



# Engineering Report

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Project title: Ebb Carbon Marine Carbon Removal Pilot Project (Project Macoma)

Project no.: 159812

Subject: Engineering Report, Ebb Carbon Project Macoma

Date: March 20, 2024

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## List of Abbreviations

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A	ampere(s)
AACE	Association for the Advancement of Cost Engineering International
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ASCE	American Society of Civil Engineers
AWG	American Wire Gauge
BC	Brown and Caldwell
BPED	bipolar electrodialysis
DIC	dissolved inorganic carbon
DO	dissolved oxygen
DOE	Washington State Department of Ecology
EC	Ebb Carbon
EPO	emergency power off
FMEA	Failure Mode and Effects Analysis
gpd	gallons per day
gpm	gallon(s) per minute
HP	horsepower
HVAC	heating, ventilation, air conditioning
I&C	instrumentation and controls
IBC	International Building Code
kVA	kilovolt-ampere(s)
kW	kilowatt
MCC	motor control center
mCDR	marine carbon dioxide removal
MMF	mixed media filters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NF	nanofiltration
NFPA	National Fire Protection Association
NTU	nephelometric turbidity unit
PF	power factor
PNNL	Pacific Northwest National Laboratory
psf	pounds per square foot
RO	reverse osmosis
SEPA	(Washington) State Environmental Policy Act
TM	technical memorandum
UPS	uninterruptible power supply
VFD	variable frequency drive
WAC	Washington (State) Administrative Code

## Engineering Report Cross-Reference Checklist

The following presents a checklist of the information mandated by Section 173-240-130 of the Washington Administrative Code for Engineering Reports (ER) prepared for industrial wastewater facilities in Washington State. Each item listed has been cross-referenced with the page number of the relevant, responsive section in the ER.

An “NA” indicates the requirement was not applicable to the Ebb Carbon Marine Carbon Removal Pilot Project (Project Macoma).

<b>WAC 173-240-130 Cross-Reference Checklist</b>	
<b>Code Requirement</b>	<b>Response provided on page:</b>
a) Type of industry or business	8
b) The kind and quantity of finished product	8
c) The quantity and quality of water used by the industry with description	8
i) The quantity and quality of all process wastewater and method of disposal	8
ii) The quantity of domestic wastewater and how it is disposed	8
iii) The quantity and quality noncontact cooling water	9
iv) The quantity of water consumed or lost to evaporation	9
d) The amount and kind of chemicals used in the treatment process	9
e) The basic design data and sizing calculations	9
f) A discussion of the suitability of the proposed site for the facility	9
g) A description of the treatment process and operation, including flow diagrams	9
h) All necessary maps and layout sketches	9
i) Provisions for bypass, if any	10
j) Physical provision for oil and hazardous material spill control or accidental discharge prevent or both	10
k) Results to be expected from the treatment process including the predicted wastewater characteristics, as shown in the wastewater discharge permit, where applicable	10
l) A description of the receiving water, location of the point discharge, applicable water quality standards, and how water quality standards will be met outside of any applicable dilution zone	10
m) Detailed outfall analysis	13
n) The relationship to existing treatment facilities, if any	13
o) Where discharge to a municipal sewerage system, a discussion of that system’s ability to transport and treat the proposed industrial waste discharge without exceeding the municipalities allocated industrial capacity. Also, a discussion on the effects of the proposed industrial discharge on the use or disposal of municipal sludge	13

<b>WAC 173-240-130 Cross-Reference Checklist</b>	
<b>Code Requirement</b>	<b>Response provided on page:</b>
p) Where the discharge is through land application, including seepage lagoons, irrigation, and subsurface disposal, a geohydrologic evaluation of factors including:	NA
i) Depth to groundwater and groundwater movement during different times of the year	NA
ii) Water balance analysis of the proposed discharge area	NA
iii) Overall effects of the proposed facility upon the groundwater in conjunction with any other land application facilities that may be present	NA
q) A statement expressing sound engineering justification through the use of pilot plant data, results from other similar installations, or scientific evidence from the literature, or both, that the effluent from the proposed facility will meet applicable permit effluent limitations or pretreatment standards or both	14
r) A discussion on the method of final sludge disposal selected and any alternatives considered with reasons for rejection	14
s) A statement regarding who will own, operate, and maintain the system after construction	14
t) A statement regarding compliance with any State or local water quality management plan or any plan adopted under the federal water pollution control act	14
u) Provisions for any committed future plans	15
v) A discussion of the various alternatives evaluated, if any , and reasons they are unacceptable	15
w) A timetable for final design and construction	15
x) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA)	15
y) Additional items to be included in an engineering report for a solid waste leachate treatment system are:	NA
i) A vicinity map and also a site map that shows topography, location of utilities, and location of the leachate collection network, treatment systems, and disposal	NA
ii) Discussion of the solids waste site, working areas, soil profile, rainfall data, and groundwater movement and usage	NA
iii) A statement of the capital costs and annual operation and maintenance costs	NA
iv) A description of all sources of water supply within two thousand feet of the proposed disposal site. Particular attention should be given to showing impact on usable or potentially usable aquifers.	NA

## Section 1: Background

This Engineering Report (ER) describes the preliminary engineering and design for Project Macoma that is Ebb Carbon's (EC) marine carbon dioxide removal (mCDR) system to be constructed and operated temporarily at a site located at the Port of Port Angeles (PoPa) in Port Angeles, Washington. The proposed facility will consist of a pilot-scale version of the mCDR system currently operating at the United States Department of Energy's Pacific Northwest National Laboratory (PNNL) in Sequim, Washington. In addition to PNNL, EC has partnered with other research institutions including the National Oceanic and Atmospheric Administration and the University of Washington to validate the science behind EC's approach and evaluate how its system could work at scale. EC will continue to partner with scientific and academic partners to validate the efficacy and safety of its pilot-scale system during pilot operations at PoPa.

## Approach

EC's system at PoPa will use electrochemistry to remove acid from seawater. The acid can be extracted and used for further research and/or neutralized through a reaction with mafic/ultramafic rocks. The remaining seawater will have enhanced alkalinity and will be returned to Port Angeles Harbor for the purposes of reducing local acidification and absorbing carbon dioxide (CO<sub>2</sub>) from the air and storing it as bicarbonate—a safe and naturally abundant form of carbon storage in seawater that does not cause harmful acidification.

The EC facility will be a first-of-a-kind mCDR removal system that returns alkaline-enhanced seawater to reduce acidification locally and draw down CO<sub>2</sub> pollution from the atmosphere, while discharging neither liquid waste nor stormwater into the municipal system. The facility will be designed to satisfy the requirements of Washington Administrative Code (WAC) Section 173-240-130.

## Engineering Report Requirements

Per Section 173-240-130 of the WAC, this ER for the EC Pilot Facility is “sufficiently complete so that plans and specifications can be developed from it without substantial changes.” This ER is intended to satisfy the requirements of WAC 173-240-130 for Submission of Plans and Reports for Construction of Wastewater Facilities under the jurisdiction of the Washington State Department of Ecology (DOE). The remainder of the ER is organized as follows:

- Section 2: Responds to WAC requirements presented in the Cross-reference Checklist above.
- Section 3: Presents discipline design data for the proposed facility.
- Section 4: Summarizes the process and provides details on the proposed process equipment.

## Section 2: Relevant Data Required by DOE

EC intends to operate a pilot-scale mCDR facility that treats seawater and is situated along the shoreline. Although EC does not discharge a waste byproduct into the water, in an abundance of caution, this ER adheres to the requirements listed under WAC 173-240-130, *Engineering Report for Industrial Wastewater Treatment Facilities*.

**(a) Type of Industry or Business;**

EC will conduct a temporary field trial of a pilot-scale mCDR facility at a site within PoPa. The facility will be the first of its kind in Washington within the nascent industry of carbon dioxide removal research and development, specifically ocean alkalinity enhancement research and development. The type of industry corresponds to Standard Industrial Classification No. 8731: Commercial Physical and Biological Research and North American Industry Classification System No. 541715: Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology).

EC's electrochemical technology uses low-carbon electricity and ion-selective membranes to remove acid (HCl) from seawater. The alkaline-enhanced seawater (NaOH) that remains is returned to the ocean so that it can absorb additional CO<sub>2</sub> from the air and store it as bicarbonate in the ocean for 10,000+ years. The process of returning alkalinity to the ocean also reduces the acidity of seawater locally.

**(b) Kind and Quantity of Finished Product;**

EC's finished product is alkaline-enhanced seawater that, once returned to Puget Sound, accelerates the ocean's natural process of drawing down CO<sub>2</sub> from the atmosphere and converting it into bicarbonate—a naturally abundant form of carbon in the ocean. The facility will be designed to deacidify and return ~90M gallons (~340M Liters) of seawater to accelerate the ocean's process of drawing down CO<sub>2</sub> from the atmosphere to remove up to 1,000 tons of CO<sub>2</sub> pollution over 2 years.

**(c) The quantity and quality of water used by the industry and a description of how it is consumed or disposed of;**

Items c.i through c.iv provide additional information required in this ER.

**(c.i) The quantity and quality of all process wastewater and method of disposal;**

The proposed EC facility is expected to consume an average daily flow of 170 gallons per minute (gpm) throughout the year (January through December). During flushing and maintenance operations the flow rate may peak to 210 gpm instantaneously. Processed seawater would be returned to Port Angeles Harbor via a proposed new barge-mounted multi-port diffuser. Wastewater quality is as described in the *Port Angeles Mixing Analyses Technical Memorandum* (TM) included as Attachment A.

**(c.ii) The quantity of domestic wastewater and how it is disposed of;**

No wastewater will be produced at the pilot facility. Mobile facilities (portable toilets) will be available for personnel use. Toilets will be maintained and emptied regularly using a sewage hauling service.

**(c.iii) The quantity and quality of noncontact cooling water (including air conditioning) and how it is disposed of;**

There will be no noncontact cooling water used at the facility.



**(c.iv) The quantity of water consumed or lost to evaporation;**

The quantity of water lost to evaporation at the facility will be minimal and has not been estimated.

**(d) The amount and kind of chemicals used in the treatment process, if any;**

Chemicals from outside sources are not used in the treatment process. Instead, the primary process chemicals are generated from constituents of ambient seawater. The process is an open system that can vary its production rate. Detailed process data is provided in Section 4 of the ER, including information on onsite chemical storage (see Table 14), tank volumes, and pumping rates.

The EC process treats seawater to reduce its acidity before returning it to the Strait. This process first uses particulate filtration, nanofiltration, and reverse osmosis (RO) to create brine. The brine undergoes electrochemical processing, which uses low-carbon electricity and ion-selective membranes to separate the seawater into dilute acidic and alkaline streams. The acidic stream is neutralized through a reaction with locally-sourced alkaline minerals, which will likely be basalt or olivine. This reaction ensures the acidity is permanently removed from the seawater. Deliveries of fresh alkaline material will occur monthly and the material will be stored in a manner to prevent stormwater runoff. After reacting with the acidic stream, the basalts and olivines can be resold or stored offsite.

**(e) The basic design data and sizing calculations of the treatment units;**

Basic design data and sizing calculations for the proposed facility are provided in Section 4 of this ER.

**(f) A discussion of the suitability of the proposed site for the facility;**

Pier 7 in the Port of Port Angeles is a suitable site for this facility because of the local infrastructure and oceanographic opportunities.

The state of Washington excels in low carbon energy production, which is key for EC to achieve net carbon removal from the atmosphere. The state also has a push for new technologies that address climate change, which makes for a promising place to pilot this technology.

The Port of Port Angeles is part of the Salish Sea which is a widely studied body of water, with many research partners investigating how similar processes would benefit the Sea. The proximity and knowledge of these partners will allow the EC process to responsibly operate. Further since the Pier is in a protected portion of the bay equipment will be easy to protect and outfalls easy to monitor for efficacy.

The on shore area will be constructed on an empty lot inside the log yard which has active industrial processes occurring today, so disruption will not take place. Existing utilities at this site will be converted over to use for the EC process minimizing the need for new installations.

**(g) Insert description of the treatment process and operation, including a flow diagram;**

The EC process flow diagram is shown on Figure 1.

**(h) All necessary maps and layout sketches;**

A site map showing the layout of the proposed EC PoPa facility is provided on Figure 2.

**(i) Provisions for bypass, if any;**

There is no provision for system bypass. All process fluid will come from the bay, which limits the system from being overloaded and needing a bypass option.

**(j) Physical provision for oil and hazardous material spill control or accidental discharge prevention or both;**

Oil will not be stored on site. Fluid materials stored inside containers will have integral berms. The site will continue to slope toward an existing stormwater management system.

**(k) Results to be expected from the treatment process including the predicted wastewater characteristics, as shown in the waste discharge permit, where applicable;**

The proposed EC facility would produce three process streams, as shown schematically on Figure 1. Each process stream is summarized briefly as follows:

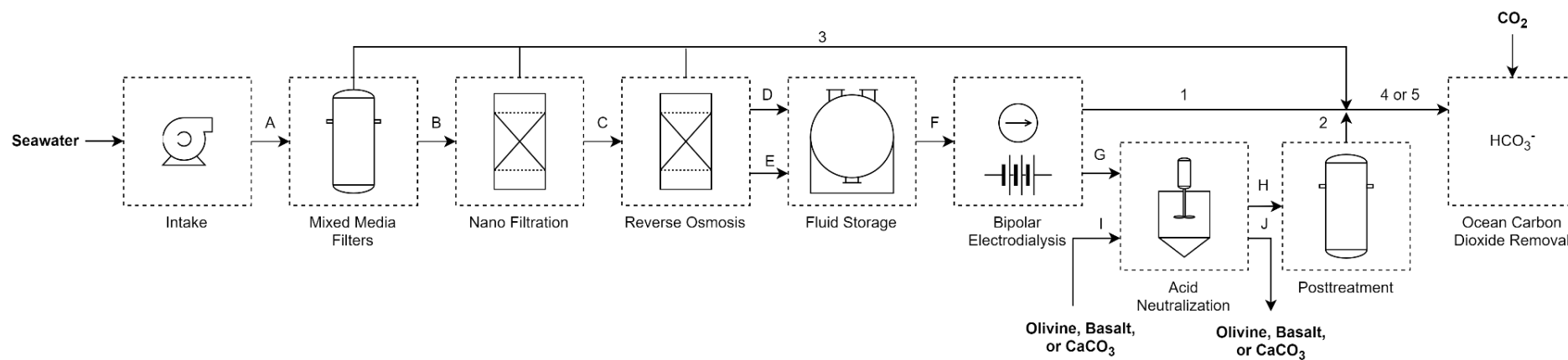
- **Outfall Stream 1.** Alkaline product–saltwater solution with enhanced alkalinity produced via the bipolar electrodialysis (BPED) process.
- **Outfall Stream 2.** The acidic process stream produced via the BPED process is neutralized with mafic/ultramafic rocks, followed by post-neutralization filtration. Neutralization may be achieved using olivine, basalt or calcium carbonate (CaCO<sub>3</sub>).
- **Outfall Stream 3.** Saltwater reject from various filtration pretreatment steps. The primary constituent is nanofiltration concentrate, but the process stream also includes flushes of other pretreatment processes as part of routine maintenance.

Typically, the three process streams would be discharged as a combined flow through the outfall. However, EC may operate the pilot facility, for limited durations, discharging only one or two of the component flow streams. These atypical operational strategies would provide additional data to EC and further the understanding of potential impacts of the discharge to water chemistry/water quality.

A detailed description of the proposed discharge combinations (scenarios) is provided in the *Port Angeles Mixing Analyses Technical Memorandum* (TM), included as Attachment A.

**(l) A description of the receiving water, location of the point of discharge, applicable water quality standards, and how water quality standards will be met outside of any applicable dilution zone;**

The proposed receiving water is Port Angeles Harbor, which is designated as ‘Excellent Quality’ for aquatic life uses. Applicable marine water quality standards are defined in WAC 173-201A. The proposed outfall discharge will be a barge-mounted multi-port diffuser located as shown in Attachment B.



**Figure 1. Process flow diagram**

*Letters indicate process streams, numbers indicate outfall streams.*



**Figure 2. Site plan for Project Macoma**



**(m) Detailed outfall analysis;**

Compliance with applicable water quality standards was evaluated using a combined dilution and water chemistry modeling approach. Model input data selection, model results, and water quality analyses are presented in the Port Angeles *Mixing Analyses TM*, included in Attachment A. For most parameters except temperature, pH, and turbidity, the proposed discharge would not be anticipated to be significantly changed from the process source waters (Port Angeles Harbor). Specific conclusions related to the mixing zone as well as the modeled mixing of temperature, pH and turbidity within the mixing zone are as follows:

- Dilution model analyses indicate nearfield dilution, the basis of the conservative water quality analyses performed, is complete within 12 meters (40 feet) laterally from the diffuser. The entire WAC-defined mixing zone (207 feet) is not required to attain applicable water quality standards. EC proposes monitoring acute and chronic mixing zone dimensions at 15 and 150 feet, respectively, to account for potential nearfield conditions and process assumptions that differ from those modeled.
- Except for discharge of the alkaline product individually, mixed pH for all scenarios will meet applicable marine aquatic life use standards within the mixing zone and accounting for tidal reflux. Should EC temporarily discharge the alkaline product only, process controls would be in place to limit effluent pH to allow for pH criteria to be met within the mixing zone. Typical scientific and routine operational scenarios would exceed the Tier II antidegradation threshold for measurable change in pH. However, any potential temporary lowering of immediate nearfield water quality with respect to pH is necessary and in the overriding public interest given the anticipated benefits associated with the proposed project.
- Assuming a maximum effluent temperature and worst-case modeled conditions, the incremental temperature increase within the area of near-field mixing is predicted to be 0.1°C or less. Mixed temperature decreases rapidly from the point of discharge and approaches background temperature well within the proposed mixing zone dimensions.
- For the typical discharge scenario, combined process streams, the chemistry model predicts worst case calcite precipitate concentrations near 150 milligrams per Liter in the nearfield. Using high effluent turbidity assumptions, dilution calculations indicate that predicted mixed turbidity would be within the allowable range of increase above background. EC proposes targeted monitoring of turbidity within the nearfield, along with pH, during initial operation of the facility to assess the impact of the discharge on the receiving water.

**(n) The relationship to existing treatment facilities, if any;**

There are no existing treatment facilities.

**(o) Where discharge is to a municipal sewerage system, a discussion of that system's ability to transport and treat the proposed industrial waste discharge without exceeding the municipality's allocated industrial capacity. Also, a discussion on the effects of the proposed industrial discharge on the use or disposal of municipal sludge.**

There will be no discharge to municipal sewerage systems. Mobile facilities (portable toilets) will be available for personnel use. Toilets will be maintained and emptied regularly using a sewage hauling service.

- (p) Where discharge is through land application, including seepage lagoons, irrigation, and subsurface disposal, a geohydrologic evaluation of factors such as:**

Items p.i through p.iii below provide additional information required in this ER.

- (p.i) Depth to groundwater and groundwater movement during different times of the year;**

Not applicable.

- (p.ii) Water balance analysis of the proposed discharge area;**

Not applicable.

- (p.iii) Overall effects of the proposed facility upon the groundwater in conjunction with any other land application facilities that may be present;**

Not applicable.

- (q) A statement expressing sound engineering justification through the use of pilot plant data, results from other similar installations, or scientific evidence from the literature, or both, that the effluent from the proposed facility will meet applicable permit effluent limitations or pretreatment standards or both.**

EC and Brown and Caldwell (BC) have used sound engineering analysis in preparing this ER. One of EC's lead scientists has been researching the ocean carbonate system for a decade. EC has been performing laboratory testing to demonstrate its process and initiated operation of a 100 ton/year carbon dioxide removal system at PNNL in Sequim.

In conjunction with academic researchers, EC has collected data for this facility to feed chemical mixing and dilution modeling supported by BC. The preliminary design of the proposed facility is based on the collective experience of EC and BC professionals in developing facility designs.

- (r) A discussion of the method of final sludge disposal selected and any alternatives considered with reasons for rejection;**

Not applicable.

- (s) A statement regarding who will own, operate, and maintain the system after construction;**

Project Macoma LLC will own, operate and maintain the system after construction and will be responsible for decommissioning.

- (t) A statement regarding compliance with any state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended;**

Project Macoma will comply with state and local water quality management and protection requirements during construction and operation as required by federal, state, and local permits and approvals issued for the project. Anticipated permits and approvals include those issued in coordination with the Washington State Department of Ecology for National Pollutant Discharge Elimination System compliance.

**(u) Provisions for any committed future plans;**

Project Macoma will have a Ecological Safety Methodology (ESM) that is meant to serve as a robust monitoring, modeling, and reporting regime designed to measure any positive impacts to water quality and marine life and ensure no adverse impacts are occurring. Certain aspects of the ESM will be implemented before, during, and after operations. The site designated for this pilot is only available for a temporary period, and based on the results of the pilot, there may be provisions to consider moving portions of the system to another location after the site is no longer available.

**(v) A discussion of the various alternatives evaluated, if any, and reasons they are unacceptable;**

No alternatives evaluated.

**(w) A timetable for final design and construction;**

See Table 1.

Table 1. Proposed Project Timetable for Design and Construction	
Milestone	Date
Engineering Report	January 2024
NPDES Permit Application	January 2024
Permit Submittals	February 2024
Building Permit Applications	March 2024
Start Construction	April 2024
Startup and Testing	July 2024
System Operational	August 2024

**(x) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.**

Project Macoma has complied with SEPA requirements. A SEPA environmental checklist was prepared to help determine whether Project Macoma will have significant adverse environmental impacts and was submitted for review to a local authority (PoPA) as the lead agency. PoPA made a Determination of Non Significance (DNS) based on review of the SEPA environmental checklist and published both the DNS and checklist to receive public input on the project.

Project Macoma is not a federal action, nor is it funded by federal grant money. If federal grant money is secured in the future, some documentation may be required to demonstrate that it qualifies for a categorical exclusion or is NEPA compliant. Currently, a federal permit from the U.S. Army Corps of Engineers is required for work in Waters of the U.S. Therefore, it is anticipated that NEPA compliance will be demonstrated through the federal permitting process. It is anticipated that the U.S. Army Corps of Engineers will be the lead federal agency and will authorize under Nationwide Permit #7 (NWP#7) or a Letter of Permission (LOP). A NWP#7 is a 2021 general federal permit, which was issued in compliance with NEPA. A LOP is an individual federal permit issued for activities that, like Project Macoma, are not major federal actions significantly affecting the quality of the human environment, and, therefore, are categorically excluded from NEPA documentation. No further NEPA review is required in either instance.

**(y) Additional items to be included in an engineering report for a solid waste leachate treatment system are:**

Items y.i through y.iv below provide additional information required in this ER.

**(y.i) A vicinity map and also a site map that shows topography, location of utilities, and location of the leachate collection network, treatment systems, and disposal;**

Not applicable.

**(y.ii) Discussion of the solid waste site, working areas, soil profile, rainfall data, and groundwater movement and usage;**

Not applicable.

**(y.iii) A statement of the capital costs and the annual operation and maintenance costs;**

Not applicable.

**(y.iv) A description of all sources of water supply within two thousand feet of the proposed disposal site. Particular attention should be given to showing impact on usable or potentially usable aquifers;**

Not applicable.



## Section 3: Discipline Design Criteria

This section provides additional details on the design criteria that will be used for the design of the proposed EC Facility.

### Civil

The proposed civil site improvements will support temporary structures to be constructed on the PoPA site to comply with cultural resource restrictions. Essentially the cultural resource site restrictions will require no or extremely limited excavation below existing grade. The site will be developed within an active logging operation area which the development will use for site access to the proposed improvements. Tentative design for the site to avoid excavation will further investigate and propose a 1-foot-thick layer of coarse aggregate base material with geogrid reinforcement to support access ways within the site and trailer mounted structures and tanks. The tentative foundation recommendation is based on a geotechnical investigation completed by PoPA for a stormwater management facility. The existing survey for the proposed site location indicates existing power, water, and storm drain management at the proposed site location. The proposed temporary facility would utilize the existing utilities to develop power needs, meet fire code requirements with existing water, and continue stormwater management with a tie in to the existing system.

The proposed treatment site development layout proposes a 4-foot separation between trailer units with 14-foot-wide access lanes and 10-foot-site access turning radius. Fire vehicle access to the site will be facilitated along the south side of the surface concrete barrier wall and two access breaks within the concrete barrier walls will provide access to the site along with access from the northwest and southeast. The layout will be subject to review and modification required by the City of Port Angeles (CoPA) building and fire Marshall authorities.

Pending a preliminary review and subsequent potential CoPA modification of the civil site layout, the advanced design will be prepared for permitting submittals using applicable sections of CoPA Title 14 Building Code which is the 2018 Washington State Buildings and Construction Code currently in use.

Peripheral site improvements will include modification of the existing electrical building and substation. Existing topography will allow access to the site without regrading.

### Architectural

The following subsection describes the applicable codes and standards and the architectural design criteria applicable to those codes and standards.

The building code is intended to provide minimum requirements to safeguard the public health, safety, and general welfare of the occupants of new and existing buildings and structures. The code also addresses structural strength, means of egress, sanitation, adequate ventilation and lighting, energy conservation, and life safety as they relate to new and existing buildings, facilities, and systems.

In general, the provisions of the building code apply to the construction, alteration, movement, addition, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures. Building codes referenced for the architectural design are summarized in Table 2.

Table 2. Applicable Architectural Codes and Standards

Abbreviation	Full Code
WABC	Washington Building Code 2018 (IBC 2018 amended)
WAEBC	Washington Existing Building Code 2018 (IEBC 2018 amended)
W AFC	Washington Fire Code 2018 (IFC 2018 amended)
WAMC	Washington Mechanical Code 2018 (IMC 2018 amended)
WAFGC	Washington Fuel Gas Code 2018 (IFGC 2018 amended)
WACEC	Washington Commercial Energy Conservation Code 2018 (IECC 2018 amended)
WASSC	Washington Storm Shelter Code 2014 (ICC 500, 2014)
WAAC	Washington Accessibility Code 2009 (A117.1, 2009 amended)
ADA	2010 Americans with Disabilities Act Standards for Accessible Design
NFPA 13	Washington Fire Sprinkler Code (NFPA 13, 2016 amended)

*Note: 2021 International Codes may be adopted in March 2024 or later.*

**Use and Occupancy Classification (WABC Chapter 3):** The provisions of this chapter shall control the classification of all buildings and structures as to the use and occupancy. The electrical (bunker) building and proposed electrical building will be classified as factory Industrial Group F. Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repairing, or processing operations that are not classified as a Group H hazardous or Group S storage occupancy. The electrical equipment portions of both buildings shall be classified as a F-1 Occupancy.

**General Building Heights and Areas (WABC Chapter 5):** The provisions of this chapter control the height and area of structures hereafter erected and additions to existing structures. The building height, number of stories, and building area shall not exceed the limits specified in Table 503 based on the type of construction as determined by Section 602 and the occupancies as determined by Section 302. The electrical (bunker) building and electrical building height, stories, and area allowances are summarized below.

- Building height: Allowable height per Table 503 = 40 ft
- Number of stories: Allowable stories per Table 503 = 1 stories
- Building area: Allowable floor area per story per Table 503 = 8,500 sq ft

**Types of Construction (WABC Chapter 6):** The provisions of this chapter shall control the classification of buildings as to type of construction. The Building shall be classified as Construction Type VB per Table 601 and Section 602.2. for evaluation pertaining to any alterations to the existing buildings. Type VB construction is the type of construction in which the structural elements, exterior walls and interior walls are of any materials permitted by this code.

**Energy Conservation (WAECC):** This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. The following minimum thermal envelope values are required to comply with the WAECC, Climate Zone 4C-Table C402.1.2/C402.2/C402.3.

- Roofs/Ceilings (Insulation Entirely Above Deck): R-38 ci (continuous insulation)
- Walls (Wood framed and other): R-21 int or R-15 + R-5 ci
- Swinging Doors: R-2.70
- Non-swinging Doors: R-2.94

**Design Criteria:** The architectural design of the bunker electrical building will consist of elements required to bring the building up to the current required codes. These items will include but will not be limited to insulating the walls and ceiling, improving the water tight resilience of the building and enlarging the door opening, changing the door swing and installing panic hardware.

The new electrical building will be designed to house electrical equipment. Building materials are summarized below:

- **Exterior Walls:** The wall will use wood 2x4 construction, plywood interior surface, metal wall panel siding matching the color and profile of the bunker electrical building and an insulated cavity.
- **Roofing Systems:** The 2x4 wood rafter roof system with a standing seam metal roofing system (20-year warranty) on rigid polyisocyanurate roof insulation (R-38) and plywood decking.
- **Roof Drainage:** The roof drainage system will consist of gutters and downspouts that will bring roof runoff to the exterior ground surface or existing underground drainage on site.
- **Doors and Frames:** Single and double doors and frames will be painted, hollow metal type.
- **Door Hardware:** Commercial-grade stainless-steel hardware. Lever handles will be provided on all new lock and latch sets. Panic exit devices will be incorporated on all egress doors.
- **Handrails:** Clear anodized aluminum guardrails and handrails with toe-plates to match those on site.
- **Fire and Safety Equipment:** Fire extinguishers and first-aid cabinets will be shown.
- **Signage:** Building signs, room signs, pipe labels, equipment identification, and hazard and safety signs will be provided.
- **Floors:** General areas will be exposed concrete with a protective sealer.
- **Interior Wall Surfaces:** Exposed plywood wall finishes will be painted.
- **Ceilings:** Operating level exposed interior surface of metal roofing will be painted.
- **Stairs:** The stair systems on site and incorporated into the electrical building will be aluminum with grating treads.

## Structural

Key structural design elements are described below.

### Applicable Codes and Standards

The structural components will be designed in accordance with the codes listed in Table 3.

Table 3. Structural Codes	
Reference	Title
ACI 318-14	Building Code Requirements for Structural Concrete
ASCE7-16	Minimum Design Loads and Associated Criteria for Buildings and Other Structures
IBC 2018	International Building Code (IBC) with Local Amendments

## Materials

The following materials are anticipated to be used for the construction of the structures:

### Concrete

- Compressive strength at 28 days: Cast-in-place concrete, 4,500 pounds per square inch
- Cement: Type II cement per ASTM C150
- Aggregate: 3/4-inch maximum typical
- Reinforcement: ASTM A615, grade 60, deformed

### Concrete Anchorage

- Type 316 stainless steel at all submerged, buried, and corrosive areas
- Galvanized ASTM F1554 at covered, non-corrosive areas
- Concrete anchors set in hardened concrete shall be adhesive or wedge type
- Adhesive anchors required at all submerged or buried locations and where subject to vibration

## Design Loads

### Dead Loads

Dead loads used in the calculations shall consist of only permanent dead load, defined as weight of the structural member, weight of material of construction incorporated into the structures to be supported permanently by the structural members, and weight of permanent building mechanical service equipment. Weight of process equipment shall be considered a live load.

### Live Loads

Live loads are loads produced by the use and occupancy of the structure and include process equipment loads and associated concrete pads. Equipment loads and pads do not have to be independently accounted for if they do not exceed the uniform design live load.

### Snow Loads

- Ground Snow Load,  $p_g = 25$  pounds per square foot (psf)
- Exposure Factor,  $C_e = 1.0$
- Thermal Factor,  $C_t =$  varies based on structure
- Snow Load Importance Factor,  $I_s = 0.8$
- Minimum Roof Snow Load,  $p_f = 25$  psf
- Drift loads in accordance with ASCE 7-16

### Wind Loads

- Ultimate Wind Speed: 91 miles per hour
- Exposure: D
- Risk Category: I

### Seismic Criteria

- 0.2 Second Mapped Spectral Response,  $S_s = 1.57$  g
- 1.0 Second Mapped Spectral Response,  $S_1 = 0.61$  g

- Site Class = D (assumed)
- 0.2 Second Spectral Response,  $SDS = 1.26\text{ g}$
- 1.0 Second Spectral Response,  $SD1 = 0.69\text{ g}$
- Seismic Importance Factor,  $I_e = 1.0$
- Seismic Design Category = D

## Geotechnical Information

Due to the cultural resources of the area, a geotechnical investigation has not been conducted at the site.

- Allowable Soil Bearing Pressure: 1,500 psf based on recommendations set forth in Chapter 18 of the IBC
- Frost depth: 12 inches per local jurisdiction
- The site is not permitted to be excavated more than 20 inches per the previous cultural resources investigation

## Structure Descriptions

Numerous pre-fabricated containers will be located throughout the site. Due to the wind and seismic loads, it is anticipated that the containers will need to be anchored to concrete pads to resist sliding forces. The slab-on-grade cast-in-place reinforced pads will be sized accordingly and will have a bearing elevation 12 inches below surrounding grade to meet frost depth requirements.

A prefabricated enclosure designed by others will be supported on a reinforced slab-on-grade cast-in-place foundation. The foundation will be designed to support the applied enclosure loads and will extend to frost depth.

The electrical room will be located within the existing “bunker” structure. A small portion of the existing concrete stem wall and floor slab will be required to be removed to install new conduit. A new concrete housekeeping pad may be required to support electrical equipment within the structure. The height of an existing door will be increased which will result in minor wood reframing at the wall.

## Mechanical

### Piping

Project piping will be PVC piping. Where secondary containment is required, double-walled PVC piping with leak detection will be used. PVC piping, fittings, and valves installed outdoors will be field coated with Latex Acrylic for UV light protection unless heat traced and insulated. Table 4 lists applicable piping codes.

Table 4. Piping Codes

Reference	Title
ASME B31.3	Process Piping
ASTM D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2464	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
ASTM D2855	Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
ASTM F402	Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings
ASTM F437	Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F439	Socket Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F441	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F493	Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F656	Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic
ASTM F1970	Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems

## Building Mechanical

Key building mechanical design elements are described below. The following sections will describe the applicable codes, ambient design conditions and relevant systems descriptions. Building mechanical system designs will be coordinated with the premanufactured enclosures supplier to ensure each enclosure meets health and safety standards.

### Applicable Codes and Standards

Applicable codes and standards relevant to the mechanical, plumbing, and fire protection design are included in the following table. Table 5 highlights the most recognizable codes and should not be considered inclusive of all relevant codes and standards.

Table 5. Applicable Codes and Standards

Abbreviation	Full Code
IBC	2018 International Building Code
IFC	2018 International Fire Code
IFGC	2018 International Fuel Gas Code
IMC	2018 International Mechanical Code
UPC	2018 Uniform Plumbing Code
WSEC	2018 Washington State Energy Code
ASHRAE 90.1	Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Design Guides	American Society of Heating Refrigerating and Air-Conditioning Engineers Design Guidelines
SMACNA Design Guidelines	Sheet Metal and Air Conditioning Contractors' National Association Design Guidelines

## HVAC Design Criteria

Heating and cooling equipment sizing shall be based upon the [2021 ASHRAE weather data](#) for Port Angeles (Fairchild Airport), Wash. The ASHRAE 0.4 percent and 99.6 percent design values are commonly used for equipment sizing. Areas where high outdoor air ventilation rates may lead to freezing conditions should take into consideration the extreme temperature values. Refer to Table 6.

Table 6. Ambient Design Conditions (Port Angeles, Wash., WMO: 727885)

Winter Design (99.6%) <sup>a</sup>		Summer Design (0.4%) <sup>b</sup>			Extreme Annual Temperature <sup>c</sup>		Extreme (n-20) <sup>c</sup>	
Heating DB (°F)	Humidity DP (°F)	Cooling DB/MCWB (°F)	Evaporation WB (°F)	Dehumidity DP (°F)	Minimum DB/WB (°F)	Maximum DB/WB (°F)	Minimum DB (°F)	Maximum DB (°F)
25.3	15.4	78.8/62.0	63.2	59.1	20.2/18.7	87.3/66.7	12.4	95.0

a. 99.6% of the time, values are above this temperature in the winter (typical design minimum).

b. 0.4% of the time values are above this temperature in the summer (typical design maximum).

c. Extreme = Highest or lowest value seen in a 20-year period.

Table abbreviations:

DB = Dry bulb temperature

DP = Dew point temperature

MCWB = Mean coincident wet bulb temperature

WB = Wet Bulb Temperature

HVAC systems for occupied areas, and other areas that require heating or cooling, will be designed using the ambient design conditions noted in Table 5. As stated above, areas that require large amounts of ventilation air will consider the extreme ambient conditions to prevent freezing of process and plumbing piping.

Packaged or split system heat pumps with supplemental electric heating will be the basis of design for conditioned areas such as the prefabricated offices and electrical rooms. Ventilation for other premanufactured areas will be coordinated with the enclosures' manufacturers and coordinated to ensure all safety measures are met and all applicable building codes are followed.

## Plumbing Design Criteria

Plumbing systems installed in occupied areas will meet the local plumbing codes. Sanitary and domestic water will be provided in areas where those services are required for human sanitation, or when the process mechanical systems require plumbing.

Emergency showers and eyewashes will be provided where chemicals are utilized and stored, and where determined by good engineering practice and the Owner deems necessary. Safety guidelines, such as OSHA, will be referenced to ensure the areas are safe for staff.

## Fire Protection Design Criteria

Fire protection systems are expected to be limited. Areas classified as hazardous storage, such as those that store chemicals in sufficient quantities, will have fire suppression as required by the Building and Fire codes and as determined by the local Fire Inspector. Water based systems will be considered based upon available site utilities, but self contained chemical based systems may be required. Chemical based systems, if required, will be coordinated with current State or Washington environmental regulations. The most environmentally friendly system suitable for the application will be utilized.

## Electrical

Key electrical design elements are described below.

### Applicable Codes and Standards

Electrical systems will be designed in accordance with the codes and standards listed in Table 7.

Table 7. Electrical Codes and Standards	
Reference	Title
NECA-1	National Electrical Contractors Association–Standard Practices for Good Workmanship in Electrical Contracting
NFPA	National Fire Protection Association
NFPA-70	National Electrical Code (NEC)
NFPA-70E	Standard for Electrical Safety in the Workplace
ANSI C2	National Electrical Safety Code (NESC)

Electrical and communications equipment and materials and products will be listed for the purpose for which they are to be used, by an independent testing laboratory. Three such organizations are Underwriters Laboratories, Canadian Standards Association, and Electrical Testing Laboratories. Independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.

