite GCL and liner base will cover an area of 14,200 sqft.

Ore is received by the ROM hopper at the crushing plant before being discharged onto the vibrating pan feeder and fed to the primary jaw crusher for the first crushing stage. The crushed ore is then conveyed to the crushed ore screen. The undersize from the screen is suitable for ball mill feed while the oversize is fed to the secondary cone crusher. The secondary cone crusher product is returned by conveyors to the crushed ore screen along with new crushed product from the primary jaw crusher, initiating the closed-circuit loop within the crushing plant. This process repeats itself to ensure that the ore is all reduced in size before moving on for further downstream processing.

Reference PFDs: 101768-0000-F-002 Rev E Crushing, Screening, and Reclaim Area

Reference GA: 101768-0000-G-102 Rev D Plant Site General Arrangement Plan

2.1 Crushing Plant

The crushing plant operates 7 days per week for the entire year with an availability of 70%. The nominal throughput is 45 short tons per hour. The crushing plant consists of one of each of the following: ROM hopper, vibrating pan feeder, primary jaw crusher, crushed ore screen, secondary crusher surge bin, secondary crusher vibrating feeder, secondary cone crusher and fine ore bin. The ROM ore is received at a ROM hopper filled either directly by the dump truck or by using a front-end loader (FEL) that draws from the ROM ore stockpile. The ore leaving the ROM hopper is fed to the primary jaw crusher by means of a vibrating pan feeder. The ore is reduced by a primary jaw crusher and discharged onto the jaw crusher discharge conveyor followed by the screen feed conveyor.

The screen feed conveyor transports the crushed ore to the crushed ore screen, where the undersize is collected and conveyed on the screen discharge conveyor followed by the product conveyor to the fine ore bin for mill feed. The crushed ore screen oversize is sent on the secondary crusher feed conveyor to the secondary crusher surge bin. Ore from the secondary crusher surge bin will pass over the secondary crusher vibrating feeder and into the secondary cone crusher to be reduced further. The secondary cone crusher discharge is recirculated to the crushed ore screen to repeat the size classification step. A metal detector and belt magnet are included in the crushing plant to recognize and remove any metal debris that could potentially cause damage to the crushing equipment.

The product from the crushing plant is conveyed to the fine ore bin to be sent to the grinding circuit in the process plant. The product conveyor is fitted with a weightometer to monitor crushing plant throughput and assist with operational and metallurgical accounting. The fine ore bin has a live capacity of 8 hours, the equivalent of 274 short tons of live material.

3 Area 3200 – Grinding

Overview:

The grinding circuit receives the fine ore product at the ball mill feed conveyor which then deposits the material at the mill feed chute. The ore is ground to a desired product size with the addition of process water and steel ball grinding media. The ground ore slurry is discharged to the cyclone feed pump box and pumped to the cyclone cluster pack to be classified into cyclone overflow stream, dominated by fine particles, and cyclone underflow stream, dominated by coarse particles. The overflow stream is passed through a trash screen to remove any trash prior to being sent to the leaching process while the underflow is recirculated back to the mill feed chute.

Reference PFDs:

101768-0000-F-002 Rev E Crushing, Screening & Reclaim Area Process Flow Diagram

101768-0000-F-003 Rev D Grinding Area Process Flow Diagram

3.1 Ball Mill

The fine ore bin provides 8 hours of storage to account for differences in availability between the crusher and milling circuits and allows for continuous milling operation at the nominal feed rate of 34.2 short tons per hour. The crushed ore is fed from the fine ore bin discharge feeder onto the ball mill feed conveyor which discharges directly into the ball mill via the mill feed chute. The mill is a 12.0 ft x 16.0 ft (d x EGL) overflow ball mill, which is operated at 70% of the critical speed and with a nominal operating ball mill charge of 31% on a volumetric basis. Ore addition to the ball mill is supplemented with process water to achieve a milling density of 72% solids (by weight). The ball mill also receives a nominal circulating load of 250% from the underflow portion of the cyclone cluster. To avoid damage to the cyclone feed pumps and cyclone cluster, the ball mill discharge is screened through a trommel to scalp off oversized particles and broken grinding media. The scalped off materials are then stored in the scats bunker. The oversize material will be manually removed periodically.

The trommel screen undersize slurry from the ball mill is discharged to the cyclone feed pump box, diluted to 63.5% solids with process water, and pumped to a classification cyclone cluster

3.2 Cyclone Classification

The cyclone cluster operates in a closed-circuit with the ball mill.

The slurry from the cyclone cluster underflow is recirculated to the ball mill feed chute for further grinding. The cyclone overflow slurry flows by gravity to a trash screen where the slurry is distributed over the trash screen to remove any plastic, steel, wood, and organic refuse coming from the mine. The overflow slurry density is nominally 45% solids.

A sump pump is installed in the grinding area to facilitate clean-up. The pump discharges into the cyclone feed pump box. Maintenance activities and mill ball charging in the grinding and classification area are serviced by the mill area crane.

4 Area 3400 – Carbon-in-Leach

Overview:

The overflow slurry from the cyclone cluster is initially screened by the trash screen to prevent any debris that could impact the gold extraction or recovery to reach the CIL circuit. After passing through the screen the slurry reports to the pre-aeration tank where the slurry is pre-treated with lime and air to ensure a protective operating pH for cyanide leaching and to ensure optimal gold extraction and minimize cyanide consumption. Following pre-treatment, the slurry flows through two leaching tanks where cyanide and lime is added. The slurry will then overflow into seven CIL tanks. During this stage the slurry and activated carbon flow counter-currently throughout the CIL tanks. Carbon is added to the last tank and sequentially pumped to the first tank, while slurry is added to the first tank and flows to the last. The slurry exits the final tank and overflows to the cyanide detox tank. The loaded carbon exiting the first CIL tank is pumped to the loaded carbon screen in the elution circuit to be prepared for acid washing and elution.

Reference PFDs: 101768-0000-F-005 Rev E Pre-Leach & CIL Area Process Flow Diagram

4.1 Process Background

The Leach-CIL circuit is responsible for the gold leaching and carbon adsorption of the main slurry stream coming from the grinding circuit. It utilizes a counter-current flow of activated carbon in reference to the slurry flow to optimize the gold extraction and recovery. After the grinding circuit the ore particle size should be sufficiently reduced so that the gold in the ore is exposed allowing for the leaching reaction to occur.

Pre-aeration is commonly applied ahead of cyanide leaching to promote oxidation and/or passivation of cyanide consuming minerals such as sulphides native to the ore. Lime and air are added to slurry ahead of cyanide leaching at an operating pH between 10–10.5. Dissolved oxygen in solution under ambient conditions can oxidise some sulphide minerals. Pyrite is relatively stable in oxygenated solutions over a wide pH range. Marcasite is a form of pyrite that is less stable and is oxidised to Fe (III) hydroxide above pH 2 according to the following reaction[1]:

$$4FeS_2 + 15O_2 + 14H_2O \rightarrow 4Fe(OH)_3 + 16H^+ + 8SO_4^{2-}$$

The acid generated reacts with available alkali metal salts in the ore to precipitate gypsum or other sulphate species.

It should be noted that the Grassy Mountain ore is low in sulphide content, at approximately 0.3% pyrite, and that the leach will operate at relatively low dissolved oxygen levels (<10 ppm), so the extent of precipitate formation in the pre-aeration step is expected to be minimal. Any precipitates formed in the pre-aeration step ahead of cyanide leaching will report to the TSF in the process plant tailings slurry stream.

[1] Marsden, J. O. & House, C. I., 2006: The Chemistry of Gold Extraction, Society for Mining, Metallurgy, and Exploration, Inc. (SME), Second Edition

Following the pre-aeration step, cyanide is added in the first leach tank. The leaching reaction follows the following reaction:

$$4Au(s) + 8NaCN(aq) + O_2(g) + 2H_2O(l) \leftrightarrow 4NaAu(CN)_2(aq) + 4NaOH(aq)$$

Sodium cyanide is dosed into the front end of the circuit along with air addition to facilitate the dissolution of gold into solution. The rate of the gold extraction is highest in the first tank where the reaction begins and rapidly decreases as the gold in the ore becomes scarcer. The extraction starts in the leach tanks, continues in the CIL adsorption tanks and eventually reaches a plateau point where all the recoverable gold has been leached into solution in the form of a soluble and stable cyanide-gold species. Test work determined that the gold is leached to completion with a residence time of 24 hours.

The availability of free cyanide in solution is dependent on the pH of the solution. At a lower pH less cyanide ions are retained in solution while more are evolved as hydrogen cyanide molecules. From this relationship we can determine that the desired result is to have the free cyanide ions stay in solution at high pH. This is true for both safety and operation, as hydrogen cyanide gas is toxic to operators and cyanide must be in solution to perform the leaching reaction. For this reason, the leach and CIL circuit is operated in a basic environment maintained through the addition of hydrated lime.

With the gold in solution, the adsorption process will then recover the dissolved gold onto activated carbon to be recovered in the elution circuit. In solution the sodium-gold-cyanide complex dissociates into a negative gold-cyanide anion and a positive sodium cation. The negative gold-cyanide ion in solution preferentially pairs with a positive ion found in solution based on reduced activation energy. The addition of lime in the leach and CIL circuit ensures sufficient calcium is available to produce an ionic pair between the gold-cyanide anion and the calcium cation resulting in a stable pair with neutral charge. The importance of this lies in the fact that the surface of activated carbon has a neutral charge and for species to adsorb to it they also require a neutral charge.

$$2Au(CN^-)_2^- \; + \; Ca^{2+} \; \leftrightarrow \; Ca\;(Au(CN_2))_2\;(ion\;pair)$$

As both the ion-pair and the surface of the carbon are neutral, no reaction occurs between the two items and the adsorption process is dependent on process parameters. Key parameters include mixing efficiency, slurry density, particle size of carbon, cyanide concentration, slurry pH and gold concentration among others used to design the adsorption process of a specific operation.

The CIL adsorption circuit recovers gold in solution from the slurry stream by contacting activated carbon with the slurry in a series of mechanically agitated tanks arranged in series. Slurry flows continuously from the first tank to the last, while the carbon in slurry is pumped countercurrent from the last tank to the first. Carbon movement is intermittent and is typically carried out once per day. The gold concentration in solution decreases as it proceeds down the train to give a barren value in the last CIL tank, while carbon increases in gold content as it is transported up the train, giving the highest concentration (loaded carbon) in the first CIL tank. Carbon is prevented from moving downstream between the tanks by inter-tank screens at the tank outlets.

Loaded carbon is harvested from the first CIL tank of the circuit and transported to the next stage for the acid wash and elution stages.

Carbon management modelling determined that the optimum adsorption circuit configuration was a hybrid leach–CIL circuit (two leach, seven CIL tanks). This circuit configuration is beneficial as it achieves higher loadings of gold on carbon (gold is fast-leaching and approximately 85% of gold is expected to be dissolved before adsorption, resulting in higher loaded carbon grades in the first adsorption tank). This translates into lower soluble losses and a smaller elution circuit size. The optimum carbon concentration is 0.21 lb/gal and advance rate to elution to minimize solution losses is 2.2 short tons per day. Silver is present in the ore and is also recovered albeit to a lesser extent as silver demonstrates similar behavior to gold during cyanidation and adsorption.

4.2 Pre-Aeration, Leach and Carbon-in-Leach Tanks

The leach feed slurry from the cyclone cluster overflow reports to the pre-aeration and leach-CIL circuit. The slurry will first reach one pre-aeration tank where low-pressure air is added prior to the introduction of cyanide. Lime is added to adjust the solution to a pH of 10–10.5. Following the pre-aeration step the slurry will then flow to two leach and seven CIL tanks, which are open top and configured in series.

The pre-aeration tank will mix the cyclone overflow with low-pressure air and hydrated lime, at an addition rate of 2.1 lb/short ton. The pH of slurry in the pre-aeration tank is monitored and lime is added as necessary to maintain target (10–10.5 pH typical). Low pressure compressed air is blown into slurry in the tank down through the agitator shaft and dispersed using a sparge nozzle which generates fine bubbles.

Slurry will overflow the pre-aeration tank to the first leach tank. In the leach-CIL tank train, the gold-bearing slurry is brought into contact with cyanide and dissolves the gold from the ore into solution by forming stable gold-cyanide complexes in the presence of sparging air. Cyanide will be added into leach tanks 1 and 2 at a total rate of 0.68 lb/short ton of feed, together with low-pressure air.

The slurry will then overflow into seven CIL tanks. Air is added in the first four CIL tanks. The purpose of the activated carbon in the CIL tanks is to recover gold from leached slurry. The gold is recovered by bringing the leached slurry, containing gold in solution, in contact with the carbon so that the dissolved gold can be loaded onto it through the process of adsorption. Each CIL tank is equipped with an agitator, an inter-stage screen to retain the carbon and a carbon advance transfer pump. Slurry in the first CIL tank flows through the inter-tank screen to the next tank via an overflow launder while the screen holds back the carbon from moving to the next tank. Each subsequent tank in the series sends slurry to the next tank until the slurry reaches the last tank which then gravity flows out to the cyanide destruction circuit. Barren carbon will be added to the last CIL tank and carbon flows through the circuit in the opposite direction, through carbon advance pumps in a batch process. The carbon is transferred once per day and is retained in the tanks by the inter-tank screens. Once the carbon has been transferred through all CIL tanks to the first tank in the train, the loaded carbon recovery pump will transfer the loaded carbon to the loaded carbon screen before being treated in the elution circuit.

Slurry exiting each tank in the pre-aeration, leach and CIL train flows by gravity to the next through an up-comer inside the tank to an overflow launder. Each tank is connected to the next two tanks via overflow launders with knife gate valves for tank isolation on each discharge point. This arrangement will allow the slurry to bypass the next tank in the series if one of the downstream tanks must be taken out of service for maintenance. Once the slurry discharges at the final tank, the slurry gravity flows to the detox tank.

Given the nature of the process, cyanide-specific design considerations are implemented for both personnel safety, equipment integrity and operational performance. Cyanide monitors will be installed at the top of the tanks and at ground level. Control valves, and alarm interlocks are utilized to ensure the operation is performed within an acceptable pH range and will monitor the presence of hydrogen cyanide, a toxic gas evolved from cyanide bearing solution when pH values are lowered out of the operating range. Operators are also equipped with hydrogen cyanide badges to alert them of any potential generation of cyanide gas. The sodium cyanide solution will be monitored by operator titration, ensuring that the dosing concentration is suitable for the leaching and adsorption processes. Piping providing cyanide solution is socket welded carbon-steel connection, with double block and bleed isolation valving. The area is also designed to account for complete containment of all process vessels. Standard operating procedures are developed to accurately describe the methods and equipment required to achieve these tasks safely.

5 Area 3500 – Acid Wash and Elution

Overview:

Carbon containing slurry from the CIL circuit is transferred by the loaded carbon recovery pump to the loaded carbon screen in preparation for the acid wash and elution steps. The undersize slurry from the screen is sent back to the first CIL tank while the carbon retained in the oversize fraction reports to the acid wash column. During the acid wash stage, acid soluble contaminants that were adsorbed onto the surface of the loaded carbon are removed using a dilute hydrochloric acid stream followed by a rinse water cycle to clean the acid washed carbon before moving onto the elution step. The acid rinsed carbon is then transferred from the acid wash column to the elution column. During this step a strip solution of dilute sodium hydroxide and cyanide is heated and is passed through the carbon in the elution column. This process reverses the gold loading onto the carbon and brings the gold into solution. The gold bearing solution, also known as the pregnant solution, then flows to the gold room where the gold will be recovered in the electrowinning process. Once the loaded carbon has been stripped of gold it is considered barren carbon and is transferred to the carbon regeneration area.

Reference PFDs: 101768-0000-F-006 Rev E – Desorption Area Process Flow Diagram

5.1 Process Background – Elution

Loaded carbon will undergo the desorption process where the loaded carbon is acid washed and eluted. The underlying principle during these stages is that the stable gold complexes loaded on the carbon must be reversed so that they separate from the carbon.

The loaded carbon is initially received from the adsorption stage to a loaded carbon screen, where the carbon and slurry are separated. The carbon is then fed to the acid wash column where a dilute hydrochloric acid solution is passed through. This process removes undesirable contaminants such as calcium carbonate from the surface of the carbon that would otherwise inhibit or foul the carbon surface and reduce the adsorption efficiency. The acid wash cycle is done at ambient conditions. Rinse water is passed through to remove residual acid and protect downstream equipment from low pH conditions.

Once the loaded carbon is acid washed it is transferred from the acid wash column to the elution column. In the elution stage a solution of sodium hydroxide and sodium cyanide, called the strip solution, is heated under pressure and flows up through the elution column. During elution the adsorption mechanism that initially bonded the gold complexes to the carbon are reversed and the gold is brought back into solution. This solution flows from the elution column to the electrowinning cells.

After the stripping of the pregnant solution by the electrowinning cell, the solution has trace amounts of gold remaining that will not be recoverable in electrowinning. The barren solution will be returned to the CIL circuit, where the gold has the potential to be re-adsorbed, and unreacted cyanide is recycled to reduce the amount of new reagent addition.

5.2 Loaded Carbon Screening

Once the carbon in the first CIL tank is loaded, carbon slurry is pumped to the loaded carbon screen where the loaded carbon is screened and separated from the slurry under water spray. Water sprays on the vibrating screen decks wash off process slurry from the loaded carbon. The loaded carbon gravity flows to the acid wash column ahead of the elution cycle, and the slurry returns to the first CIL tank.

5.3 Acid Wash

The loaded carbon from the leach circuit recovered on the loaded carbon screen is directed to the acid wash column. Acid soluble foulants which have loaded onto the carbon are dissolved during the acid washing stage. Hydrochloric (HCl) acid is diluted with process water to provide the required acid wash solution concentration of 3% HCl and injected into the acid wash column. The carbon will soak in the acidic solution for 30 minutes.

Following acid solution contact, the carbon is rinsed with process water to remove residual acid of the liquor in the carbon column at a rate of two bed volumes (BVs) per hour for a duration of 2 hours. The rinse solution is discarded to the cyanide detox tank. Acid washed carbon is then hydraulically transferred to the elution column using pressurised transport water supplied by a carbon transfer water pump.

5.4 Elution

A pressure Zadra circuit is incorporated for elution of gold and silver from carbon. In the Zadra elution system, elution and electrowinning are carried out concurrently, with strip solution circulating through the elution and electrowinning circuits in a closed loop for a pre-determined time.

The elution system comprises an elution column, eluate storage tank, elution pump and an elution heater package. At the beginning of an elution cycle, strip solution is made up in the eluate storage tank using raw water dosed with 2% sodium hydroxide and 0.2% cyanide. The strip solution is pumped through the recovery heat exchanger and the strip solution heater before entering the elution column. The elution recovery heat exchanger transfers heat from the hot eluate exiting the elution column to the incoming strip solution before passing through the strip solution heater, which heats the strip solution, the carbon and the column to 275°F. At this temperature, gold that was previously adsorbed on the carbon is desorbed from the carbon.

Hot eluate (or pregnant solution) exiting the elution column passes through the elution recovery heat exchanger which cools the eluate before it passes through the trim heat exchanger and the elution flash pot to ensure that the nominal temperature is below boiling point before entering the electrowinning cell. The gold depleted solution from electrowinning is then re-heated and recycled as strip solution to the elution column for additional stripping.

The electrowinning cell is bypassed at the start of the elution cycle until the required system temperature is reached. The elution system is pressurized to keep the solution from flashing to steam in the strip solution heater or elution column.

Given the use of sodium cyanide during the elution of the loaded carbon, additional steps are included to ensure safe and efficient operation. The pH of the solution will be properly buffered using sodium hydroxide, utilizing control valve interlocks to ensure the process is operating at the designed operating parameters.

6 Area 3500 – Carbon Regeneration and Management

Overview:

After the completion of the elution stage, the barren carbon is transported to the carbon regeneration area to treat the used carbon to be recycled for the adsorption process. The carbon is dewatered over the barren carbon dewatering screen and fed to the carbon regeneration kiln where it is exposed to elevated temperatures to remove any remaining foulants that could impact the adsorption process. The carbon is then received by the quench tank for cooling before being sent to the barren carbon sizing screen in the CIL circuit.

Reference PFDs:

101768-0000-F-007 Rev E Carbon Regeneration Process Flow Diagram

6.1 Carbon Regeneration

After completion of the elution process, barren carbon is hydraulically transferred from the elution column to the barren carbon dewatering screen, where the oversize will report to the regeneration kiln feed hopper while the undersize carbon and water are collected in the carbon transfer water tank. The discharge from the regeneration kiln feed hopper is metered into the carbon regeneration kiln by the kiln screw feeder. The carbon regeneration kiln is a horizontal, rotary, electrically heated unit and reaches a temperature of at least 1382°F to regenerate the barren carbon.

Barren carbon discharges by gravity from the carbon regeneration kiln to a water-filled quench tank to cool down and is then transferred hydraulically to the barren carbon sizing screen. The barren carbon is then screened to remove fines as well as to dewater the carbon, and reports to the last tank in the CIL adsorption train.

6.2 Carbon Transport Water

All carbon movements in the elution and regeneration circuits are accomplished using carbon transfer water. A carbon transfer water tank and pump are provided to supply transport water to carbon movement demands as needed.

As an example, when moving carbon from the acid wash column to the elution column, the acid wash column is pressurised through the addition of carbon transfer water in sufficient quantity and velocity to carry it to the next destination at an effective solids concentration of about 20%. As the carbon arrives at the elution column, strainers in the column discharge ports allow the carbon transfer water to exit the column while retaining the carbon.

Carbon transfer water picks up fines when moving carbon from one place to another due to the attrition associated with the carbon movement itself. The carbon transfer water tank is periodically drained to tailings, and process water is used to refill the tank.

7 Area 3650 – Electrowinning and Gold Room

Overview:

The elution circuit produces a gold-bearing solution that will flow through an electrowinning cell to remove the gold from solution and onto cathodes. The flow of eluate (or pregnant solution) and the electrical current is controlled for operation under optimal gold plating parameters. The plated gold is removed from the cathodes with the use of the cathode pressure washer and the gold sludge is collected in the electrowinning sludge settling tank. The sludge is pumped through the gold room sludge filter press and then moved by trolley to the mercury retort package to be dried and then mixed with fluxes prior to being moved by hand to the smelting furnace to ultimately pour doré bars.

