



March 17, 2021

Scott McDaniel
OceanaGold - Haile Operation
6911 Snowy Owl Road
Kershaw, SC 29067

Re: Construction Permit No. IW021107
Haile Gold Mine, Inc.
Contact Wastewater Treatment Facility Upgrade
Lancaster County

Dear Mr. McDaniel:

Enclosed is a SC Wastewater Construction Permit for the above referenced project. Construction is to be performed in accordance with this permit and supporting engineering report, plans, and specifications approved by this Office.

This system cannot be placed into operation until final approval is granted by the appropriate Bureau of Environmental Health Services (BEHS) Regional Office. Your Regional contact is Erin Evans, in the Midlands EA Lancaster Office. This regional office should be notified when construction begins at the following address and phone number: 2475 DHEC Road, Lancaster SC 29720, 803-285-7461.

Upon completion of any construction, a letter must be submitted to the BEHS Regional Office from the registered engineer certifying that the construction has been completed in accordance with the approved plans and specifications. An inspection may then be scheduled. The BEHS Regional Office will approve the system for operation upon successful completion of this project.

Sincerely,

Byron M Amick
Industrial Wastewater Permitting Section
Water Facilities Permitting Division

cc via email: Sam Billin, Sam.Billin@linkan.biz
Veronica Barringer, Midlands EA Lancaster
Erin Evans, Midlands EA Lancaster
Anastasia Shaw, Water Pollution Enforcement Section
Jeremy Eddy, Mining and Reclamation Section

Wastewater Construction Permit Bureau of Water



PROJECT NAME: Haile Gold Mine, Inc. Contact Wastewater Treatment Facility Upgrade	COUNTY: LANCASTER
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PERMISSION IS HEREBY GRANTED TO: **Haile Gold Mine, Inc.**
6911 Snowy Owl Road
Kershaw, SC 29067

For the construction of an upgrade to an existing wastewater treatment plant in accordance with the construction plans, specifications, engineering report and the Construction Permit Application signed by Samuel Billin, Registered Professional Engineer, S.C. Registration Number: 38192.

The effluent will be discharged to a tributary of Haile Gold Mine Creek at a daily average rate of 3,456,000 gallons per day.

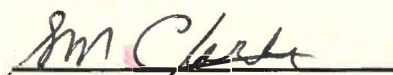
The effluent concentrations of those constituents the wastewater treatment system is designed to remove or reduce are contained in NPDES Permit #SC0040479.

PROJECT DESCRIPTION: See Attached

CONDITIONS: See page 2.

In accepting this permit, the owner agrees to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection. This is a permit for construction only and does not constitute DHEC approval, temporary or otherwise, to place the system in operation. An Approval to Place in Operation is required and can be obtained following the completion of construction by contacting the Midlands EA Lancaster Office at 803-285-7461. Additional permits may be required prior to construction (e.g., Stormwater).

PERMIT NUMBER:	IW021107
ISSUANCE DATE:	March 17, 2021
EXPIRATION DATES:	March 17, 2023 (to begin construction) March 17, 2024 (to obtain Approval to Place in Operation)


 Shawn M. Clarke, P.E., Director
 Water Facilities Permitting Division

CONDITIONS

1. This Permit supersedes the following Permit to Construct: 19830-IW issued October 30, 2014 and revised May 20, 2016.
2. All waste oil and solid and hazardous waste shall be properly disposed of in accordance with the rules and regulations of the Bureau of Land and Waste Management of SCDHEC.
3. The permittee shall update, implement, and maintain a Best Management Practice (BMP) Plan to identify and control the discharge of significant amounts of oils and the hazardous and toxic substances listed in 40 CFR, Part 117 and Tables II and III of Appendix D to 40 CFR, Part 122. The plan shall include a listing of all potential sources of spills or leaks of these materials, a method of containment, a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters or plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and materials handling areas; loading and unloading operations; plant site runoff; and sludge and disposal areas. The BMP plan shall be updated in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps. The BMP plan shall be maintained at the plant site and shall be available for inspection by Department personnel.
3. The operator shall monitor the Leak Collection and Recovery System (LCRS) in the 19 Pond, Johnny's/West PAG Collection Ponds (465 Pond, 541 Pond, and 470 Pond) and East PAG Collection Pond (500 Pond). The monitoring shall be conducted at least once per month for the following parameters: Total Volume, Field pH, Field Conductivity, Total Dissolved Solids (TDS), Aluminum, Copper, Iron, and Sulfate (SO₄). If there is insufficient volume available to test, this shall be noted in the report. LCRS results shall be reported in an annual report to the Department on or before January 28th of the following year. This annual report is to be submitted like any "other report" required by the NPDES permit. The permittee shall use the electronic reports via ePermitting. If the permittee encounters technical difficulties using the electronic report schedule, contact DHEC for technical assistance at epermittinghelp@dhec.sc.gov. Please contact the Compliance Manager for your permit to obtain approval to submit paper DMRs until the technical issue is resolved.

The operator shall report monthly accumulated volume. The operator shall investigate and report instances where volume has exceeded the 12 month rolling average accumulation over 50 gallons per day; or the 3-month rolling average accumulation over 150 gallons per day. The report shall be in writing and submitted within seven (7) days of the event. Details of the investigation and any corrective actions shall be included in the annual LCRS report.

5. In accordance with Regulation 61-67, Standards for Wastewater Facility Construction, all wastewater treatment facilities shall be closed out within one hundred eighty (180) days when the facility is closed or the effluent disposal permit is inactivated, terminated or revoked, unless otherwise determined by the Department. Closure of wastewater treatment facilities necessitates the submittal of a closure plan and approval of the plan by the Department in accordance with R.61-82 prior to closure of any wastewater treatment unit(s).

PROJECT DESCRIPTION

* Upgrades documented March 16, 2021 are in **Red Bold** text

The wastewater collection and treatment system will consist of the following:

Source Water Collection:

- 1) Mine Sediment Ponds:
 - a. **Mill Zone Pond** - This pond has an operating capacity of approximately 407,000-gallons with a maximum capacity of approximately 570,000-gallons and has two bays. The first bay (sediment bay) has a 10^{-6} low permeable soil liner. The second bay (collection pond) is designed for a 100-year, 24-hour storm event and has a single 60-mil HDPE liner. One transfer pump designed for 3,000-gpm at 145-ft TDH, and approximately 9,600 LF of 16-inch HDPE pipe to transfer water to 19 Pond. A temporary sludge pump for occasional removal of build-up in the sediment fore-bay. An emergency overflow pipe will return water to the Mill Zone Pit. **This pond is scheduled to be removed with the construction of Mill Zone 2 Pit in 2021.**
 - b. **Snake Pond** - **This pond has been eliminated and is no longer part the contact wastewater collection system.**
 - c. **Mining Pit Collections** - **Each pit (Snake Pit, Red Hill Pit, Haile Pit, Mill Zone 2 Pit and Ledbetter Pit) will be equipped transfer pumps designed for 3,000-gpm at 145-ft TDH, and various lengths of 16-inch HDPE pipe as required by the pit location to transfer water to 19 Pond.**
- 2) **Coarse Ore Stockpile Pond** - **This pond has a capacity of 1,400,000-gallons with a maximum capacity of 1,760,00-gallons. The pond is constructed with single 60-mil HDPE liner. The pond is equipped with one transfer pump, designed for 150-gpm at 160-ft TDH, and approximately 1,800 LF of 4-inch HDPE pipe, to transfer water to 19 Pond.**
- 3) Johnny's PAG/**West PAG** Collection Ponds:
 - a. **465 Pond** - This pond has an operating capacity of approximately 20.3 million gallons with a maximum capacity of approximately 20.4 million gallons and is constructed with a Leak Collection and Removal System (LCRS) between a double 60-mil HDPE liner with leak detection. The LCRS is a gravel and pump collection system sandwiched between 60-mil HDPE primary and secondary liners. Two transfer pumps designed for 5,000-gpm at 158-ft TDH, and approximately 3,400 LF of 30-inch HDPE pipe to transfer water to 19 Pond.
 - b. **469 Pond** - **This pond has been eliminated and is no longer part the contact wastewater collection system.**
 - c. **541 Pond will be constructed with the expansion of Johnny's PAG Phase into the northern lobe of West PAG construction. It is anticipated to be constructed by 2022. This pond will have an operating capacity of approximately 56.0 million gallons with a maximum capacity of approximately 74.7 million gallon and will be constructed with a Leak Collection and Removal System (LCRS) between a double 60-mil HDPE liner with leak detection. Two transfer pumps designed for 3,500-gpm at 165-ft TDH, and approximately 7,200 LF of 30-inch HDPE pipe to transfer water to 19 Pond.**
 - d. **470 Pond will be constructed with the expansion of West PAG Phase 2 (southern-phase) construction. It is anticipated to be constructed by 2024. This pond will have an operating capacity of approximately 25.1 million gallons with a maximum capacity of approximately 32.3 million gallon and will be constructed with a Leak Collection and Removal System (LCRS) between a double 60-mil HDPE liner with leak detection. Two transfer pumps designed for**

3,500-gpm at 165-ft TDH, and approximately 3,000 LF of 30-inch HDPE pipe to transfer water to 19 Pond.

- 4) **East PAG Collection Pond:**
 - a. **500 Pond (Cell A and B) was constructed in conjunction with East PAG construction. Cell A (17.4 million gallons) was constructed in 2019 and Cell B (23.3 million gallons) is completing construction in 2021. The combined operating capacity of approximately 40.7 million gallons with a maximum capacity of approximately 51.2 million gallons and has a Leak Collection and Removal System (LCRS) between a double 60-mil HDPE liner with leak detection. Two transfer pumps designed for 5,000-gpm at 158-ft TDH, and approximately 3,400 LF of 30-inch HDPE pipe to transfer water to 19 Pond.**
- 5) **19 Pond** was constructed with a center septum to equally divide the pond into two operating cells with each cell having an operating capacity of approximately 9.9 million gallons with a maximum capacity of approximately 11.6 million gallons. This pond is constructed with a Leak Collection and Removal System (LCRS) between a double 60-mil HDPE liners with leak detection. Two transfer pumps designed for 1,200-gpm at 95-ft TDH (one pump in each cell), and approximately 250 LF of 16-inch HDPE pipe to transfer water to either the Mill or to the 1st Stage Reaction Tank at the head of the Treatment System. **A dose of Sodium Permanganate is added to the pipeline to the 1st Stage Reaction Tank to assist in the removal of Thallium.**

Treatment System:

- 1) **1st Stage Reaction Tank:** an open top cylindrical 36,000-gallon FRP tank equipped with a 7.5-HP agitator and lime addition from the Lime Reaction Tanks (See item #2). **The pH is set at 8.9 s.u. with an addition of ferric chloride and hydrous ferric oxide flocculant.**
- 2) **Lime Reaction Tank:** an open top dished bottom 1,940-gallon FRP tank equipped with a 3-HP agitator and lime addition from the lime feed loop (See item #3).
- 3) **Lime Feed Loop:** Vendor Supplied Hydrated Lime is sent to the Lime Reaction Tank (See item #2) and the 2nd Stage Reaction Tank (See item #7) by two lime feed pumps designed for 250-gpm at 92-ft TDH.
- 4) **Multiflo Clarifier:** a package plant designed for a flow rate between of 400-gpm and 1,200-gpm with six mixing chambers and a clarification chamber and will be equipped with seven agitators (three with 1.5-HP motors, two with 1.0-HP motors, one with 0.5-HP motor and one with a 7.5-HP motor), **a metal precipitant (TMT-15) with two distribution pumps designed for 2.9-gph at 101 psig (repurposed coagulant feed system)**, a flocculant feed system with a flocculant pump designed for 3.54-gph at 25 psig and a sludge handling system which can recycle the sludge back to the Lime Reaction Tank or send it to the Sludge Transfer Pump Box.
- 5) **1st Stage Clearwell Tank:** an open top, flat bottom cylindrical 6,000-gallon FRP tank.
- 6) **1st Stage Clearwell Transfer Station:** a pump skid with two transfer pumps designed for 1,140-gpm at 100-ft TDH.
- 7) **2nd Stage Reaction Tank:** an open top cylindrical 36,000-gallon FRP tank equipped with a 3-HP agitator, lime addition from the lime feed loop (See item #3).
- 8) **Lamella Clarifier:** a Lamella clarifier unit designed for maximum flow rate of 1,200-gpm, with a 220-gallon flashmix chamber equipped with a 0.5-HP agitator, a 1,280-gallon flocculation chamber equipped with a 0.5-HP agitator, **oxidation neutralization reagent (Sodium Metabisulfite)** and a flocculant feed system with a flocculant pump designed for 0.71-gph at 100 psi.
- 9) **Lamella Sludge Transfer Pumps:** a pump skid with two sludge transfer pumps designed for 50-gpm at 50-ft TDH which will send the sludge back to the 2nd Stage Reaction Tank or to the Sludge Transfer Pump Box.
- 10) **2nd Stage Clearwell Tank:** an open top, flat bottom cylindrical 6,000-gallon FRP tank.

- 11) **2nd Stage Clearwell Transfer Station:** a pump skid with two transfer pumps designed for 1,140-gpm at 100-ft TDH which will send the water to the **Microfiltration Units.**
- 12) **Microfiltration Units: up to six units connected in a parallel free-standing arrangement, each unit uses multiple microfiltration canisters and has an operational design flow rate of 2,400-gpm with surge capacity of 3,100-gpm. (replacing the multimedia filters)**
- 13) **Filter Backwash Tank:** an open top, flat bottom cylindrical 36,000-gallon FRP tank.
- 14) **Filter Backwash Pumps:** a pump skid with two transfer pumps designed for 1,140-gpm at 100-ft TDH which will send the water to the **Microfiltration Units.**
- 15) **pH Neutralizations Tank:** an open top cylindrical 36,000-gallon FRP tank equipped with a 2.0-HP agitator and sulfuric acid feed system with two sulfuric acid distribution pumps designed for 1.9-gph at 145 psig.
- 16) **Treated Water Discharge Pump Box:** an open top rectangular 12,400-gallon carbon steel tank.
- 17) **Treated Water Discharge Pumps:** a pump skid with two transfer pumps designed for **2,400-gpm with surge capacity of 3,100-gpm** at 150-ft TDH, the water from these pumps will either be sent to 19 Pond, to the Mill Facility, or to discharge through the permitted Outfall.

Sludge Handling:

- 1) **Sludge Transfer Pump Box:** an open top cylindrical 565-gallon carbon steel tank with sloped bottom.
- 2) **Sludge Transfer Pumps:** a pump skid with two transfer pumps designed for 50-gpm at 92-ft TDH, the sludge will be pumped to the Cyanide Recovery Thickener during production **where any residual gold can be extracted prior to being re-hydrated and discharged with the process tailings in the Tailing Storage Facility (TSF).**
- 3) **Process Event Pond has been converted into an overflow pond for rain events that exceed the capacity of the Process Plant containment areas. Because sludge is now directed to the Cyanide Destruct Thickener, it is no longer part of the Contact Water Treatment system.**

Wastewater - Construction Permit Application Wastewater Facilities - Industrial (D-1970)

version 2.3

(Submission #: HP2-T98H-QZJ1V, version 2)

Details

Submission ID HP2-T98H-QZJ1V
Submission Reason New
Status Submitted

Fees

Fee \$800.00
Payments/Adjustments (\$800.00)
Balance Due \$0.00 (Paid)

Form Input

Submittal Details

Is this a Delegated Review Project submittal?

No

Will the flow from this project go to a publicly owned treatment works (POTW)?

No

Project Name

Haile Gold Mine Contact Wastewater Treatment Facility

Project Description - Wastewater

See Attached

Specific Wastewater Project Type

WWTF Upgrade (modification)

Initial Owner

Initial Owner [Time of Application]

Prefix*NONE PROVIDED***First Name***NONE PROVIDED***Last Name***NONE PROVIDED***Title***NONE PROVIDED***Organization Name***Haile Gold Mine***Phone Type**

Business

Number

803-475-1220

Extension**Email**

scott.mcdaniel@oceanagold.com

Fax*NONE PROVIDED***Address**

6911 Snowy Owl Road

Kershaw, SC 29067

USA

Is the final owner the same as the initial owner?

Yes

Additional Contacts

Entity Responsible for Final Operation & Maintenance of System - Wastewater**Prefix***NONE PROVIDED***First Name***NONE PROVIDED***Last Name***NONE PROVIDED***Title***NONE PROVIDED***Organization Name***Haile Gold Mine***Phone Type****Number****Extension**

Business

803-475-1220

Email

scott.mcdaniel@oceanagold.com

Fax*NONE PROVIDED***Address**

6911 Snowy Owl Road

Kershaw, SC 29067

USA

Design Engineer**Prefix***NONE PROVIDED***First Name**

Sam

Last Name*Billin***Title***NONE PROVIDED***Organization Name***HAILE GOLD MINE INC***Phone Type****Number****Extension**

Business

775-777-8003

Email

Sam.Billin@linkan.biz

Fax*NONE PROVIDED***Address**

2720 Ruby Vista Drive

Elko, NV 89801

US

S.C. Registration Number (Design Engineer):

38192

Is the Construction Engineer the same as the Design Engineer?

Yes

Are there additional design engineers?

No

LLR Licensing Lookup[Engineers and Land Surveyors - Licensee Lookup](#)**Wastewater Facility Contact****First Name Last Name**Scott *McDaniel***Title***Environmental Manager***Organization Name***OceanaGold - Haile Operation***Phone Type Number Extension**

Business 803-475-2943

Email

scott.mcdaniel@oceanagold.com

Address

6911 Snowy Owl Road

Kershaw, SC 29067

USA

Site Information**Project Location**

6911 Snowy Owl Road

Kershaw, SC 29067

Site County

Lancaster

Site Location

34.59853929669307,-80.5346581541842

Project Details

Is this project part of a phased project?

No

Is this project a revision to a previously permitted project?

Yes

Permit Number

SC0040479

Date Approved

12/01/2013

Project Name (if different)

NONE PROVIDED

Is this application being submitted based on an Order issued by DHEC?

No

Is this application being submitted based on a Schedule of Compliance issued by DHEC?

No

Will this project cross a waterbody (e.g. river, creek)?

No

Are Wastewater Standard Specifications approved by the Department being used by this project?

No

Wastewater Systems**Wastewater System Types**

Process/Industrial

Project Average Design Flow

For domestic contributions to wastewater projects, this is based on Reg. 61-67, Appendix A. For other projects, the flow is determined based on design capacity of the component(s) being installed. If the treatment system has already accounted for the flow, the flow for the project will be zero (0). Calculations should be submitted to document the flow.

Project Average Design Flow (GPD)

1728000

Treatment System Average Design Flow (GPD)

Provide the average design capacity of the treatment plant in gallons per day (GPD).

Treatment System Average Design Flow (GPD)

1728000

Name and NPDES/ND Permit Number of Facility Treating the Wastewater

HAILE GOLD MINE - SC0040479

Has a Preliminary Engineering Report already been approved for this project?

No

Was a NPDES/ND application submitted?

No

Disposal Sites

Effluent Disposal Site (Description)	Sludge Disposal Site (Description)
Haile Gold Mine	Tailing Storage Facility

Required Documents**Standard Submittal**

The below items must be included along with a Standard Submittals. These items should be uploaded using the attachment tool.

- 1) A transmittal letter outlining the submittal package.
- 2) The signed and sealed plans and the construction specifications. Specifications may be omitted if approved standard specifications are already on file with DHEC.
- 3) One (1) set of the appropriate design calculations (e.g., flow calculations, pump station calculations, pump curve, etc.).
- 4) Construction easements, unless the project owner has the right of eminent domain.
- 5) A letter(s) from the entity providing wastewater treatment stating their willingness and ability to serve the project, (state the flow, number of lots, etc.), including pretreatment permits, if applicable.
- 6) A letter(s) from the entity agreeing to be responsible for the operation and maintenance (O&M) of the systems.

NOTE: Other approvals may include 208 (wastewater only) and OCRM CZC Certification, and navigable waterway permitting. To expedite the project review, the 208 and OCRM CZC Certification may be included with the project submittal.

One hard copy of signed and sealed plans must also be submitted.

Required Documents

[CWTP 2020 Application_09102020.pdf - 09/16/2020 10:32 AM](#)

Comment

NONE PROVIDED

Signatures

Signature Instructions

Applications. All permit applications shall be signed as follows:

(1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or

(ii) The manager of one or more manufacturing, production, or operating facilities, provided,

the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency or public facility: By either a principal executive officer, mayor, or other duly authorized employee or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) The chief executive officer of the agency, or

(ii) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator, Region IV, EPA).

This application must be certified by the owner, the design engineer(s) and the construction/certifying engineer responsible for this project. A signature page may be obtained through the below link and attached.

[Signature Page](#)

Signature

CWTP 2020 Application_10282020.pdf - 12/04/2020 01:20 PM

Comment

NONE PROVIDED

CORRECTION REQUEST (APPROVED)

Signature page

Please submit signature page with engineer's signature. Thanks
Created on 9/22/2020 11:09 AM by **Patty Barnes**

Fees

Sewer Systems (DRP)

No

Sewer System

Not Applicable

ONLY identify one design flow for fee purposes.

Treatment Systems < 1.0 MGD

Not Applicable

Treatment Systems >= 1.0 MGD

Expansion

Pretreatment System

Not Applicable

Fees

Treatment Systems >= 1.0 MGD: Expansion

800

Total Fee

800

Attachments

Date	Attachment Name	Context	User
12/4/2020 1:20 PM	CWTP 2020 Application_10282020.pdf	Attachment	Scott McDaniel
9/16/2020 10:32 AM	CWTP 2020 Application_09102020.pdf	Attachment	Scott McDaniel

Status History

	User	Processing Status
12/4/2020 1:14:26 PM	Scott McDaniel	Draft
12/4/2020 1:20:49 PM	Scott McDaniel	Submitting
12/4/2020 1:21:11 PM	Scott McDaniel	Submitted

Audit

Event	Event Description	Event By	Event Date
Submission Locked	Submission Locked	Patty G Barnes	9/22/2020 11:08 AM
Submission Unlocked	Submission Unlocked	Patty G Barnes	9/22/2020 11:09 AM
Submission Unlocked	Submission Unlocked	Patty G Barnes	9/22/2020 11:09 AM
Submission Locked	Submission Locked	Patty G Barnes	12/8/2020 8:40 AM
Submission Unlocked	Submission Unlocked	Patty G Barnes	12/8/2020 8:41 AM
Submission Locked	Submission Locked	Byron M Amick	3/15/2021 10:44 AM
Submission Unlocked	Submission Unlocked	Byron M Amick	3/15/2021 10:44 AM

Revisions

Revision	Revision Date	Revision By
Revision 1	9/16/2020 10:09 AM	Scott McDaniel
Revision 2	12/4/2020 1:14 PM	Scott McDaniel



Construction Permit Application Water/Wastewater Facilities

BUREAU OF WATER

DELEGATED REVIEW PROJECT SUBMITTAL: Yes EXPEDITED REVIEW PROGRAM SUBMITTAL: Yes

SELECT ONE Water Facilities Wastewater Facilities Combined Water & Wastewater Facilities

I. **Project Name:** Haile Gold Mine **County:** Lancaster

II. **Project Location** (street names, etc.): 6911 Snowy Owl Road

III. **Project Description(s):** Water System:

Wastewater System: Contact Wastewater Treatment Facility

Project Type (A-Z): Water: Wastewater: (See instructions for the appropriate project code)

IV. **Initial Owner:** [Time of Application] Name/Organization: Haile Gold Mine, Inc.

Address: 6911 Snowy Owl Road City: Kershaw State: SC Zip: 29067

Phone #: () E-mail (Initial Owner):

V. **Final Owner:** [After Construction] Name/Organization: Same

Address: City: State: Zip:

Phone #: () E-mail (Final Owner):

VI. **Entity Responsible for Final Operation & Maintenance of System:**

Water System: Name: Address:

City: State: Zip: Phone#: () Fax#: ()

Wastewater System: Name: Same Address:

City: State: Zip: Phone#: () Fax#: ()

VII. **Engineering Firm:** Name: Same Address:

City: State: Zip: Phone #: () Fax #: ()

E-mail (Design Engineer):

VIII. **Is this project:** A) Part of a phased project? No Yes . If Yes, Phase _____ of _____

B) A revision to a previously permitted project? No Yes . If Yes, Permit#: SC0040479

Date Approved: 12/1/2013 Project name (if different):

C) Submitted based on a Schedule of Compliance or Order issued by DHEC? No Yes . Order #: _____

D) Anticipating funding by the State Revolving Fund (SRF)? No Yes .

E) Crossing a water body (e.g., river, creek)? No Yes . If Yes, Name of waterbody: _____

IX. **Are Standard Specifications approved by DHEC being used on this project?** No Yes . If Yes:

Water: Date Approved: Approved for whom:

Wastewater: Date Approved: Approved for whom:

X. **Wastewater Systems:** A) Type: Domestic Process (Industrial) Combined (Domestic & Process)

B) *Average Design Flow* 1. Project: 1728000 GPD 2. Treatment system: 1728000 GPD

C) *Sewers or Pretreatment* 1. Name of facility (e.g., POTW) treating the wastewater: _____

2. NPDES/ND Number of facility in Item #1: _____

Treatment Systems 3. Date Preliminary Engineering Report (PER) approved: _____

4. NPDES/ND application submitted? No Yes . If Yes, Date: _____

Disposal Sites 5. Effluent Disposal Site (Description): Haile Gold Mine

6. Sludge Disposal Site (Description): Hail eGold Mine

XI. **Water Systems:** Project located within city limits? No Yes .

Public water system providing water. Name: _____ System #: _____

New water system (including master meter)? No Yes . If Yes, System name: _____

XII. **Type of Submittal** Complete Section A (Standard) or Section B (Delegated Review Program - DRP)

A) Standard Submittal *must* include the following:

- 1. A transmittal letter outlining the submittal package.
- 2. The **original** construction permit application, properly completed, with one (1) copy.
- 3. Three (3) sets of signed and sealed plans and one (1) set of construction specifications. Specifications may be omitted if approved standard specifications are on file with DHEC. Four (4) sets of plans are required for a combined submittal, if the project includes a wastewater treatment facility.
- 4. One (1) set of the appropriate design calculations. **WASTEWATER:** Design flow (based on R.61-67, Appendix A), pump station calc's. and pump curve. **WATER:** Recent flow test from a location near the tie-on site, design calc's. indicating pressure maintained in the distribution system during max. instantaneous demand, fire flow and flushing velocities achieved. Number/types of service connections, well record form, pumping test results, etc.
- 5. Three (3) copies of a detailed 8½" x 11" location map, separate from the plans.
- 6. Two (2) copies of construction easements unless the project owner has the right of eminent domain.
- 7. A letter(s) from the entity supplying water and/or providing wastewater treatment stating their willingness and ability to serve the project, (state the flow, number of lots, etc.), including pretreatment permits, if applicable.
- 8. A letter(s) from the entity agreeing to be responsible for the operation and maintenance (O&M) of the systems.
- 9. Application fee enclosed \$ _____. (Refer to Instructions).
- 10. **WATER SYSTEMS:** a) A letter from the local government which has potable water planning authority over the area, if applicable, in which the project is located, stating project consistency with water supply service plan for area.
b) For wells, four (4) copies of a well head protection area inventory.
c) For new wells, a viability demonstration is required in accordance with Regulation 61-58.1.B.(4).

Note: Other approvals may include 208 (wastewater only) and OCRM CZC Certification, and navigable waterway permitting. To expedite the project review, the 208 and OCRM CZC Certification may be included with the project submittal.

B) DRP submittal *must* include the following:

- 1. A transmittal letter, signed by the professional engineer representing the DRP entity, noting this is a DRP submittal. The letter should state that the project has been reviewed and complies with R.61-58 and/or R.61-67.
- 2. The **original** construction permit application, properly completed, with one (1) copy.
- 3. Two (2) sets of the signed and sealed plans.
- 4. One (1) set of the appropriate design calculations. **WASTEWATER:** Same information as required under Section XII.A.4. above. **WATER:** Same information as required under Section XII.A.4. above.
- 5. One (1) copy of a detailed 8½" x 11" location map, separate from the plans.
- 6. Two (2) copies of construction easements, unless the project owner has the right of eminent domain.
- 7. DHEC's OCRM CZC Certification (for water and/or wastewater facilities, in the eight coastal counties).
- 8. DHEC's Water Quality permit or conditions for placement in navigable waters, and other Agency approvals.
- 9. **WASTEWATER SYSTEMS:** a) A letter of acceptance from the entity providing the treatment of the wastewater that includes the specific flow and, when applicable, the specific number of lots being accepted.
b) A letter from the organization agreeing to be responsible for the O&M of the wastewater system.
c) The 208 Plan certification from the appropriate Council of Governments (designated 208 areas), or from DHEC on the non-designated 208 areas.
- 10. **WATER SYSTEMS:** A letter from the local government which has potable water planning authority over the area, if applicable, in which the project is located, stating project consistency with water supply service plan for area.
- 11. Fee of \$75 for water and \$75 for wastewater (\$150 if combined).

Note: The DRP entity should ensure that a copy of the final approved plans are returned to the design engineer.

XIII. Construction plans, material and construction specifications, the engineering report including supporting design data and calculations are herewith submitted and made a part of this application. I have placed my signature and seal on the engineering documents submitted, signifying that I accept responsibility for the design of this system, and that I have submitted a complete administrative package.