### Electrical System Description

The following describes components of the electrical system proposed for the EC facility.

#### Utility Coordination

- Utility: Port Angeles Public Works & Utilities Department
- Electrical Service Application for Port Angeles Public Works & Utilities Department submitted.
- 739KVA (Demand), 480/277V secondary metered service is required to support the new EC Facility loads and existing Chip Handling facility loads currently fed out of the Chip Handling Facility Bunker Building (Bunker Building).
- PoPa will install a new 1,000KVA, 12.47kV-480/277V 3P4W outdoor substation transformer as part of this project. Will replace the current 300kVA Utility transformer located on the existing Utility Transformer cable vault, located on the northwest side of the existing Bunker Building.

#### Electrical Demolition

- Removal of the existing 300kVA utility transformer (by Utility).
- Existing transformer secondary conductors and conduit removal between transformer vault and Bunker Building.
- Removal of electrical equipment within the Bunker Building associated with the decommissioned chip handling equipment.
- Removal and relocation of existing distribution equipment within the Bunker Building associated with area lighting, convenience receptacles and stormwater treatment process.



### **Cable/Raceways**

- Power, control and communication cable and raceways above grade on site. No site trenching will be permitted.
- **Cable:** Power and Control: XHHW-2 Cu, 600V insulation for exterior 480, 277/120V power and control feeders.
- **Raceways:** Schedule 80 PVC conduit raceways or FG cable trays for Power/Control/ Communication cabling.

### **Lighting**

- Lighting and associated lighting controls will be provided within and on the exterior of EC Containers and Facility Trailers as part of EC packages. Container and trailer lighting power/control will be part of the EC Trailer/Container packages.
- No additional site lighting provided.
- Lighting and lighting upgrades will be provided within the existing Bunker electrical room and new electrical shed as required.
- Emergency Lighting and Exit Signage for life safety, where required, will use integral battery units.
- Lighting and lighting controls will meet current Washington State Non-Residential Energy Code.

### **Receptacles**

- 480V: No 480V general or welding receptacles will be provided.
- 120V: Convenience receptacles will be provided in the Bunker Building, Electrical Shed and within the Facility Trailers. Additional 120V receptacles within the EC containers shall be supplied by EC.

### **Electric Heat Trace**

- Outdoor process and water lines needing freeze protection will be electrically heat traced. Heat trace distribution and control equipment will be located within the Electrical Shed.

### **Equipment grounding**

- Grounding and bonding per NEC Section 250.
- 1-2 ground rods provided at each EC container containing process skids, Facility trailers, and electrical shed.
- Grounding conductors will be installed in raceways to meet NEC, installed above grade on site. No site trenching will be permitted.

### **Provisions for standby power**

- No emergency or standby power will be provided for this facility.
- Provisions for future connection to 480/277V portable standby generators to support select loads will be provided at select distribution panelboards located in the site electrical shed, if required. Size to be determined during site development.

### **Systems Not Included or by Others**

- Security Systems
- Fire Alarm Systems
- Lighting and Lighting Control (except as noted above)
- Lightning Protection Systems

## Data Communication and Network Systems

### Applicable Codes and Standards

The data communication and network systems will be generally designed and tested in accordance with the codes and standards listed in Table 8.

Table 8. Data Communication and Network Codes and Standards	
Reference	Title
EIA	Electronics Industries Alliance
TIA	Telecommunications Industry Association
NFPA-70	National Electrical Code (NEC)
ANSI C2	National Electrical Safety Code (NESC)

### Communication and Network Systems Description

- The network will be a Ring Network, with short connections made via Cat6a, and longer connections made via Fiber Optic.

### Cable/Raceways

- Control and communication cable and raceways installed above grade on site. No site trenching will be permitted.

#### Cable

- Cat 6a Ethernet Cable, Shielded, 4 twisted pair, 26 American Wire Gauge (AWG) PVC Jacket, Blue
- Fiber Optic: Plenum, 6-strand OS2 9/25 single mode
- Control signal wires: 18 AWG twisted shielded pair

### UPS

- An uninterruptible power supply (UPS) will be provided and installed within the Facility Trailer as a means of providing continuous power to networking, controls and communication equipment.

## Section 4: Process Description and Equipment

This section summarizes the EC process and equipment to be used at the proposed EC facility. The EC process follows the simplified diagram shown on Figure 1, with references to individual streams. The process takes in seawater (A) where it is first filtered for unwanted particulates and removal of biologics. It is then treated through two, high-pressure membrane filtration processes: nanofiltration (NF) and reverse osmosis (RO). The rejects and flush operations from these generate one outfall stream (3) and two working fluids, RO Concentrate and RO Permeate (D, E). The working fluids (D, E) then go through BPED where an electro-chemical reaction takes place to generate an acid (G) and alkaline product (1). The acid product (G) is either taken off site or reacted with mafic/ultramafic rocks (I) to neutralize. This process fluid (G) is then treated to remove particulate matter and metals. It then is added to the outfall mixture (2).

The three outfall streams (1,2, and 3) then combine to form the alkalinity-enhanced outfall solution which mixes with ambient seawater in the bay. Due to the increased alkalinity, the dissolved inorganic carbon (DIC) is out of equilibrium which causes removal of atmospheric carbon dioxide and in turn storage as bicarbonate.

### Process Equipment

Major components included in the proposed process are summarized below. Details on key pieces of process equipment and relevant sizing information are also provided. A detailed process and instrumentation diagram (P&ID) exists as a controlled document for the system. Tag references are provided in Tables 8 through 16 below.

#### Intake

The intake system as described in Table 9 will be used to withdraw seawater from the harbor and transport it to the onshore site. As part of the intake system macro particulates will be prevented from entering the system.

Table 9. Intake Equipment

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0170	U-1020	Intake Pump	40 HP	Exercises with U-1021
EBB-0170	U-1021	Intake Pump	40 HP	Exercises with U-1020
EBB-0170	VF-1011	Macro filter	x micron	To be determined.

#### Mixed Media Filters

The mixed media filters (MMF) described in Table 10 are responsible for filtering out fine particulate and organic matter to protect downstream equipment. Flushes of these filters happen periodically and are sent to the outfall as part of "Pretreatment Reject".

Table 10. Mixed Media Filters

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0022	VF-2011	Carbon Filter	50 micron	
EBB-0022	VF-2014	Sand Filter		To be determined.
EBB-0022	VF-2017	Granulated Activated Carbon		To be determined.
EBB-0022	U-2023	Pretreat Feed Pump	40 HP	

## Nanofiltration

The NF system as described in Table 11 is responsible for removal of divalent ions or “hardness” from the process water to protect downstream equipment. The removed material remains dissolved in solution and goes to the outfall as the “Pretreatment Reject” stream.

Table 11. Nanofiltration

Container ID	P&ID Tag	Description	Sizing (HP)	Notes
EBB-0023	U-2023	NF Booster Pump	40	
EBB-0023	VF-2025	NF Stage 1		To be determined.
EBB-0023	U-2031	NF Stage 2 Booster Pump	25	
EBB-023	VF-2032	NF Stage 2		To be determined.

## Reverse Osmosis

The RO system as described in Table 12 is responsible for separation of permeate water and RO concentrate, which are used as working fluids downstream. Flushes of this system happen periodically and are sent to the outfall as part of “Pretreatment Reject.”

Table 12. RO Equipment

Container ID	P&ID Tag	Description	Sizing (HP)	Notes
EBB-0040	U-2050	RO Feed Pump	15	
EBB-0040	U-2057	RO Booster Pump	125	
EBB-0040	VF-2062	RO Vessel		To be determined.

## Fluid Storage

Process fluids are stored throughout the process to allow for asynchronous subsystem operation and process quality control checks. See Table 13.

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0031	V-2043	Softened Seawater Tank	21,000 gal	Mobile storage tank
EBB-0060	V-2115	RO Concentrate Tank	21,000 gal	Mobile storage tank
EBB-0070	V-2384	Pretreat Clean-in-Place Tank		Intermediate Bulk Container Inside container
EBB-0050	V-2515	RO Permeate Tank	8,300 gal	Mobile storage tank
EBB-0081 EBB-0082	V-3101, 3201, 3301	ED Module Process Tanks	500 gal	Rotomolded tank Inside container Store: acid, base, salt
EBB-0081 EBB-0082	V-3152, V-3252, V-3352	ED Module Product Tanks	500 gal	Rotomolded tank Inside container Store: acid, base, salt
EBB-0091 EBB-0092	V-3401	ED Module Redox Solution Tank	250 gal	Intermediate Bulk Container Inside container Stores sodium sulfate
EBB-0091 EBB-0092	V-3410	ED Module Sulfuric Acid Tank	30 gal	Inside container Stores sulfuric acid
EBB-0100	V-4301	Acid Product Tank	21,000 gal	Mobile storage tank Double-walled
EBB-0151	V-4701	Solid Alkaline Holding Basin	Multiple 2.4 cubic yds	ECO-pan Covered Multiple in storage area
EBB-0161	V-5025	Product Mixing Tank	21,000 gal	Mobile storage tank Double-walled
EBB-0130	V-5200	Alkaline Product Tank	21,000 gal	Mobile storage tank Double-walled

## Bipolar Electrodialysis

The BPED system is responsible for the conversion of RO concentrate to acid and alkaline products. There are two repeats of this system. See Table 14.

Table 14. Bipolar Electrodialysis

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0091 EBB-0092	Z-3701	BPED Stack	30 kW	6 per module
EBB-0081 EBB-0082	U-3112, 3212, 3312	Process Pumps	3 HP	
EBB-0081 EBB-0082	U-3160, 3260, 3360, 3370	Transfer Pumps	1 HP	
EBB-0091 EBB-0092	U-3405	Process Pump	1 HP	
EBB-0091 EBB-0092	B-3605	Air Blower	0.25 HP	

## Acid Neutralization

The acid neutralization system summarized in Table 15 is responsible for reacting the acid product with solid alkaline feedstocks. After this the process solution goes for post treatment. The solids are transported in and out of the site as required.

Table 15. Acid Neutralization

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0140	U-4730	Slurry Pump	3 HP	
EBB-0140	U-4308	Acid Pump	3 HP	
EBB-0140	V-4702	Acid Reactor		Integrated mixing motor

## Post Treatment

The post-treatment system will be used to remove solid particulate and leached metals from the acid neutralization process. After post treatment, the process fluid flows to the outfall as “Reacted Acid”.

Table 16. Post Treatment

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0140	VF-4760	Solid Separator		To be determined.
EBB-0140	VF-4766	Particulate Filter		To be determined.
EBB-0140	VF-4767	Granulated Activated Carbon		Preliminary <a href="https://www.cleanwayusa.com/product/metalzorb/">https://www.cleanwayusa.com/product/metalzorb/</a>
EBB-0140	VF-4768	Metal Extraction		Preliminary <a href="https://proaquawater.com/collections/media">https://proaquawater.com/collections/media</a>

## Outfall

A barge-mounted multi-port outfall diffuser pipe will be used to return the alkaline-enhanced process fluid to Port Angeles Harbor. It will also act as the primary monitoring point for the process effluent at the point of discharge. Equipment associated with the outfall is listed in Table 17. Attachment B includes proposed barge layout and diffuser pipe and port configuration schematic drawings.

Table 17. Outfall

Container ID	P&ID Tag	Description	Sizing	Notes
EBB-0180	FD-1205	Outfall diffuser pipe		See Attachment B
EBB-0180	TT-5032	Temperature probe	N/A	
EBB-0180	CPT-5034	pH sensor	N/A	
EBB-0180	RT-5036	Turbidity sensor	N/A	
EBB-0180	FT-5048	Flow meter	N/A	

## Process Controls

The automated controls for the system are developed and implemented by EC. By design there are multiple layers of automation to keep the system functioning safely and efficiently. The level of control and safety needed for a process is determined by a detailed Failure Mode and Effects Analysis (FMEA) conducted under industry standard constraints.

### Emergency Power Off

The system has the ability to Emergency Power Off (EPO) in case of situations that present high severity risks. This can be triggered by manual push buttons on the exterior of process equipment or through select process sensors. The intent of the EPO system is to quickly stop an unsafe event from evolving, but the system is not necessarily safe for interaction after.

When an EPO is triggered, all equipment goes to its normal/safe state. This includes isolation valves closing, pumps stopping, and rectifiers going open circuit. After an EPO trigger, the system latches and an operator must manually reset it to resume operation. In the event of an EPO, notification is sent to the EC operations team. Any process that could lead to a high severity level based on the FMEA requires an EPO ability.

### Process Alarms

Individual subsystems have the ability to automatically shut down based on set process alarm values. These alarm settings are used to prevent a process from developing an issue for safety or quality.

Automated responses and alarm thresholds are determined based on the severity of the fault. All alarms will notify the EC operations team.

### Active Controls

Individual subsystems maintain their process through either a set of logic gates or state machines, depending on required complexity. These controls will modulate system setpoint and monitor the process to reach optimum performances.

Process data is constantly uploaded to the cloud for EC engineering staff to review and ensure proper operation. The control scheme will be updated as the process develops.

## Site Materials

Information on what materials are expected to be transported to and from, and stored at the site are detailed below. Washington Department of Transportation regulations will be followed whenever materials must be transported to or from the site. While working with materials onsite, all best practices will be used, and applicable codes followed.

Project Macoma, LLC, will follow all pertinent laws for properly managing and disposing of dangerous/hazardous waste, including Washington’s Hazardous Waste Management Act, Chapt. 70A.300 RCW and Chapt. 173-303 WAC, and the federal Resource and Conservation Recovery Act, 42 U.S.C. § 6901 et seq. and the regulations thereunder.

As part of the EC process carbon emissions are closely tracked, and minimized, including those from material transportation.

## Material Flows

Material and information flow is shown on Figure 3. Materials flowing into the site include: seawater, data, electricity, mafic/ultramafic rocks. Leaving the site is: alkalinity enhanced seawater, data, neutralized mafic/ultramafic rocks, diluted hydrogen and oxygen, and acid. Materials that are not detailed elsewhere are described below.

The mafic and ultramafic rocks that will be utilized are basalt and olivine. These are ideal feedstocks due to their abundance and alkaline nature. These will be mined from local sources in Washington State and will be transported by a combination of barge and truck to arrive at the site. They will be stored in impermeable containers and covered to prevent stormwater runoff. After treatment they will be transported to other partners or landfilled.

As a byproduct of the BPED process, hydrogen and oxygen gas are produced at ambient pressure. An air blower is used to dilute these gasses to less than 25 percent of the Lower Explosive Limit, or 1 percent in air. The gas is then vented at the high point of the container.

## Onsite Chemicals

Table 17 lists the chemicals expected to be onsite and maximum storage volumes. All chemicals will be stored on land. Safety Data Sheets are provided in Attachment C. Chemicals with hazardous characteristics are noted.

Chemical Name	CAS Number	Max Storage Volume	Site Location	Max Concentration	Hazardous	Combustible
Seawater	N/A	21,000 gal	EBB-0031	NA	N	N
Hydrochloric Acid	7647-01-0	21,000 gal	EBB-0100	5 wt%	Y	N
Sodium Hydroxide	1310-73-2	21,000 gal	EBB-0110	5 wt%	Y	N
RO Concentrate Water	7647-14-5	21,000 gal	EBB-0060	9 wt%	N	N
Deionized Water	7732-18-5	9,000 gal	EBB-0050	N/A	N	N
Sodium Hydrogen Sulfate	7681-38-1	250 gal	EBB-0091 EBB-0092	20 wt%	N	N
Sulfuric Acid	7664-93-9	10 gal	EBB-0091 EBB-0092	50 wt%	Y	N
pH 4, 7, 10 Buffer	127-09-3	5 gal	EBB-0201	NA	N	N
Conductivity Standard	7647-14-5	5 gal	EBB-0201	NA	N	N
Mercuric Chloride	7487-94-7	0.2 gal	EBB-0201	6.5 wt%	Y	N
Calmagite	3147-14-6	0.1 lbs	EBB-0201	Powder	Y	N
Ammonia Buffer	1336-21-6	0.5 gal	EBB-0201	10 wt%	Y	N
Sodium bicarbonate	144-55-8	50 lbs	EBB-0201	Powder	N	N
Citric Acid	77-92-9	250 gal	EBB-0070	3 wt%	N	N
Olivine Rock	1317-71-1	30-60 tons	EBB-0151	N/A	N	N



Table 17. Onsite Chemicals

Chemical Name	CAS Number	Max Storage Volume	Site Location	Max Concentration	Hazardous	Combustible
Basalt Rock	14808-60-7 Mix of silicates	30-60 tons	EBB-0151	N/A	N	N

## Electrical Equipment

Table 18 summarizes the electrical equipment that has been pre purchased for use at the EC facility.

Table 18. Pre-Purchased Electrical Equipment

Equipment Number	Equipment Manufacture/Model	Voltage	Size/Ampacity	Enclosure NEMA Rating	Location
Main Switchboard SE SWBD A	Schneider Sq-D Type QED-2 SE rated	480/277V 3PH/4W	2000A MB	NEMA 1	Bunker Electrical room
Switchboard SWBD A	Schneider Sq-D Type QED-2	480/277V 3PH/4W	800A MB	NEMA 1	Electrical shed
Panel C	Schneider Sq-D Type NF	480/277V 3PH/4W	200A MB	NEMA 3R	Bunker Electrical room
Panel D	Schneider Sq-D Type NF	480/277V 3PH/4W	200A MB	NEMA 3R	Electrical shed
Panel D1	Schneider Sq-D Type NQ	120/208V 3PH/4W	225A MB	NEMA 3R	Electrical shed
Transformer	Schneider Sq-D EXN75T3H	480D-120/208Y	75KVA	NEMA 1	Electrical shed

## **Attachment A: Port Angeles Mixing Analyses Technical Memorandum**

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# Technical Memorandum

Prepared for: Ebb Carbon (EC)

Project Title: Project Macoma, LLC, Preliminary Design

Project No.: 159812


## Technical Memorandum

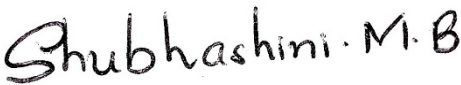
Subject: Port Angeles Mixing Analyses

Date: March 21, 2024

To: Todd Pelman (EC)

From: Matt DeBoer, Brown and Caldwell (BC)

Prepared by:   
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### Limitations:

*This document was prepared solely for Ebb Carbon, Inc. in accordance with professional standards at the time the services were performed and in accordance with the contract between Ebb Carbon, Inc. and Brown and Caldwell dated November 3, 2022. This document is governed by the specific scope of work authorized by Ebb Carbon, Inc; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by Ebb Carbon, Inc. and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.*

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## Section 1: Introduction

This Technical Memorandum (TM) evaluates potential water quality impacts of the Project Macoma, LLC, marine carbon dioxide removal (mCDR) system proposed to be constructed and operated temporarily at Terminal 7 of the Port of Port Angeles in Port Angeles, Washington. Project Macoma, LLC, is a wholly owned subsidiary of Ebb Carbon. Ebb Carbon has developed an mCDR technology to safely and permanently remove carbon dioxide (CO<sub>2</sub>) from the atmosphere while reducing seawater acidity locally. The pilot-scale system would use electrochemical processes to remove acid from the ambient seawater of Port Angeles Harbor. The produced alkaline seawater that remains would be returned to the ocean where it can absorb carbon dioxide (CO<sub>2</sub>) from the atmosphere and store it as bicarbonate—a safe and naturally abundant form of carbon storage in the ocean that doesn't acidify seawater.

The proposed Project Macoma facility would include a barge-mounted seawater intake and discharge outfall connected to process equipment and storage at the shoreline. The preliminary site layout is as shown in Figure 1-1.



Figure 1-1. Preliminary site layout

Brown and Caldwell (BC) analyses include hydrodynamic dilution modeling using Visual Plumes software (<https://www.epa.gov/ceam/visual-plumes>) and water quality/chemistry modeling using commercial OLI Systems software ([www.olisystems.com](http://www.olisystems.com)). Modeling analyses are supported by collected data, where available, and conservative assumptions. The combined results of the dilution and chemistry modeling support evaluation of compliance with applicable water quality standards.

## Section 2: Previous Analyses

The proposed facility will be a pilot scale version of an mCDR system developed by Ebb Carbon that has been running since Summer 2023 at the Department of Energy’s (DOE) Pacific Northwest National Laboratory (PNNL) in Sequim, Washington. The Sequim facility is currently discharging alkaline seawater produced by Ebb Carbon’s system from their existing wastewater outfall. Ebb Carbon is currently sampling water quality at the intake and several locations within the pre-treatment and electrochemical processes. PNNL has requested 2024 funding for monitoring carbonate chemistry in Sequim Bay. Data collected would be used to support and/or confirm the analyses presented herein.

In addition to PNNL, Ebb Carbon has partnered with other research institutions including the National Oceanic and Atmospheric Administration (NOAA) and the University of Washington to evaluate how its system could work at-scale and potential uses for acidic and alkaline process streams. Numerous experiments are being performed in parallel to understand biological and toxicological impacts on target species and to model the alkaline plume in the farfield beyond the immediate nearfield evaluated herein. Project Macoma, LLC will continue to partner with local scientific and academic partners to validate the efficacy and safety of the system.

## Section 3: Ambient Water Quality

Ambient water column density data was collected by Ecology in Port Angeles Harbor between 2001 and 2004 at Station PAH003. Ecology mapping shows Station PAH003 approximately 650 feet north of the proposed Project Macoma, LLC discharge location. During the data collection period, 29 water column profiles were collected, including density, salinity, and temperature, at 0.5-meter depth increments. Most profiles indicated some level of density stratification. For the dilution model analyses presented in Section 5, representative maximum (June 2004) and minimum (March 2004) stratification conditions were selected to evaluate potential critical dilution conditions. Table 3-1 summarizes water column density (kilograms per cubic meter (kg/m³)) data through a depth of 10 meters for the selected representative stratification conditions.

Table 3-1. Water Column Density–Maximum and Minimum Stratification Conditions		
Depth (meters)	Maximum Stratification (June 2004)	Minimum Stratification (March 2004)
	Density (sigma t, kg/m³)	Density (sigma t, kg/m³)
1.0		24.02
1.5	23.62	24.02
2.0	23.65	24.02
2.5	23.79	24.02
3.0	23.93	24.02
3.5	24.04	24.02
4.0	24.10	24.02
4.5	24.17	24.02
5.0	24.22	24.02
5.5	24.26	24.02
6.0	24.30	24.03



<b>Table 3-1. Water Column Density–Maximum and Minimum Stratification Conditions</b>		
<b>Depth (meters)</b>	<b>Maximum Stratification (June 2004)</b>	<b>Minimum Stratification (March 2004)</b>
	<b>Density (sigma t, kg/m<sup>3</sup>)</b>	<b>Density (sigma t, kg/m<sup>3</sup>)</b>
6.5	24.33	24.03
7.0	24.39	24.03
7.5	24.46	24.03
8.0	24.47	24.03
8.5	24.48	24.03
9.0	24.48	24.03
9.5	24.49	24.03
10.0	24.50	24.03

Additional ambient water quality samples were collected by Ebb Carbon at the proposed discharge location to characterize the specific chemical (cation and anion) distribution of the process intake water. Ambient samples were also collected to determine the presence of trace metals. Anion, cation, and trace metals data are provided in Attachment A.

## Section 4: Effluent Flow and Water Quality

The proposed Project Macoma, LLC, facility would produce three process streams, as shown schematically in Figure 4-1. Typically, the three process streams would be discharged as a combined flow through the outfall. However, Project Macoma, LLC, may operate the pilot facility, for limited durations, discharging only one or two of the component flow streams. These atypical operational strategies would provide additional data to Project Macoma, LLC, and further the understanding of potential impacts of the discharge to water chemistry/water quality. Each individual process stream is summarized as follows:

1. Outfall Stream 1 Alkaline Product–Saltwater solution with enhanced alkalinity produced via the bipolar electrodialysis (BPED) process.
2. Outfall Stream 2 Neutralized Acid–The acidic process stream produced via the BPED process is neutralized followed by post-neutralization settling and filtration. Neutralization may be achieved using mafic rocks (i.e., Olivine or basalt) or calcium carbonate (CaCO<sub>3</sub>).
3. Outfall Stream 3 Pretreatment Reject–Saltwater reject from various filtration pretreatment steps. Most of this stream is comprised of nanofiltration (NF) membrane reject, but the process stream also includes flushes of other pretreatment processes as part of routine maintenance.



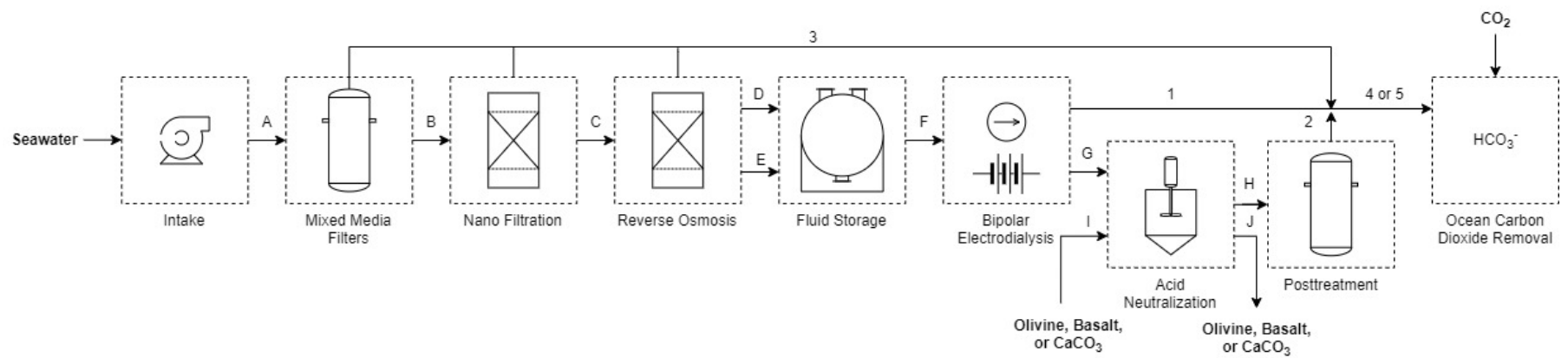


Figure 4-1. Process flow diagram

The dilution and water chemistry modeling discussed in this TM evaluated five discharge scenarios (and sub-scenarios) that reflect different combinations of process flow streams. Predicted effluent flow, pH, temperature, and density are summarized in Table 4-1 for the proposed scenarios. Table 4-1 also identifies anticipated frequency and duration for routine, maintenance, and scientific (targeted data collection) operating scenarios. These results and additional water chemistry data and assumptions specific to the water chemistry modeling are discussed in Section 6. Anion/cation and trace metals data for the effluent scenarios are provided in Attachment A. Trace metals data are based on samples collected in Port Angeles Harbor and from the Pretreatment Reject stream from the pilot at the PNNL facility.

Table 4-1. Effluent Flow and Water Quality Summary

Scenario	Frequency	Duration	Discharge Flow (L/hr)	Temperature (deg C)	Density (kg/m <sup>3</sup> )	pH (s.u.)
<b>Scientific Operations</b>						
Scenario 1a–Alkaline Product Only (13.9 pH)	Not discharged–See Section 5.3		5,900	30.0	1,072	13.9
Scenario 1b–Alkaline Product Only (13.5 pH)	A few times per month	Single tidal cycle	5,900	30.0	1,028	13.5
Scenario 5b–All 3 Process Flows (CaCO <sub>3</sub> neutralization) <sup>a</sup>	1 or 2 times over project lifetime	Single tidal cycle	38,800	20.4	1,038	12.1
<b>Maintenance Operations</b>						
Scenario 2a–Neutralized Acid Only (with Olivine)	Weekly	<8 hours	5,900	30.0	1,020	2.3
Scenario 2b–Neutralized Acid Only (with CaCO <sub>3</sub> )	Weekly	<8 hours	5,900	30.0	1,028	8.1
Scenario 3–Pretreatment Reject Only	Weekly	<8 hours	27,000	17.0	1,042	7.1
Scenario 4a–Neutralized Acid (with Olivine) + Pretreatment Reject	Weekly	<8 hours	32,900	19.3	1,038	6.4
Scenario 4b–Neutralized Acid (with CaCO <sub>3</sub> ) + Pretreatment Reject	Weekly	<8 hours	32,900	19.3	1,039	6.8
<b>Routine Operations</b>						
Scenario 5a–All 3 Process Flows (with Olivine neutralization) <sup>1</sup>	Daily	50% operating capacity	38,800	20.4	1,037	9.8

a. Scenarios 5a and 5b assume contribution of the alkaline product at a pH of 13.9 (Scenario 1a).

L/hr. = liters per hour; deg C = degree Celsius; s.u. = standard units

## Section 5: Model Predicted Initial Dilution

BC evaluated predicted dilution using the outfall dilution model UM3, as included in the most recent release of the United States Environmental Protection Agency (USEPA)-supported Visual Plumes modeling package (<https://www.epa.gov/ceam/visual-plumes>). The model is applicable to submerged single and multi-port diffusers with both positively or negatively buoyant plumes. BC selected Visual Plumes for dilution modeling since it is well proven and widely used in Washington and is appropriate for the type of discharge and receiving water conditions. Model results provide predicted effluent plume dilution and effluent plume dimensions, including whether the plume rises to the surface or traps at neutral buoyancy within the water column.

## 5.1 General Plume Mixing Concepts

The mixing of effluent discharged from an outfall to receiving waters is typically described in two distinct phases: 1) rapid initial dilution in the nearfield, and 2) slower subsequent dilution in the farfield. Rapid initial dilution in the nearfield has two distinct physical components. The first component is turbulent jet mixing and entrainment resulting from the momentum of the discharge exiting the diffuser ports. The second component is turbulent mixing and entrainment resulting from the plume rising (or falling) in the water column due to the effluent buoyancy. When the jet momentum and buoyancy mixing forces dissipate, the slower process of subsequent dilution continues in the farfield. Mixing and dispersion in the farfield occurs along the boundaries of the plume, primarily in the horizontal plane laterally and longitudinally as the plume is carried by ambient currents. The dilution analysis in this section conservatively reports minimum initial dilution after completion of nearfield mixing.

## 5.2 Key Model Input Parameters

Input parameters to the UM3 model include the physical configuration of the proposed outfall discharge, and effluent and receiving water characteristics. Input parameters were selected consistent with the guidance provided in Ecology's Permit Writer's Manual (Ecology 2018).

### 5.2.1 Effluent Scenarios

BC performed dilution model analyses for the five scenarios and the discharge characteristics as shown in Table 4-1. The Ebb Carbon process is not influenced by seasonal conditions nor are flows anticipated to fluctuate significantly while process equipment is operational. The flows and effluent characteristics in Table 4-1 are conservatively representative of maximum daily and monthly conditions.

### 5.2.2 Ambient Conditions

Water column density, including representative maximum and minimum stratification conditions, are shown in Table 3-1. Model runs for each scenario were evaluated using both maximum and minimum stratification conditions.

Ambient current speed and direction data are not available for the proposed discharge location; however, current speed distribution was measured to support dilution analyses of the Port Angeles municipal wastewater treatment facility which discharges to Port Angeles Harbor near the Harbor mouth (Ecology 2016). Reported 10<sup>th</sup> and 50<sup>th</sup> percentile current speeds for Outfall 001 at the Harbor mouth are 5.6 centimeters per second (cm/s) and 15.5 cm/s, respectively. For the present analyses, current speeds are conservatively assumed to be lower within the Harbor (10<sup>th</sup> percentile = 2 cm/s and 50<sup>th</sup> percentile = 5 cm/s). Ambient current direction was conservatively assumed to be co-flowing with the effluent (cross current flows result in higher predicted dilution).

### 5.2.3 Discharge Parameters

The proposed outfall discharge will be a barge-mounted multi-port diffuser located as shown in Figure 1-1. Water depth at the barge location, immediately adjacent to the pier, is approximately 25 feet mean lower low water (MLLW). Preliminary diffuser design parameters were selected to combine different momentum and negative buoyancy regimes to maintain the effluent plume near the water surface (promoting CO<sub>2</sub> absorption) and maximize dilution. Specifically, port depth and discharge angle, were used to generate initial plume trajectory upward through the water column before momentum dissipates and negative buoyancy draws the effluent plume downward prior to reaching equilibrium with ambient density.

Input parameters used for model analyses include the following:

- Number of Ports = 25
- Port Diameter = 0.5 inches
- Port Spacing = 2 feet
- Port Discharge Angle = 45 degrees
- Port Depth = 2 meters

#### 5.2.4 Mixing Zone Dimensions

Applicable mixing zone dimensions for discharges that meet all known, available and reasonable methods of prevention control and treatment (AKART) are established in Washington Administrative Code (WAC) 173-201A-400. The proposed mCDR technology and discharge do not have established AKART. The mCDR process, as described in Section 4, is state-of-the-art technology designed to return alkaline seawater to Port Angeles Harbor waters via a diffuser that promotes nearfield mixing. The design of the system increases localized pH values to achieve project goals, removing CO<sub>2</sub> safely and responsibly, without concentrating toxic parameters or other parameters impacting aquatic life uses within the mixing zone. Therefore, the proposed process and discharge meet AKART requirements and should be granted a mixing zone.

The analyses herein assume a designated chronic mixing zone of 207 feet in any horizontal direction of the diffuser ports and including the entire vertical water column. Acute water quality criteria apply within a smaller portion of the designated mixing zone, limited to 10 percent of the chronic mixing zone (20.7 feet), and including the entire vertical water column.

Figure 5-1 provides a plan view of the mixing zone with applicable dimensions scaled to the proposed outfall diffuser and in relationship to the existing pier and facility location.

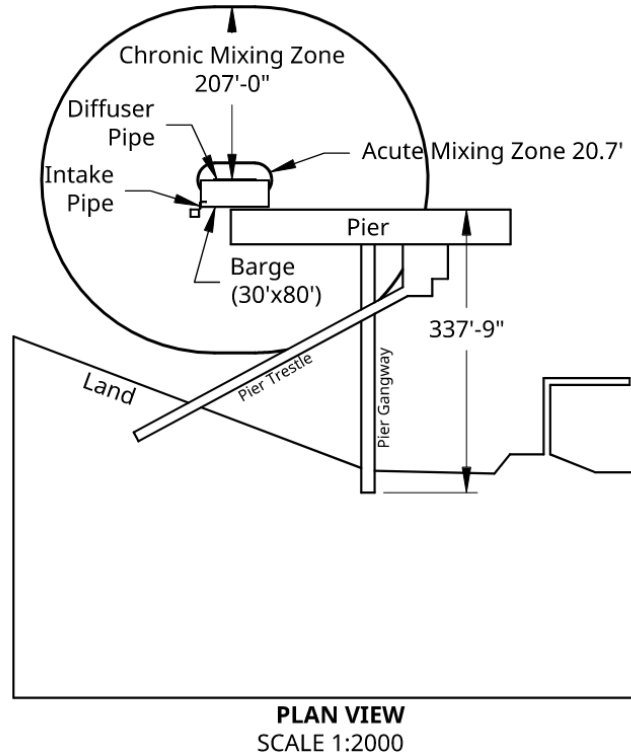


Figure 5-1. Mixing zone plan view

## 5.3 Model Results

Dilution model runs indicate that minimum dilutions occur for all scenarios using maximum stratification conditions. All model results presented herein conservatively assume maximum stratification conditions. Under these stratification conditions, and based on the diffuser port design, the effluent plume trajectory is initially upward through the water column before momentum dissipates and negative buoyancy draws the effluent plume downward prior to reaching equilibrium with ambient density. For most scenarios, the effluent plume is generally bounded within the upper 3 meters of the water column, changing between minimum and maximum depths as the governing dynamics transition from momentum- to buoyancy-based driving forces. However, due to the high density of Scenario 1a, the effluent plume is predicted to quickly reach depths near or at the sea bottom at low current speeds (in the range of those assumed for acute conditions) prior to rising slightly and attaining neutral buoyancy. Because it is desirable for the effluent plume to be near the water surface to promote carbon dioxide absorption, Project Macoma would not operate at the identified Scenario 1a conditions. Project Macoma proposes to use 13.9 pH alkaline process stream waters when combined with other process streams (Scenarios 5a and 5b) but would control alkaline process stream pH at 13.5 or below if discharged alone (Scenario 1b).

For all proposed discharge scenarios, the effluent plume achieves neutral buoyancy with the ambient harbor waters within approximately 12 meters (40 feet) laterally from the multi-port diffuser at the assumed 50<sup>th</sup> percentile current speeds. The lateral distance to achieve neutral buoyancy decreases at lower current speeds. The UM3 model terminates at this neutral buoyancy (nearfield) location. Additional farfield dilution occurs within the chronic mixing zone, but at a much lower magnitude. The model results herein conservatively report minimum initial dilution at the acute mixing zone boundary and at completion of nearfield mixing. Minimum nearfield mixing is used for analyses at the chronic mixing zone in Section 7.

Table 5-1 summarizes dilution model results for the proposed effluent scenarios, including minimum acute and nearfield dilution, nearfield mixing distance, and range of effluent plume centerline depth. Minimum acute and nearfield dilutions assume 10<sup>th</sup> percentile and 50<sup>th</sup> percentile ambient current speeds, respectively. UM3 model input/output data are provided in Attachment B.

**Table 5-1. Dilution Model Results Summary**

Scenario	Minimum Acute Dilution <sup>a</sup>	Minimum Nearfield Dilution <sup>b</sup>	Nearfield Mixing Distance (m)	Effluent Plume Centerline Depth (m)
Scenario 1b–Alkaline Product Only (pH = 13.5)	240:1	580:1	8.6	1.8–2.8
Scenario 2a–Neutralized Acid Only (Olivine)	160:1	415:1	9.8	1.2–2.0
Scenario 2b–Neutralized Acid Only (CaCO <sub>3</sub> )	240:1	580:1	8.6	1.8–2.8
Scenario 3–Pretreatment Reject Only	215:1	520:1	11.6	1.5–5.1
Scenario 4a–Neutralized Acid (Olivine) + Pretreatment Reject	160:1	415:1	10.9	1.3–4.1
Scenario 4b–Neutralized Acid (CaCO <sub>3</sub> ) + Pretreatment Reject	170:1	430:1	11.1	1.3–4.4
Scenario 5a–All Process Flows (Olivine neutralization)	145:1	390:1	11.7	1.1–3.8
Scenario 5b–All Process Flows (CaCO <sub>3</sub> neutralization)	150:1	395:1	11.4	1.2–4.0

a. Minimum acute dilution reported at the effluent plume centerline

b. Minimum nearfield dilution reported as the flux average dilution of the effluent plume.