The gold room houses the electrowinning cell, mercury retort package, smelting furnace, and associated support equipment within a security envelope which limits access to authorized gold room personnel only. Access and egress are controlled by security personnel at both a pedestrian door and a vehicle access roll up door.

Reference PFDs:

101768-0000-F-008 Rev E Gold Room Process Flow Diagram

7.1 Electrowinning

A single electrowinning cell is located on the upper floor within the gold room. The rectifier associated with the electrowinning cell backs onto the gold room wall, allowing easy access for operations and maintenance outside the secure area of the gold room.

The electrowinning cell operates in a closed loop with the elution column and associated equipment. Eluate flows directly from the top of the elution column to the elution flash pot and then electrowinning cell after cooling through heat exchangers. The eluate flows through the electrowinning cell and then gravitates to the eluate storage tank to be pumped back to the elution circuit (as strip solution) in a continuous closed loop. The electrowinning cell extracts gold by passing a current through the liquid solution, resulting in metal extraction through electroplating onto the cathodes within the cell. The process will continue to deposit metals into the electrowinning cell for a maximum of 16 hours.

Once a week, the cathode pressure washer is used to dislodge sludge from the cathodes and then gravity flow to the electrowinning sludge settling tank and gold room sludge filter press to be dewatered. The pressed filter cake (gold sludge) is loaded from the plate and frame filter into trays on the electrowinning sludge trolley to be transported manually to the mercury retort package. Mercury is removed from the gold sludge and the sludge is simultaneously dried. Mercury collected is sent off site for third-party processing.

7.2 Smelting

The dried and cooled sludge is combined with fluxes (silica, nitre, borax and sodium carbonate) in the flux mixer prior to the smelting furnace. The fluxes are manually added to the flux mixer after they are weighed. The sludge-flux mix is directly smelted in the smelting furnace. The fluxes react with base metal oxides to form a low viscosity, free flowing slag, whilst the gold and silver remains as a molten metal.

The gold doré is poured into molds on a mound tray. The slag (non-precious metal compounds) is separated from the precious metal and collected in slag trays at the bottom of the cascade tables. The doré bars solidify and are quenched in water, cleaned to remove slag, weighed, stamped for identification, sampled for analysis, and stored in a vault while awaiting dispatch to a refinery.

Dust collection is provided in the gold room for smelting. Extraction fans are included for the kiln, electrowinning cell, retort/drying oven, and smelting furnace off gasses. All extraction fans are led to a gas scrubbing system.

8 Area 3600 – Cyanide Detoxification

Overview:

Tailings from the CIL circuit that no longer contains economically recoverable gold will flow to the cyanide detoxification stage. The slurry contains cyanide species that are not suitable for release from the process plant, and therefore a detoxification process is completed. In this circuit reagents are added to facilitate the breakdown of cyanide species to acceptable levels before reporting to the carbon safety screen and tailings pump box for transfer to the TSF. The carbon safety screen will collect carbon that would otherwise be lost to the tailings in the event of a hole in one of the inter-tank screens. Additional lime or other base is added to the tailings slurry prior to deposition in the TSF to provide for neutralization of acid that may be generated by geochemical reactions of the tailings within the TSF.

Reference PFDs:

101768-0000-F-009 Rev E Cyanide Detoxification & Tailings Disposal Area Process Flow Diagram.

8.1 Process Background

The cyanide detoxification stage of a gold processing operation is the location where the process slurry reports prior to tailings storage to reduce the level of Weak Acid Dissociable (WAD) cyanide and in turn the total cyanide released from the plant.

WAD cyanides are described as weak metal complexes that form during the leaching stage of the operation. Typical metals seen in these complexes include copper, zinc and nickel. The concern with these complexes is that they dissociate in solution to produce an environmentally significant concentration of free cyanide that could pose a risk to the environment and wildlife or persist on a longer basis due to a resistance to natural degradation.

The detoxification circuit receives all the slurry from the upstream processes with the addition of acid rinse solution from the elution circuit and spillage sump slurry on an intermittent basis from several areas within the plant. During the detoxification process the reaction will convert the free cyanide in solution to the less toxic cyanate ion. This is achieved through the SO_2/Air reaction utilizing a copper catalyst, and the oxidation reaction for free and WAD cyanides are shown below.

$$CN^- + SO_2 + O_2 + H_2O \rightarrow OCN^- + H_2SO_4$$

$$Me(CN)_4{}^{2-} + 4SO_2 + 4O_2 + 4H_2O \rightarrow 4OCN^- + 4H_2SO_4 + Me^{2+}$$

where Me represents metals such as Cu, Zn and Ni

The free cyanide and WAD cyanide anions are oxidized during the reaction to form cyanate and sulphuric acid. The reaction typically operates in the pH range of 8 to 9, and therefore requires the addition of lime to counteract the acid production. Sulphuric acid is neutralized, and the residual metals liberated from CN_{WAD} complexes are precipitated as hydroxides according to the reactions below.

$$H_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + 2H_2O$$

$$Me^{2+} + Ca(OH)_2 \rightarrow Me(OH)_2 + Ca^{2+}$$

Iron cyanide removal is initiated by the reduction of iron from the ferric to the ferrous state according to the following reaction:

$$2Fe(CN)_6{}^{-3} + SO_2 + 2H_2O \rightarrow 2Fe(CN)_6{}^{-4} + 4H^+ + SO_4{}^{-2}$$

The ferrous cyanide complex is then removed through precipitation with either copper, nickel or zinc according to the following generalised reaction:

$$2Me^{2+} + Fe(CN)_6^{4-} \rightarrow Me_2Fe(CN)^6$$

The remaining cyanide species of thiocyanate and cyanate are reduced by means of oxidation and hydrolysis, respectively.

Cyanate (OCN^-) is relatively unstable and hydrolyses to ammonia and bicarbonate as a function of reduced pH, as seen in the SO_2/Air cyanide destruction process. The addition of SO_2 causes a pH reduction and ammonia is produced according to below reaction:

$$OCN^{-} + 2H_2O \rightarrow NH_3 + HCO_3^{2-}$$

Thiocyanate (SCN^-) is more stable than OCN^- but can be oxidized by nitrifiers to also produce ammonia and carbonate. (Reactive sulphides produce thiocyanate during cyanide leaching, this effect is reduced through sulphide oxidation in the pre-aeration step ahead of the leach).

Sodium metabisulphite ($Na_2S_2O_5$), also known as SMBS, is the source for SO_2 in the SO_2/Air process. The reaction also requires a soluble copper catalyst to achieve the cyanide reduction. The copper is typically administered in the form of a soluble copper sulphate pentahydrate solution.

Through the cyanide detoxification process the key cyanide species of interest are converted into chemical species acceptable for discharge to the tailings storage facility. Low concentrations of metal hydroxide precipitates are expected to be generated from the Grassy Mountain cyanide destruction circuit, with a starting concentration of 200 ppm $CN_{WAD.}$ Any precipitates formed in the cyanide destruction step will report to the TSF in the process plant tailings slurry stream. Representative samples of the process plant tailings slurry after cyanide destruction have been the subject of tailings geochemical characterisation studies by SRK.

Once in the tailings storage facility, processes such as photodegradation by UV light and biodegradation will also contribute to the minimization of cyanide species in a lined TSF where precautions are implemented to minimize the impact to wildlife.

As described in Section 4.1 above, there are sulfide minerals (e.g., pyrite and marcasite) in the ore which can oxidize. The chemical equations in Section 4.1 indicate that the oxidation reactions generate acid (i.e., H_2SO_4, sulfuric acid). The sulfide minerals oxidize relatively slowly, so the acid generation does not occur in the beneficiation process but may occur once the tailings are deposited in the TSF. Geochemical characterization of the tailings performed by SRK (SRK, 2021) indicate that the tailings are net acid producing. Oregon regulations require that the tailings must be net neutralizing when disposed in a TSF (OAR 340-043-0130 (2)). Therefore, additional base must be added to the tailings prior to deposition in the lined TSF to render them net neutralizing.

8.2 Cyanide Detoxification Tank

Tailings from the CIL circuit flows by gravity to the cyanide detoxification tank. The cyanide detoxification circuit provides sufficient residence time for the detoxification reaction. In addition to leach tailings, the tank receives acid wash effluent from the acid wash column and the reagents storage and mixing area sump pumps discharge on an intermittent basis.

The cyanide detoxification circuit reduces weak acid dissociable cyanide (CN_{WAD}) to a target value of 15 ppm (30 ppm maximum). Air supply for the detoxification reaction is supplied to the cyanide detoxification tank. The tank utilizes a dual-impeller high shear agitator to enhance air dispersion and dissolution in the slurry to meet the oxygen demand of the cyanide destruction process. A sodium metabisulphite solution (the source of SO_2) is added to the slurry in the tank. Copper sulphate solution, when needed, is dosed as catalyst for the cyanide detoxification process while lime slurry is added from a ring main into the tank to maintain a desired pH between 8.0 and 9.0. pH monitoring and hydrogen cyanide (HCN) gas monitors will be interlocked with control valves to prevent and detect the evolution of HCN gas, respectively. Operators will also wear personal HCN badges or monitors.

The slurry will be reduced from a CN_{WAD} concentration of 200 ppm from the CIL circuit to below the not-to-exceed limit of 30 ppm. The final CN_{WAD} concentration will be monitored by automated titration to ensure compliance with the lowest practical levels and the not-to-exceed regulatory limit of 30 ppm. A secondary means of control and monitoring of the cyanide destruction process is provided through ORP (Oxidation Reduction Potential) measurement.

Results obtained in metallurgical test work showed that CN_{WAD} concentrations in plant discharge to tailings of <1ppm were achieved in two campaigns on composite samples at the cyanide destruction design conditions selected for the project. Actual CN_{WAD} concentrations in tailings are likely to be well below the design target value.

8.3 Tailings Neutralization Potential Augmentation

Detoxified slurry overflows to the carbon safety screen and screen undersize reports to the tailings pump box, where it is treated to augment its acid neutralization potential pursuant to Oregon regulations.

OAR 340-043-0130 (2) requires that the tailings must be net neutralizing prior to disposal in the TSF. Because the tailings have been demonstrated to be potentially net acid-generating (SRK, 2021), additional base (e.g., lime) must be added to the tailings to offset the acid that may be generated.

8.4 Tailings Discharge

The tailings are then pumped from the tailings pump box to the TSF by two tailings pumps (1 duty / 1 standby). The tailings slurry flows through a tailings discharge pipeline and will have dual containment initially provided through a buried pipe-in-pipe configuration before daylighting to an HDPE-lined containment trench. At the TSF, the tailings are deposited using spigot manifolds positioned along the rim of the impoundment to create low-angle deposition beaches. The position of the spigot manifolds is moved periodically to produce an even beach head and push decant water (or supernatant) towards the decant water pool.

WAD cyanide levels will be monitored and assessed from samples collected from the TSF and reclaim pond during operations to ensure the WAD cyanide concentrations achieve the lowest practical levels that also result in a Hazard Quotient of <1.0 for representative wildlife species when analyzed following the EPA's Guidelines for Risk Assessment (EPA, 1998) and the Guide for Performing Screening Ecological Risk Assessments at DOE Facilities (Sutter, 1995).

The entire mining project will be surrounded by a perimeter fence to restrict access by wildlife and livestock. In addition, the Reclaim Pond for TSF underdrain collection will be covered with bird deterrent balls to reduce the likelihood of wildlife accessing the surface of the water. As noted in section 8.2, WAD cyanide levels will be monitored by automated titration to ensure compliance with the lowest practical levels and the not-to-exceed regulatory limit of 30 ppm. Once in the TSF, natural processes such as photodegradation by UV light and biodegradation will also contribute to the minimization of cyanide species in the lined TSF and Reclaim Pond.

9 Area 3800 – Reagents and Services

Overview:

Given the properties of the reagents and their interactions with each other, design of the process plant reagent preparation areas will largely focus on the isolation of the cyanide. The cyanide offloading and storage area is located away from incompatible reagents and in a low traffic area of the process plant. The cyanide storage area will also be separated from the acidic reagent preparation area by the alkaline reagents. In this configuration, the basic chemicals act as a buffer to prevent the exposure of acidic reagents and sodium cyanide, which would lead to the generation of hydrogen cyanide gas.

Reference PFDs:

101768-0000-F-010 Rev E Alkaline Reagents Process Flow Diagram

101768-0000-F-011 Rev E Acidic Reagents Process Flow Diagram

101768-0000-F-012 Rev E Reagents General Process Flow Diagram

101768-0000-F-013 Rev E Plant Services – Air Process Flow Diagram

9.1 Hydrated Lime

Preparation of the hydrated lime will require:

- A bulk storage silo;
- A mixing tank;
- Distribution pumps feeding a ring main;
- Automatically controlled dosing points from the ring main.

Hydrated lime is used in leaching and detoxification for pH control. The hydrated lime powder is delivered to site by bulk tankers and blown into the lime silo.

When the lime tank level is low, hydrated lime is added to the tank via a rotary valve and screw feeder. Process water is added at the same time to maintain the mixture strength of 20% forming a milk-of-lime suspension.

Milk-of-lime is distributed to the various dosing points using a ring main that provides constant flow to various destinations. Dosing is accomplished with drop lines off the ring main with automated on-off valves that open when pH is low and close when the operator specified target is reached.

9.2 Sodium Hydroxide

Distribution of sodium hydroxide will require a dosing pump. Sodium hydroxide (NaOH), also known as caustic soda, is used in the elution circuit to prepare the stripping solution used to recover the gold from the loaded carbon. The reagent will be delivered in 330 US gal totes and unloaded near the sodium hydroxide storage area using a forklift. The solution is supplied at a concentration of 50% by weight basis. A dosing pump is connected directly to the tote and will then provide the required dosage of sodium hydroxide to the point of use in the elution circuit. The sodium hydroxide dosing pump runs for less than one hour per day and therefore an installed standby pump and tote are not needed. Additional totes are stored in secured containers in a bunded Reagents Storage area adjacent to the leach-CIL circuit.

9.3 Sodium Cyanide

Storage and distribution of sodium cyanide will require:

- A tanker unloading pad;
- A bulk storage tank;
- A ring main;
- Dosing pumps.

Sodium cyanide is used in leaching as a lixiviant and in elution as a carbon stripping aid. Sodium cyanide is delivered in liquid form by bulk tanker in 6,400 US gal loads at 30% purity and emptied into the sodium cyanide storage tank.

Sodium cyanide is dosed from the storage tank to dosing points via a ring main that provides constant flow to various destinations. For additional information on the equipment and procedures for the handling of cyanide, reference the Cyanide Management Plan in the appendices of the Consolidated Permit Application.

9.4 Sodium Metabisulphite

Preparation of sodium metabisulphite (SMBS) will require:

- A bulk bag handling system;
- A combined mix/storage tank;
- Dosing pumps.

Sodium metabisulphite ($Na_2S_2O_5$), also known as SMBS, is the source for SO_2 in the SO_2/Air process and will be supplied in 2750lb bulk bags. It will be shipped by road to site, offloaded by forklift, and stored in the reagents storage area adjacent to the reagents mixing facility. SMBS is mixed and stored in a combined mix/storage tank laid out such that the mix tank is directly above the storage tank and mixed solution drops by gravity into the storage tank.

When the storage tank level is low, SMBS is added to the mix tank by dropping a bulk bag onto a bag breaker which discharges SMBS into the mix tank. The mix tank has been previously filled with sufficient process water to produce a mixture strength of 20%. Once mixing is complete, and there is sufficient room in the storage tank, the mixed SMBS solution is transferred by gravity to the storage tank.

SMBS is dosed to the cyanide detoxification circuit via a dosing pump. A second pump is provided as an installed spare.

9.5 Copper Sulphate (Pentahydrate)

Preparation of Copper Sulphate will require:

- A bulk bag handling system;
- A combined mix/storage tank;
- Dosing pumps.

Copper sulphate (pentahydrate) ($CuSO_2.5H_2O$) is supplied in 2750lb bulk bags at a purity of 98% on a weight basis. It will be shipped by road to site, offloaded by forklift and stored in the reagents storage area adjacent to the reagents mixing facility. Copper sulphate is mixed and stored in a combined mix/storage tank laid out such that the mix tank is directly above the storage tank and mixed solution drops by gravity into the storage tank.

When the storage tank level is low copper sulphate is added to the mix tank by dropping a bulk bag onto a bag breaker which discharges copper sulphate into the mix tank. The mix tank has been previously filled with sufficient process water to produce a mixture strength of 15%. Once mixing is complete, and there is sufficient room in the storage tank, the mixed copper sulphate solution is transferred by gravity to the storage tank.

Copper sulphate is dosed from the storage tank to the detoxification circuit via duty / standby dosing pumps.

9.6 Hydrochloric Acid

Hydrochloric Acid (HCl) is used in the elution circuit and is supplied in 330 US gal totes in liquid form at 33% concentration on a weight basis. The acid will be dosed directly from the tote to the acid wash column using a dosing pump. The hydrochloric acid dosing pump runs for less than one hour per day and therefore an installed standby pump and tote are not needed. Raw water is added to the HCl to a strength of 3% via inline mixing ahead of the acid wash column.

9.7 Diesel Storage

Two double-walled steel tanks will be used for diesel storage. The total volume between the two tanks is 8,250 gal. Diesel will primarily be used by the underground mining equipment. A fuel truck will be used to fuel underground equipment as required and may be used to fuel surface equipment as needed.

9.8 Low Pressure Air

The low-pressure air blowers supply air to the pre-aeration, leach, CIL and the cyanide detoxification circuits. The installed blowers are multiple-stage, centrifugal-type blowers and are used with a “blow-off” arrangement to adapt to fluctuations in air demand.

9.9 Plant and Instrument Air

Two plant air compressors in a duty-standby configuration provide high pressure compressed air to meet the demand for plant and instrument air requirements.

Wet plant air is stored in the plant air receivers to account for variations in demand prior to being distributed throughout the plant. Instrument air is filtered and then dried in an instrument air dryer prior to reporting to the gold room or general plant distribution.

9.10 Assay and Metallurgical Laboratory and Quality Control

The plant is equipped with automatic samplers to collect shift and routine samples for aqua-regia digestion, atomic absorption, and fire assays. The samples include plant feed, intermediate products, tailings, and final products. The data obtained is used for product quality control and routine process optimization.

The metallurgical laboratory will perform metallurgical tests for quality control and process flowsheet optimization. The laboratory will include equipment such as laboratory crushers, ball mill, sieve screens, bottle rollers, leach reactors, balances, DO meters, and pH meters.

The laboratory will be situated adjacent to the process building. The laboratory facility will include areas for sample receiving and preparation, fire assay, weighing room, wet analytical laboratory, dry instrument room, and utilities and storage. Chemicals proposed for use in the laboratory include, but are not limited to, acetylene (for fire assay), hydrochloric acid, hydrofluoric acid, lead oxide, methyl ethyl ketone, nitric acid, sodium cyanide (solid), and sulfuric acid. The laboratory will house the laboratory equipment for assaying, metallurgical, and environmental requirements. Dust-collection and gas scrubbing equipment will be located external to the laboratory building. The building will be serviced with power, water, air conditioning and heating, communications, air and fume hoods.

10 Area 3920 – Water Services

Overview:

The overall process has a negative water balance and requires raw water makeup from site wells. The raw water is used for gland water, makeup water, and treated to produce potable water. Raw water that has entered the process becomes part of the process water circuit and may be eventually discharged to the TSF. Decanted water from the TSF is recycled back to the process plant for reuse in the process water circuit.

Reference PFDs:

101768-0000-F-014 Rev D Plant Services – Water (Sheet 1 of 2)

101768-0000-F-015 Rev D Plant Services – Water (Sheet 2 of 2)

10.1 Tailings Storage Facility – Water Reclaim

Water separating from the tailings solids after deposition will be managed with two independent return-water systems. One will manage flows collected in the seepage collection pond from the underdrain collection systems and the other will manage water collected in the decant (or supernatant) pool. The decant pool will be managed with two centrifugal pumps (1 duty / 1 standby) with a barge mounted floating suction line located on the eastern edge of the facility. The seepage collection pond water return pump is located at the seepage pond to the north of the facility and returns water to the decant pond. Water from both systems will be returned to the mill for use in the process circuit. TSF decant water is returned through a decant water pipeline, which runs in the same containment trench used for the tailings discharge pipeline.

10.2 Catchment Pond

Contact water collected from the process plant pad will be diverted through contact water diversion ditches and channels to the catchment pond, described in section 12.2a Water entering the catchment pond will be returned to the process plant for use as process water or will be evaporated.

10.3 Raw Water

Raw water is pumped from borehole wells via a well water pump to the raw water tank for distribution throughout the operation.

Raw water in the tank is used to supply the following services:

- Reagent preparation and mixing;
- Slurry pumps gland seal water;
- Fire protection requirements;
- Potable water treatment plant.

10.4 Gland Water

Water for the gland water system is supplied by raw water from the raw water tank and distributed to each slurry pump by the gland seal water pumps in a duty/standby configuration.

10.5 Process Water

Process water is comprised of decant water from the TSF, contact water from the catchment pond and raw water additions. Process water is stored in the process water tank and distributed by the process water pumps in a duty/standby configuration.

10.6 Potable Water

Potable water is sourced from the raw water tank and treated in the potable water treatment plant. The treated water is then stored in the potable water tank for distribution via two potable water pumps in a duty/standby configuration.

11 Other Process Waste Materials

Carbon fines generated in the process are disposed of with the tailings slurry stream to the TSF. Any coarse carbon collected from the carbon safety screen as oversize is returned to the process.

Elemental mercury collected by the retort condenser will be securely contained and temporarily stored for transport to a mercury waste processing facility for cleaning. Thereafter, the elemental mercury will be temporarily stored and transported to a DOE site for permanent storage.

Mercury control carbon from the gas scrubbers will be transported to a company specialising in hazardous waste management for disposal or recycling at a treatment, storage, and disposal facility (TSDF).

Slag from the smelting process is returned to the process via the mill feed.

The assay laboratory is expected to produce the following waste streams:

Lead contaminated waste in the form of used lead cupels from fire assay will be transported to a company specialising in hazardous waste management for disposal or recycling at a TSDF.

Sample residue solids and pulps will be returned for reprocessing through the process plant.