Engineer's Name (Printed): Sam Billin Signature: See Application Package
S.C. Registration Number: _____ Registered Professional Engineer

XIV. Prior to final approval, I will submit a statement certifying that construction is complete and in accordance with the approved plans and specifications, to the best of my knowledge, information and belief. This certification will be based upon periodic observations of construction and a final inspection for design compliance by me or a representative of this office who is under my supervision.

Engineer's Name (Printed): Sam Billin Signature: See Application Package
S.C. Registration Number: _____ Registered Professional Engineer

XV. I hereby make application for a permit to construct the project as described above. I have read this application and agree to the requirements and conditions and agree to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection.

Owner's Name (Printed): Scott McDaniel Signature: [Signature]
Owner's Title: Environmental Manager Date: 09/16/2020

XI. **Water Systems:** Project located within city limits? No Yes .
Public water system providing water. Name: _____ System #: _____
New water system (including master meter)? No Yes . If Yes, System name: _____

XII. **Type of Submittal:** Complete **Section A (Standard)** or **Section B (Delegated Review Program - DRP)**.

A) Standard Submittal *must* include the following:

- 1. A transmittal letter outlining the submittal package.
- 2. The **original** construction permit application, properly completed, with one (1) copy.
- 3. Three (3) sets of signed and sealed plans and one (1) set of construction specifications. Specifications may be omitted if approved standard specifications are on file with DHEC. Four (4) sets of plans are required for a combined submittal, if the project includes a wastewater treatment facility.
- 4. One (1) set of the appropriate design calculations. **WASTEWATER:** Design flow (based on R.61-67, Appendix A), pump station calc's. and pump curve. **WATER:** Recent flow test from a location near the tie-on site, design calc's. indicating pressure maintained in the distribution system during max. instantaneous demand, fire flow and flushing velocities achieved. Number/types of service connections, well record form, pumping test results, etc.
- 5. Three (3) copies of a detailed 8½" x 11" location map, separate from the plans.
- 6. Two (2) copies of construction easements unless the project owner has the right of eminent domain.
- 7. A letter(s) from the entity supplying water and/or providing wastewater treatment stating their willingness and ability to serve the project, (state the flow, number of lots, etc.), including pretreatment permits, if applicable.
- 8. A letter(s) from the entity agreeing to be responsible for the operation and maintenance (O&M) of the systems.
- 9. Application fee enclosed \$ _____. (Refer to Instructions).
- 10. **WATER SYSTEMS:** a) A letter from the local government which has potable water planning authority over the area, if applicable, in which the project is located, stating project consistency with water supply service plan for area.
b) For wells, four (4) copies of a well head protection area inventory.
c) For new wells, a viability demonstration is required in accordance with Regulation 61-58.1.B.(4).

Note: Other approvals may include 208 (wastewater only) and OCRM CZC Certification, and navigable waterway permitting. To expedite the project review, the 208 and OCRM CZC Certification may be included with the project submittal.

B) DRP submittal *must* include the following:

- 1. A transmittal letter, signed by the professional engineer representing the DRP entity, noting this is a DRP submittal. The letter should state that the project has been reviewed and complies with R.61-58 and/or R.61-67.
- 2. The **original** construction permit application, properly completed, with one (1) copy.
- 3. Two (2) sets of the signed and sealed plans.
- 4. One (1) set of the appropriate design calculations. **WASTEWATER:** Same information as required under Section XII.A.4. above. **WATER:** Same information as required under Section XII.A.4. above.
- 5. One (1) copy of a detailed 8½" x 11" location map, separate from the plans.
- 6. Two (2) copies of construction easements, unless the project owner has the right of eminent domain.
- 7. DHEC's OCRM CZC Certification (for water and/or wastewater facilities, in the eight coastal counties).
- 8. DHEC's Water Quality permit or conditions for placement in navigable waters, and other Agency approvals.
- 9. **WASTEWATER SYSTEMS:** a) A letter of acceptance from the entity providing the treatment of the wastewater that includes the specific flow and, when applicable, the specific number of lots being accepted.
b) A letter from the organization agreeing to be responsible for the O&M of the wastewater system.
c) The 208 Plan certification from the appropriate Council of Governments (designated 208 areas), or from DHEC on the non-designated 208 areas.
- 10. **WATER SYSTEMS:** A letter from the local government which has potable water planning authority over the area, if applicable, in which the project is located, stating project consistency with water supply service plan for area.
- 11. Fee of \$75 for water and \$75 for wastewater (\$150 if combined).

Note: The DRP entity should ensure that a copy of the final approved plans are returned to the design engineer.

XIII. Construction plans, material and construction specifications, the engineering report including supporting design data and calculations are herewith submitted and made a part of this application. I have placed my signature and seal on the engineering documents submitted, signifying that I accept responsibility for the design of this system, and that I have submitted a complete administrative package.

Engineer's Name (Printed): Sam Billin

Signature: _____

S.C. Registration Number: _____

XIV. Prior to final approval, I will submit a statement certifying that construction is complete and in accordance with the approved plans and specifications, to the best of my knowledge, information and belief. This certification will be based upon periodic observations of construction and a final inspection for design compliance by me or a representative of this office who is under my supervision.

Engineer's Name (Printed): Sam Billin

Signature: _____

S.C. Registration Number: _____

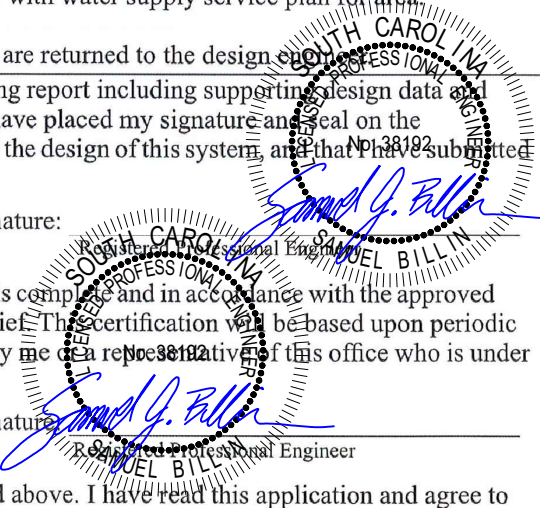
XV. I hereby make application for a permit to construct the project as described above. I have read this application and agree to the requirements and conditions and agree to the admission of properly authorized persons at all reasonable hours for the purpose of sampling and inspection.

Owner's Name (Printed): Scott McDaniel

Signature: _____

Owner's Title: Environmental Manager

Date: 09/16/2020





September 10, 2020

Byron Amick
S.C. Dept. of Health and Environmental Control
NPDES Administration Section
2600 Bull Street
Columbia, SC 29201

RE: Construction Application for Modifications to Contact Wastewater Treatment Plant (CWTP)
NPDES Permit Number SC0040479

Dear Mr. Amick:

Enclosed are the construction documents required for modifications to the Contact Wastewater Treatment Plant (CWTP) under NPDES Permit Number SC0040479.

In compliance with the regulations outlined in the NPDES regulations, please find enclosed:

- a) Cooling Water Intake Disclosure Statement (below)
- b) EPA Form 3510-2C (8-90) Application for Permit to Discharge Wastewater
- c) Process Description (stamped by Sam Billin - SC Licensed PE - 38192)
 - a. Description
 - b. Reagent Dosing Details
 - c. Flow Diagrams
 - d. P&ID Diagrams
 - e. SDS Sheets on Reagents
- d) NPDES Effluent Limits
- e) EPA Form 3510-1 (8-90) General Information Statement
- f) EPA Form 3510-2D (8-90) New Sources and New Discharge Locations
- g) DHEC Bureau of Water Sludge Disposal Statement
- h) DHEC Bureau of Water Location Statement
- i) Mixing Zone Request for Surface Water Discharges

Cooling Water Intake Disclosure Statement:

Haile Gold Mine does not use or intake cooling water into the Contact Wastewater Treatment process.

If you have any questions, please contact me at 803 475-1220 or scott.mcdaniel@oceanagold.com.

Sincerely,

Scott McDaniel
Environmental Manager

cc. Anastasia Shaw
File



WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
(Subject to any provisions which may appear
in the construction permit)

Final written approval for operation must be obtained from DHEC after
completion of construction.

Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick

CONTINUED FROM THE FRONT

C. Except for storm runoff, leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal? <input type="checkbox"/> YES (complete the following table) <input type="checkbox"/> NO (go to Section III)								
1. OUTFALL NUMBER (list)	2. OPERATION(S) CONTRIBUTING FLOW (list)	3. FREQUENCY		4. FLOW				C. DURATION (in days)
		a. DAYS PER WEEK (specify average)	b. MONTHS PER YEAR (specify average)	a. FLOW RATE (in mgd)		B. TOTAL VOLUME (specify with units)		
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
III. PRODUCTION								
A. Does an effluent guideline limitation promulgated by EPA under Section 304 of the Clean Water Act apply to your facility? <input type="checkbox"/> YES (complete Item III-B) <input type="checkbox"/> NO (go to Section IV)								
B. Are the limitations in the applicable effluent guideline expressed in terms of production (or other measure of operation)? <input type="checkbox"/> YES (complete Item III-C) <input type="checkbox"/> NO (go to Section IV)								
C. If you answered "yes" to Item III-B, list the quantity which represents an actual measurement of your level of production, expressed in the terms and units used in the applicable effluent guideline, and indicate the affected outfalls.								
1. AVERAGE DAILY PRODUCTION							2. AFFECTED OUTFALLS (list outfall numbers)	
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC. (specify)						
IV. IMPROVEMENTS								
A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operations of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions. <input type="checkbox"/> YES (complete the following table) <input type="checkbox"/> NO (go to Item IV-B)								
1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC.	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE				
	a. NO.	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED			
B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs (or other environmental projects which may affect your discharges) you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction. <input type="checkbox"/> MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED								

CONTINUED FROM PAGE 2

V. INTAKE AND EFFLUENT CHARACTERISTICS

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.
 NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Use the space below to list any of the pollutants listed in Table 2c-3 of the instructions, which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it to be present and report any analytical data in your possession.

1. POLLUTANT	2. SOURCE	1. POLLUTANT	2. SOURCE

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Item V-C a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?
 YES (list all such pollutants below) NO (go to Item VI-B)

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

YES (identify the test(s) and describe their purposes below)

NO (go to Section VIII)

As part of the permit, a Whole Effluent Toxicity (WET) Test is required on all discharges. Under those conditions, the WET test results have PASSED.

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

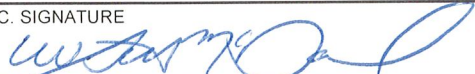
YES (list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below)

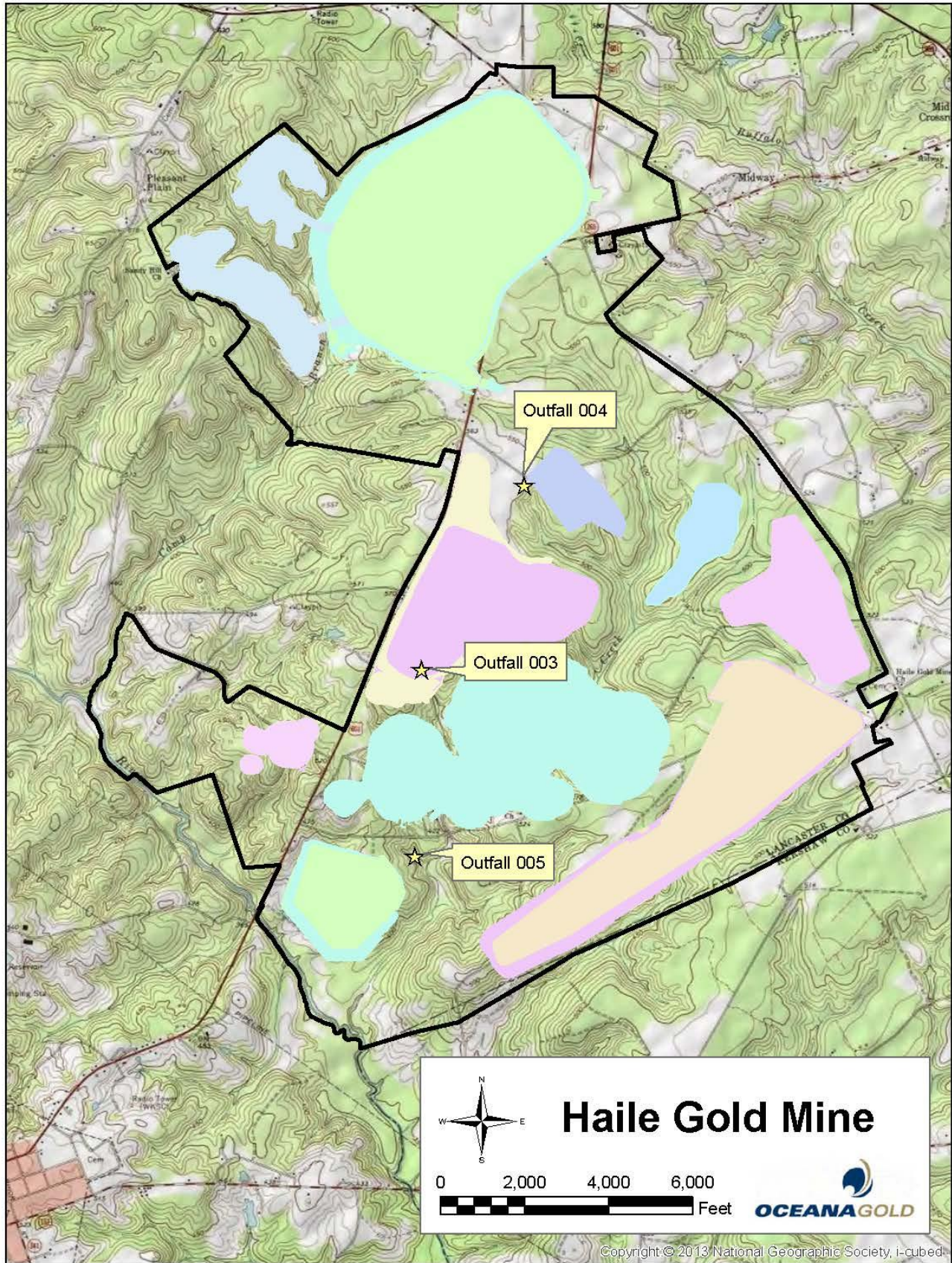
NO (go to Section IX)

A. NAME	B. ADDRESS	C. TELEPHONE (area code & no.)	D. POLLUTANTS ANALYZED (list)
Shealy Environmental Services, Inc.	106 Vantage Point Drive West Columbia, SC 29172	(803) 791-9700	See attached "Form 2C VIII Attachment"
ACZ Laboratories	2773 Downhill Drive Steamboat Springs, CO 80487	800-334-5493	See attached "Form 2C VIII Attachment"

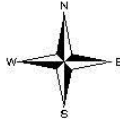
IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE (type or print) W. Scott McDaniel Environmental Manager	B. PHONE NO. (area code & no.) (803) 475-1220
C. SIGNATURE 	D. DATE SIGNED 10 Sep, 2020



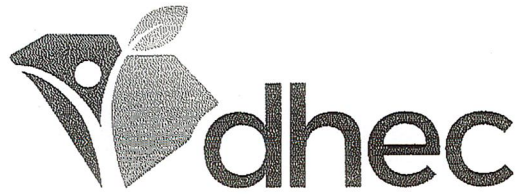
Haile Gold Mine



0 2,000 4,000 6,000 Feet



Copyright © 2013 National Geographic Society, i-cubed



Healthy People. Healthy Communities.
S.C. Department of Health and
Environmental Control

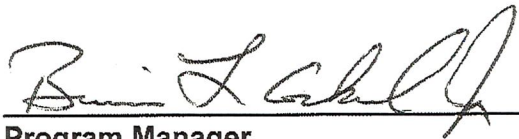
Environmental Laboratory Certification Program

In accordance with the provisions of Regulation 61-81, entitled "State Environmental Laboratory Certification Regulations"

**ACZ LABORATORIES INC
2773 DOWNHILL DR
STEAMBOAT SPRINGS, COLORADO 80487-5051**

is hereby certified to perform analyses as documented on the attached parameter list(s). This certification does not guarantee validity of the data generated, but indicates the laboratory's adherence to prescribed methodology, quality control, records keeping, and reporting procedures. This certificate is the property of S.C. DHEC and must be surrendered upon demand. This certificate is non-transferable and is valid only for the parameters and methodology listed on the attached parameter list(s).

Laboratory Director: BRETT DALKE
Certifying Authority: UT
Date of Issue: March 05, 2020
Date of Expiration: July 31, 2020
Certificate Number: 72011001



Program Manager
Office of Environmental Laboratory Certification

**SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM**

ACZ LABORATORIES INC (Laboratory ID 72011)
Laboratory Director: BRETT DALKE
Certifying Authority: UT
Certificate Number: 72011001

Date of Issue: March 05, 2020
Expiration Date: July 31, 2020

SOLID & HAZARDOUS WASTES

INORGANIC - TRACE METAL

BORON	EPA 6010D (2018)	ICP/AES
CADMIUM	EPA 6020B (2014)	ICP/MS
CALCIUM	EPA 6010D (2018)	ICP/AES
CHROMIUM	EPA 6010D (2018)	ICP/AES
COBALT	EPA 6010D (2018)	ICP/AES
COPPER	EPA 6010D (2018)	ICP/AES
IRON	EPA 6010D (2018)	ICP/AES
LEAD	EPA 6010D (2018)	ICP/AES
LEAD	EPA 6020B (2014)	ICP/MS
MAGNESIUM	EPA 6010D (2018)	ICP/AES
MANGANESE	EPA 6010D (2018)	ICP/AES
NICKEL	EPA 6010D (2018)	ICP/AES
PHOSPHORUS	EPA 6010D (2018)	ICP/AES
POTASSIUM	EPA 6010D (2018)	ICP/AES
SELENIUM	EPA 6020B (2014)	ICP/MS
SILICA, TOTAL	EPA 6010D (2018)	ICP/AES
SODIUM	EPA 6010D (2018)	ICP/AES
THALLIUM	EPA 6020B (2014)	ICP/MS
ZINC	EPA 6010D (2018)	ICP/AES

Certified Laboratories
COMMERCIAL Laboratories

CLEAN WATER ACT

EPA 1631E (2002)

Lab ID	Lab Name / Address	Director Name / Phone No.
	ACZ LABORATORIES INC 2773 DOWNHILL DR STEAMBOAT SPRINGS CO 80487-5051	DALKE, BRETT 970-879-6590
	ALS ENVIRONMENTAL KELSO 1317 S 13TH AVE KELSO WA 98626	HUGHEY, AMBROSE 360-577-7222
	GEL LABORATORIES LLC PO BOX 30712 CHARLESTON SC 29417	BOCKLET, CAREY J 843-556-8171
	KATAHDIN ANALYTICAL SERVICES LLC PO BOX 540 SCARBOROUGH ME 04070-0540	FLANDERS, MICHAEL 207-874-2400
	PACE ANALYTICAL LABORATORY SC 106 VANTAGE POINT DR WEST COLUMBIA SC 29172	WRIGHT, DAN 803-791-9700
	PACE ANALYTICAL SERVICES LLC ASHEVILLE 2225 RIVERSIDE DR ASHEVILLE NC 28804-9623	GROGAN, FELICIA 828-254-7176
	SGS NORTH AMERICA INC DAYTON 2235 RT 130 BLDG B DAYTON NJ 08810	DEGENHARDT, LAURA 732-329-0200

Count: 7

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER (copy from Item 1 of Form 1)

V. INTAKE AND EFFLUENT CHARACTERISTICS (continued from page 3 of Form 2-C)		OUTFALL NO.
--	--	-------------

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT						3. UNITS <i>(specify if blank)</i>			4. INTAKE <i>(optional)</i>		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand (BOD)												
b. Chemical Oxygen Demand (COD)												
c. Total Organic Carbon (TOC)												
d. Total Suspended Solids (TSS)												
e. Ammonia (as N)												
f. Flow	VALUE		VALUE		VALUE					VALUE		
g. Temperature (winter)	VALUE		VALUE		VALUE			°C		VALUE		
h. Temperature (summer)	VALUE		VALUE		VALUE			°C		VALUE		
i. pH	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM				STANDARD UNITS				

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. <i>(if available)</i>	2. MARK "X"		3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)														
b. Chlorine, Total Residual														
c. Color														
d. Fecal Coliform														
e. Fluoride (16984-48-8)														
f. Nitrate-Nitrite (as N)														

ITEM V-B CONTINUED FROM FRONT

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT						4. UNITS		5. INTAKE (optional)			
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCEN- TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
g. Nitrogen, Total Organic (as N)														
h. Oil and Grease														
i. Phosphorus (as P), Total (7723-14-0)														
j. Radioactivity														
(1) Alpha, Total														
(2) Beta, Total														
(3) Radium, Total														
(4) Radium 226, Total														
k. Sulfate (as SO ₄) (14808-79-8)														
l. Sulfide (as S)														
m. Sulfite (as SO ₃) (14265-45-3)														
n. Surfactants														
o. Aluminum, Total (7429-90-5)														
p. Barium, Total (7440-39-3)														
q. Boron, Total (7440-42-8)														
r. Cobalt, Total (7440-48-4)														
s. Iron, Total (7439-89-6)														
t. Magnesium, Total (7439-95-4)														
u. Molybdenum, Total (7439-98-7)														
v. Manganese, Total (7439-96-5)														
w. Tin, Total (7440-31-5)														
x. Titanium, Total (7440-32-6)														

EPA I.D. NUMBER <i>(copy from Item 1 of Form 1)</i>	OUTFALL NUMBER
---	----------------

CONTINUED FROM PAGE 3 OF FORM 2-C

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (*secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions*), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (*all 7 pages*) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>				
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES	
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS		
METALS, CYANIDE, AND TOTAL PHENOLS																
1M. Antimony, Total (7440-36-0)																
2M. Arsenic, Total (7440-38-2)																
3M. Beryllium, Total (7440-41-7)																
4M. Cadmium, Total (7440-43-9)																
5M. Chromium, Total (7440-47-3)																
6M. Copper, Total (7440-50-8)																
7M. Lead, Total (7439-92-1)																
8M. Mercury, Total (7439-97-6)																
9M. Nickel, Total (7440-02-0)																
10M. Selenium, Total (7782-49-2)																
11M. Silver, Total (7440-22-4)																
12M. Thallium, Total (7440-28-0)																
13M. Zinc, Total (7440-66-6)																
14M. Cyanide, Total (57-12-5)																
15M. Phenols, Total																
DIOXIN																
2,3,7,8-Tetra-chlorodibenzo-P-Dioxin (1764-01-6)				DESCRIBE RESULTS												

CONTINUED FROM THE FRONT

1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1)	(2)	(1)	(2)	(1)	(2)				(1)	(2)	
				CONCENTRATION	MASS	CONCENTRATION	MASS	CONCENTRATION	MASS				CONCENTRATION	MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Accrolein (107-02-8)															
2V. Acrylonitrile (107-13-1)															
3V. Benzene (71-43-2)															
4V. Bis (Chloromethyl) Ether (542-88-1)															
5V. Bromoform (75-25-2)															
6V. Carbon Tetrachloride (56-23-5)															
7V. Chlorobenzene (108-90-7)															
8V. Chlorodibromomethane (124-48-1)															
9V. Chloroethane (75-00-3)															
10V. 2-Chloroethylvinyl Ether (110-75-8)															
11V. Chloroform (67-66-3)															
12V. Dichlorobromomethane (75-27-4)															
13V. Dichlorodifluoromethane (75-71-8)															
14V. 1,1-Dichloroethane (75-34-3)															
15V. 1,2-Dichloroethane (107-06-2)															
16V. 1,1-Dichloroethylene (75-35-4)															
17V. 1,2-Dichloropropane (78-87-5)															
18V. 1,3-Dichloropropylene (542-75-6)															
19V. Ethylbenzene (100-41-4)															
20V. Methyl Bromide (74-83-9)															
21V. Methyl Chloride (74-87-3)															

1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1)	(2)	(1)	(2)	(1)	(2)				(1)	(2)	
				CONCENTRATION	MASS	CONCENTRATION	MASS	CONCENTRATION	MASS				CONCENTRATION	MASS	
GC/MS FRACTION – VOLATILE COMPOUNDS <i>(continued)</i>															
22V. Methylene Chloride (75-09-2)															
23V. 1,1,2,2-Tetrachloroethane (79-34-5)															
24V. Tetrachloroethylene (127-18-4)															
25V. Toluene (108-88-3)															
26V. 1,2-Trans-Dichloroethylene (156-60-5)															
27V. 1,1,1-Trichloroethane (71-55-6)															
28V. 1,1,2-Trichloroethane (79-00-5)															
29V. Trichloroethylene (79-01-6)															
30V. Trichlorofluoromethane (75-69-4)															
31V. Vinyl Chloride (75-01-4)															
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)															
2A. 2,4-Dichlorophenol (120-83-2)															
3A. 2,4-Dimethylphenol (105-67-9)															
4A. 4,6-Dinitro-O-Cresol (534-52-1)															
5A. 2,4-Dinitrophenol (51-28-5)															
6A. 2-Nitrophenol (88-75-5)															
7A. 4-Nitrophenol (100-02-7)															
8A. P-Chloro-M-Cresol (59-50-7)															
9A. Pentachlorophenol (87-86-5)															
10A. Phenol (108-95-2)															
11A. 2,4,6-Trichlorophenol (88-05-2)															

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1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)															
2B. Acenaphthylene (208-96-8)															
3B. Anthracene (120-12-7)															
4B. Benzidine (92-87-5)															
5B. Benzo (a) Anthracene (56-55-3)															
6B. Benzo (a) Pyrene (50-32-8)															
7B. 3,4-Benzo-fluoranthene (205-99-2)															
8B. Benzo (ghi) Perylene (191-24-2)															
9B. Benzo (k) Fluoranthene (207-08-9)															
10B. Bis (2-Chloro-ethoxy) Methane (111-91-1)															
11B. Bis (2-Chloro-ethyl) Ether (111-44-4)															
12B. Bis (2-Chloroisopropyl) Ether (102-80-1)															
13B. Bis (2-Ethyl-hexyl) Phthalate (117-81-7)															
14B. 4-Bromophenyl Phenyl Ether (101-55-3)															
15B. Butyl Benzyl Phthalate (85-68-7)															
16B. 2-Chloro-naphthalene (91-58-7)															
17B. 4-Chloro-phenyl Phenyl Ether (7005-72-3)															
18B. Chrysene (218-01-9)															
19B. Dibenzo (a,h) Anthracene (53-70-3)															
20B. 1,2-Dichloro-benzene (95-50-1)															
21B. 1,3-Di-chloro-benzene (541-73-1)															

1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS <i>(continued)</i>															
22B. 1,4-Dichlorobenzene (106-46-7)															
23B. 3,3-Dichlorobenzidine (91-94-1)															
24B. Diethyl Phthalate (84-66-2)															
25B. Dimethyl Phthalate (131-11-3)															
26B. Di-N-Butyl Phthalate (84-74-2)															
27B. 2,4-Dinitrotoluene (121-14-2)															
28B. 2,6-Dinitrotoluene (606-20-2)															
29B. Di-N-Octyl Phthalate (117-84-0)															
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)															
31B. Fluoranthene (206-44-0)															
32B. Fluorene (86-73-7)															
33B. Hexachlorobenzene (118-74-1)															
34B. Hexachlorobutadiene (87-68-3)															
35B. Hexachlorocyclopentadiene (77-47-4)															
36B Hexachloroethane (67-72-1)															
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)															
38B. Isophorone (78-59-1)															
39B. Naphthalene (91-20-3)															
40B. Nitrobenzene (98-95-3)															
41B. N-Nitrosodimethylamine (62-75-9)															
42B. N-Nitrosodi-N-Propylamine (621-64-7)															

CONTINUED FROM THE FRONT

1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1)	(2)	(1)	(2)	(1)	(2)				(1)	(2)	
				CONCENTRATION	MASS	CONCENTRATION	MASS	CONCENTRATION	MASS				CONCENTRATION	MASS	
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS <i>(continued)</i>															
43B. N-Nitrosodiphenylamine (86-30-6)															
44B. Phenanthrene (85-01-8)															
45B. Pyrene (129-00-0)															
46B. 1,2,4-Trichlorobenzene (120-82-1)															
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)															
2P. α-BHC (319-84-6)															
3P. β-BHC (319-85-7)															
4P. γ-BHC (58-89-9)															
5P. δ-BHC (319-86-8)															
6P. Chlordane (57-74-9)															
7P. 4,4'-DDT (50-29-3)															
8P. 4,4'-DDE (72-55-9)															
9P. 4,4'-DDD (72-54-8)															
10P. Dieldrin (60-57-1)															
11P. α-Endosulfan (115-29-7)															
12P. β-Endosulfan (115-29-7)															
13P. Endosulfan Sulfate (1031-07-8)															
14P. Endrin (72-20-8)															
15P. Endrin Aldehyde (7421-93-4)															
16P. Heptachlor (76-44-8)															

EPA I.D. NUMBER <i>(copy from Item 1 of Form 1)</i>	OUTFALL NUMBER
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CONTINUED FROM PAGE V-8

1. POLLUTANT AND CAS NUMBER <i>(if available)</i>	2. MARK "X"			3. EFFLUENT						4. UNITS		5. INTAKE <i>(optional)</i>			
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE <i>(if available)</i>		c. LONG TERM AVRG. VALUE <i>(if available)</i>		d. NO. OF ANALYSES	a. CONCEN- TRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION – PESTICIDES <i>(continued)</i>															
17P. Heptachlor Epoxide (1024-57-3)															
18P. PCB-1242 (53469-21-9)															
19P. PCB-1254 (11097-69-1)															
20P. PCB-1221 (11104-28-2)															
21P. PCB-1232 (11141-16-5)															
22P. PCB-1248 (12672-29-6)															
23P. PCB-1260 (11096-82-5)															
24P. PCB-1016 (12674-11-2)															
25P. Toxaphene (8001-35-2)															

OCEANA GOLD

ENGINEERING DESIGN CHANGES

STAGE 0

Prepared for:



August 2020

Prepared by:

Linkan
ENGINEERING
2720 Ruby Vista Drive
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LIST OF APPENDICES

A	DRAWINGS
B	SDS SHEETS

LIST OF ACRONYMS AND ABBREVIATIONS

CWTP	Contact Water Treatment Plant
Fe	Iron
gpd	Gallons per Day
KMnO ₄	Potassium Permanganate
MF	Microfilter
mg/L	Milligrams per Liter
Mn	Manganese
NaMnO ₄	Sodium Permanganate
NaOCl	Sodium Hypochlorite
PFD	Process Flow Diagram
pH	Hydrogen Potential
s.g.	Specific Gravity
s.u.	Standard Units
Tl	Thallium
TSS	Total Suspended Solids

1.0 INTRODUCTION

This report will address the proposed changes and will be presented with the following structure:

Section 1 – Presents a discussion of the proposed changes.