Model predicted dilution ratios presented in Table 5-1 do not account for effluent reflux, the long-term buildup of effluent in tidally impacted areas. Reflux has not been quantified within Port Angeles Harbor. Ecology guidance in the Permit Writer's Manual conservatively recommends reducing measured/predicted

dilution by a factor of two to account for unquantified tidal reflux. The water quality analyses in Section 7 address reflux and the impact on model predicted dilution using the conservative Ecology guidance.

## Section 6: Water Chemistry Modeling

BC evaluated mixed water chemistry using the commercial water chemistry modeling software OLI Studio ([www.olisystems.com](http://www.olisystems.com)). The software is an electrolytic water chemistry model based on first principles, that provides the predicted equilibrium composition of blended streams under variable conditions. Specific model outputs of interest were the mixed pH and the potential for solids formation within the mixed effluent plume.

### 6.1 Chemistry Model Input Data

Ebb Carbon provided the water quality data and ion concentrations for ambient Port Angeles Harbor waters and the three process streams generated onsite (see Section 4) to be used as modeling input. The chemistry model input data is tabulated in Attachment A, Table A-1 (ambient) and Table A-2 (process streams).

To conduct water chemistry modeling, the following assumptions were made:

- Ionic charge balance of the waste streams was performed by adjusting (adding or removing) chloride ions prior to the blending evaluation.
- The alkaline process stream in Scenarios 1a and 1b was assumed to be a pure stream of sodium hydroxide (NaOH) with a pH of 13.9 or 13.5, respectively. The solution strength of NaOH necessary to reach the target pH was generated in the model.

### 6.2 Water Chemistry Modeling

This section provides example dilution calculations used for the chemistry modeling and presents findings related to predicted pH trends and potential particulate formation.

#### 6.2.1 Dilution Ratios

The process stream scenarios were modeled at various dilution ratios. The dilution ratio is calculated by dividing the total volume of process stream and harbor water with the incoming process stream volume. For example, a dilution ratio of 10 = (5,900 L/hr process stream + 60,000 L/hr harbor)/5,900 L/hr process stream. The dilution ratios were simulated by using a fixed volume of process stream entering the Port Angeles Harbor waters and considering the addition of increasingly higher volumes of Port Angeles Harbor water. Examples of a few selected dilution ratio calculations are presented in Table 6-1. Model outputs, including mixed pH, ion concentrations and potential precipitation for each scenario, are summarized and presented in Attachment C.

Table 6-1. Blending Ratios Calculation Examples			
Process stream volume L/hr	Port Angeles Harbor volume L/hr	Total volume L/hr	Dilution Ratio
5,900	761,100	767,000	130
5,900	1,410,100	1,416,000	240
5,900	1,646,100	1,652,000	580

## 6.2.2 pH Trends

For Scenarios 2 through 4, the process stream pH is near ambient pH (7.8) at the point of discharge and achieves a mixed pH equal to the ambient at dilutions less than 100:1. For Scenarios 1 and 5, the process stream pH is significantly higher than the ambient pH. For these scenarios, mixed pH initially decreases rapidly or after periods of steps where pH changes little with dilution (Figure 6-1). Mixed pH for Scenario 1b achieves a value within 0.5 standard units at a dilution of approximately 500:1. Mixed pH for Scenarios 5a and 5b achieve a value within 0.5 standard units at a dilution of approximately 200:1.

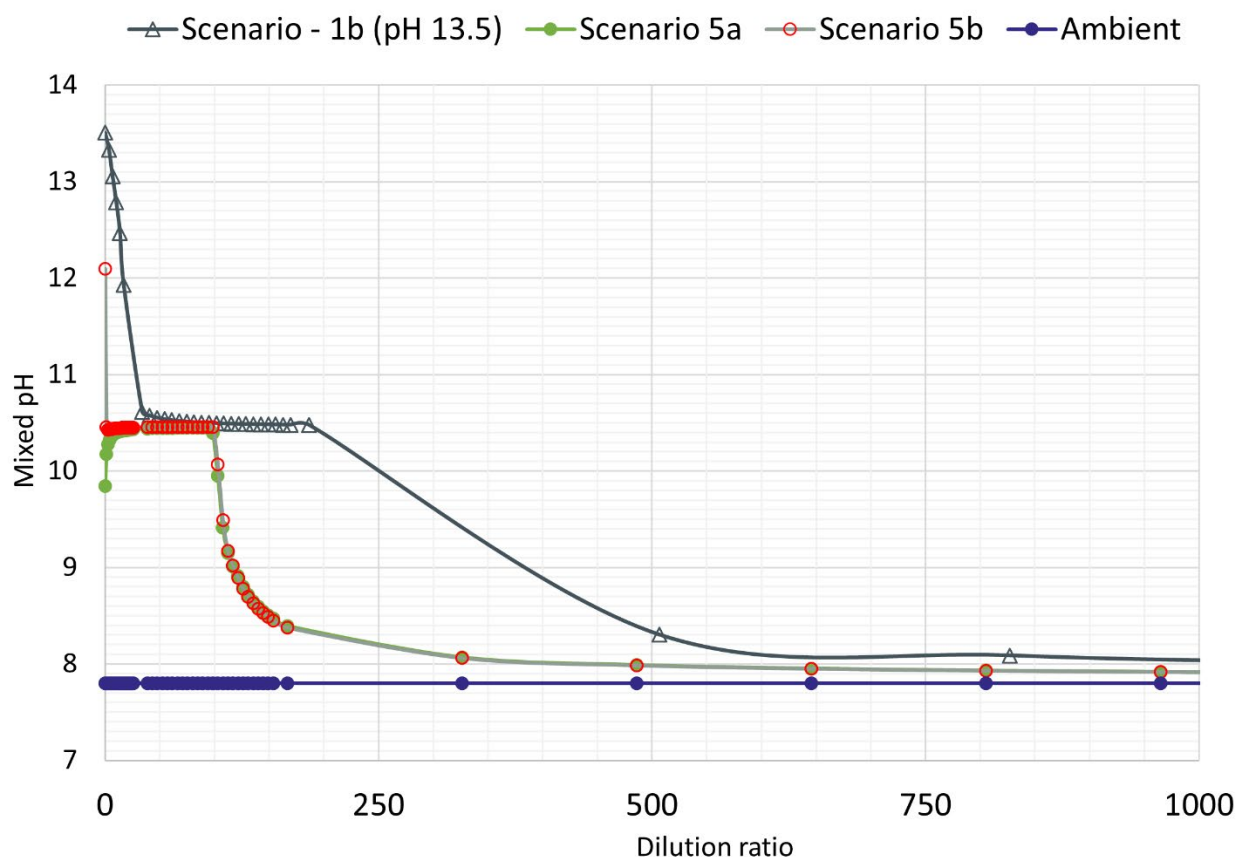


Figure 6-1. Chemistry model results—pH trends

## 6.2.3 Potential for Particulate Formation

Solids precipitation in OLI Studio is calculated as a reaction taking place in a closed system and at equilibrium conditions (i.e., the reaction immediately going to completion). Therefore, the solids generation predicted in the model is conservative and may not occur in an open/dynamic system. Further, the model predicts all the solids that could potentially be formed based on thermodynamics of the system. However, all the solids predicted by the model may not actually form and depending on the system parameters such as pH, temperature, alkalinity, nucleation sites available, competing ions, etc., the dominant scaling compound would most likely be formed. The dominate particulate as predicted by the model is Calcite ( $\text{CaCO}_3$ ). Particulate formation involving trace heavy metals is negligible even using the conservative model methodology. Table 6-2 provides a conservative estimate of the solids that may be formed for the modeled scenarios at the minimum nearfield dilutions.



Table 6-2. Particulate Formation Summary

Scenario	Chronic Dilution <sup>a</sup>	Mixed pH <sup>b</sup>	CaCO <sub>3</sub> (mg/L)
Scenario 1b–Alkaline Product Only (pH = 13.5)	290:1	9.2	225
Scenario 2a–Neutralized Acid Only (Olivine)	207:1	7.7	0
Scenario 2b–Neutralized Acid Only (CaCO <sub>3</sub> )	290:1	7.8	4
Scenario 3–Pretreatment Reject Only	260:1	7.8	1
Scenario 4a–Neutralized Acid (Olivine) + Pretreatment Reject	207:1	7.8	1
Scenario 4b–Neutralized Acid (CaCO <sub>3</sub> ) + Pretreatment Reject	215:1	7.8	2
Scenario 5a–All Process Flows (Olivine neutralization)	195:1	8.3	150
Scenario 5b–All Process Flows (CaCO <sub>3</sub> neutralization)	200:1	8.3	150

a. Minimum nearfield dilution divided by two to account for tidal reflux.

b. OLI model runs assume an ambient pH of 7.8.

## Section 7: Water Quality Analyses

This section presents water quality analyses based on the supporting modeling discussed in Sections 5 and 6. Water quality analyses reference marine water quality standards identified in WAC 173-201A-210. Port Angeles Harbor is designated as ‘Excellent Quality’ for aquatic life uses. Input data for the analyses discussed in each section herein were selected consistent with the guidance provided in Ecology’s Permit Writer’s Manual. Individual water quality parameters are also evaluated with respect to Tier II antidegradation standards identified in WAC 173-201A-320.

### 7.1 Temperature

Compliance with temperature criteria was evaluated using Ecology’s Reasonable Potential Analysis (RPA) methodology and supporting *PermitCalc* spreadsheets (see Attachment D). Input values for the calculations were conservatively selected as follows:

- Chronic Dilution Factor–The minimum nearfield dilution for all scenarios in Table 5-1 (390:1) was selected and divided by a factor of two to account for reflux. Temperature analyses assume a dilution factor of 195:1.
- Ambient Temperature–Ambient surface temperature data for the 29 sample dates at Ecology Station PAH003 were evaluated to develop 90<sup>th</sup> percentile values for May–September (11.4 °C) and October–April (10.0 °C).
- Effluent Temperature–The maximum effluent temperature for any discharge scenario is 30 °C.

Using the above input values, there is no reasonable potential to exceed water quality criteria for temperature. The incremental temperature increase within the area of nearfield mixing is predicted to be 0.1 °C or less, which is below the Tier II threshold for measurable change (+ 0.3 °C). The values above combine worst case dilution and effluent conditions that are unlikely to occur simultaneously.



## 7.2 Dissolved Oxygen

The proposed discharge is not anticipated to contain chemical and/or biological oxygen demand. Therefore, compliance with dissolved oxygen (DO) criteria was evaluated using a volumetric mixing calculation. Input values for the calculation were conservatively selected as follows:

- Chronic Dilution Factor–The minimum nearfield dilution for all scenarios in Table 5-1 (390:1) was selected and divided by a factor of two to account for reflux. DO analyses assume a dilution factor of 195:1.
- Ambient DO–Ambient DO concentrations at the proposed discharge location are assumed to be 7.3 mg/L, based on the Ecology Fact Sheet analyses for the Port Angeles municipal wastewater treatment facility (Ecology 2016).
- Effluent DO–The minimum effluent DO for any discharge scenario is estimated to be 7.0 mg/L based upon sample analyses of process streams at the PNNL–Project Macoma facility.

The mixed DO concentration meets the applicable minimum water quality criteria (6.0 mg/L), has a negligible DO concentration change with respect to background and therefore is below the Tier II threshold for measurable change (0.2 mg/L). The input values above combine worst case dilution and effluent conditions that are unlikely to occur simultaneously.

## 7.3 pH

The OLI model discussed in Section 6 was used to predict mixed pH at the predicted minimum nearfield dilution for each scenario. Table 7-1 summarizes the minimum dilution factor (accounting for reflux), effluent pH, mixed pH, and pH change for each scenario. As shown in Table 7-1, except for Scenario 1b, all discharge scenarios meet applicable pH water quality criteria with a pH between 7.0 and 8.5, and a 0.5 standard unit change (or less) with respect to background.

**Table 7-1. pH Water Quality Analyses Summary**

Scenario	Chronic Dilution <sup>a</sup>	Effluent pH	Mixed pH <sup>b</sup>	pH Change
Scenario 1b–Alkaline Product Only (pH = 13.5)	290:1	13.5	9.2	1.4
Scenario 2a–Neutralized Acid Only (Olivine)	207:1	2.3	7.7	-0.1
Scenario 2b–Neutralized Acid Only (CaCO <sub>3</sub> )	290:1	8.1	7.8	No change
Scenario 3–Pretreatment Reject Only	260:1	7.1	7.8	No change
Scenario 4a–Neutralized Acid (Olivine) + Pretreatment Reject	207:1	6.4	7.8	No change
Scenario 4b–Neutralized Acid (CaCO <sub>3</sub> ) + Pretreatment Reject	215:1	6.8	7.8	No change
Scenario 5a–All Process Flows (Olivine neutralization)	195:1	9.8	8.3	+0.5
Scenario 5b–All Process Flows (CaCO <sub>3</sub> neutralization)	200:1	12.1	8.3	+0.5

a. Minimum nearfield dilution divided by two to account for tidal reflux.

b. OLI model runs assume an ambient pH of 7.8.

For Scenario 1b, the predicted mixed pH would be 8.2 at the nearfield mixing boundary assuming the predicted effluent dilution (580:1) without accounting for tidal reflux. Therefore, Scenario 1b would meet pH standards without reflux. As noted in Section 4, Scenario 1 discharge would be for a limited duration, likely on the order of several hours to collect pilot data. Under this scenario, tidal reflux is not significant and should not be applied to the dilution predictions. Should Project Macoma temporarily discharge the alkaline product only, process controls would be in place to limit effluent pH below 13.5.

Typical scientific and routine operational scenarios would exceed the Tier II antidegradation criteria threshold for measurable change in pH of 0.1 units. However, per WAC 173-201A-320, a measurable change is permitted when necessary and in the overriding public interest. The purpose of mCDR technology is to create localized areas of increased alkaline/pH conditions to absorb carbon dioxide from the atmosphere and store it as bicarbonate and combat ocean acidification in local receiving waters. The environmental and societal benefit provided by the proposed mCDR facility is only possible with the pH gradient generated by the proposed discharge. Attachment E provides supporting documentation to assist Ecology's determination that the project is in the overriding public interest thereby meeting Tier II antidegradation analysis criteria.

## 7.4 Bacteria

The proposed discharge is not anticipated to contain pathogenic bacteria. Source water for the Project Macoma process is ambient Port Angeles Harbor water and the proposed process will not introduce human or animal wastes. The proposed discharge meets marine water quality and Tier II antidegradation criteria.

## 7.5 Turbidity

The potential for solids formation in the effluent plume of the proposed discharge is discussed in Section 6.2.3. The dominant particulate predicted by the model is calcite. For the typical discharge scenario, Scenario 5a, the chemistry model predicts worst case calcite concentrations near 150 mg/L in the nearfield. However, as discussed in Section 6, actual solids formation may be less in a dynamic condition versus model assumptions. Site-specific data that would correlate calcite concentrations to turbidity values are not available.

A basic mixing equation was used to predict mixed turbidity following the completion of nearfield dilution. While turbidity values may not respond linearly with dilution, and the relationship of potential calcite concentrations to turbidity is currently unknown, the analysis is informative for comparison to WAC criteria which allow for a 5 NTU increase above background when background is less than 50 NTU. Turbidity measured by Ecology in Sequim Bay (Station SEQ002) ranged between 0.5 and 2.0 NTU in 2014. Assuming a worst-case dilution of 195:1 and an ambient turbidity of 2.0 NTU, a discharge turbidity of 100 NTU would increase ambient turbidity approximately 0.5 NTU within the nearfield. These assumed conditions would also be at or below the Tier II threshold for measurable change (0.5 NTU).

Project Macoma, LLC proposes targeted monitoring of turbidity within the nearfield, along with pH, during initial operation of the facility to assess the impact of the discharge on the receiving water. Modeled calcite concentrations are higher at high pH values. Therefore, effluent pH controls could potentially be used to maintain turbidity values within applicable standards, as needed. Because calcite formation decreases the efficiency of the proposed system with respect to CO<sub>2</sub> absorption, Project Macoma, LLC is actively developing methods to minimize the potential for calcite precipitation.

## 7.6 Toxics

Trace heavy metals data collected from Port Angeles Harbor and the PNNL pretreatment reject stream are either non-detect or below applicable acute water quality criteria at the point of discharge. The proposed process does not concentrate toxic parameters present in the ambient Port Angeles Harbor waters. The proposed discharge meets marine water quality and Tier II antidegradation criteria.

## Section 8: Conclusions

The combined results of the dilution and chemistry modeling presented herein support the determination of compliance with applicable water quality standards based upon collected data, where available, and conservative assumptions. For most parameters, except for temperature, pH and turbidity, the proposed discharge would not be anticipated to be significantly changed from the process source waters (Port Angeles Harbor). Specific conclusions related to the mixing zone as well as the modeled mixing of temperature, pH and turbidity within the mixing zone are as follows:

- Dilution model analyses indicate nearfield dilution, the basis of the conservative water quality analyses herein, is complete within 12 meters (40 feet) laterally from the diffuser at the assumed 50<sup>th</sup> percentile current speeds. The entire WAC-defined mixing zone (207 feet) is not required to attain applicable water quality standards. Ebb Carbon proposes monitoring acute and chronic mixing zone dimensions at 15 and 150 feet, respectively, to account for potential nearfield conditions and process assumptions that differ from those modeled.
- Except for Scenario 1b, mixed pH for all scenarios will meet applicable marine aquatic life use standards within the mixing zone and accounting for reflux. For Scenario 1b, the predicted mixed pH would be 8.2 at the nearfield mixing boundary assuming the predicted effluent dilution (580:1) without accounting for tidal reflux. As noted in Section 4, Scenario 1 discharge would be for a limited duration, likely on the order of several hours to collect pilot data. Under this scenario, tidal reflux is not significant and should not be applied to the dilution predictions. Should Project Macoma temporarily discharge the alkaline product only, process controls would be in place to limit effluent pH at or below 13.5.

Typical scientific and routine operational scenarios would exceed the Tier II antidegradation criteria threshold for measurable change in pH of 0.1 units. However, the environmental and societal benefit provided by the proposed pilot study of the mCDR facility is only possible with the pH gradient generated by the proposed discharge. The proposed pilot-scale system will provide valuable field-tested data that will be used to both improve process efficiency and reduce potential impacts to the surrounding receiving waters through rigorous study. Any potential temporary lowering of immediate nearfield water quality with respect to pH is necessary and in the overriding public interest given the anticipated benefits associated with restoring water quality closer to pre-anthropogenic conditions and permanently removing atmospheric carbon dioxide, thereby meeting Tier II antidegradation analysis criteria as more fully articulated in the documentation provided in Attachment E.

- Assuming a maximum effluent temperature (30 °C) and worst-case modeled conditions, the incremental temperature increase within the area of nearfield mixing is predicted to be 0.1 °C or less. Mixed temperature decreases rapidly from the point of discharge and approaches background temperature well within the proposed chronic mixing zone dimensions.
- For the typical discharge, Scenario 5a, the chemistry model predicts worst case calcite precipitate concentrations near 150 mg/L in the nearfield. Turbidity analyses are qualitative, because site-specific data that would correlate calcite concentrations to turbidity values are not currently available. However, using high effluent turbidity assumptions simple dilution calculations indicate that predicted mixed turbidity would be within the allowable range of increase above background. Project Macoma, LLC, proposes targeted monitoring of turbidity within the nearfield, along with pH, during initial operation of the facility to assess the impact of the discharge on the receiving water.

## References

- Ecology 2016. National Pollutant Discharge Elimination System Permit No. WA0023973 and Fact Sheet. Ecology Water Quality Program. Effective February 2016.
- Ecology 2018. Water Quality Program Permit Writer's Manual. Publication No. 92-109. Revised July 2018.
- Frick, et al. 2003. Dilution Models for Effluent Discharges, 4th Edition (Visual Plumes). Environmental Research Division, USEPA. Athens, Georgia.

## Attachment A: Ambient and Process Stream Water Quality Data

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**Table A-1. Port of Port Angeles Water Quality Data**

Parameter	Units	Value
pH		7.78
Conductivity	µmhos/cm	47,000
Total sulfide	mg/L	< 0.05
Total dissolved solids	mg/L	34,000
Total suspended solids	mg/L	48.0
Bulk density	g/cm <sup>3</sup>	1.002
Total organic carbon	mg/L as C	1.6
Total alkalinity	mg/L as CaCO <sub>3</sub>	130
Carbonate alkalinity	mg/L as CaCO <sub>3</sub>	< 2
Bicarbonate alkalinity	mg/L as CaCO <sub>3</sub>	130
Bromide	mg/L	51.9
Chloride	mg/L	18,400
Fluoride	mg/L	< 5
Sulfate	mg/L	2,420
Calcium	mg/L	300
Potassium	mg/L	330
Magnesium	mg/L	460
Sodium	mg/L	8,570
Ammonia	mg/L as N	0.026
Nitrite	mg/L as N	< 0.5
Nitrate	mg/L as N	< 2.5
Orthophosphate	mg/L as P	0.04
Total phosphorus	mg/L as P	0.064
Aluminum	mg/L	< 0.30
Arsenic	mg/L	< 0.01
Barium	mg/L	< 0.01
Beryllium	mg/L	< 0.01
Cadmium	mg/L	< 0.005
Cobalt	mg/L	< 0.01
Chromium	mg/L	< 0.02
Copper	mg/L	< 0.01
Iron	mg/L	< 0.03
Mercury	mg/L	< 0.0001
Manganese	mg/L	< 0.01
Nickel	mg/L	< 0.01
Lead	mg/L	< 0.02
Antimony	mg/L	< 0.02
Silica	mg/L as SiO <sub>2</sub>	1.40

**Table A-1. Water Quality (Nominal) of Various Waste Streams**

Parameter	Units	Alkaline Product	Acid with Olivine	Acid with Limestone	Pretreat Reject
Flow	L/hr	5,900	5,900	5,900	27,000
pH		13.93	2.26	8.10	8.00
Temperature	°C	30.0	30.0	30.0	17.0
Sodium	mg/L	--	--	--	12,500
Magnesium	mg/L	ND	7,379	198	4,631
Calcium	mg/L	ND	137.6	13,954	1,350
Iron	mg/L	ND	2.43	ND	ND
Nickel	mg/L	ND	18.13	0.001	ND
Cobalt	mg/L	ND	0.853	0.0003	ND
Silica	mg/L	ND	114.8	ND	ND
Aluminum	mg/L	ND	1.13	ND	ND
Phosphorus	mg/L	ND	0.133	ND	ND
Titanium	mg/L	ND	0.061	ND	ND
Chromium	mg/L	ND	0.051	ND	ND
Arsenic	mg/L	ND	ND	0.05	ND
Cadmium	mg/L	ND	ND	0.0002	ND
Mercury	mg/L	ND	ND	0.002	ND
Molybdenum	mg/L	ND	ND	0.0001	ND
Lead	mg/L	ND	ND	0.0025	ND
Selenium	mg/L	ND	ND	0.019	ND
Zinc	mg/L	ND	ND	0.0003	ND
Chloride	mg/L	--	22,055	26,300	27,203
Carbonate	mg/L	--	--	--	18.0
Bicarbonate	mg/L	--	--	172.26	216
Bromide	mg/L	--	--	--	53.0
Fluoride	mg/L	--	--	--	ND
Sulfate	mg/L	--	--	--	4,922
Carbon-dioxide	mg/L	--	--	0.42	--
CaHCO <sub>3</sub> +1	mg/L	--	--	92.8	--
Total dissolved solids	mg/L	--	30,629	41,033	50,893

## **Attachment B: Dilution Model Input/Output**

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## Scenario 1b – Alkaline Product Only (pH=13.5)

### Acute Conditions

Ambient Table:														
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density				
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T				
0.0	0.020	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000				
3.000	0.020	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000				
6.000	0.020	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000				
9.000	0.020	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000				
12.00	0.020	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000				
15.00	0.020	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000				
Diffuser table:														
P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt	
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)	
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	1.64E-3	1028.0	30.000	100.00	
Simulation:														
Froude No:	-23.03;		Strat No:	-3.16E-4;		Spog No:	48.00; k:		25.89;		eff den (sigmaT)	28.00000; eff vel		0.518(r
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia				
(m)	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)				
0	2.000	2.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;				
50	1.962	2.000	1.346	36.10	2.770	1.385	0.000	0.0402	0.198	0.03418;				
100	1.885	2.000	3.389	13.94	7.173	3.586	0.000	0.144	1.354	0.08608;				
150	1.834	2.000	5.491	8.347	11.98	5.990	0.000	0.260	3.403	0.1395;				
200	1.815	2.000	6.968	6.329	15.80	7.901	0.000	0.372	5.917	0.1770;				
209	1.815	2.000	7.180	6.089	16.42	8.212	0.000	0.393	6.421	0.1824;	local maximum rise c			
250	1.826	2.000	8.062	5.142	19.45	9.725	0.000	0.495	8.995	0.2048;				
300	1.888	2.000	10.09	3.535	28.29	14.15	0.000	0.667	13.92	0.2563;				
350	2.120	2.000	17.55	1.403	71.30	35.65	0.000	1.041	27.44	0.4458;				
376	2.286	2.000	24.01	0.838	119.3	59.66	0.000	1.304	38.51	0.6100;	merging;			
400	2.498	2.000	32.43	0.528	189.3	103.8	0.000	1.702	56.41	0.8237;				
402	2.514	2.000	33.11	0.513	194.8	107.6	0.000	1.738	58.03	0.8409;	trap level;			
450	2.722	2.000	43.05	0.368	271.7	169.5	0.000	2.371	87.55	1.0934;				
488	2.759	2.000	45.50	0.346	289.4	186.4	0.000	2.776	106.6	1.1557;	local maximum rise c			
500	2.755	2.000	45.59	0.344	290.6	187.5	0.000	2.903	112.6	1.1580;				
549	2.505	2.000	51.26	0.278	359.4	239.6	0.000	3.998	164.5	1.3021;	trap level;			
Horiz plane projections in effluent direction: radius(m):							0.0;	CL(m):		3.9984				

### Chronic Conditions

Ambient Table:													
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density			
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T			
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000			
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000			
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000			
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000			
12.00	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000			
15.00	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000			
Diffuser table:													
P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	1.64E-3	1028.0	30.000	100.00
Simulation:													
Froude No:	-23.03; Strat No:-3.16E-4; Spog No: 48.00; k: 10.36; eff den (sigmaT) 28.00000; eff vel 0.518(r												
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia			
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)			
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;			
50	1.965	5.000	1.296	36.17	2.765	1.382	0.000	0.039	0.177	0.03292;			
100	1.916	5.000	2.974	13.91	7.191	3.596	0.000	0.119	0.867	0.07555;			
150	1.872	5.000	5.259	6.473	15.45	7.725	0.000	0.258	2.639	0.1336;			
191	1.852	5.000	7.016	4.155	24.07	12.03	0.000	0.505	6.406	0.1782;	local maximum rise c		
200	1.854	5.000	7.297	3.890	25.71	12.85	0.000	0.581	7.605	0.1854;			
250	1.943	5.000	11.87	1.631	61.32	30.66	0.000	1.167	17.65	0.3015;			
300	2.105	5.000	20.13	0.606	165.1	82.53	0.000	2.029	33.90	0.5113;			
318	2.184	5.000	24.24	0.424	235.7	117.9	0.000	2.530	43.62	0.6157;	merging;		
334	2.282	5.000	28.79	0.309	323.6	170.3	0.000	3.277	58.22	0.7313;	trap level;		
350	2.407	5.000	34.20	0.230	435.4	243.5	0.000	4.726	86.73	0.8686;			
361	2.433	5.000	35.67	0.215	466.5	265.2	0.000	5.787	107.7	0.9061;	local maximum rise c		
382	2.272	5.000	40.65	0.172	581.6	351.8	0.000	8.609	163.4	1.0325;	trap level;		
Horiz plane projections in effluent direction: radius(m):							0.0;	CL(m):	8.6092				

### Acute Conditions

## Chronic Conditions

Ambient Table:													
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density			
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T			
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000			
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000			
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000			
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000			
12.00	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000			
15.00	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000			
Diffuser table:													
P-diaVer	anl	H-Angle	SourceX	SourceY	Ports	Spacing	NZ-dis	IsopltH	P-depth	Ttl-flw	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	1.64E-3	1020.0	30.000	100.00
Simulation:													
Froude No:	23.95;	Strat No:	3.44E-4;	Spgr No:	48.00;	k:	10.36;	eff den (sigmaT)	20.00000;	eff vel	0.518(r		
Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia				
(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)				
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;			
50	1.965	5.000	1.284	36.34	2.752	1.376	0.000	0.0384	0.174	0.03262;			
100	1.912	5.000	2.986	13.51	7.402	3.701	0.000	0.118	0.864	0.07585;			
150	1.844	5.000	6.084	5.020	19.92	9.960	0.000	0.278	3.012	0.1545;			
200	1.752	5.000	11.04	1.865	53.61	26.81	0.000	0.670	9.657	0.2804;			
250	1.608	5.000	18.87	0.693	144.3	72.15	0.000	1.769	30.25	0.4792;			
255	1.590	5.000	19.87	0.628	159.3	79.66	0.000	1.965	34.01	0.5047;	trap level;		
274	1.515	5.000	24.17	0.431	232.1	116.0	0.000	3.089	55.79	0.6138;	merging;		
285	1.484	5.000	26.45	0.364	274.6	140.9	0.000	4.568	84.69	0.6717;	local maximum rise c		
300	1.571	5.000	29.75	0.293	341.2	181.5	0.000	7.071	133.7	0.7557;			
301	1.578	5.000	30.08	0.287	348.6	185.8	0.000	7.239	137.0	0.7641;	trap level;		
313	1.638	5.000	33.31	0.241	414.7	229.6	0.000	9.752	186.5	0.8460;	local maximum rise c		
Horiz plane projections in effluent direction: radius(m):													
Time(m):	9.7519												
								0.0;	CL(m):	9.7519			

## Scenario 2b – Neutralized Acid Only (CaCO3)

### Acute Conditions

Ambient Table:												
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density		
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T		
0.0	0.020	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000		
3.000	0.020	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000		
6.000	0.020	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000		
9.000	0.020	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000		
12.00	0.020	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000		
15.00	0.020	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000		
Diffuser table:												
P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C) (%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	1.64E-3	1028.0	30.000 100.00
Simulation:												
Froude No:	-23.03;	Strat No:-3.16E-4;	Spog No:	48.00;	k:	25.89;	eff den (sigmaT)	28.00000;	eff vel	0.518(r		
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia		
(m)	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)		
0	2.000	2.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;		
50	1.962	2.000	1.346	36.10	2.770	1.385	0.000	0.0402	0.198	0.03418;		
100	1.885	2.000	3.389	13.94	7.173	3.586	0.000	0.144	1.354	0.08608;		
150	1.834	2.000	5.491	8.347	11.98	5.990	0.000	0.260	3.403	0.1395;		
200	1.815	2.000	6.968	6.329	15.80	7.901	0.000	0.372	5.917	0.1770;		
209	1.815	2.000	7.180	6.089	16.42	8.212	0.000	0.393	6.421	0.1824;	local maximum rise c	
250	1.826	2.000	8.062	5.142	19.45	9.725	0.000	0.495	8.995	0.2048;		
300	1.888	2.000	10.09	3.535	28.29	14.15	0.000	0.667	13.92	0.2563;		
350	2.120	2.000	17.55	1.403	71.30	35.65	0.000	1.041	27.44	0.4458;		
376	2.286	2.000	24.01	0.838	119.3	59.66	0.000	1.304	38.51	0.6100;	merging;	
400	2.498	2.000	32.43	0.528	189.3	103.8	0.000	1.702	56.41	0.8237;		
402	2.514	2.000	33.11	0.513	194.8	107.6	0.000	1.738	58.03	0.8409;	trap level;	
450	2.722	2.000	43.05	0.368	271.7	169.5	0.000	2.371	87.55	1.0934;		
488	2.759	2.000	45.50	0.346	289.4	186.4	0.000	2.776	106.6	1.1557;	local maximum rise c	
500	2.755	2.000	45.59	0.344	290.6	187.5	0.000	2.903	112.6	1.1580;		
549	2.505	2.000	51.26	0.278	359.4	239.6	0.000	3.998	164.5	1.3021;	trap level;	
Horiz plane projections in effluent direction: radius(m):							0.0;	CL(m):	3.9984			

### Chronic Conditions

Ambient Table:												
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density		
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T		
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000		
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000		
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000		
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000		
12.00	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000		
15.00	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000		
Diffuser table:												
P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C) (%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	1.64E-3	1028.0	30.000 100.00
Simulation:												
Froude No:	-23.03;	Strat No:-3.16E-4;	Spog No:	48.00;	k:	10.36;	eff den (sigmaT)	28.00000;	eff vel	0.518(r		
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia		
(m)	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)		
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;		
50	1.965	5.000	1.296	36.17	2.765	1.382	0.000	0.039	0.177	0.03292;		
100	1.916	5.000	2.974	13.91	7.191	3.596	0.000	0.119	0.867	0.07555;		
150	1.872	5.000	5.259	6.473	15.45	7.725	0.000	0.258	2.639	0.1336;		
191	1.852	5.000	7.016	4.155	24.07	12.03	0.000	0.505	6.406	0.1782;	local maximum rise c	
200	1.854	5.000	7.297	3.890	25.71	12.85	0.000	0.581	7.605	0.1854;		
250	1.943	5.000	11.87	1.631	61.32	30.66	0.000	1.167	17.65	0.3015;		
300	2.105	5.000	20.13	0.606	165.1	82.53	0.000	2.029	33.90	0.5113;		
318	2.184	5.000	24.24	0.424	235.7	117.9	0.000	2.530	43.62	0.6157;	merging;	
334	2.282	5.000	28.79	0.309	323.6	170.3	0.000	3.277	58.22	0.7313;	trap level;	
350	2.407	5.000	34.20	0.230	435.4	243.5	0.000	4.726	86.73	0.8686;		
361	2.433	5.000	35.67	0.215	466.9	265.2	0.000	5.787	107.7	0.9061;	local maximum rise c	
382	2.272	5.000	40.65	0.172	581.6	351.8	0.000	8.609	163.4	1.0325;	trap level;	
Horiz plane projections in effluent direction: radius(m):							0.0;	CL(m):	8.6092			

## Scenario 3 – Pretreatment Reject Only

### Acute Conditions

Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spnd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0.0	0.020	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000
3.000	0.020	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000
6.000	0.020	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000
9.000	0.020	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000
12.00	0.020	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000
15.00	0.020	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000

Diffuser table:

P-diaVer	angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	7.50E-3	1042.0	17.000	100.00

Simulation:

Froude No: -50.81; Strat No:-7.25E-5; Spcg No: 48.00; k: 118.4; eff den (sigmaT) 42.000000; eff vel 2.368(r

Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia	
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)	
0	2.000	2.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;	
50	1.951	2.000	1.594	30.73	3.255	1.627	0.000	0.0494	0.0626	0.04048;	
100	1.835	2.000	4.270	11.38	8.790	4.395	0.000	0.176	0.488	0.1085;	
150	1.614	2.000	10.36	4.746	21.07	10.53	0.000	0.483	2.822	0.2633;	
200	1.504	2.000	15.08	3.306	30.25	15.12	0.000	0.746	5.909	0.3830;	
250	1.473	2.000	18.31	2.694	37.12	18.56	0.000	0.964	9.036	0.4652;	
254	1.473	2.000	18.53	2.658	37.62	18.81	0.000	0.981	9.295	0.4706;	local maximum rise c
300	1.497	2.000	20.61	2.305	43.39	21.69	0.000	1.177	12.49	0.5235;	
350	1.592	2.000	22.82	1.923	52.00	26.00	0.000	1.423	16.92	0.5797;	
369	1.661	2.000	24.05	1.741	57.44	28.72	0.000	1.539	19.21	0.6109;	merging;
400	1.855	2.000	26.99	1.403	71.29	36.79	0.000	1.789	24.61	0.6855;	
450	3.090	2.000	45.55	0.656	152.5	98.31	0.000	2.838	54.07	1.1569;	
465	3.823	2.000	61.82	0.495	202.0	134.7	0.000	3.453	74.97	1.5703;	trap level;
500	4.588	2.000	91.73	0.383	261.2	174.1	0.000	4.256	104.4	2.3299;	
529	4.855	2.000	111.4	0.346	289.2	192.8	0.000	4.655	119.7	2.8294;	begin overlap;
550	4.974	2.000	122.8	0.331	302.5	201.7	0.000	4.897	129.1	3.1189;	
600	5.121	2.000	138.1	0.316	316.0	210.7	0.000	5.393	148.7	3.5086;	
632	5.142	2.000	141.1	0.314	318.2	212.2	0.000	5.680	160.0	3.5832;	local maximum rise c
650	5.134	2.000	140.8	0.314	318.6	212.4	0.000	5.840	166.3	3.5767;	
700	5.022	2.000	135.7	0.311	321.9	214.6	0.000	6.332	185.8	3.4465;	
726	4.873	2.000	131.8	0.305	327.9	218.8	0.000	6.672	199.3	3.3467;	end overlap;
750	4.576	2.000	129.7	0.292	342.1	228.1	0.000	7.171	219.2	3.2932;	
764	3.793	2.000	140.9	0.258	387.2	258.1	0.000	8.262	263.6	3.5789;	trap level;

### Chronic Conditions

Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spnd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000
12.00	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000
15.00	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000

Diffuser table:

P-diaVer	angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	7.50E-3	1042.0	17.000	100.00

Simulation:

Froude No: -50.81; Strat No:-7.25E-5; Spcg No: 48.00; k: 47.36; eff den (sigmaT) 42.000000; eff vel 2.368(r

Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia	
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)	
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;	
50	1.952	5.000	1.576	30.78	3.249	1.625	0.000	0.0496	0.0613	0.04003;	
100	1.844	5.000	4.117	11.39	8.776	4.388	0.000	0.177	0.456	0.1046;	
150	1.666	5.000	9.618	4.565	21.90	10.95	0.000	0.465	2.258	0.2443;	
200	1.555	5.000	15.23	2.655	37.67	18.84	0.000	0.811	5.541	0.3869;	
239	1.525	5.000	18.46	2.062	48.49	24.24	0.000	1.138	9.255	0.4688;	local maximum rise c
250	1.528	5.000	19.22	1.945	51.42	25.71	0.000	1.241	10.49	0.4882;	
295	1.625	5.000	24.02	1.358	73.62	36.81	0.000	1.776	17.42	0.6101;	merging;
300	1.652	5.000	25.08	1.266	78.99	39.95	0.000	1.865	18.66	0.6369;	
350	2.377	5.000	47.13	0.491	203.8	134.2	0.000	3.545	45.55	1.1970;	
365	2.761	5.000	59.85	0.367	272.4	181.6	0.000	4.432	61.14	1.5201;	trap level;
400	3.203	5.000	80.08	0.274	365.6	243.7	0.000	5.908	87.90	2.0340;	
441	3.377	5.000	90.85	0.243	411.9	274.6	0.000	7.709	121.1	2.3077;	local maximum rise c
450	3.366	5.000	91.32	0.241	414.8	276.4	0.000	8.120	128.7	2.3195;	
494	2.708	5.000	108.5	0.191	522.6	348.4	0.000	11.63	194.3	2.7556;	trap level;

Horiz plane projections in effluent direction: radius(m): 0.0; CL(m): 11.633

Time(m): 11.633

### Acute Conditions

### Chronic Conditions

Ambient Table:												
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprn	Density		
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T		
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000		
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000		
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000		
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000		
12.000	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000		
15.000	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000		

Diffuser table:													
P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	9.10E-3	1038.0	19.300	100.00

Simulation:													
Froude No:	-69.68; Strat No:-9.29E-5;				Spceg No:	48.00; k:	57.47; eff den (sigmaT)	38.000000; eff vel	2.873(r				
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia			
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)			
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;			
50	1.950	5.000	1.638	29.69	3.369	1.684	0.000	0.0519	0.0549	0.04161;			
100	1.835	5.000	4.289	11.00	9.091	4.546	0.000	0.183	0.409	0.1089;			
150	1.614	5.000	10.64	4.141	24.15	12.07	0.000	0.515	2.322	0.2703;			
200	1.439	5.000	18.60	2.149	46.53	23.26	0.000	0.973	6.598	0.4724;			
243	1.372	5.000	24.00	1.537	65.06	32.53	0.000	1.479	12.50	0.6097;	merging;		
250	1.371	5.000	24.67	1.479	67.60	34.04	0.000	1.573	13.67	0.6265;	local maximum rise c		
300	1.487	5.000	30.25	1.085	92.18	49.30	0.000	2.395	24.56	0.7684;			
350	2.346	5.000	56.17	0.461	217.0	144.7	0.000	4.656	59.98	1.4267;			
354	2.461	5.000	60.17	0.426	234.7	156.5	0.000	4.959	65.14	1.5284;	trap level;		
400	2.953	5.000	83.97	0.308	324.3	216.2	0.000	6.894	99.03	2.1328;			
425	2.999	5.000	87.80	0.296	337.5	225.0	0.000	7.707	113.5	2.2302;	local maximum rise c		
450	2.939	5.000	89.36	0.289	346.5	231.0	0.000	8.562	128.8	2.2698;			
478	2.426	5.000	102.6	0.240	416.6	277.7	0.000	10.90	171.1	2.6060;	trap level;		

Horiz plane projections in effluent direction:			
radius(m):	0.0;	CL(m):	10.902

Ambient Table:													
Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density			
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T			
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000			
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000			
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000			
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000			
12.00	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000			
15.00	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000			
Diffuser table:													
P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	IsopltH	P-depth	Ttl-fllo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	9.10E-3	1039.0	19.300	100.00
Simulation:													
Froude No:	-67.38;	Strat No:	-8.68E-5;	Spcg No:	48.00;	k:	57.47;	eff den	(sigmaT)	39.00000;	eff vel	2.873;	
Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia			
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)			
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;			
50	1.950	5.000	1.639	29.67	3.370	1.685	0.000	0.0519	0.0549	0.04162;			
100	1.835	5.000	4.291	10.99	9.097	4.549	0.000	0.183	0.410	0.1090;			
150	1.616	5.000	10.61	4.160	24.04	12.02	0.000	0.514	2.309	0.2696;			
200	1.448	5.000	18.28	2.202	45.42	22.71	0.000	0.958	6.415	0.4643;			
249	1.386	5.000	23.98	1.540	64.93	32.47	0.000	1.514	12.88	0.6090;	local maximum rise c		
250	1.386	5.000	24.07	1.531	65.30	32.65	0.000	1.526	13.04	0.6114;	merging;		
300	1.498	5.000	29.52	1.121	89.19	47.32	0.000	2.298	23.12	0.7499;			
350	2.314	5.000	53.66	0.484	206.8	137.9	0.000	4.372	55.31	1.3630;			
358	2.544	5.000	61.48	0.414	241.6	161.1	0.000	4.943	65.00	1.5615;	trap level;		
400	3.015	5.000	84.28	0.306	327.0	218.0	0.000	6.667	95.25	2.1407;			
431	3.091	5.000	90.01	0.288	346.8	231.2	0.000	7.724	114.2	2.2864;	local maximum rise c		
450	3.054	5.000	91.11	0.283	352.8	235.2	0.000	8.403	126.3	2.3141;			
486	2.467	5.000	106.2	0.231	432.8	288.5	0.000	11.12	175.5	2.6965;	trap level;		
Horiz plane projections in effluent direction, radius:							0.0;	CL(m):	11.118				

## Scenario 5a – All Process Flows (Olivine neutralization)

### Acute Conditions

Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0.0	0.020	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000
3.000	0.020	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000
6.000	0.020	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000
9.000	0.020	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000
12.00	0.020	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000
15.00	0.020	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000

Diffuser table:

P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	0.0108	1037.0	20.400	100.00

Simulation:

Froude No: -85.74; Strat No:-1.00E-4; Spcg No: 48.00; k: 170.5; eff den (sigmaT) 37.00000; eff vel 3.410(r

Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)
0	2.000	2.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;
50	1.946	2.000	1.721	28.52	3.506	1.753	0.000	0.0542	0.0512	0.0437;
100	1.820	2.000	4.601	10.57	9.460	4.730	0.000	0.188	0.395	0.1169;
150	1.510	2.000	12.31	3.926	25.47	12.74	0.000	0.571	2.825	0.3127;
200	1.242	2.000	21.57	2.270	44.05	22.02	0.000	1.067	8.385	0.5479;
218	1.195	2.000	24.01	2.041	48.99	24.49	0.000	1.211	10.39	0.6098; merging;
250	1.149	2.000	27.36	1.796	55.68	28.85	0.000	1.449	13.99	0.6949;
273	1.140	2.000	29.18	1.680	59.53	31.46	0.000	1.613	16.64	0.7412; local maximum rise c
300	1.154	2.000	30.88	1.571	63.64	34.28	0.000	1.806	19.88	0.7844;
350	1.263	2.000	33.44	1.385	72.18	40.02	0.000	2.197	26.91	0.8493;
400	1.589	2.000	37.70	1.117	89.51	52.21	0.000	2.759	38.12	0.9576;
439	2.790	2.000	57.17	0.674	148.4	98.95	0.000	4.071	70.41	1.4520; trap level;
450	3.057	2.000	66.26	0.613	163.2	108.8	0.000	4.374	78.95	1.6831;
500	3.565	2.000	93.42	0.508	196.9	131.3	0.000	5.152	102.2	2.3729;
515	3.643	2.000	100.0	0.491	203.8	135.8	0.000	5.335	107.9	2.5401; begin overlap;
550	3.754	2.000	110.7	0.468	213.6	142.4	0.000	5.725	120.3	2.8130;
589	3.791	2.000	115.4	0.459	217.7	145.1	0.000	6.128	133.2	2.9310; local maximum rise c
600	3.788	2.000	115.6	0.458	218.2	145.5	0.000	6.241	136.8	2.9370;
650	3.681	2.000	113.4	0.451	222.0	148.0	0.000	6.792	154.6	2.8809;
662	3.626	2.000	112.6	0.447	224.0	149.3	0.000	6.948	159.6	2.8593; end overlap;
700	3.281	2.000	110.6	0.423	236.5	157.7	0.000	7.619	181.6	2.8102;
720	2.519	2.000	119.7	0.373	268.3	178.9	0.000	8.704	218.3	3.0412; trap level;

Horiz plane projections in effluent direction: radius(m): 0.0; CL(m): 8.7036

### Chronic Conditions

Depth	Amb-cur	Amb-dir	Amb-den	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0.0	0.050	90.00	30.95	11.20	0.0	0.0	-	-	0.0003	23.62000
3.000	0.050	90.00	31.17	10.35	0.0	0.0	-	-	0.0003	23.93000
6.000	0.050	90.00	31.16	9.690	0.0	0.0	-	-	0.0003	24.03000
9.000	0.050	90.00	31.68	9.440	0.0	0.0	-	-	0.0003	24.48000
12.00	0.050	90.00	31.76	9.340	0.0	0.0	-	-	0.0003	24.56000
15.00	0.050	90.00	31.87	9.220	0.0	0.0	-	-	0.0003	24.66000

Diffuser table:

P-dia	Ver angl	H-Angle	SourceX	SourceY	Ports	Spacing	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-den	Temp	Polutnt
(in)	(deg)	(deg)	(m)	(m)	( )	(ft)	(ft)	(concent)	(m)	(m3/s)	(kg/m3)	(C)	(%)
0.5000	45.000	90.000	0.0	0.0	25.000	2.0000	200.00	0.0	2.0000	0.0108	1037.0	20.400	100.00

Simulation:

Froude No: -85.74; Strat No:-1.00E-4; Spcg No: 48.00; k: 68.20; eff den (sigmaT) 37.00000; eff vel 3.410(r

Step	Depth	Amb-cur	P-dia	Polutnt	Dilutn	CL-diln	x-posn	y-posn	Time	Iso dia
	(m)	(cm/s)	(in)	(%)	( )	( )	(m)	(m)	(s)	(m)
0	2.000	5.000	0.500	100.0	1.000	1.000	0.0	0.0	0.0	0.0127;
50	1.947	5.000	1.705	28.56	3.501	1.750	0.000	0.0543	0.0504	0.04331;
100	1.826	5.000	4.477	10.59	9.445	4.723	0.000	0.190	0.376	0.1137;
150	1.575	5.000	11.32	3.932	25.43	12.72	0.000	0.548	2.262	0.2875;
200	1.345	5.000	21.08	1.913	52.27	26.13	0.000	1.091	7.097	0.5353;
217	1.294	5.000	24.15	1.612	62.04	31.02	0.000	1.305	9.438	0.6133; merging;
250	1.240	5.000	28.45	1.312	76.24	39.97	0.000	1.795	15.26	0.7226;
257	1.239	5.000	29.12	1.272	78.59	41.51	0.000	1.908	16.66	0.7397; local maximum rise c
300	1.333	5.000	33.75	1.029	97.14	54.06	0.000	2.708	26.99	0.8571;
350	2.188	5.000	58.66	0.492	203.1	135.4	0.000	5.063	62.24	1.4900;
355	2.348	5.000	64.17	0.446	224.0	149.4	0.000	5.480	69.07	1.6298; trap level;
400	2.844	5.000	89.03	0.331	302.5	201.7	0.000	7.413	101.9	2.2614;
426	2.894	5.000	93.43	0.317	315.4	210.2	0.000	8.259	116.5	2.3732; local maximum rise c
450	2.838	5.000	95.04	0.309	322.2	215.4	0.000	9.073	130.7	2.4140;
481	2.252	5.000	110.4	0.255	392.0	261.3	0.000	11.68	176.5	2.8031; trap level;

Horiz plane projections in effluent direction: radius(m): 0.0; CL(m): 11.676

Lnz(m): 11.676







## Attachment C: Chemistry Model Output

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Model Scenarios			
Scenario No.	Streams	Flow Rate <sup>*</sup> (L/hr.)	Refernce Tab
Scenario 1	Alkaline product only	5,900	
	at pH 13.5		Scenario1_pH13-5
	at pH 13.9		Scenario1_pH13-9
Scenario 2	Reacted acid only	5,900	
	2A Reacted acid with Olivine		Scenario2A
	2B Reacted acid with CaCO <sub>3</sub>		Scenario2B
Scenario 3	Pretreat NF reject +IX waste	27,000	Scenario3
Scenario 4	Reacted acid+Pretreat reject waste	32,900	
	4A Reacted acid with Olivine		Scenario4A
	4B Reacted acid with CaCO <sub>3</sub>		Scenario4B
Scenario 5	Alkaline+Reacted acid+Pretreat reject waste	38,800	
	5A Reacted acid with Olivine		Scenario5A
	5B Reacted acid with CaCO <sub>3</sub>		Scenario5B

SCENARIO 1 at pH 13.5

Dilution Ratio	Volume - PoPA	Volume - Total	pH	Total Dissolved Solids	Temperature	Density - Total	Cl(-1) Liq1	Salinity	Si(+4)	Se(+4)	Sb(+5)	Si(+6)	Pb(+2)	P(+5)	Ni(+2)	Na(+1)	N(-3)	N(+5)	N(+3)	Mn(+2)	Mg(+2)	K(+1)	Hg(+2)	Fe(+2)	F(-1)	Cl(+2)	Cr(+6)	Cr(+3)	Co(+2)	Zn(+2)	Cd(+2)	Ca(+2)	Br(-1)	Be(+2)	Ba(+2)	As(+5)	Al(+3)	NiCl204	NaAlCO3OH2 (Dawsonite) -	CoCl204	CaCO3 (Calcite) -
	L/hr	L/hr		mg/L	°C	kg/m3	mg/L	g/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0	5.900	13.5	18.860	30.0	1.028	9	0	0	0	0	0	0	0.000	0	17.434	0.000	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	20.000	25.908	13.3	30.350	13.2	1.026	14.210	25.0	0.505	6.05E-04	0.008	624	0	0.002	0	13.054	0.016	0.218	0.059	0.004	0.001	254.88	2.70E-07	1.16E-02	1.93E+00	1.44E-03	9.77E-05	0.0	0.0	4.94E-03	2.61E-05	1.53E+02	40.0827	0.004	0.004	0.0033	0.116	0	0.000	0.003	195.449
7	40.000	45.927	13.1	31.748	11.0	1.025	16.033	28.2	0.125	6.82E-04	0.009	704	0	0.001	0	12.488	0.018	0.246	0.066	0.004	0.005	287.55	3.05E-07	1.31E-02	2.18E+00	1.62E-03	1.10E-04	0	0.0	5.58E-03	2.95E-05	1.72E+02	45.2241	0.004	0.004	0.0037	0.131	0	0.000	0.003	222.677
10	60.000	65.948	12.8	32.280	10.2	1.025	16.749	29.5	0.044	7.13E-04	0.009	735	0	0.001	0	12.265	0.018	0.257	0.069	0.005	0.013	300.39	3.19E-07	1.37E-02	2.28E+00	1.69E-03	1.15E-04	0	0.0	5.83E-03	3.08E-05	1.80E+02	47.2432	0.005	0.005	0.0039	0.137	0	0.000	0.003	233.29
14	80.000	85.969	12.5	32.322	9.71	1.025	17.131	30.2	0.017	7.29E-04	0.009	752	0	0.001	0	12.146	0.019	0.263	0.071	0.005	0.048	307.25	3.26E-07	1.23E-02	2.33E+00	1.73E-03	1.18E-04	0	0.0	5.90E-03	3.15E-05	1.84E+02	48.3217	0.005	0.005	0.0040	0.140	0	0.000	0.003	238.93
17	1.00E+05	1.06E+05	11.9	32.349	9.43	1.025	17.369	30.6	0.004	7.39E-04	0.009	763	0	0.001	0	12.072	0.019	0.267	0.072	0.005	0.500	311.51	3.30E-07	8.20E-03	2.36E+00	1.76E-03	1.19E-04	0	0.0	6.04E-03	3.19E-05	1.86E+02	48.9927	0.005	0.005	0.0041	0.142	0	0.000	0.003	242.42
34	2.00E+05	2.06E+05	10.6	32.929	8.87	1.025	17.869	31.5	0.000	7.60E-04	0.010	785	0	0.008	0	11.921	0.020	0.274	0.074	0.005	216.407	320.48	3.40E-07	1.46E-02	2.43E+00	1.25E-04	1.23E-04	0	0.0	6.22E-03	3.28E-05	1.92E+02	50.4034	0.004	0.005	0.0042	0.081	0	0.000	0.004	248.37
41	2.40E+05	2.46E+05	10.6	33.073	8.77	1.025	17.956	31.6	0.000	7.64E-04	0.010	788	0	0.009	0	11.894	0.020	0.276	0.074	0.005	261.486	322.03	3.42E-07	1.46E-02	2.44E+00	1.15E-04	1.23E-04	0	0.0	6.25E-03	3.30E-05	1.93E+02	50.6469	0.004	0.005	0.0042	0.073	0	0.000	0.004	249.42
47	2.80E+05	2.86E+05	10.6	33.191	8.70	1.025	18.018	31.7	0.000	7.67E-04	0.010	791	0	0.010	0	11.876	0.020	0.277	0.075	0.005	293.982	323.15	3.43E-07	1.47E-02	2.45E+00	1.10E-04	1.24E-04	0	0.0	6.27E-03	3.31E-05	1.94E+02	50.8222	0.004	0.005	0.0042	0.069	0	0.000	0.004	250.19
54	3.20E+05	3.26E+05	10.5	33.273	8.65	1.025	18.065	31.8	0.000	7.69E-04	0.010	793	0	0.011	0	11.862	0.020	0.277	0.075	0.005	318.514	323.99	3.44E-07	1.47E-02	2.45E+00	1.07E-04	1.24E-04	0	0.0	6.28E-03	3.32E-05	1.94E+02	50.9546	0.004	0.005	0.0042	0.066	0	0.000	0.004	250.76
61	3.60E+05	3.66E+05	10.5	33.325	8.61	1.025	18.102	31.9	0.000	7.70E-04	0.010	795	0	0.011	0	11.850	0.020	0.278	0.075	0.005	337.688	324.65	3.44E-07	1.48E-02	2.46E+00	1.04E-04	1.24E-04	0	0.0	6.30E-03	3.33E-05	1.94E+02	51.058	0.004	0.005	0.0042	0.064	0	0.000	0.004	251.21
68	4.00E+05	4.06E+05	10.5	33.368	8.58	1.025	18.131	31.9	0.000	7.71E-04	0.010	796	0	0.011	0	11.842	0.020	0.278	0.075	0.005	353.086	325.17	3.45E-07	1.48E-02	2.46E+00	1.03E-04	1.25E-04	0	0.0	6.31E-03	3.33E-05	1.95E+02	51.141	0.004	0.005	0.0042	0.062	0	0.000	0.004	251.58
75	4.40E+05	4.46E+05	10.5	33.409	8.55	1.025	18.155	32.0	0.000	7.72E-04	0.010	797	0	0.011	0	11.834	0.020	0.279	0.075	0.005	365.724	325.61	3.45E-07	1.48E-02	2.47E+00	1.01E-04	1.25E-04	0	0.0	6.31E-03	3.34E-05	1.95E+02	51.2094	0.004	0.005	0.0042	0.061	0	0.000	0.004	251.88
81	4.80E+05	4.86E+05	10.5	33.462	8.53	1.025	18.175	32.0	0.000	7.73E-04	0.010	798	0	0.012	0	11.828	0.020	0.279	0.075	0.005	376.282	326.57	3.46E-07	1.48E-02	2.47E+00	1.00E-04	1.25E-04	0	0.0	6.32E-03	3.34E-05	1.95E+02	51.266	0.004	0.005	0.0043	0.060	0	0.000	0.004	252.13
88	5.20E+05	5.26E+05	10.5	33.473	8.51	1.025	18.192	32.1	0.000	7.74E-04	0.010	799	0	0.012	0	11.823	0.020	0.279	0.075	0.005	385.236	326.28	3.46E-07	1.48E-02	2.47E+00	9.94E-05	1.25E-04	0	0.0	6.33E-03	3.34E-05	1.96E+02	51.3142	0.004	0.005	0.0043	0.059	0	0.000	0.004	252.34
95	5.60E+05	5.66E+05	10.5	33.522	8.49	1.025	18.207	32.1	0.000	7.75E-04	0.010	799	0	0.012	0	11.819	0.020	0.279	0.075	0.005	392.924	326.54	3.46E-07	1.48E-02	2.47E+00	9.87E-05	1.25E-04	0	0.0	6.33E-03	3.34E-05	1.96E+02	51.3557	0.004	0.005	0.0043	0.059	0	0.000	0.004	252.52
102	6.00E+05	6.06E+05	10.5	33.538	8.48	1.025	18.220	32.1	0.000	7.75E-04	0.010	800	0	0.012	0	11.815	0.020	0.280	0.075	0.005	399.597	326.77	3.47E-07	1.49E-02	2.48E+00	9.80E-05	1.25E-04	0	0.0	6.34E-03	3.35E-05	1.96E+02	51.3916	0.004	0.005	0.0043	0.058	0	0.000	0.004	252.68
108	6.40E+05	6.46E+05	10.5	33.547	8.47	1.025	18.231	32.1	0.000	7.76E-04	0.010	800	0	0.012	0	11.811	0.020	0.280	0.075	0.005	405.444	326.97	3.47E-07	1.49E-02	2.48E+00	9.75E-05	1.25E-04	0	0.0	6.34E-03	3.35E-05	1.96E+02	51.4231	0.004	0.005	0.0043	0.058	0	0.000	0.004	252.82
115	6.80E+05	6.86E+05	10.5	33.553	8.46	1.025	18.241	32.1	0.000	7.76E-04	0.010	801	0	0.012	0	11.808	0.020	0.280	0.075	0.005	410.609	327.15	3.47E-07	1.49E-02	2.48E+00	9.71E-05	1.25E-04	0	0.0	6.34E-03	3.35E-05	1.96E+02	51.451	0.004	0.005	0.0043	0.057	0	0.000	0.004	252.94
122	7.20E+05	7.26E+05	10.5	33.559	8.45	1.025	18.250	32.2	0.000	7.76E-04	0.010	801	0	0.012	0	11.806	0.020	0.280	0.075	0.005	415.206	327.30	3.47E-07	1.49E-02	2.48E+00	9.67E-05	1.25E-04	0	0.0	6.35E-03	3.35E-05	1.96E+02	51.4757	0.004	0.005	0.0043	0.057	0	0.000	0.004	253.05
129	7.60E+05	7.66E+05	10.5	33.564	8.44	1.025	18.257	32.2	0.000	7.77E-04	0.010	802	0	0.012	0	11.803	0.020	0.280	0.076	0.005	419.322	327.44	3.47E-07	1.49E-02	2.48E+00	9.63E-05	1.26E-04	0	0.0	6.35E-03	3.35E-05	1.96E+02	51.4979	0.004	0.005	0.0043	0.057	0	0.000	0.004	253.15
136	8.00E+05	8.06E+05	10.5	33.569	8.43	1.025	18.265	32.2	0.000	7.77E-04	0.010	802	0	0.012	0	11.801	0.020	0.280	0.076	0.005	423.030	327.57	3.47E-07	1.49E-02	2.48E+00	9.60E-05	1.26E-04	0	0.0	6.35E-03	3.36E-05	1.96E+02	51.5179	0.004	0.005	0.0043	0.056	0	0.000	0.004	253.24
142	8.40E+05	8.46E+05	10.5	33.573	8.42	1.025	18.271	32.2	0.000	7.77E-04	0.010	802	0	0.012	0	11.799	0.020	0.280	0.076	0.005	426.387	327.69	3.48E-07	1.49E-02	2.48E+00	9.58E-05	1.26E-04	0	0.0	6.36E-03	3.36E-05	1.96E+02	51.536	0.004	0.005	0.0043	0.056	0	0.000	0.004	253.31
149	8.80E+05	8.86E+05	10.48	33.577	8.42	1.025	18.277	32.2	0.000	7.78E-04	0.010	802	0	0.013	0	11.798	0.020	0.280	0.076	0.005	429.441	327.79	3.48E-07	1.49E-02	2.48E+00	9.55E-05	1.26E-04	0	0.0	6.36E-03	3.36E-05	1.96E+02	51.5524	0.004	0.005	0.0043	0.056	0	0.000	0.004	253.39
156	9.20E+05	9.26E+05	10.48	33.580	8.41	1.025	18.282	32.2	0.000	7.78E-04	0.010	803	0	0.013	0	11.796	0.020	0.281	0.076	0.005	432.232	327.89	3.48E-07	1.49E-02	2.48E+00	9.53E-05	1.26E-04	0	0.0	6.36E-03	3.36E-05	1.97E+02	51.5674	0.005	0.005	0.0043	0.056	0	0.000	0.004	253.45
163	9.60E+05	9.66E+05	10.48	33.583	8.40	1.025	18.287	32.2	0.000	7.78E-04	0.010	803	0	0.013	0	11.794	0.020	0.281	0.076	0.005	434.791	327.97	3.48E-07	1.49E-02	2.48E+00	9.51E-05	1.26E-04	0	0.0	6.36E-03	3.36E-05	1.97E+02	51.5812	0.005	0.005	0.0043	0.056	0	0.000	0.004	253.51
169	1.00E+06	1.01E+06	10.48	33.586	8.40	1.025	18.292	32.2	0.000	7.78E-04	0.010	803	0	0.013	0	11.793	0.020	0.281	0.076	0.005	437.147	328.05	3.48E-07	1.49E-02	2.48E+00	9.49E-05	1.26E-04	0	0.0	6.36E-03	3.36E-05	1.97E+02	51.5939								

**SCENARIO 1 at pH 13.93**

[illegible]

## SCENARIO 2A

Dilution Ratio	Volume PoPA	Volume - Total	pH	Total Dissolved Solids	Temperature	Density - Total	Cl(-1)	Salinity	Si(+4)	S(+6)	Ni(+2)	Na(+1)	Mg(+2)	K(+1)	Fe(+3)	Cr(+3)	Co(+2)	Ca(+2)	Br(-1)	Al(+3)	Ti(+4)	TiO2 (Rutile)	SiO2 (lechatellierite)	NiFe2O4 (Trevorite)	NiCr2O4	NaAlCO3(OH)2 (Dawsonite)	CaCO3 (Calcite)
0	0	5.900	2.26	28,755	30	1.020	22,041	39.0	53.6	0	18.1	0	7,379	0	2.43	0.05	0.853	138	0	1.13	0.002	0.098906	131	0	0	0	0
8	50,000	55,894	6.53	33,419	10.5	1.025	18,787	33.1	12.7	723	1.78	10,520	1,190	295	4,29E-08	1,07E-05	0.095	283	46.4	0.0099	0.001	8,41E-03	0	0.5379	0.016	1,300	0
17	1.00E+05	105,893	6.92	33,640	9.46	1.025	18,604	32.8	7.01	763	0.94	11,106	846	312	1,25E-08	1,28E-06	0.052	291	49.0	0.0008	0.001	3,31E-03	0	0.2839	0.011	1,088	0
25	1.50E+05	1,56E+05	7.12	33,500	9.07	1.025	18,539	32.7	4.97	777	0.64	11,315	722	318	7,48E-09	4,55E-07	0.037	294	49.9	0.0002	0.001	1,48E-03	0	0.1929	0.009	0.997	0
34	2.00E+05	2,06E+05	7.24	33,646	8.87	1.026	18,505	32.6	3.92	785	0.48	11,423	658	321	5,59E-09	2,37E-07	0.029	295	50.4	0.0001	0.001	5,36E-04	0	0.1460	0.008	0.950	0
42	2.50E+05	2,56E+05	7.34	33,735	8.75	1.026	18,485	32.6	3.29	789	0.39	11,489	620	322	4,63E-09	1,51E-07	0.025	296	50.7	7,60E-05	0.001	0	0	0.1175	0.007	0.921	0
51	3.00E+05	3,06E+05	7.40	33,794	8.67	1.026	18,471	32.5	2.86	792	0.32	11,533	593	324	4,07E-09	1,08E-07	0.021	297	50.9	5,95E-05	0.001	0	0	0.0983	0.007	0.901	0
59	3.50E+05	3,56E+05	7.46	33,837	8.61	1.026	18,461	32.5	2.55	794	0.28	11,565	575	325	3,71E-09	8,44E-08	0.019	297	51.0	5,16E-05	0.001	0	0	0.0845	0.007	0.887	0
68	4.00E+05	4,06E+05	7.50	33,870	8.56	1.026	18,453	32.5	2.31	796	0.24	11,589	561	325	3,47E-09	6,96E-08	0.017	298	51.1	4,75E-05	8,92E-04	0	0	0.0741	0.006	0.876	0
76	4.50E+05	4,56E+05	7.54	33,895	8.53	1.026	18,447	32.5	2.13	797	0.22	11,608	550	326	3,30E-09	5,98E-08	0.016	298	51.2	4,55E-05	7,94E-04	0	0	0.0660	0.006	0.868	0
85	5.00E+05	5,06E+05	7.57	33,884	8.50	1.026	18,443	32.5	1.99	798	0.20	11,623	541	326	3,17E-09	5,29E-08	0.015	298	51.3	4,44E-05	7,16E-04	0	0	0.0594	0.006	0.861	0
93	5.50E+05	5,56E+05	7.59	33,871	8.48	1.026	18,439	32.5	1.87	799	0.18	11,635	533	327	3,09E-09	4,80E-08	0.014	298	51.3	4,40E-05	6,52E-04	0	0	0.0541	0.006	0.856	0
102	6.00E+05	6,06E+05	7.62	33,861	8.46	1.026	18,436	32.5	1.77	800	0.16	11,646	527	327	3,02E-09	4,43E-08	0.013	298	51.4	4,39E-05	5,98E-04	0	0	0.0496	0.006	0.851	0
110	6.50E+05	6,56E+05	7.64	33,851	8.44	1.026	18,433	32.5	1.68	801	0.15	11,654	522	327	2,97E-09	4,15E-08	0.013	299	51.4	4,40E-05	5,52E-04	0	0	0.0458	0.006	0.847	0
119	7.00E+05	7,06E+05	7.65	33,849	8.43	1.026	18,431	32.5	1.61	801	0.14	11,662	518	327	2,94E-09	3,93E-08	0.012	299	51.5	4,43E-05	5,13E-04	0	0	0.0426	0.006	0.844	0
127	7.50E+05	7,56E+05	7.67	33,851	8.42	1.026	18,429	32.5	1.55	801	0.13	11,668	514	327	2,92E-09	3,76E-08	0.012	299	51.5	4,46E-05	4,79E-04	0	0	0.0398	0.006	0.841	0
136	8.00E+05	8,06E+05	7.68	33,853	8.41	1.026	18,427	32.5	1.49	802	0.12	11,674	511	328	2,90E-09	3,62E-08	0.011	299	51.5	4,49E-05	4,49E-04	0	0	0.0373	0.006	0.839	0
144	8.50E+05	8,56E+05	7.69	33,825	8.40	1.026	18,425	32.5	1.44	802	0.12	11,679	508	328	2,89E-09	3,50E-08	0.011	299	51.5	4,53E-05	4,23E-04	0	0	0.0351	0.006	0.836	0
153	9.00E+05	9,06E+05	7.70	33,856	8.39	1.026	18,424	32.5	1.40	803	0.11	11,684	505	328	2,89E-09	3,41E-08	0.011	299	51.6	4,56E-05	4,00E-04	0	0	0.0332	0.005	0.834	0
161	9.50E+05	9,56E+05	7.71	33,858	8.38	1.026	18,423	32.5	1.36	803	0.10	11,688	503	328	2,89E-09	3,33E-08	0.010	299	51.6	4,60E-05	3,79E-04	0	0	0.0315	0.005	0.833	0
169	1.00E+06	1,01E+06	7.72	33,813	8.38	1.026	18,422	32.4	1.32	803	0.10	11,691	501	328	2,89E-09	3,27E-08	0.010	299	51.6	4,64E-05	3,60E-04	0	0	0.0299	0.005	0.831	0
254	1.50E+06	1,51E+06	7.78	33,789	8.33	1.026	18,414	32.4	1.10	805	0.07	11,714	487	329	3,03E-09	3,02E-08	0.008	299	51.7	4,94E-05	2,40E-04	0	0	0.0200	0.005	0.821	0
330	1.95E+06	1,96E+06	7.81	33,777	8.32	1.026	18,411	32.4	1.00	805	0.05	11,725	481	329	3,21E-09	3,03E-08	0.008	300	51.7	5,12E-05	1,85E-04	0	0	0.0154	0.005	0.816	0
407	2.40E+06	2,41E+06	7.82	33,874	8.30	1.026	18,409	32.4	0.93	806	0.04	11,731	477	329	3,40E-09	3,11E-08	0.007	300	51.8	5,24E-05	1,51E-04	0	0	0.0125	0.005	0.813	0
483	2.85E+06	2,86E+06	7.84	33,876	8.29	1.026	18,408	32.4	0.89	806	0.03	11,736	474	329	3,60E-09	3,21E-08	0.007	300	51.8	5,33E-05	1,27E-04	0	0	0.0105	0.005	0.811	0
559	3.30E+06	3,31E+06	7.84	33,877	8.29	1.026	18,407	32.4	0.86	806	0.03	11,739	472	329	3,79E-09	3,33E-08	0.007	300	51.8	5,40E-05	1,10E-04	0	0	0.0091	0.005	0.810	0
636	3.75E+06	3,76E+06	7.85	33,878	8.28	1.026	18,406	32.4	0.83	807	0.03	11,742	471	329	3,98E-09	3,45E-08	0.006	300	51.8	5,45E-05	9,64E-05	0	0	0.0080	0.005	0.808	0
712	4.20E+06	4,21E+06	7.85	33,878	8.28	1.026	18,405	32.4	0.81	807	0.02	11,744	470	330	4,20E-09	3,64E-08	0.006	300	51.8	5,46E-05	8,61E-05	0	0	0.0071	0.005	0.808	0.096
788	4.65E+06	4,66E+06	7.85	33,879	8.28	1.026	18,405	32.4	0.80	807	0.02	11,745	469	330	4,43E-09	3,84E-08	0.006	300	51.8	5,46E-05	7,78E-05	0	0	0.0065	0.005	0.807	0.191
864	5.10E+06	5,11E+06	7.85	33,879	8.28	1.026	18,404	32.4	0.79	807	0.02	11,746	468	330	4,65E-09	4,03E-08	0.006	300	51.8	5,46E-05	7,09E-05	0	0	0.0059	0.005	0.806	0.269
941	5.55E+06	5,56E+06	7.85	33,880	8.27	1.026	18,404	32.4	0.78	807	0.02	11,748	467	330	4,85E-09	4,21E-08	0.006	300	51.8	5,46E-05	6,52E-05	0	0	0.0054	0.005	0.806	0.334
1017	6.00E+06	6,01E+06	7.85	33,880	8.27	1.026	18,404	32.4	0.77	807	0.02	11,749	467	330	5,06E-09	4,38E-08	0.006	300	51.8	5,46E-05	6,03E-05	0	0	0.0050	0.005	0.805	0.390
1102	6.50E+06	6,51E+06	7.85	33,881	8.27	1.026	18,403	32.4	0.76	807	0.01	11,749	466	330	5,27E-09	4,57E-08	0.006	300	51.9	5,46E-05	5,57E-05	0	0	0.0046	0.005	0.805	0.443