Solution waste streams (dilute acid and cyanide waste streams) will each be returned to appropriate locations in the process. Concentrated acid waste will be collected into a satellite accumulation drum in the laboratory. The concentrated waste will be pH adjusted, following the elementary neutralization protocols for hazardous waste, as incorporated into the Oregon Administrative Rules, and returned to the plant tailings stream.

A waste determination will be performed on personal protective equipment (PPE) to determine disposal status. If determined to be hazardous waste, PPE will be shipped offsite to a TSDF. Non-hazardous waste PPE is placed in the landfill dumpster.

12 Process Solution Containment

The containment strategy associated with the process plant can be divided between the containment of process flows and reagents, and the collection and containment of surface contact water.

12.1 Process Flows and Reagents

There are six primary areas which require containment at the plant site. Each area is located on a cast in-situ concrete slab, which will have bund walls providing the required containment volume. The required volume is determined by the equipment located in the area, and in each area, this has been determined to be 110% of the volume of the largest vessel plus allowance for adequate freeboard and precipitation. Adequate precipitation is defined as the height required to provide a volume capable of containing a 1-in-100-year 24-hour storm event. The containment areas have been summarized in the following table:

Table 12-1: Process Plant Containment Areas and Volumes

Location	Required Containment Volume (ft^3)	Total Containment Volume (ft^2)	Reference Drawing
Grinding Area	597.1	2497.7	101768-1200-C-101
CIL Area	9039.0	9687.2	101768-1200-C-102
Goldroom	38.9	431.9	101768-1200-C-104
Reagent Areas			101768-1200-C-103
Lime & Tailings Pump	248.1	283.5	
SMBS & $CuSO_4$	395.1	423.5	
Hydrochloric Acid	166.7	197.7	
Elution and Caustic Area	166.7	236.8	101768-1200-C-103
Process Water Area	5766.3	5780.4	101768-1200-C-103
Cyanide Storage Area	2222.1	2238.3	101768-1200-C-105

The concrete slab and bund walls in the hydrochloric acid storage and dosing area will be covered with an acid resistant epoxy coating.

12.2 Surface Contact Water

For a detailed description of contact water management and the design of water management structures, reference the Stormwater Pollution Control Plan by Golder Associates Inc., included in the CPA appendices.

Diversion ditches will be constructed above plant infrastructure where required to prevent runoff from entering the process plant areas. Precipitation that falls directly on the pad will be collected in a system of ditches and culverts and directed by gravity towards the catchment pond. The ditches and culverts located within the process plant areas are sized to contain the 100-year, 24-hour storm event.

The catchment pond is also sized to contain the runoff from a 100-year 24-hour storm event. Additionally, a 2-foot dead storage allowance for siltation and pump suction at the bottom of the pond and a 2-foot freeboard allowance, measured from the top of the high-water level to the pond crest have been included, external to the indicated pond capacity.

The pond will have a minimum 14-foot wide crest around the outside with internal and external batter slopes of 3H:1V. The liner system is composed of two liners, an upper liner of 80mil HDPE and Geonet, and a lower liner of 60mil HPDE over non-woven geotextile. Sand bedding below the lower liner is included where necessary to create a smooth base.

A leak detection zone of drainage gravel is included between the liners. The leak detection system is found on the pond base and sides and is connected to down-batter leak monitoring wells and sumps, provided with sensors and the capacity to recover the leaked solution.

No spillway is designed for the catchment pond as overflow is not permitted.

13 Dust Suppression and Collection

Considerations for the design of particulate matter (PM) control and dust suppression for the proposed project is intended to comply with applicable federal and state regulations for air quality. The Grassy Mountain project is required to obtain a Standard Air Contaminant Discharge Permit (ACDP) under OAR 340-216, which will include the regulation of PM emissions and fugitive dust from mining operations and onsite haul roads. A complete list of emission units will be provided in the ACDP application, which will be submitted following submittal of the Consolidated Permit Application (CPA). The specific control methods for PM and fugitive dust will vary and will be included in the ACDP application. The table below summarizes the key sources of PM and fugitive dust and the possible control methods.

Table 13-1: Dust Sources and Control Methods

PM and Fugitive Dust Sources	Possible Control Methods
Unpaved Roads	Dust suppression chemicals and water application
Stockpile (ROM Ore)	Inherent moisture content of the ore
Crushing units and associated handling (e.g., bins, conveyors)	Inherent moisture content of the ore
Lime Silo Loading	Bin vent
Carbon Regeneration Kiln	Wet scrubber/carbon filter
Electrowinning Cells & Pregnant Solution Tank	Carbon filter
Mercury Retort	Condenser/carbon filter
Melting Furnace	Baghouse/carbon filter
Laboratory operations	Fume hoods
Mixer loading	May include water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, central dust collection systems, etc.

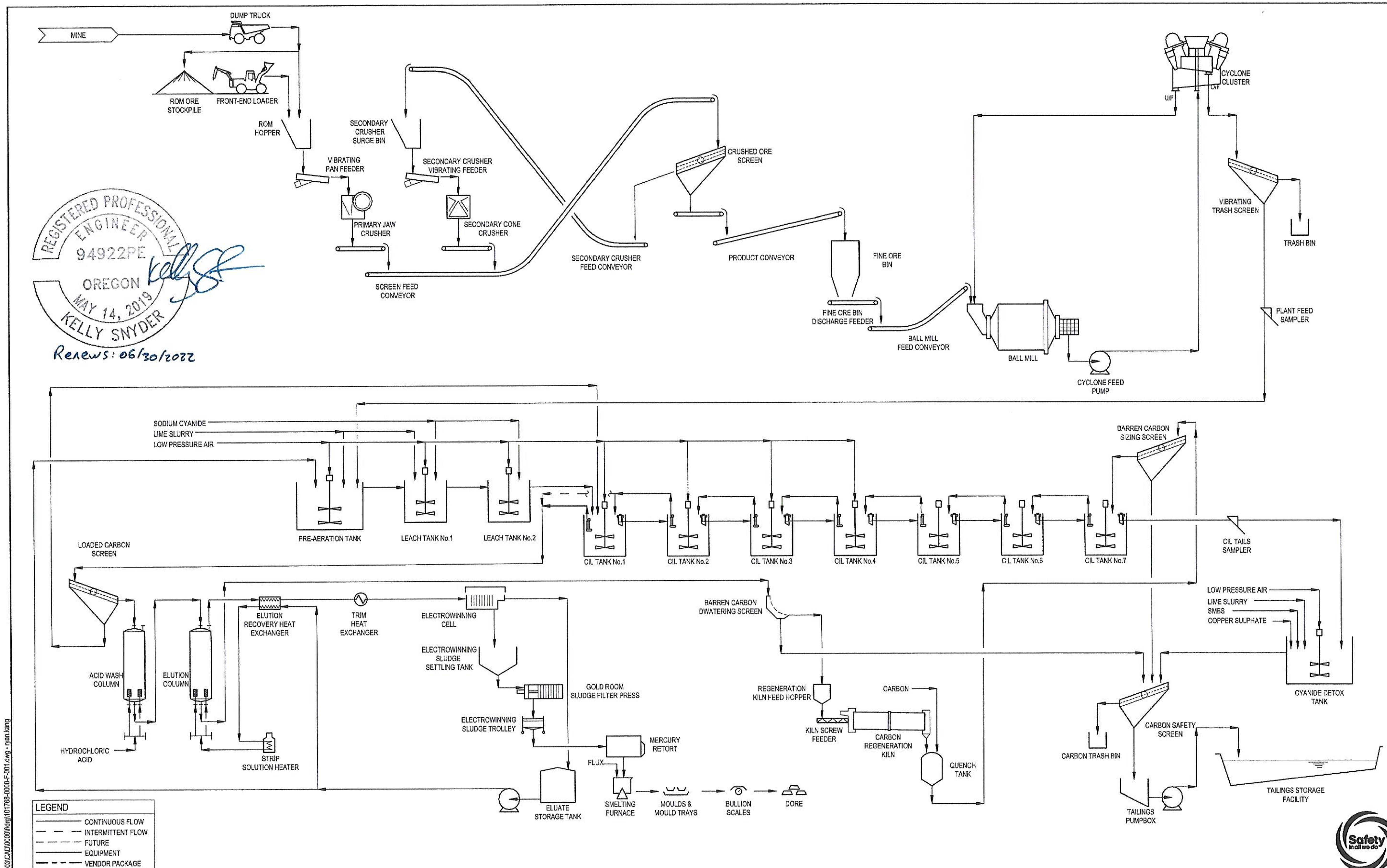
PM and Fugitive Dust Sources	Possible Control Methods
Fugitive Dust Emissions: • Ore and waste rock crushing • Rock drilling • Rock blasting • Material transfers • Wind erosion	Water application or other methods, to be determined

14 Reclamation Plan

The Reclamation Plan is submitted as a separate document as part of the Consolidated Permit Application. The Reclamation Plan was developed to satisfy the requirements of the following state and federal regulatory requirements:

- OAR 632-037-0070, Consolidated Permitting of Mining Operations Reclamation and Closure Plan;
- OAR 340-043-0080, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: General Provisions;
- OAR 340-043-0090, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: Control of Surface Water Run-On and Run-Off;
- OAR 340-043-0100, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: Physical Stability of Retaining Structures and Emplaced Mine Materials;
- OAR 340-043-0110, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: Protection of Wildlife;
- OAR 340-043-0130, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: Guidelines for Disposal of Mill Tailings;
- OAR 340-043-0150, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: Guidelines for Heap-Leach and Tailings Disposal Facility Closure;
- OAR 340-043-0160, Guidelines for the Design, Construction, Operation and Closure of Chemical Mining Operations: Post-Closure Monitoring;
- OAR 632-030-0027, Minimum Standards for a Reclamation Plan (Applicable to the Quarry);
- 43 CFR 3809.420(3), Reclamation; and
- Other state and federal permits required for the operation of the Project.

Appendix A – Overall Process Flow Diagram



PARAMOUNT GOLD Nevada

No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
E	RK	10DEC21	ISSUED FOR PERMITTING	SS	CH	AW
D	LT	31JAN20	UPDATED	SS	CH	NM
C	LT	15NOV19	ISSUED FOR STUDY	SS	CH	NM
B	LT	20OCT19	ISSUED FOR CLIENT REVIEW	SS	CH	NM
A	LT	15OCT19	ISSUED FOR INTERNAL REVIEW	LT	SS	SS

REF. | DRAWING No. | REFERENCE DRAWING

DRAWN	L. TSENG	10OCT2019
DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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CLIENT: PARAMOUNT GOLD NEVADA

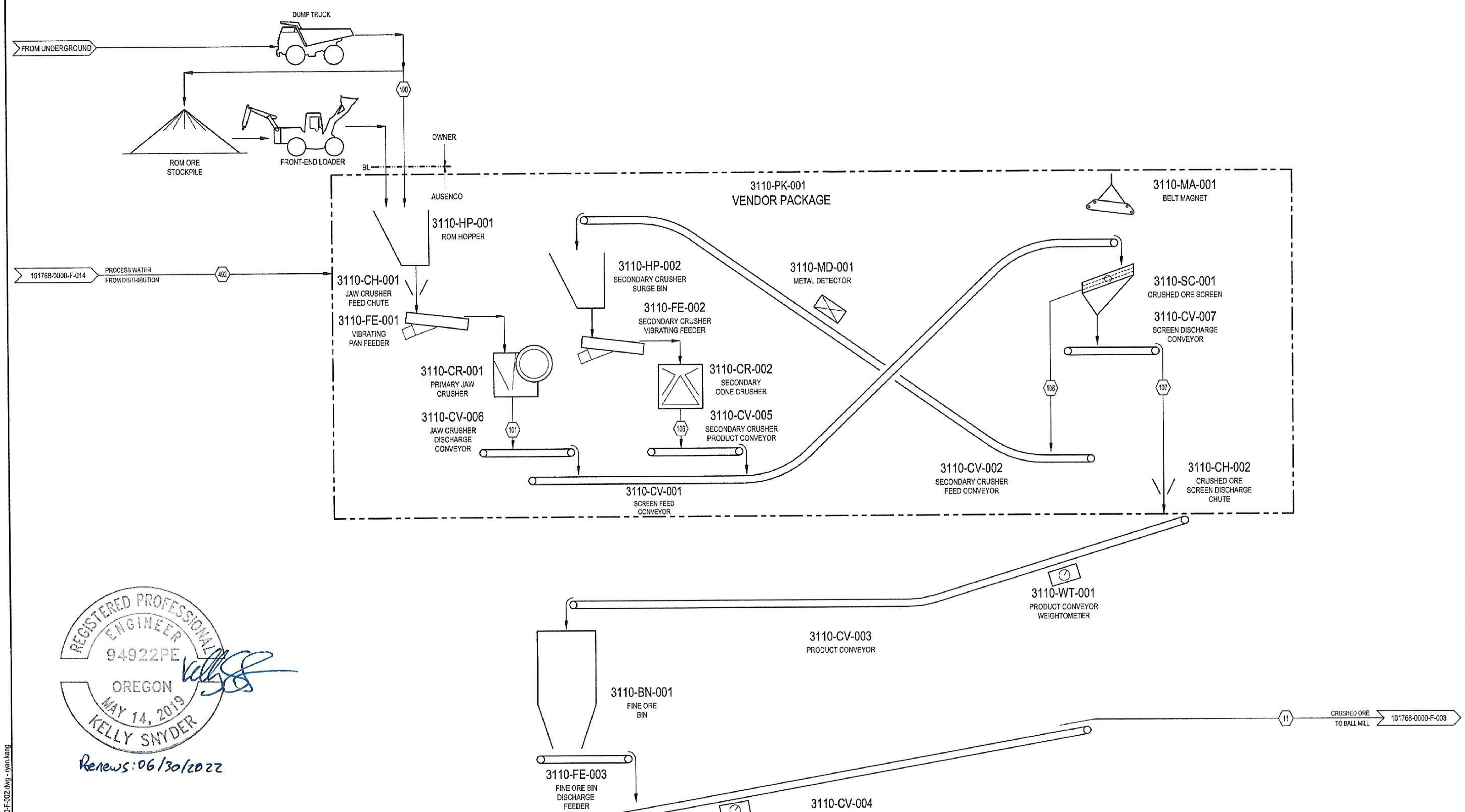
TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
OVERALL
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-001 | REV E

Dec 10,2021 - 3:58pm S:\proj\101768-03\CAD\0000\f\dwg\101768-0000-F-001.dwg - ryan.kang

Appendix B – Process Flow Diagrams



LEGEND

- CONTINUOUS FLOW
- INTERMITTENT FLOW
- FUTURE
- EQUIPMENT
- VENDOR PACKAGE

Dec 10,2021 - 4:02pm S:\proj\101768-03\CAD\0000\Pfds\101768-0000-F-002.dwg - ryan.kang

PARAMOUNT GOLD Nevada

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DRAWN	L. TSENG	10OCT2019
DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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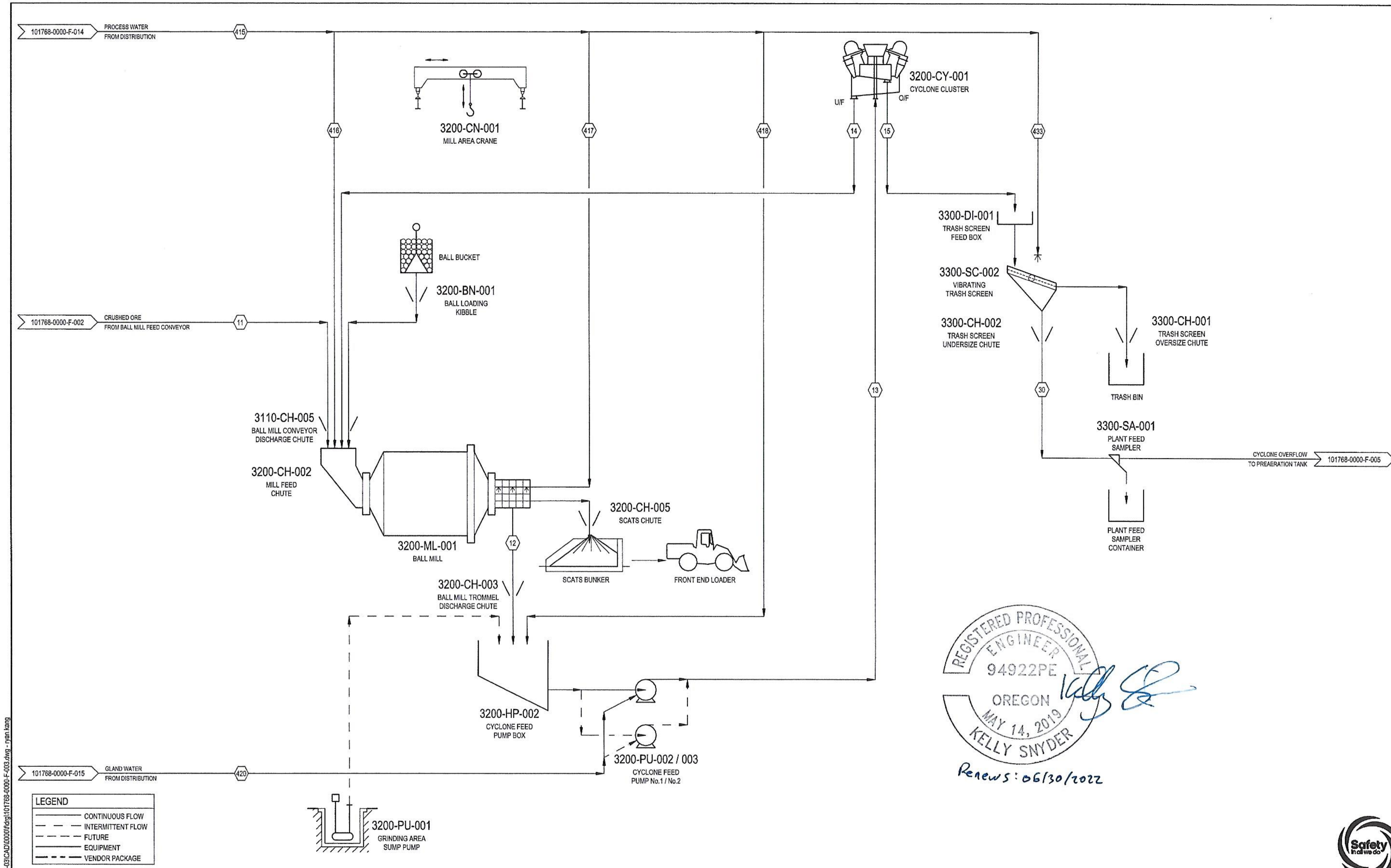
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
CRUSHING, SCREENING & RECLAIM AREA
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-002 | REV E

Safety in all we do



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PARAMOUNT GOLD Nevada

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DRAWN	L. TSENG	10OCT2019
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PROJ. APPR.	A. WIESZBECK	10OCT2019

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
GRINDING AREA
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-003 | REV E

GRAVITY CIRCUIT REMOVED

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER

Renews: 06/30/2022

LEGEND

- ———— CONTINUOUS FLOW
- — — — INTERMITTENT FLOW
- – – – – FUTURE
- ———— EQUIPMENT
- — - — VENDOR PACKAGE

PARAMOUNT GOLD Nevada

No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
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D	LT	31JAN20	UPDATED	SS	CH	NM
C	LT	15NOV19	ISSUED FOR STUDY	SS	CH	NM
B	LT	28OCT19	ISSUED FOR CLIENT REVIEW	SS	CH	NM
A	LT	15OCT19	ISSUED FOR INTERNAL REVIEW	LT	SS	SS

REF.	DRAWING No.	REFERENCE DRAWING

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PROJ. APPR.	A. WIESZBECK	10OCT2019

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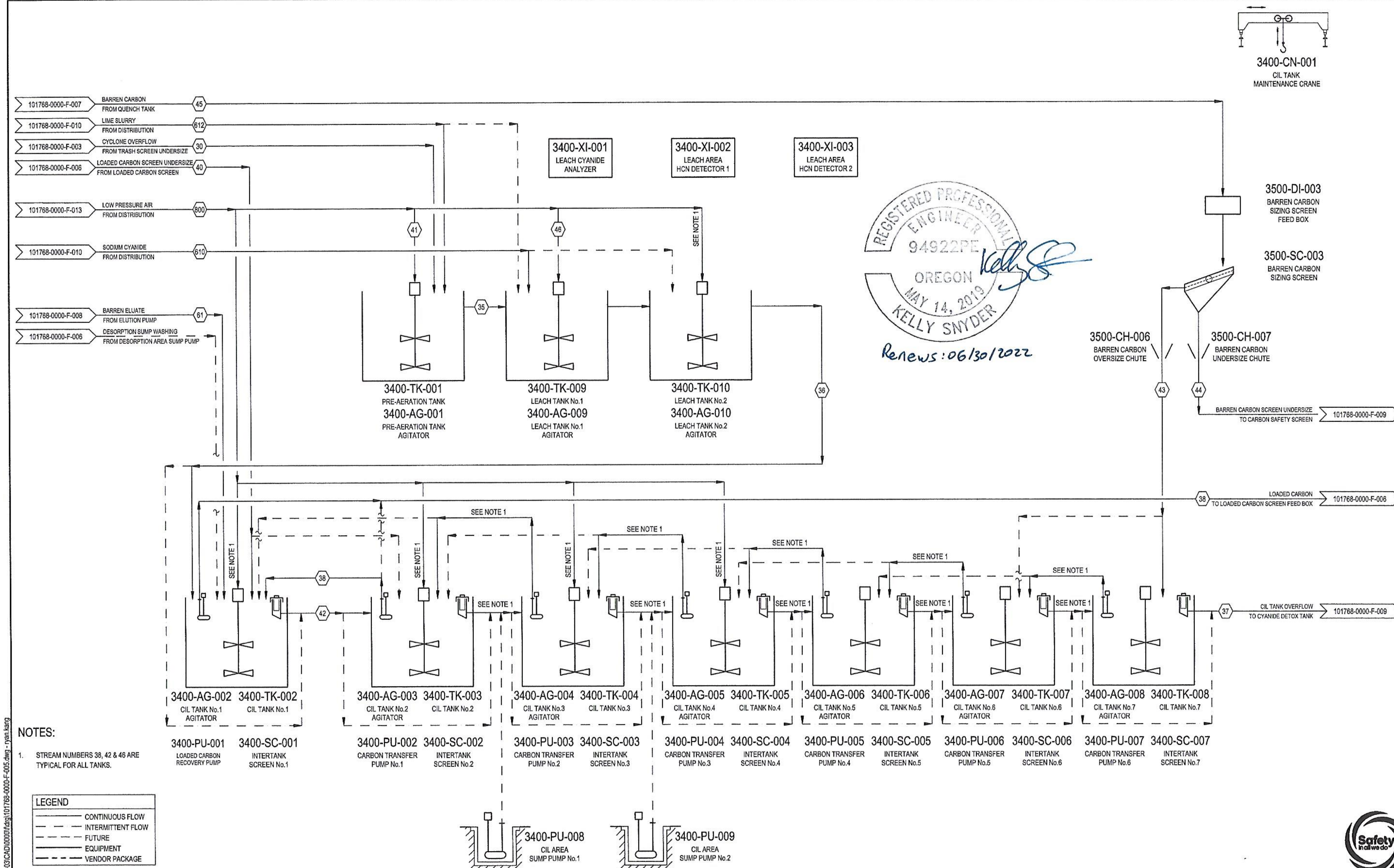
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
INTENSIVE CYANIDATION
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-004 | REV E