Section 2 – Presents the proposed process description.

Section 3 – Presents the chemical dosing requirements.

Section 4 – Presents process-associated drawings.

Section 5 – Presents SDS sheets for all chemicals that are proposed for use.

1.1 Discussion

This report presents proposed changes to the Oceana Gold Haile CWTP in support of their initiative to reduce thallium (Tl) levels in their plant discharge. These changes are based upon bench-scale tests that were performed in June 2020 by Linkan Engineering (Linkan) on the CWTP feed water, the results of which were very favorable.

The tests included oxidation of the water by chemical means for iron (Fe) and manganese (Mn) removal, and this mechanism proved beneficial in the removal of Tl. Oxidation of aqueous Fe and Mn is an electrochemical process in which each metal reacts with oxygen occurring either naturally or as a chemically bound form. This reaction between the metal and the oxygen forms a hydrated species. This occurs in a 2-step mechanism in which there is an anodic dissolution of the aqueous metal, which loses electrons and becomes ionic and soluble in water. This is then followed by a cathodic reduction of oxygen, where it reacts with water and the available electrons lost from the metal, and this reaction yields hydroxide ions. These hydroxide ions then react with the metal ions and form metal hydroxides, which eventually become super-saturated in solution and begin to precipitate out as solid masses. This precipitation, especially of Mn, provides Tl removal through co-precipitation mechanisms including inclusions, occlusions, and adsorptions into the forming crystal structures. These precipitated masses can then be removed via sedimentation and filtration, both of which the Haile CWTP has in current operation.

The oxidant proposed for use is sodium hypochlorite (NaOCl), with either potassium permanganate (KMnO₄) or sodium permanganate (NaMnO₄) being appropriate substitutions, as determined by the bench-scale test results. Each of these chemicals will have residuals controlled by way of the addition of a reducing agent, with sodium metabisulfite being proposed due to its high efficiency to neutralize these oxidants and thereby safeguard downstream ecosystems from their effects. The treatment for Tl at the Haile CWTP is based upon the aforementioned chemical processes, the details of which are included in the following sections of this report:

2.0 PROCESS DESCRIPTION

The proposed Haile CWTP water treatment process is described in the following section. It should be noted that all of the proposed treatment components have been used successfully on an industrial scale for the contaminants of concern noted at the Haile facility, with none of them being novel or experimental in any way. The science behind each proposed component is well understood and has been validated over years of application in facilities worldwide.

Influent to the process will be obtained at the discharge of the plant feed pond (Pond A-19), at which point it is proposed that sodium hypochlorite will be introduced into the plant feed piping at a dose of 15 - 25 mg/L. This chemical will ideally be injected just upstream of the CWTP feed water delivery pump, and therefore use the pump energy to efficiently disperse the chemical into the feed water.

Calcium hydroxide (slaked lime) will be introduced into the Stage 1 Reaction Tank to maintain a pH of 8.7 plus or minus 0.2 standard units (s.u.). Ferric chloride will also be added as a coagulant into the Stage 1 Reaction Tank at a dose of 15 mg/L to provide available iron to form hydrous ferric oxide (HFO) floc.

The water will then be conveyed via gravity transfer into the Stage 1 MultiFlo unit where some sedimentation will occur of the precipitated species. The supernatant will then be conveyed via gravity to the Second Stage Reaction Tank where a precipitant chemical will be administered. The proposed precipitant is an organo-sulfide chemical manufactured by Evonik Industries that has been labeled with the trade name of 'TMT-15'. This product forms sulfide-metal bonds, which chelate the metals out of solution. Specifically, it is a trimercaptotriazine that has a cyclic structure affording it its stability, and which also imparts its eco-friendly qualities, as it does not degrade and remobilize toxic metals or form harmful decomposition byproducts. The cyclic structure of the molecule has 3 equidistantly spaced sulfide atoms instead of the single atom in most other inorganic and organic precipitant chemicals, which allows it to be a more efficient metal scavenger, per equivalent dose, than its industry counterparts.

Once again, the water is conveyed via gravity, entering the Lamella Clarifier where it is proposed to be injected with approximately 4 mg/L of high molecular weight, an anionic polymer that will agglomerate a significant amount of the remaining precipitated masses. These agglomerates will form 3-dimensional structures of increasing size, whereupon at a certain size gravity will act upon them and they will settle out of solution as governed by Stoke's Law.

Gravity transfer then conveys the water to the Second Stage Clearwell, where it is proposed that sodium metabisulfite is added to neutralize any residual oxidant that was not consumed in the treatment reactions. The effectiveness of this oxidant quench can be monitored by residual free chlorine testing.

A pump will convey the water to the microfiltration (MF) units that will remove the remaining total suspended solids (TSS). Filtrate water will enter the system Backwash Tank and once it is full will flow into the pH Adjustment Tank, where depending on the regulatory requirements; either acid or base will be

added before the water flowing via gravity to the Discharge Pump Box. The treated water will then be pumped to discharge Outfall 003

Solid waste handling will be maintained in the same way as the currently permitted process, with underflow from the Multiflo and the Lamella clarifiers being directed to the Sludge Transfer Box where it will be sent to the Cyanide Recovery Thickener Box, or the Process Events Pond. Liquid waste from routine periodic reverse flushes of the MF units and all MF chemical cleaning events will be directed to the plant's sump where it will be returned to Pond A-19.

3.0 CHEMICAL DOSING REQUIREMENTS

It is anticipated that the Haile CWTP will operate at an average of 1,200 gpm. The following are the chemical dosing requirements for this flow:

3.1 Sodium Hypochlorite

15 mg/L of 12.5 percent by weight solution and specific gravity (s.g.) of 1.17 will require that 7.38 gallons per hour (177.2 gpd) are pumped into the CWTP feed water.

3.2 Calcium Oxide (Quick Lime)

The demand for anhydrous calcium oxide was determined via titration to be approximately 350 mg/L. It is anticipated that the hydrated equivalent will be used in the process for pH control of the First Stage Reaction Tank.

3.3 Ferric Chloride

15 mg/L of 12.5 percent by weight solution and an s.g. of 1.42 will require that 1.9 gallons per hour (45.6 gpd) are pumped into the CWTP First Stage Reaction Tank.

3.4 TMT-15

5 mg/L of 1 percent by weight solution and an s.g. of 1.1375 will require that 0.633 gallons per hour (15.2 gpd) are pumped into the CWTP Second Stage Reaction Tank.

3.5 Polymer

4 mg/L of 30 percent by weight solution and an s.g. of 1.1 will require that 0.873 gallons per hour (20.95 gpd) are pumped into the CWTP Second Stage Lamella Clarifier.

3.6 Sodium Metabisulfite

A projected dose of 1 mg/L of 40 percent by weight solution and an s.g. of 1.33 will require that 0.135 gallons per hour (3.2 gpd) are pumped into the CWTP Second Stage Clearwell.

4.0 DRAWINGS

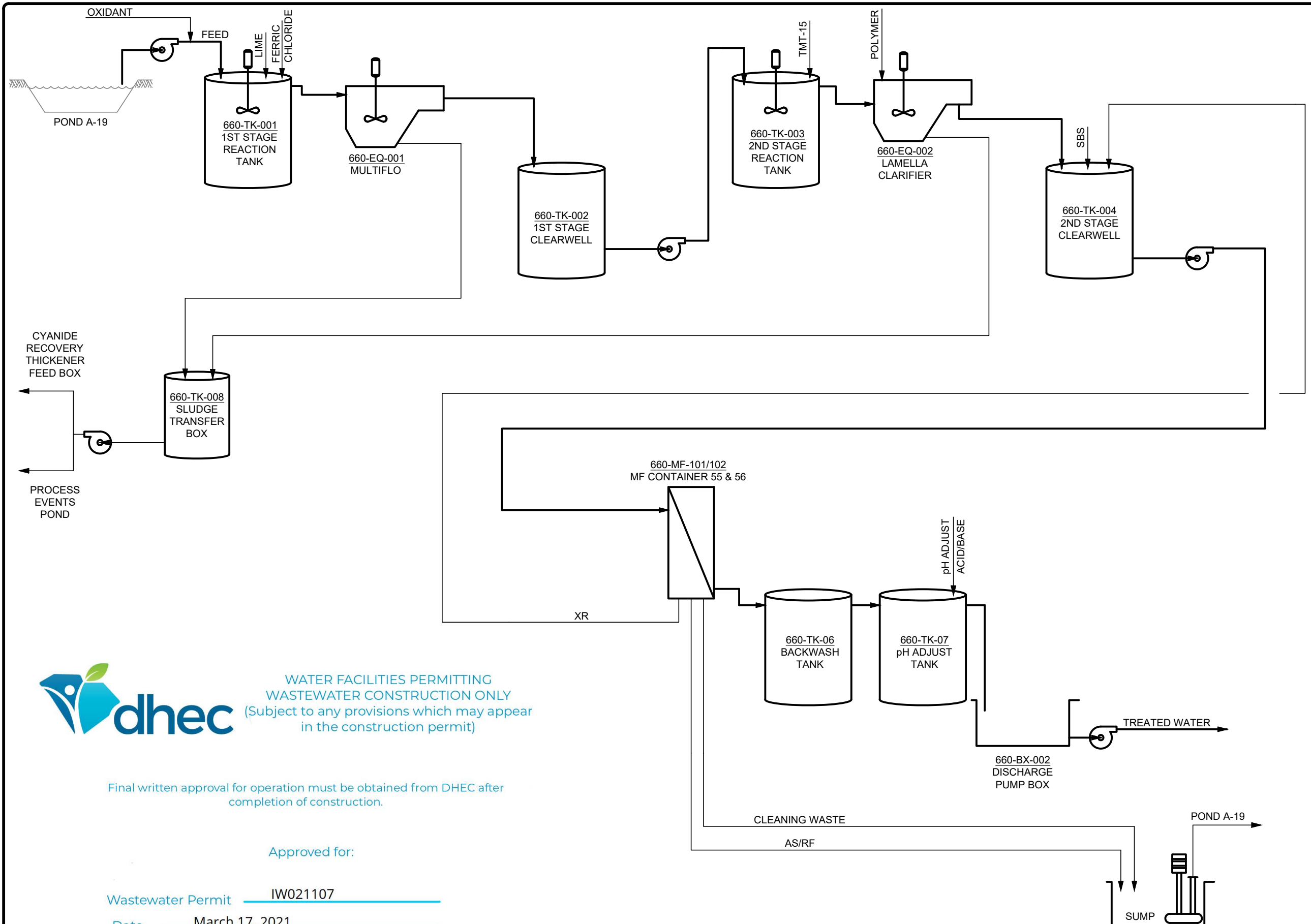
Refer to Appendix A for the proposed process flow diagram (PFD).

5.0 SDS SHEETS

Refer to Appendix B for applicable SDS sheets.

APPENDIX A
DRAWINGS

8/5/2020 5:12 PM S:\Projects\69 Oceana Gold\69.05 CWTP 2400 gpm Design\CADD\DWG\Phase 0\G-200 Stage 0 PROCESS FLOW.dwg



WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
(Subject to any provisions which may appear
in the construction permit)

Final written approval for operation must be obtained from DHEC after
completion of construction.

Approved for:

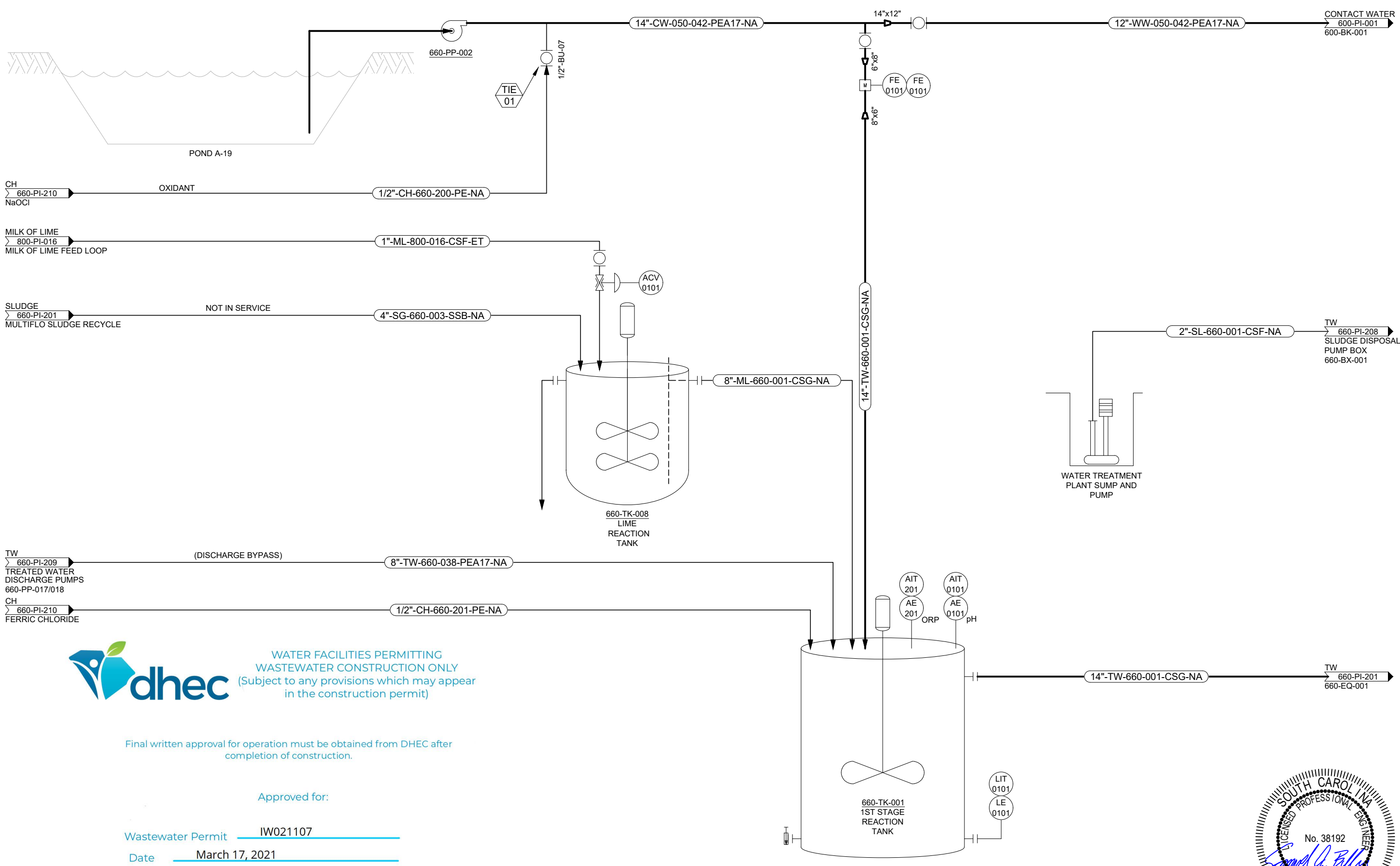
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE: PHASE 0 1200 GPM WATER TREATMENT PROCESS FLOW DIAGRAM	
PROJECT: HAILE GOLD PROJECT WTP EXPANSION	
PROJECT NO. 69.05	DATE: AUGUST 05, 2020
SCALE: NTS	
SHEET NO. G-200	

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dhec WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
(Subject to any provisions which may appear
in the construction permit)

Final written approval for operation must be obtained from DHEC after
completion of construction.

Approved for:
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 38192
Samuel J. Billin
SAMUEL BILLIN
08/05/2020

Linkan
ENGINEERING
2720 Ruby Vista Dr, Suite 101
Elko, NV 89801
775-777-8003

REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE: PHASE 0 1200 GPM WATER TREATMENT P&ID
1ST STAGE REACTION TANK
LIME REACTION TANK
PROJECT: HAILE GOLD PROJECT
WTP EXPANSION

PROJECT NO. 69.05
DATE: AUGUST 05, 2020
SCALE: NTS
SHEET NO. 660-PI-200

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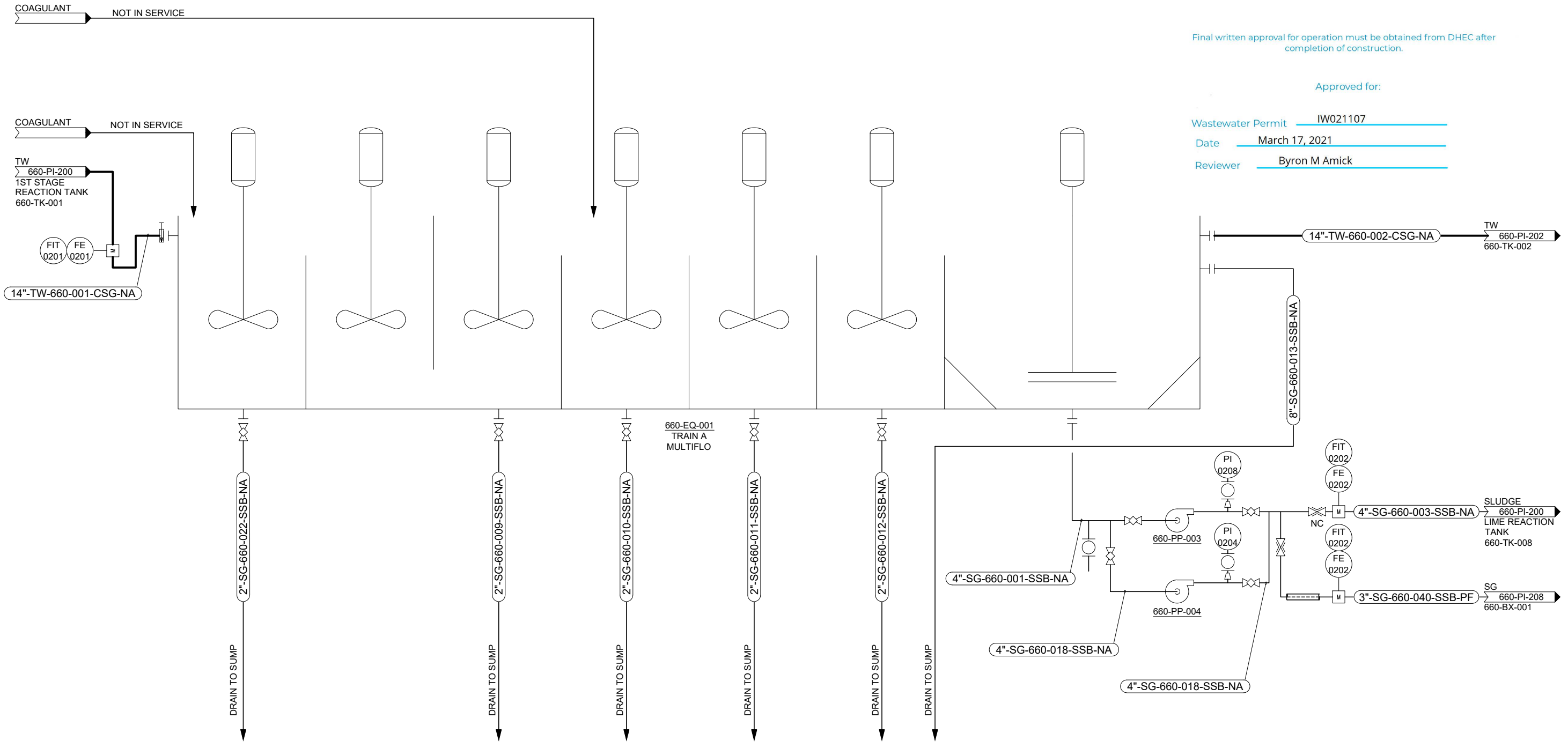


WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
(Subject to any provisions which may appear
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Final written approval for operation must be obtained from DHEC after
completion of construction.

Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
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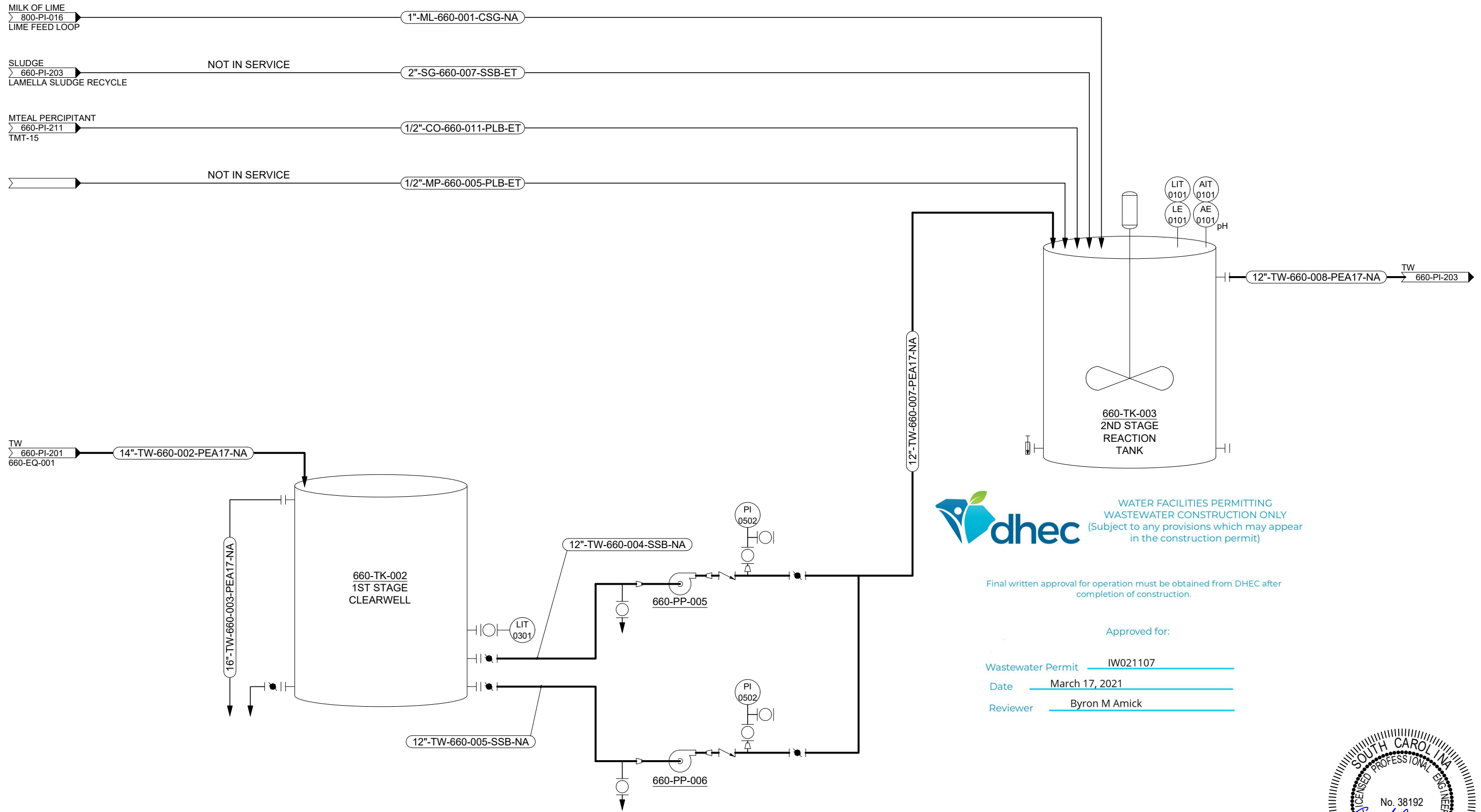
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WTP EXPANSION

TITLE: PHASE 0 1200 GPM WATER TREATMENT P&ID
STAGE 1 MULTIFLOW CLARIFIER

PROJECT NO. 69.05
DATE: AUGUST 05, 2020
SCALE: NTS
SHEET NO. 660-PI-201



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WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
(Subject to any provisions which may appear
in the construction permit)

Final written approval for operation must be obtained from DHEC after
completion of construction.

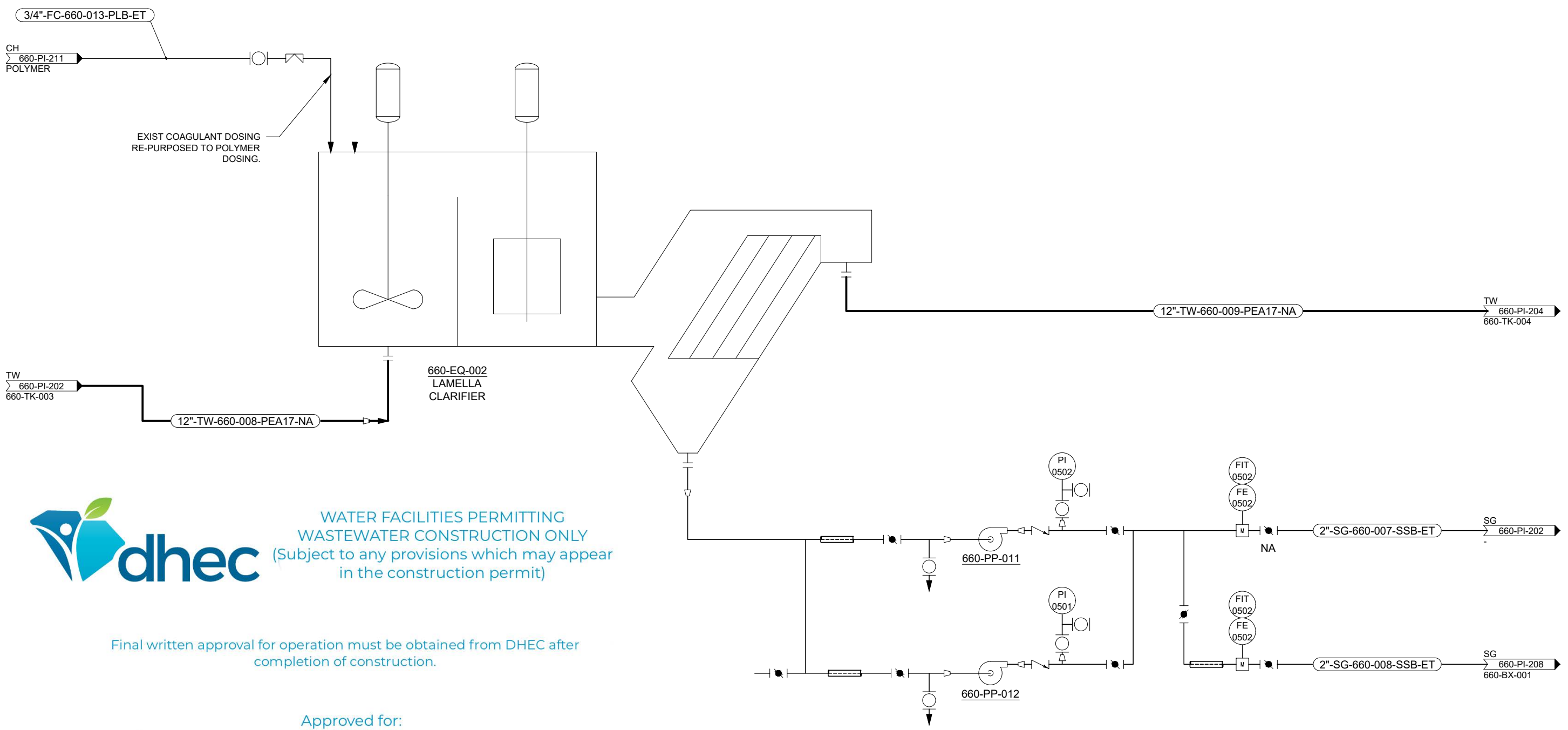
Approved for:
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID
	STAGE 1 CLEARWELL
	STAGE 2 REACTION TANK
PROJECT:	HAILE GOLD PROJECT
	WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NTS
SHEET NO.	660-PI-202

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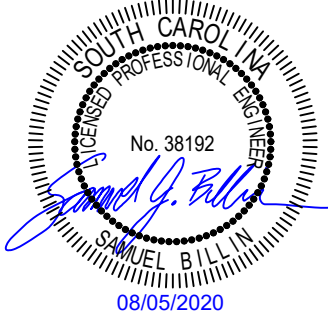


**WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY**
(Subject to any provisions which may appear
in the construction permit)

Final written approval for operation must be obtained from DHEC after
completion of construction.