## SCENARIO 2B

Dilution Ratio	Volume - Reconcile PoPA_W O	Volume - Total	pH	Total Dissolved Solids	Temperature	Density - Total	Cl(-1)	Salinity	Si(+4)	Se(+4)	S(+6)	Pb(+2)	P(+5)	Ni(+2)	Na(+1)	N(-3)	Mo(+6)	Mg(+2)	K(+1)	Hg(+2)	Co(+2)	Zn(+2)	Cd(+2)	Ca(+2)	Br(-1)	As(+5)	NiCr2O4	NaAlCO3(OH)2 (Dawsonite)	CoCr2O4	CaF2 (Fluorite)	CaCO3 (Calcite)
	L/hr	L/Total		mg/L	°C	kg/m3	mg/L	g/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0	5,901	8.10	39,282	30.0	1.028	25,165	44.2	0	0.0192	0	2.50E-03	0	1.00E-03	107	0	1.00E-04	198	0	2.00E-03	3.00E-04	3.00E-04	2.00E-04	13,805	0	0.100	0	0	0	463	
8	50,000	55,892	7.18	34,511	10.5	1.026	19,117	33.7	0.585	0.0027	723	3.02E-04	0.036	2.02E-06	10,532	0.018	1.06E-05	432	295	2.11E-04	3.89E-03	5.76E-03	5.14E-05	1,718	46.4	0.014	0.0017	0.72	0.0024	0.09	67.1
17	#####	105,891	7.36	34,217	9.45	1.026	18,779	33.1	0.618	0.0018	763	1.80E-04	0.038	2.80E-06	11,112	0.019	5.57E-06	445	312	1.12E-04	3.98E-03	6.06E-03	4.31E-05	1,047	49.0	0.010	0.0015	0.76	0.0029	0	38.9
25	#####	#####	7.46	33,567	9.06	1.026	18,657	32.9	0.630	0.0015	777	1.36E-04	0.038	3.40E-06	11,320	0.019	3.78E-06	450	318	7.60E-05	4.02E-03	6.17E-03	4.01E-05	807	49.9	0.008	0.0015	0.77	0.0031	0	27.8
34	#####	#####	7.52	34,056	8.87	1.026	18,595	32.8	0.636	0.0013	785	1.13E-04	0.039	3.88E-06	11,427	0.020	2.87E-06	453	321	5.77E-05	4.04E-03	6.23E-03	3.86E-05	684	50.4	0.007	0.0015	0.78	0.0032	0	21.9
42	#####	#####	7.57	34,023	8.75	1.026	18,557	32.7	0.639	0.0012	789	9.94E-05	0.039	4.26E-06	11,492	0.020	2.31E-06	454	322	4.65E-05	4.06E-03	6.26E-03	3.76E-05	608	50.7	0.007	0.0015	0.78	0.0032	0	18.1
51	#####	#####	7.60	34,000	8.67	1.026	18,531	32.6	0.642	0.0011	792	9.01E-05	0.039	4.58E-06	11,536	0.020	1.93E-06	455	324	3.89E-05	4.07E-03	6.28E-03	3.70E-05	558	50.9	0.006	0.0014	0.78	0.0032	0	15.6
59	#####	#####	7.63	33,984	8.61	1.026	18,513	32.6	0.644	0.0011	794	8.34E-05	0.039	4.84E-06	11,567	0.020	1.66E-06	456	325	3.35E-05	4.07E-03	6.30E-03	3.66E-05	522	51.0	0.006	0.0014	0.79	0.0033	0	13.7
68	#####	#####	7.65	33,972	8.56	1.026	18,499	32.6	0.645	0.0011	796	7.84E-05	0.039	5.07E-06	11,591	0.020	1.45E-06	456	325	2.94E-05	4.08E-03	6.31E-03	3.62E-05	494	51.1	0.006	0.0014	0.79	0.0033	0	12.2
76	#####	#####	7.67	33,962	8.53	1.026	18,488	32.6	0.646	0.0010	797	7.45E-05	0.039	5.26E-06	11,610	0.020	1.29E-06	457	326	2.62E-05	4.08E-03	6.32E-03	3.60E-05	473	51.2	0.006	0.0014	0.79	0.0033	0	11.1
85	#####	#####	7.68	33,955	8.50	1.026	18,479	32.5	0.647	9.98E-04	798	7.14E-05	0.040	5.43E-06	11,624	0.020	1.17E-06	457	326	2.37E-05	4.09E-03	6.33E-03	3.57E-05	456	51.3	0.005	0.0014	0.79	0.0033	0	10.2
93	#####	#####	7.70	33,948	8.48	1.026	18,472	32.5	0.647	9.78E-04	799	6.88E-05	0.040	5.58E-06	11,637	0.020	1.06E-06	457	327	2.16E-05	4.09E-03	6.34E-03	3.56E-05	442	51.4	0.005	0.0014	0.79	0.0033	0	9.38
102	#####	#####	7.71	33,943	8.46	1.026	18,466	32.5	0.648	9.62E-04	800	6.66E-05	0.040	5.71E-06	11,647	0.020	9.74E-07	457	327	1.98E-05	4.09E-03	6.34E-03	3.54E-05	430	51.4	0.005	0.0014	0.79	0.0033	0	8.73
110	#####	#####	7.72	33,939	8.44	1.026	18,461	32.5	0.649	9.49E-04	801	6.48E-05	0.040	5.82E-06	11,655	0.020	8.99E-07	458	327	1.83E-05	4.09E-03	6.35E-03	3.53E-05	420	51.4	0.005	0.0014	0.79	0.0033	0	8.18
119	#####	#####	7.72	33,935	8.43	1.026	18,457	32.5	0.649	9.37E-04	801	6.32E-05	0.040	5.93E-06	11,663	0.020	8.36E-07	458	327	1.71E-05	4.09E-03	6.35E-03	3.52E-05	411	51.5	0.005	0.0014	0.79	0.0033	0	7.70
127	#####	#####	7.73	33,932	8.42	1.026	18,453	32.5	0.649	9.27E-04	802	6.19E-05	0.040	6.02E-06	11,669	0.020	7.80E-07	458	327	1.60E-05	4.10E-03	6.35E-03	3.51E-05	404	51.5	0.005	0.0014	0.79	0.0033	0	7.28
136	#####	#####	7.74	33,929	8.41	1.026	18,450	32.5	0.650	9.18E-04	802	6.07E-05	0.040	6.11E-06	11,675	0.020	7.32E-07	458	328	1.50E-05	4.10E-03	6.36E-03	3.50E-05	397	51.5	0.005	0.0014	0.79	0.0033	0	6.92
144	#####	#####	7.74	33,926	8.40	1.026	18,447	32.5	0.650	9.10E-04	802	5.96E-05	0.040	6.19E-06	11,680	0.020	6.89E-07	458	328	1.41E-05	4.10E-03	6.36E-03	3.49E-05	392	51.5	0.005	0.0014	0.79	0.0034	0	6.59
153	#####	#####	7.75	33,924	8.39	1.026	18,444	32.5	0.650	9.03E-04	803	5.87E-05	0.040	6.26E-06	11,684	0.020	6.51E-07	458	328	1.34E-05	4.10E-03	6.36E-03	3.49E-05	387	51.6	0.005	0.0014	0.80	0.0034	0	6.30
161	#####	#####	7.75	33,922	8.38	1.026	18,442	32.5	0.650	8.97E-04	803	5.79E-05	0.040	6.32E-06	11,688	0.020	6.17E-07	458	328	1.27E-05	4.10E-03	6.36E-03	3.48E-05	382	51.6	0.005	0.0014	0.80	0.0034	0	6.04
169	#####	#####	7.76	33,920	8.38	1.026	18,440	32.5	0.651	8.91E-04	803	5.71E-05	0.040	6.38E-06	11,692	0.020	5.86E-07	458	328	1.21E-05	4.10E-03	6.36E-03	3.48E-05	378	51.6	0.005	0.0014	0.80	0.0034	0	5.80
254	#####	#####	7.79	33,908	8.33	1.026	18,427	32.5	0.652	8.55E-04	805	5.23E-05	0.040	6.80E-06	11,714	0.020	3.92E-07	459	329	8.18E-06	4.10E-03	6.38E-03	3.45E-05	352	51.7	0.005	0.0014	0.80	0.0034	0	4.27
330	#####	#####	7.80	33,903	8.31	1.026	18,421	32.4	0.652	8.38E-04	805	5.01E-05	0.040	7.01E-06	11,725	0.020	3.02E-07	459	329	6.38E-06	4.11E-03	6.38E-03	3.43E-05	340	51.7	0.005	0.0014	0.80	0.0034	0	3.56
407	#####	#####	7.81	33,899	8.30	1.026	18,417	32.4	0.653	8.28E-04	806	4.87E-05	0.040	7.15E-06	11,732	0.020	2.45E-07	459	329	5.25E-06	4.11E-03	6.39E-03	3.42E-05	332	51.8	0.005	0.0014	0.80	0.0034	0	3.10
483	#####	#####	7.82	33,897	8.29	1.026	18,414	32.4	0.653	8.21E-04	806	4.78E-05	0.040	7.25E-06	11,736	0.020	2.07E-07	459	329	4.48E-06	4.11E-03	6.39E-03	3.41E-05	327	51.8	0.005	0.0014	0.80	0.0034	0	2.79
559	#####	#####	7.82	33,895	8.29	1.026	18,412	32.4	0.653	8.16E-04	806	4.71E-05	0.040	7.33E-06	11,739	0.020	1.78E-07	460	329	3.92E-06	4.11E-03	6.39E-03	3.41E-05	323	51.8	0.004	0.0014	0.80	0.0034	0	2.56
635	#####	#####	7.83	33,894	8.28	1.026	18,411	32.4	0.653	8.12E-04	807	4.66E-05	0.040	7.39E-06	11,742	0.020	1.57E-07	460	329	3.49E-06	4.11E-03	6.39E-03	3.41E-05	321	51.8	0.004	0.0014	0.80	0.0034	0	2.38
712	#####	#####	7.83	33,893	8.28	1.026	18,410	32.4	0.653	8.09E-04	807	4.61E-05	0.040	7.43E-06	11,744	0.020	1.40E-07	460	330	3.16E-06	4.11E-03	6.39E-03	3.40E-05	318	51.8	0.004	0.0014	0.80	0.0034	0	2.24
788	#####	#####	7.83	33,892	8.28	1.026	18,409	32.4	0.654	8.06E-04	807	4.58E-05	0.040	7.47E-06	11,745	0.020	1.27E-07	460	330	2.88E-06	4.11E-03	6.39E-03	3.40E-05	316	51.8	0.004	0.0014	0.80	0.0034	0	2.13
864	#####	#####	7.83	33,891	8.27	1.026	18,408	32.4	0.654	8.04E-04	807	4.55E-05	0.040	7.50E-06	11,747	0.020	1.16E-07	460	330	2.66E-06	4.11E-03	6.39E-03	3.40E-05	315	51.8	0.004	0.0014	0.80	0.0034	0	2.04
941	#####	#####	7.83	33,891	8.27	1.026	18,407	32.4	0.654	8.02E-04	807	4.53E-05	0.040	7.53E-06	11,748	0.020	1.06E-07	460	330	2.47E-06	4.11E-03	6.39E-03	3.40E-05	314	51.8	0.004	0.0014	0.80	0.0034	0	1.96
1017	#####	#####	7.84	33,890	8.27	1.026	18,407	32.4	0.654	8.01E-04	807	4.51E-05	0.040	7.55E-06	11,749	0.020	9.82E-08	460	330	2.31E-06	4.11E-03	6.39E-03	3.40E-05	313	51.8	0.004	0.0014	0.80	0.0034	0	1.90
1102	#####	#####	7.84	33,890	8.27	1.026	18,406	32.4	0.654	7.99E-04	807	4.49E-05	0.040	7.57E-06	11,750	0.020	9.07E-08	460	330	2.16E-06	4.11E-03	6.39E-03	3.40E-05	312	51.9	0.004	0.0014	0.80	0.0034	0	1.83
2158	#####	#####	7.85	33,887	8.26	1.026	18,403	32.4	0.654	7.91E-04	807	4.38E-05	0.040	7.71E-06	11,755	0.020	4.63E-08	460	330	1.28E-06	4.11E-03	6.40E-03	3.39E-05	306	51.9	0.004	0.0014	0.80	0.0034	0	1.46
3214	#####	#####	7.85	33,886	8.26	1.026	18,402	32.4	0.654	7.89E-04	808	4.35E-05	0.040	7.75E-06	11,756	0.020	3.11E-08	460	330	9.72E-07	4.11E-03	6.40E-03	3.39E-05	304	51.9	0.004	0.0014	0.80	0.0034	0	1.34
4270	#####	#####	7.85	33,886	8.26	1.026	18,402	32.4	0.654	7.87E-04	808	4.33E-05	0.040	7.78E-06	11,757	0.020	2.34E-08	460	330	8.18E-07	4.11E-03	6.40E-03	3.38E-05	303	51.9	0.004	0.0014	0.80	0.0034	0	1.27
5327	#####	#####	7.85	33,886	8.25	1.026	18,401	32.4	0.654	7.86E-04	808	4.32																			

## SCENARIO 3

Dilution Ratio	Volume - PoPA	Volume - Total	pH	Total Dissolved Solids	Temperature	Density - Total	Cl(-1)	Salinity	Si(+4)	Se(+4)	Sh(+5)	Si(+6)	Pb(+2)	Pi(+5)	Ni(+2)	Na(+1)	N(-3)	N(+5)	N(+3)	Mn(+2)	Mg(+2)	Zn(+2)	K(+1)	Hg(+2)	Fe(+2)	Fe(-1)	Cu(+2)	Cr(+6)	Cr(+3)	Co(+2)	Co(+2)	Ca(+2)	B(-1)	Be(+2)	Ba(+2)	As(+5)	Al(+3)	NiCr204	NaAlCO3OH2 (Dawsonite)	CoCr204	CaCO3 (Calcite)		
	L/hr	L/hr		mg/L	°C	kg/m3	mg/L	g/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0	27.001	7.10	55.069	17.0	1.042	31.372	54.4	0	7.83E-04	0	1.643	0.003	0	1.29E-07	12.500	0	0	0	0	4.631	0.001	0	6.50E-08	0	0	3.74E-04	2.69E-04	7.82E-04	0	7.79E-05	1.328	53.0	0	0	3.26E-03	0	0.003	0	0	54.9		
0.4	10.000	36.995	7.24	49.219	14.6	1.037	27.870	48.5	0.18	7.83E-04	0.003	1.417	0.002	0.011	4.22E-06	12.302	0.005	0.076	0.021	0.001	3.504	0.003	89.2	1.42E-07	0.004	0.68	7.76E-04	2.30E-04	6.36E-05	0.0008	6.60E-05	1.050	52.7	0.0014	0.0014	0.0035	3.84E-05	0.003	0.216	0.0020	39.7		
0.7	20.000	46.992	7.33	45.859	13.3	1.035	25.857	45.1	0.28	7.83E-04	0.004	1.288	0.001	0.017	5.05E-06	12.187	0.009	0.120	0.032	0.002	2.857	0.004	140	1.86E-07	0.006	1.06	0.0010	2.08E-04	3.53E-05	0.0015	5.91E-05	891	52.5	0.0021	0.0021	0.0037	3.82E-05	0.002	0.341	0.0024	31.3		
1.1	30.000	56.990	7.39	43.681	12.4	1.033	24.549	42.9	0.34	7.83E-04	0.005	1.204	0.001	0.021	5.40E-06	12.113	0.011	0.149	0.040	0.003	2.436	0.004	174	2.15E-07	0.008	1.32	0.0012	1.94E-04	2.39E-05	0.0020	5.47E-05	787	52.4	0.0026	0.0026	0.0038	3.84E-05	0.002	0.421	0.0026	25.9		
1.5	40.000	66.989	7.44	42.157	11.8	1.032	23.632	41.4	0.39	7.83E-04	0.006	1.145	0.001	0.024	5.63E-06	12.060	0.012	0.169	0.045	0.003	2.141	0.004	197	2.35E-07	0.009	1.49	0.0013	1.84E-04	1.79E-05	0.0023	5.16E-05	714	52.4	0.0030	0.0030	0.0039	3.89E-05	0.002	0.478	0.0027	22.1		
1.9	50.000	76.987	7.48	41.032	11.3	1.031	22.952	40.2	0.43	7.83E-04	0.006	1.101	0.001	0.026	5.79E-06	12.022	0.013	0.183	0.049	0.003	1.923	0.005	214	2.50E-07	0.010	1.62	0.0013	1.76E-04	1.43E-05	0.0025	4.93E-05	661	52.3	0.0032	0.0032	0.0039	3.94E-05	0.002	0.520	0.0028	19.4		
2.2	60.000	86.987	7.51	40.463	10.9	1.031	22.429	39.3	0.45	7.83E-04	0.007	1.067	0.001	0.028	5.92E-06	11.992	0.014	0.195	0.053	0.003	1.755	0.005	228	2.62E-07	0.010	1.72	0.0014	1.71E-04	1.19E-05	0.0027	4.75E-05	619	52.2	0.0034	0.0034	0.0040	4.00E-05	0.002	0.552	0.0029	17.3		
2.6	70.000	96.986	7.54	39.785	10.7	1.030	22.014	38.6	0.47	7.83E-04	0.007	1.040	0.001	0.029	6.04E-06	11.968	0.015	0.204	0.055	0.004	1.621	0.005	238	2.71E-07	0.011	1.80	0.0014	1.66E-04	1.02E-05	0.0029	4.61E-05	586	52.2	0.0036	0.0036	0.0040	4.05E-05	0.002	0.578	0.0029	15.6		
3.0	80.000	1.07E+05	7.56	39.234	10.4	1.030	21.676	38.0	0.49	7.83E-04	0.007	1.019	0.001	0.030	6.13E-06	11.948	0.015	0.211	0.057	0.004	1.513	0.005	247	2.78E-07	0.011	1.87	0.0015	1.62E-04	9.00E-06	0.0030	4.49E-05	559	52.2	0.0037	0.0037	0.0040	4.10E-05	0.002	0.598	0.0030	14.3		
3.3	90.000	1.17E+05	7.58	38.777	10.3	1.029	21.396	37.5	0.50	7.83E-04	0.008	1.001	0.001	0.031	6.22E-06	11.932	0.016	0.217	0.059	0.004	1.423	0.005	254	2.84E-07	0.012	1.92	0.0015	1.59E-04	8.07E-06	0.0031	4.40E-05	537	52.2	0.0038	0.0038	0.0041	4.15E-05	0.002	0.616	0.0030	13.1		
3.7	1.00E+05	1.27E+05	7.60	38.392	10.1	1.029	21.160	37.1	0.52	7.83E-04	0.008	985	5.65E-04	0.031	6.29E-06	11.919	0.016	0.222	0.060	0.004	1.347	0.005	260	2.89E-07	0.012	1.97	0.0015	1.57E-04	7.35E-06	0.0031	4.32E-05	518	52.1	0.0039	0.0039	0.0041	4.20E-05	0.002	0.630	0.0030	12.2		
7	2.00E+05	2.27E+05	7.70	36.406	9.28	1.028	19.945	35.1	0.58	7.83E-04	0.009	907	3.35E-04	0.035	6.78E-06	11.849	0.018	0.249	0.067	0.004	956	0.006	291	3.16E-07	0.013	2.20	0.0017	1.43E-04	4.36E-06	0.0036	3.90E-05	422	52.0	0.0044	0.0044	0.0042	4.55E-05	0.002	0.705	0.0032	7.32		
44	1.18E+06	1.21E+06	7.82	34.359	8.44	1.026	18.691	32.9	0.64	7.83E-04	0.010	826	9.77E-05	0.039	7.58E-06	11.777	0.020	0.276	0.074	0.005	553	0.006	323	3.44E-07	0.015	2.44	0.0018	1.30E-04	2.31E-06	0.0040	3.48E-05	323	51.9	0.0049	0.0049	0.0043	5.22E-05	0.001	0.782	0.0034	2.26		
80	2.16E+06	2.19E+06	7.83	34.146	8.36	1.026	18.560	32.7	0.65	7.83E-04	0.010	818	7.30E-05	0.040	7.70E-06	11.769	0.020	0.279	0.075	0.005	511	0.006	326	3.46E-07	0.015	2.47	0.0018	1.28E-04	2.14E-06	0.0041	3.43E-05	312	51.9	0.0049	0.0049	0.0043	5.31E-05	0.001	0.790	0.0034	1.73		
116	3.14E+06	3.17E+06	7.84	34.065	8.32	1.026	18.511	32.6	0.65	7.83E-04	0.010	815	6.36E-05	0.040	7.74E-06	11.766	0.020	0.280	0.075	0.005	496	0.006	327	3.48E-07	0.015	2.48	0.0018	1.28E-04	2.08E-06	0.0041	3.42E-05	308	51.9	0.0050	0.0050	0.0043	5.35E-05	0.001	0.793	0.0034	1.53		
153	4.12E+06	4.15E+06	7.84	34.022	8.31	1.026	18.485	32.6	0.65	7.83E-04	0.010	813	5.87E-05	0.040	7.77E-06	11.765	0.020	0.281	0.076	0.005	487	0.006	328	3.48E-07	0.015	2.48	0.0019	1.27E-04	2.05E-06	0.0041	3.41E-05	306	51.9	0.0050	0.0050	0.0043	5.38E-05	0.001	0.795	0.0034	1.42		
189	5.10E+06	5.13E+06	7.85	33.996	8.30	1.026	18.468	32.5	0.65	7.83E-04	0.010	812	5.36E-05	0.040	7.78E-06	11.764	0.020	0.281	0.076	0.005	482	0.006	328	3.49E-07	0.015	2.49	0.0019	1.27E-04	2.03E-06	0.0041	3.40E-05	305	51.9	0.0050	0.0050	0.0043	5.39E-05	0.001	0.796	0.0034	1.35		
225	6.08E+06	6.11E+06	7.85	33.978	8.29	1.026	18.457	32.5	0.65	7.83E-04	0.010	811	5.30E-05	0.040	7.79E-06	11.763	0.020	0.281	0.076	0.005	478	0.006	329	3.49E-07	0.015	2.49	0.0019	1.27E-04	2.02E-06	0.0041	3.40E-05	304	51.9	0.0050	0.0050	0.0043	5.40E-05	0.001	0.797	0.0034	1.31		
261	7.06E+06	7.09E+06	7.85	33.965	8.28	1.026	18.450	32.5	0.65	7.83E-04	0.010	811	5.21E-05	0.040	7.80E-06	11.763	0.020	0.281	0.076	0.005	476	0.006	329	3.49E-07	0.015	2.49	0.0019	1.27E-04	2.01E-06	0.0041	3.40E-05	303	51.9	0.0050	0.0050	0.0043	5.40E-05	0.001	0.797	0.0034	1.28		
298	8.04E+06	8.07E+06	7.85	33.955	8.28	1.026	18.444	32.5	0.65	7.83E-04	0.010	811	5.09E-05	0.040	7.81E-06	11.763	0.020	0.281	0.076	0.005	474	0.006	329	3.49E-07	0.015	2.49	0.0019	1.27E-04	2.00E-06	0.0041	3.39E-05	303	51.9	0.0050	0.0050	0.0043	5.41E-05	0.001	0.798	0.0034	1.25		
334	9.02E+06	9.05E+06	7.85	33.948	8.28	1.026	18.439	32.5	0.65	7.83E-04	0.010	810	5.00E-05	0.040	7.81E-06	11.762	0.020	0.282	0.076	0.005	472	0.006	329	3.49E-07	0.015	2.49	0.0019	1.27E-04	2.00E-06	0.0041	3.39E-05	302	51.9	0.0050	0.0050	0.0043	5.41E-05	0.001	0.798	0.0034	1.23		
370	1.00E+07	1.00E+07	7.85	33.941	8.27	1.026	18.435	32.5	0.65	7.83E-04	0.010	810	4.93E-05	0.040	7.81E-06	11.762	0.020	0.282	0.076	0.005	471	0.006	329	3.49E-07	0.015	2.49	0.0019	1.27E-04	1.99E-06	0.0041	3.39E-05	302	51.9	0.0050	0.0050	0.0043	5.42E-05	0.001	0.798	0.0034	1.22		
37	1.00E+06	1.03E+06	7.81	34.442	8.48	1.026	18.741	33.0	0.64	7.83E-04	0.010	830	1.07E-04	0.039	7.54E-06	11.780	0.020	0.275	0.074	0.005	570	0.006	321	3.43E-07	0.015	2.43	0.0018	1.30E-04	2.37E-06	0.0040	3.50E-05	327	51.9	0.0049	0.0049	0.0043	5.18E-05	0.001	0.779	0.0034	2.47		
404	1.09E+07	1.09E+07	7.85	33.937	8.27	1.026	18.432	32.5	0.65	7.83E-04	0.010	810	4.88E-05	0.040	7.82E-06	11.762	0.020	0.282	0.076	0.005	470	0.006	329	3.49E-07	0.015	2.49	0.0019	1.27E-04	1.99E-06	0.0041	3.39E-05	302	51.9	0.0050	0.0050	0.0043	5.42E-05	0.001	0.798	0.0034	1.21		
770	2.08E+07	2.08E+07	7.85	33.912	8.26	1.026	18.417	32.4	0.65	7.83E-04	0.010	809	4.59E-05	0.040	7.83E-06	11.761	0.020	0.282	0.076	0.005	465	0.006	330	3.50E-07	0.015	2.50	0.0019	1.27E-04	1.97E-06	0.0041	3.39E-05	301	51.9	0.0050	0.0050	0.0043	5.43E-05	0.001	0.799	0.0034	1.14		
1137	3.07E+07	3.07E+07	7.85	33.903	8.26	1.026	18.411	32.4	0.65	7.83E-04	0.010	809	4.49E-05	0.040	7.84E-06	11.761	0.020	0.282	0.076	0.005	464	0.006	330	3.50E-07	0.015	2.50	0.0019	1.27E-04	1.96E-06	0.0041	3.38E-05	300	51.9	0.0050	0.0050	0.0043	5.44E-05	0.001	0.800	0.0034	1.12		
1504	4.06E+07	4.06E+07	7.85	33.898	8.26	1.026	18.409	32.4	0.65	7.83E-04	0.010	808	4.43E-05	0.040	7.84E-0																												

## SCENARIO 4A

[illegible]



SCENARIO 4B

Dilution Ratio	Volume - Reconcile _PoPA_W Q	Volume - Total	pH	Total Dissolved Solids, Rigo	Temperature	Density - Total	Cl(-1) Liq1	Salinity	Si(+4) Liq1	Se(+4) Liq1	S(+6) Liq1	Pb(+2) Liq1	P(+5) Liq1	Ni(+2) Liq1	Na(+1) Liq1	N(-3) Liq1	Mo(+6) Liq1	Mg(+2) Liq1	K(+1) Liq1	Hg(+2) Liq1	Co(+2) Liq1	Zn(+2) Liq1	Cd(+2) Liq1	Ca(+2) Liq1	Br(-1) Liq1	As(+5) Liq1	NiCr2O4 - Sol	NaAlCO3(OH)2 (Dawsonite) - Sol	CoCr2O4 - Sol	CaSO4.2 H2O (Gypsum)	CaCO3 (Calcite) - Sol	
	L/hr	L/hr		mg/L	°C	kg/m3	mg/L	g/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	0	32.905	6.81	50,547	19.3	1.039	30,269	52.6	0	0.0041	1.141	2.50E-03	0	1.05E-05	10,281	0	1.79E-05	3.837	0	3.59E-04	0.0000	0.0012	9.98E-05	3.301	43.5	0.0206	0.0032	0	0.0001	1.114	145	
2	50.000	82,883	7.16	40,487	12.6	1.031	23,112	40.5	0.395	0.0021	1.023	1.02E-03	0.024	3.06E-06	11,174	0.0122	7.12E-06	1.800	199	1.43E-04	0.0025	0.0043	6.00E-05	1.591	48.6	0.0108	0.0021	0.48	0.0021	0	63.2	
3	1.00E+05	1.33E+05	7.31	38,455	11.0	1.029	21,340	37.5	0.492	0.0016	942	6.51E-04	0.030	3.46E-06	11,395	0.0152	4.44E-06	1,296	248	8.91E-05	0.0031	0.0051	5.01E-05	1.105	49.8	0.0083	0.0019	0.60	0.0026	0	41.5	
5	1.50E+05	1.83E+05	7.40	37,206	10.2	1.028	20,536	36.1	0.537	0.0014	905	4.85E-04	0.033	3.84E-06	11,495	0.0166	3.23E-06	1,067	271	6.48E-05	0.0034	0.0055	4.57E-05	884	50.4	0.0072	0.0017	0.66	0.0029	0	31.2	
6	2.00E+05	2.33E+05	7.46	36,043	9.80	1.028	20,078	35.3	0.562	0.0012	884	3.90E-04	0.034	4.16E-06	11,552	0.0173	2.53E-06	937	283	5.10E-05	0.0035	0.0057	4.31E-05	759	50.7	0.0066	0.0017	0.69	0.0030	0	25.2	
8	2.50E+05	2.83E+05	7.51	36,033	9.53	1.027	19,781	34.8	0.578	0.0012	871	3.29E-04	0.035	4.44E-06	11,589	0.0178	2.09E-06	853	292	4.20E-05	0.0036	0.0058	4.15E-05	677	50.9	0.0062	0.0016	0.71	0.0031	0	21.2	
9	3.00E+05	3.33E+05	7.55	35,710	9.33	1.027	19,574	34.4	0.590	0.0011	861	2.86E-04	0.036	4.68E-06	11,615	0.0182	1.77E-06	794	297	3.58E-05	0.0037	0.0059	4.03E-05	620	51.1	0.0059	0.0016	0.72	0.0031	0	18.4	
11	3.50E+05	3.83E+05	7.58	35,023	9.19	1.027	19,420	34.2	0.598	0.0011	854	2.54E-04	0.037	4.89E-06	11,634	0.0185	1.54E-06	750	302	3.11E-05	0.0038	0.0060	3.95E-05	579	51.2	0.0057	0.0016	0.73	0.0032	0	16.3	
12	4.00E+05	4.33E+05	7.60	35,289	9.08	1.027	19,303	34.0	0.605	0.0010	849	2.29E-04	0.037	5.08E-06	11,648	0.0187	1.36E-06	717	305	2.76E-05	0.0038	0.0060	3.88E-05	546	51.3	0.0055	0.0015	0.74	0.0032	0	14.6	
14	4.50E+05	4.83E+05	7.62	35,143	9.00	1.027	19,209	33.8	0.610	0.0010	845	2.10E-04	0.037	5.24E-06	11,660	0.0188	1.22E-06	690	308	2.48E-05	0.0038	0.0060	3.83E-05	521	51.3	0.0054	0.0015	0.75	0.0032	0	13.3	
15	5.00E+05	5.33E+05	7.64	35,025	8.93	1.027	19,133	33.7	0.614	0.0010	841	1.94E-04	0.038	5.38E-06	11,669	0.0189	1.11E-06	668	310	2.25E-05	0.0039	0.0061	3.79E-05	500	51.4	0.0053	0.0015	0.75	0.0032	0	12.2	
17	5.50E+05	5.83E+05	7.65	34,927	8.87	1.026	19,070	33.6	0.618	0.0010	838	1.81E-04	0.038	5.51E-06	11,677	0.0191	1.01E-06	651	311	2.06E-05	0.0039	0.0061	3.75E-05	483	51.4	0.0052	0.0015	0.76	0.0032	0	11.3	
18	6.00E+05	6.33E+05	7.67	34,845	8.82	1.026	19,017	33.5	0.620	0.0010	836	1.70E-04	0.038	5.63E-06	11,684	0.0191	9.32E-07	636	313	1.90E-05	0.0039	0.0061	3.72E-05	468	51.5	0.0052	0.0015	0.76	0.0033	0	10.5	
20	6.50E+05	6.83E+05	7.68	34,775	8.78	1.026	18,972	33.4	0.623	0.0009	834	1.61E-04	0.038	5.74E-06	11,689	0.0192	8.64E-07	623	314	1.76E-05	0.0039	0.0061	3.70E-05	456	51.5	0.0051	0.0015	0.76	0.0033	0	9.87	
21	7.00E+05	7.33E+05	7.69	34,714	8.74	1.026	18,933	33.3	0.625	0.0009	832	1.53E-04	0.038	5.83E-06	11,694	0.0193	8.05E-07	612	315	1.64E-05	0.0039	0.0062	3.68E-05	445	51.5	0.0050	0.0015	0.76	0.0033	0	9.30	
23	7.50E+05	7.83E+05	7.70	34,661	8.71	1.026	18,899	33.3	0.627	0.0009	831	1.46E-04	0.038	5.92E-06	11,698	0.0193	7.53E-07	602	316	1.54E-05	0.0039	0.0062	3.66E-05	436	51.5	0.0050	0.0015	0.77	0.0033	0	8.80	
24	8.00E+05	8.33E+05	7.70	34,614	8.68	1.026	18,869	33.2	0.629	0.0009	829	1.40E-04	0.038	6.00E-06	11,702	0.0194	7.08E-07	593	317	1.45E-05	0.0039	0.0062	3.64E-05	428	51.6	0.0049	0.0015	0.77	0.0033	0	8.35	
26	8.50E+05	8.83E+05	7.71	34,573	8.66	1.026	18,843	33.2	0.630	0.0009	828	1.34E-04	0.039	6.08E-06	11,705	0.0194	6.68E-07	586	318	1.37E-05	0.0040	0.0062	3.63E-05	420	51.6	0.0049	0.0015	0.77	0.0033	0	7.96	
27	9.00E+05	9.33E+05	7.72	34,536	8.64	1.026	18,819	33.1	0.631	0.0009	827	1.29E-04	0.039	6.14E-06	11,708	0.0195	6.32E-07	579	318	1.30E-05	0.0040	0.0062	3.61E-05	414	51.6	0.0049	0.0015	0.77	0.0033	0	7.61	
29	9.50E+05	9.83E+05	7.72	34,503	8.62	1.026	18,798	33.1	0.633	0.0009	826	1.25E-04	0.039	6.21E-06	11,711	0.0195	6.00E-07	573	319	1.23E-05	0.0040	0.0062	3.60E-05	408	51.6	0.0048	0.0015	0.77	0.0033	0	7.29	
30	1.00E+06	1.03E+06	7.73	34,473	8.60	1.026	18,778	33.1	0.634	0.0009	825	1.21E-04	0.039	6.27E-06	11,713	0.0195	5.71E-07	568	319	1.18E-05	0.0040	0.0062	3.59E-05	403	51.6	0.0048	0.0014	0.77	0.0033	0	7.00	
46	1.50E+06	1.53E+06	7.77	34,281	8.49	1.026	18,655	32.9	0.640	0.0009	819	9.54E-05	0.039	6.68E-06	11,728	0.0198	3.85E-07	532	323	8.04E-06	0.0040	0.0063	3.52E-05	369	51.7	0.0047	0.0014	0.78	0.0033	0	5.12	
59	1.95E+06	1.98E+06	7.78	34,191	8.43	1.026	18,597	32.8	0.644	0.0008	817	8.35E-05	0.039	6.91E-06	11,736	0.0199	2.97E-07	516	325	6.30E-06	0.0040	0.0063	3.49E-05	353	51.8	0.0046	0.0014	0.79	0.0034	0	4.22	
73	2.40E+06	2.43E+06	7.80	34,134	8.40	1.026	18,561	32.7	0.646	0.0008	815	7.59E-05	0.039	7.06E-06	11,740	0.0199	2.42E-07	506	326	5.20E-06	0.0041	0.0063	3.47E-05	343	51.8	0.0045	0.0014	0.79	0.0034	0	3.65	
87	2.85E+06	2.88E+06	7.80	34,095	8.38	1.026	18,536	32.6	0.647	0.0008	814	7.07E-05	0.040	7.17E-06	11,743	0.0200	2.05E-07	499	326	4.44E-06	0.0041	0.0063	3.46E-05	337	51.8	0.0045	0.0014	0.79	0.0034	0	3.26	
100	3.30E+06	3.33E+06	7.81	34,067	8.36	1.026	18,517	32.6	0.648	0.0008	813	6.70E-05	0.040	7.25E-06	11,746	0.0200	1.77E-07	493	327	3.89E-06	0.0041	0.0063	3.45E-05	332	51.8	0.0045	0.0014	0.79	0.0034	0	2.97	
114	3.75E+06	3.78E+06	7.82	34,045	8.35	1.026	18,503	32.6	0.649	0.0008	813	6.41E-05	0.040	7.32E-06	11,747	0.0200	1.56E-07	489	327	3.47E-06	0.0041	0.0064	3.44E-05	328	51.8	0.0044	0.0014	0.79	0.0034	0	2.74	
128	4.20E+06	4.23E+06	7.82	34,028	8.34	1.026	18,492	32.6	0.649	0.0008	812	6.18E-05	0.040	7.37E-06	11,749	0.0200	1.39E-07	486	327	3.14E-06	0.0041	0.0064	3.43E-05	325	51.8	0.0044	0.0014	0.79	0.0034	0	2.57	
141	4.65E+06	4.68E+06	7.82	34,014	8.33	1.026	18,483	32.6	0.650	0.0008	812	6.00E-05	0.040	7.41E-06	11,750	0.0200	1.26E-07	484	328	2.87E-06	0.0041	0.0064	3.43E-05	322	51.8	0.0044	0.0014	0.79	0.0034	0	2.43	
155	5.10E+06	5.13E+06	7.83	34,003	8.32	1.026	18,476	32.5	0.650	0.0008	811	5.85E-05	0.040	7.45E-06	11,751	0.0201	1.15E-07	482	328	2.65E-06	0.0041	0.0064	3.42E-05	320	51.8	0.0044	0.0014	0.80	0.0034	0	2.31	
169	5.55E+06	5.58E+06	7.83	33,993	8.31	1.026	18,470	32.5	0.651	0.0008	811	5.72E-05	0.040	7.48E-06	11,751	0.0201	1.06E-07	480	328	2.46E-06	0.0041	0.0064	3.42E-05	319	51.9	0.0044	0.0014	0.80	0.0034	0	2.21	
182	6.00E+06	6.03E+06	7.83	33,985	8.31	1.026	18,465	32.5	0.651	0.0008	811	5.61E-05	0.040	7.50E-06	11,752	0.0201	9.78E-08	478	328	2.30E-06	0.0041	0.0064	3.42E-05	317	51.9	0.0044	0.0014	0.80	0.0034	0	2.13	
198	6.50E+06	6.53E+06	7.83	33,978	8.31	1.026	18,460	32.5	0.651	0.0008	811	5.51E-05	0.040	7.53E-06	11,753	0.0201	9.03E-08	477	328	2.15E-06	0.0041	0.0064	3.41E-05	316	51.9	0.0044	0.0014	0.80	0.0034	0	2.05	
482	1.59E+07	1.59E+07	7.84	33,923	8.27	1.026	18,425	32.5	0.653	0.0008	809	4.78E-05	0.040	7.71E-06	11,757	0.0201	3.71E-08	467	329	1.09E-06	0.0041	0.0064	3.39E-05	306	51.9	0.0043	0.0014	0.80	0.0034	0	1.48	
766	2.52E+07	2.52E+07	7.85	33,909	8.26	1.026	18,416	32.4	0.654	0.0008	809	4.59E-05	0.040	7.76E-06	11,758	0.0202	2.34E-08	464	330	8.17E-07	0.0041	0.0064	3.39E-05	304	51.9	0.0043	0.0014	0.80	0.0034	0		

## SCENARIO 5A

[illegible]

## SCENARIO 5B

[illegible]

## **Attachment D: Reasonable Potential Analysis Spreadsheet Calculations-Temperature**

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## Marine Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)–(ii) and Water Quality Program Guidance. All Data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at:

<http://www.ecy.wa.gov/biblio/0610100.html>

INPUT	May-Sep	Oct-Apr
1. Chronic Dilution Factor at Mixing Zone Boundary	195.0	195.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	11.4 °C	10.0 °C
3. 1DADMax Effluent Temperature (95th percentile)	30.0 °C	30.0 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C	16.0 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	11.50 °C	10.10 °C
6. Incremental Temperature Increase or decrease:	0.10 °C	0.10 °C
7. Incremental Temperature Increase $12/(T-2)$ if $T \leq \text{crit}$ :	1.28 °C	1.50 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	12.68 °C	11.50 °C
<b>A. If ambient temp is warmer than WQ criterion</b>		
9. Does temp fall within this warmer temp range?	NO	NO
10. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>B. If ambient temp is cooler than WQ criterion but within <math>12/(T_{\text{amb}}-2)</math> and within 0.3 °C of the criterion</b>		
11. Does temp fall within this incremental temp. range?	NO	NO
12. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>C. If ambient temp is cooler than (WQ criterion-0.3) but within <math>12/(T_{\text{amb}}-2)</math> of the criterion</b>		
13. Does temp fall within this Incremental temp. range?	NO	NO
14. Temp increase allowed at mixing zone boundary, if required:	---	---
<b>D. If ambient temp is cooler than (WQ criterion - <math>12/(T_{\text{amb}}-2)</math>)</b>		
15. Does temp fall within this Incremental temp. range?	YES	YES
16. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
RESULTS		
17. Do any of the above cells show a temp increase?	NO	NO
18. Temperature Limit if Required?	NO LIMIT	NO LIMIT

Notes:

## **Attachment E: Tier II Criteria Analysis Statement of Compliance**

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Aziz Mahar, PE  
South Puget Sound Basin – Industrial Permit Manager  
Washington State Department of Ecology  
Water Quality Program  
PO Box 47775  
Olympia, WA 98504-7775

Re: Project Macoma LLC's NPDES/SWD Permit Application; Statement of Compliance with WAC 173-201A-320, Tier II Criteria

Dear Mr. Mahar,

Project Macoma, LLC, proposes to operate a marine carbon dioxide removal (mCDR) pilot project (pilot project or Project Macoma). The pilot project would build upon public-private research undertaken with Pacific Northwest National Laboratory-Sequim (PNNL-Sequim); National Oceanic and Atmospheric Administration's (NOAA's) Pacific Marine Environmental Laboratory (PMEL); the University of Washington (UW) Cooperative Institute for Climate, Ocean and Ecosystem Studies (CICOES); and the Salish Sea Modeling Center (SSMC) and would operate for less than two years at the Port of Port Angeles. Project Macoma would remove up to 1,000 net tonnes of carbon dioxide (CO<sub>2</sub>) pollution from the atmosphere while reducing ocean acidification (OA) in local receiving waters in Port Angeles Harbor.