NOTES:

1. STREAM NUMBERS 38, 42 & 46 ARE TYPICAL FOR ALL TANKS.

LEGEND

- CONTINUOUS FLOW
- INTERMITTENT FLOW
- FUTURE
- EQUIPMENT
- VENDOR PACKAGE

PARAMOUNT GOLD Nevada

No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
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REF.	DRAWING No.	REFERENCE DRAWING

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DESIGNED	S. STEFANSSON	10OCT2019
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PROJ. APPR.	A. WIESZBECK	10OCT2019

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
PRE-LEACH & CIL AREA
PROCESS FLOW DIAGRAM

PROJECT No.	SCALE	SIZE
101768-03	N.T.S.	A1

DRAWING No.	REV
101768-0000-F-005	E

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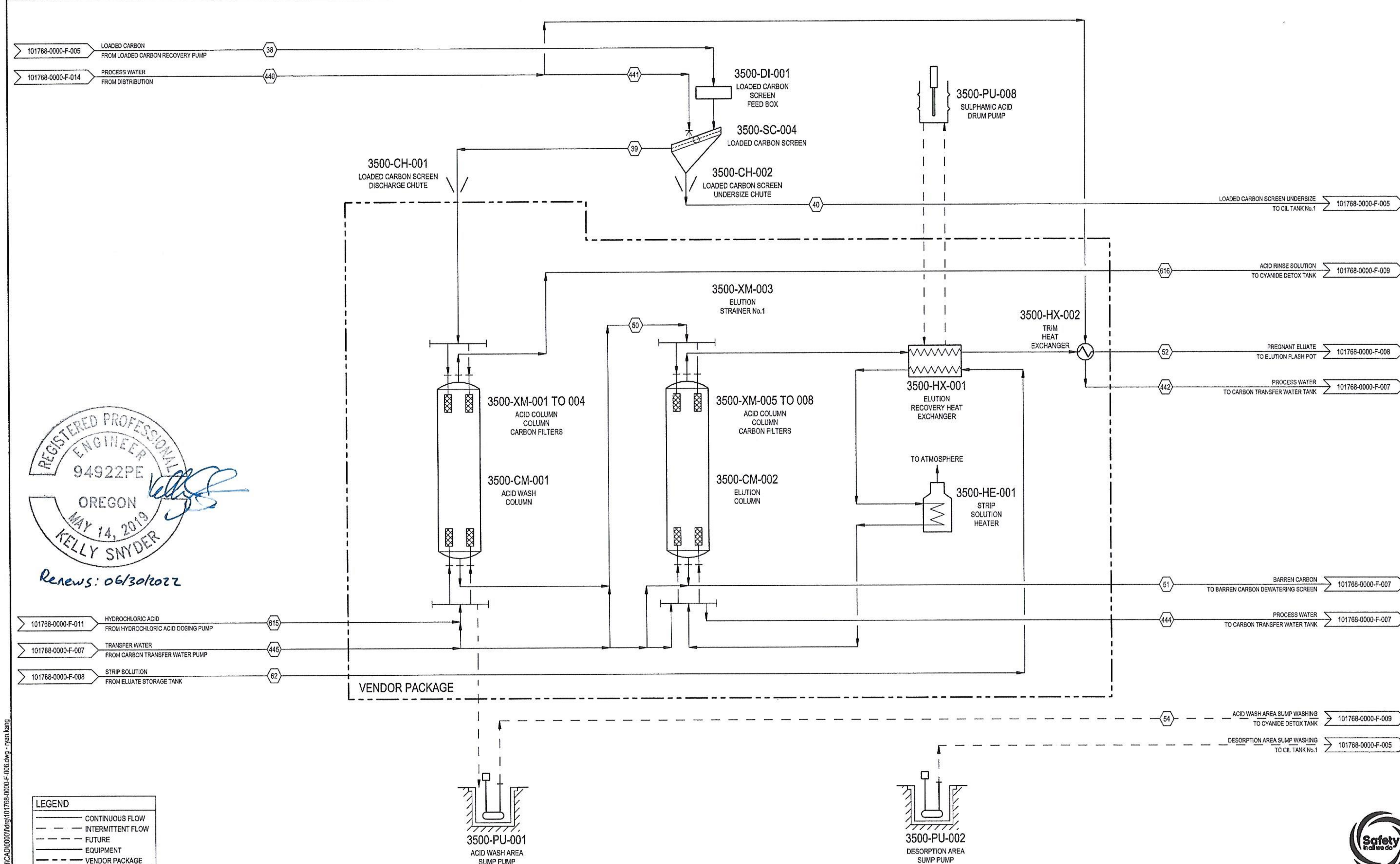

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PARAMOUNT GOLD Nevada

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DRAWN	L. TSENG	10OCT2019
DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
DESORPTION AREA
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-006 | REV E

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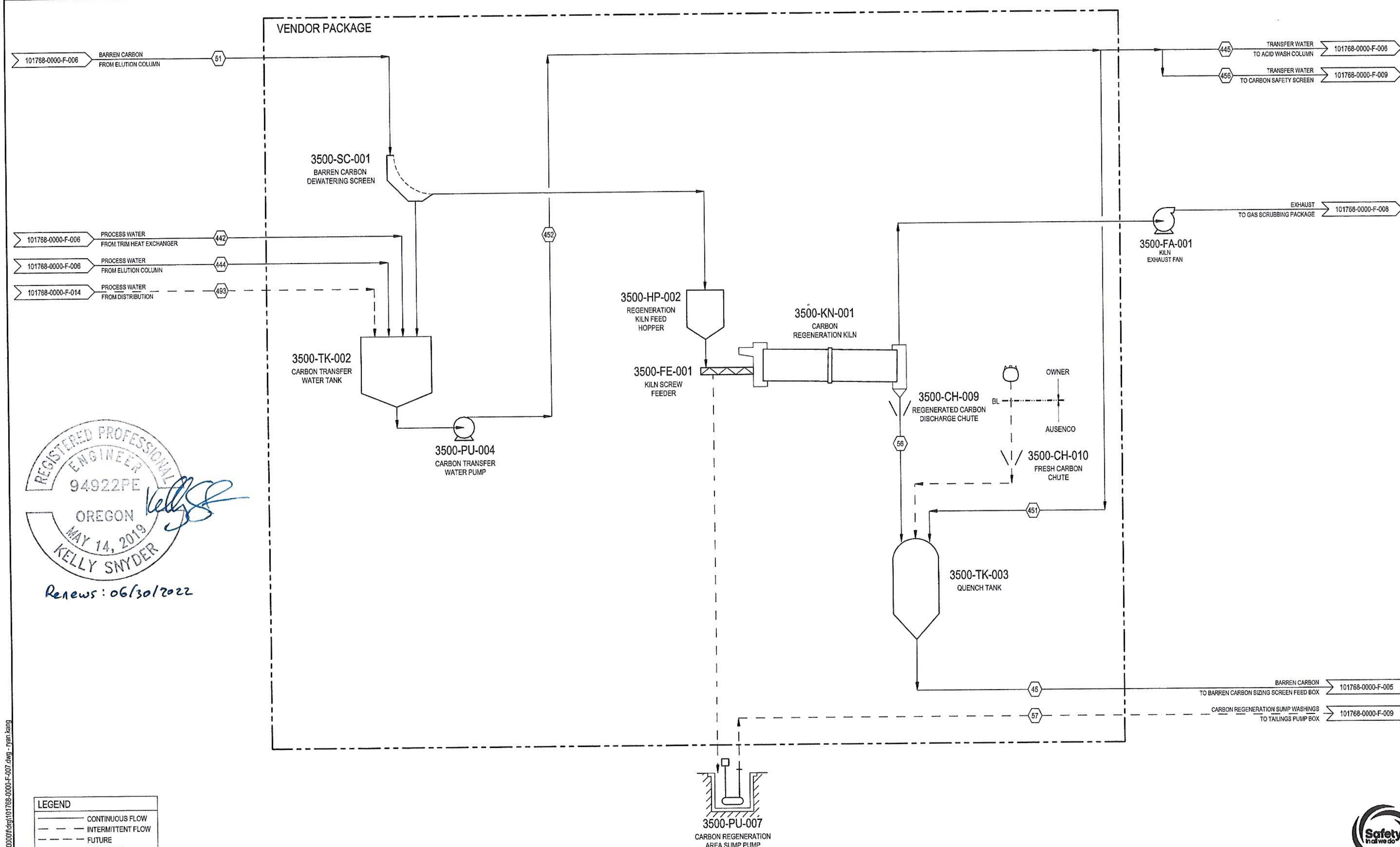

LEGEND

- CONTINUOUS FLOW
- INTERMITTENT FLOW
- FUTURE
- EQUIPMENT
- VENDOR PACKAGE

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PARAMOUNT GOLD Nevada

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No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
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DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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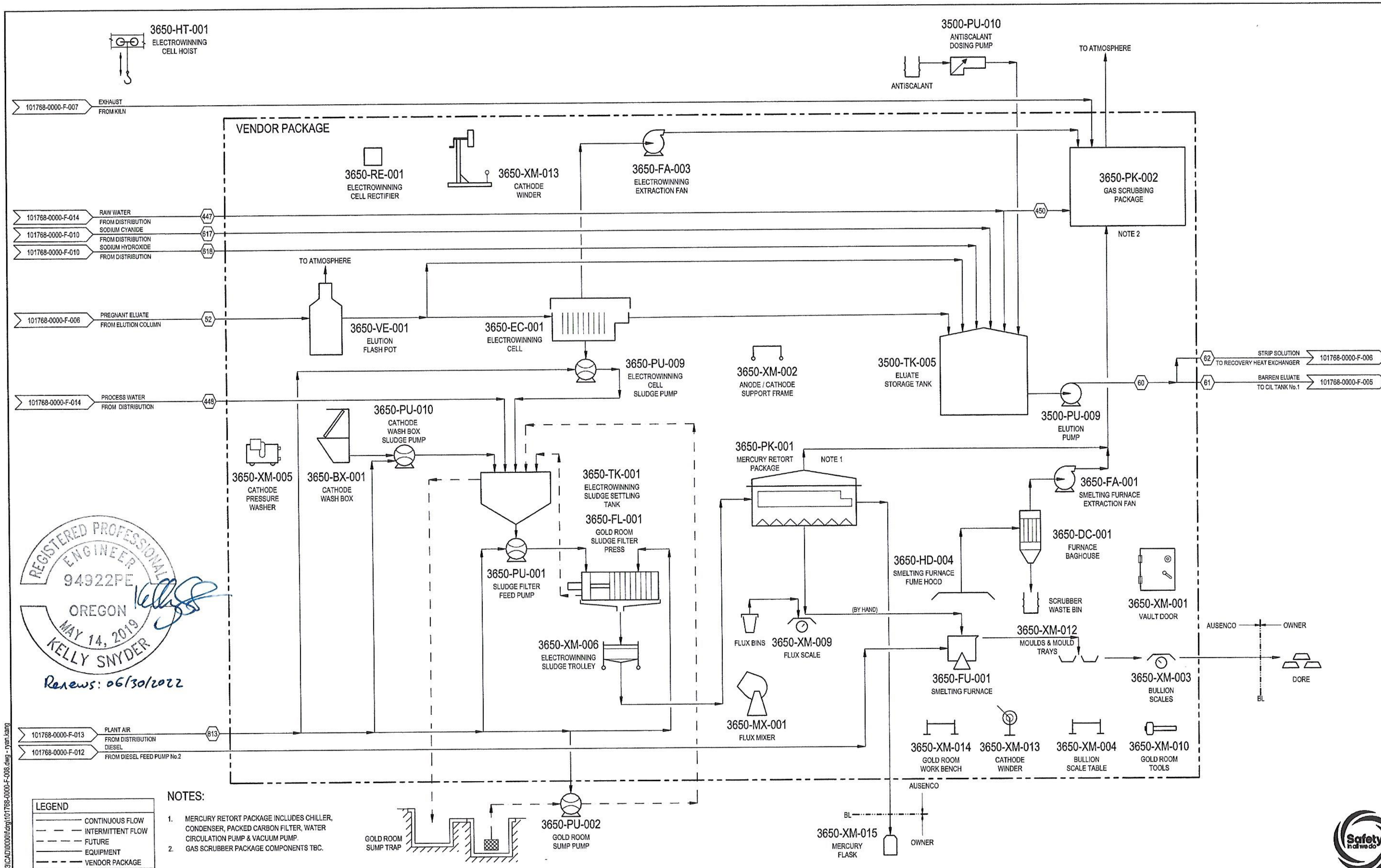
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
CARBON REGENERATION AREA
PROCESS FLOW DIAGRAM

PROJECT No.	SCALE	SIZE
101768-03	N.T.S.	A1
DRAWING No. 101768-0000-F-007		REV E

Safety in all we do



NOTES:

1. MERCURY RETORT PACKAGE INCLUDES CHILLER, CONDENSER, PACKED CARBON FILTER, WATER CIRCULATION PUMP & VACUUM PUMP.
2. GAS SCRUBBER PACKAGE COMPONENTS TBC.

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DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
GOLD ROOM AREA
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-008 | REV E

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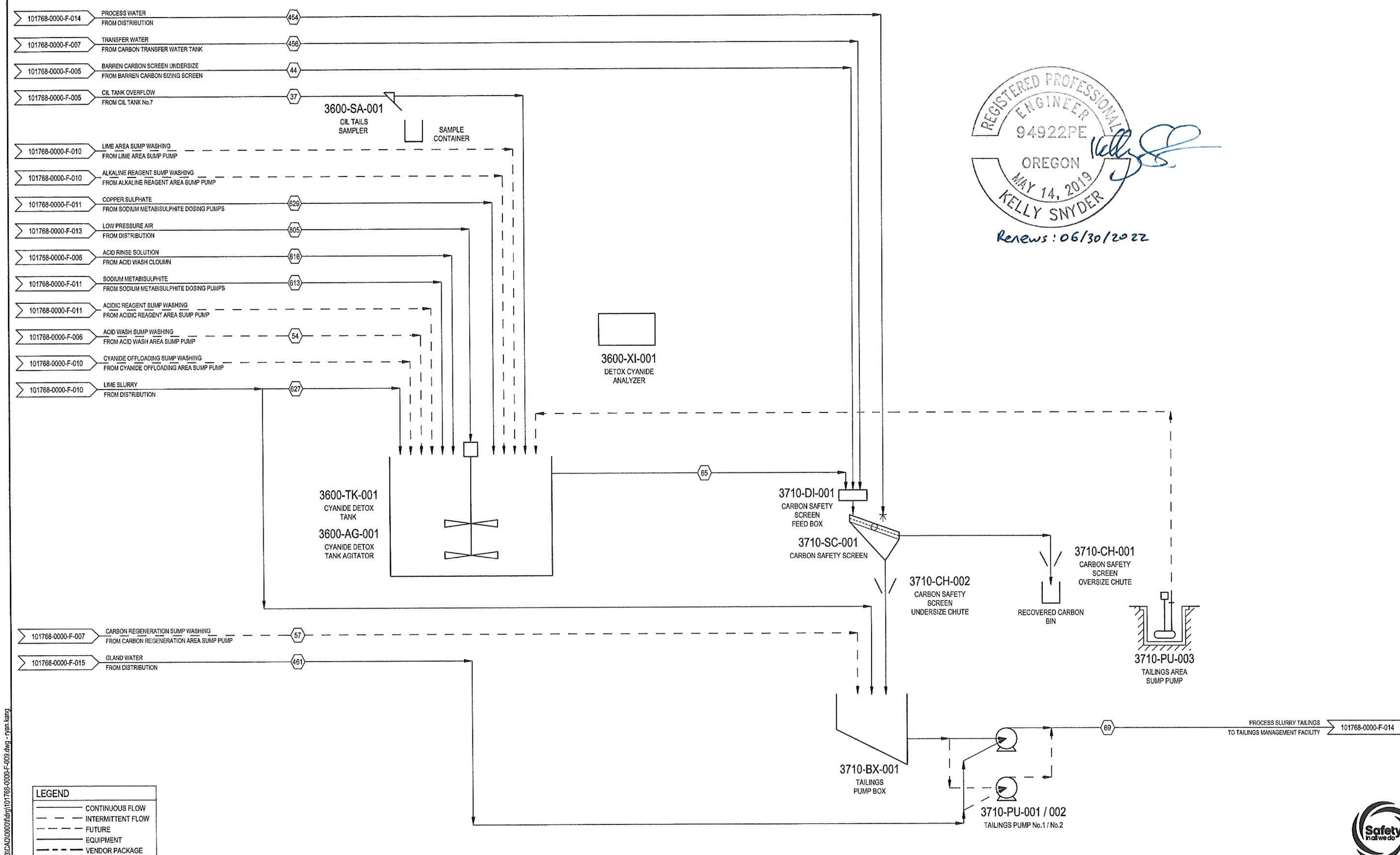

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PARAMOUNT GOLD Nevada

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DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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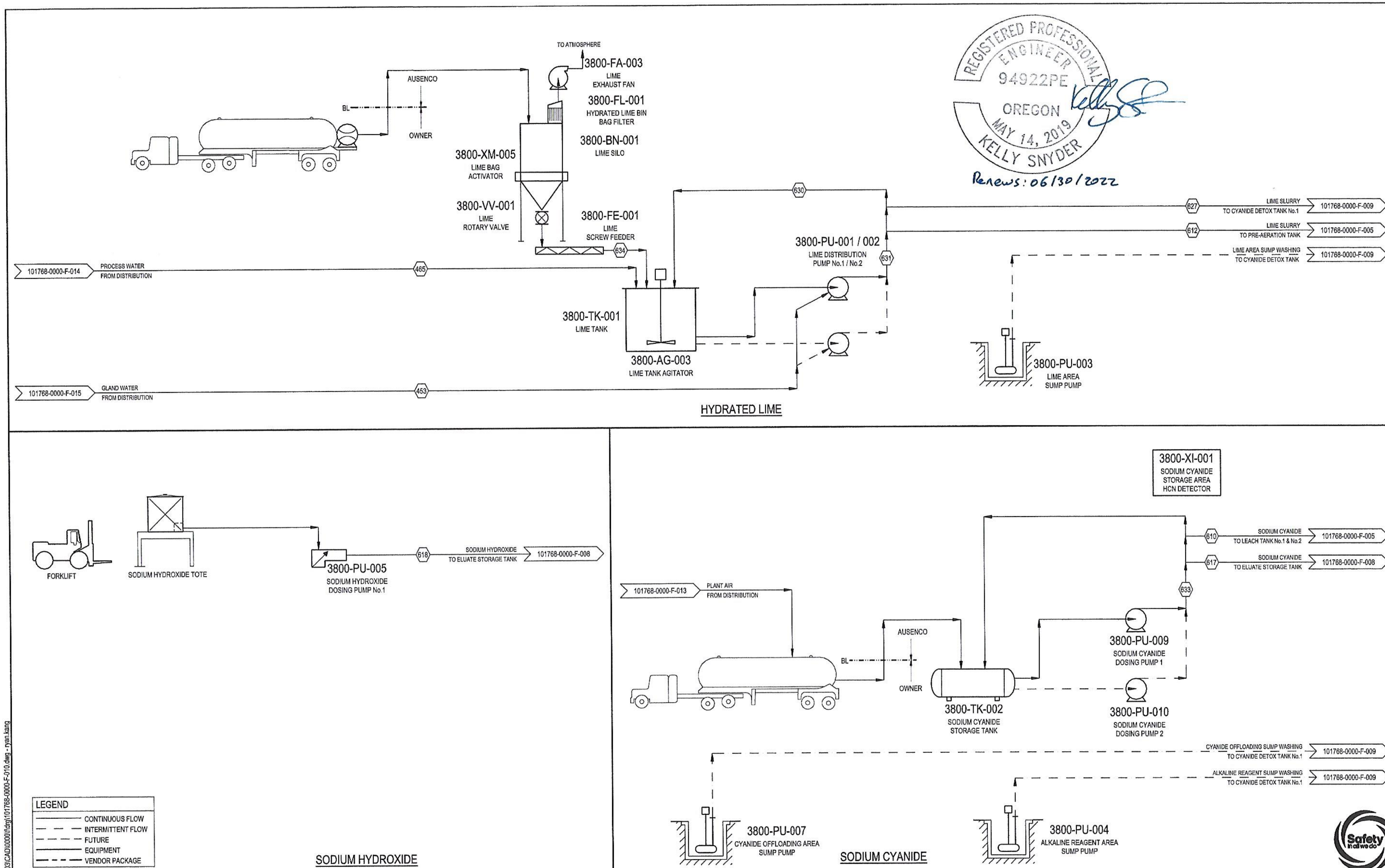
CLIENT PARAMOUNT GOLD NEVADA

TITLE GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
CYANIDE DETOXIFICATION & TAILINGS DISPOSAL AREA
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-009 | REV E



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DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
ALKALINE REAGENTS
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