Approved for:

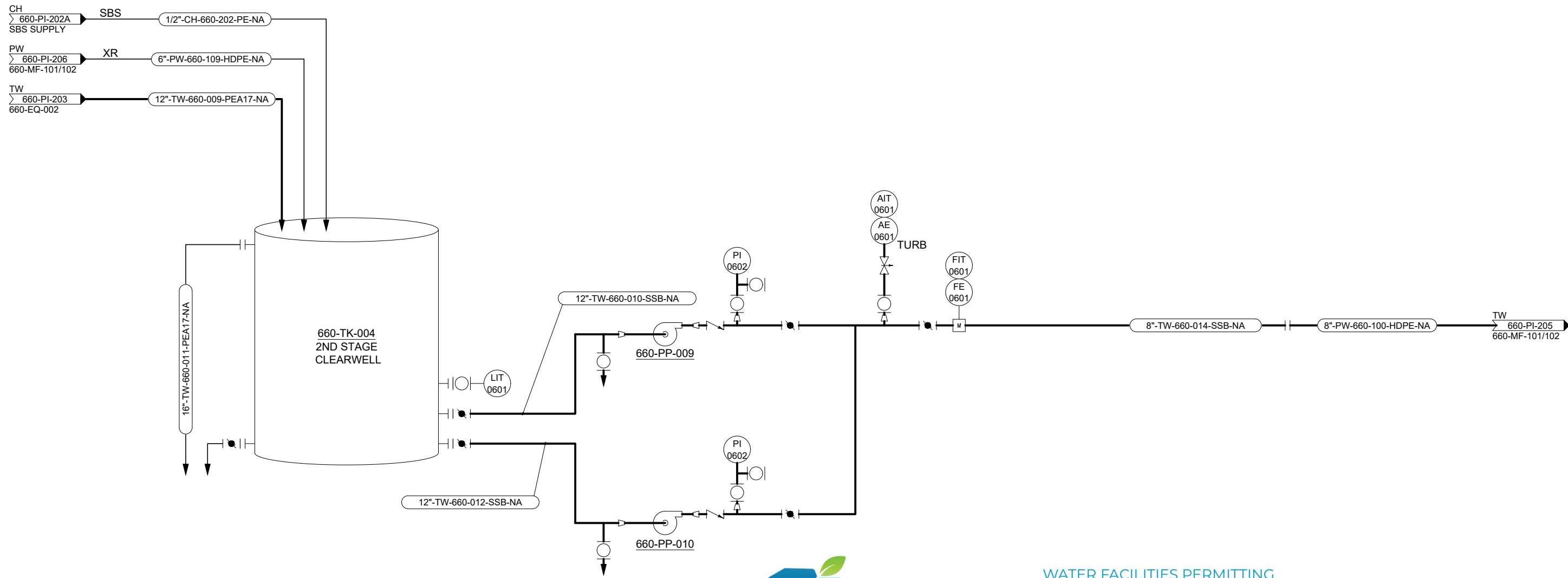
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID LAMELLA CLARIFIER LAMELLA TRANSFER PUMPS
PROJECT:	HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NTS
SHEET NO.	660-PI-203

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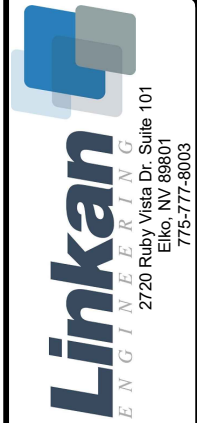
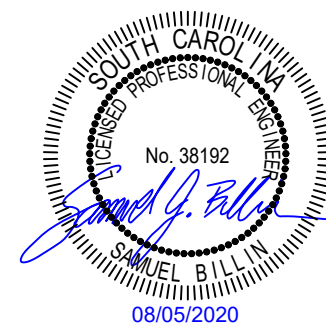


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Approved for:

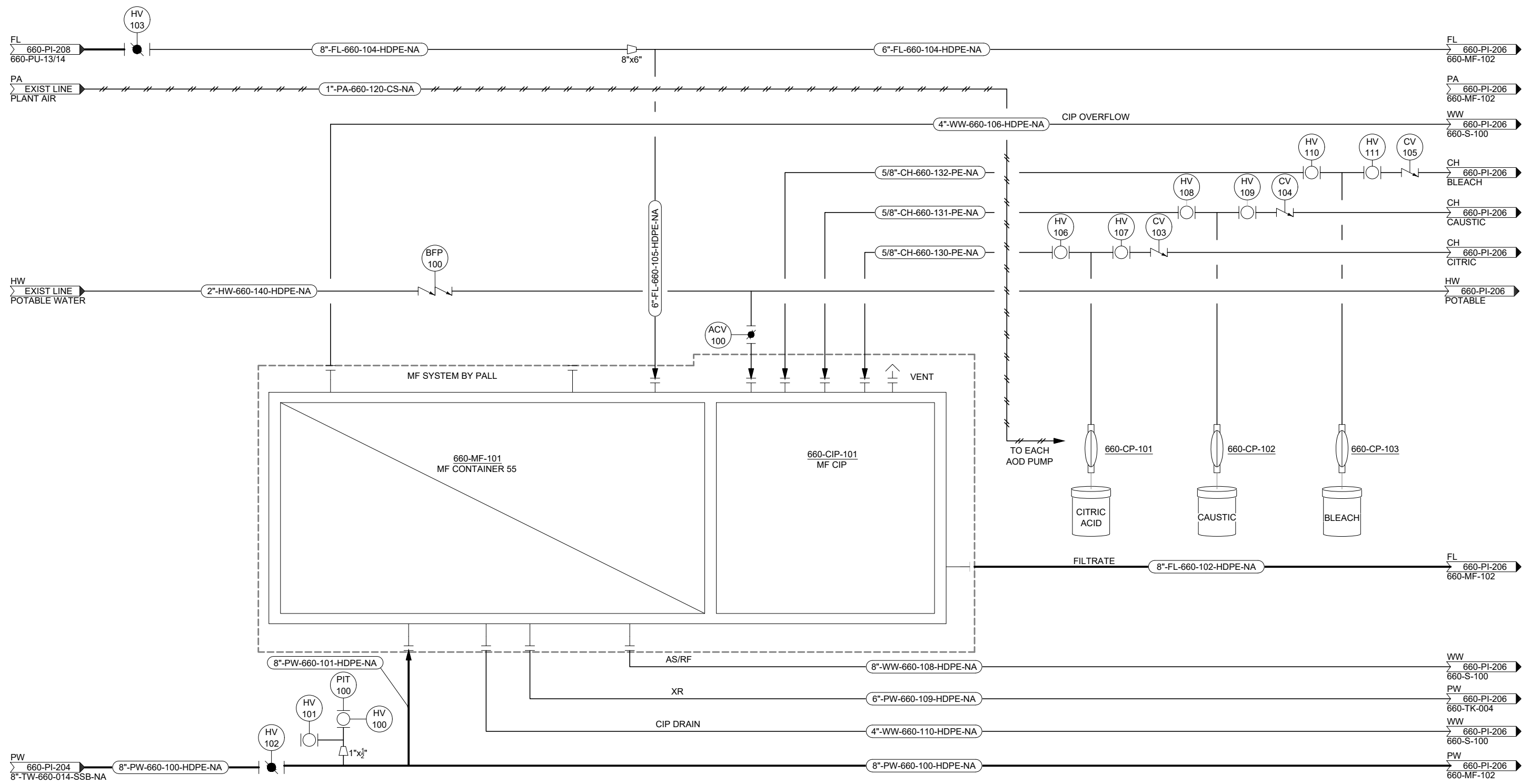
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID 2ND STAGE CLEARWELL TANK AND TRANSFER PUMPS
PROJECT:	HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NA
SHEET NO.	660-PI-204

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Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



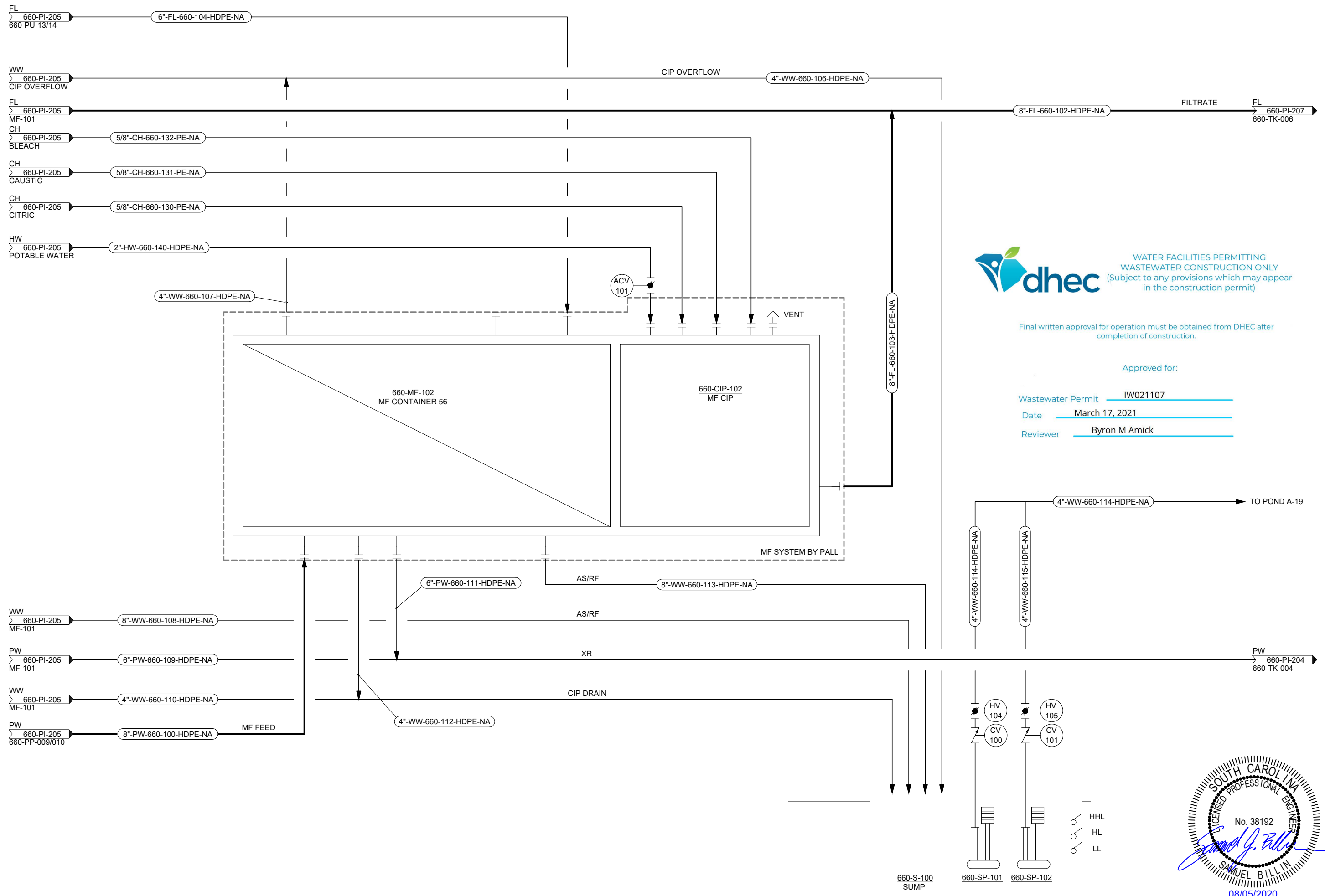
REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE: **PHASE 0 1200 GPM WATER TREATMENT P&ID
MICROFILTRATION 660-MF-101**

PROJECT: **HAILE GOLD PROJECT
WTP EXPANSION**

PROJECT NO. 69.05
DATE: AUGUST 05, 2020
SCALE: NA
SHEET NO. **660-PI-205**

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Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



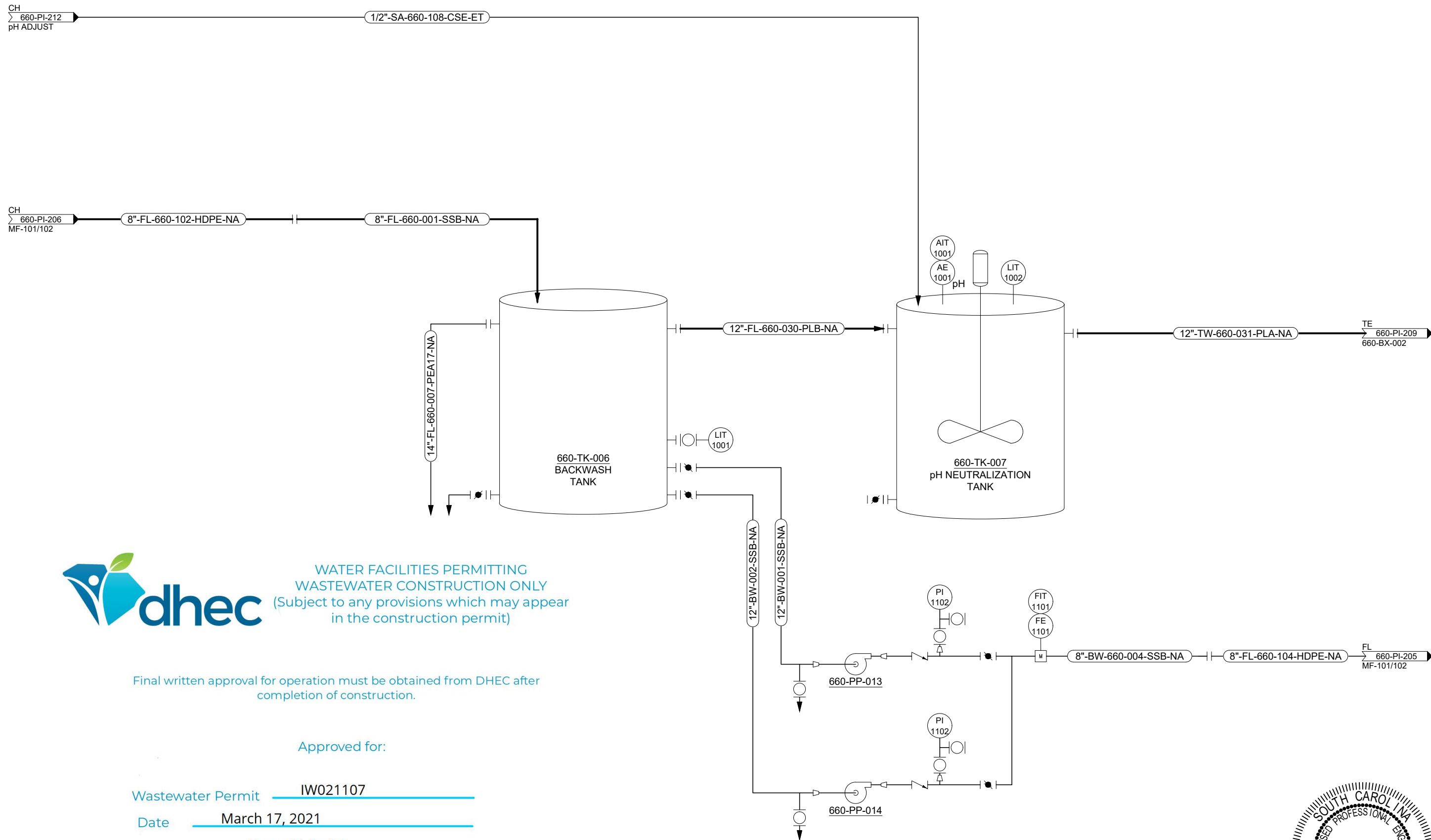
REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE: PHASE 0 1200 GPM WATER TREATMENT P&ID
MICROFILTRATION 660-MF-102

PROJECT: HAILE GOLD PROJECT
WTP MODIFICATION

PROJECT NO. 69.05
DATE: AUGUST 05, 2020
SCALE: NA
SHEET NO. 660-PI-206

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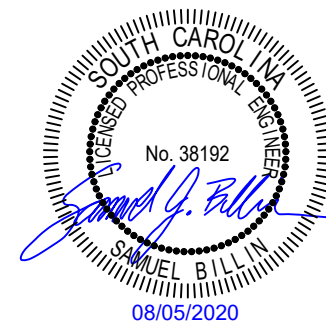


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Approved for:

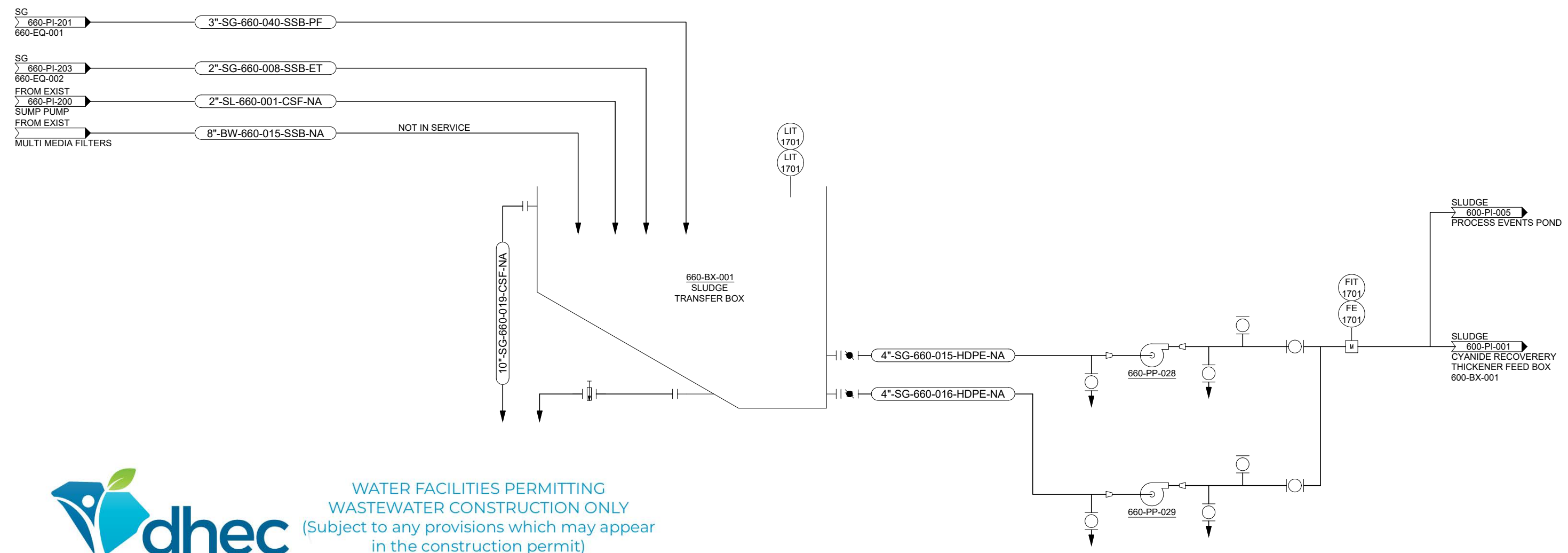
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE: PHASE 0 1200 GPM WATER TREATMENT P&ID BACKWASH TANK & ADJUST TANK	
PROJECT: HAILE GOLD PROJECT WTP EXPANSION	
PROJECT NO. 69.05	DATE: AUGUST 05, 2020
SCALE: NTS	
SHEET NO. 660-PI-207	

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Approved for:

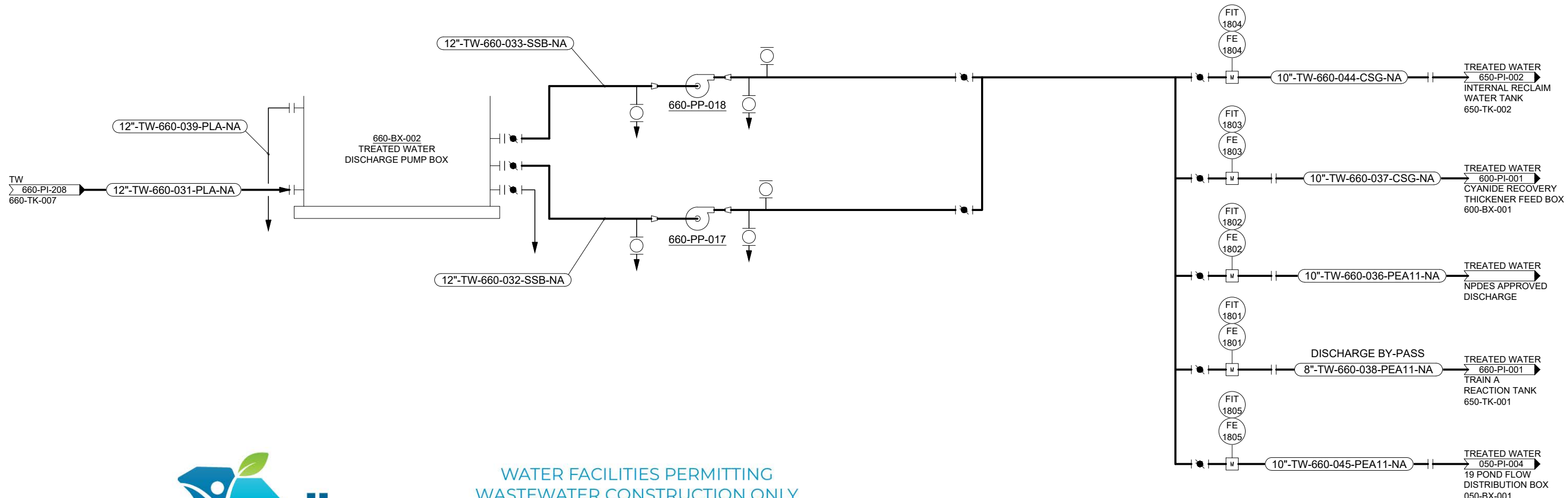
Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID SLUDGE TRANSFER PUMP BOX
PROJECT:	HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NTS
SHEET NO.	660-PI-208

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Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick

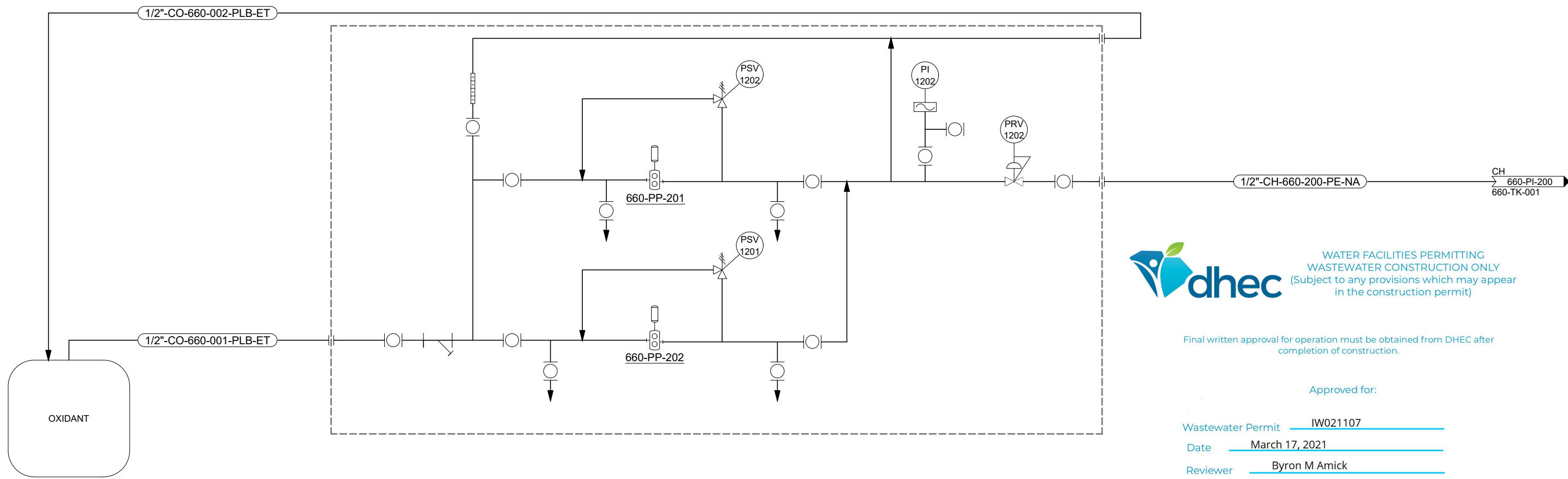


2720 Ruby Vista Dr., Suite 101
Elko, NV 89801
775-777-8003

REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE: PHASE 0 1200 GPM WATER TREATMENT P&ID TREATED WATER DISCHARGE PUMP BOX	PROJECT: HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO. 69.05	DATE: AUGUST 05, 2020
SCALE: NTS	SHEET NO. 660-PI-209

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OXIDANT DOSING

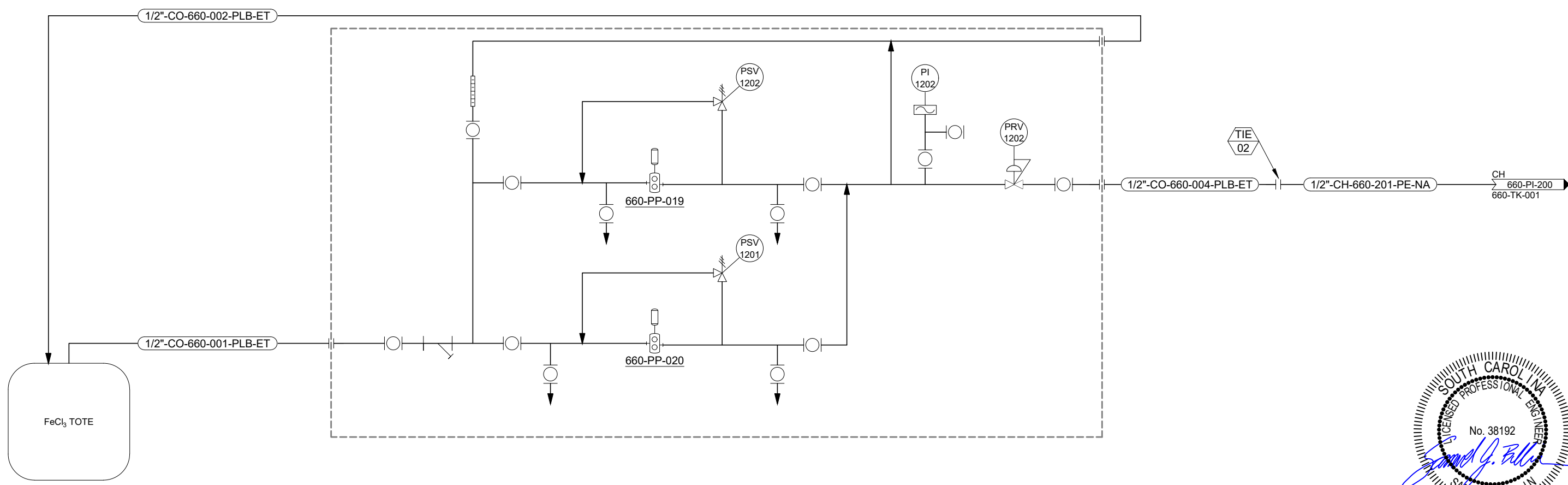


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Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



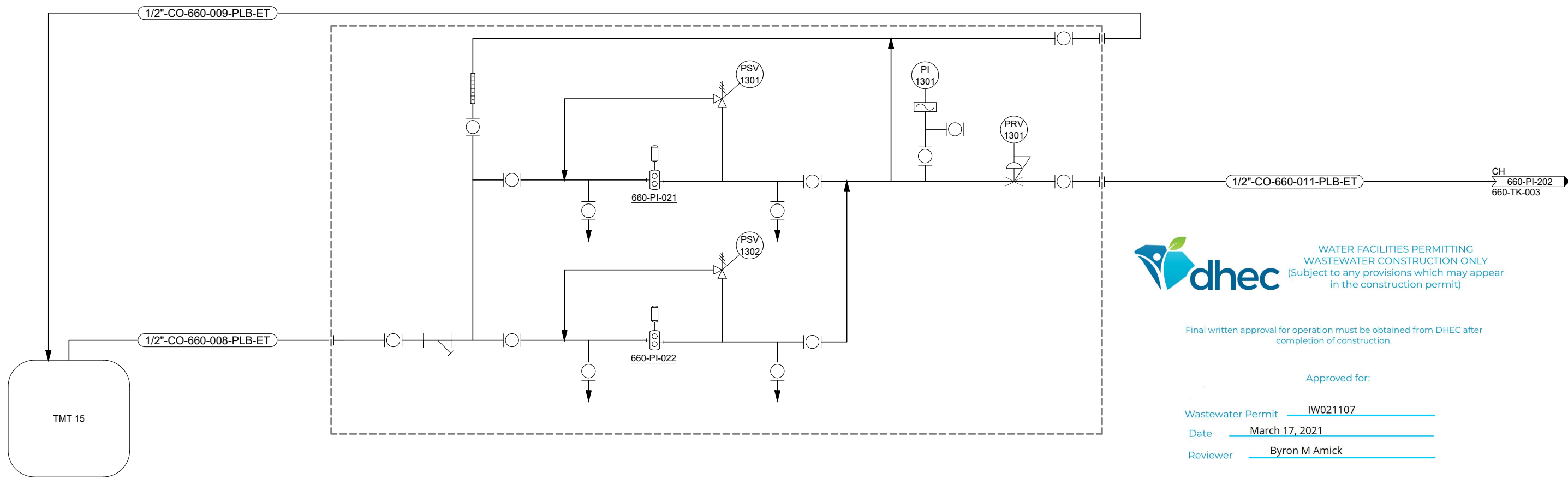
FERRIC CHLORIDE DOSING



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID OXIDANT DOSING FERRIC CHLORIDE DOSING
PROJECT:	HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NTS
SHEET NO.	660-PI-210