Project Macoma will not discharge a waste byproduct, but rather seawater that Project Macoma has pumped from Port Angeles Harbor and deacidified. Project Macoma will discharge this alkaline-enhanced seawater to de-acidify local receiving waters, temporarily restoring the pH of receiving waters in Port Angeles Harbor closer to pre-anthropogenic conditions and drawing down CO<sub>2</sub> pollution. Project Macoma will closely monitor the impacts of its discharge and will stop and adjust its operations if adverse impacts to the marine environment occur.

Although Project Macoma is discharging a treatment technology and not polluted wastewater, Project Macoma, LLC, has developed an application for a National Pollutant Discharge Elimination System / State Waste Discharge (NPDES/SWD) permit under Section 402 of the Clean Water Act and Chapter 90.48 Revised Code of Washington. This application consists of the following components:

- Engineering Report
- Port Angeles Mixing Analysis Technical Memorandum
- Statement of Compliance with WAC 173-201A-320, Tier II Criteria (the remainder of this correspondence).

#### **Statement of Compliance with WAC 173-201A-320, Tier II**

We understand that the Washington State Department of Ecology plans to seek early public comments on one aspect of Project Macoma LLC's NPDES/SWD permit application under WAC 173-201-320(2): Public involvement will inform Ecology's Tier II determination about whether the temporary change

that Project Macoma will have on the pH of local receiving waters in Port Angeles Harbor is necessary and in the overriding public interest. We provide the following statement of compliance in support of that process and Ecology's forthcoming determination.

#### **A. Background: Ocean Acidification Impacts the Salish Sea**

Human activities, especially fossil fuel combustion and land use changes, have caused global atmospheric CO<sub>2</sub> to increase by more than 50% since the pre-industrial era. Atmospheric CO<sub>2</sub> has risen from approximately 278 parts per million (ppm) to 425 ppm, which is higher than at any other time during the last 800,000 years. Over the last 12 years, since Governor Gregoire first convened the Washington State Blue Ribbon Panel on Ocean Acidification, atmospheric CO<sub>2</sub> has risen approximately 30 ppm. There is scientific consensus that so much CO<sub>2</sub> is now in the atmosphere that reaching net-zero emissions by 2050 cannot alone keep global warming to below 1.5°C above pre-industrial levels. The Intergovernmental Panel on Climate Change has concluded that carbon dioxide removal (CDR) is "unavoidable." See *generally*, IPCC, Summary for Policymakers, in Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change 1, 40 (P.R. Shukla et al. eds, 2022).

The level of CO<sub>2</sub> in the atmosphere would be higher but for the ocean, which naturally equilibrates with the atmosphere. The ocean has absorbed approximately 30% of the total CO<sub>2</sub> released and continues to do so. As a result, the natural pH of the upper ocean has decreased (acidified) by approximately 0.1 units globally; average global ocean surface pH has decreased from 8.2 to 8.1. Surface ocean pH is expected to decline (become more acidic) by another 0.3–0.4 pH units by the end of the century. Feely, R.A., T. Klinger, J.A. Newton, and M. Chadsey (2012): Scientific Summary of Ocean Acidification in Washington State Marine Waters. NOAA OAR Special Report, at 6 (22). The ocean is unfortunately acidifying at such a fast rate that "the natural processes that ultimately will restore the oceanic pH and carbonate chemistry balance cannot compensate rapidly enough, since full ocean circulation and dissolution of carbonate sediments require tens to hundreds of thousands of years to reach equilibrium." *Id.* at 9 (25). We as a global society have outpaced "the natural capacity of the ocean to buffer the excess CO<sub>2</sub> levels[.]" *Id.*

Washington State's waters are particularly vulnerable to acidification because of location and regional oceanography, and local waters have and will experience a particularly significant and rapid decline in quality. Coastal acidification impacts both marine calcifiers, which are limited in carbonate ion availability for shell and skeleton building and may experience dissolution in lowered seawater pH, and the trophic levels that depend on them. Washington's shellfish industry suffers the consequences of too-acidic waters.

Port Angeles Harbor is an example of a relatively enclosed area that is highly vulnerable to acidification. A pH reading of 7.8 was taken in the Harbor in September 2023, and pH levels as low as 7.4 have been recorded in nearby Hood Canal. See University of Washington and Washington Sea Grant, Ocean Acidification in Washington State, available at [Ocean Acidification in Washington State](#).

#### **B. Overview of Project Macoma and Ebb Carbon's Marine Carbon Dioxide Removal Technology**

Project Macoma, LLC, a wholly owned subsidiary of Ebb Carbon, proposes a temporary pilot-scale project to permanently remove CO<sub>2</sub> from the atmosphere while reducing seawater acidity locally. Project Macoma proposes to deploy and study an mCDR pilot project sited at Terminal 7 of the Port of Port Angeles.



Project Macoma, LLC, would utilize mCDR technology developed by Ebb Carbon. Ebb Carbon's mCDR technology removes acid from seawater, generating alkaline-enhanced seawater. The alkaline-enhanced seawater is returned to the ocean, which enables the ocean to draw down and store additional CO<sub>2</sub> from the atmosphere. Since June 2022, Ebb Carbon has undertaken a joint research effort to study the effects of its mCDR technology in partnership with the PNNL-Sequim; NOAA's PMEL; the UW Cooperative Institute for Climate, Ocean and Ecosystem Studies (CICOES); and the SSMC. The scope of this research includes: directly measuring changes in seawater chemistry resulting from Ebb Carbon's electrochemical acid sequestration process, simulating the effects of ocean alkalinity enhancement using oceanographic modeling tools, and conducting biological studies to better understand potential impacts of alkalinity.

Project Macoma will build on the body of research at PNNL-Sequim. The pilot project intends to safely advance critical and rigorous environmental research to evaluate the effectiveness of Ebb Carbon's mCDR technology for solving the global-scale environmental risks of climate change and coastal acidification. Project Macoma proposes to intake seawater from Port Angeles Harbor, treat it to create alkaline-enhanced seawater, and return the alkaline-enhanced seawater to increase the pH of receiving waters—both to enhance marine carbon capture and to mitigate coastal acidification in the Harbor. Scientific monitoring would occur in the receiving waters throughout operations. For example, water quality sensors would be attached to existing piers to collect regular measurements. Project Macoma would use these measurements to adaptively manage operations, if needed, and to monitor environmental health and potential benefits.

Project Macoma has begun outreach and engagement about the pilot project's potential impacts and benefits, particularly with potentially impacted or interested Indian Tribes, the Northwest Indian Fisheries Commission, the scientific community, local government, and environmental nonprofits. This engagement work will continue throughout the pilot project.

### **C. Compliance with Tier II Criteria**

Project Macoma will not discharge a waste byproduct, but rather seawater made more alkaline to improve pH levels and reduce atmospheric carbon. Project Macoma has a restorative purpose. Project Macoma, LLC, has conservatively applied for an individual NPDES/SWD permit under Section 402 of the Clean Water Act and Chapter 90.48 Revised Code of Washington.

Project Macoma has prepared a draft mixing zone technical memorandum, this letter, and other documentation in support of its permit application. The results of the mixing zone analysis demonstrate that discharging alkaline-enhanced seawater is likely to result in a measurable change in pH of the receiving waters at the boundary of the chronic mixing zone by more than 0.1 standard units (SU) during operations—as intended to increase the pH of local waters in Port Angeles Harbor closer to pre-anthropogenic conditions. Receiving waters will re-acidify shortly after the pilot project ends.

Every measurable change in water quality, whether beneficial or harmful, temporary or permanent, must be found to be necessary and in the overriding public interest. See WAC 173-201A-320. The following is a summary response, or applicability determination, (in bold) of each subsection of WAC 173-201A-320.

#### **i. Checklist Demonstrating Necessity and Public Interest**

*(4) Necessary and overriding public interest determinations. Once an activity has been determined to cause a measurable lowering in water quality, then an analysis must be conducted to determine if the lowering of water quality is necessary and in the overriding public interest. Information to conduct the*

analysis must be provided by the applicant seeking the authorization, or by the department in developing a general permit or pollution control program, and must include:

*(a) A statement of the benefits and costs of the social, economic, and environmental effects associated with the lowering of water quality. This information will be used by the department to determine if the lowering of water quality is in the overriding public interest. Examples of information that can assist in this determination include:*

*(i) Economic benefits such as creating or expanding employment, increasing median family income, or increasing the community tax base; The pilot project will be a first-of-its-kind deployment in the burgeoning mCDR industry. As such, the pilot project will conduct cutting-edge scientific studies to assess and determine the effectiveness of Ebb Carbon's mCDR technology, which will enable future evaluations of the economic and societal benefits of the technology (e.g., on fisheries and shellfish harvesting) and could accelerate the growth of the mCDR industry in Washington's rural coastal communities. The pilot project will produce temporary localized employment opportunities in the Port Angeles Harbor community.*

*(ii) Providing or contributing to necessary social services; This section is not applicable.*

*(iii) The use and demonstration of innovative pollution control and management approaches that would allow a significant improvement in AKART for a particular industry or category of action; The pilot project is cutting-edge and state of the art technology that establishes AKART in the context of mCDR. The pilot project will implement a robust monitoring and reporting regime to reduce the likelihood of adverse impacts to water quality and species listed as threatened or endangered under the Endangered Species Act, as described in Project Macoma's Ecological Safety Methodology shared with Ecology on March 5, 2024.*

*(iv) The prevention or remediation of environmental or public health threats; As detailed in this letter, the pilot project is designed to address the global societal challenges of OA, which has only worsened in Washington's coastal and Puget Sound waters since the 2012 Blue Ribbon Panel was convened, and global climate change, the effects of which are also worsening for Washington communities. The pilot study is required to safely assess and advance the effectiveness of Ebb Carbon's mCDR technology (and the field in general) to ultimately remediate the environmental and public health threats associated with OA and global climate change.*

*(v) The societal and economic benefits of better health protection; As detailed in this letter, the pilot project addresses the global societal challenges of global warming and OA. The pilot study is required to advance the effectiveness of the mCDR technology to more accurately determine its potential societal and economic benefits, including for public health.*

*(vi) The preservation of assimilative capacity for future industry and development; and Project Macoma is not releasing a waste product and will control the pH of its discharge. Project Macoma LLC will publish its findings about the impact of its*

discharges, setting a standard for compliance and enabling others in the field to benefit from the pilot project's learnings.

*(vii) The benefits associated with high water quality for uses such as fishing, recreation, and tourism. The pilot project expects to temporarily raise the pH of receiving waters to conditions more similar to pre-anthropogenic conditions, as described in this letter and the Port Angeles Mixing Analysis Technical Memorandum. Given the limited duration of the pilot project, any benefits of less acidic waters to these uses would be short-lived; however, the pilot project, including its community engagement activities, will inform future deployments of the mCDR technology and how co-benefits for communities can be realized.*

*(b) Information that identifies and selects the best combination of site, structural, and managerial approaches that can be feasibly implemented to prevent or minimize the lowering of water quality. This information will be used by the department to determine if the lowering of water quality is necessary. Examples that may be considered as alternatives include:*

*(i) Pollution prevention measures (such as changes in plant processes, source reduction, and substitution with less toxic substances);* **Project Macoma LLC intends to improve, not lower, water quality in Port Angeles Harbor. Project Macoma will draw down excess CO<sub>2</sub> pollution from the atmosphere and will de-acidify seawater locally during operations. No pollutants will be added to the alkaline-enhanced seawater. The pilot study will result in intentional changes to pH under a range of operational conditions to allow for robust but safe scientific evaluation of the mCDR technology.**

*(ii) Recycle/reuse of waste by-products or production materials and fluids;* **No waste is discharged to the Harbor as a result of the pilot study. Waste product generated in the uplands will be properly disposed of on land.**

*(iii) Application of water conservation methods;* **Not applicable**

*(iv) Alternative or enhanced treatment technology;* **Not applicable**

*(v) Improved operation and maintenance of existing treatment systems;* **Not applicable**

*(vi) Seasonal or controlled discharge options to avoid critical conditions of water quality;* **Project Macoma will slowly ramp up its operations and conduct in-water monitoring to validate the results from the Port Angeles Mixing Analysis Technical Memorandum before discharging for the pilot project. Operational controls built into the mCDR system include the ability to pause or stop operations within seconds, so operations can be adjusted and any critical conditions of water quality can be avoided or adaptively managed. The pilot project will also conduct limited durations of discharges to avoid critical conditions such as tidal reflux.**

*(vii) Establishing buffer areas with effective limits on activities;* **A mixing zone evaluation has been conducted to evaluate chronic boundaries under various types and frequencies of discharge. This evaluation informs Project Macoma's proposed operations as described further in the Port Angeles Mixing Analysis Technical**

**Memorandum and Ecological Safety Methodology.** As discussed herein, it is anticipated that the pH change greater than 0.1 SU will result beyond the chronic mixing zone boundary; however, this change is not considered a risk to human health or the environment as the resulting pH is more similar to pre-anthropogenic conditions rather than current conditions due to OA, and because the pilot project is undergoing an assessment of effects under the State Environmental Policy Act and the Endangered Species Act, and Project Macoma, LLC, will comply with all applicable permit terms and conditions.

*(viii) Land application or infiltration to capture pollutants and reduce surface runoff, on-site treatment, or alternative discharge locations; Not applicable; Project Macoma will not interfere with the Port of Port Angeles's stormwater infrastructure.*

*(ix) Water quality offsets as described in WAC 173-201A-450. Not applicable*

**ii. The State Has Already Determined that Research like Project Macoma's is Necessary and in the Overriding Public Interest.**

Moreover, the State Legislature, Blue Ribbon Panel, and Marine Resources Advisory Council (MRAC), established by the Legislature to maintain a sustained and coordinated state strategy on OA, have stated that deploying mCDR in the State is in the public's best interest. When enacting the Climate Commitment Act, the Legislature found climate change presents environmental and health risks and Washington should lead on efforts to reduce greenhouse gases:

(1) The legislature finds that climate change is one of the greatest challenges facing our state and the world today, an existential crisis with major negative impacts on environmental and human health. Washington is experiencing environmental and community impacts due to climate change through increasingly devastating wildfires, flooding, droughts, rising temperatures and sea levels, and ocean acidification. Greenhouse gas emissions already in the atmosphere will increase impacts for some period of time. Actions to increase resilience of our communities, natural resource lands, and ecosystems can prevent and reduce impacts to communities and our environment and improve their ability to recover.

...

(6) The legislature further finds that by exercising a leadership role in addressing climate change, Washington will position its economy, technology centers, financial institutions, and manufacturers to benefit from national and international efforts that must occur to reduce greenhouse gases.

Senate Bill 5126 (2021). The Legislature has also called for a statewide Integrated Climate Change Response Strategy under RCW 70A.05 to better enable the State to prepare for, address, and adapt to the impacts of climate change, including to OA.

In 2012, the Blue Ribbon Panel on OA wrote, "Washington State will need to respond vigorously to [OA] if we are going to avoid significant and possibly irreversible losses to our marine environment and all it

supports, including shellfish farming and wild harvest of shellfish and other commercially and culturally important marine species.” Washington State Blue Ribbon Panel on Ocean Acidification (2012): Ocean Acidification: From Knowledge to Action, Washington State’s Strategic Response. H. Adelsman and L. Whitely Binder (eds). Washington Department of Ecology, Olympia, Washington. Publication no. 12-01-015. Addressing this conclusion, MRAC developed a comprehensive strategy for addressing OA in Washington’s marine waters. The strategy involves six focus areas, four of which are incorporated into Project Macoma’s pilot project:

- (1) increasing the State’s ability to remediate the impacts of ocean acidification;
- (2) reducing carbon emissions;
- (3) informing, educating, and engaging stakeholders, the public, and decision makers; and
- (4) investing in related monitoring and scientific investigations.

See Washington Marine Resources Advisory Council (2017): 2017 Addendum to Ocean Acidification: From Knowledge to Action, Washington State’s Strategic Response. EnviroIssues (eds), 8. Seattle, Washington. Furthermore, MRAC recommends “supporting research and implementation of activities to increase the marine ecosystem’s ability to ... capture and store additional carbon from atmospheric sources (Action 6.1.4) and “coordinat[ing] lab and field efforts for mutual benefit” (Action 7.5.2). See *id.* at 27, 29.

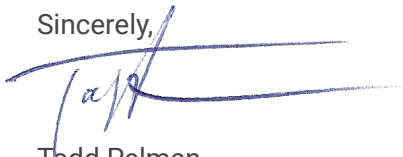
Project Macoma will continue demonstrating Washington’s strong leadership on innovative efforts to mitigate and adapt to climate change while fostering a justice transition, particularly for rural coastal communities. Project Macoma also will implement MRAC’s recommendations by building upon public-private research at PNNL-Sequim. By safely studying Port Angeles Harbor’s ability to capture and store carbon from the atmosphere and its response to alkalinity enhancement, the pilot project will help ensure future, larger-scale deployments of mCDR are also safe, responsible, and in the public interest.

#### **D. Conclusion**

The drawdown of atmospheric CO<sub>2</sub> that will be effectuated by Ebb’s technology is necessary and in the public interest. Permanently removing CO<sub>2</sub> from the atmosphere is necessary to keep global warming below 1.5°C or 2.0°C above pre-industrial levels to avert the worst consequences of climate change for all. Developing this technology in Washington State will help the State to meet its greenhouse gas reduction goals, combat the impacts of OA, and continue leading on the development and deployment of innovative negative emissions technologies.

We respectfully request that Ecology’s Water Quality Program determine Project Macoma is necessary and in the public interest under WAC 173-201A-320 because Project Macoma is designed to address two urgent and interrelated global challenges: climate change and OA. Project Macoma has developed monitoring and operational protocols to protect the marine environment from unintended consequences, and Project Macoma will comply with all permit terms and conditions.

Sincerely,

A handwritten signature in blue ink, appearing to read "T. Pelman", with a long horizontal flourish extending to the right.

Todd Pelman

Manager - Project Macoma, LLC., Co-Founder and COO - Ebb Carbon, Inc.

## **Attachment B: Barge and Outfall Diffuser Pipe Schematic Drawings**

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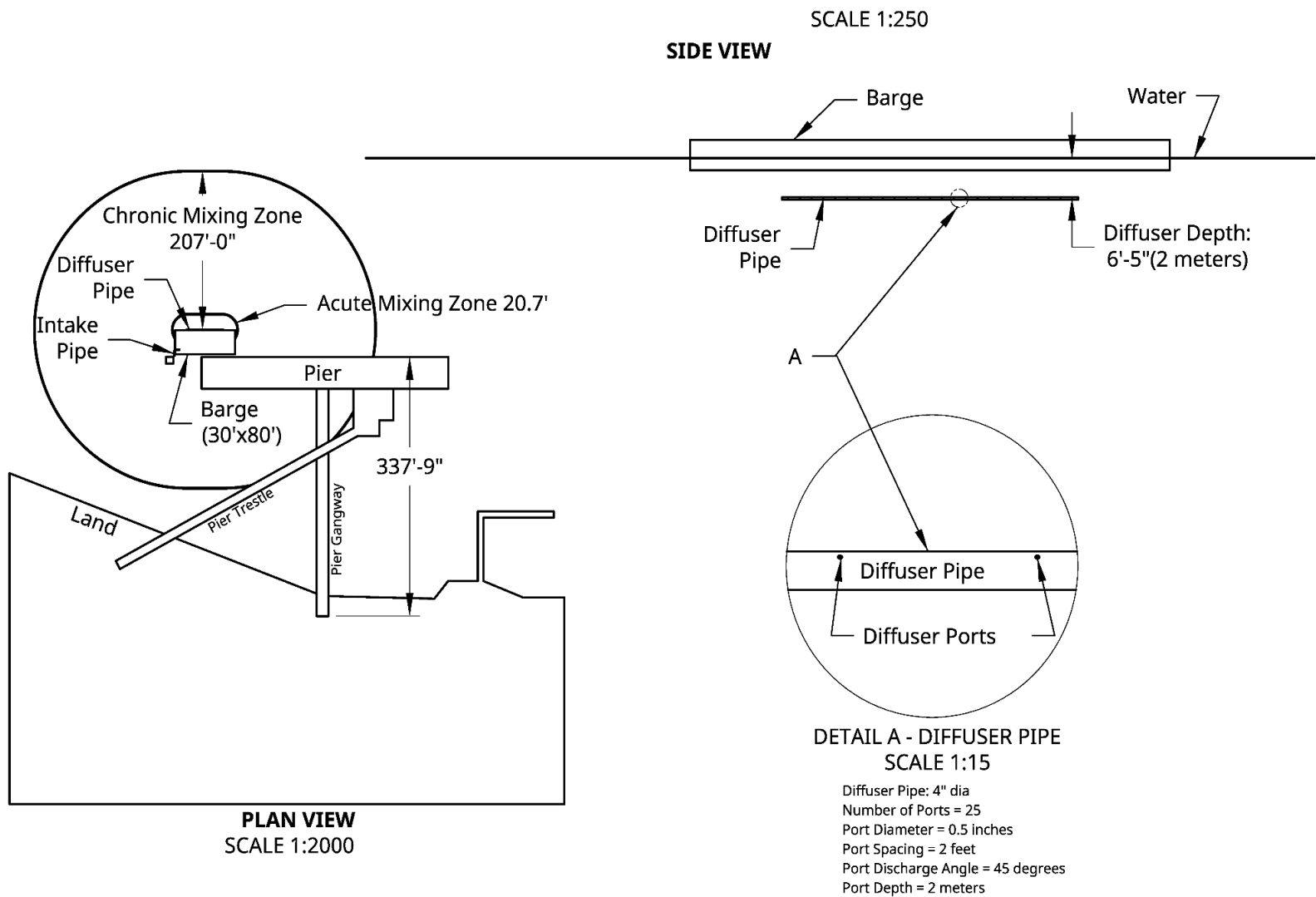


Figure B-1. Plan View

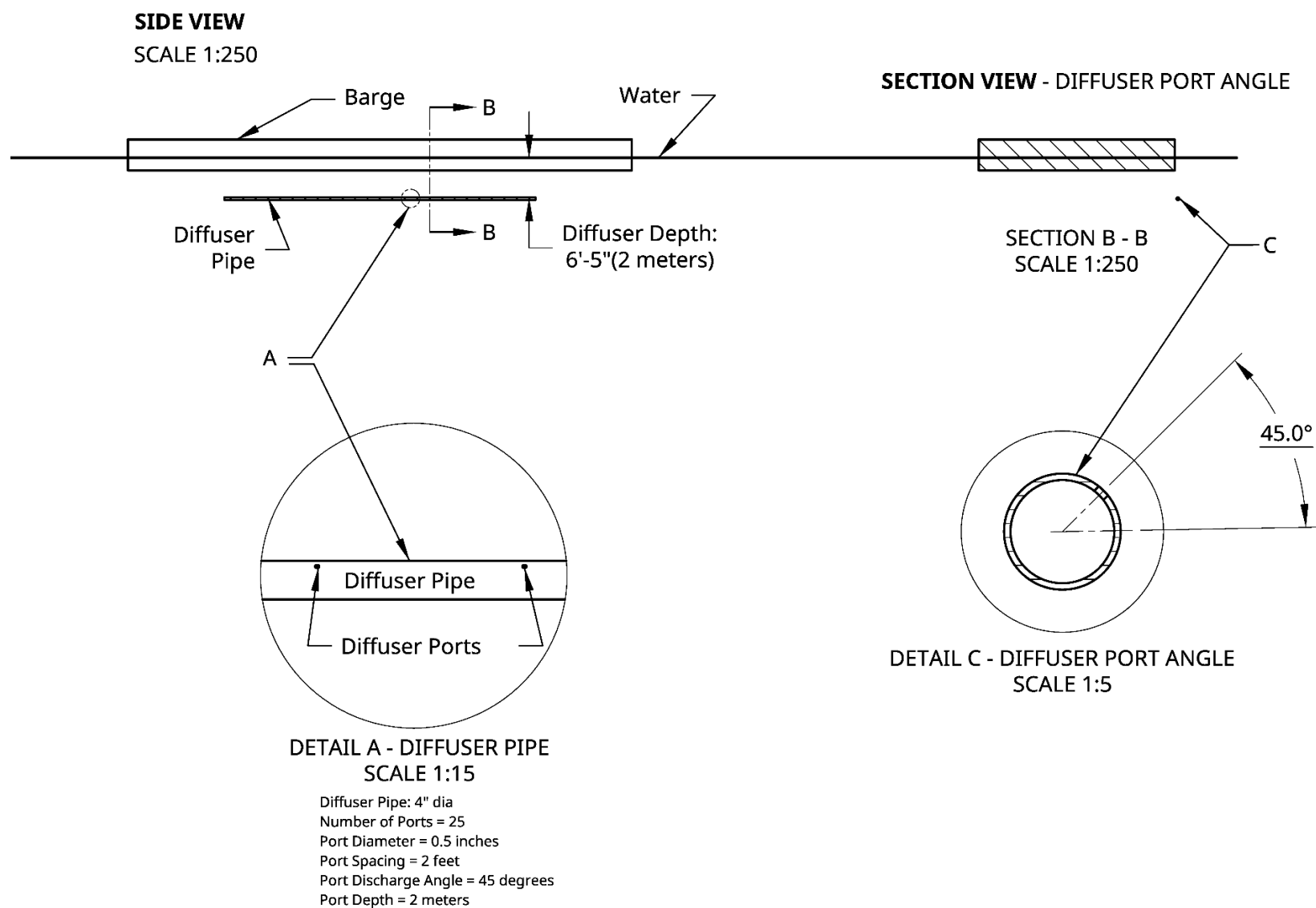


Figure B-2. Section View



## Attachment C: Safety Data Sheets

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### SECTION 1: Identification

#### 1.1. Identification

Product form : Mixtures  
Product name : Sulfuric Acid, 50% v/v  
Product code : LC25640

#### 1.2. Recommended use and restrictions on use

Use of the substance/mixture : For laboratory and manufacturing use only.  
Recommended use : Laboratory chemicals  
Restrictions on use : Not for food, drug or household use

#### 1.3. Supplier

LabChem, Inc.  
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court  
Zelienople, PA 16063 - USA  
T 412-826-5230 - F 724-473-0647

#### 1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or +1-703-741-5970

### SECTION 2: Hazard(s) identification

#### 2.1. Classification of the substance or mixture

##### GHS-US classification

Skin corrosion/irritation H314 Causes severe skin burns and eye damage  
Category 1B  
Serious eye damage/eye irritation Category 1 H318 Causes serious eye damage

Full text of H statements : see section 16

#### 2.2. GHS Label elements, including precautionary statements

##### GHS US labeling

Hazard pictograms (GHS US) :



GHS05

Signal word (GHS US) : Danger  
Hazard statements (GHS US) : H314 - Causes severe skin burns and eye damage  
Precautionary statements (GHS US) : P260 - Do not breathe mist, spray, vapors.  
P264 - Wash exposed skin thoroughly after handling.  
P280 - Wear eye protection, face protection, protective clothing, protective gloves.  
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.  
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.  
P363 - Wash contaminated clothing before reuse.  
P405 - Store locked up.  
P501 - Dispose of contents/container to comply with local, state and federal regulations  
If inhaled: Remove person to fresh air and keep comfortable for breathing

#### 2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

#### 2.4. Unknown acute toxicity (GHS US)

Not applicable

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### SECTION 3: Composition/Information on ingredients

#### 3.1. Substances

Not applicable

#### 3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Sulfuric Acid	(CAS-No.) 7664-93-9	59.23	Skin Corr. 1A, H314 Eye Dam. 1, H318
Water	(CAS-No.) 7732-18-5	40.77	Not classified

Full text of hazard classes and H-statements : see section 16

### SECTION 4: First-aid measures

#### 4.1. Description of first aid measures

- First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
- First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
- First-aid measures after skin contact : Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a poison center or doctor/physician.
- First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
- First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor/physician.

#### 4.2. Most important symptoms and effects (acute and delayed)

- Symptoms/effects : Causes severe skin burns and eye damage.
- Symptoms/effects after inhalation : Coughing. Irritation of the respiratory tract.
- Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.
- Symptoms/effects after eye contact : Corrosion of the eye tissue.
- Symptoms/effects after ingestion : Bleeding of the gastrointestinal tract.
- Symptoms/effects upon intravenous administration : Not available.
- Chronic symptoms : Respiratory difficulties. Inflammation/damage of the eye tissue. Irritation of the respiratory tract. Skin rash/inflammation.

#### 4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

### SECTION 5: Fire-fighting measures

#### 5.1. Suitable (and unsuitable) extinguishing media

- Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.
- Unsuitable extinguishing media : Do not use a heavy water stream.

#### 5.2. Specific hazards arising from the chemical

- Fire hazard : Reacts exothermically with water (moisture).
- Explosion hazard : Not applicable.
- Reactivity : Violent exothermic reaction with (some) bases.

#### 5.3. Special protective equipment and precautions for fire-fighters

- Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.
- Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.
- Other information : Not applicable.

### SECTION 6: Accidental release measures

#### 6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Evacuate area.

##### 6.1.1. For non-emergency personnel

- Protective equipment : Face-shield. Gloves. Protective clothing. Protective goggles.
- Emergency procedures : Evacuate unnecessary personnel.

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### 6.1.2. For emergency responders

- Protective equipment : Equip cleanup crew with proper protection.  
Emergency procedures : Ventilate area.

### 6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

### 6.3. Methods and material for containment and cleaning up

- For containment : Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.  
Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

### 6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

- Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. Do not breathe mist, vapors, spray. Avoid contact during pregnancy/while nursing.  
Hygiene measures : Wash exposed skin thoroughly after handling.

### 7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations.  
Storage conditions : Keep only in the original container in a cool, well ventilated place away from : incompatible materials. Keep container closed when not in use.  
Incompatible products : Strong bases. combustible materials. metals.  
Incompatible materials : Sources of ignition. Direct sunlight.  
Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: (strong) bases. combustible materials. metals. metal powders.  
Storage area : Keep container in a well-ventilated place. Keep only in the original container.  
Packaging materials : MATERIAL TO AVOID: aluminium, bronze, copper, iron, lead, monel steel, nickel, steel, tin, zinc.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Sulfuric Acid (7664-93-9)		
ACGIH	ACGIH TWA (mg/m <sup>3</sup> )	0.2 mg/m <sup>3</sup> (Thoracic fraction)
NIOSH	NIOSH REL (TWA) (mg/m <sup>3</sup> )	1 mg/m <sup>3</sup>
Water (7732-18-5)		
Not applicable		

### 8.2. Appropriate engineering controls

- Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

### 8.3. Individual protection measures/Personal protective equipment

#### Personal protective equipment:

Protective goggles. Gloves. Protective clothing. Face shield. Mist formation: aerosol mask with filter type P1.



#### Hand protection:

Wear protective gloves.

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### Eye protection:

Chemical goggles or face shield

### Skin and body protection:

Wear suitable protective clothing

### Respiratory protection:

Mist formation: aerosol mask

### Thermal hazard protection:

None necessary.

### Other information:

Do not eat, drink or smoke during use.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Appearance	: Clear, colorless liquid.
	: Colorless
	: odorless
Odor threshold	: No data available
pH	: $\leq 1$
Melting point	: No data available
Freezing point	: No data available
Boiling point	: No data available
Flash point	: No data available
Relative evaporation rate (butyl acetate=1)	: No data available
Flammability (solid, gas)	: Not flammable Non flammable.
Vapor pressure	: No data available
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Specific gravity / density	: 1.49 g/ml
Molecular mass	: 98.08 g/mol
Solubility	: Exothermically soluble in water.
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity, kinematic	: 3.9 cSt
Viscosity, dynamic	: No data available
Explosion limits	: No data available
Explosive properties	: Not applicable.
Oxidizing properties	: None.

### 9.2. Other information

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

Violent exothermic reaction with (some) bases.

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

Reacts violently with (some) bases: release of heat.

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### 10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

### 10.5. Incompatible materials

metals. Strong bases. combustible materials.

### 10.6. Hazardous decomposition products

Sulfur compounds. Thermal decomposition generates : Corrosive vapors.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

Likely routes of exposure : Skin and eye contact

Acute toxicity : Not classified

Sulfuric Acid (7664-93-9)	
LD50 oral rat	2140 mg/kg body weight (Rat, Experimental value, Oral)
ATE US (oral)	2140 mg/kg body weight

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Skin corrosion/irritation : Causes severe skin burns and eye damage.

pH: ≤ 1

Serious eye damage/irritation : Causes serious eye damage.

pH: ≤ 1

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Based on available data, the classification criteria are not met

Carcinogenicity : Not classified

Sulfuric Acid (7664-93-9)	
Additional information	Strong inorganic acid mists containing sulfuric acid are carcinogenic to humans
National Toxicology Program (NTP) Status	2 - Known Human Carcinogens

Reproductive toxicity : Not classified

Based on available data, the classification criteria are not met

Specific target organ toxicity – single exposure : Not classified

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

Symptoms/effects after inhalation : Coughing. Irritation of the respiratory tract.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Corrosion of the eye tissue.

Symptoms/effects after ingestion : Bleeding of the gastrointestinal tract.

Symptoms/effects upon intravenous administration : Not available.

Chronic symptoms : Respiratory difficulties. Inflammation/damage of the eye tissue. Irritation of the respiratory tract. Skin rash/inflammation.

## SECTION 12: Ecological information

### 12.1. Toxicity

Sulfuric Acid (7664-93-9)	
LC50 fish 1	42 mg/l (96 h, Gambusia affinis)
EC50 Daphnia 1	29 mg/l (24 h, Daphnia magna)

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### 12.2. Persistence and degradability

Sulfuric Acid, 50% v/v	
Persistence and degradability	Not established.
Sulfuric Acid (7664-93-9)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable
Water (7732-18-5)	
Persistence and degradability	Not established.

### 12.3. Bioaccumulative potential

Sulfuric Acid, 50% v/v	
Bioaccumulative potential	Not established.
Sulfuric Acid (7664-93-9)	
Log Pow	-2.2 (Estimated value)
Bioaccumulative potential	Not bioaccumulative.
Water (7732-18-5)	
Bioaccumulative potential	Not established.

### 12.4. Mobility in soil

No additional information available

### 12.5. Other adverse effects

Other information : Avoid release to the environment.

## SECTION 13: Disposal considerations

### 13.1. Disposal methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to comply with local, state and federal regulations.

Ecology - waste materials : Avoid release to the environment.

## SECTION 14: Transport information

### Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1830 Sulfuric acid (with more than 51 percent acid), 8, II

UN-No.(DOT) : UN1830

Proper Shipping Name (DOT) : Sulfuric acid  
with more than 51 percent acid

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 8 - Corrosive



DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

# Sulfuric Acid, 50% v/v

## Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

DOT Special Provisions (49 CFR 172.102)	: A3 - For combination packaging, if glass inner packaging (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packaging. A7 - Steel packaging must be corrosion-resistant or have protection against corrosion. B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized. B83 - Bottom outlets are prohibited on tank car tanks transporting sulfuric acid in concentrations over 65.25 percent. B84 - Packaging must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance for sulfuric acid or spent sulfuric acid in concentration up to 65.25 percent. IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T8 - 4 178.274(d)(2) Normal..... Prohibited TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively. TP12 - This material is considered highly corrosive to steel.
DOT Packaging Exceptions (49 CFR 173.xxx)	: 154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: 1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: 30 L
DOT Vessel Stowage Location	: C - The material must be stowed "on deck only" on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	: 14 - For metal drums, stowage permitted under deck on cargo vessels
Other information	: No supplementary information available.

### Transport by sea

Transport document description (IMDG)	: UN 1830 SULPHURIC ACID, 8, II
UN-No. (IMDG)	: 1830
Proper Shipping Name (IMDG)	: SULPHURIC ACID
Class (IMDG)	: 8 - Corrosive substances
Packing group (IMDG)	: II - substances presenting medium danger

### Air transport

Transport document description (IATA)	: UN 1830 Sulphuric acid, 8, II
UN-No. (IATA)	: 1830
Proper Shipping Name (IATA)	: Sulphuric acid
Class (IATA)	: 8 - Corrosives
Packing group (IATA)	: II - Medium Danger

## SECTION 15: Regulatory information

### 15.1. US Federal regulations

Sulfuric Acid, 50% v/v	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
SARA Section 311/312 Hazard Classes	Health hazard - Serious eye damage or eye irritation Health hazard - Skin corrosion or Irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Sulfuric Acid	CAS-No. 7664-93-9	59.23%
---------------	-------------------	--------



# Sulfuric Acid, 50% v/v

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Sulfuric Acid (7664-93-9)	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	1000 lb
SARA Section 311/312 Hazard Classes	Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation

### 15.2. International regulations

#### CANADA

Sulfuric Acid, 50% v/v	
Listed on the Canadian DSL (Domestic Substances List)	
Water (7732-18-5)	
Listed on the Canadian DSL (Domestic Substances List)	

#### EU-Regulations

No additional information available

#### National regulations

Sulfuric Acid, 50% v/v	
Listed on the Canadian IDL (Ingredient Disclosure List)	
Sulfuric Acid (7664-93-9)	
Listed on IARC (International Agency for Research on Cancer)	
Listed as carcinogen on NTP (National Toxicology Program)	

### 15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

## SECTION 16: Other information

Revision date : 03/20/2019

Other information : None.