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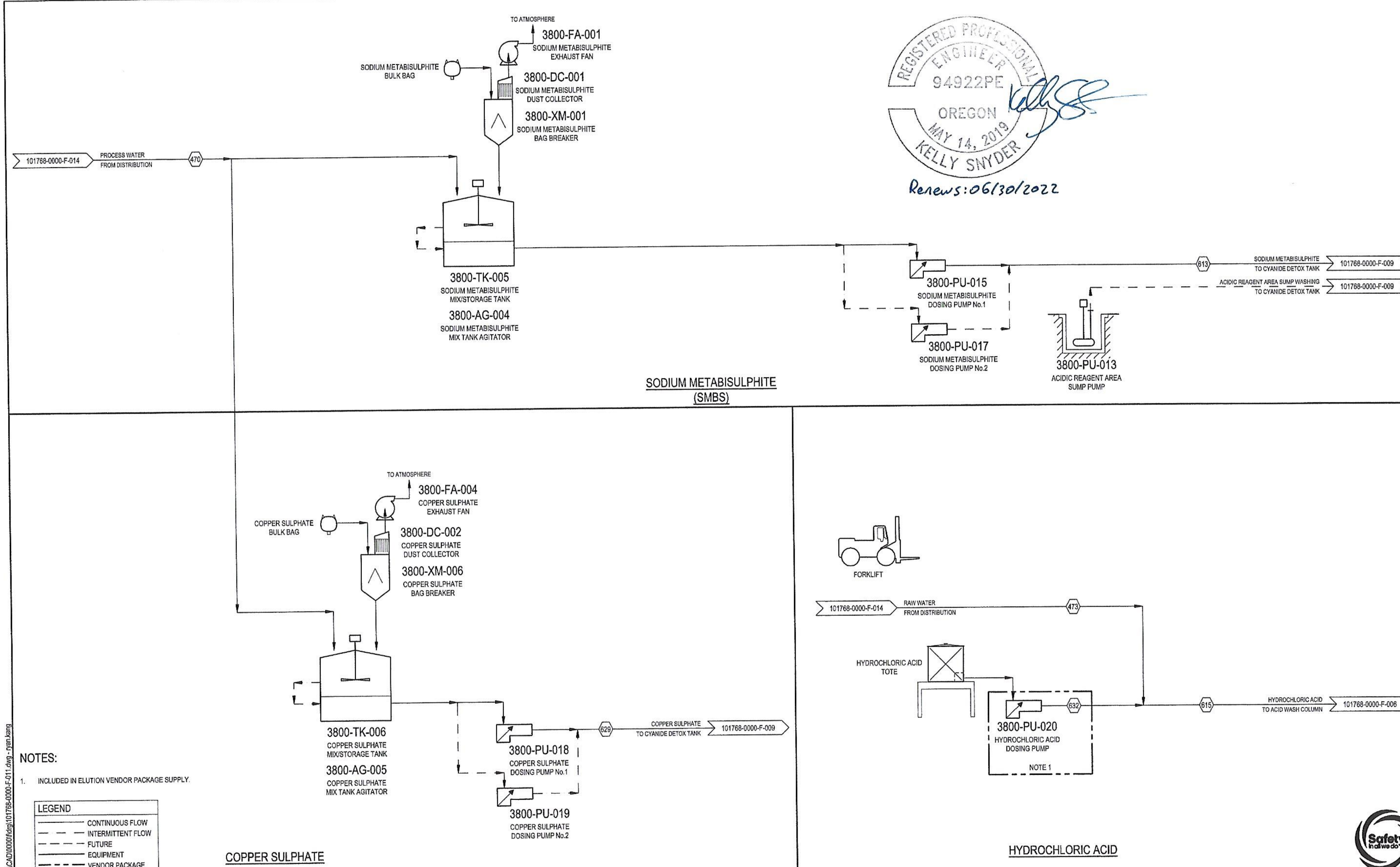

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1. INCLUDED IN ELUTION VENDOR PACKAGE SUPPLY.

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PROJ. APPR.	A. WIESZBECK	10OCT2019

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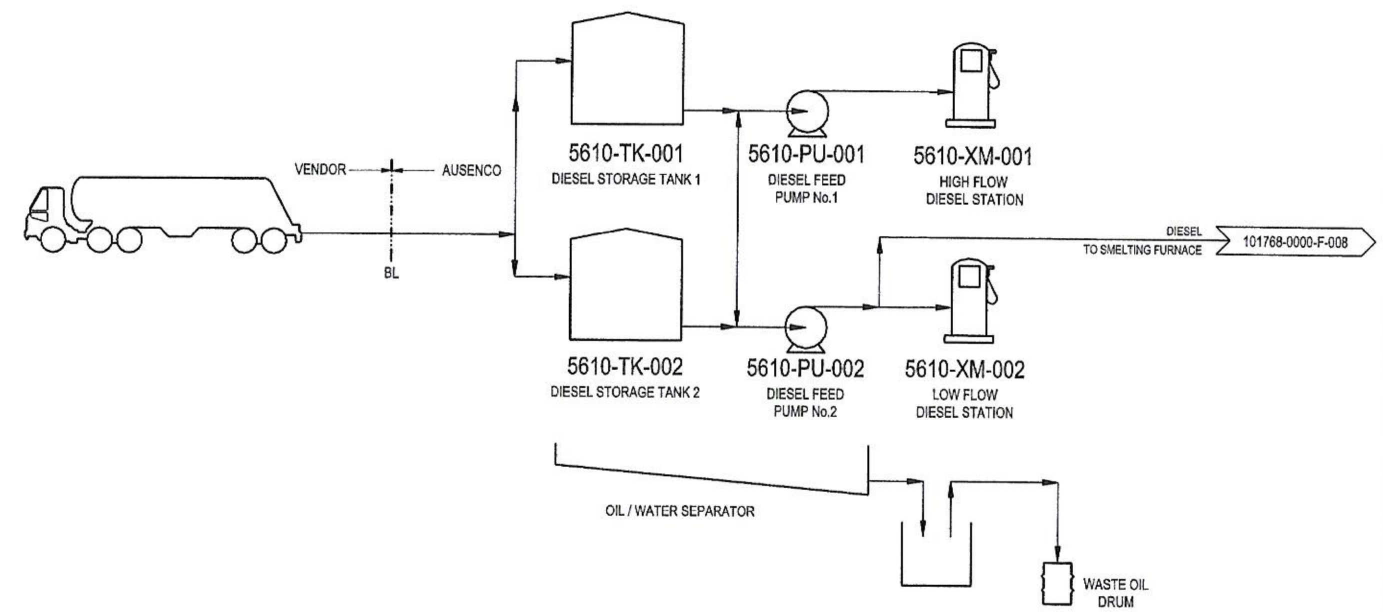
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
ACIDIC REAGENTS
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-011 | REV E



DIESEL

OTHER REAGENTS

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER

Renews: 06/30/2022

LEGEND

- CONTINUOUS FLOW
- INTERMITTENT FLOW
- FUTURE
- EQUIPMENT
- VENDOR PACKAGE

No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
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DRAWN	L. TSENG	10OCT2019
DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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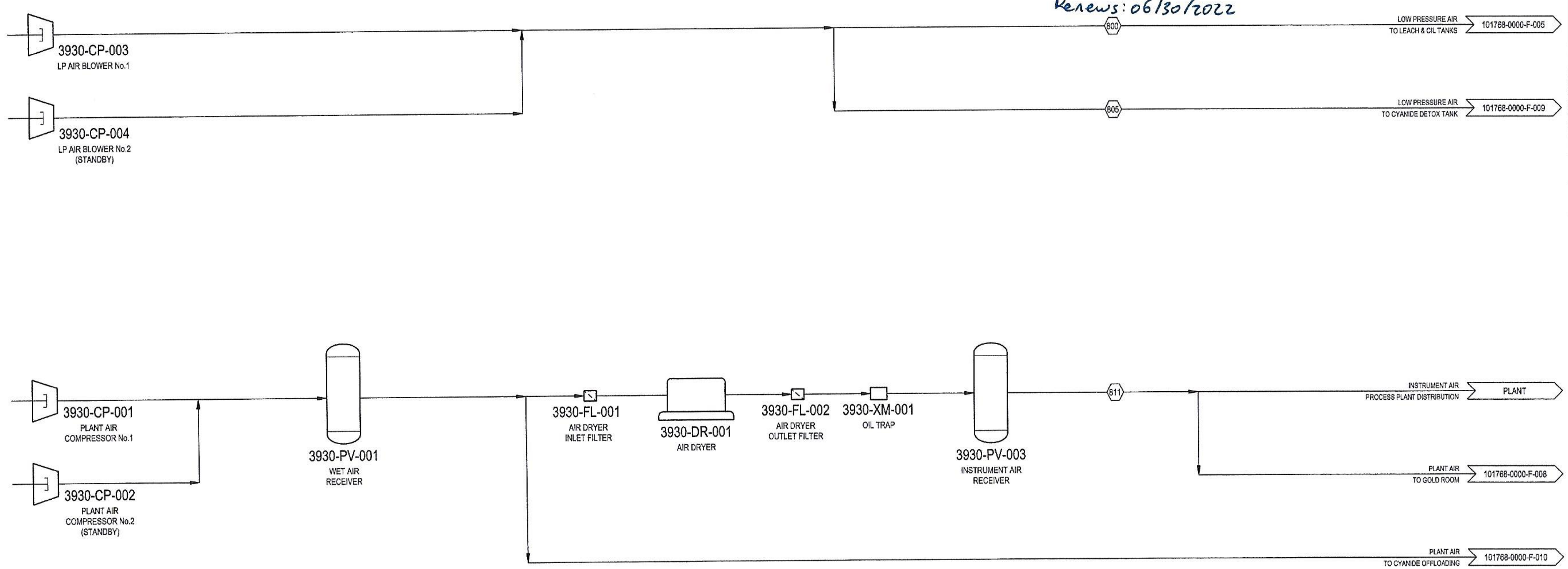
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
REAGENTS GENERAL
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-012 | REV E

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER
Renews: 06/30/2022



LEGEND
- CONTINUOUS FLOW
- INTERMITTENT FLOW
- FUTURE
- EQUIPMENT
- VENDOR PACKAGE

Safety in all we do

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
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DRAWN	L. TSENG	10OCT2019
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DESIGNED	S. STEFANSSON	10OCT2019
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PROJ. APPR.	A. WIESZBECK	10OCT2019

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
PLANT SERVICES - AIR
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-013 | REV E

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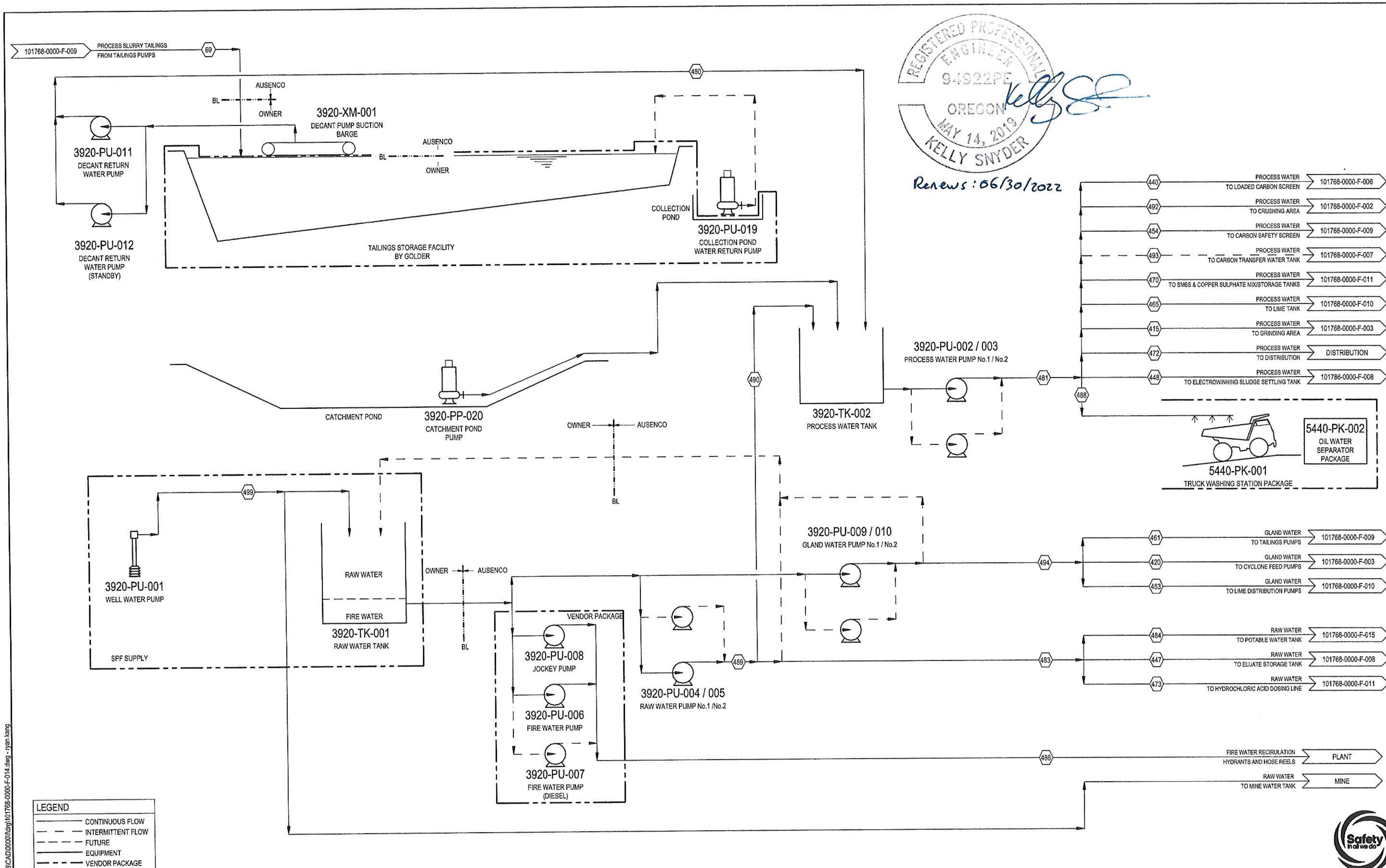

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PARAMOUNT GOLD Nevada

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DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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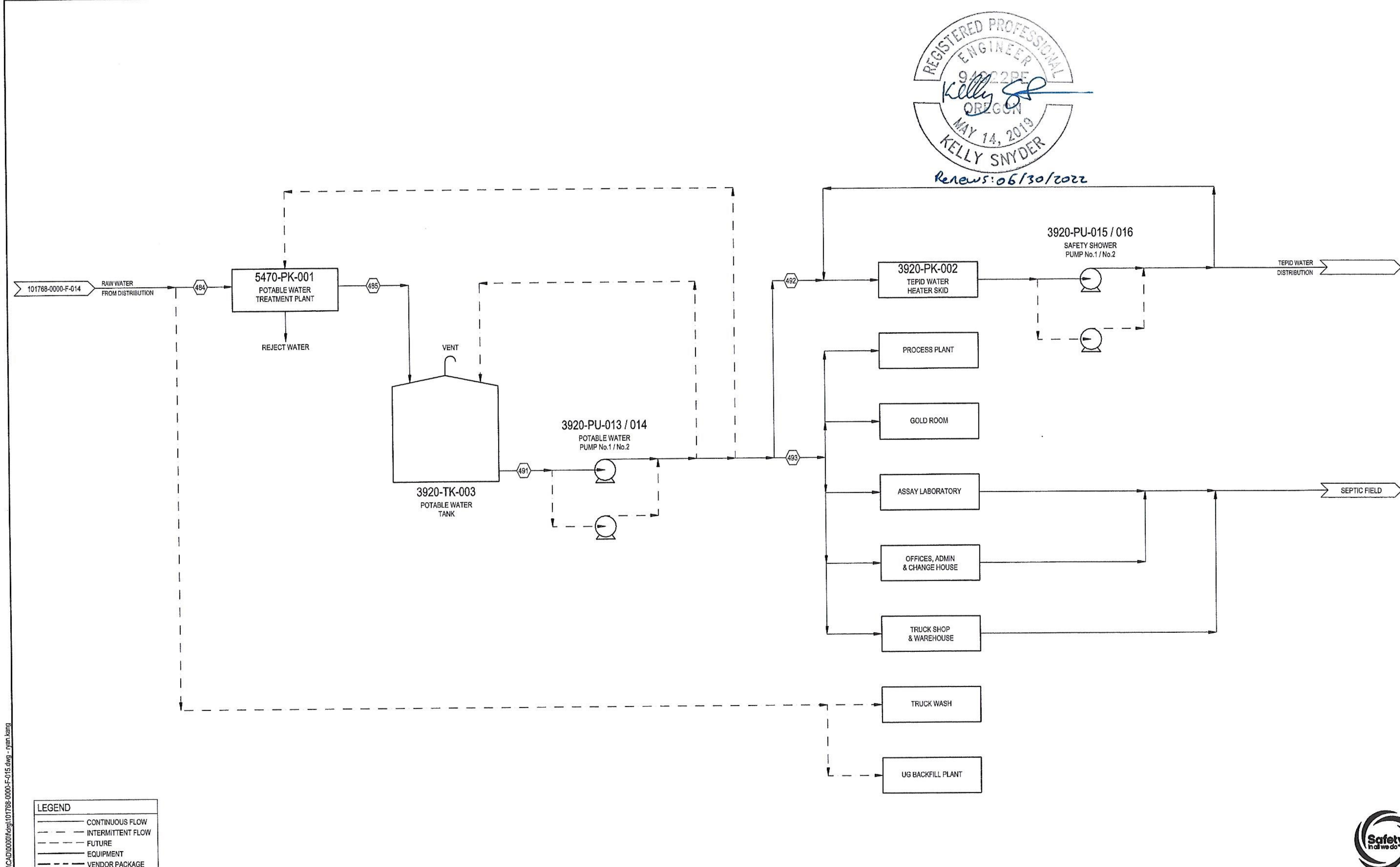
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
PLANT SERVICES - WATER (SHEET 1 OF 2)
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1

DRAWING No. 101768-0000-F-014 | REV E



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PARAMOUNT GOLD Nevada

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			E	RK	10DEC21	ISSUED FOR PERMITTING	SS	CH	AW
			D	LT	31JAN20	UPDATED	SS	CH	NM
			C	LT	15NOV19	ISSUED FOR STUDY	SS	CH	NM
			B	LT	28OCT19	ISSUED FOR CLIENT REVIEW	SS	CH	NM
			A	LT	15OCT19	ISSUED FOR INTERNAL REVIEW	LT	SS	SS

DRAWN	L. TSENG	10OCT2019
DWG. CHECKED	S. STEFANSSON	15OCT2019
DESIGNED	S. STEFANSSON	10OCT2019
DES. APPR.	C. HOWARD	10OCT2019
PROJ. APPR.	A. WIESZBECK	10OCT2019

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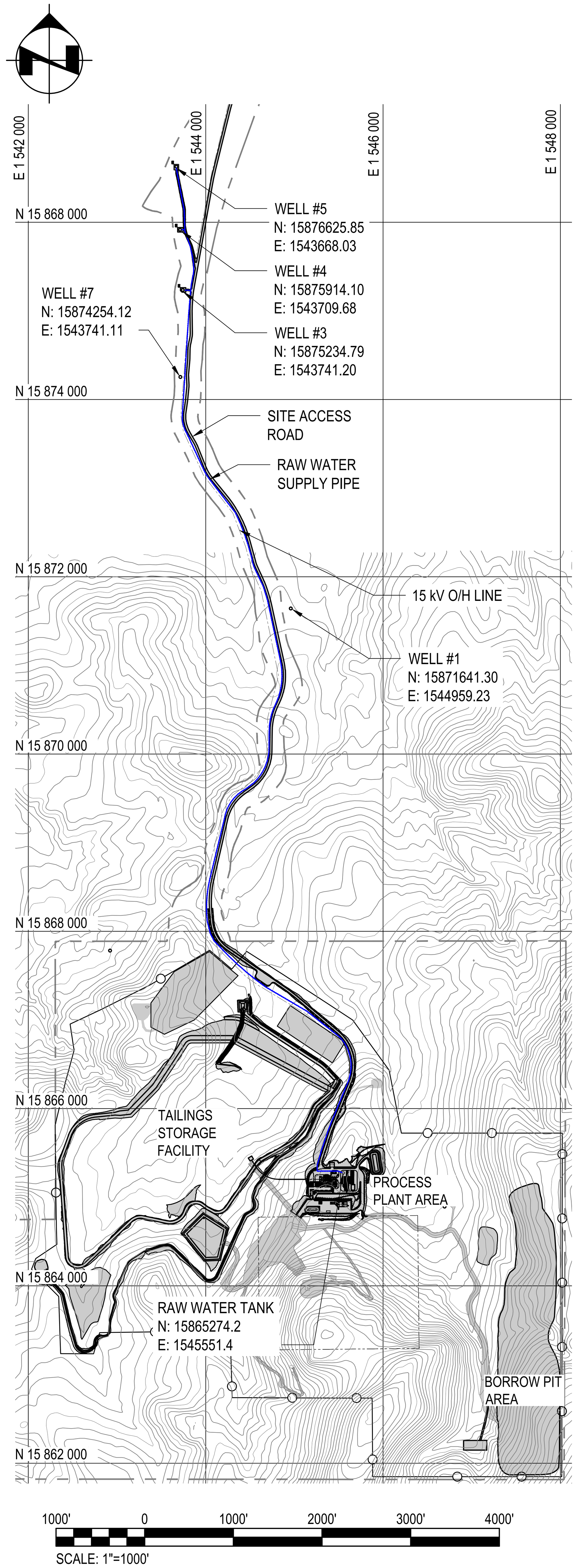
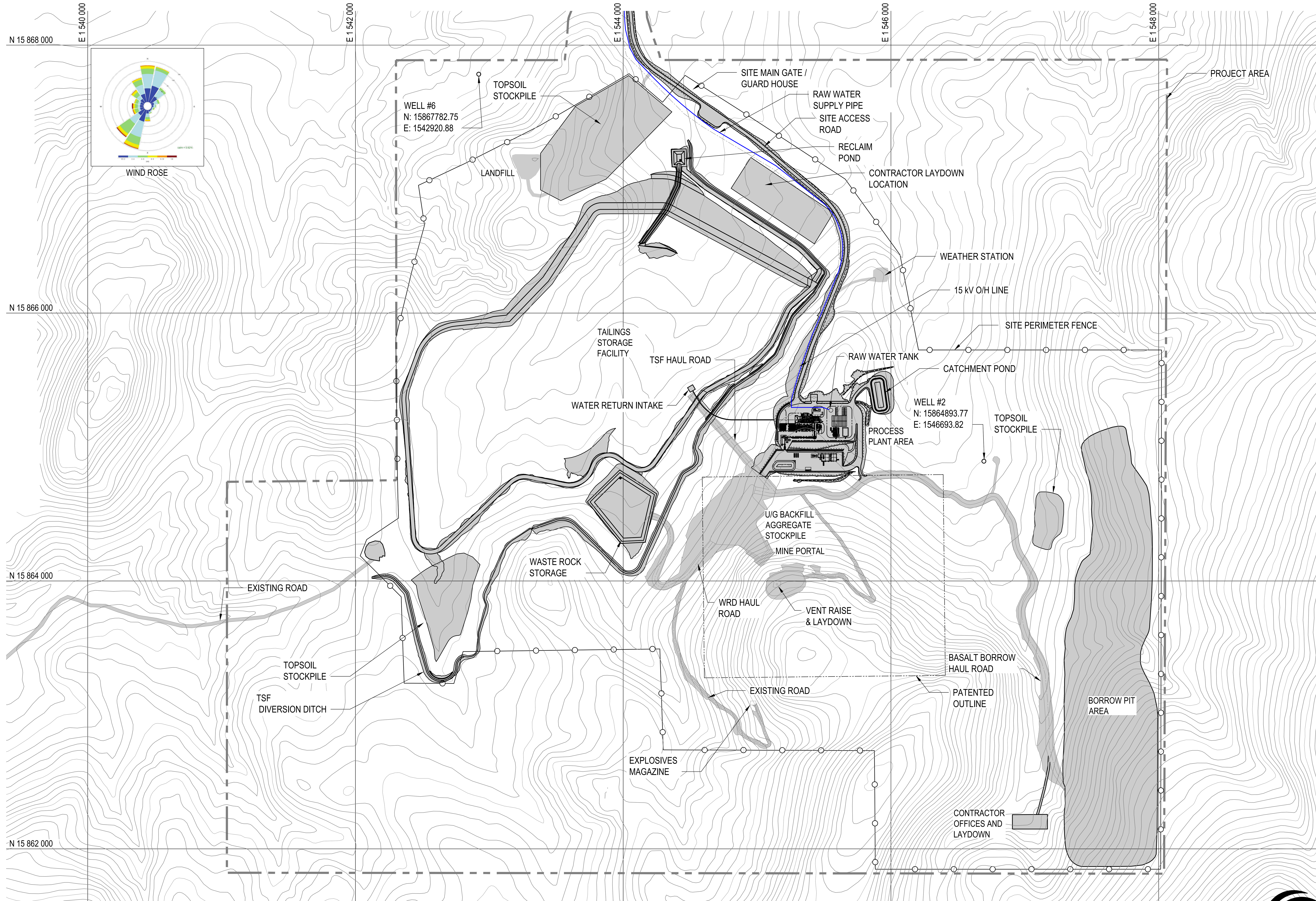
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT
FEASIBILITY STUDY
PLANT SERVICES - WATER (SHEET 2 OF 2)
PROCESS FLOW DIAGRAM