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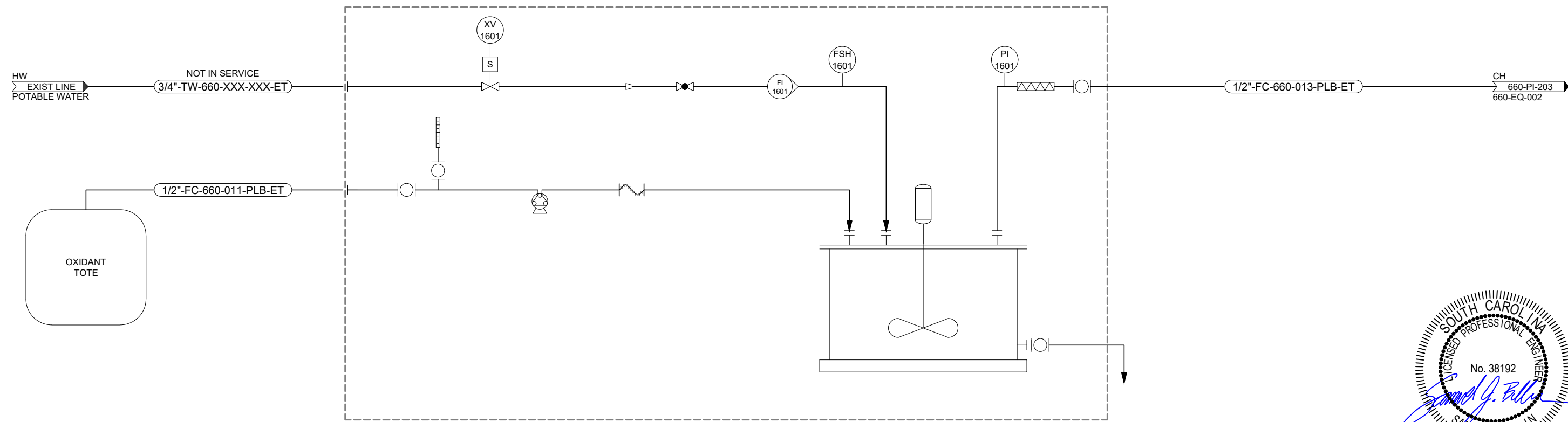
TMT 15 DOSING

dhec WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
(Subject to any provisions which may appear
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Final written approval for operation must be obtained from DHEC after
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Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



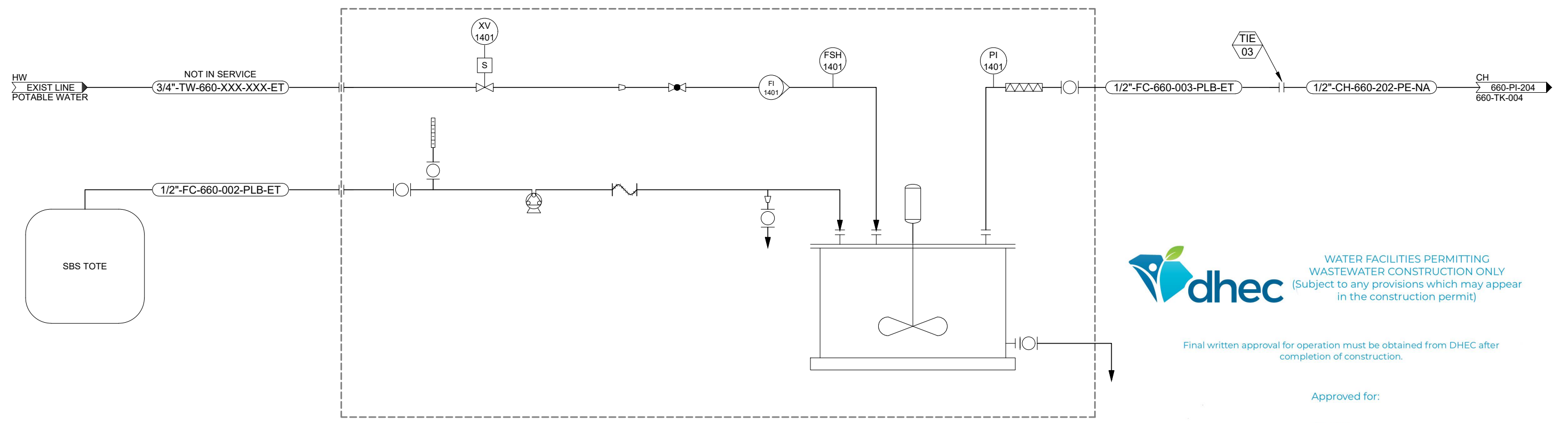
POLYMER DOSING

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 38192
Samuel J. Billin
SAMUEL BILLIN
08/05/2020

REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID TMT 15 DOSING POLYMER DOSING
PROJECT:	HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NTS
SHEET NO.	660-PI-211

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SBS DOSING

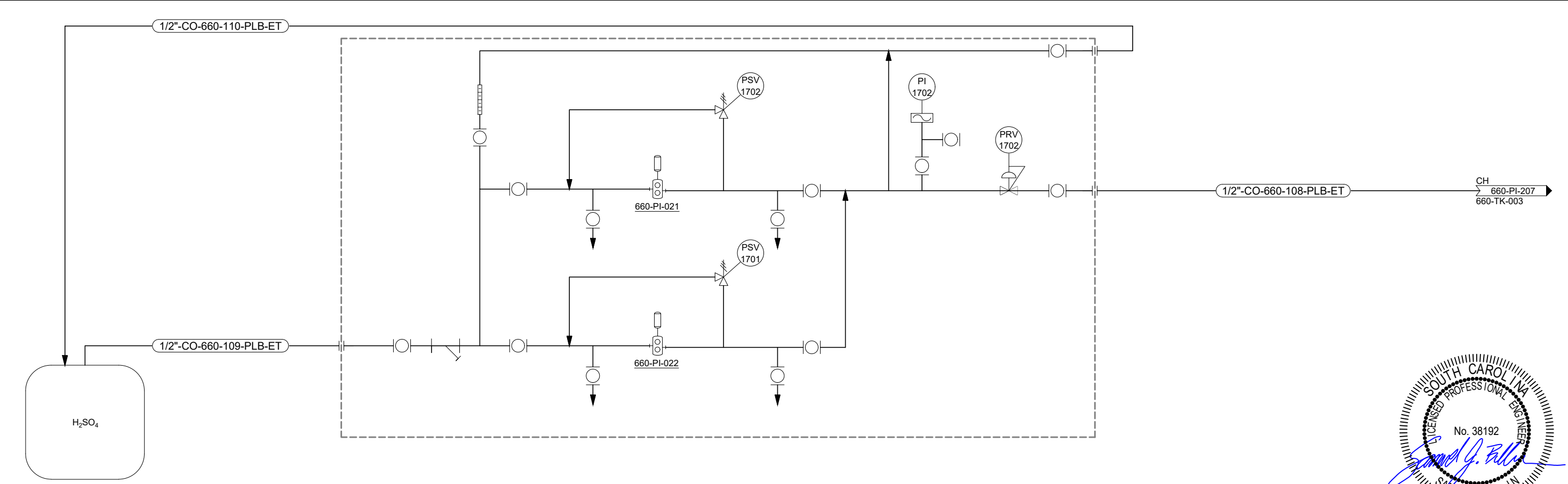


WATER FACILITIES PERMITTING
WASTEWATER CONSTRUCTION ONLY
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Approved for:

Wastewater Permit IW021107
Date March 17, 2021
Reviewer Byron M Amick



SULFURIC ACID DOSING



REV.	DATE	REVISION DESCRIPTION
0	08/05/20	ISSUED FOR CONSTRUCTION

TITLE:	PHASE 0 1200 GPM WATER TREATMENT P&ID SBS DOSING SULFURIC ACID DOSING
PROJECT:	HAILE GOLD PROJECT WTP EXPANSION
PROJECT NO.	69.05
DATE:	AUGUST 05, 2020
SCALE:	NTS
SHEET NO.	660-PI-212

APPENDIX B
SDS SHEETS

Material Safety Data Sheet

Spirit Drilling & Completion Fluids

Lime

I. PRODUCT AND COMPANY IDENTIFICATION

Chemical Name: CALCIUM HYDROXIDE CAS#: 01305-62-0
Chemical Family: BASE
Chemical Formula: Ca(OH)₂
Synonyms: CALCIUM HYDRATE, SLAKED LIME

NFPA Properties: Health: 1 Flammability: 1 Reactivity: 0 Contact: 2

Supplier:

Spirit Drilling & Completion Fluids

4310 N. Sam Houston Parkway E
Houston, TX 77032
Office: (713) 482-0500
Fax: (713) 482-0695
Company website: www.nov.com

Emergency Telephone Number:

CHEMTREC: 1-800-424-9300 or International +1-703-527-3887

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

TLV's (ACGIH)

OTHER

Hazardous Components	TWAPPM	TWA MG/M ³	STEL PPM	STEL MG/M ³	CAS#	LIMITS	%
1. CALCIUM HYDROXIDE					1305-62-0		90-100
2.							
3.							

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point °F: N/A
Specific Gravity: 2.24
Vapor Pressure: N/A
Percent Volatility: N/A
Vapor Density: 2.5
Evaporation Rate: N/A
Solubility In Water: NEGLIBLE, LESS THAN 1 %
Melting Point °F: N/A

Color: WHITE TO OFF-WHITE
Odor: NONE
Appearance: POWDER OR CRYSTALS
pH:
Viscosity: N/A
Activity: N/A
LC50: NDA
LD50: 7340

Material Safety Data Sheet

Spirit Drilling & Completion Fluids

Lime

Material Safety Data Sheet

IV. FIRE & EXPLOSION HAZARD DATA

Extinguishing Agents: DRYCHEMICAL OR WATERSPRAY OR WATERFOG OR CO2 OR FOAM OR SAND & EARTH

Flash Point °F: N/A

Flammable Limits: N/A **LEL:** N/A **UEL:** N/A

Special Firefighting Procedures: USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE

Unusual Fire & Explosion Hazards: NONE

N/A = Not Applicable NDA = No Data Available

V. HEALTH HAZARD DATA

Routes of Entry: Inhalation: YES Skin: YES Ingestion: YES

Effects of Overexposure: DUST MAY IRRITATE NOSE AND THROAT. CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.

Toxicological Properties: NDA

Chronic & Acute Effects of Overexposure:

Carcinogenicity: NTP: NO IARC Monographs: NO OSHA Regulated: NO

Emergency First Aid Procedures

Eyes: IMMEDIATELY FLUSH WITH LARGE QUANTITIES OF WATER FOR AT LEAST 15 MINUTES AND CALL A PHYSICIAN.

Skin Contact: FLUSH WITH LARGE AMOUNTS OF WATER FOR 15 MINUTES.

Inhalation: REMOVE TO FRESH AIR, IF BREATHING IS DIFFICULT, GIVE OXYGEN AND CALL A PHYSICIAN.

Ingestion: CALL A PHYSICIAN.

VI. REACTIVITY DATA

Stability: STABLE Hazardous Polymerization: WILL NOT OCCUR

Hazardous Decomposition Products: AS WITH ANY ORGANIC MATERIAL, COMBUSTION WILL PRODUCE CARBON DIOXIDE (CO2) AND PROBABLY CARBON MONOXIDE (CO). OXIDES OF NITROGEN

Conditions to Avoid:

Incompatibility and Materials to Avoid: STRONG ACIDS

N/A = Not Applicable NDA = No Data Available

VII. SPILL & DISPOSAL PROCEDURES

Steps To Be Taken in Case Material is Released or Spilled --- Procedures For Clean - Up: WEAR SELF CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL ARE WITH WATER

Waste Disposal Method: DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS.

Precautions To Be Taken In Handling & Storage: STORE BETWEEN 40°F AND 120°F.

Material Safety Data Sheet

Spirit Drilling & Completion Fluids

Lime

Material Safety Data Sheet

VIII. PROTECTIVE EQUIPMENT

Ventilation Type Required: MECHANICAL
Protective Gloves: RUBBER OR PLASTIC (RECOMMENDED)
Respiratory Protection: USE NIOSH/OSHA APPROVED RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IF VAPOR CONCENTRATION EXCEEDS PERMISSIBLE EXPOSURE LIMIT.
Eye/Skin Protection: SAFETY GLASSES WITH SIDESHIELDS, UNIFORM,
Other Protective Equipment: NEOPRENE TYPE APRON
Comments:

IX. REGULATORY & TRANSPORTATION INFORMATION

US DOT Proper Shipping Name: "OIL - WELL TREATING COMPOUND"
US DOT Hazard Class: NON-HAZARDOUS DOT ID Number:
ID Number: Freight Classification:
Unregulated By DOT: Regulated by DOT: NO
Special Transportation Note:
Labels Required: NO

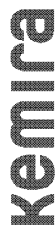
DISCLAIMER:

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Spirit Drilling and Completion Fluids, makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the person receiving this MSDS will make own determination as to its suitability for their intended purpose prior to use. Since the product is within the exclusive control of the user, it is the user's obligation to determine the conditions of safe use of this product. Such conditions should comply with all Federal Regulations concerning the Product. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER NATURE ARE MADE HERUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

For further information contact:



4310 N. Sam Houston Parkway E
Houston, Texas 77032
Office: (713) 482-0500
Fax: (713) 482-0695
Company website: www.nov.com



MATERIAL SAFETY DATA SHEET

Ferric Chloride

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

	<u>USA</u>	<u>CANADA</u>
Supplier:	Kemira Water Solutions, Inc. 316 Bartow Municipal Airport Bartow, Florida 33830	Kemira Water Solutions, Inc. of Canada 3405 Blvd. Marie Victorin Varenes, Québec J3X 1T6
Customer Service Telephones:	(800) 879-6353 (785) 842-7424	(800) 465-6171 (450) 652-0665
	(800) 450-7352 - Polymers	

Emergency Contacts (24 hr.)

FOR EMERGENCIES INVOLVING CHEMICAL SPILL OR RELEASE, CALL

CHEMTREC (800) 424-9300	USA (TOLL FREE)
CANUTEC (613) 996-6666	CANADA (CALL COLLECT)

Product Name:	Ferric Chloride
Chemical Family:	Inorganic Salts
Formula:	FeCl ₃
Synonym:	Iron (III) Chloride
Acceptable Product Uses:	Water and wastewater treatment, odor removal, adhesive for dye, textile impression pigment, ink and photoengraving.

2. COMPOSITION / INFORMATION ON INGREDIENTS

<u>Component</u>	<u>CAS Number #</u>	<u>Concentration</u>	<u>ACGIH TWA</u>
Ferric Chloride	7705-08-0	28 – 43 %	1 mg/m ³ (as Fe)
Hydrochloric Acid	7647-01-0	<5 %	5 ppm

3. HAZARDS IDENTIFICATION

Emergency Overview: Eye contact may cause irritation. Harmful if inhaled. Harmful or fatal if swallowed.

Potential Effects on Health: Acute and chronic.

Carcinogenicity: Does not contain any known carcinogens or potential carcinogens.

4. FIRST AID MEASURES

General: If you feel unwell, seek medical attention (show the label or this MSDS if possible). Effects of exposure (inhalation, ingestion, or skin contact) to substance may be delayed. Ensure that medical personnel are

Kemira

MATERIAL SAFETY DATA SHEET

Ferric Chloride

aware of the material(s) involved, and take precautions to protect themselves.

- Skin Contact:** Remove all contaminated clothing, jewellery, and shoes. Wash affected area with soap or mild detergent and running water for at least 15 minutes. If irritation is still present, seek medical attention.
- Eye Contact:** Flush immediately with water for at least 15 minutes, occasionally lifting upper and lower lids, until no evidence of chemical remains. Obtain medical attention immediately.
- Inhalation:** Move to fresh air. Give artificial respiration ONLY if breathing has stopped. Do not use mouth-to-mouth method if victim has ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Obtain medical attention immediately.
- Ingestion:** *If conscious*, give two (2) glasses of water. DO NOT INDUCE VOMITING. Do not give anything by mouth to an unconscious person. Obtain immediate medical attention.

5. FIRE FIGHTING MEASURES

Flash point	Not applicable. Will not burn
Flammable Limits (Lower)	Not applicable
Flammable Limits (Upper)	Not applicable
Auto Ignition Temperature	Not applicable
Combustion and Thermal Decomposition Products	hydrogen chloride gas, phosgene gas if dried and then heated
Rate of Burning	Does not burn
Explosive Power	Not applicable
Sensitivity to Static Discharge	Not available

Fire and Explosion Hazards: During a fire, irritating/toxic hydrogen chloride, and/or phosgene gases may be generated if material is dried and then heated to decomposition.

Extinguishing Media: The substance is not combustible. Use extinguishing media appropriate to the surrounding fire.

NOTE: Also see "Section 10 – Stability and Reactivity"

6. ACCIDENTAL RELEASE MEASURES

Spills, Leaks, or Release:

- Restrict access until clean-up operations are complete. Wear appropriate Personal Protective Equipment per Section 8. Ensure trained personnel conduct clean up and wear Personal Protective Equipment per Section 8.
- Stop leak if possible. Avoid personal risk.
- Notify Authorities if release exceeds reportable quantity per Section 15

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MATERIAL SAFETY DATA SHEET

Ferric Chloride

- Small Spills – Absorb spill with clay or dry material or neutralize with lime, limestone or soda ash and collect in appropriate container for disposal. Neutralization with soda ash can generate carbon dioxide so additional ventilation may be necessary.
- Large Spills – Prevent entry into sewers and confined areas. Dike, if possible. Keep unnecessary people away, isolate area and deny entry. Pump liquid material into appropriate vessels as possible or absorb spill with clay absorbents or non-reactive dry materials and collect in appropriate container for disposal.
Neutralize spill residuals carefully with lime, limestone, or soda ash and collect in suitable container for disposal. Flush area with water. This could generate carbon dioxide so additional ventilation may be necessary. Notify the appropriate environmental authorities.

7. HANDLING AND STORAGE

Handling: Handle all chemicals with respect. Review the label, this MSDS and any other applicable information before use. Keep separated from incompatible substances. Use appropriate Personal Protective Equipment per Section 8. Handle only with equipment, materials and supplies specified by their manufacturer as being compatible and appropriate for use with this product.

Storage Requirements:

Bulk storage containers and ancillary fill and feed systems should be constructed out of appropriate materials such as polyethylene, polypropylene, rubber-lined steel and FRP designated as appropriate for use with this product. Storage tanks should be vented to scrubber or exterior atmosphere. Storage facilities should have secondary containment as required by law or regulation. Storage tanks, piping and offloading points should be labeled with appropriate signage to avoid accidents.

Some concentrations of this product will freeze or crystallize at low temperatures. Insulate and heat-trace storage tanks, pumps, pipes and ancillary equipment as necessary.

Product should be used within one (1) year.

Material may be stored in tightly closed shipping containers, preferably the supplier containers. Containers of this material may be hazardous when empty, since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Preventive Measures:

Engineering Controls: A ventilation system of local/general exhaust is recommended to keep employee exposure below the Airborne Exposure Limits. Ensure that eyewash station and safety showers are proximal to the workstation location.

Personal Protection Equipment:

Eye Protection: Wear splash resistant chemical goggles and, where splashing is possible, a full face shield. Maintain eye wash fountain and quick-drench facilities in work area.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to avoid skin contact.

Recommended Protective Material: Neoprene

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MATERIAL SAFETY DATA SHEET

Ferric Chloride

Respiratory Protection: Under conditions of misting or contact with head gases, respiratory protection may be needed. Consider respirator warning properties before use.

- With limited contact use an appropriate chemical cartridge respirator with acid gas cartridge(s)
- When cleaning, decontaminating or performing maintenance on tanks, containers, piping systems and accessories, and in any other situations where airborne contaminants and/or dust could be generated, use protective equipment to protect against ingestion or inhalation. HEPA or air supplied respirator, full protective coveralls with head cover, gloves and boots or chemical suits, and boots are suggested.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Reddish Brown
Odor:	Slight pungent odor
Form:	Liquid
pH as is:	<2
Vapor Pressure (mm Hg):	Negligible
Boiling Point:	105 °C - 110 °C (220 - 230 °F)
Specific Gravity (20°C):	1.26 – 1.48
Solubility (water):	max 0.78 kg FeCl ₃ (anhydrous) / kg water
Vapor Density (Air=1):	N/A
Percent Volatile by Vol.:	N/A
Freezing Point:	Concentration dependent (Consult your Kemiron representative)

10. STABILITY AND REACTIVITY

Hazardous Decomposition Products: Thermal decomposition of dried residues - will produce hydrogen chloride gas.

Chemical Stability: Stable at normal temperatures and pressure.

Conditions to Avoid: Dangerous gases may accumulate in confined spaces.

Incompatibility with other Substances: Reacts with most metals (except Titanium and Tantalum) and bases (alkaline materials). Material has moderate oxidizing capability, avoid contact with strong reducing agents.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Based on Ferric Chloride Solid (anhydrous)

TOXICOLOGICAL DATA: LD₅₀ (oral, rat) = 450 mg/kg

Mutagenicity: Other mutation test systems: Escherichia coli – 500 nmol/tube;

Phage inhibition capacity: Escherichia coli 41 ng/well

Reproductive Effects: TDLo Rat 1 day(s) intratesticular 12976 µg/kg;

TDLo Rat 1 day(s) intravaginal 29 mg/kg pre pregnancy continuous

Kemira

MATERIAL SAFETY DATA SHEET

Ferric Chloride

Teratogenicity and Fetotoxicity: Not available

Synergistic Materials: Not available

12. ECOLOGICAL INFORMATION

Based on Ferric Chloride Solution

Ecotoxicological Information: TLm Daphnia 15 ppm/96 hr fresh water / Conditions of bioassay not specified

Persistence and Degradation: No data available

13. DISPOSAL CONSIDERATIONS

Review Federal, State, Provincial, and Local government regulations prior to disposal. This material exhibits the characteristic of corrosivity to metals and other building materials and any disposal must comply with hazardous waste disposal requirements. Any residues and/or rinse waters from cleaning of tanks, containers, piping systems and accessories may be a hazardous characteristic waste and must be properly disposed of in accordance with federal, state, provincial and local laws.

RCRA: Test waste material for corrosivity, D002, prior to disposal

14. TRANSPORT INFORMATION

	Canada (TDG)	U.S. (DOT)
Shipping Name	Ferric Chloride Solution	Ferric Chloride Solution
Hazard Class/Division	8: Corrosive liquid	8: Corrosive liquid
Identification No. Packing Group:	UN2582 III	UN2582 III

IATA/ICAO Class: 8

15. REGULATORY INFORMATION**USA CLASSIFICATION:**

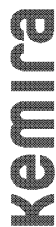
OSHA Classification: Hazardous by definition of Hazard Communication Standard (29 CFR 1920.1200)

CERCLA: Hazardous substance/reportable quantity (RQ): final RQ = 1000 lb. (454 kg)
Based on Anhydrous Ferric Chloride (divide by solution concentration to obtain solution weight)

SARA Regulations sections 313 and 40 CFR 372: No

SARA Hazard Categories, SARA SECTIONS 311/312 (40CFR370.21):

Acute	Yes
Chronic	No
Fire	No
Reactive	No
Sudden Release	No



MATERIAL SAFETY DATA SHEET Ferric Chloride

OSHA Process Safety (29CFR1910.119)	Yes
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Clean Water Act Requirements: Designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance.

TSCA: This substance or all ingredients of this product are listed on the Chemical Substances Inventory of the TSCA. Does not require reporting.

Other Regulations/Legislation which apply to this product:

California Proposition 65: No

Right-To-Know Lists: Massachusetts, New Jersey, Pennsylvania, California

This product does not contain, nor is it manufactured with, ozone-depleting substances.

CANADIAN CLASSIFICATION

This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS (Material Safety Data Sheet) contains all information required by the CPR.

Controlled Products Regulation (WHMIS) Classification: E: Corrosive

CEPA / Canadian Domestic Substances List (DSL): The substance in this product is not on the Canadian Domestic Substances List (CEPA DSL).

EEC CLASSIFICATION

EINECS: 231-729-4

16. OTHER INFORMATION

National Fire Protection Association (NFPA) and Hazardous Materials Identification System (HMIS) Ratings:

	NFPA	HMIS
HEALTH	2	2
FIRE	0	0
REACTIVITY	1	1

4 = Extreme/Severe
 3 = High/Serious
 2 = Moderate
 1 = Slight
 0 = Minimum

Kemira Water Solutions, Inc., and Kemira Water Solutions of Canada, Inc. provide the foregoing information in good faith and make no representations as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using the product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Kemira Water Solutions, Inc., and Kemira Water Solutions of Canada, Inc. make no representations or warranties, either expressed or implied, including without limitation any warranties of merchantability or fitness for a particular purpose with respect to the information set forth herein or the product to which the information refers. Accordingly, Kemira Water Solutions, Inc., and Kemira Water Solutions of Canada, Inc. disclaim responsibility for damages resulting from use or reliance upon this information.

MSDS Revised on October 1, 2006 by Kemira Water Solutions HSE group



SAFETY DATA SHEET

According to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: **HYPERFLOC™ AF 304**

Type of product: Mixture.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Processing aid for industrial applications.

Uses advised against: None.

1.3. Details of the supplier of the safety data sheet

Company: SNF Inc.
1 Chemical Plant Road
Riceboro, GA 31323
United States

Telephone: 912-884-3366

Telefax: 912-884-8770

E-mail address: info@snfhc.com

1.4. Emergency telephone number

24-hour emergency number: 800-424-9300 CHEMTREC (CCN 20412), Outside U.S. 703-527-3887

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to paragraph (d) of 29 CFR 1910.1200:

Not classified.

2.2. Label elements

Labelling according to paragraph (f) of 29 CFR 1910.1200:

Hazard symbol(s): None.

Signal word: None.

Hazard statement(s): None.

Precautionary statement(s): None.

2.3. Other hazards

Aqueous solutions or powders that become wet render surfaces extremely slippery.

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable, this product is a mixture.

3.2. Mixtures

This product is a mixture.

Hazardous components

Contains no reportable hazardous substances.

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:

Move to fresh air. No hazards which require special first aid measures.

Skin contact:

Wash off with soap and plenty of water. Get medical attention if irritation develops and persists.

Eye contact:

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of persistent eye irritation, consult a physician.

Ingestion:

Rinse mouth with water. Do NOT induce vomiting. No hazards which require special first aid measures.

4.2. Most important symptoms and effects, both acute and delayed

None.

4.3. Indication of any immediate medical attention and special treatment needed

None reasonably foreseeable.

Other information:

None.

SECTION 5: Firefighting measures**5.1. Extinguishing media***Suitable extinguishing media:*

Water. Water spray. Foam. Carbon dioxide (CO₂). Dry powder.

Warning! Aqueous solutions or powders that become wet render surfaces extremely slippery.

Unsuitable extinguishing media:

None.

5.2. Special hazards arising from the substance or mixture*Hazardous decomposition products:*

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x). Hydrogen cyanide (hydrocyanic acid) may be produced in the event of combustion in an oxygen deficient atmosphere.

5.3. Advice for firefighters*Protective measures:*

In the event of fire, wear self-contained breathing apparatus.

Other information:

Aqueous solutions or powders that become wet render surfaces extremely slippery.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures***Personal precautions:*

Aqueous solutions or powders that become wet render surfaces extremely slippery.

Protective equipment:

Wear adequate personal protective equipment (see Section 8 Exposure Controls/Personal Protection).

Emergency procedures:

Keep people away from spill/leak. Prevent further leakage or spillage if safe to do so.

6.2. Environmental precautions

As with all chemical products, do not flush into surface water.

6.3. Methods and material for containment and cleaning up*Small spills:*

Do not flush with water. Clean up promptly by sweeping or vacuum. Keep in suitable, closed containers for disposal.

Large spills:

Do not flush with water. Clean up promptly by sweeping or vacuum. Keep in suitable, closed containers for disposal.

Residues:

After cleaning, flush away traces with water.

6.4. Reference to other sections

SECTION 7: Handling and storage; SECTION 8: Exposure controls/personal protection; SECTION 13: Disposal considerations;

SECTION 7: Handling and storage**7.1. Precautions for safe handling**

Aqueous solutions or powders that become wet render surfaces extremely slippery. Use personal protective equipment.

7.2. Conditions for safe storage, including any incompatibilities

Keep in a dry place. Keep container closed when not in use.
Incompatible with oxidizing agents.

7.3. Specific end use(s)

This information is not available.

SECTION 8: Exposure controls/personal protection**8.1. Control parameters**

Occupational exposure limits:
None known.

8.2. Exposure controls**Appropriate engineering controls:**

Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dusts.

Individual protection measures, such as personal protective equipment:**a) Eye/face protection:**

Safety glasses with side-shields.

b) Skin protection:

i) *Hand protection:* PVC or other plastic material gloves.

ii) *Other:* Workclothes protecting arms, legs and body.

c) Respiratory protection:

No personal respiratory protective equipment normally required. Dust safety masks recommended where working powder concentration is more than 10 mg/m³.

d) Additional advice:

Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls:

Do not allow uncontrolled discharge of product into the environment. Do not flush into surface water.