Full text of H-phrases: see section 16:

H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage

NFPA health hazard

: 4 - Materials that, under emergency conditions, can be lethal.

NFPA fire hazard

: 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity

: 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.

NFPA specific hazard

: W - Materials that react violently or explosively with water.

Hazard Rating

Health

: 4 Severe Hazard - Life-threatening, major or permanent damage may result from single or repeated overexposures

Flammability

: 0 Minimal Hazard - Materials that will not burn

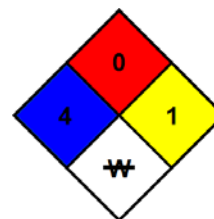
Physical

: 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection

: H

H - Splash goggles, Gloves, Synthetic apron, Vapor respirator



# Sulfuric Acid, 50% v/v

## Safety Data Sheet

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*Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.*

## SAFETY DATA SHEET

Version 8.9  
Revision Date 11/27/2023  
Print Date 12/30/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Ammonium buffer solution for complexometry  
(ammonium chloride/ammonia) pH = 10-11

Product Number : 1.09478  
Catalogue No. : 109478  
Brand : Millipore

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

Identified uses : Reagent for analysis

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin corrosion (Category 1B), H314  
Serious eye damage (Category 1), H318  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335  
Short-term (acute) aquatic hazard (Category 1), H400  
Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



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Signal Word	Danger
Hazard Statements	
H314	Causes severe skin burns and eye damage.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.
Precautionary Statements	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

Component		Classification	Concentration
<b>ammonia solution</b>			
CAS-No.	1336-21-6	Skin Corr. 1B; Eye Dam. 1; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H314, H318, H335, H400, H410 Concentration limits: ≥ 5 %: STOT SE 3, H335; M-Factor - Aquatic Acute: 10 M-Factor - Aquatic Chronic: 1	≥ 5 - < 10 %
EC-No.	215-647-6		
Index-No.	007-001-01-2		
Registration number	01-2119488876-14-XXXX		

<b>ammonium chloride</b>			
CAS-No.	12125-02-9	Acute Tox. 4; Eye Irrit. 2A; H302, H319	$\geq 5 - < 10$ %
EC-No.	235-186-4		
Index-No.	017-014-00-8		
Registration number	01-2119489385-24-XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air. Call in physician.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

### 5.2 Special hazards arising from the substance or mixture

Nitrogen oxides (NO<sub>x</sub>)

Hydrogen chloride gas

Not combustible.

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Ammonia solution itself is not flammable, but can form an ignitable ammonia/air-mixture by outgassing.

Fire may cause evolution of:

nitrogen oxides

Ambient fire may liberate hazardous vapours.

### **5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### **5.4 Further information**

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

### **6.2 Environmental precautions**

Do not let product enter drains.

### **6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent and neutralising material (e.g. Chemizorb® OH<sup>-</sup>, Merck Art. No. 101596). Dispose of properly. Clean up affected area.

### **6.4 Reference to other sections**

For disposal see section 13.

---

## **SECTION 7: Handling and storage**

### **7.1 Precautions for safe handling**

For precautions see section 2.2.

### **7.2 Conditions for safe storage, including any incompatibilities**

#### **Storage conditions**

Tightly closed.

Recommended storage temperature see product label.

#### **Storage class**

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

### **7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
ammonia solution	1336-21-6	TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		STEL	35 ppm	USA. ACGIH Threshold Limit Values (TLV)
		TWA	25 ppm 18 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		ST	35 ppm 27 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
ammonium chloride	12125-02-9	TWA	10 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		STEL	20 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Values (TLV)
		TWA	10 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		ST	20 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
		PEL	10 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	20 mg/m <sup>3</sup>	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

### 8.2 Exposure controls

#### Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

#### Personal protective equipment

##### Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

##### Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: [www.kcl.de](http://www.kcl.de)).

Full contact

Material: Nitrile rubber

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Minimum layer thickness: 0.11 mm  
Break through time: > 480 min  
Material tested: KCL 741 Dermatrill® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: [www.kcl.de](http://www.kcl.de)).

Splash contact

Material: Latex gloves

Minimum layer thickness: 0.6 mm

Break through time: > 30 min

Material tested: Lapren® (KCL 706 / Aldrich Z677558, Size M)

### **Body Protection**

protective clothing

### **Respiratory protection**

Recommended Filter type: Filter type K

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### **Control of environmental exposure**

Do not let product enter drains.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |  |                                  |
|--|----------------------------------|
| a) Appearance                              | Form: liquid<br>Color: colorless |
| b) Odor                                    | ammoniacal                       |
| c) Odor Threshold                          | No data available                |
| d) pH                                      | 10.5 at 20 °C (68 °F)            |
| e) Melting point/freezing point            | No data available                |
| f) Initial boiling point and boiling range | No data available                |
| g) Flash point                             | ( )Not applicable                |
| h) Evaporation rate                        | No data available                |
| i) Flammability (solid, gas)               | No data available                |
| j) Upper/lower                             | No data available                |

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flammability or  
explosive limits

- |  |  |
|--|--|
| k) Vapor pressure                            | No data available                        |
| l) Vapor density                             | No data available                        |
| m) Density                                   | 0.978 g/cm <sup>3</sup> at 20 °C (68 °F) |
| Relative density                             | No data available                        |
| n) Water solubility                          | soluble                                  |
| o) Partition coefficient:<br>n-octanol/water | No data available                        |
| p) Autoignition<br>temperature               | Not applicable                           |
| q) Decomposition<br>temperature              | No data available                        |
| r) Viscosity                                 | No data available                        |
| s) Explosive properties                      | Not classified as explosive.             |
| t) Oxidizing properties                      | none                                     |

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

See section 10.3

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

A risk of explosion and/or of toxic gas formation exists with the following substances:

Oxidizing agents

Mercury

Oxygen

silver compounds

nitrogen trichloride

hydrogen peroxide

silver

antimony hydride

Halogens

Acids

Calcium

Chlorites

auric salts

perchlorates

sodium hypochlorite

mercury compounds  
halogen oxides  
Heavy metals  
Heavy metal salts  
Acid chlorides  
Acid anhydrides  
Risk of ignition or formation of inflammable gases or vapours with:  
Boranes  
Boron  
Oxides of phosphorus  
Nitric acid  
silicon compounds  
chromium(VI) oxide  
chromyl chloride  
Exothermic reaction with:  
Acetaldehyde  
Acrolein  
Barium  
boron compounds  
Bromine  
halogen-halogen compounds  
hydrogen bromide  
silane  
Hydrogen chloride gas  
halogen compounds  
dimethylsulfate  
nitrogen oxides  
Fluorine  
Hydrogen fluoride  
chlorates  
Carbon dioxide (CO<sub>2</sub>)  
Ethylene oxide  
polymerisable  
Violent reactions possible with:  
The generally known reaction partners of water.

#### **10.4 Conditions to avoid**

no information available

#### **10.5 Incompatible materials**

Aluminum, Lead, Nickel, silver, Zinc, Copper, metal alloys, various metals, copper compounds

#### **10.6 Hazardous decomposition products**

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Mixture

##### Acute toxicity

Acute toxicity estimate Oral - > 5,000 mg/kg  
(Calculation method)

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Acute toxicity estimate Dermal - > 5,000 mg/kg  
(Calculation method)

##### Skin corrosion/irritation

Remarks: Mixture causes burns.

##### Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Risk of blindness!

##### Respiratory or skin sensitization

No data available

##### Germ cell mutagenicity

No data available

##### Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

##### Reproductive toxicity

No data available

##### Specific target organ toxicity - single exposure

Mixture may cause respiratory irritation.

##### Specific target organ toxicity - repeated exposure

No data available

##### Aspiration hazard

No data available

### 11.2 Additional Information

bronchitis

Cough

Shortness of breath

Abdominal pain

Bloody vomiting

Nausea  
shock  
Convulsions  
Systemic effects:  
collapse  
Unconsciousness  
Lung edema

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

## **Components**

### **ammonia solution**

#### **Acute toxicity**

Oral: No data available

Inhalation: Irritating to respiratory system.

Inhalation: Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

Dermal: No data available

#### **Skin corrosion/irritation**

Remarks: Causes skin burns.

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

#### **Serious eye damage/eye irritation**

Remarks: Causes serious eye damage.

Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

#### **Respiratory or skin sensitization**

No data available

#### **Germ cell mutagenicity**

No data available

#### **Carcinogenicity**

No data available

#### **Reproductive toxicity**

No data available

#### **Specific target organ toxicity - single exposure**

May cause respiratory irritation.

#### **Specific target organ toxicity - repeated exposure**

No data available

#### **Aspiration hazard**

No data available

## **ammonium chloride**

### **Acute toxicity**

LD50 Oral - Rat - male and female - 1,410 mg/kg

(OECD Test Guideline 401)

Symptoms: Irritations of mucous membranes in the mouth, pharynx, oesophagus and gastrointestinal tract.

Inhalation: No data available

Symptoms: Possible damages:, mucosal irritations

LD50 Dermal - Rat - male and female - > 2,000 mg/kg

Remarks: (ECHA)

No data available

### **Skin corrosion/irritation**

Skin - Rabbit

Result: No skin irritation - 24 h

(Draize Test)

### **Serious eye damage/eye irritation**

Eyes - Rabbit

Result: Eye irritation

Remarks: (ECHA)

### **Respiratory or skin sensitization**

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

### **Germ cell mutagenicity**

In vivo tests did not show mutagenic effects

Test Type: Ames test

Test system: Escherichia coli/Salmonella typhimurium

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Test system: Chinese hamster lung cells

Result: positive

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: negative

### **Carcinogenicity**

No data available

### **Reproductive toxicity**

No data available

### **Specific target organ toxicity - single exposure**

Acute oral toxicity - Irritations of mucous membranes in the mouth, pharynx, oesophagus and gastrointestinal tract.

Acute inhalation toxicity - Possible damages:, mucosal irritations

### **Specific target organ toxicity - repeated exposure**

### **Aspiration hazard**

No data available

---

## SECTION 12: Ecological information

### 12.1 Toxicity

#### Mixture

No data available

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Endocrine disrupting properties

No data available

### 12.7 Other adverse effects

Biological effects:

Harmful effect due to pH shift.

Discharge into the environment must be avoided.

#### Components

##### ammonia solution

Toxicity to fish

flow-through test LC50 - Pimephales promelas (fathead minnow) - 0.068 mg/l - 96 h

Remarks: (ECHA)

The value is given in analogy to the following substances: ammonium sulphate

Toxicity to daphnia and other aquatic invertebrates

static test LC50 - Daphnia magna (Water flea) - 101 mg/l - 48 h

Remarks: (ECHA) anhydrous

Toxicity to fish(Chronic toxicity)

flow-through test NOEC - Ictalurus punctatus - 0.048 mg/l - 31 d

(OECD Test Guideline 215)

Remarks: anhydrous

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)

flow-through test LC50 - Daphnia magna (Water flea) - 4.07 mg/l - 96 h

(US-EPA)

Remarks: The value is given in analogy to the following substances:

The value is given in analogy to the following substances:  
ammonium chloride

flow-through test NOEC - Daphnia magna (Water flea) - 0.79  
mg/l - 96 h  
(US-EPA)

Remarks: The value is given in analogy to the following  
substances:

The value is given in analogy to the following substances:  
ammonium chloride

#### **ammonium chloride**

Toxicity to fish	semi-static test LC50 - Cyprinus carpio (Carp) - 209.00 mg/l - 96 h Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 101 mg/l - 48 h Remarks: (ECHA)
Toxicity to algae	static test ErC50 - Chlorella vulgaris (Fresh water algae) - 1,300 mg/l - 5 d Remarks: (ECHA)
Toxicity to bacteria	static test EC50 - activated sludge - 1,310 mg/l - 0.5 h (OECD Test Guideline 209)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 14.6 mg/l - 21 d Remarks: (ECHA)

---

## **SECTION 13: Disposal considerations**

### **13.1 Waste treatment methods**

#### **Product**

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See [www.retrologistik.com](http://www.retrologistik.com) for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

---

## SECTION 14: Transport information

### DOT (US)

Not dangerous goods

### IMDG

Not dangerous goods

### IATA

Not dangerous goods

### Further information

Not classified as dangerous in the meaning of transport regulations.

---

## SECTION 15: Regulatory information

### SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

### SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
ammonia solution	1336-21-6	2007-03-01
ammonium chloride	12125-02-9	1994-04-01

### Massachusetts Right To Know Components

	CAS-No.	Revision Date
water	7732-18-5	
ammonia solution	1336-21-6	2007-03-01
ammonium chloride	12125-02-9	1994-04-01

### Pennsylvania Right To Know Components

	CAS-No.	Revision Date
ammonia solution	1336-21-6	2007-03-01
ammonium chloride	12125-02-9	1994-04-01



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## SECTION 16: Other information

### Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 8.9

Revision Date: 11/27/2023

Print Date: 12/30/2023



# Weldon Materials, Inc.

## BASALT TRAP ROCK

### SAFETY DATA SHEET

OSHA HCS (29 CFR 1910.1200)

#### SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

**Product identifier**

Basalt Trap Rock

Chemical Name

Mixture

CAS No.

Mixture

Trade Name(s)

Construction aggregate

**Relevant identified uses of the substance or mixture and uses advised against**

Identified Use(s)

Construction Material

Uses Advised Against

None.

**Details of the supplier of the safety data sheet**

Company Identification

Weldon Materials  
141 Central Ave  
Westfield, NJ 07090

Telephone

908-233-4444

**Emergency telephone number**

Emergency Phone No.

Not classified as dangerous for supply/use. Please contact the supplier above during normal business hours.

#### SECTION 2: HAZARDS IDENTIFICATION

**Classification of the substance or mixture**

OSHA HCS (29 CFR 1910.1200) / GHS Classification

Not classified as dangerous for supply/use. Unlikely to be hazardous by inhalation unless present as a dust.

**Label elements**

Hazard Symbol

None

Signal Word(s)

None

Hazard Statement(s)

None

Precautionary Statement(s)

None

**Other hazards**

Inhalable size dust particles may be released under certain conditions of handling. This dust may contain crystalline silica dust which: Causes damage to organs: Lungs (silicosis) and May cause cancer: Lungs

**Additional Information**

Control dust formation. Avoid breathing dust. As necessary, wear eye and/or respiratory protection (safety glasses and dust mask).  
Wash hands and exposed skin after use.

#### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Composition/information on ingredients	% wt.	CAS No.
Basalt Trap Rock *	100	-----

Other Substances in the product which may present a health or environmental hazard, or which have been assigned occupational exposure limits, are detailed below. Please see Section 8 of SDS for more details.

- Contains: Dust may contain >1% crystalline silica (inherent in the sand / gravel).

**Additional Information** - None



# Weldon Materials, Inc.

## BASALT TRAP ROCK

### SECTION 4: FIRST AID MEASURES



#### Description of first aid measures

Inhalation	Not normally required. Move person to fresh air. Apply artificial respiration if necessary. If symptoms persist, obtain medical attention.
Skin Contact	Gently wash with plenty of soap and water. If irritation (redness, rash, blistering) develops, get medical attention.
Eye Contact	Flush eyes with water for at least 15 minutes while holding eyelids open. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation develops and persists, get medical attention.
Ingestion	Not normally required. Do not induce vomiting. Do not give anything by mouth to an unconscious person. Get medical advice/attention if you feel unwell.
<b>Most important symptoms and effects, both acute and delayed</b>	None known
<b>Indication of any immediate medical attention and special treatment needed</b>	None known

### SECTION 5: FIRE-FIGHTING MEASURES

#### Extinguishing Media

-Suitable Extinguishing Media	Non-combustible. As appropriate for surrounding fire.
-Unsuitable Extinguishing Media	None anticipated.

#### Special hazards arising from the substance or mixture

None known

#### Advice for fire-fighters

A self contained breathing apparatus and suitable protective clothing should be worn in fire conditions.

### SECTION 6: ACCIDENTAL RELEASE MEASURES

<b>Personal precautions, protective equipment and emergency procedures</b>	Not normally required.
<b>Environmental precautions</b>	Not normally required.
<b>Methods and material for containment and cleaning up</b>	Not normally required.
<b>Reference to other sections</b>	None
<b>Additional Information</b>	None.

### SECTION 7: HANDLING AND STORAGE

#### Precautions for safe handling

Inhalable size dust particles may be released under certain conditions of handling. Control dust formation. Avoid breathing dust. As necessary, wear eye and/or respiratory protection (safety glasses and dust mask).

#### Conditions for safe storage, including any incompatibilities

-Storage temperature	Ambient temperatures.
-Incompatible materials	Strong oxidizing agents.



# Weldon Materials, Inc.

## BASALT TRAP ROCK

### SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Control parameters

#### Occupational Exposure Limits

SUBSTANCE.	CAS No.	(8hr TWA)		(STEL)		Note:
		PEL (OSHA) *	TLV (ACGIH)	PEL (OSHA)	TLV (ACGIH)	
Crystalline Silica (respirable particulate)	-----	$\frac{10 \text{ mg/m}^3}{\% \text{SiO}_2 + 2}$	0.025 mg/m <sup>3</sup> ^	-----	-----	See below

^Suspected Human Carcinogen; \*Refer to OSHA 29 CFR 1910.1000 & 29 CFR 1926.55; 8hr TWA = 8 hour time-weighted average; STEL = Short Term Exposure Limit.

#### Recommended monitoring method

NIOSH 0500 (Total Dust); NIOSH 7500 (Crystalline Silica)

#### Exposure controls

#### Appropriate engineering controls

Use only outdoors or in a well-ventilated area.

#### Personal protection equipment

##### Eye/face protection

The following to be used as necessary: Safety Glasses



##### Skin protection (Hand protection/ Other)

The following to be used as necessary: Leather or thick textile gloves.



##### Respiratory protection

Inhalable size dust particles may be released under certain conditions of handling. Respiratory protection may be needed if occupational exposure limits are exceeded. Air-purifying respirator with combination organic vapor cartridge / particulate filter may be sufficient. Check with protective equipment manufacturer's data.



##### Thermal hazards

Use gloves with insulation for thermal protection, when needed.

#### Environmental Exposure Controls

Not normally required.

### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

#### Information on basic physical and chemical properties

Appearance	Solid
Color.	earthy tan and gray colors
Odor	None
Odor Threshold (ppm)	Not applicable.
pH (Value)	Not available.
Melting Point (°C) / Freezing Point (°C)	Not available.
Boiling point/boiling range (°C):	Not available.
Flash Point (°C)	Non-combustible
Evaporation Rate	Not available.
Flammability (solid, gas)	Non-combustible
Explosive Limit Ranges	Non-combustible
Vapor pressure (Pascal)	Not applicable.



# Weldon Materials, Inc.

## BASALT TRAP ROCK

Vapor Density (Air=1)	Not applicable.
Density (g/ml)	Not available.
Solubility (Water)	Insoluble
Solubility (Other)	Not known
Partition Coefficient (n-Octanol/water)	Not available.
Auto Ignition Point (°C)	Non-combustible
Decomposition Temperature (°C)	Not available.
Kinematic Viscosity (cSt) @ 40°C	Not applicable.
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.

### Other information

Not available.

## SECTION 10: STABILITY AND REACTIVITY

<b>Reactivity</b>	Stable under normal conditions.
<b>Chemical stability</b>	Stable.
<b>Possibility of hazardous reactions</b>	None known
<b>Conditions to avoid</b>	Incompatible materials
<b>Incompatible materials</b>	Acids and Oxidizers
<b>Hazardous decomposition product(s)</b>	None known

## SECTION 11: TOXICOLOGICAL INFORMATION

**Exposure routes:** Inhalation, Skin Contact, Eye Contact

### Crystalline Silica (quartz and cristobalite)

Acute toxicity	LD50 (rat): >5000 mg/kg bw LD50 (dermal): >2000 mg/kg bw LC50 (inhalation, fume): >94.4 mg/m <sup>3</sup> - Causes damage to organs: Lungs (silicosis)
Irritation/Corrosivity	Not to be expected
Sensitization	Not to be expected
Repeated dose toxicity	Causes damage to organs through prolonged or repeated exposure: Lungs (silicosis)
Carcinogenicity	May cause cancer. Lungs

NTP	IARC	ACGIH	OSHA
No.	Yes.	A2	Yes.

Mutagenicity	Not to be expected.
Reproductive toxicity	Not to be expected.

## SECTION 12: ECOLOGICAL INFORMATION

### Ecotoxicity

Short term	LL50 (48 hour): >1000 mg/l (Fish) LL50 (48 hour): >1000 mg/L (Aquatic Invertebrates) EL50 (48 hour): >1000 mg/L (Aquatic Plants)
Long Term	No data
<b>Persistence and degradability</b>	The substance is non biodegradable.
<b>Bioaccumulative potential</b>	The product has no potential for bioaccumulation.
<b>Mobility in soil</b>	The product has low mobility in soil.
<b>Results of PBT and vPvB assessment</b>	Not classified as PBT or vPvB.
<b>Other adverse effects</b>	None known.



# Weldon Materials, Inc.

## BASALT TRAP ROCK

### SECTION 13: DISPOSAL CONSIDERATIONS

#### Waste treatment methods

Disposal should be in accordance with local, state or national legislation. Consult an accredited waste disposal contractor or the local authority for advice.

#### Additional Information

None known.

### SECTION 14: TRANSPORT INFORMATION

Ground or Water Domestic Voyage (DOT): Not classified as dangerous for transport.

### SECTION 15: REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture:

TSCA (Toxic Substance Control Act) - Inventory Status: All components listed or polymer exempt.

RCRA Hazardous Waste Number (40 CFR 261.33): None

US RCRA Hazard Class: Not applicable.

Designated Hazardous Substances and Reportable Quantities (40 CFR 302.4):

Chemical Name	CAS No.	Typical %wt.	RQ (Pounds)
None	-----	-----	-----

SARA 311/312 - Hazard Categories: None

☐ Fire ☐ Sudden Release ☐ Reactivity ☐ Immediate (acute) ☐ Chronic (delayed)

SARA 313 - Toxic Chemicals (40 CFR 372):

Chemical Name	CAS No.	Typical %wt.
None	-----	-----

SARA 302 - Extremely Hazardous Substances(40 CFR 355):

Chemical Name	CAS No.	Typical %wt.	TPQ (pounds)
None	-----	-----	-----

### SECTION 16: OTHER INFORMATION

#### Additional Information

The following sections contain revisions or new statements: 1-16.

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## SAFETY DATA SHEET

Version 6.4  
Revision Date 11/14/2023  
Print Date 12/30/2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifiers**

Product name : Calmagite

Product Number : C204  
Brand : Aldrich  
CAS-No. : 3147-14-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

**1.3 Details of the supplier of the safety data sheet**

Company : Sigma-Aldrich Inc.  
3050 SPRUCE ST  
ST. LOUIS MO 63103  
UNITED STATES

Telephone : +1 314 771-5765  
Fax : +1 800 325-5052

**1.4 Emergency telephone**

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-  
527-3887 CHEMTREC (International) 24  
Hours/day; 7 Days/week

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315  
Eye irritation (Category 2A), H319  
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal Word

Warning

Aldrich - C204

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Hazard statement(s)	
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Precautionary statement(s)	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Synonyms	: 3-Hydroxy-4-(2-hydroxy-5-methylphenylazo)naphthalene-1-sulfonic acid 3-Hydroxy-4-(6-hydroxy-m-tolylazo)naphthalene-1-sulphonic acid 1-(1-Hydroxy-4-methyl-2-phenylazo)-2-naphthol-4-sulfonic acid
Formula	: C <sub>17</sub> H <sub>14</sub> N <sub>2</sub> O <sub>5</sub> S
Molecular weight	: 358.37 g/mol
CAS-No.	: 3147-14-6
EC-No.	: 221-563-0

Component	Classification	Concentration
<b>3-hydroxy-4-(2-hydroxy-5-methylphenylazo)-1-naphthalenesulphonic acid</b>		
	Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H315, H319, H335	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.



---

## SECTION 4: First aid measures

### 4.1 Description of first-aid measures

#### General advice

Show this material safety data sheet to the doctor in attendance.

#### If inhaled

After inhalation: fresh air.

#### In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

#### In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

#### If swallowed

After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

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

No data available

---

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

#### Suitable extinguishing media

Water Foam Carbon dioxide (CO<sub>2</sub>) Dry powder

#### Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

### 5.2 Special hazards arising from the substance or mixture

Nature of decomposition products not known.

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

### 5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

### 5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

---

## **SECTION 6: Accidental release measures**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

### **6.2 Environmental precautions**

Do not let product enter drains.

### **6.3 Methods and materials for containment and cleaning up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

### **6.4 Reference to other sections**

For disposal see section 13.

---

## **SECTION 7: Handling and storage**

### **7.1 Precautions for safe handling**

For precautions see section 2.2.

### **7.2 Conditions for safe storage, including any incompatibilities**

#### **Storage conditions**

Tightly closed. Dry.

#### **Storage class**

Storage class (TRGS 510): 11: Combustible Solids

### **7.3 Specific end use(s)**

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## **SECTION 8: Exposure controls/personal protection**

### **8.1 Control parameters**

#### **Ingredients with workplace control parameters**

Contains no substances with occupational exposure limit values.

### **8.2 Exposure controls**

#### **Appropriate engineering controls**

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

#### **Personal protective equipment**

##### **Eye/face protection**

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

### **Skin protection**

Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: [www.kcl.de](http://www.kcl.de)).

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: KCL 741 Dermatril® L

### **Body Protection**

protective clothing

### **Respiratory protection**

Recommended Filter type: Filter type P2

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### **Control of environmental exposure**

Do not let product enter drains.

---

## **SECTION 9: Physical and chemical properties**

### **9.1 Information on basic physical and chemical properties**

- |  |   |
|--|---|
| a) Appearance                              | Form: powder                                |
| b) Odor                                    | No data available                           |
| c) Odor Threshold                          | No data available                           |
| d) pH                                      | No data available                           |
| e) Melting point/freezing point            | Melting point/range: 330 °C (626 °F) - lit. |
| f) Initial boiling point and boiling range | No data available                           |
| g) Flash point                             | ( )Not applicable                           |

h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

## 9.2 Other safety information

No data available

---

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid

no information available

### 10.5 Incompatible materials

Strong oxidizing agents

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

Oral: No data available

Inhalation: No data available

Dermal: No data available

No data available

#### Skin corrosion/irritation

Remarks: No data available

#### Serious eye damage/eye irritation

Remarks: No data available

#### Respiratory or skin sensitization

No data available

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

#### Reproductive toxicity

No data available

#### Specific target organ toxicity - single exposure

May cause respiratory irritation.

#### Specific target organ toxicity - repeated exposure

No data available

#### Aspiration hazard

No data available

### 11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

---

## SECTION 12: Ecological information

### 12.1 Toxicity

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4 Mobility in soil**

No data available

**12.5 Results of PBT and vPvB assessment**

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

**12.6 Endocrine disrupting properties**

No data available

**12.7 Other adverse effects**

No data available

---

**SECTION 13: Disposal considerations****13.1 Waste treatment methods****Product**

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

---

**SECTION 14: Transport information****DOT (US)**

Not dangerous goods

**IMDG**

Not dangerous goods

**IATA**

Not dangerous goods

**Further information**

Not classified as dangerous in the meaning of transport regulations.

---

**SECTION 15: Regulatory information****SARA 302 Components**

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This material does not contain any components with a section 302 EHS TPQ.

**SARA 313 Components**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**SARA 311/312 Hazards**

No SARA Hazards

**Massachusetts Right To Know Components**

No components are subject to the Massachusetts Right to Know Act.

---

**SECTION 16: Other information****Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.4

Revision Date: 11/14/2023

Print Date: 12/30/2023

# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

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## Citric Acid,Anhydrous,

### SECTION 1 : Identification of the substance/mixture and of the supplier

**Product name :** Citric Acid,Anhydrous,

**Manufacturer/Supplier Trade name:**

**Manufacturer/Supplier Article number:** S25255

**Recommended uses of the product and uses restrictions on use:**

**Manufacturer Details:**

AquaPhoenix Scientific  
9 Barnhart Drive, Hanover, PA 17331

**Supplier Details:**

Fisher Science Education  
15 Jet View Drive, Rochester, NY 14624

**Emergency telephone number:**

Fisher Science Education Emergency Telephone No.: 800-535-5053

### SECTION 2 : Hazards identification

**Classification of the substance or mixture:**



**Irritant**

Eye irritation, category 2A

Eye Irritation 2

**Signal word :**Warning

**Hazard statements:**

Causes serious eye irritation

**Precautionary statements:**

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Wash ... thoroughly after handling

Wear protective gloves/protective clothing/eye protection/face protection

Do not eat, drink or smoke when using this product

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do.

Continue rinsing

If eye irritation persists get medical advice/attention

**Combustible Dust Hazard: :**

May form combustible dust concentrations in air (during processing).

**Other Non-GHS Classification:**

**WHMIS**



# Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

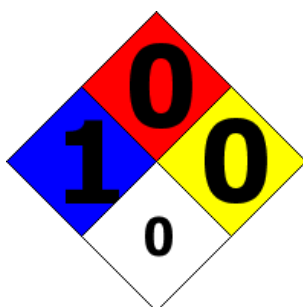
Effective date : 12.14.2014

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## Citric Acid, Anhydrous,



NFPA/HMIS



NFPA SCALE (0-4)

Health	1
Flammability	0
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

### SECTION 3 : Composition/information on ingredients

#### Ingredients:

CAS 77-92-9	Citric Acid, Anhydrous, ACS	100 %
Percentages are by weight		

### SECTION 4 : First aid measures

#### Description of first aid measures

**After inhalation:** Move exposed individual to fresh air. Loosen clothing as necessary and position individual in a comfortable position. Seek medical advice if discomfort or irritation persists. If breathing difficult, give oxygen.

**After skin contact:** Wash affected area with soap and water. Rinse thoroughly. Seek medical attention if irritation, discomfort or vomiting persists.

**After eye contact:** Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

**After swallowing:** Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.

#### Most important symptoms and effects, both acute and delayed:

Irritation, Nausea, Headache, Shortness of breath.;

#### Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.

### SECTION 5 : Firefighting measures

#### Extinguishing media

**Suitable extinguishing agents:** If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition

**For safety reasons unsuitable extinguishing agents:**

#### Special hazards arising from the substance or mixture:

## Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

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### Citric Acid, Anhydrous,

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

#### Advice for firefighters:

**Protective equipment:** Use NIOSH-approved respiratory protection/breathing apparatus.

**Additional information (precautions):** Move product containers away from fire or keep cool with water spray as a protective measure, where feasible. Use spark-proof tools and explosion-proof equipment.

### SECTION 6 : Accidental release measures

#### Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Transfer to a disposal or recovery container. Use spark-proof tools and explosion-proof equipment. Use respiratory protective device against the effects of fumes/dust/aerosol. Keep unprotected persons away. Ensure adequate ventilation. Keep away from ignition sources. Protect from heat. Stop the spill, if possible. Contain spilled material by diking or using inert absorbent.

#### Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13

#### Methods and material for containment and cleaning up:

If in a laboratory setting, follow Chemical Hygiene Plan procedures. Collect liquids using vacuum or by use of absorbents. Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).

#### Reference to other sections:

### SECTION 7 : Handling and storage

#### Precautions for safe handling:

Minimize dust generation and accumulation. Wash hands after handling. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Follow good hygiene procedures when handling chemical materials. Do not eat, drink, smoke, or use personal products when handling chemical substances. If in a laboratory setting, follow Chemical Hygiene Plan. Use only in well ventilated areas. Avoid generation of dust or fine particulate. Avoid contact with eyes, skin, and clothing.

#### Conditions for safe storage, including any incompatibilities:

Store in a cool location. Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store away from foodstuffs. Store away from oxidizing agents. Store in cool, dry conditions in well sealed containers. Keep container tightly sealed.

### SECTION 8 : Exposure controls/personal protection



#### Control Parameters:

No applicable occupational exposure limits

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### Citric Acid, Anhydrous,

**Appropriate Engineering controls:** Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. Use under a fume hood. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

**Respiratory protection:** Not required under normal conditions of use. Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.

**Protection of skin:** The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

**Eye protection:** Safety glasses with side shields or goggles.

**General hygienic measures:** The usual precautionary measures are to be adhered to when handling chemicals. Keep away from food, beverages and feed sources. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

### SECTION 9 : Physical and chemical properties

<b>Appearance (physical state,color):</b>	White solid	<b>Explosion limit lower:</b> <b>Explosion limit upper:</b>	Not determined Not determined
<b>Odor:</b>	Odorless	<b>Vapor pressure:</b>	Not determined
<b>Odor threshold:</b>	Not determined	<b>Vapor density:</b>	Not determined
<b>pH-value:</b>	Not determined	<b>Relative density:</b>	Not determined
<b>Melting/Freezing point:</b>	Not determined	<b>Solubilities:</b>	Soluble in water
<b>Boiling point/Boiling range:</b>	Not determined	<b>Partition coefficient (n-octanol/water):</b>	Not determined
<b>Flash point (closed cup):</b>	Not determined	<b>Auto/Self-ignition temperature:</b>	Not determined
<b>Evaporation rate:</b>	Not determined	<b>Decomposition temperature:</b>	Not determined
<b>Flammability (solid,gaseous):</b>	Not determined	<b>Viscosity:</b>	a. Kinematic: Not determined b. Dynamic: Not determined
<b>Density:</b> Not determined			

### SECTION 10 : Stability and reactivity

## Safety Data Sheet

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### Citric Acid, Anhydrous,

**Reactivity:**

**Chemical stability:** No decomposition if used and stored according to specifications.

**Possible hazardous reactions:**

**Conditions to avoid:** Store away from oxidizing agents, strong acids or bases.

**Incompatible materials:** Oxidizers, sulfuric and nitric acid. Strong acids. Strong bases.

**Hazardous decomposition products:** Oxides of carbon and irritating and toxic gases/fumes. Carbon oxides (CO, CO<sub>2</sub>).

#### SECTION 11 : Toxicological information

**Acute Toxicity:**

<b>Oral:</b>	6730 mg/kg	LD50 orl-rat:
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**Chronic Toxicity:** No additional information.

**Corrosion Irritation:**

<b>Ocular:</b>	Section 2	Classified as an eye irritant
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<b>Sensitization:</b>	No additional information.
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<b>Single Target Organ (STOT):</b>	No additional information.
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<b>Numerical Measures:</b>	No additional information.
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<b>Carcinogenicity:</b>	No additional information.
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<b>Mutagenicity:</b>	No additional information.
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<b>Reproductive Toxicity:</b>	No additional information.
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#### SECTION 12 : Ecological information

**Ecotoxicity**

**Fish: LC50 (96h) L. macrochius:** 1516 mg/L

**Persistence and degradability:** Readily degradable in the environment.

**Bioaccumulative potential:**

**Mobility in soil:**

**Other adverse effects:**

#### SECTION 13 : Disposal considerations

**Waste disposal recommendations:**

Product/containers must not be disposed together with household garbage. Do not allow product to reach sewage system or open water. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Consult federal state/ provincial and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product.

#### SECTION 14 : Transport information

**UN-Number**

Not Regulated.

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### Citric Acid, Anhydrous,

#### UN proper shipping name

Not Regulated.

#### Transport hazard class(es)

Packing group: Not Regulated

#### Environmental hazard:

Transport in bulk:

Special precautions for user:

### SECTION 15 : Regulatory information

#### United States (USA)

##### SARA Section 311/312 (Specific toxic chemical listings):

Acute

##### SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

##### RCRA (hazardous waste code):

None of the ingredients is listed

##### TSCA (Toxic Substances Control Act):

All ingredients are listed.

##### CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

None of the ingredients is listed

#### Proposition 65 (California):

##### Chemicals known to cause cancer:

None of the ingredients is listed

##### Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

##### Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

##### Chemicals known to cause developmental toxicity:

None of the ingredients is listed

#### Canada

##### Canadian Domestic Substances List (DSL):

All ingredients are listed.

##### Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

##### Canadian NPRI Ingredient Disclosure list (limit 1%):

77-92-9 Citric acid, anhydrous

### SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information

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### Citric Acid, Anhydrous,

contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

#### **GHS Full Text Phrases:**

#### **Abbreviations and acronyms:**

IMDG: International Maritime Code for Dangerous Goods

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

**Effective date** : 12.14.2014

**Last updated** : 03.19.2015

# SAFETY DATA SHEET

## Section 1: Identification

**Product Name:** Ebb Carbon Acid

**Chemical Name/Synonyms:** Hydrochloric Acid 1%-5% w/w, Muriatic Acid, hydrogen chloride solution

**Recommended Use:** Industrial neutralization

**Uses advised against:** Food, drug, pesticide, or biocidal

**Company:**

Ebb Carbon  
950 Commercial St  
San Carlos, CA 94070  
United States  
415 275 0449

**In emergency call 911.**

**For Chemical Emergencies Call: 800-468-1760**

## Section 2: Hazard(s) Identification

**Hazard Classification:**

Corrosive to Metals (Category 1)

Skin Corrosion/Irritation (Category 2)

Serious Eye Damage/Eye Irritation (Category 1)

**Signal Word(s):**

Danger

**Pictograms:**



**Hazard Statements:**

H290 May be corrosive to metals

H315 Causes skin irritation

H318 Causes serious eye damage

**Precautionary Statements:**

P234 Keep only in original container  
P264 Wash skin thoroughly after handling  
P280 Wear protective gloves / protective clothing / eye protection / face protection  
P390 Absorb spillage to prevent material damage  
P406 Store in corrosive resistant container with a resistance inner liner

If on skin: Wash with plenty of water

If skin irritation occurs: Get medical advice/attention.