PROJECT No. 101768-03 | SCALE N.T.S. | SIZE A1
DRAWING No. 101768-0000-F-015 | REV E

Appendix C – General Arrangements





PRELIMINARY

PARAMOUNT GOLD
Nevada

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			D	RK	10DEC21	ISSUED FOR PERMITTING	RK	AW	AW
			C	JOF	03SEP20	ISSUED FOR INFORMATION			
			B	BR	10MAR10	ISSUED FOR STUDY	BR	NM	FR
			A	BR	13FEB20	ISSUED FOR INTERNAL REVIEW	BR	NM	FR

DRAWN	B. ROBINSON	04FEB2020
DWG. CHECKED	B. ROBINSON	04FEB2020
DESIGNED	B. ROBINSON	04FEB2020
DES. APPR.	N. MYERS	04FEB2020
PROJ. APPR.	F. RODRIGUES	04FEB2020

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROJECT SITE
GENERAL ARRANGEMENT
PLAN

PROJECT No. 101768-03 | SCALE AS NOTED | SIZE D

DRAWING No. 101768-0000-G-101 | REV D

PARAMOUNT GOLD
Nevada

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			E	RS	06SEP2022	ISSUED FOR PERMITTING	BH		
			D	RK	10DEC21	ISSUED FOR PERMITTING	RK	AW	AW
			C	JOF	11SEP20	ISSUED FOR INFORMATION			
			B	BR	10MAR20	ISSUED FOR STUDY	BR	NM	FR
			A	RK	13FEB20	ISSUED FOR INTERNAL REVIEW	BR	NM	FR

DRAWN	R. KANG	04FEB2020
DWG. CHECKED	B. ROBINSON	04FEB2020
DESIGNED	B. ROBINSON	04FEB2020
DES. APPR.	N. MYERS	04FEB2020
PROJ. APPR.	F. RODRIGUES	04FEB2020

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PLANT SITE
GENERAL ARRANGEMENT
PLAN

PROJECT No.	SCALE	SIZE
101768-03	1"=40'	D

DRAWING No.	REV
101768-0000-G-102	E

PLAN

PARAMOUNT GOLD Nevada

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			C	RK	10DEC21	ISSUED FOR PERMITTING	RK	AW	AW
			B	BR	10MAR20	ISSUED FOR STUDY	BR	NM	FR
			A	RK	13FEB20	ISSUED FOR INTERNAL REVIEW	BR	NM	FR

DRAWN	R. KANG	04FEB2020
DWG. CHECKED	B. ROBINSON	04FEB2020
DESIGNED	B. ROBINSON	04FEB2020
DES. APPR.	N. MYERS	04FEB2020
PROJ. APPR.	F. RODRIGUES	04FEB2020

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
OVERALL GENERAL ARRANGEMENT
PLAN

PROJECT No. 101768-03 | SCALE 3/32"=1'-0" | SIZE D

DRAWING No. 101768-0000-G-103 | REV C

PARAMOUNT GOLD Nevada

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			D	RK	10DEC21	ISSUED FOR PERMITTING	RK	AW	AW
			C	JOF	11SEP20	ISSUED FOR INFORMATION			
			B	BR	10MAR20	ISSUED FOR STUDY	BR	NM	FR
			A	RK	13FEB20	ISSUED FOR INTERNAL REVIEW	BR	NM	FR

DRAWN	R. KANG	04FEB2020
DWG. CHECKED	B. ROBINSON	04FEB2020
DESIGNED	B. ROBINSON	04FEB2020
DES. APPR.	N. MYERS	04FEB2020
PROJ. APPR.	F. RODRIGUES	04FEB2020

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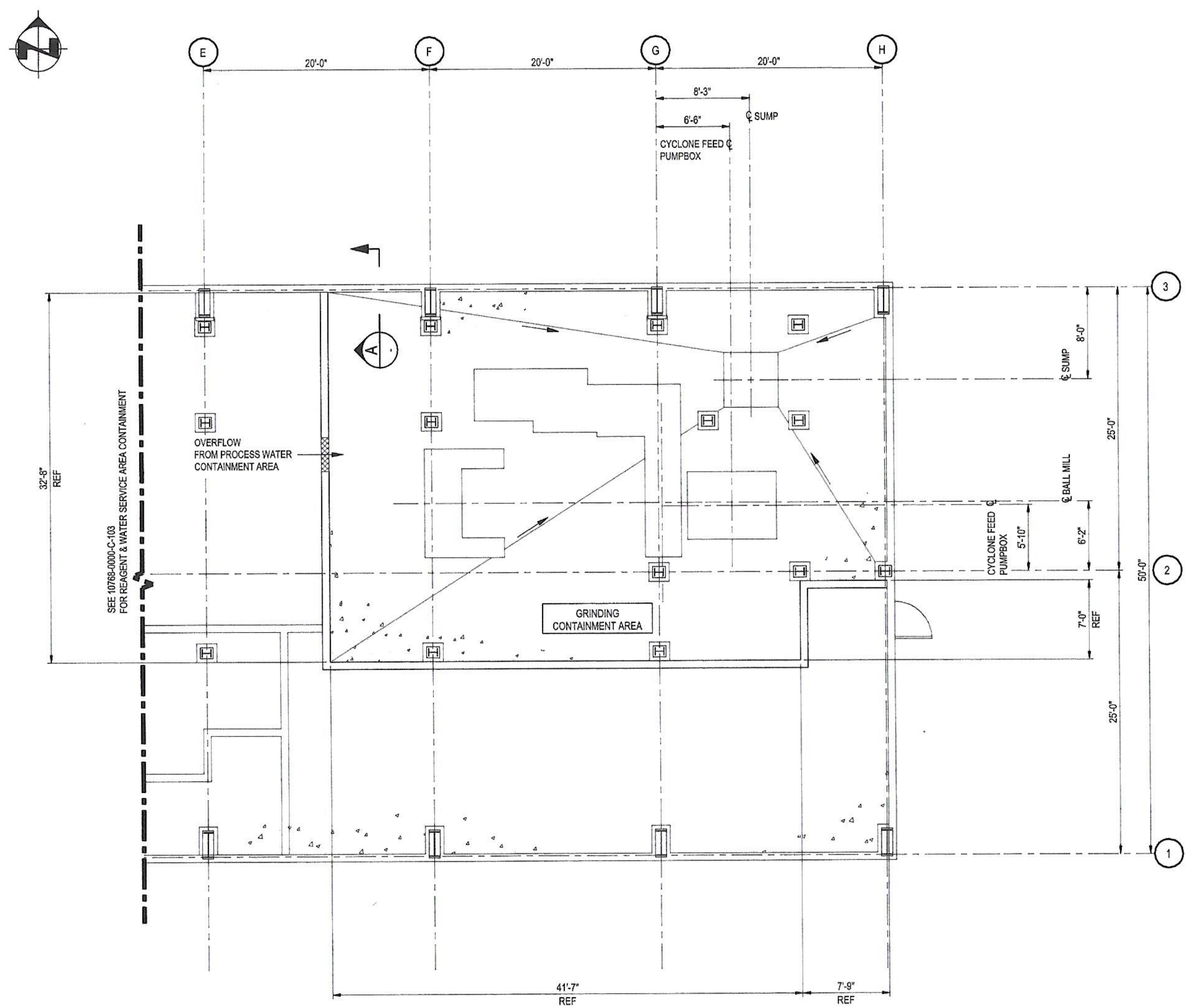
CLIENT PARAMOUNT GOLD NEVADA

TITLE GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
GENERAL ARRANGEMENT
SECTION A & B & C

PROJECT No. 101768-03 | SCALE 3/32"=1'-0" | SIZE D

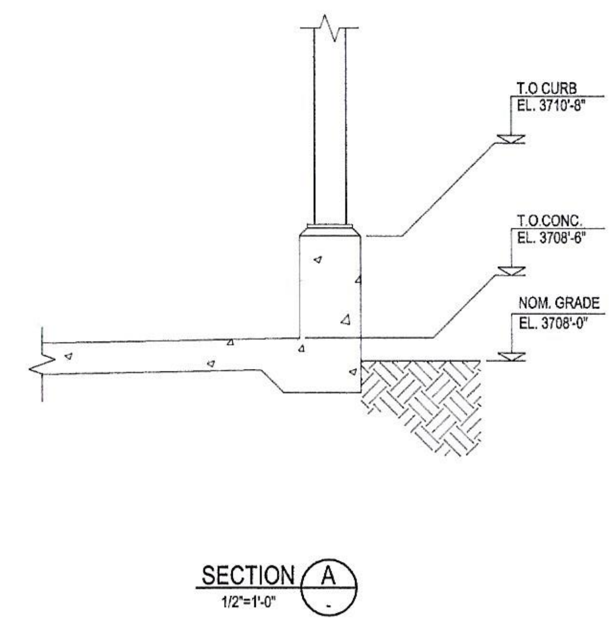
DRAWING No. 101768-0000-G-104 | REV D

Appendix D – Concrete Containment Drawings



PLAN

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER
Renews: 06/30/2022



SECTION A
1/2"=1'-0"

NOTES:

1. TOTAL CONTAINMENT VOLUME FOR THE GRINDING AREA: 2497.74ft³.
2. VOLUME OF LARGEST VESSEL WITHIN THE GRINDING AREA (110%) : 597.05ft³.
3. DESIGN CURB HEIGHT: 26".
4. THE BUNDED AREA IS SIZED TO CONTAIN 110% OF THE LARGEST TANK VOLUME.
5. REFERENCE CALCULATION: 101768-0000-MX-CALC-0004.

1'-0" 0 2'-0" 4'-0" 6'-0" 8'-0"
SCALE: 1/2"=1'-0"

4'-0" 0 4'-0" 8'-0" 12'-0" 16'-0" 20'-0"
SCALE: 3/16"=1'-0"

FOR PERMITTING PURPOSES ONLY

Safety in all we do

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			C	RK	13DEC2021	ISSUED FOR PERMITTING	CH	DH	AW
			B	RK	18OCT2021	ISSUED FOR CLIENT REVIEW	DY	-	-
			A	RK	07OCT2021	ISSUED FOR INTERNAL REVIEW	DY	-	-

DRAWN	R. KANG	04OCT2021
DWG. CHECKED	D. YU	04OCT2021
DESIGNED	R. KANG	04OCT2021
DES. APPR.	D. YU	04OCT2021
PROJ. APPR.	A. WEISZBECK	04OCT2021

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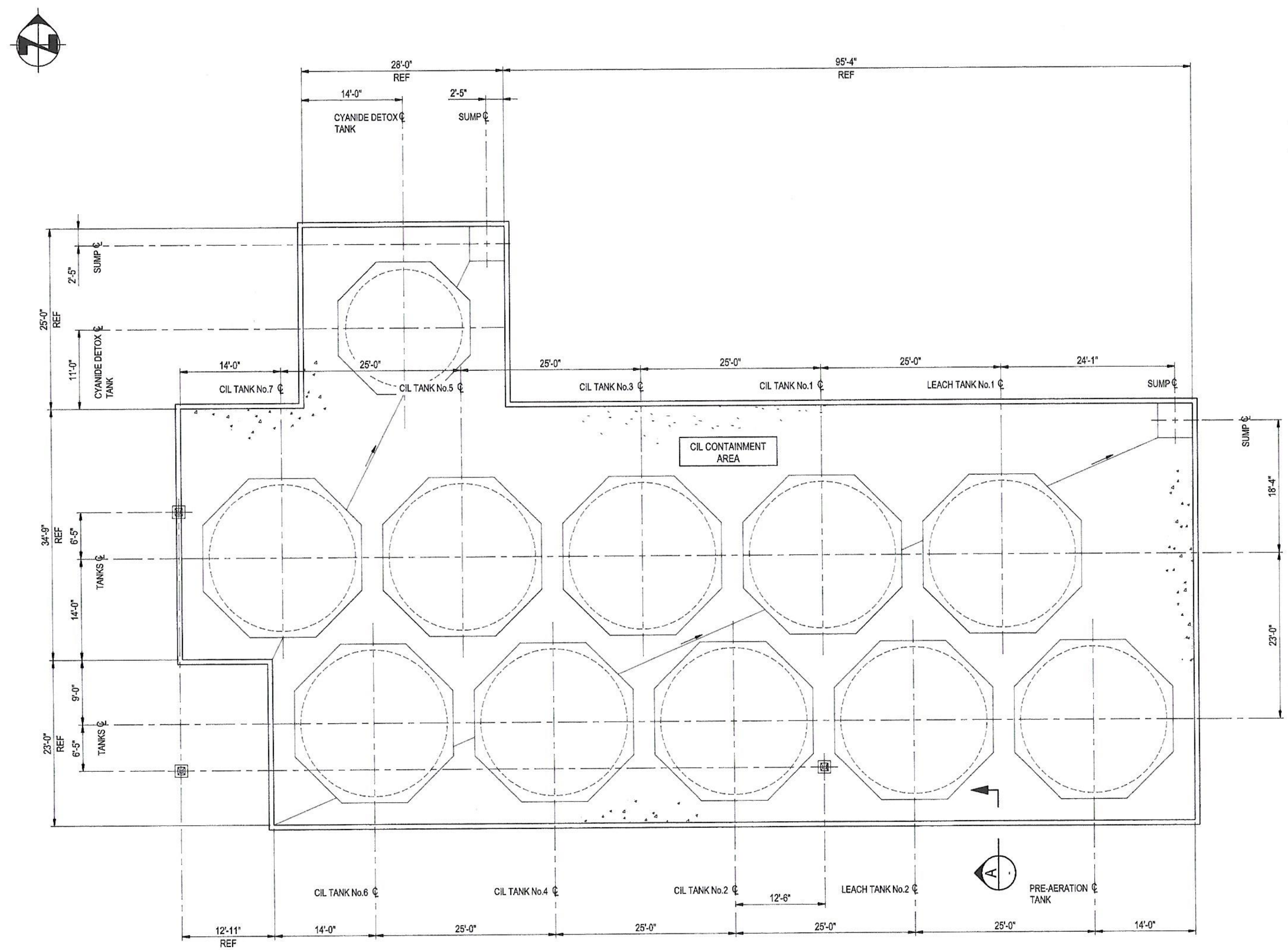
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
GRINDING AREA
CONTAINMENT-GENERAL ARRANGEMENT

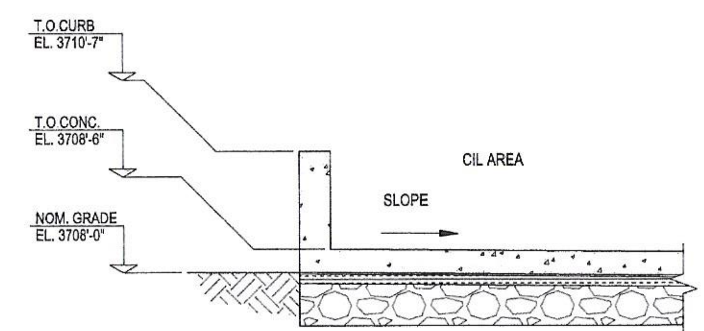
PROJECT No. 101768-03
SCALE AS SHOWN
SIZE D
DRAWING No. 101768-0000-C-101
REV C



PLAN

REGISTERED PROFESSIONAL ENGINEER 94922PE OREGON MAY 14, 2019 KELLY SNYDER

Renews: 06/30/2022



SECTION A
1/2"=1'-0"

NOTES:

1. TOTAL CONTAINMENT VOLUME FOR THE CIL AREA: 9687.20ft³.
2. VOLUME OF LARGEST VESSEL WITHIN THE CIL AREA (110%) : 6590.86ft³.
3. DESIGN CURB HEIGHT: 25".
4. THE BUNDED AREA IS SIZED TO CONTAIN 110% OF THE LARGEST TANK VOLUME PLUS A 1-IN-100 YEAR 24 HOUR STORM EVENT.
5. REFERENCE CALCULATION: 101768-0000-MX-CALC-0001.