SECTION 9: Physical and chemical properties

SECTION 9: Physical and chemical properties**9.1. Information on basic physical and chemical properties**

a) Appearance:	Granular solid, White.
b) Odour:	None.
c) Odour Threshold:	Not applicable.
d) pH:	5 - 9 @ 5 g/L
e) Melting point/freezing point:	> 150°C
f) Initial boiling point and boiling range:	Not applicable.
g) Flash point:	Not applicable.
h) Evaporation rate:	Not applicable.
i) Flammability (solid, gas):	No data available.
j) Upper/lower flammability or explosive limits:	Not expected to create explosive atmospheres.
k) Vapour pressure:	Not applicable.
l) Vapour density:	Not applicable.
m) Relative density:	0.6 - 0.9
n) Solubility(ies):	Soluble in water.
o) Partition coefficient:	-2
p) Autoignition temperature:	Does not self-ignite (based on the chemical structure).
q) Decomposition temperature:	> 150°C
r) Viscosity:	See Technical Bulletin.
s) Explosive properties:	Kst = 0 Non-flammable to ignition sources of less than 2.5 kJ.
t) Oxidizing properties:	Not expected to be oxidising based on the chemical structure.

9.2. Other information

None.

SECTION 10: Stability and reactivity**10.1. Reactivity**

None known.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Oxidizing agents may cause exothermic reactions.

10.4. Conditions to avoid

None known.

10.5. Incompatible materials

Incompatible with oxidizing agents.

10.6. Hazardous decomposition products

Thermal decomposition may produce: nitrogen oxides (NO_x), carbon oxides (CO_x), hydrogen cyanide (hydrocyanic acid).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Information on the product as supplied:

<i>Acute oral toxicity:</i>	LD50/oral/rat > 5000 mg/kg
<i>Acute dermal toxicity:</i>	LD50/dermal/rat > 5000 mg/kg.
<i>Acute inhalation toxicity:</i>	The product is not expected to be toxic by inhalation.
<i>Skin corrosion/irritation:</i>	Not irritating.
<i>Serious eye damage/eye irritation:</i>	Not irritating.
<i>Respiratory/skin sensitisation:</i>	Not sensitizing.
<i>Mutagenicity:</i>	Not mutagenic.
<i>Carcinogenicity:</i>	Not carcinogenic.
<i>Reproductive toxicity:</i>	Not toxic for reproduction.
<i>STOT - Single exposure:</i>	No known effects.
<i>STOT - Repeated exposure:</i>	No known effect.
<i>Aspiration hazard:</i>	No hazards resulting from the material as supplied.

SECTION 12: Ecological information

12.1. Toxicity

Information on the product as supplied:

Acute toxicity to fish:	LC50/Danio rerio/96 hours > 100 mg/L (OECD 203) LC50/Fathead minnow/96 hours > 100 mg/L (OECD 203)
Acute toxicity to invertebrates:	EC50/Daphnia magna/48 hours > 100 mg/L (OECD 202)
Acute toxicity to algae:	IC50/Scenedesmus subspicatus/72 hours > 100 mg/L (OECD 201)
Chronic toxicity to fish:	No data available.
Chronic toxicity to invertebrates:	No data available.
Toxicity to microorganisms:	No data available.
Effects on terrestrial organisms:	No known effects.
Sediment toxicity:	No data available.

12.2. Persistence and degradabilityInformation on the product as supplied:

Degradation:	Not readily biodegradable.
Hydrolysis:	Does not hydrolyse.
Photolysis:	No data available.

12.3. Bioaccumulative potentialInformation on the product as supplied:

Not bioaccumulating.

Partition co-efficient (Log Pow):	-2
Bioconcentration factor (BCF):	~0

12.4. Mobility in soilInformation on the product as supplied:

None.

12.5. Other adverse effects

None known.

SECTION 13: Disposal considerations**13.1. Waste treatment methods**Waste from residues/unused products:

Dispose in accordance with local and national regulations. Can be landfilled or incinerated, when in compliance with local regulations.

Contaminated packaging:

Rinse empty containers with water and use the rinse-water to prepare the working solution. If recycling is not practicable, dispose of in compliance with local regulations. Can be landfilled or incinerated, when in compliance with local regulations.

Recycling:

In accordance with local and national regulations.

SECTION 14: Transport information**Land transport (DOT)**

Not classified.

Sea transport (IMDG)

Not classified.

Air transport (IATA)

Not classified.

SECTION 15: Regulatory information**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**Information on the product as supplied:TSCA Chemical Substances Inventory:

All components of this product are either listed on the inventory or are exempt from listing.

US SARA Reporting Requirements:

SARA (Section 311/312) hazard class:
Not concerned.

SARA Title III Sections:

Section 302 (TPQ) - Reportable Quantity:
Not concerned.

Section 304 - Reportable Quantity:
Not concerned.

Section 313 (De minimis concentration):
Not concerned.

Clean Water Act

Section 311 Hazardous Substances (40 CFR 117.3) - Reportable Quantity:
Not concerned.

Clean Air Act

Section 112(r) Accidental release prevention requirements (40 CFR 68) - Reportable Quantity:
Not concerned.

CERCLA

Hazardous Substances List (40 CFR 302.4) - Reportable Quantity:
Not concerned.

RCRA status :

Not RCRA hazardous.

California Proposition 65 Information:

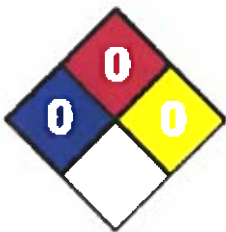
WARNING! This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm, Acrylamide

SECTION 16: Other information

NFPA and HMIS Ratings:

NFPA:

Health:	0
Flammability:	0
Instability:	0



HMIS:

Health: 0
Flammability: 0
Physical Hazard: 0
PPE Code: B

This data sheet contains changes from the previous version in section(s):

SECTION 16. Other Information.

Key or legend to abbreviations and acronyms used in the safety data sheet:

Acronyms

STOT = Specific target organ toxicity

Training advice:

Do not handle until all safety precautions have been read and understood.

This SDS was prepared in accordance with the following:

U.S. Code of Federal Regulations 29 CFR 1910.1200

Version: 19.01.a

PRAC001

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.



Sierra Chemical Co.

Material Safety Data Sheet

This MSDS has been prepared within the guidelines of the Federal OSHA Hazard Communication Standard, 29CFR 1910.1200.

Product Name: Sierra Sani Chlor / Sierra Pure Chlor / Sierra Bleach / Sierra Sanitizer

I. GENERAL INFORMATION

Manufacturer: Sierra Chemical Co. **Emergency Phone:** (800) 424-9300
Address: 2302 Larkin Cr. **Information Phone:** (775) 358-0888
 Sparks, NV 89431 **CHEMTREC Phone:** (800) 424-9300
Date: 12-20-06 **Supersedes:** 9-23-05

II. PRODUCT IDENTIFICATION

Proper Shipping Name: Hypochlorite Solution **Chemical Formula:** NaOCl
Synonyms/Common Names: Liquid Bleach, Liquid Chlorine **Chemical Family:** Acid Salts, Oxidizers
CAS Number: 7681-52-9

III. PHYSICAL DATA

Appearance and Odor: Light greenish-yellow liquid, chlorine-like odor.
Boiling Point: Decomposes on heating **Vapor Pressure @ 25° C:** No data
Water Solubility: Miscible **Specific Gravity:** 1.08 - 1.26
pH @ 25°C: 11.5 (approximately) **Molecular Weight:** 75.45 (NaOCl Active ingredient)

IV. INGREDIENTS/IDENTITY INFORMATION

Component	CAS No.	OSHA PEL/TLV	%
Sodium Hypochlorite	7681-52-9	Not Established	5-15
Sodium Chloride	7647-14-5		5-11
Sodium Hydroxide	1310-73-2	2 mg/m ³	.5-2.0
Water	7732-18-5		Balance



Sierra Chemical Co.

MSDS: Sierra Pure Chlor/Sierra Sani Chlor/ Sierra Industrial Bleach

V. FIRE AND EXPLOSION DATA

Flash Point: N/A

Auto-ignition Temperature: N/A

LEL: N/A

UEL: N/A

Extinguishing Media: Use any media appropriate for surrounding fire. Use water to cool containers exposed to fire.

Special Fire Fighting Procedures: Wear NIOSH approved self-contained breathing apparatus (SCBA) and protective clothing to prevent direct contact with the material (to include, but not limited to; boots, gloves, hard hat and impervious clothing).

Unusual Fire and Explosion Hazards: None

VI. STABILITY/REACTIVITY DATA

Stability: Unstable Stable

Hazardous Polymerization: May Occur Will Not Occur

Conditions to Avoid: High temperatures, sunlight and ultraviolet light. Decomposition will result from contact with iron and copper. Do not store at temperatures above 60-70o F (15-21o C). This product has a shelf life of up to 6 months at 60o F or lower.

Incompatibility: This product is incompatible with iron, copper, acids, ammonium compounds, organics and other oxidizers. It will react violently with phenyl acetonitrile, cellulose and ethylene.

Hazardous Decomposition or Byproducts: Produces toxic chlorine gas upon contact with acids.

VII. TOXICOLOGICAL INFORMATION/HEALTH HAZARD DATA

This product is harmful if inhaled or ingested and is harmful if contacted by the skin or eyes. The reported threshold for odor is approximately 0.9 mg/m³ based on the odor of chlorine. Symptoms which may be aggravated by exposure are asthma, respiratory and cardiovascular disease.

Eye Contact: Contact with eyes will cause irritation. It may also cause burns to the eyes or impairment of vision and corneal damage.

Skin Contact: Contact with skin can cause burns and/or irritation. Symptoms of contact are redness, swelling and scab formation of contacted area. If prolong exposure occurs, it can cause damage to the secondary tissue resulting in the inability of regeneration to the affected area.

Inhalation: Sodium Hypochlorite when inhaled is irritating to the nose, mouth, throat, and lungs. Burns to the respiratory tract may occur with production of lung edema which could result in shortness of breath, wheezing, choking, chest pain, and impairment of lung function. High concentrations can result in permanent lung damage. Repeated exposure can cause impairment of lung function and permanent lung damage.

Ingestion: Irritation and/or burns can occur to the entire gastro-intestinal tract. Symptoms are characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration.

Exposure Limit Information: There is no established PEL for sodium hypochlorite. The Federal OSHA Permissible Exposure Limit (PEL) for sodium hydroxide is 2 mg/m³.



VIII. EMERGENCY AND FIRST AID

If a known exposure occurs or if poisoning is suspected, do not wait for symptoms to develop. Immediately initiate the recommended procedures below. Simultaneously contact a Poison Control Center, a physician or the nearest hospital. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow the advice given. For additional information call, **CHEMTREC (800) 424-9300**.

Eye Contact: Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids with water. Do not attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not immediately available.

Skin Contact: Immediately remove contaminated clothing and shoes under a safety shower. Flush all affected areas with large amount of water for at least 15 minutes. Do NOT attempt to neutralize with chemical agents. Obtain medical attention as soon as possible.

Inhalation: Nausea, headaches and dizziness are signs that a person should stop working and be taken to fresh air immediately until symptoms are gone. Should breathing become difficult, give oxygen. Keep the person warm, resting and contact a physician. A person could inhale enough vapors to lose consciousness. This person should be moved to fresh air. Call a physician immediately. If breathing stops, artificial respiration should be given immediately. In all cases, ensure adequate ventilation and provide respiratory protection before returning to work.

Ingestion: Do NOT induce vomiting. Immediately give large quantities of water. If vomiting does occur, give fluids again. Do not induce vomiting or give anything by mouth to an unconscious person. Call a physician or the nearest Poison Control Center immediately.

IX. PROTECTIVE EQUIPMENT REQUIREMENTS

Ventilation Requirements: Local exhaust ventilation if vapors, mists, or aerosols are present. If these are not present use general exhaust ventilation.

Respiratory Requirements: Due to low volatility and toxicity, a respirator is not normally needed. However, if vapors, mists, or aerosols are generated, wear a NIOSH/MSHA approved respirator.

Additional Protective Clothing: Use chemical safety goggles and impermeable gloves. Use rubber apron to protect body from splashing conditions.

Other: Safety shower and eye-wash station recommended.

X. HANDLING AND STORAGE

Normal Handling: Store in vented, closed, clean, non-corrosive containers in a cool, dry, well ventilated location, away from direct sunlight and from chemicals which may react with the bleach if spillage occurs. If closed containers become heated, the containers should be vented to release decomposition product. **Do not** mix or contaminate with ammonia, hydrocarbon, acids, alcohols, ethers.

Do not store at temperatures above 60-70°F (15-21°). This product has a shelf life of up to six months at 60°F or lower. **DO NOT** package in metal containers.

**Sierra Chemical Co. MSDS: Sierra Pure Chlor/Sierra Sani Chlor/ Sierra Industrial Bleach**

Material Release or Spills: Always wear personal protective equipment including, but not limited to; boots gloves and impervious clothing. If hazardous concentrations are found in the local spill area, use a NIOSH/MSHA approved respirator. Vapors may be suppressed by the use of a water fog and all water runoff should be captured for treatment and disposal. Dike or contain spill by using a compatible absorbent such as sand, clay, soil or commercial absorbents.

XI. SPILL OR LEAK HANDLING

IN CASE OF AN EMERGENCY, CALL CHEMTREC (800) 424-9300

Any person responding to a spill or leak should use a NIOSH/MSHA approved respirator. Additional protective clothing must be worn to prevent direct contact with the material. This includes (but is not limited to) boots, gloves, hard hat, and impervious clothing. Compatible materials are neoprene, butyl rubber, viton, and saranex.

Hazardous concentrations may be found in the local spill area and immediately downwind. Vapors may be suppressed by the use of a water fog and all water run off should be captured for treatment and disposal. Dike or contain by using a compatible absorbent such as sand, clay, soil, commercial absorbents. Use vacuum or pump operation to remove product released and treat before disposal. Dispose of spill residues per guidelines in Section "XII Disposal" of this MSDS.

XII. ENVIRONMENTAL-REGULATORY STATUS/DISPOSAL

The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and non-hazardous wastes.

EPA Hazardous Substance Status: Reportable Quantity (RQ) = 100 lbs. NOTICE: this product contains chlorine which is listed in the Toxic Substance Control Act (TSCA) and is subject to reporting requirements of EPCRA Section 313.

RCRA Status of Unused Material if Discarded: Not a hazardous waste. As a non-hazardous waste, this material should be disposed of in accordance with Federal, State and local regulations by treatment in a wastewater treatment system.

XIII. TRANSPORTATION DATA

DOT Proper Shipping Name: Hypochlorite Solution

Hazard Class: 8 **UN I.D. Number:** UN1791 **PACKING GROUP:** III

Reportable Quantity: 100 lbs. (80 Gallons 12.5% Solution)

XIV. ADDITIONAL INFORMATION

All information is offered in good faith, without guarantee or obligation for the accuracy or sufficiency thereof, or the results obtained, and is accepted at user's risk. The uses referred to are for the purpose of illustration only. User should investigate and establish the suitability of such use(s) in every case. Nothing herein shall be construed as a recommendation for uses which infringe valid patents or as extending license under valid patents.

Creation Date 08-Feb-2010

Revision Date 03-May-2012

Revision Number 4

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**1.1. Product identifier**

Product Description: Sodium metabisulfite
Cat No. 419580000; 419580010; 419580025; 419580050; 419582500
Synonyms Sodium pyrosulfite
Molecular Formula Na₂ O₅ S₂
Reach Registration Number --

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Laboratory chemicals
Uses advised against No Information available

1.3. Details of the supplier of the safety data sheet

Company Acros Organics BVBA
Janssen Pharmaceuticaaan 3a
2440 Geel, Belgium
E-mail address begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number For information in the US, call: 001-800-ACROS-01
For information in Europe, call: +32 14 57 52 11

Emergency Number, Europe: +32 14 57 52 99
Emergency Number, US: 001-201-796-7100

CHEMTREC Phone Number, US: 001-800-424-9300
CHEMTREC Phone Number, Europe: 001-703-527-3887

SECTION 2: HAZARDS IDENTIFICATION**2.1. Classification of the substance or mixture****CLP Classification - Regulation (EC) No 1272/2008****Physical hazards**

Based on available data, the classification criteria are not met

Health hazards

Based on available data, the classification criteria are not met

Acute oral toxicity

Category 4

Serious Eye Damage/Eye Irritation

Category 1

Environmental hazards

Based on available data, the classification criteria are not met

Classification according to EU Directives 67/548/EEC or 1999/45/EC**Symbol(s)** Xn - Harmful

SECTION 2: HAZARDS IDENTIFICATION

R-phrase(s)	R22 - Harmful if swallowed R31 - Contact with acids liberates toxic gas R41 - Risk of serious damage to eyes
--------------------	--

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16

2.2. Label elements**Signal Word****Danger****Hazard Statements**

H302 - Harmful if swallowed
H318 - Causes serious eye damage
EUH031 - Contact with acids liberates toxic gas

Precautionary Statements

P280 - Wear eye protection/ face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P233 - Keep container tightly closed
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell

2.3. Other hazards

No information available.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008	DSD Classification - 67/548/EEC
Sodium metabisulfite	7681-57-4	EEC No. 231-673-0	>95	Acute Tox. 4 (H302) Eye Dam. 1 (H318) (EUH031)	Xn; R22 R31 Xi; R41

Reach Registration Number

--

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16

SECTION 4: FIRST AID MEASURES**4.1. Description of first aid measures****Eye Contact**

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Ingestion

Do not induce vomiting. Call a physician or Poison Control Center immediately.

Sodium metabisulfite

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Get medical attention immediately if symptoms occur.

Protection of First-aiders Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination

4.2. Most important symptoms and effects, both acute and delayed

No information available

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically

SECTION 5: FIREFIGHTING MEASURES**5.1. Extinguishing media****Suitable Extinguishing Media**

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire..

Extinguishing media which must not be used for safety reasons

No information available.

5.2. Special hazards arising from the substance or mixture

Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products

Sodium oxides, Sulfur oxides.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear

SECTION 6: ACCIDENTAL RELEASE MEASURES**6.1. Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Should not be released into the environment.

6.3. Methods and material for containment and cleaning up

Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE**7.1. Precautions for safe handling**

Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Keep away from acids.

7.2. Conditions for safe storage, including any incompatibilities

Sodium metabisulfite

Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near acids.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1. Control parameters****Exposure limits**

Component	European Union	The United Kingdom	France	Belgium	Spain
Sodium metabisulfite		STEL: 15 mg/m ³ 15 min TWA: 5 mg/m ³ 8 hr	TWA / VME: 5 mg/m ³ (8 heures).	TWA: 5 mg/m ³ 8 uren	TWA / VLA-ED: 5 mg/m ³ (8 horas)
Component	Italy	Germany	Portugal	The Netherlands	Finland
Sodium metabisulfite			TWA: 5 mg/m ³ 8 horas		
Component	Austria	Denmark	Switzerland	Poland	Norway
Sodium metabisulfite		TWA: 5 mg/m ³ 8 timer	MAK: 5 mg/m ³ 8 Stunden		TWA: 5 mg/m ³ 8 timer STEL: 10 mg/m ³ 15 minutter.
Component	Bulgaria	Croatia	Ireland	Cyprus	Czech Republic
Sodium metabisulfite		TWA: 5 mg/m ³ 8 satima.	TWA: 5 mg/m ³ 8 hr.		
Component	Estonia	Gibraltar	Greece	Hungary	Iceland
Sodium metabisulfite			TWA: 5 mg/m ³		TWA: 5 mg/m ³ 8 klukkustundum. Ceiling: 10 mg/m ³

Biological limit values

This product, as supplied, does not contain any hazardous materials with biological limits established by the region specific regulatory bodies.

Monitoring methods

BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

Derived No Effect Level (DNEL) No information available.

Route of exposure	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral Dermal Inhalation				

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Sodium metabisulfite

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source.

Personal protective equipment**Eye Protection**

Safety glasses with side-shields (European standard - EN 166)

Hand Protection

Protective gloves

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Disposable gloves	See manufacturers recommendations	-	EN 374	(minimum requirement)

Inspect gloves before use.

Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)

Ensure gloves are suitable for the task: Chemical compatibility, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion. Remove gloves with care avoiding skin contamination.

Skin and body protection

Long sleeved clothing

Respiratory Protection

When workers are facing concentrations above the exposure limit they must use appropriate certified respirators
To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly.

Large scale/emergency use

In case of insufficient ventilation wear suitable respiratory equipment

Small scale/Laboratory use

Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

When RPE is used a face piece Fit Test should be conducted.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice

Environmental exposure controls

No information available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Off-white	
Physical State	Powder, Solid.	
Odor	rotten-egg like	
Odor Threshold	No data available	
pH	4-6	5% aq.sol.
Melting Point/Range	150°C / 302°F	
Softening Point	No data available	
Boiling Point/Range	No information available.	
Flash Point	Not applicable	Method - No information available.
Evaporation Rate	No information available.	
Flammability (solid,gas)	No information available.	
Explosion Limits	No data available.	

Sodium metabisulfite

Vapor Pressure	No information available.	
Vapor Density	No information available.	(Air = 1.0)
Specific Gravity / Density	No data available	1.4
Bulk Density	No data available	
Water Solubility	540 g/L (20°C)	
Solubility in other solvents	No information available.	

Partition Coefficient (n-octanol/water)	Component Sodium metabisulfite	log Pow -3.7
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Autoignition Temperature	No data available
Decomposition temperature	120 °C
Viscosity	No data available
Explosive Properties	No information available.
Oxidizing Properties	No information available.

9.2. Other information

Molecular Formula	Na ₂ O ₅ S ₂
Molecular Weight	190.1

SECTION 10: STABILITY AND REACTIVITY**10.1. Reactivity**

None known, based on information available.

10.2. Chemical stability

Air sensitive. Moisture sensitive.

10.3. Possibility of hazardous reactions

Hazardous Polymerization	No information available
Hazardous Reactions	Contact with acids liberates toxic gas.

10.4. Conditions to avoid

Avoid dust formation, Incompatible products, Excess heat, Exposure to air or moisture over prolonged periods.

10.5. Incompatible materials

Acids. Strong oxidizing agents.

10.6. Hazardous decomposition products

Sodium oxides, Sulfur oxides.

SECTION 11: TOXICOLOGICAL INFORMATION**11.1. Information on toxicological effects**

Product Information No acute toxicity information is available for this product

(a) acute toxicity;

Oral	No data available
Dermal	No data available
Inhalation	No data available

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium metabisulfite	1131 mg/kg (Rat)	2 g/kg (Rat)	

(b) skin corrosion/irritation; No data available

Sodium metabisulfite

(c) serious eye damage/irritation;	No data available
(d) respiratory or skin sensitization;	
Respiratory	No data available
Skin	No data available
(e) germ cell mutagenicity;	No data available
	Mutagenic effects have occurred in experimental animals.
(f) carcinogenicity;	No data available
	There are no known carcinogenic chemicals in this product
(g) reproductive toxicity;	No data available
Reproductive Effects	Experiments have shown reproductive toxicity effects on laboratory animals.
(h) STOT-single exposure;	No data available
(i) STOT-repeated exposure;	No data available
Target Organs	Eyes, Central nervous system (CNS), Liver, Kidney.
(j) aspiration hazard;	No data available
Other Adverse Effects	The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information
Symptoms / effects, both acute and delayed	No information available.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecotoxicity effects . Do not empty into drains.

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
Sodium metabisulfite	32 mg/L LC50 96 h	89 mg/L EC50 = 24 h	40 mg/L EC50 = 96 h 48 mg/L EC50 = 72 h	EC50 = 56 mg/L 17 h

12.2. Persistence and degradability No information available

12.3. Bioaccumulative potential No information available.

Component	log Pow	Bioconcentration factor (BCF)
Sodium metabisulfite	-3.7	No data available

12.4. Mobility in soil . .

12.5. Results of PBT and vPvB assessment No data available for assessment

12.6. Other adverse effects

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

Persistent Organic Pollutant This product does not contain any known or suspected substance

Ozone Depletion Potential This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Sodium metabisulfite

Waste from Residues / Unused Products

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Contaminated Packaging

Empty remaining contents. Dispose of in accordance with local regulations. Do not re-use empty containers.

European Waste Catalogue (EWC)

According to the European Waste Catalogue, Waste Codes are not product specific, but application specific

Other Information

Waste codes should be assigned by the user based on the application for which the product was used

SECTION 14: TRANSPORT INFORMATION**IMDG/IMO**

Not regulated

14.1. UN number**14.2. UN proper shipping name****14.3. Transport hazard class(es)****14.4. Packing group****ADR**

Not regulated

14.1. UN number**14.2. UN proper shipping name****14.3. Transport hazard class(es)****14.4. Packing group****IATA**

Not regulated

14.1. UN number**14.2. UN proper shipping name****14.3. Transport hazard class(es)****14.4. Packing group****14.5. Environmental hazards**

No hazards identified

14.6. Special precautions for user

No special precautions required

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture****International Inventories**

X = listed

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	CHINA	AICS	KECL
Sodium metabisulfite	231-673-0	-		X	X	-	X	X	X	X	X

National Regulations

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
Sodium metabisulfite	WGK 1	

Component	France - INRS (Tables of occupational diseases)
Sodium metabisulfite	Tableaux des maladies professionnelles (TMP) - RG 66

Sodium metabisulfite

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment
Take note of Dir 94/33/EC on the protection of young people at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

SECTION 16: OTHER INFORMATION**Full text of R-phrases referred to under sections 2 and 3**

R22 - Harmful if swallowed
R31 - Contact with acids liberates toxic gas
R41 - Risk of serious damage to eyes

Legend

CAS - Chemical Abstracts Service	TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances	DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
PICCS - Philippines Inventory of Chemicals and Chemical Substances	ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances	AICS - Australian Inventory of Chemical Substances
KECL - Existing and Evaluated Chemical Substances	NZIoC - New Zealand Inventory of Chemicals
WEL - Workplace Exposure Limit	TWA - Time Weighted Average
ACGIH - American Conference of Industrial Hygiene	IARC - International Agency for Research on Cancer
DNEL - Derived No Effect Level	PNEC - Predicted No Effect Concentration
RPE - Respiratory Protective Equipment	LD50 - Lethal Dose 50%
LC50 - Lethal Concentration 50%	EC50 - Effective Concentration 50%
NOEC - No Observed Effect Concentration	POW - Partition coefficient Octanol:Water
PBT - Persistent, Bioaccumulative, Toxic	vPvB - very Persistent, very Bioaccumulative
ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road	ICAO/IATA - International Civil Aviation Organization/International Air Transport Association
IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code	MARPOL - International Convention for the Prevention of Pollution from Ships
OECD - Organisation for Economic Co-operation and Development	ATE - Acute Toxicity Estimate
BCF - Bioconcentration factor	VOC - Volatile Organic Compounds

Key literature references and sources for data

Suppliers safety data sheet,
Chemadvisor - LOLI,
Merck index,
RTECS

Training Advice

Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Creation Date	08-Feb-2010
Revision Date	03-May-2012
Revision Summary	
Reason for revision	(M)SDS sections updated, 3.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

MATERIAL SAFETY DATA SHEET

TMT 15®



Material no.		Version	3.1 / US
Specification	101001	Revision date	10/04/2011
Order Number		Print Date	11/15/2011
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1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product information

Trade name : TMT 15®
Use of the Substance / Preparation : For industrial use
Function : Precipitant

Company : Evonik Degussa Corporation
USA
299 Jefferson Road
Parsippany, NJ 07054-0677
USA

Telephone : 973-929-8000
Telefax : 973-929-8040

US: CHEMTREC EMERGENCY NUMBER : 800-424-9300

CANADA: CANUTEC EMERGENCY NUMBER : 613-996-6666

Product Regulatory Services : 973-929-8060

2. HAZARDS IDENTIFICATION

*** EMERGENCY OVERVIEW ***

Form-liquid **Color-colourless to yellowish** **Odor-almost odourless**

Irritating to eyes.

Eye contact

irritating

Skin Contact

Slightly irritating.

Inhalation

No hazard expected in normal use.

Ingestion

No hazard expected in normal use.

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3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature

Aqueous preparation
Content min. 15 %

The preparation contains:

Information on ingredients / Hazardous components

1,3,5-triazine-2,4,6(1H,3H,5H)-trithione, trisodium salt			
CAS-No.	17766-26-6	Percent (Wt./ Wt.)	15 %

Other information

This material is classified as hazardous under OSHA regulations.

4. FIRST AID MEASURES

General advice

Pay attention to self-protection.

Remove victims from hazardous area. Immediately remove soiled or soaked clothing and remove it to a safe distance. Keep victim warm, in a stabilized position and covered.

Do not leave victims unattended.

If the casualty is unconscious: Place the victim in the recovery position.

Inhalation

Potential for exposure by inhalation if aerosols or mists are generated.

Move victims into fresh air.

With labored breathing: Provide with oxygen. Consult a doctor.

If the casualty is not breathing: Perform mouth-to-mouth resuscitation, notify emergency physician immediately.

Skin contact

Wash off affected area immediately with plenty of water for at least 15 minutes.

If symptoms persist, consult a physician for treatment.

Eye contact

With eye held open, thoroughly rinse immediately with plenty of water for at least 10 minutes.

Consult an ophthalmologist immediately if the symptoms persist.

Ingestion

Rinse out mouth.

Immediately give large quantities of water to drink.

Consult a physician immediately.

Notes to physician

The initial focus is only on the local action, possibly characterized by a progressive tissue irritation.

In the eye, irritating liquids cause, depending on the intensity of exposure, irritation of the conjunctiva and, in exceptional cases, damage to the cornea.

There is a danger of blindness if corneas are damaged!

Superficial irritations and only infrequent damage with ulcerations develop on the skin.

An irritation of the mucous membranes may develop and lead to coughing after inhalation.