1'-0" 0 2'-0" 4'-0" 6'-0" 8'-0"
SCALE: 1/2"=1'-0"

5'-0" 0 10'-0" 20'-0" 30'-0"
SCALE: 1/8"=1'-0"

FOR PERMITTING PURPOSES ONLY

Safety in all we do

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			C	RK	13DEC2021	ISSUED FOR PERMITTING	CH	DH	AW
			B	RK	18OCT2021	ISSUED FOR CLIENT REVIEW	DY	-	-
			A	RK	07OCT2021	ISSUED FOR INTERNAL REVIEW	DY	-	-

DRAWN	R. KANG	04OCT2021
DWG. CHECKED	D. YU	04OCT2021
DESIGNED	R. KANG	04OCT2021
DES. APPR.	D. YU	04OCT2021
PROJ. APPR.	A. WEISZBECK	04OCT2021

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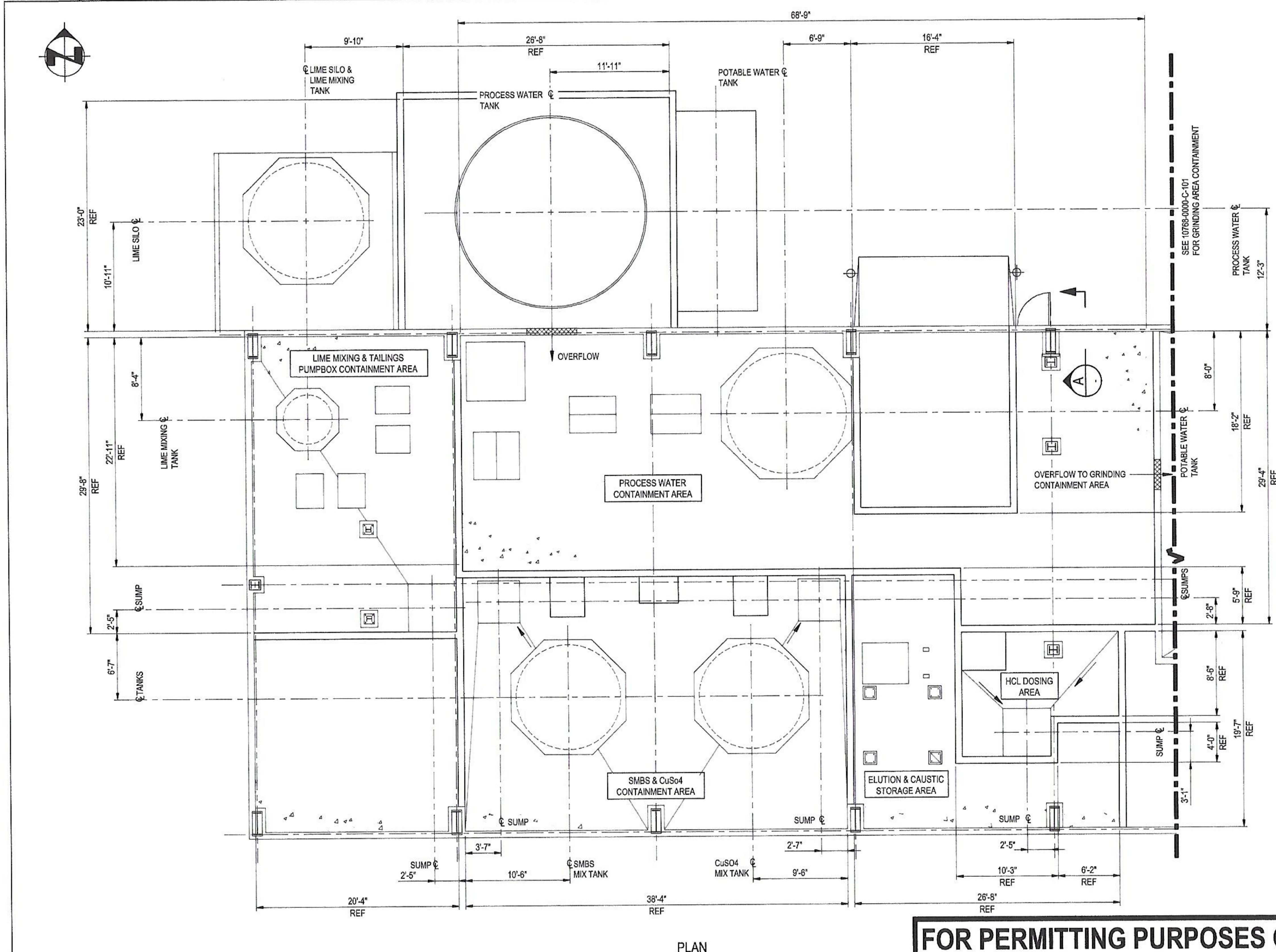
CLIENT: PARAMOUNT GOLD NEVADA

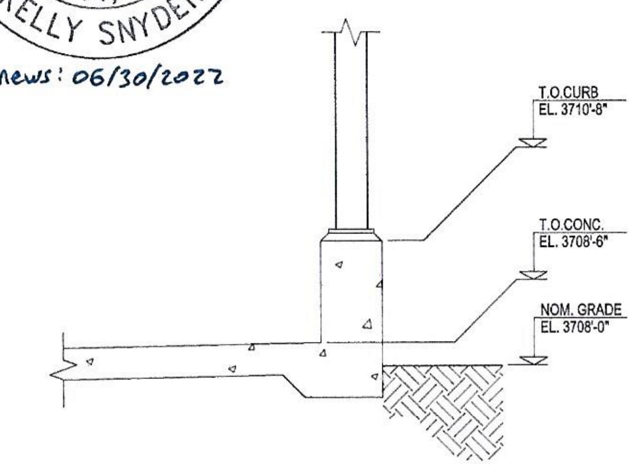
TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
CIL AREA
CONTAINMENT-GENERAL ARRANGEMENT

PROJECT No. 101768-03 | SCALE AS SHOWN | SIZE D

DRAWING No. 101768-0000-C-102 | REV C



REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER
Renews: 06/30/2022



SECTION A
1/2"=1'-0"

NOTES:

1. IN THE ACID CONTAINMENT THE SLAB AND WALL SHALL BE COVERED BY EPOXY COATING.
2. TOTAL CONTAINMENT VOLUME FOR THE LIME MIXING & TAILINGS PUMPBOX AREA: 283.50ft³.
3. VOLUME OF LARGEST VESSEL WITHIN THE LIME MIXING & TAILINGS PUMPBOX AREA (110%) : 248.13ft³.
4. DESIGN CURB HEIGHT: 8".
5. TOTAL CONTAINMENT VOLUME FOR THE SMBS & CuSO4 AREA: 423.48ft³
6. VOLUME OF LARGEST VESSEL WITHIN THE SMBS & CuSO4 AREA (110%): 395.11ft³
7. DESIGN CURB HEIGHT: 8".
8. TOTAL CONTAINMENT VOLUME FOR THE ELUTION AND CAUSTIC STORAGE AREA: 236.77ft³.
9. VOLUME OF LARGEST VESSEL WITHIN THE ELUTION AND CAUSTIC STORAGE AREA (110%): 166.71ft³
10. DESIGN CURB HEIGHT: 10"
11. TOTAL CONTAINMENT VOLUME FOR THE HYDROCHLORIC ACID DOSING AREA: 197.66ft³.
12. VOLUME OF LARGEST VESSEL WITHIN THE HYDROCHLORIC ACID DOSING AREA (110%): 166.71ft³
13. DESIGN CURB HEIGHT: 14"
14. TOTAL CONTAINMENT VOLUME FOR THE PROCESS WATER TANK AREA: 3276.57ft³.
15. VOLUME OF LARGEST VESSEL WITHIN THE PROCESS WATER TANK AREA (110%): 5639.10ft³
16. DESIGN CURB HEIGHT: 26"
17. PROCESS WATER TANK AREA CONTAINMENT WILL OVERFLOW INTO GRINDING AREA IN CASE OF TANK FAILURE.
18. THE BUNDED AREAS ARE SIZED TO CONTAIN 110% OF THE LARGEST TANK VOLUMES PLUS A 1-IN-100 YEAR 24 HOUR STORM EVENT.
19. REFERENCE CALCULATION: 101768-0000-MX-CALC-0002 & 0008.

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

SCALE: 3/16"=1'-0"

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PARAMOUNT GOLD Nevada

No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
C	RK	13DEC2021	ISSUED FOR PERMITTING	CH	DH	AW
B	RK	18OCT2021	ISSUED FOR CLIENT REVIEW	DY	-	-
A	RK	07OCT2021	ISSUED FOR INTERNAL REVIEW	DY	-	-

REF.	DRAWING No.	REFERENCE DRAWING

DRAWN	R. KANG	04OCT2021
DWG. CHECKED	D. YU	04OCT2021
DESIGNED	R. KANG	04OCT2021
DES. APPR.	D. YU	04OCT2021
PROJ. APPR.	A. WEISZBECK	04OCT2021

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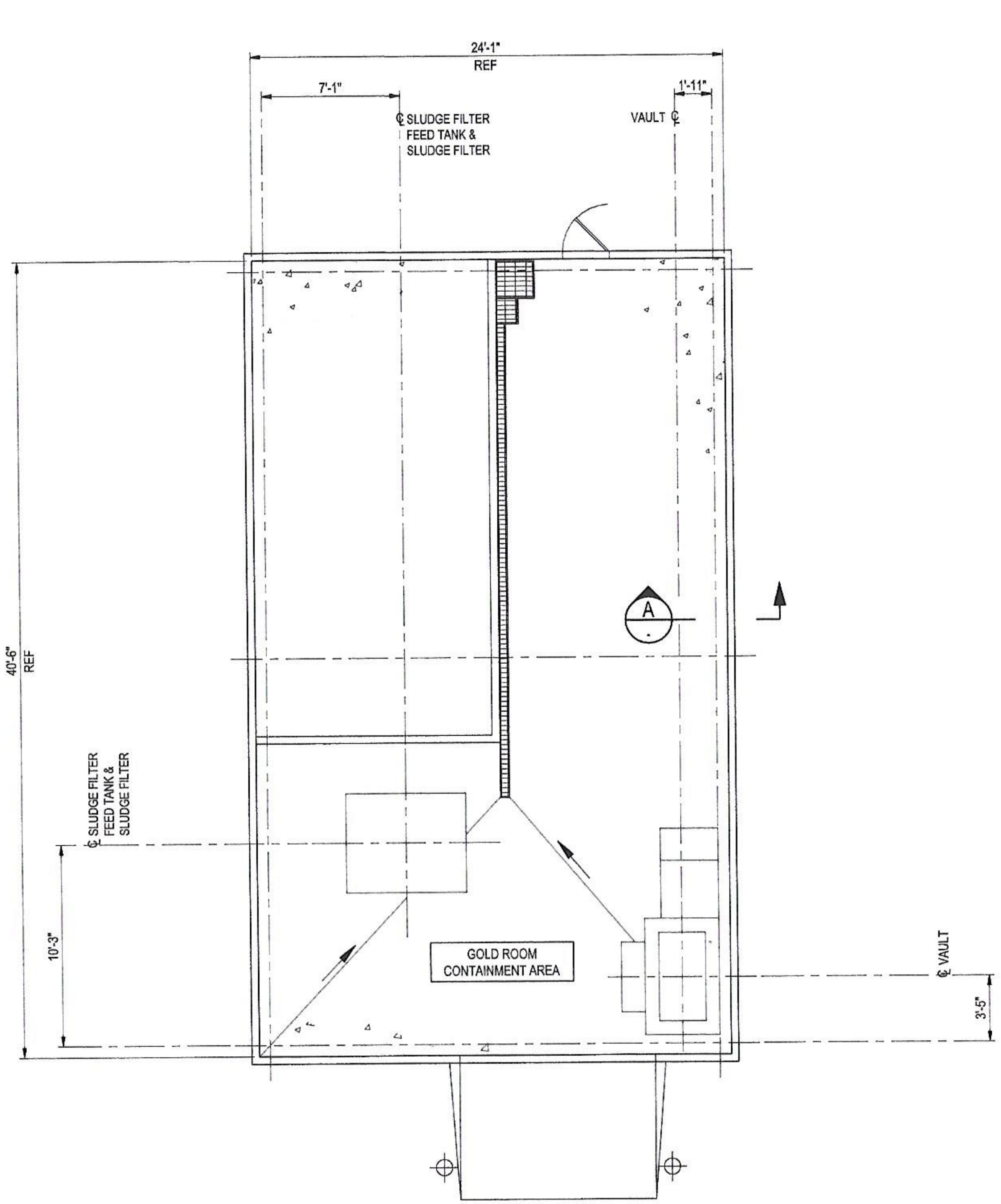
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
REAGENT & PROCESS WATER AREA
CONTAINMENT-GENERAL ARRANGEMENT

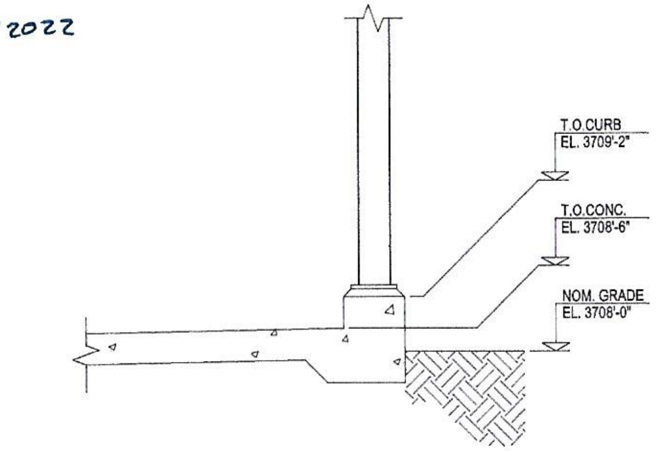
PROJECT No. 101768-03 | SCALE AS SHOWN | SIZE D

DRAWING No. 101768-0000-C-103 | REV C



PLAN

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER
Renews: 06/30/2022



SECTION A
1/2"=1'-0"

NOTES:

1. TOTAL CONTAINMENT VOLUME FOR THE GOLD ROOM AREA: 431.68ft³.
2. VOLUME OF LARGEST VESSEL WITHIN THE GOLD ROOM AREA (110%) : 38.85ft³.
3. DESIGN CURB HEIGHT: 8".
4. THE BUNDED AREA IS SIZED TO CONTAIN 110% OF THE LARGEST TANK VOLUME.
5. REFERENCE CALCULATION: 101768-0000-MX-CALC-0005.

1'-0" 0 2'-0" 4'-0" 6'-0" 8'-0"
SCALE: 1/2"=1'-0"

4'-0" 0 4'-0" 8'-0" 12'-0" 16'-0" 20'-0"
SCALE: 3/16"=1'-0"

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FOR PERMITTING PURPOSES ONLY

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			C	RK	13DEC2021	ISSUED FOR PERMITTING	CH	DH	AW
			B	RK	18OCT2021	ISSUED FOR CLIENT REVIEW	DY	-	-
			A	RK	07OCT2021	ISSUED FOR INTERNAL REVIEW	DY	-	-

DRAWN	R. KANG	04OCT2021
DWG. CHECKED	D. YU	04OCT2021
DESIGNED	R. KANG	04OCT2021
DES. APPR.	D. YU	04OCT2021
PROJ. APPR.	A. WEISZBECK	04OCT2021

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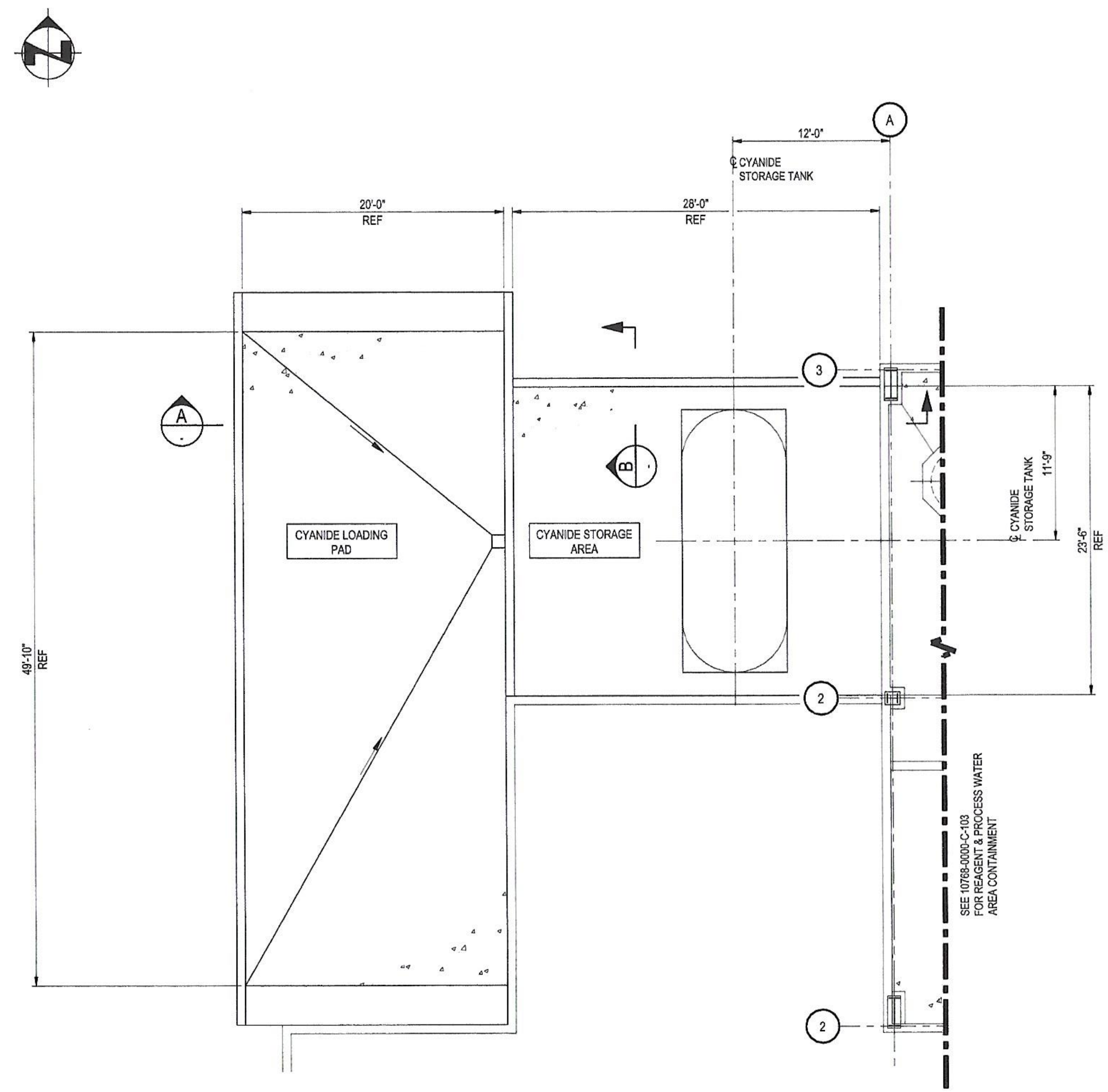
CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
GOLDROOM AREA
CONTAINMENT-GENERAL ARRANGEMENT

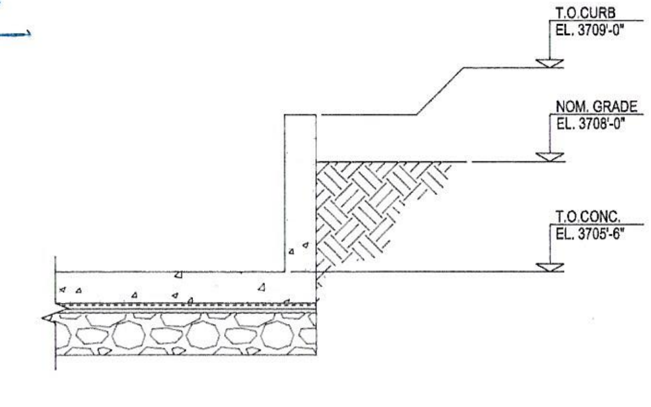
PROJECT No. 101768-03 | SCALE AS SHOWN | SIZE D

DRAWING No. 101768-0000-C-104 | REV C

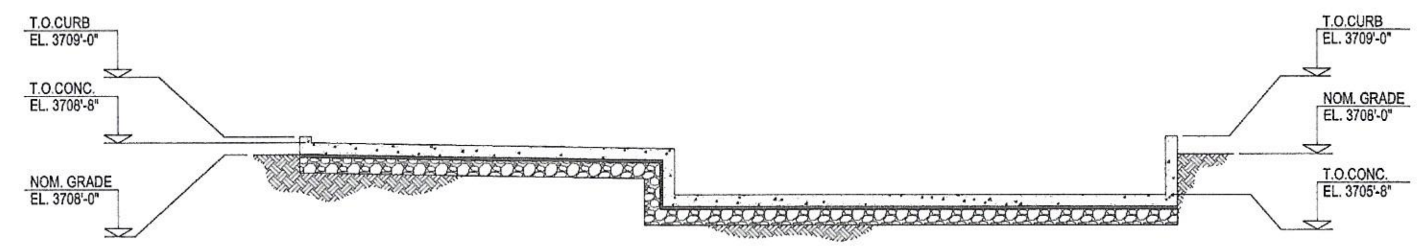


PLAN

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER
Renews: 06/30/2022



SECTION B
1/2"=1'-0"



SECTION A
3/16"=1'-0"

NOTES:

1. TOTAL CONTAINMENT VOLUME FOR THE CYANIDE STORAGE AREA + CYANIDE OFFLOADING AREA: 2238.32ft³.
2. VOLUME OF LARGEST VESSEL WITHIN THE CYANIDE STORAGE AREA (110%) : 1907.50ft³.
3. DESIGN CURB HEIGHT: 40".
4. THE BUNDED AREA IS SIZED TO CONTAIN 110% OF THE LARGEST TANK VOLUME PLUS A 1-IN-100 YEAR 24 HOUR STORM EVENT.
5. REFERENCE CALCULATION: 101768-0000-MX-CALC-0007.

1'-0" 0 2'-0" 4'-0" 6'-0" 8'-0"
SCALE: 1/2"=1'-0"

4'-0" 0 4'-0" 8'-0" 12'-0" 16'-0" 20'-0"
SCALE: 3/16"=1'-0"

FOR PERMITTING PURPOSES ONLY

Safety in all we do

No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
C	RK	13DEC2021	ISSUED FOR PERMITTING	CH	DH	AW
B	RK	18OCT2021	ISSUED FOR CLIENT REVIEW	DY	-	-
A	RK	07OCT2021	ISSUED FOR INTERNAL REVIEW	DY	-	-

REF.	DRAWING No.	REFERENCE DRAWING

DRAWN	R. KANG	04OCT2021
DWG. CHECKED	D. YU	04OCT2021
DESIGNED	R. KANG	04OCT2021
DES. APPR.	D. YU	04OCT2021
PROJ. APPR.	A. WEISZBECK	04OCT2021

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CLIENT: PARAMOUNT GOLD NEVADA

TITLE: GRASSY MOUNTAIN PROJECT - FEASIBILITY STUDY
PROCESS PLANT
CYANIDE STORAGE AREA
CONTAINMENT-GENERAL ARRANGEMENT

PROJECT No. 101768-03 | SCALE AS SHOWN | SIZE D

DRAWING No. 101768-0000-C-105 | REV C

REGISTERED PROFESSIONAL ENGINEER
94922PE
OREGON
MAY 14, 2019
KELLY SNYDER
Kelly S
Renews: 06/30/2022

Calculation

CIL Area Containment	Calculation No: 101768-0000-MX-CALC-0001

Project Title:	Grassy Mountain	**Project No:**	101768-03
Area/Code:			
Equipment Description:	Containment of CIL area to cyanide code requirements		
Equipment No:			

Design Inputs	References
Containment Volume Requirement = 110% Volume of largest tank + one design storm event + 50 mm freeboard	International Cyanide Code of Practice Section 4.7
100 Yr Storm event = 58 mm (2.28 inches)	Detailed Design Tailings Storage Facility and Waste Rock Dump, Grassy Mountain Mine, Report number 1663241-049-R-Rev0, November 6, 2019

Design Asumptions and Basis

Calculation Summary and Outcome

The CIL containment area will require a minimum curb height of 635 mm (25 inches).

	m^3	ft^3
Volume of largest vessel *110%	187.0	6590.9
Required containent volume	256.5	9039.0
Designed containment volume	274.9	9687.2

Other calculations if this calculation is revised:

Rev	Date	Description	Prepared	Checked	Approved
A	2019-03-28	Issued for Internal Review	JT	TM	
B	2019-04-11	Issued for Peer Review	JT	JTR	
C	2019-04-22	Issued for Permitting	JT	TM	
D	2021-10-01	Re-Issued for Internal Review	DY	CH	AW
E	2021-10-18	Re-iIssued for Client Review	DY	CH	AW
F	2021-11-16	Issued for Permitting	DY	CH	AW

Calculation

CIL Area Containment	Calculation No: 101768-0000-MX-CALC-0001

Project Title:	Grassy Mountain	**Project No:**	101768-03
Rev: F			

GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
Pre-AreationTank Diameter	6.2	m	
Pre-Areation Tank Plinth Diameter	6.8		
Pre-Areation Tank Height	6	m	
Number of Pre-Areation Tanks	1	No	
CIL/Leach Tank Diameter	6.2	m	
CIL/Leach Tank Plinth Diameter	6.8	m	
CIL/Leach Tank Height	6	m	
Number of CIL/Leach Tanks	9	No	
Detox Tank Diameter	5	m	
Detox Tank Plinth Diameter	5.6	m	
Detox Tank Height	5.8	m	
Number of Detox Tanks	1	No	
Volume of largest tank	170	m^3	
BUND DIMENSIONS			
CIL / Detox			
CIL Bund Length	n/a	m	
CIL Bund Width	n/a	m	
CIL Area for rainfall catchment	792	m^2	Measured from drawing
CIL/Leach Tank Area	272	m^2	
Pre-Aeration Tank Area	30	m^2	
Detox Tank Area	20	m^2	
CIL/Leach Tanks Plinth Area	327	m^2	
Pre-Aeration Tank Plinth Area	36	m^2	
Detox Tank Plinth Area	25	m^2	
Equipment Deductions	2	m^2	
CIL Containment Catchment Area below top of plinth	402	m^2	
CIL Containment Catchment Area above top of plinth	470	m^2	
Containment CALCULATION			
Bund Wall Height (required)	0.635	m	
CIL and Detox Average Tank Plinth height	0.35	m	
Volume below top of plinth	141	m^3	
Volume above top of plinth to Bund Wall	134	m^3	
Total Volume Designed	**275**	**m^3**	
STORMWATER			
24 Hour 100 Year Storm Event Cover	58	mm	
CIL/Detox Stormwater Catchment	46	m^3	
Total Stormwater Catchment Volume	46	m^3	
FREEBOARD			
Freeboard height	50	mm	
Total Freeboard Volume	24	m3	
CONTAINMENT REQUIRED			
110% Largest Tank Volume + One Storm Event + FreeBoard	**256**	**m^3**	

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Calculation

Reagents Area Containment	Calculation No: 101768-0000-MX-CALC-0002

Project Title:	Grassy Mountain	**Project No:**	101768-03
Area/Code:			
Equipment Description:	Containment of Reagents Area		
Equipment No:			

Design Inputs	References
Containment Volume Requirement = 110% Volume of largest tank + Freeboard 50 mm	International Cyanide Code of Practice Section 4.7
Containment General Arrangement	101768-0000-G-103

Design Assumptions and Basis

No storm containment required as this area is covered.

Calculation Summary and Outcome

Curb height of 203 mm (8") is good for containing 110% of largest container volume in Lime and SMBS areas.

Hydrochloric Acid dosing area 356 mm (14") curb height is required.

Elution and Caustic storage area 254 mm (10") curb height is required.

	m^3	ft^3
Lime Mixing & Tailings Pump Area		
Volume of largest vessel * 110%	7.0	248.1
Required containment volume	7.0	248.1
Designed containment volume	8.0	283.5
SMBS and $CuSO_4$ Area		
Volume of largest vessel * 110%	11.2	395.1
Required containment volume	11.2	395.1
Designed containment volume	12.0	423.5
Hydrochloric Acid Dosing Area		
Volume of largest vessel * 110%	4.7	166.7
Required containment volume	4.7	166.7
Designed containment volume	5.6	197.7
Elution and Caustic Area		
Volume of largest vessel * 110%	4.7	166.7
Required containment volume	4.7	166.7
Designed containment volume	6.7	236.8

Other calculations if this calculation is revised:

Rev	Date	Description	Prepared	Checked	Approved
A	2019-03-28	Issued for Internal Review	JT	TM	
B	2019-04-11	Issued for Peer Review	JT	JTR	
C	2019-04-22	Issued for Permitting	JT	TM	
D	2021-10-01	Re-Issued for Internal Review	DY	CH	AW
E	2021-10-18	Re-iIssued for Client Review	DY	CH	AW
F	2021-11-16	Issued for Permitting	DY	CH	AW

Calculation

Reagents Area Containment		**Calculation No:** 101768-0000-MX-CALC-0002		
Lime & Tailings Pump Box				
Project Title:	Grassy Mountain	**Project No:**	101768-03	
Rev: F				

GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
Lime Tank Diameter	1.51	m	
Lime Tank Plinth Diameter	1.91		
Lime Tank Height	1.51	m	
Number of Lime Tanks	1	No	
Tailings Pump 3710 HP001	6.4	m3	
Volume of largest tank	6.4	m^3	
BUND DIMENSIONS			
Lime Area			
Bund Length	9.0	m	
Bund Width	6.2	m	
Area for rainfall catchment	55.3	m^2	
Lime Tank Area	1.8	m^2	
Lime Area Tank Plinth Area (Divide is middle of detox tanks)	2.9	m^2	
Containment Catchment Area below top of plinth	52	m^2	
Containment Catchment Area above top of plinth	54	m^2	
CONTAINMENT CALCULATION			
Bund Wall Height	0.203	m	
Bund Wall Height after deduction for freeboard	0.153	m	
Average Tank Plinth height	0.20	m	
Volume below top of plinth	8	m^3	
Volume above top of plinth to Bund Wall	0.0	m^3	
Total Volume Designed	**8.0**	m^3	
STORMWATER			
24 Hour 25 Year Storm Event Cover	0	mm	
Stormwater Catchment	0	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume	**7.0**	m^3	

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Calculation

Reagents Area Containment	Calculation No: 101768-0000-MX-CALC-0002
SMBS & CuSO4	

Project Title:	Grassy Mountain	Project No:	101768-03
Rev: F			

GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
CuSO4 Tank Diameter	1.8	m	
CuSO4 Tank Plinth Diameter	2.2		
CuSO4 Tank Height	1.08	m	
Number of CuSO4 Tanks	1	No	
SMBS Mix Tank Diameter	2.3	m	
SMBS Mix Tank Plinth Diameter	2.7	m	
SMBS Mix Tank Height	2.45	m	
Number of SMBS Mix Tanks	1	No	
Volume of largest tank	10.2	m^3	
BUND DIMENSIONS			
SMBS & CuSO4 Area			
Bund Length	11.7	m	
Bund Width	7.7	m	
Area of Bund	86.5	m^2	
CuSO4 Tank Area	2.5	m^2	
SMBS Mix Tank Area	4.2	m^2	
SMBS Mix Area Tank Plinth Area	5.7	m^2	
CuSO4 Storage Area Tank Plinth Area	2.5	m^2	
Containment Catchment Area below top of plinth	78	m^2	
Containment Catchment Area above top of plinth	80	m^2	
CONTAINMENT CALCULATION			
Bund Wall Height	0.203	m	
Bund Wall Height after deduction for freeboard	0.153	m	
Average Tank Plinth height	0.203	m	
Volume below top of plinth	12.0	m^3	
Volume above top of plinth to Bund Wall	0.0	m^3	
Total Volume Designed	**12.0**	**m^3**	
STORMWATER			
24 Hour 25 Year Storm Event Cover	0	mm	
Stormwater Catchment	0	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume	**11.2**	**m^3**	

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Calculation

Reagents Area Containment			Calculation No: 101768-0000-MX-CALC-0002
Hydrochloric Acid Dosing			
Project Title: Grassy Mountain	**Project No:**	101768-03	
Rev: F			
GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
Acid Wash Column Diameter (assumed)	1.15	m	
Acid Wash Column Plinth Diameter	0	m	
Acid Wash Column Height	4.6	m	
Number of Acid Wash Column	1	No	
Acid Wash Column Volume	4.3	m3	
HCL Tote	1.25	m3	
Volume of largest tank (Equipment list)	4.3	m^3	From data sheet
BUND DIMENSIONS			
Acidic Area			
Bund Length	n/a	m	
Bund Width	n/a	m	
Area of Bund	14.0	m^2	
Acid Wash Column Area	1.0	m^2	
Acid Wash Column Plinth Area	0.0	m^2	
Containment Catchment Area below top of plinth	14	m^2	
Containment Catchment Area above top of plinth	13	m^2	
CONTAINMENT CALCULATION			
Bund Wall Height	0.356	m	
Bund Wall Height after deduction for freeboard	0.306	m	
Average Tank Plinth height	0.203	m	
Volume below top of plinth	4.3	m^3	
Volume above top of plinth to Bund Wall	1.33	m^3	
Total Volume Designed	**5.6**	m^3	
STORMWATER			
24 Hour 25 Year Storm Event Cover	0	mm	
Stormwater Catchment	0	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume	**4.7**	m^3	

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Calculation

Reagents Area Containment	Calculation No: 101768-0000-MX-CALC-0002		
Elution and Caustic Storage			
Project Title: Grassy Mountain	Project No: 101768-03		
Rev: F			
GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
Eluate Storage Tank Diameter (assumed)	1.5	m	
Eluate Storage Tank Plinth Diameter	1.9		
Eluate Storage Tank Level	n/a	m	
Number of Eluate Storage Tank	1	No	
Elution Column	4.3	m^3	
NaOH Tote	1.25	m^3	
Volume of largest tank (Equipment list)	4.3	m^3	
BUND DIMENSIONS			
NaOH Area			
Bund Length	n/a	m	
Bund Width	n/a	m	
Area of Bund	35.6	m^2	
Eluate Storage Tank Area	1.8	m^2	
Eluate Storage Tank Plinth Area	2.8	m^2	
Containment Catchment Area below top of plinth	33	m^2	
Containment Catchment Area above top of plinth	34	m^2	
CONTAINMENT CALCULATION			
Bund Wall Height	0.254	m	
Bund Wall Height after deduction for freeboard	0.204	m	
Average Tank Plinth height	0.203	m	
Volume below top of plinth	6.7	m^3	
Volume above top of plinth to Bund Wall	0.0	m^3	
Total Volume Designed	**6.7**	m^3	
STORMWATER			
24 Hour 25 Year Storm Event Cover	0	mm	
Stormwater Catchment	0	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume	**4.7**	m^3	

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Calculation

Grinding Area Containment	Calculation No: 101768-0000-MX-CALC-0004

Project Title:	Grassy Mountain	**Project No:**	101768-03
Area/Code:			
Equipment Description:	Containment of Grinding Area		
Equipment No:			

Design Inputs	References
Containment Volume = 110% Volume of largest container + Freeboard 50 mm	International Cyanide Code of Practice Section 4.7
100 Yr Storm event = 58 mm (2.28 inches) This is not applicable.	Detailed Design Tailings Storage Facility and Waste Rock Dump, Grassy Mountain Mine, Report number 1663241-049-R-Rev), November 6, 2019
30% of Mill Volume - 3.66m dia x 4.88 m EGL	
Containment General Arrangement	101768-0000-C-101

Design Assumptions and Basis

Calculation Summary and Outcome

The grinding area will require a volume of 16.9 m^3 to satisfy the minimum containment requirements, but has been designed with 660 mm (26in) curb height to provide process water containment, which provides 70.9 m^3 available volume.

	m^3	ft^3
Volume of largest vessel *110%	16.9	597.1
Required containent volume	16.9	597.1
Designed containment volume	70.9	2497.7

Other calculations if this calculation is revised:

Rev	Date	Description	Prepared	Checked	Approved
A	2019-03-28	Issued for Internal Review	JT	TM	
B	2019-04-11	Issued for Peer Review	JT	JTR	
C	2019-04-22	Issued for Permitting	JT	TM	
D	2021-10-01	Re-Issued for Internal Review	DY	CH	AW
E	2021-10-18	Re-iIssued for Client Review	DY	CH	AW
F	2021-11-16	Issued for Permitting	DY	CH	AW

Calculation

Grinding Area Containment	Calculation No: 101768-0000-MX-CALC-0004

Project Title:	Grassy Mountain	**Project No:**	101768-03
Rev: F			

GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
Volume of Grinding Mill	15.4	m^3	30% of 3.66m x 4.88m EGL
BUND DIMENSIONS			
Grinding Area			
Bund Length	n/a	m	
Bund Width	n/a	m	
Additional Bund Length	0.0	m	
Additional Bund Width	0.0	m	
Area of catchment	142.1	m^2	
Tank Area	0.0	m^2	no tanks
Deductions for other equipment	26.0	m^2	mill foundations ($20m^2$) and cyclone feed hopper ($6m^2$)
Tank Plinth Area	0.0	m^2	
Containment Catchment Area below top of plinth	0	m^2	
Containment Catchment Area above top of plinth	116.1	m^2	
CONTAINMENT CALCULATION			
Bund Wall Height	0.660	m	
Effective Bund Wall Height (deduct 100 mm freeboard)	0.610	m	
Average Tank Plinth height	0.00	m	
Volume below top of plinth	0	m^3	
Volume above top of plinth to Bund Wall	71	m^3	
Total Volume Designed	**70.9**	m^3	
STORMWATER			
24 Hour 100 Year Storm Event Cover	0	mm	covered
Stormwater Catchment	0	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume + One Storm Event	**16.9**	m^3	

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Calculation

Gold Room Containment	Calculation No: 101768-0000-MX-CALC-0005

Project Title:	Grassy Mountain	**Project No:**	101768-03
Area/Code:			
Equipment Description:	Containment of Gold Room		
Equipment No:			

Design Inputs	References
Containment Volume = 110% Volume of largest tank + Freeboard 50 mm	International Cyanide Code of Practice Section 4.7
Largest Tank - EW Area = 1m^3	from 101768-0000-G-103

Design Asumptions and Basis

The gold room will be covered, so therefore no requirement to design for storm event.

Calculation Summary and Outcome

The EW Area requires a minimum of 1.1 m^3 containment. The area has been designed with curb height of 203mm (8in) which provides 12.2 m^3.

	m^3	ft^3
Volume of largest vessel *110%	1.10	38.85
Required containent volume	1.10	38.85
Designed containment volume	12.2	431.7

Other calculations if this calculation is revised:

Rev	Date	Description	Prepared	Checked	Approved
A	2019-03-28	Issued for Internal Review	JT	TM	
B	2019-04-11	Issued for Peer Review	JT	JTR	
C	2019-04-22	Issued for Permitting	JT	TM	
D	2021-10-01	Re-Issued for Internal Review	DY	CH	AW
E	2021-10-18	Re-iIssued for Client Review	DY	CH	AW
F	2021-11-16	Issued for Permitting	DY	CH	AW

Calculation

Gold Room Containment	Calculation No: 101768-0000-MX-CALC-0005

Project Title:	Grassy Mountain	Project No:	101768-03
Rev: F			

GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME	**N/A - old option**		
Sludge Filter Feed Tank Diameter	0.99	m	
Sludge Filter Feed Tank Plinth Diameter	0.00		no plinths
Sludge Filter Feed Tank Level	0.99	m	
Number of Sludge Filter Feed Tanks	1	No	
Volume of largest tank	1.00	m^3	
BUND DIMENSIONS			
EW Area			
Bund Length	7.30	m	
Bund Width	12.30	m	
Area of catchment	89.79	m^2	
Sludge Filter Feed Tank Area	0.77	m^2	
Electrowinning Cell Plinth Area	0.00	m^2	no plinths
Equipment Area Deductions	10.00	m^2	
Containment Catchment Area below top of plinth	79.79	m^2	
Containment Catchment Area above top of plinth	79.02	m^2	no plinths
CONTAINMENT CALCULATION			
Bund Wall Height	0.203	m	
Bund Wall Height after deduction for freeboard	0.153	m	
Volume floor to Bund Wall	12.22	m^3	
Total Volume Designed	**12.22**	**m^3**	
STORMWATER			
1-in-100 yr 24 Hour Storm Event	0.00	mm	covered
Stormwater Catchment	0.00	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume	**1.10**	**m^3**	

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Calculation

Cyanide Storage Area Containment	Calculation No: 101768-0000-MX-CALC-0007

Project Title:	Grassy Mountain	**Project No:**	101768-03
Area/Code:			
Equipment Description:	Containment of Cyanide Storage Area		
Equipment No:			

Design Inputs	References
Containment Volume Requirement = 110% Volume of largest tank + design storm event + 50mm freeboard	International Cyanide Code of Practice Section 4.7
Containment General Arrangement	101768-0000-C-105
100 Yr Storm event = 58 mm (2.28 inches)	Detailed Design Tailings Storage Facility and Waste Rock Dump, Grassy Mountain Mine, Report number 1663241-049-R-Rev0, November 6, 2019

Design Assumptions and Basis

Consider 1-in-100 yr of 58 mm storm water in 24 hrs

Calculation Summary and Outcome

Curb height of 1020 mm (40") is needed for containing 110% of largest container volume in cyanide area.

	m^3	ft^3
Volume of largest vessel *110%	54.1	1907.5
Required containent volume	63.0	2222.1
Designed containment volume	63.5	2238.3

Other calculations if this calculation is revised:

Rev	Date	Description	Prepared	Checked	Approved
A	2021-10-01	Issued for Internal Review	DY	CH	AW
B	2021-10-18	Issued for Client Review	DY	CH	AW
C	2021-11-16	Issued for Permitting	RK	CH	DH

Calculation

Cyanide Storage Area Containment			Calculation No: 101768-0000-MX-CALC-0007			
Cyanide						
Project Title: Grassy Mountain			Project No: 101768-03			
Rev: C						
GENERAL INPUTS			**Comments**			
TANK SIZE AND VOLUME						
Cyanide Tank Diameter	n/a	m				
Cyanide Tank Plinth Diameter	n/a	m				
Cyanide Tank Level	n/a	m				
Number of Cyanide Tank	1	No				
Volume of largest tank (Equipment list)	49.2	m^3	Cyanco vendor advice			
BUND DIMENSIONS						
	Cyanide Storage Area				**Cyanide Offloading Area**	
Bund Length	8.5	m			6.1	m
Bund Width	7.2	m			15.2	m
Area of Bund	61.2	m^2			92.7	m^2
Cyanide Tank Area	0.0	m^2			0.0	m^2
Cyanide Tank Plinth Area	2.0	m^2			0.0	m^2
Containment Area below top of plinth	59	m^2			93	m^2
Containment Area above top of plinth	61	m^2			93	m^2
CONTAINMENT CALCULATION						
Bund Wall Height	1.016	m			0.102	m
Bund Wall Height after deduction for freeboard	0.966	m			0.052	m
Average Tank Plinth height	0.203	m			0.000	m
Volume below top of plinth	12.0	m^3			0.0	m^3
Volume above top of plinth to Bund Wall	46.70	m^3			4.78	m^3
Total Volume Designed	**58.7**	m^3		+	**4.8**	m^3
				=	**63.5**	m^3
STORMWATER						
24 Hour 100 Year Storm Event Cover	58	mm				
Stormwater Catchment	9	m^3				
CONTAINMENT REQUIRED						
110% One Largest Tank Volume + Stormwater + Freeboard	**63.0**	m^3				

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Calculation

Process Water Area Containment	Calculation No: 101768-0000-MX-CALC-0008

Project Title:	Grassy Mountain	**Project No:**	101768-03
Area/Code:			
Equipment Description:	Containment of Process Water Tank Area		
Equipment No:			

Design Inputs	References
Containment Volume Requirement = 110% Volume of largest tank + Design Storm Event + Freeboard 50 mm	International Cyanide Code of Practice Section 4.7
Containment General Arrangement	101768-0000-C-103

Design Assumptions and Basis

Make use of linked containment to water and grinding area in the process building for containment in addition to the process water bund.
Consider 58 mm storm water (1-in-100 yr 24 hrs event)

Calculation Summary and Outcome

Curb height of 660 mm (26") is needed for containing 110% of largest container volume in process water area.

	m^3	ft^3	
Volume of largest vessel *110%	160.0	5639.1	
Required containent volume	163.3	5766.3	
Designed containment volume	163.7	5780.4	containment is linked to water storage and grinding areas

Other calculations if this calculation is revised:

Rev	Date	Description	Prepared	Checked	Approved
A	2021-10-01	Issued for Internal Review	DY	CH	AW
B	2021-10-18	Issued for Client Review	DY	CH	AW
C	2021-11-16	Issued for Permitting	DY	CH	AW

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Calculation

Process Water Area Containment		Calculation No: 101768-0000-MX-CALC-0008	
Process Water			
Project Title: Grassy Mountain	**Project No:**	101768-03	
Rev: C			

GENERAL INPUTS			**Comments**
TANK SIZE AND VOLUME			
Process Water Tank Diameter	5.7	m	
Process Water Tank Plinth Diameter	6.3		
Process Water Tank Height	5.7	m	
Number of Process Water Tank	1	No	
Volume of largest tank (Equipment list)	145	m^3	
OUTSIDE BUND DIMENSIONS			
Process Water Area			
Bund Length	8.1	m	
Bund Width	7.0	m	
Area of Bund	57	m^2	
Process Water Tank Area	25.5	m^2	
Process Water Tank Plinth Area	31.2	m^2	
Containment Catchment Area below top of plinth	26	m^2	
Containment Catchment Area above top of plinth	31	m^2	
CONTAINMENT CALCULATION			
Bund Wall Height	0.67	m	
Bund Wall Height after deduction for freeboard	0.62	m	
Average Tank Plinth height	0.20	m	
Volume below top of plinth	5.2	m^3	
Volume above top of plinth to Bund Wall	12.85	m^3	
Total Volume Designed	**18.0**	**m^3**	
STORMWATER			
24 Hour 100 Year Storm Event Cover	58	mm	
Stormwater Catchment	3	m^3	
CONTAINMENT REQUIRED			
110% One Largest Tank Volume + Stormwater	**163.3**	**m^3**	

Potable Water Tank Diameter	3.9	m
Potable Water Tank Plinth Diameter	4	
Potable Water Tank Height	4	m
Number of Potable Water Tank	1	No

INSIDE BUND DIMENSIONS		
Process Water Area		
Bund Length	N/A	m
Bund Width	N/A	m
Area of Bund	134	m^2
Potable Water Tank Area	11.9	m^2
Potable Water Tank Plinth Area	12.6	m^2
Containment Catchment Area below top of plinth	121	m^2
Containment Catchment Area above top of plinth	122	m^2
CONTAINMENT CALCULATION		
Bund Wall Height	0.67	m
Bund Wall Height after deduction for freeboard	0.62	m
Average Tank Plinth height	0.20	m
Volume below top of plinth	24.6	m^3
Volume above top of plinth to Bund Wall	50.16	m^3
Total Volume Designed	**74.8**	**m^3**

Process Water Containment Outside + Inside Designed Volume	**92.8**	**m^3**
Grinding Area Designed Volume	**70.9**	**m^3**
Total Volume Designed	**163.7**	**m^3**