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5. FIRE-FIGHTING MEASURES

Flash point	does not flash
Lower explosion limit	No data available
Upper explosion limit	No data available
Autoignition temperature	not applicable

Suitable extinguishing media

water, mist, quenching powder, foam

Extinguishing media which must not be used for safety reasons

None known

Specific hazards during fire fighting

In the case of fire, the following hazardous smoke fumes may be produced: nitric oxides, sulphur oxides.

Special protective equipment for fire-fighters

As in any fire, wear self-contained positive-pressure breathing apparatus, (MSHA/NIOSH approved or equivalent) and full protective gear.

Further information

Standard procedure for chemical fires.

Ensure there are sufficient retaining facilities for water used to extinguish fire. Water used to extinguish fire should not enter drainage systems, soil or stretches of water. Contaminated fire-extinguishing water must be disposed of in accordance with the regulations issued by the appropriate local authorities. Fire residues should be disposed of in accordance with the regulations.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear personal protective equipment; see section 8.

Environmental precautions

Observe regulations on prevention of water pollution (collect, dam up, cover up).

Do not allow the product into the following compartments:

surface water
stretches of water

Obey relevant local, state, provincial and federal laws and regulations. Do not contaminate any lakes, streams, rivers, groundwater or soil.

Methods for cleaning up

Absorb with liquid-binding material (e.g. inert absorbent or universal binder).

Dispose of absorbed material in accordance with the regulations.

see section 13.

Rinse away any residue with plenty of water.

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Additional advice

Isolate and seal off defective containers immediately.

7. HANDLING AND STORAGE

Handling

Safe handling advice

Handle in accordance with good industrial hygiene and safety practices.

Avoid contact with skin and eyes.

Wear personal protective equipment.

For personal protection see section 8.

Immediately change moistened and saturated work clothes.

No eating, drinking, smoking, or snuffing tobacco at work.

Wash hands before breaks and at the end of workday.
preventive skin protection

Advice on protection against fire and explosion

The product is not combustible.

Storage

Requirements for storage areas and containers

clean, dry.

Use shatterproof containers.

Protect from frost.

Transport and store container in upright position only.

Always close container tightly after removal of product.

Further information

Use by date of the product: min. 2 years.

Use alkali-resistant materials.

Advice on common storage

Store away from: oxidizing agents, acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Remarks

No substance-specific limiting value being known.

Component occupational exposure guidelines

Engineering measures

No dangerous reactions are known to occur with correct handling and storage.

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Personal protective equipment

Respiratory protection

A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 or applicable federal/provincial requirements must be followed whenever workplace conditions warrant respirator use. NIOSH's "Respirator Decision Logic" may be useful in determining the suitability of various types of respirators.

Hand protection

Applies to handling for brief periods or of small amounts

Glove material	Nitrile, for example, Dermatril P 743, Kächele-Cama Latex GmbH (KCL), Germany
Material thickness	0.20 mm
Break through time	> 480 min
Method	DIN EN 374

Applies to handling for longer periods or of large amounts

Glove material	Chloroprene, for example: Camapren 720, Kächele-Cama Latex GmbH (KCL), Germany
Material thickness	0.65 mm
Break through time	> 480 min
Method	DIN EN 374

The above mentioned hand protection is based on knowledge of the chemistry and anticipated uses of this product but it may not be appropriate for all workplaces. A hazard assessment should be conducted prior to use to ensure suitability of gloves for specific work environments and processes prior to use.

Eye protection

wear basket-shaped glasses or safety goggles with side-shields.

Skin and body protection

A safety shower and eye wash fountain should be readily available.

To identify additional Personal Protective Equipment (PPE) requirements, it is recommended that a hazard assessment in accordance with the OSHA PPE Standard (29CFR1910.132) be conducted before using this product.

Hygiene measures

No eating, drinking, smoking, or snuffing tobacco at work.
Wash face and/or hands before break and end of work.
Avoid contaminating clothes with product.
Immediately change moistened and saturated work clothes.

Protective measures

Avoid contact with skin and eyes.
Handle in accordance with good industrial hygiene and safety practices.
Wear suitable protective clothing, gloves and eye/face protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Color	colourless to yellowish
Odor	almost odourless

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Safety data

pH	ca. 12.3	(22.5 °C)
Melting point/range	-3 °C	
Boiling point/range	101 °C	
Flash point	does not flash	
Flammability	not applicable	
Autoignition temperature:	not applicable	
Autoinflammability	not spontaneously flammable	
Explosiveness	not applicable	
Lower explosion limit	No data available	
Upper explosion limit	No data available	
Vapor pressure	22 mbar	(20 °C)
Density	ca. 1.12 g/cm ³	(20 °C)
Relative density	No data available	
Water solubility	No data available	
Partition coefficient (n-octanol/water)	log Pow: < -2	Method: (calculated)
Viscosity, dynamic	1.6 mPa.s	(20 °C)
conductivity	ca. 60 mS/cm	(22 °C)
Molecular Weight	243.22 g/Mol	

Further information

Miscibility in water	completely miscible
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10. STABILITY AND REACTIVITY

Conditions to avoid	frost.
Materials to avoid	strong oxidant, acids.
Hazardous decomposition products	None known

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Thermal decomposition	> 370 °C solid No decomposition if stored and applied as directed.
Hazardous reactions	No dangerous reactions are known to occur with correct handling and storage. product is stable.

11. TOXICOLOGICAL INFORMATION

Product Acute oral toxicity	LD50 Rat: 7878 mg/kg Method: analogy OECD-method related to substance: TMT (15%)
Product Acute inhalation toxicity	No data available
Product Acute dermal toxicity	LD50 Rat: > 2000 mg/kg Method: OECD Test Guideline 402 related to substance: TMT (55%) LD50 Rat: 7333 mg/kg (calculated based on TMT 55%) related to substance: TMT (15%)
Product Skin irritation	Rabbit / 4 h slightly irritating Method: OECD Test Guideline 404 related to substance: TMT (55%)
Product Eye irritation	Rabbit irritant Method: OECD Test Guideline 405 related to substance: TMT (55%)
Product Sensitization	maximization test guinea pig: not sensitizing Method: OECD Test Guideline 406 related to substance: TMT (55%)
Product Repeated dose toxicity	Oral Rat Testing period: 30 d NOAEL: 526 mg/kg target organ/effect: Erythrocytes Method: OECD Test Guideline 407 related to substance: TMT (55%) Oral Rat Testing period: 30 d NOAEL: 1929 mg/kg target organ/effect: Erythrocytes (calculated based on TMT 55%) related to substance: TMT (15%)

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Product	Gentoxicity in vitro	Ames test <i>S. typhimurium</i> / <i>E. coli</i> negative Method: analogy OECD-method related to substance: TMT (15%)
Product	Gentoxicity in vivo	Micronucleus test mouse Oral negative Method: OECD TG 474 related to substance: TMT (15%)
Product	Carcinogenicity	No data available
Product	Toxicity to reproduction	No data available
Product	Human experience	To date handling this product has not been known to cause any detrimental effects.

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Biodegradability	aerobic inoculum: Activated sludge Not readily biodegradable. 0 % Exposure time: 28 d Method: OECD TG 302 B related to substance: TMT (15%)
	anaerobic inoculum: Activated sludge Not readily biodegradable. 0 % Exposure time: 60 d Method: CO2 Evolution Test related to substance: TMT (15%)

Ecotoxicity effects

Toxicity to fish	LC0 static test <i>Leuciscus idus melanotus</i> : 1000 mg/l / 96 h Analytical monitoring: no Method: DIN 38412 Teil 15 related to substance: TMT (acid form)
	LC0 static test <i>Leuciscus idus melanotus</i> : 9147 mg/l / 96 h (calculated based on acid form) related to substance: TMT (15%)
	LC0 static test <i>Leuciscus idus melanotus</i> : 1500 mg/l / 48 h Analytical monitoring: no Method: DIN 38412 Teil 15

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related to substance: TMT (acid form)

LC0 static test *Leuciscus idus melanotus*: 13720 mg/l / 48 h
(calculated based on acid form)

related to substance: TMT (15%)

LC50 semi-static test *Brachydanio rerio*: > 560 - 1000 mg/l / 96 h

Analytical monitoring: no

Method: OECD TG 203

Noxious effect due to pH shift

pH: 8 - 11

related to substance: TMT (60%)

LC50 semi-static test *Brachydanio rerio*: 2240 - 4000 mg/l / 96 h

Noxious effect due to pH shift

pH: 8 - 11

(Calculated from TMT 60%).

related to substance: TMT (15%)

LC50 static test *Pimephales promelas* (fathead minnow): 190.1 mg/l / 96 h

Analytical monitoring: yes

Method: ASTM

related to substance: TMT (15%)

Toxicity to daphnia

EC50 *Daphnia magna*: 38 mg/l / 48 h

Method: OECD TG 202

related to substance: TMT (acid form)

EC50 *Daphnia magna*: 253 mg/l / 48 h

(calculated based on acid form)

related to substance: TMT (15%)

Toxicity to algae

IC 50 *scenedesmus subspicatus*: 273 mg/l / 72 h

End point: Biomass

Analytical monitoring: no

Method: OECD 201

related to substance: TMT (15%)

Toxicity to bacteria

EC50 Activated sludge: 1036 mg/l / 3 h

Analytical monitoring: no

Method: DEV L3 (TTC test)

related to substance: TMT (60%)

EC50 Activated sludge: 4144 mg/l / 3 h

(Calculated from TMT 60%).

related to substance: TMT (15%)

Further information on ecology

Chemical Oxygen Demand (COD) 139800 mg/l

Method: DEV H 41

related to substance: TMT (15%)

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Biochemical Oxygen Demand (BOD) 0 mg/g
Concentration: 16 mg/l (BOD5)
Method: DEV H5/a2 (dilution method)
related to substance: TMT (60%)

0 mg/g
Concentration: 64 mg/l (BOD5)
(Calculated from TMT 60%).
related to substance: TMT (15%)

AOX The product does not contain any organically bonded halogen.

General Ecological Information Does not contain any heavy metals and compounds from EC directive 76/464
Is adsorbed to activated sludge

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL

Advice on disposal Waste must be disposed of in accordance with local, state, provincial and federal laws and regulations. Empty containers must be handled with care due to product residue.

14. TRANSPORT INFORMATION

Transport/further information

Not dangerous according to transport regulations.

15. REGULATORY INFORMATION

Information on ingredients / Non-hazardous components

This product contains the following non-hazardous components

Water			
CAS-No.	7732-18-5	Percent (Wt./ Wt.)	85 %

US Federal Regulations

OSHA

If listed below, chemical specific standards apply to the product or components:

- None listed

Clean Air Act Section (112)

If listed below, components present at or above the de minimus level are hazardous air pollutants:

- None listed

MATERIAL SAFETY DATA SHEET

TMT 15®



Material no.		Version	3.1 / US
Specification	101001	Revision date	10/04/2011
Order Number		Print Date	11/15/2011
		Page	11 / 12

CERCLA Reportable Quantities

If listed below, a reportable quantity (RQ) applies to the product based on the percent of the named component:

- None listed

SARA Title III Section 311/312 Hazard Categories

The product meets the criteria only for the listed hazard classes:

- Acute Health Hazard

SARA Title III Section 313 Reportable Substances

If listed below, components are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

- None listed

Toxic Substances Control Act (TSCA)

If listed below, non-proprietary substances are subject to export notification under Section 12 (b) of TSCA:

- None listed

State Regulations

California Proposition 65

A warning under the California Drinking Water Act is required only if listed below:

- None listed

MATERIAL SAFETY DATA SHEET

TMT 15®



Material no.		Version	3.1 / US
Specification	101001	Revision date	10/04/2011
Order Number		Print Date	11/15/2011
		Page	12 / 12

International Chemical Inventory Status

Unless otherwise noted, this product is in compliance with the inventory listing of the countries shown below. For information on listing for countries not shown, contact the Product Regulatory Services Department.

• Europe (EINECS/ELINCS)	Listed/registered
• USA (TSCA)	Listed/registered
• Canada (DSL)	Listed/registered
• Australia (AICS)	Listed/registered
• Japan (MITI)	Listed/registered
• Korea (TCCL)	Listed/registered
• Philippines (PICCS)	Listed/registered
• China	Listed/registered

16. OTHER INFORMATION

HMIS Ratings

Health :	2
Flammability :	0
Physical Hazard :	0

Further information

Data for the production of the safety data sheet from the studies available and from the literature. Further information about the characteristics of the product can be found in the product code of practice or in the Product-Brochure .

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Contact Water Containment Facilities

(NPDES Permit SC0040479)



Contents

1. Executive Summary	1
2. Project Location and Background	1
3. Collection Ponds	2
Appendix A.....	12

1. Summary

Haile Gold Mine, Inc. (Haile) is applying to construct and operate the following holding ponds for contact water treatment. All flows are from the Potentially Acid Generation (PAG) facilities, will flow through 19 Pond and the Contact Wastewater Treatment Plant prior to being discharged to one of the outfalls along Haile Gold Mine Creek.

This Water Treatment Plant (WTP) is originally designed by Veolia Water Solutions & Technologies and modified by Linken Engineering.

Influent will be supplied from the following sources:

- 465 Pond – runoff from JPAG overburden storage facility
- 500 Pond – runoff from East PAG overburden storage facility
- 475 Pond (future) - runoff from south end of West PAG overburden storage facility
- 541 Pond (future) – runoff from north end of West PAG overburden storage facility
- Mine Pit Sediment Ponds, and
- Coarse Ore Stockpile Pond.

Water from the 19 Pond will be reclaimed and used as makeup water to the Mill or treated and then delivered to the Mill. It is Haile's objective to use as much water as possible from 19 Pond and minimize the discharge of treated water reporting to a new NPDES Outfall network on Haile Gold Mine Creek.

2. Project Location and Background

Haile Gold Mine is owned and operated by Haile Gold Mine, Inc. (Haile) a wholly owned subsidiary of OceanaGold. The Haile property site is located 3 miles northeast of the town of Kershaw in southern Lancaster County, South Carolina. Lancaster County lies in the north-central part of the state. The Haile Gold Mine is approximately 17 miles southeast of the city of Lancaster, the county seat, which is approximately 30 miles south of Charlotte, North Carolina. (See Figure 1 – Site Map)

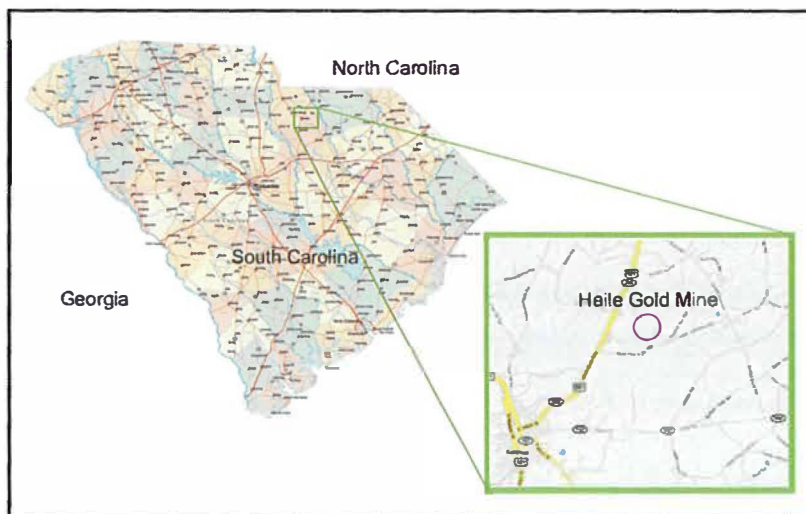


Figure 1 – Site Map

In 1984, Piedmont Mining Company acquired the property, and in 1985 initiated a heap leach operation. Mining ceased in 1991, and the last gold was poured in 1992. Through a series of mergers and acquisitions, Kinross Gold Corporation acquired the property in 1998 and initiated closure activities. When Romarco acquired the property in 2007, the site had been fully reclaimed and in the advanced stages of final closure. Haile initiated exploration drilling to confirm existing mineral resource information and to expand upon the resource. At the same time, Haile supplemented existing environmental baseline information and initiated its own environmental baseline programs and engineering studies. A component of the permitting and application process is to upgrade the wastewater treatment system.

Piedmont applied for, received approval and operated two NPDES Outfalls (001 and 002). Outfall 001 discharged treated process waters from the leach pad operations and Outfall 002 discharged mine related water from various pits and over burden facilities. Outfall 001 was closed in 2001 and Outfall 002 was closed in 2016. Both Outfalls were closed under plans approved by the South Carolina Department of Health and Environmental Control (DHEC).

OceanaGold and Romarco completed the joint venture in October of 2016 and initiated construction, culminating in the first gold bar pour in January 2017. Haile completed commissioning and began commercial operations on October 4, 2017.

3. Collection Ponds

a. 465 Johnny's PAG Collection Pond

Johnny's PAG is an overburden storage facility with the potential to generate acid and poor water quality. This facility was permitted through DHEC-Mining in 2014. It is designed with under liner drains, low permeable soil liner overlain by an 80 mil HDPE liner with a minimum 2-foot sand protective layer over the HDPE liner. Storm water and drainage through the PAG cell is collected in 465 Pond.

The 465 Pond is a double 60-mil HDPE lined ponds with leak detection and designed for approximately 19 million gallons to contain the normal drainage and stormwater from a 100-year, 24-hour storm event falling on this phase of Johnny's PAG.

	465 Pond		
	Area (Sq. feet)	Elevation	Volume (gallons)
Pond Bottom	67,725	450	0
Maximum operating level (3 ft of freeboard)	113,100	472	20.3 million
Maximum Capacity	120,000	475	20.4 million

Table 1 – 465 Pond Capacity

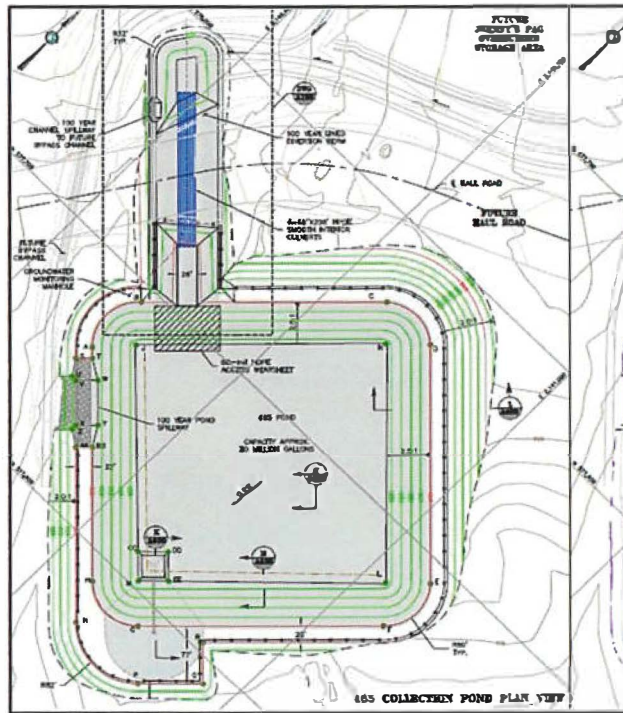


Figure 2 – 465 Pond Plan View

b. 500 East PAG Collection Pond

East PAG is an overburden storage facility with the potential to generate acid and poor water quality. This facility was permitted through DHEC-Mining in 2019. It is designed with under liner drains, low permeable soil liner overlain by an 80 mil HDPE liner with a minimum 2-foot sand protective layer over the HDPE liner. Storm water and drainage through the PAG cell is collected in 500 Pond.

The 500 Pond is a double 60-mil HDPE lined ponds with leak detection and designed for approximately 40 million gallons to contain the normal drainage and stormwater from a 100-year, 24-hour storm event falling on this phase of East PAG.

	500 Pond Cell A		500 Pond Cell B		Volume (gallons)
	Area (Sq. feet)	Elevation	Area (Sq. feet)	Elevation	
Pond Bottom	121,000	482	184,910	481	0
Maximum operating level (2 ft of freeboard)	198,200	502	291,750	502	20.3 million
Maximum Capacity	222,500	504	313,830	504	20.4 million

Table 2 – 500 Pond Capacity

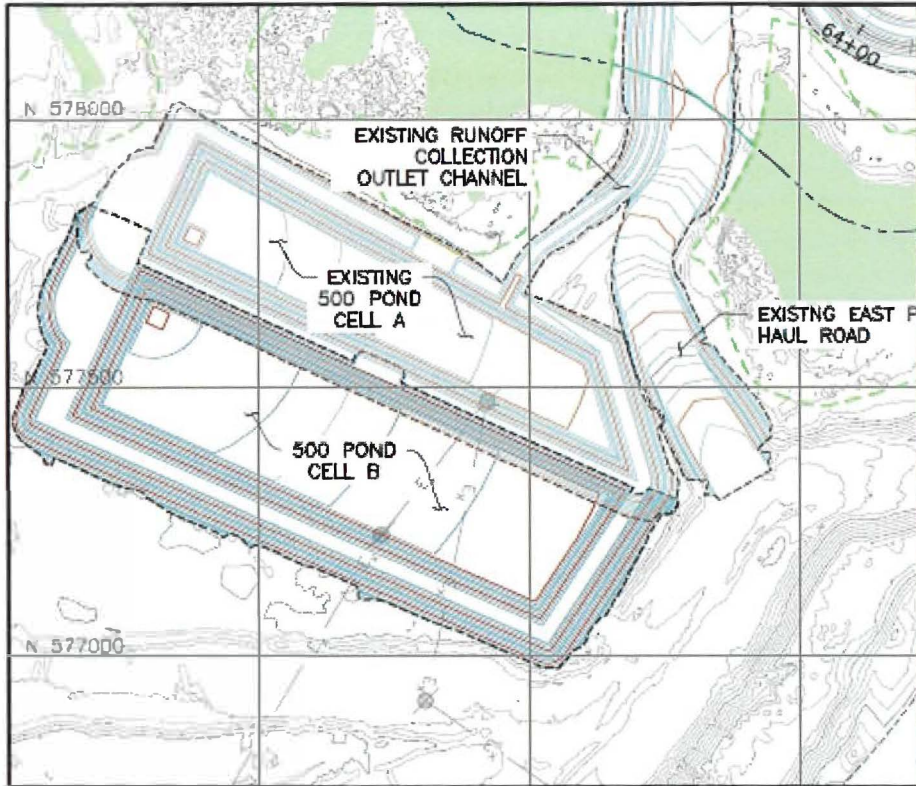


Figure 3 – 500 Pond Plan View

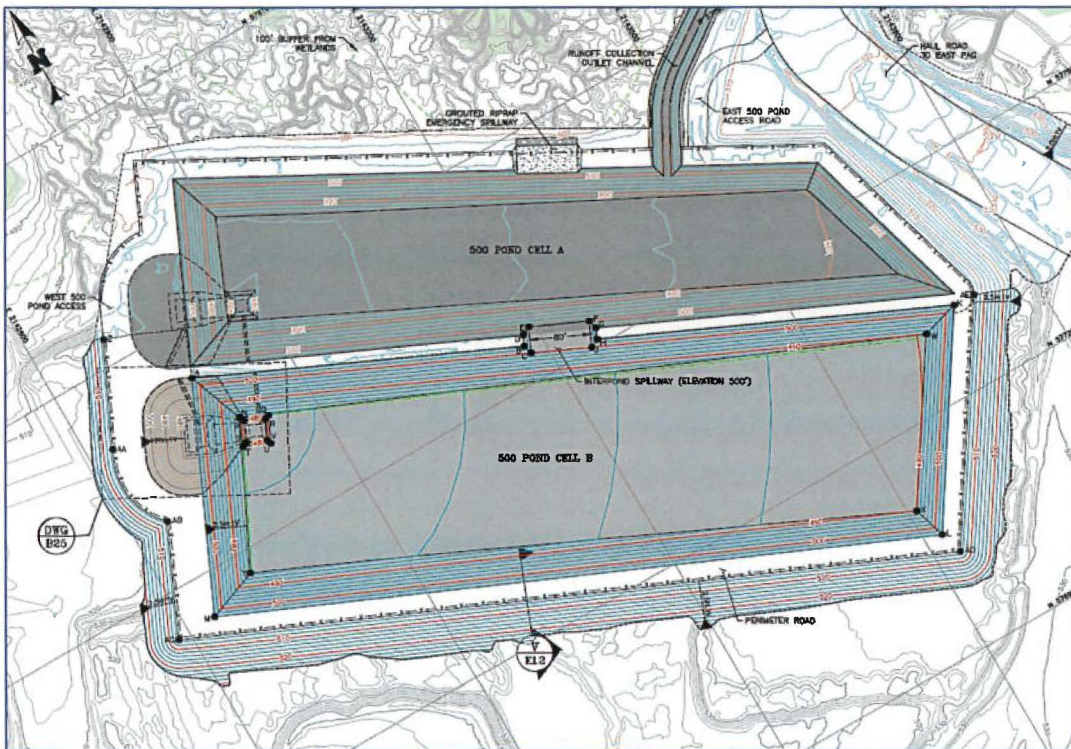
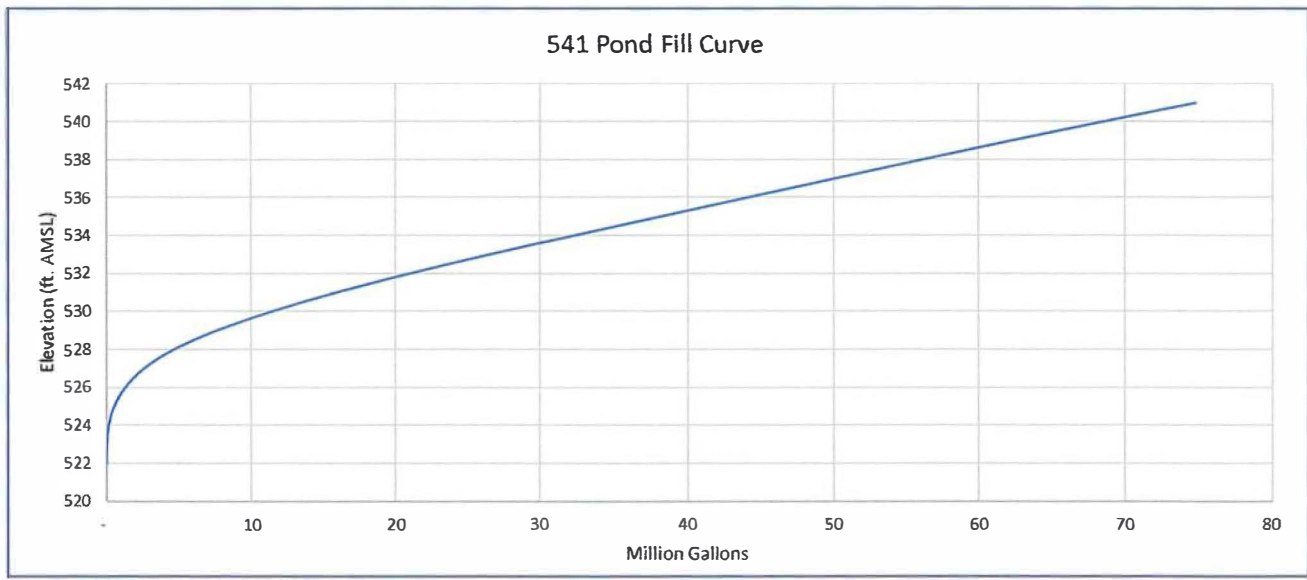


Figure 4 – 500 Pond Detailed Plan View with Pump Stations

	541 Pond		Volume (gallons)
	Area (Sq. feet)	Elevation	
Pond Bottom	730,200	522	0
Maximum operating level (3 ft of freeboard)	816,200	539	56.0 million
Maximum Capacity	834,500	541	74.7 million

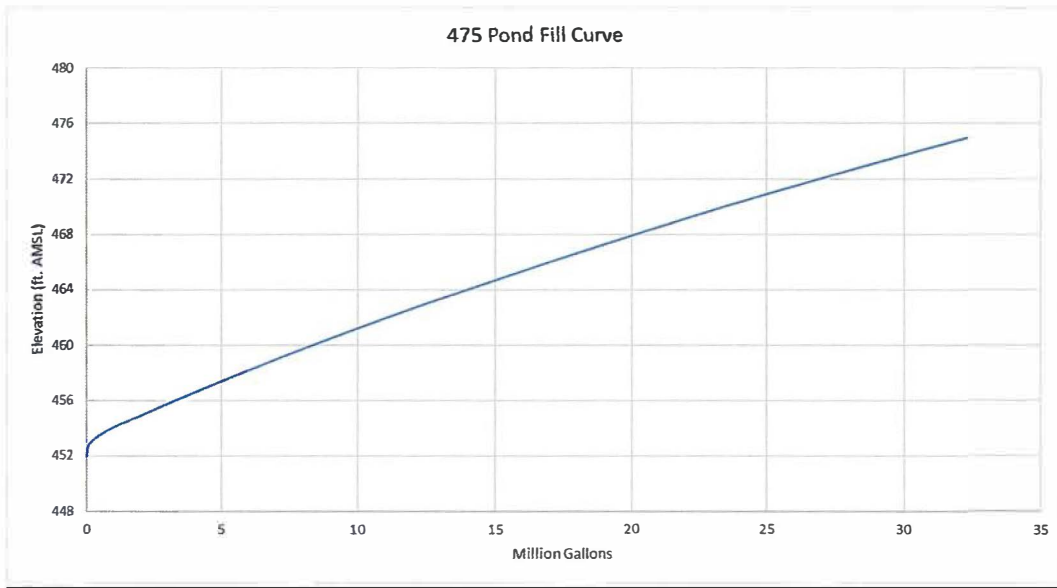
Table 3 – 541 Pond Capacities



The 475 Pond is a 60-mil HDPE lined pond with leak detection and designed for approximately 27 million gallons to contain the normal drainage and stormwater from a 100-year, 24-hour storm event.

	475 Pond		Volume (gallons)
	Area (Sq. feet)	Elevation	
Pond Bottom	150,000	452	0
Maximum operating level (3 ft of freeboard)	235,800	472	26.9 million
Maximum Capacity	241,000	475	32.3 million

Table 4 – 475 Pond Capacities



Mine Pit Sediment Ponds

Water collecting in the sump at the bottom of the mine pits will be pumped to a sediment settling pond. The first sediment pond will be placed close to Mill Zone Pit and be accessible by the Haul Road. Pit water will be collected in the first bay (sediment bay), which will have a 10-6 low permeable soil liner. Sediment will be physically removed, as required, to be processed in the Mill or disposed on Johnny’s PAG. Water will be decanted to the second bay (collection pond) and then pumped to 19 Pond. The collection pond is designed for a 100 year, 24 hour event and lined with a single 60-mil HDPE liner and 2-foot freeboard (See Table 4 Mine Pit Sediment Pond Capacities and Figure 6 – Sediment Ponds) and any overflow would be returned to Mill Zone Pit in the case of multiple severe storm events. A second sediment pond, of the same design, will be constructed during the development of the Snake Pit. Any overflow from this pond would be returned to the Snake Pit.

	Sediment Bay			Collection Pond		
	Area (Sq feet)	Elevation	Volume (gallons)	Area (Sq feet)	Elevation	Volume (gallons)
Pond Bottom	1,100	Vary by Pond	0	3,600	Vary by Pond	0
Maximum operating level (2 ft of freeboard)	1,500		36,495	10,000		406,800
Maximum Capacity	1,800		89,456	12,100		571,873

Table 5 – Mine Pit Sediment Pond Capacities

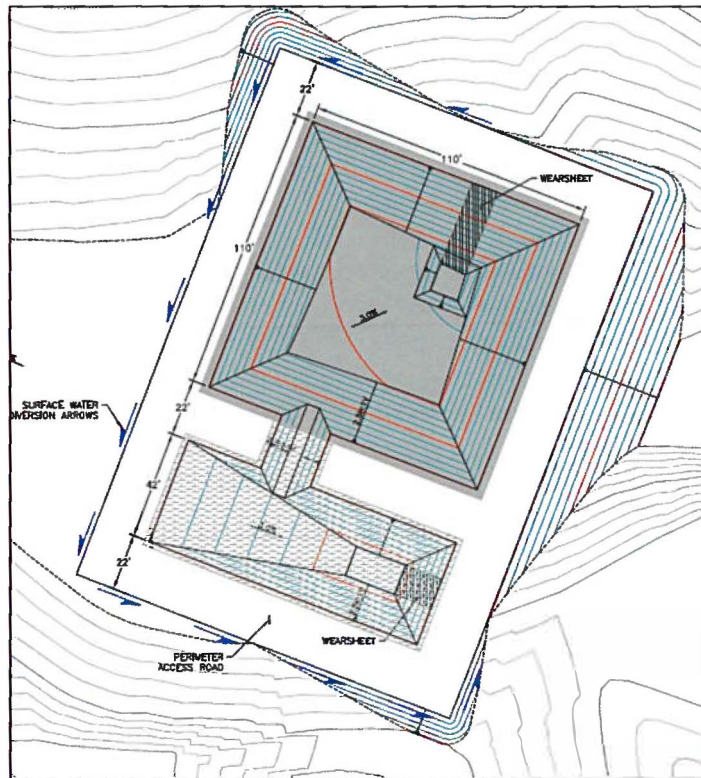


Figure 6 – Sediment Pond

Coarse Ore Stockpile Collection Pond

Ore trucked to the crusher area of the Mill has the potential to generate acid and poor water quality. For this reason, stormwater in the crusher and stockpile areas will be routed to this pond and pumped either to the Mill or to the 19 Pond. This pond will be constructed with a single 60-mil HDPE liner. See Table 5 – Coarse Ore Stockpile Pond Capacity and Figure 7 – Coarse Ore Stockpile Pond. It is designed with a maximum operating capacity of 1.4 million gallons with a 2-foot freeboard, which will handle a 100-year, 24-hour storm event (See Appendix C).

	Coarse Ore Stockpile Pond		
	Area (Sq feet)	Elevation	Volume (gallons)
Pond Bottom	7,450	505 ft.	0
Maximum operating level (2 ft of freeboard)	17,920	512 ft.	1.40 Million
Maximum Capacity	22,500	514 ft.	1.76 Million

Table 6 – Coarse Ore Stockpile Pond Capacity

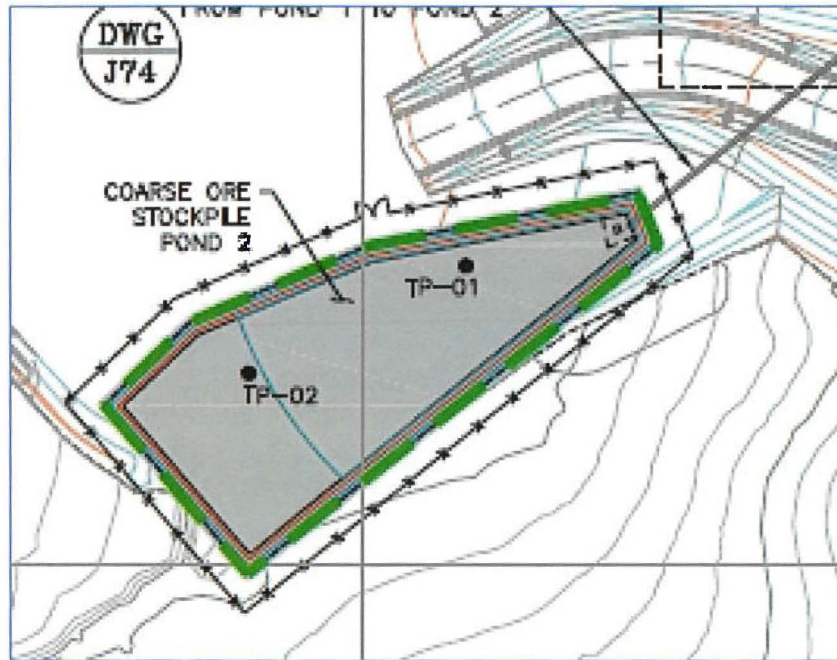


Figure 7 – Coarse Ore Stockpile Pond

Pipelines and Pumps - Drawing Details – Book 2, Section 1

The water on site will be transported using pumps and pipelines. The majority of the pipes will be 10”, 16”, or 18” black HDPE which can be welded to form continuous lengths of pipe (See Table 6 Pipeline Dimensions). The pipes will be placed above ground in designed pipe corridors (See Figure 8 – Typical Mine Service Road Cross Section). These corridors are along the sides of the roads for ease of maintenance and routine inspection. If pipes must cross the roads, they are placed below the road surface inside protective culverts.

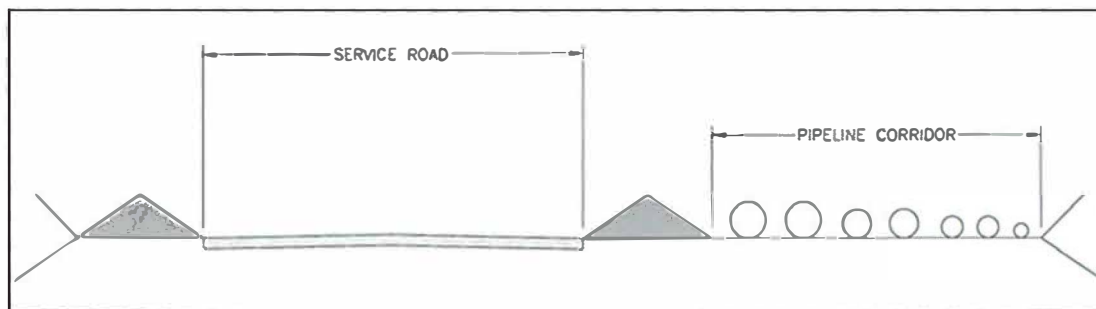


Figure 8 – Typical Mine Service Road Cross Section

All pipelines are equipped with pressure sensors to allow immediate shut off of the pump should a loss of pressure be detected. The Mill Control Room will also receive an alarm should a pipeline experience pressure become irregular. Ponds and pipelines are inspected daily.

Pipelines	Pipe Diameter	Length (approx..)
Pit Sediment Pond to 19 Pond	16"	Various
465 Pond to 19 Pond	30"	3,400 ft.
500 Pond to 465 Pond	30"	1,000 ft.
541 Pond to 19 Pond (gravity flow)	30"	7,200 ft.
475 Pond to 541 Pond	30"	3,000 ft.
19 Pond to WWTP	16"	250 ft.
Coarse Ore Stockpile Pond to 19 Pond	4"	1,800 ft.
WWTP to Outfall 003 / 004 / 005	16"	Various.

Table 7 – Pipe Dimensions

There are redundant pumps to facilitate preventative maintenance, repairs, maximize operational efficiency, and minimize downtime. Both pumps are identical, and each pump is sized to handle the respective load at that stage in the process. Summary of pumps (Table 7 – Pump Sizes) are as follows:

Pump	No. of Pumps	Pump Rate	Head (TDH)	Vendor
Sediment Pond Discharge Pumps	2	3,000 GPM	145 ft.	See note #1
Pond Discharge Pumps	2	5,000 GPM	158 ft.	See note #1
19 Pond Transfer Pumps	2	1,200 GPM	95 ft.	See note #1
Lime Pumps	2	250 GPM	92 ft.	Flowserve
Flocculant Pumps	2	3.2 GPH	92 ft.	Prominent
Coagulant Distribution Pumps	2	3.2 GPH	92 ft.	Prominent
1st Stage Clearwell Transfer Pumps	2	1,140 GPM	92 ft.	Flowserve
Multiflo Sludge Tank Transfer Pumps	2	50 GPM	92 ft.	Linatex
2nd Stage Clearwell Transfer Pumps	2	1,140 GPM	100 ft.	Flowserve
Metals Precipitant Pumps	2	3.2 GPH	92 ft.	Prominent
Lamella Sludge Transfer Pumps	2	30 GPM	92 ft.	Flowserve
Filter Backwash Pumps	2	1,140 GPM	75 ft.	Flowserve
Sulfuric Acid Distribution Pumps	2	3.2 GPH	92 ft.	Prominent
Treated Water Discharge Pumps	2	1,200 GPM	150 ft.	See note #1

Table 8 – Pump Sizes

Note #1: These pumps have not been released for procurement and a vendor has not been selected. Once that has been completed, the vendor will supply the applicable pump curves for the specific make and model of the pump.

Process Event Pond - Drawing Details

The Process Event Pond is permitted through the Mining and Reclamation Department. The pond is designed to hold approximately 1.5 million gallons in a single 60-mil HDPE-lined pond. The purpose for this pond is to be a final catchment for any overflow from the Process Plant containment zones. The capacity and plan view are shown below.

Process Event Pond		
	Elevation	Volume (gallons)
Pond Bottom	525	0
Maximum Capacity	539	1.5 million

Table 9 – Process Event Pond Capacity

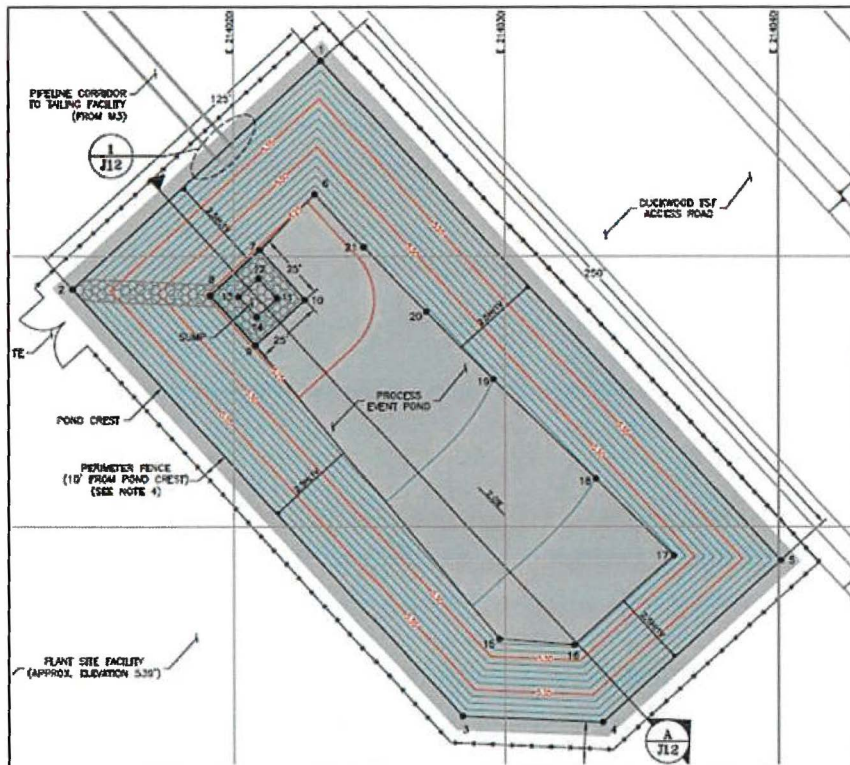


Figure 9 – Process Event Plan View

Appendix A

Precipitation

For consistency in the designs, the following conservative precipitation information was provided to each firm. The average annual rainfall for the Haile site is 46.55 inches with 24-hour rainfall events as follows:

Frequency	Rain Amount (Inches in 24 hours)
1 Year	2.97
2 Year	3.58
5 Year	4.51
10 Year	5.30
25 Year	6.48
50 Year	7.48
100 Year	8.59

Table 10 - Site Precipitation

Assumptions

- a. Storm Volume is total volume of water accumulated in the water shed area feeding the pond.
- b. No water shed into 19 Pond, only the precipitation falling directly into the pond.
- c. 100yr. / 24 hr. Storm Events are known and emergency provisions are in place (mobile generators, reagents on site, etc.)
- d. Water falling into the mine pits would be retained in the pits and Sediment Ponds would be used as temporary storage. Overflow from these ponds would report be back to the pits. Access into the mine pits would be limited.
- e. Water levels in each of the ponds would be pulled down to minimal levels prior to the event.
- f. If a larger precipitation event occurs or back-to-back events occur above the 100-year, 24-hour design criteria, Haile can move water to an active pit until capacity in 19 Pond is available.
- g. Water Treatment Plant would be operational during the event and continue to pull down water level in 19 Pond, therefore the Storm Volume values represent worst case expected.

PROCESS DESCRIPTION

**Limits on Effluent from Treatment System for
Contact Waters: Metals & Cyanide**

NPDES Permit No. SC0040479, dated July 10, 2013

Constituent	Monthly Average (µg/L)	Daily Maximum (µg/L)	Sample Frequency	Sample Type	Controlling Basis-Average	Controlling Basis-Maximum
Arsenic, total	10.0	14.6	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Cadmium, total	2.4	28.7	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Copper, total	94.9	160.8	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Lead, total	49.9	600.0	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Mercury, total	0.051	0.074	1 / week	Grab	Human Heath - Organism	Human Heath - Organism
Selenium, total	5.0	20.0	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Thallium, total	0.47	0.69	1 / week	24-hr. Composite	Human Heath - Organism	Human Heath - Organism
Zinc, total	750	1500	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Cyanide, total	140	204	1 / week	Grab	Aquatic life	Aquatic life
Cyanide, free	5.2	22.0	1 / week	Grab	Aquatic life	Aquatic life
Hydrogen Sulfide (H ₂ S)	2.0	4.0	1 / week	Calculation	Aquatic life	Aquatic life
pH	6.0 to 8.5	6.0 to 8.5	1 / week	Continuous	Aquatic life	Aquatic life
TSS (mg/l)	20	30	1 / week	24-hr. Composite	Aquatic life	Aquatic life
Whole Effluent Toxicity (WET)	25%	40%	1 / week	Grab	Aquatic life	Aquatic life

Assumptions:

- Average effluent flow of 1.728 MGD (1,200 gpm)
- Effluent hardness of 100 mg/L as CaCO₃ as a grab sample
- Average results calculated from four (4) samples/month

FORM 1 GENERAL	U.S. ENVIRONMENTAL PROTECTION AGENCY GENERAL INFORMATION Consolidated Permits Program <i>(Read the "General Instructions" before starting.)</i>	I. EPA I.D. NUMBER <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%;">S</td> <td style="width:85%;"></td> <td style="width:5%;">T/A</td> <td style="width:5%;">C</td> </tr> <tr> <td>F</td> <td></td> <td></td> <td>D</td> </tr> <tr> <td>1</td> <td>2</td> <td>13</td> <td>14 15</td> </tr> </table>	S		T/A	C	F			D	1	2	13	14 15
S		T/A	C											
F			D											
1	2	13	14 15											
LABEL ITEMS	PLEASE PLACE LABEL IN THIS SPACE	GENERAL INSTRUCTIONS If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent (<i>the area to the left of the label space lists the information that should appear</i>), please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI (<i>except VI-B which must be completed regardless</i>). Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.												
I. EPA I.D. NUMBER														
III. FACILITY NAME														
V. FACILITY MAILING ADDRESS														
VI. FACILITY LOCATION														
II. POLLUTANT CHARACTERISTICS														
INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms .														
SPECIFIC QUESTIONS	Mark "X" YES NO FORM ATTACHED	Mark "X" YES NO FORM ATTACHED												
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)	16 17 18	B. Does or will this facility (<i>either existing or proposed</i>) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)												
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	22 23 24	D. Is this a proposed facility (<i>other than those described in A or B above</i>) which will result in a discharge to waters of the U.S.? (FORM 2D)												
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	28 29 30	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)												
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)	34 35 36	H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)												
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)	40 41 42	J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)												
III. NAME OF FACILITY														
C 1	SKIP													
15	16 - 29	30												
IV. FACILITY CONTACT														
A. NAME & TITLE (<i>last, first, & title</i>)		B. PHONE (<i>area code & no.</i>)												
C 2														
15	16	45 46 48 49 51 52 55												
V. FACILITY MAILING ADDRESS														
A. STREET OR P.O. BOX														
C 3														
15	16													
B. CITY OR TOWN		D. ZIP CODE												
C 4														
15	16	40 41 42 47 51												
VI. FACILITY LOCATION														
A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER														
C 5														
15	16													
B. COUNTY NAME														
46	70													
C. CITY OR TOWN		D. STATE												
C 6														
15	16	40 41 42 47 51 52 54												

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)																
A. FIRST										B. SECOND						
C	7	1	0	4	1	(specify) Mining - Gold Bearing Ores	C	7	1	0	4	4	(specify) Mining - Silver Bearing Ores			
15	16	-	19													
C. THIRD										D. FOURTH						
C	7	(specify)														
15	16	-	19													

VIII. OPERATOR INFORMATION															
A. NAME													B. Is the name listed in Item VIII-A also the owner?		
C	8	Haile Gold Mine												<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
15	16														

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box: if "Other," specify.)													D. PHONE (area code & no.)								
F = FEDERAL			M = PUBLIC (other than federal or state)			O = OTHER (specify)			M			(specify) Traded on Toronto Stock Market (OGC)	C								
S = STATE												A	(803)	475-1220							
P = PRIVATE												15	16	-	18	19	-	21	22	-	25

E. STREET OR P.O. BOX														
6911 Snowy Owl Road														
26														

F. CITY OR TOWN										G. STATE	H. ZIP CODE	IX. INDIAN LAND					
C	B Kershaw										SC	29067	Is the facility located on Indian lands?				
15	16											40	41	42	47	-	51
												<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					

X. EXISTING ENVIRONMENTAL PERMITS															
A. NPDES (Discharges to Surface Water)										D. PSD (Air Emissions from Proposed Sources)					
C	T	I	SC 0040479							C	T	I	1460-0070-CA		
9	N									9	P				
15	16	17	18												
B. UIC (Underground Injection of Fluids)										E. OTHER (specify)					
C	T	I								C	T	I	I-000601		
9	U									9			(specify) Mine Permit		
15	16	17	18												
C. RCRA (Hazardous Wastes)										E. OTHER (specify)					
C	T	I	SCD987596806							C	T	I	SAC_1992_24122_4IA		
9	R									9			(specify) Army Corp of Engineers 404 Permit		
15	16	17	18												

XI. MAP


Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Haile Gold Mine is an Open Pit Mining operation with a Crushing, Grinding, Flotation and CIL extraction Process Plant. Gold is extracted from eight open pits at a rate of approximately 70,000 tons a day from an ore body that has a grade of approximately 2.25 g/ton gold. The Process Plant processes the ore through a crushing, grinding operation and pours gold into dore bars that are shipped to an independent refiner.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
W. Scott McDaniel		09/10/2020

COMMENTS FOR OFFICIAL USE ONLY														
C														
15	16													

B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

C. Except for storm runoff, leaks, or spills, will any of the discharges described in Items III-A be intermittent or seasonal?

YES (complete the following table)

NO (go to Section IV)

Outfall Number	1. Frequency		2. Flow		
	a. Days Per Week (specify average)	b. Months Per Year (specify average)	a. Maximum Daily Flow Rate (in mgd)	b. Maximum Total Volume (specify with units)	c. Duration (in days)

IV. Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

Year	A. Quantity Per Day	B. Units Of Measure	c. Operation, Product, Material, etc. (specify)

CONTINUED FROM THE FRONT	EPA I.D. NUMBER (copy from Item 1 of Form 1)	
--------------------------	--	--

C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.

1. Pollutant	2. Reason for Discharge

VI. Engineering Report on Wastewater Treatment

A. If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below.

Report Available No Report

B. Provide the name and location of any existing plant(s) which, to the best of your knowledge resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.

Name	Location

VII. Other Information (Optional)


Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

VIII. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title (type or print)
Scott McDaniel, Environmental Manager

B. Phone No.
(803) 475-1220

C. Signature


D. Date Signed
10 Sept 2020



BUREAU OF WATER
SLUDGE DISPOSAL SUPPLEMENT FOR NPDES AND ND PERMIT APPLICATIONS

Facility Name: Haile Gold mine

Permit Number: SC00 40479 (leave blank for a new facility)

or ND00 _____

Please check your proposed or current sludge disposal procedure:

I. Existing Facilities:

- Lagoon or other facility with no routine sludge disposal. Please attach a letter that addresses the approximate schedule for sludge removal and address the anticipated disposal method (note that the proposed sludge disposal method must be approved by the Department prior to initiation).
- Sludge disposal at another wastewater treatment facility. Attached is a recent letter of acceptance dated _____. This letter must include the NPDES or ND number of the treatment facility accepting the sludge for disposal. If no previous SCDHEC approval has been granted on the disposal method, then please include a detailed report on the existing sludge disposal method. See the attached requirements for Sludge Disposal Report A. If a previous SCDHEC approval has been granted, then include a recent analysis that shows the non-hazardous nature of the sludge or a signed statement that the sludge characteristics have not changes since the last analysis.
- Sludge disposal at a landfill. If the landfill is SWAIP (special waste) approved, an recent acceptance letter from the landfill is acceptable. If the landfill is not SWAIP approved, attached is SCDHEC Solid and Hazardous Waste approval dated _____, or other SCDHEC approval dated _____. If no previous approval has been granted on the disposal method, then please include a detailed report on the existing sludge disposal method. See the attached requirements for Sludge Disposal Report B.
- Sludge disposal by Beneficial Use of Sludge. Attached is SCDHEC approval letter or program approval dated 10/7/2013. If no previous approval has been granted on the disposal method, then please include a detailed report on the existing sludge disposal method. See the attached requirements for Sludge Disposal Report C.

II. Proposed Facilities:

- Lagoon or other facility with no routine sludge disposal. Please attach a letter that addresses the approximate schedule for sludge removal and address the anticipated disposal method (note that the proposed sludge disposal method must be approved by the Department prior to initiation).
- Sludge disposal at another wastewater treatment facility. Please include a detailed report on the proposed sludge disposal method. See the attached requirements for Sludge Disposal Report A.
- Sludge disposal at a landfill. Please include a detailed report on the proposed sludge disposal method. See the attached requirements for Sludge Disposal Report B.
- Sludge disposal by Beneficial Use. Please include a detailed report on the proposed sludge disposal method. See the attached requirements for Sludge Disposal Report C.

Send this form and the appropriate disposal report (if applicable) with your NPDES or ND permit application.

ALSO SEE ATTACHED INSTRUCTIONS



Catherine B. Templeton, Director

Promoting and protecting the health of the public and the environment

CERTIFIED MAIL/RETURN RECEIPT REQUESTED

91 7199 9991 7031 3716 7638

October 07, 2013

DAVID B THOMAS, VICE PRESIDENT AND GENERAL MANAGER
HAILE GOLD MINE INC
PO BOX 128
KERSHAW, SC 29067

Re: Department Decision
HAILE GOLD MINE
NPDES Permit # SC0040479
Lancaster County

Dear Mr. Thomas:

Enclosed is the National Pollutant Discharge Elimination system (NPDES) Permit for the above referenced facility.

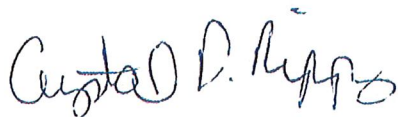
In order that you understand your responsibilities included in the provisions of this permit, particular attention should be given to the following sections:

1. PART III: This section contains all listings of effluent characteristics, discharge limitations, and groundwater, soil and sludge monitoring.
2. PART ILL.4: This section contains your responsibilities for reporting monitoring results. Preprinted Discharge Monitoring Report (DMR) forms will be provided at a later date by DHEC for reporting monitoring results.
3. PART ILL.3: This section describes the specific requirements for this permit to be transferred to another party.
4. PART ILE: This section contains responsibilities for the proper operation and maintenance of your facility.
5. PART V: This section contains all the special requirements relative to your permit. Such items in this section include the certified operator required to operate your wastewater treatment plant, the day of the week on which monitoring shall occur, sludge disposal requirements, and whole effluent toxicity requirements.

Please note the effective date on the permit and see the enclosed South Carolina Board of Health and Environmental Control Guide to Board Review.

If you have any questions about the technical aspects of this permit, please contact Byron M Amick at 803-898-4236. Information pertaining to adjudicatory matters may be obtained by contacting the Legal Office, SCDHEC, 2600 Bull Street, Columbia, SC 29201, or by calling them at (803) 898-3350.

Sincerely,



Crystal D. Rippy, Manager
Industrial Wastewater Permitting Section

Enclosure

e-mail: EPA
Harry L Mathis, Lancaster EQC Office, MIDLANDS REGION BEHS LANCASTER
Marc McKenna, BOW/WPC Enforcement
Brian Wisnewski, BOW
Chuck Gorman, BOW
David Graves, BOW
CATAWBA EQC LAB
Byron M Amick, BOW

**SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
BUREAU OF WATER**

LOCATION SUPPLEMENT FOR ND AND NPDES PERMIT APPLICATIONS

FACILITY: _____ DATE: _____

ITEM 1: Please give a short description of the plant location, if the address is not a specific location. Example: Plant is located at the interchange of Interstate 26 and U.S. Highway #1.

ITEM 2: Please give a description of the location of the discharge point into the receiving stream using some landmark as a reference point, i.e., bridge, stream, road junction, the plant itself, etc. Give the direction and the distance in feet from the reference point. Example: Discharge #001 is into Johnny Creek approximately 300 feet directly behind the plant. Discharge #002 is into Doris Creek 150 feet downstream from U.S. Highway #30 bridge.

ITEM 3: Please locate the discharge on a U.S. Geological Survey 7 1/2 minute quad sheet (or a 15 minute quad if a 7 1/2 quad is not available for the area). The entire quad sheet need not be submitted. An 8 1/2 by 11 inch photocopy of the applicable portion of the map is sufficient. The quad sheet name must be provided on the copy submitted to the Department. USGS Maps are available at the SC Dept. Of Natural Resources/Map Division, 2221 Devine Street, Suite 222, Columbia, SC 29205. Phone number is 734-9108.

RETURN TO: SCDHEC
Bureau of Water
NPDES Administration
2600 Bull Street
Columbia, SC 29201



South Carolina Department of Health and Environmental Control

Mixing Zone Request for Surface Water Discharges

NPDES #: SC 0040479

Facility Name: Haile Gold Mine

County: Lancaster County

Are you requesting a mixing zone for whole effluent toxicity (WET) in accordance with the back of this form?

[checked] No. No further information is needed. Submit this form. If WET testing is required, a chronic test at 100% will be required, unless the IWC is at least 80%. Proposed IWC _____%

[] Yes. Check one of the boxes below and submit this form with the appropriate information.

[] Check this block if you are proposing to perform or have performed a mixing zone demonstration to determine the appropriate zone of initial dilution (ZID) and/or mixing zone size. Complete the remainder of this form and submit a mixing zone demonstration plan as described on the back of this form. The Department recommends the demonstration plan be approved prior to implementation of any demonstration work.

[] Check this block if you are requesting a mixing zone by providing limited information such as a mixing model like CORMIX to determine mixing in accordance with suggested zone of initial dilution (ZID) and/or mixing zone sizes. Complete the remainder of this form, as applicable, and submit the CORMIX Supplement and modeling results (or other model assumptions, inputs and results).

What is the proposed ZID size (in meters)? Length: _____m Width: _____m

What is the proposed acute WET test concentration? _____%

What is the proposed mixing zone size (in meters)? Length: _____m Width: _____m

What is the proposed chronic WET test concentration? _____%

Printed Name: Scott McDaniel Firm: Haile Gold Mine

Signature: [Signature] Date: 10 Sept 2020