Take off contaminated clothing and wash it before reuse.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

**Description of other hazards:** N/A

### Section 3: Composition/ Information on Ingredients

Chemical Name	CAS#	Conc.
Deionized Water, water	7732-18-5	95-99%
Hydrochloric Acid, muriatic acid, hydrogen chloride solution	7647-01-0	1-5%

### Section 4: First-Aid Measures

**General Advice:**

If symptoms persist, call a physician



**After skin contact:**

Take off all contaminated clothing. Rinse skin with water / shower for 15 minutes

**After eye contact:**

Rinse out with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do so. Immediate medical attention is required

**After inhalation:**

Fresh Air

**After swallowing:**

Make the victim drink water (two glasses at most). Consult doctor if feeling unwell.

**Most important symptoms and effects, both acute and delayed:**

May cause skin irritation, dermatitis, and/or eye damage.

**Indication of any immediate medical attention and special treatment needed:**

Eye contact, or difficulty breathing

### Section 5: Fire-Fighting Measures

**Suitable extinguishing agents:**

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

**Special protective equipment and precautions for firefighters:**

Stay in danger area only when equipped with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing. Prevent fire extinguishing water for contaminating surface water or the ground water.

Suppress (knock down) gases/vapors/mists with a water spray jet.

**Special Hazards:**

Hydrogen Chloride gas.

Not Combustible.

### Section 6: Accidental Release Measures

**Personal precautions, protective equipment, and emergency procedures:**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, consult an expert.

Advice for emergency responders: Personal Protective Equipment see section 8.

**Measures for environmental protection:**

Do not let product enter drains.

**Measures for cleaning/collecting:**

Cover drains. Collect, bind, and pump off spills. Take up with inert liquid-absorbent and neutralizing material. Clean up affected area. Keep in suitable, closed containers for disposal.

## Section 7: Handling and Storage

### Handling:

Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

Change contaminated clothing. Wash hands after working with substance.

### Storage:

No metal containers.

Tightly closed.

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

## Section 8: Exposure Controls/Personal Protection

Chemical Name	Value	Control Parameter	Basis
hydrochloric acid	Conc	2 ppm	USA. ACGIH Threshold Limit Value TLV
	Conc	5 ppm 7 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
	Conc	5 ppm 7 mg/m <sup>3</sup>	USA. OSHA Exposure Limit - Table Z-1 Limits for Air Contaminants 1910.1000
	PEL -TWA	0.3 ppm 0.45 mg/m <sup>3</sup>	California PEL for chemical contaminants TWA (Title 8, Article 107)
	Conc	2 ppm	California ceiling exposure limit for chemical contaminants, ceiling (Title 8, Article 107)

	Remark	Not classified as a human carcinogen	
<p><b>Engineering Measures:</b> Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.</p> <p><b>General protective and hygienic measures:</b> Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.</p> <p><b>Eye protection:</b> Safety glasses</p> <p><b>Skin protection:</b> Full contact Material: Nitrile rubber Minimum Thickness: 0.11mm Break through time: 480 min</p> <p>Splash contact Material: Nitrile rubber Minimum layer thickness: 0.11mm Break through time: 480 min</p> <p><b>Body protection:</b> Protective clothing</p> <p><b>Respiratory protection:</b> Required when vapors/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.</p> <p><b>Control of environmental exposure:</b> Do not let product enter drains.</p>			
Section 9: Physical and Chemical Properties			
<p><b>Appearance (physical state, color):</b></p> <p><b>Odor:</b></p> <p><b>Odor threshold:</b></p> <p><b>pH:</b></p>		<p>liquid, clear</p> <p>odorless</p> <p>No applicable information available</p> <p>&lt;1 at 20 C (68F)</p>	

<b>Melting point/freezing point:</b>	23F/-5C
<b>Boiling point/boiling range:</b>	217F/103C
<b>Flash point:</b>	No applicable information available
<b>Evaporation rate:</b>	No applicable information available
<b>Flammability:</b>	No applicable information available
<b>Upper/lower flammability limits:</b>	No applicable information available
<b>Vapor pressure:</b>	0.5 Pa
<b>Vapor density:</b>	No applicable information available
<b>Relative density:</b>	1-1.05 SG
<b>Solubility in/Miscibility with water:</b>	soluble
<b>Partition coefficient: n-octanol/water:</b>	No applicable information available
<b>Auto ignition temperature:</b>	No applicable information available
<b>Decomposition temperature:</b>	No applicable information available
<b>Viscosity:</b>	1-1.3 cps
<b>Molecular Formula:</b>	HCl
<b>Molecular Weight:</b>	36.46

## Section 10: Stability and Reactivity

### Reactivity:

Generates dangerous gases or fumes in contact with metals

Violent reactions possible with:

Generally known reaction partners of water

### Chemical stability:

This chemical is stable under standard ambient conditions (room temperature)

### Possibility of hazardous reactions:

No applicable information available

### Conditions to avoid:

No applicable information available

### Incompatible materials:

Metals, metal alloys

### Hazardous decomposition products:

Thermal decomposition can lead to release of irritating gasses and vapors; Hydrogen chloride gas

## Section 11: Toxicological Information

### Acute Toxicity

**Product Information**

Oral LD50            ATE criteria not met. ATE> 2000 mg/kg  
Dermal LD50        ATE criteria not met. ATE> 2000 mg/kg  
Vapor LC50         ATE criteria not met. ATE> 20 mg/kg

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Hydrochloric Acid	238-277 mg/kg (Rat)	>5010 mg/kg (Rabbit)	1.68 mg/L (Rat) 1h

**Toxicologically Synergistic**

No applicable information available

**Routes of possible exposure**

Inhalation, ingestion, skin and eye contact

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation**        Causes eye burns; Irritating to skin

**Sensitization**    No applicable information available

**Carcinogenicity**

Component	IARC	NTP	ACGIH	OSHA
Water	Not listed	Not listed	Not listed	Not listed
Hydrochloric Acid	Not listed	Not listed	Not listed	Not listed

**Mutagenic Effects**

Mutagenic effects have occurred in microorganisms

**Reproductive Effects**

Experiments have shown reproductive toxicity effects on laboratory animals

**Developmental Effects**

Developmental effects have occurred in experimental animals

**Teratogenicity**

Teratogenic effects have occurred in experimental animals

**STOT - single exposure**

No applicable information available

**STOT - repeated exposure**

No applicable information available

**Aspiration Hazard**

No applicable information available

**Endocrine Disruptor Information**

No applicable information available

**Section 12: Ecological Information (non-mandatory)****Mixture****Ecotoxicity:**

No applicable information available

**Mobility:**

No applicable information available

**Biodegradation:**

No applicable information available

**Bioaccumulation:**

No applicable information available

**Other:**

Avoid discharge to the environment

**Components**

Hydrochloric acid

**Toxicity to fish:**

LC50 - Gambusia affinis (Mosquito fish) - 282 mg/L - 96hr - IUCLID

**Section 13: Disposal Considerations (non-mandatory)****Waste treatment methods:**

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

#### Section 14: Transport Information (non-mandatory)

##### **DOT (US)**

UN number: 1789  
Class: 8 Packing group: III  
Proper shipping name: Hydrochloric acid  
Reportable Quantity (RQ): 5000 lbs (2270 kg)  
Poison Inhalation Hazard: No

##### **IMDG**

UN number: 1789  
Class: 8  
Packing group: III E  
MS-No: F-A, S-B  
Proper shipping name: HYDROCHLORIC ACID

##### **IATA**

UN number: 1789  
Class: 8  
Packing group: III  
Proper shipping name: Hydrochloric acid

#### Section 15: Regulatory Information (non-mandatory)

##### **SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

##### **SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:  
Hydrochloric Acid CAS-No. 7647-01-0 Revision Date 2013-02-08

#### Section 16: Other Information

##### **SDS date of preparation/update:**

Prepared August 2023

The above information is based on the present state of our knowledge and is believed to be correct as of the date issued; however no representation is made as to the comprehensiveness of the information.<sup>a</sup> The SDS shall be used only as a guide, and in the course of handling and using the product, other considerations may arise or be required.



# SAFETY DATA SHEET

## Section 1: Identification

**Chemical Name/Synonyms:** Sodium Hydroxide 1%-5% w/w

**Product Name:** Ebb Carbon Base

**Company:**

Ebb Carbon  
(415) 275-0449  
950 Commercial St  
San Carlos, CA 94070  
United States

**Recommended Use:** For use with marine carbon dioxide removal, ocean alkalinity enhancement, and ocean de-acidification

**Use Restrictions:** Not for consumer use. Not for carbon emitting technologies.

**In emergency call 911.**

**For Chemical Emergencies Call: 800-468-1760**

## Section 2: Hazard(s) Identification

**Hazard Classification:**

Corrosive to Metals (Category 1)  
Skin Corrosion (Category 1B)  
Serious Eye Damage (Category 1)

**Signal Word(s):**

Danger

**Pictograms:**



**Hazard Statements:**

H290                      May be corrosive to metals

H314 Causes severe skin burns and eye damage

**Precautionary Statements:**

P234 Keep only in original container  
P261 Do not breathe dust or mists  
P264 Wash skin thoroughly after handling  
P280 Wear protective gloves / protective clothing / eye protection / face protection  
P301,P330,P331 If swallowed: Rinse mouth. Do NOT induce vomiting  
P303,P361,P343 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower  
P304,P340,P310 If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor  
P305,P351,P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor  
P363 Wash contaminated clothing before reuse.  
P390 Absorb spillage to prevent material damage  
P405 Store locked up.  
P406 Store in corrosive resistant container with a resistant inner liner  
P501 Dispose of contents in accordance with local/regional/national/international regulations.

**Description of other hazards:** N/A

**Section 3: Composition/ Information on Ingredients**

Chemical Name	CAS#	Conc.
Deionized Water	7732-18-5	95-99%
Sodium Hydroxide	1310-73-2	1-5%

## Section 4: First-Aid Measures

**First Aid after skin contact:**

Take off all contaminated clothing. Rinse skin with water / shower. Call a physician.

**First Aid after eye contact:**

Rinse out with plenty of water. Call an ophthalmologist. Remove contact lenses, if present and easy to do so.

**First Aid after inhalation:**

Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.

**First Aid after ingestion:**

Make the victim drink water (two glasses at most). Consult doctor. Avoid vomiting (risk of perforation). Do not attempt to neutralize.

**Most important symptoms and effects, both acute and delayed:**

**Symptoms after skin contact:** Caustic burns/corrosion of the skin

**Symptoms after eye contact:** Causes serious eye damage

**Symptoms after inhalation:** Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes.

**Symptoms after ingestion:** Abdominal pain. Bleeding of the gastrointestinal tract. Burns to the gastric/intestinal mucosa. Nausea. Possible esophageal perforation.

**Immediate medical attention and special treatment:**

Obtain medical assistance.

## Section 5: Fire-Fighting Measures

**Suitable extinguishing agents:**

Carbon dioxide. Dry Powder. Water spray. Foam. Sand.

**Unsuitable extinguishing media:**

No applicable information available

**Firefighting instructions:**

Use water spray. Exercise caution when fighting any chemical fire. In case of fire, stop the leak if it is safe to do so. Prevent fire-fighting water from entering the environment.

**Special protective equipment and precautions for firefighters:**

Stay in danger area only when equipped with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

**Special Hazards:**

Sodium oxides

Not Combustible.

Ambient fire may liberate hazardous vapors.

## Section 6: Accidental Release Measures

### **General measures:**

Eliminate ignition sources. Ensure adequate ventilation.

### **Personal precautions protective equipment, and emergency procedures:**

For emergency responders:

Equip cleanup crew with proper protection including: chemically resistant gloves, lab coat or apron. Wear self-contained breathing apparatus when entering an area unless the atmosphere is proved to be safe.

For non-emergency responders:

Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area.

Equip cleanup crew with proper protection including: chemically resistant gloves, lab coat or apron.

### **Measures for environmental protection:**

Prevent entry to sewers or ground water. Notify authorities if liquid enters sewers or ground water.

### **Methods and materials for containment and cleaning up:**

Take up liquid spill into inert absorbent material. Carefully collect the spill/leftovers. Clean contaminated surfaces with excess water. Wash clothing and equipment after handling. Collect spillage. Store away from other materials.

## Section 7: Handling and Storage

### **Handling:**

May be corrosive to metals.

Do not get in eyes, on skin, or on clothing. Remove contaminated clothing immediately. Use corrosion proof equipment. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in the process area to prevent formation of vapor. Do not breathe mist, spray, or vapors.

### **Storage:**

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials  
Store in a corrosive resistance container with a resistant inner liner.

Comply with applicable regulations.  
Keep the container closed when not in use.

## Section 8: Exposure Controls/Personal Protection

Chemical Name	Value	Control Parameter	Basis
sodium hydroxide	TLV-Ceiling	2 mg/m <sup>3</sup>	USA. ACGIH Threshold Limit Value TLV
	REL-Ceiling	2 mg/m <sup>3</sup>	USA. NIOSH Recommended Exposure Limits
	PEL -TWA	2 mg/m <sup>3</sup>	USA. OSHA Exposure Limit - Table Z-1 Limits for Air Contaminants 1910.1000
	PEL -Ceiling	2 mg/m <sup>3</sup>	California PEL for chemical contaminants TWA (Title 8, Article 107)
		Not classified as a carcinogen	

### General protective and hygienic measures:

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

### Appropriate engineering controls:

Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure.

### Eye protection:

Safety glasses

### Skin and body protection:

Wear chemically resistant protective gloves. Chemical resistant coat or apron

**Respiratory protection:**

Required when vapors/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

## Section 9: Physical and Chemical Properties

<b>Physical State:</b>	liquid
<b>Color:</b>	Clear, colorless
<b>Odor:</b>	Odorless
<b>Odor threshold:</b>	No applicable information available
<b>pH:</b>	>13 at 20 C (68F)
<b>Melting point/freezing point:</b>	No applicable information available
<b>Boiling point/boiling range:</b>	No applicable information available
<b>Flash point:</b>	No applicable information available
<b>Evaporation rate:</b>	No applicable information available
<b>Flammability:</b>	No applicable information available
<b>Upper/lower flammability or explosive limits:</b>	No applicable information available
<b>Vapor pressure:</b>	No applicable information available
<b>Vapor density:</b>	No applicable information available
<b>Specific gravity:</b>	1.02-1.05 at 20 C (68F)
<b>Solubility in/Miscibility with water:</b>	soluble
<b>Partition coefficient: n-octanol/water:</b>	No applicable information available
<b>Auto ignition temperature:</b>	No applicable information available
<b>Decomposition temperature:</b>	No applicable information available
<b>Viscosity:</b>	1.24 mm <sup>2</sup> /s

## Section 10: Stability and Reactivity

**Reactivity:**

Reactions possible with:

Metals

Generally known reaction partners of water

**Chemical stability:**

This chemical is stable under standard ambient conditions (room temperature)

**Conditions to avoid:**

Incompatible materials. Extremely high or low temperatures.

**Incompatible materials:**

Strong oxidizing agents  
Metals, metal alloys

**Hazardous decomposition products:**

Sodium Oxide. Thermal decomposition generates corrosive vapors.

**Section 11: Toxicological Information****Acute Toxicity (oral)**

Not classified

**Acute Toxicity (dermal)**

Not classified

**Acute Toxicity (inhalation)**

Not classified

	LD50	ATE US
Sodium Hydroxide 1-5 w/w%	28421 mg/kg (dermal)	28421 mg/kg (dermal)

**Skin corrosion/irritation**

Causes severe burns. pH>13

**Serious eye damage/irritation**

Causes severe eye damage. pH>13

**Respiratory or skin sensitization**

Not classified

**Germ cell mutagenicity**

Not classified

**Carcinogenicity**

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen by OSHA.

**Reproductive toxicity**

Not classified

**STOT - single exposure**

Not classified

**STOT - repeated exposure**

Not classified

**Aspiration hazard**

Not classified

**Likely routes of exposure**

Skin and eye contact

**Symptoms/effects**

Causes severe skin burns and eye damage

**Symptoms/effects after inhalation**

Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes.

**Symptoms/effects after skin contact**

Caustic burns/corrosion of the skin

**Symptoms/effects after eye contact**

Causes serious eye damage

**Symptoms/effects after ingestion**

Abdominal pain. Bleeding of the gastrointestinal tract. Burns to the gastric/intestinal mucosa. Nausea.

Possible esophageal perforation.

**Chronic symptoms**

No applicable information available

## Section 12: Ecological Information (non-mandatory)

**General**

The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment.

	<b>Sodium Hydroxide 1-5 w/w%</b>	<b>Sodium Hydroxide (1310-73-2)</b>	<b>Water (7732-18-5)</b>
<b>LC50 fish 1</b>	956 mg/L	No applicable information available	No applicable information available
<b>EC50 Daphnia 1</b>	851 mg/L	40.4 mg/L	No applicable information available
<b>Persistence and degradability</b>	Not established	Not applicable (inorganic)	Not established
<b>Chemical oxygen demand (COD)</b>	Not applicable (inorganic)	Not applicable (inorganic)	Not established
<b>ThOD</b>	Not applicable (inorganic)	Not applicable (inorganic)	Not established
<b>Bioaccumulative potential</b>	Not established	Not bioaccumulative	Not established



<b>Surface Tension</b>	45-60 ,mN	No applicable information available	73 mN
<b>Ecology - soil</b>	No applicable information available	No applicable information available	No applicable information available
<b>Section 13: Disposal Considerations (non-mandatory)</b>			
<b>Waste treatment methods:</b> Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.			
<b>Section 14: Transport Information (non-mandatory)</b>			
<b>DOT (US)</b> UN number: 1824 Class: 8 Packing group: II Proper shipping name: Sodium hydroxide solution Reportable Quantity (RQ): 1000 lbs (454 kg) Poison Inhalation Hazard: No  <b>IMDG</b> UN number: 1824 Class: 8 Packing group: II MS-No: F-A, S-B Proper shipping name: SODIUM HYDROXIDE SOLUTION  <b>IATA</b> UN number: 1824 Class: 8 Packing group: II Proper shipping name: Sodium hydroxide solution			
<b>Section 15: Regulatory Information (non-mandatory)</b>			
<b>SARA 302 Components</b> This material does not contain any components with a section 302 EHS TPQ.			

**SARA 313 Components**

The following components are subject to reporting levels established by SARA Title III, Section 313:  
Sodium Hydroxide CAS-No. 1310-73-2 Revision Date 2013-02-08

**SARA 311/312**

Acute Health Hazard

**Section 16: Other Information****SDS date of preparation/update:**

Prepared: December 2023

The above information is based on the present state of our knowledge and is believed to be correct as of the date issued; however, no representation is made as to the comprehensiveness of the information. The SDS shall be used only as a guide, and in the course of handling and using the product, other considerations may arise or be required.

### SECTION 1: Identification

#### 1.1. Identification

Product form : Mixtures  
Product name : Mercuric Chloride, Saturated  
Product code : LC16620

#### 1.2. Recommended use and restrictions on use

Use of the substance/mixture : For laboratory and manufacturing use only.  
Recommended use : Laboratory chemicals  
Restrictions on use : Not for food, drug or household use

#### 1.3. Supplier

LabChem Inc  
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court  
Zelienople, PA 16063 - USA  
T 412-826-5230 - F 724-473-0647  
[info@labchem.com](mailto:info@labchem.com) - [www.labchem.com](http://www.labchem.com)

#### 1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

### SECTION 2: Hazard(s) identification

#### 2.1. Classification of the substance or mixture

##### GHS-US classification

Acute toxicity (oral) Category 2	H300	Fatal if swallowed
Acute toxicity (dermal) Category 3	H311	Toxic in contact with skin
Carcinogenicity Category 2	H351	Suspected of causing cancer
Reproductive toxicity Category 2	H361	Suspected of damaging fertility or the unborn child
Specific target organ toxicity (repeated exposure) Category 2	H373	May cause damage to organs (nervous system) through prolonged or repeated exposure
Hazardous to the aquatic environment - Acute Hazard Category 1	H400	Very toxic to aquatic life
Hazardous to the aquatic environment - Chronic Hazard Category 2	H411	Toxic to aquatic life with long lasting effects

Full text of H statements : see section 16

#### 2.2. GHS Label elements, including precautionary statements

##### GHS-US labeling

Hazard pictograms (GHS-US) :



GHS06

GHS08

GHS09

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :

- H300 - Fatal if swallowed
- H311 - Toxic in contact with skin
- H351 - Suspected of causing cancer
- H361 - Suspected of damaging fertility or the unborn child
- H373 - May cause damage to organs (nervous system) through prolonged or repeated exposure
- H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) :

- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P260 - Do not breathe mist

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P264 - Wash exposed skin thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P273 - Avoid release to the environment  
P280 - Wear protective gloves, protective clothing, eye protection, face protection  
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower  
P308+P313 - IF exposed or concerned: Get medical advice/attention  
P363 - Wash contaminated clothing before reuse  
P391 - Collect spillage  
P405 - Store locked up  
P501 - Dispose of contents/container to comply with local, state and federal regulations  
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting

### 2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None under normal conditions.

### 2.4. Unknown acute toxicity (GHS US)

Not applicable

## SECTION 3: Composition/Information on ingredients

### 3.1. Substances

Not applicable

### 3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Water	(CAS-No.) 7732-18-5	93.5	Not classified
Mercuric Chloride	(CAS-No.) 7487-94-7	6.5	Acute Tox. 1 (Oral), H300 Acute Tox. 1 (Dermal), H310 Carc. 2, H351 Repr. 2, H361 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of hazard classes and H-statements : see section 16

## SECTION 4: First-aid measures

### 4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. Suspected of causing cancer. IF exposed or concerned: Get medical advice/attention.

First-aid measures after inhalation : Allow victim to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact : Immediately call a poison center or doctor/physician. Remove/Take off immediately all contaminated clothing. Wash with plenty of soap and water. Wash contaminated clothing before reuse.

First-aid measures after eye contact : Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persists.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Fatal if swallowed. Immediately call a poison center or doctor/physician.

### 4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects : Suspected of damaging fertility or the unborn child. Causes damage to organs (central nervous system).

Symptoms/effects after inhalation : No data available.

Symptoms/effects after skin contact : Repeated exposure to this material can result in absorption through skin causing significant health hazard. Toxic in contact with skin.

Symptoms/effects after eye contact : No data available.

Symptoms/effects after ingestion : Fatal if swallowed.

Chronic symptoms : Impairment of the nervous system.

### 4.3. Immediate medical attention and special treatment, if necessary

Hospitalize at once.

## SECTION 5: Fire-fighting measures

### 5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

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Unsuitable extinguishing media : Do not use a heavy water stream.

### 5.2. Specific hazards arising from the chemical

No additional information available

### 5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

## SECTION 6: Accidental release measures

### 6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate area. Absorb spillage to prevent material damage.

#### 6.1.1. For non-emergency personnel

Protective equipment : Safety glasses. Protective clothing. Gloves.

Emergency procedures : Evacuate unnecessary personnel.

#### 6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area.

### 6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

### 6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

### 6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

## SECTION 7: Handling and storage

### 7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid breathing mist.

Hygiene measures : Do not eat, drink or smoke when using this product. Wash exposed skin thoroughly after handling.

### 7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use.

Incompatible products : Strong bases. Strong acids. Strong oxidizers.

Incompatible materials : Sources of ignition. Direct sunlight.

## SECTION 8: Exposure controls/personal protection

### 8.1. Control parameters

Mercuric Chloride (7487-94-7)		
ACGIH	ACGIH TWA (mg/m³)	0.025 mg/m³ (Mercury, Inorganic forms, as Hg; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)
OSHA	OSHA PEL (TWA) (mg/m³)	0.1 mg/m³
IDLH	US IDLH (mg/m³)	10 mg/m³
NIOSH	NIOSH REL (TWA) (mg/m³)	0.05 mg/m³
NIOSH	NIOSH REL (ceiling) (mg/m³)	0.1 mg/m³
Water (7732-18-5)		
Not applicable		

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### 8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation.

### 8.3. Individual protection measures/Personal protective equipment

#### Personal protective equipment:

Gloves. Protective clothing. Safety glasses.



#### Hand protection:

Wear protective gloves

#### Eye protection:

Chemical goggles or safety glasses

#### Skin and body protection:

Protective clothing

#### Respiratory protection:

Respiratory protection not required in normal conditions

#### Other information:

Do not eat, drink or smoke during use.

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Color	: Colorless
Odor	: None.
Odor threshold	: No data available
pH	: No data available
Melting point	: No data available
Freezing point	: No data available
Boiling point	: No data available
Flash point	: No data available
Relative evaporation rate (butyl acetate=1)	: No data available
Flammability (solid, gas)	: Non flammable.
Vapor pressure	: No data available
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Solubility	: Soluble in water.
Log Pow	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosion limits	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available

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### 9.2. Other information

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

No additional information available

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

Not established.

### 10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

### 10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizers.

### 10.6. Hazardous decomposition products

Hydrogen chloride. mercury.

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

Likely routes of exposure : Skin and eye contact

Acute toxicity : Oral: Fatal if swallowed. Dermal: Toxic in contact with skin.

Mercuric Chloride, Saturated	
LD50 oral rat	15.4 mg/kg
LD50 dermal rat	631 mg/kg
ATE US (oral)	15.4 mg/kg body weight
ATE US (dermal)	631 mg/kg body weight

Mercuric Chloride (7487-94-7)	
LD50 oral rat	1 mg/kg (Rat)
LD50 dermal rat	41 mg/kg (Rat)
ATE US (oral)	1 mg/kg body weight
ATE US (dermal)	41 mg/kg body weight

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Skin corrosion/irritation : Not classified  
Serious eye damage/irritation : Not classified  
Respiratory or skin sensitization : Not classified  
Germ cell mutagenicity : Not classified  
Carcinogenicity : Suspected of causing cancer.

Mercuric Chloride (7487-94-7)	
IARC group	2B - Possibly carcinogenic to humans

Reproductive toxicity : Suspected of damaging fertility or the unborn child.  
Specific target organ toxicity – single exposure : Not classified

Specific target organ toxicity – repeated exposure : May cause damage to organs (nervous system) through prolonged or repeated exposure.

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met. Toxic in contact with skin. Fatal if swallowed.

Symptoms/effects after inhalation : No data available.

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Symptoms/effects after skin contact	: Repeated exposure to this material can result in absorption through skin causing significant health hazard. Toxic in contact with skin.
Symptoms/effects after eye contact	: No data available.
Symptoms/effects after ingestion	: Fatal if swallowed.
Chronic symptoms	: Impairment of the nervous system.

### SECTION 12: Ecological information

#### 12.1. Toxicity

Ecology - water : Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.

Mercuric Chloride, Saturated	
LC50 fish 1	0.46 mg/l 96 hr.
EC50 Daphnia 1	0.05 mg/l 48 hr.
Mercuric Chloride (7487-94-7)	
LC50 fish 1	0.03 mg/l (LC50; 96 h)
EC50 Daphnia 2	0.003 mg/l (EC50; 48 h)
Threshold limit algae 2	0.07 mg/l (EC0)

#### 12.2. Persistence and degradability

Mercuric Chloride, Saturated	
Persistence and degradability	May cause long-term adverse effects in the environment.
Mercuric Chloride (7487-94-7)	
Persistence and degradability	Biodegradability: not applicable. No test data on mobility of the substance available.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
Water (7732-18-5)	
Persistence and degradability	Not established.

#### 12.3. Bioaccumulative potential

Mercuric Chloride, Saturated	
Bioaccumulative potential	Not established.
Mercuric Chloride (7487-94-7)	
BCF fish 1	10000 (BCF)
BCF fish 2	500 - 4620 (BCF)
BCF other aquatic organisms 1	10000 (BCF)
Log Pow	0.1 - 0.22 (Calculated)
Bioaccumulative potential	Potential for bioaccumulation ( $500 \leq \text{BCF} \leq 5000$ ).
Water (7732-18-5)	
Bioaccumulative potential	Not established.

#### 12.4. Mobility in soil

No additional information available

#### 12.5. Other adverse effects

Effect on the global warming	: No known effects from this product.
GWPmix comment	: No known effects from this product.
Other information	: Avoid release to the environment.

### SECTION 13: Disposal considerations

#### 13.1. Disposal methods

Waste disposal recommendations	: Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to comply with local, state and federal regulations.
Ecology - waste materials	: Hazardous waste due to toxicity. Avoid release to the environment.



# Mercuric Chloride, Saturated

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### SECTION 14: Transport information

#### Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN2024 Mercury compounds, liquid, n.o.s. (Mercuric chloride), 6.1, II

UN-No.(DOT) : UN2024

Proper Shipping Name (DOT) : Mercury compounds, liquid, n.o.s.

Transport hazard class(es) (DOT) : 6.1 - Class 6.1 - Poisonous materials 49 CFR 173.132

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 6.1 - Poison inhalation hazard



Dangerous for the environment : Yes

Marine pollutant : Yes



DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 243

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.

DOT Packaging Exceptions (49 CFR 173.xxx) : 153

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

DOT Vessel Stowage Location : B - (i) The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) "On deck only" on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.

DOT Vessel Stowage Other : 40 - Stow "clear of living quarters"

Other information : No supplementary information available.

### SECTION 15: Regulatory information

#### 15.1. US Federal regulations

##### Mercuric Chloride, Saturated

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard
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All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Mercuric Chloride	CAS-No. 7487-94-7	6.5%
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### Mercuric Chloride (7487-94-7)

Listed on the United States SARA Section 302

RQ (Reportable quantity, section 304 of EPA's List of Lists)

500 lb

SARA Section 302 Threshold Planning Quantity (TPQ)

500 lb

SARA Section 311/312 Hazard Classes

Immediate (acute) health hazard  
Delayed (chronic) health hazard

### 15.2. International regulations

#### CANADA

### Mercuric Chloride (7487-94-7)

Listed on the Canadian DSL (Domestic Substances List)

#### EU-Regulations

No additional information available

#### National regulations

### Mercuric Chloride (7487-94-7)

Listed on the Canadian IDL (Ingredient Disclosure List)

### 15.3. US State regulations

California Proposition 65 - This product contains, or may contain, trace quantities of a substance(s) known to the state of California to cause cancer, developmental and/or reproductive harm

### Mercuric Chloride (7487-94-7)

U.S. - California -  
Proposition 65 -  
Carcinogens List

U.S. - California -  
Proposition 65 -  
Developmental Toxicity

U.S. - California -  
Proposition 65 -  
Reproductive Toxicity -  
Female

U.S. - California -  
Proposition 65 -  
Reproductive Toxicity -  
Male

No significant risk  
level (NSRL)

No

Yes

No

No

## SECTION 16: Other information

Revision date : 11/20/2017

Other information : None.

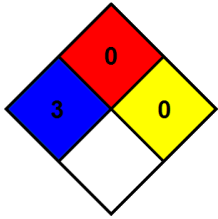
Full text of H-phrases: see section 16:

H300	Fatal if swallowed
H310	Fatal in contact with skin
H311	Toxic in contact with skin
H351	Suspected of causing cancer
H361	Suspected of damaging fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H411	Toxic to aquatic life with long lasting effects

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NFPA health hazard	: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.	
NFPA fire hazard	: 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.	
NFPA reactivity	: 0 - Material that in themselves are normally stable, even under fire conditions.	
Hazard Rating		
Health	: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given * - Chronic (long-term) health effects may result from repeated overexposure	
Flammability	: 0 Minimal Hazard - Materials that will not burn	
Physical	: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.	
Personal protection	: D D - Face shield and eye protection, Gloves, Synthetic apron	

SDS US LabChem

*Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.*

# SAFETY DATA SHEET

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**Product Name:** Olivine

**Product Description:** Foundry Sand or Abrasive Particles

## 1. IDENTIFICATION

### 1.1. Product Identifier

Product Name - Olivine

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

Identified use(s) Used as abrasive particles for grinding or blasting

### 1.3. Details of the supplier of the safety data sheet

Company Name:	AGSCO Corporation	Emergency number: 847-520-4455
Address:	160 West Hintz Road	Information number: 847-520-4455
	Wheeling Illinois 60090	Date prepared: March 2020

## 2. HAZARDS IDENTIFICATION

### 2.1. Classification of the substance or mixture:

This product does not meet the criteria for classification as hazardous as defined in the Regulation EC 1272/2008 and in Directive 67/548/EEC.

Depending on the type of handling and use (e.g. grinding, drying), airborne respirable dust may be generated. Prolonged and/or massive inhalation of respirable dust may cause mucous membrane and respiratory irritation and lung injury. Principal symptoms are shortness of breath and reduced pulmonary function. Occupational exposure to respirable dust should be monitored and controlled.

This product should be handled with care to avoid dust generation

Regulation EC 1272/2008: No classification

Classification EU (67/548/EEC): No classification

### 2.2. Label elements

None

### 2.3. Other hazards

This product is an inorganic substance and does not meet the criteria for PBT or vPvB in accordance with Annex XIII of REACH.

## 3. COMPOSITION / INFORMATION ON INGREDIENTS

**Main constituent:** Olivine

Amount:	Olivine: 100%
EINECS:	215-281-7
CAS:	1317-71-1

### 3.1. Impurities :

None

# SAFETY DATA SHEET

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## 4. FIRST AID MEASURES

### 4.1. Description of first aid measures

**Eye contact:** Rinse with copious quantities of water and seek medical attention if irritation persists.

**Inhalation:** Movement of the exposed individual from the area to fresh air is recommended.

**Ingestion:** No first-aid measures required.

**Skin contact:** No special first aid measures necessary.

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

No acute and delayed symptoms and effects are observed.

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

No specific actions are required.

## 5. FIRE-FIGHTING MEASURES

### 5.1. Extinguishing media

No specific extinguishing media is needed.

### 5.2. Special hazards arising from the substance or mixture

Non-combustible. No hazardous thermal decomposition.

### 5.3. Advice for firefighters

No specific fire-fighting protection is required.

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

Avoid airborne dust generation, wear personal protective equipment in compliance with national legislation.

### 6.2. Environmental precautions

No special requirements.

### 6.3. Methods and material for containment and cleaning up

Avoid dry sweeping and use water spraying or vacuum cleaning systems to prevent airborne dust generation. Wear personal protective equipment in compliance with national legislation.

### 6.4. Reference for other sections

See sections 8 and 13.

## 7. HANDLING AND STORAGE

### 7.1. Precautions for safe handling

7.1.1. Avoid airborne dust generation. Provide appropriate exhaust ventilation at places where airborne dust is generated. In case of insufficient ventilation, wear suitable respiratory protective equipment. Handle packaged products carefully to prevent accidental bursting. If you require advice on safe handling techniques, please contact your supplier.

7.1.2. Do not to eat, drink and smoke in work areas; wash hands after use; remove contaminated clothing and protective equipment before entering eating areas.

# SAFETY DATA SHEET

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## 7.2. Conditions for safe storage, including any incompatibilities

Technical measures/Precautions:

Minimize airborne dust generation and prevent wind dispersal during loading and unloading.

Keep containers closed and store packaged products so as to prevent accidental bursting.

## 7.3. Specific end use(s)

If you require advice on specific uses, please contact your supplier.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### 8.1. Control parameters

Follow workplace regulatory exposure limits for all types of airborne dust (e.g. total dust, respirable dust).

The OEL (Occupational Exposure Limit) for respirable dust is 4 mg/m<sup>3</sup> in UK, measured as an 8 hour TWA (Time Weighted Average). For the equivalent limits in other countries, please consult a competent occupational hygienist or the local regulatory authority

### 8.2. Exposure controls

#### 8.2.1. Appropriate engineering controls

Minimize airborne dust generation. Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below specified exposure limits. If user operations generate dust, fumes or mist, use ventilation to keep exposure to airborne particles below the exposure limit. Apply organizational measures, e.g. by isolating personnel from dusty areas. Remove and wash soiled clothing.

#### 8.2.2. Individual protection measures, such as personal protective equipment

- a) Eye / face protection: Wear safety glasses with side-shields in circumstances where there is a risk of penetrative eye injuries.
- b) Skin protection: No specific requirement. For hands, see below. Appropriate protection (e.g. protective clothing, barrier cream) is recommended for workers who suffer from dermatitis or sensitive skin.
- c) Hand protection: Appropriate protection (e.g. gloves, barrier cream) is recommended for workers who suffer from dermatitis or sensitive skin. Wash hands at the end of each work session.
- d) Respiratory protection: In case of prolonged exposure to airborne dust concentrations, wear respiratory protective equipment that complies with the requirements of European or national legislation.

#### 8.2.3. Environmental exposure controls

Avoid wind dispersal.

# SAFETY DATA SHEET

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

a) Appearance:	Pale-green powder, granular particles or aggregates
b) Grain shape:	Sub-angular
c) Odor:	Odorless
d) Odor threshold:	Not relevant
e) pH (400 g/l WATER AT 20°C):	8.9-9.5
f) Melting range:	1400-1700°C
g) Specific density:	3.3 g/cm <sup>3</sup>
h) Solubility in water:	Negligible
i) Solubility in hydrofluoric acid:	Yes

### 9.2. Other information

a) Angle of repose:	approx. 45°
b) Stowage factor:	0.54 m <sup>3</sup> (19 ft <sup>3</sup> /t)

## 10. STABILITY AND REACTIVITY

### 10.1. Reactivity

Inert, not reactive.

### 10.2. Chemical stability

Chemically stable.

### 10.3. Possibility of hazardous reactions

No hazardous reactions.

### 10.4. Conditions to avoid

Not relevant

### 10.5. Incompatible materials

No particular incompatibility.

### 10.6. Hazardous decomposition products

Not relevant.

## 11. TOXICOLOGICAL INFORMATION

### 11.1. Information on toxicological effects

- a) Acute toxicity: Based on available data, the classification criteria are not met.
- b) Skin corrosion/irritation: Based on available data, the classification criteria are not met.
- c) Serious eye damage/irritation: Based on available data, the classification criteria are not met.
- d) Respiratory or skin sensitization: Based on available data, the classification criteria are not met.
- e) Germ cell mutagenicity: Based on available data, the classification criteria are not met.
- f) Carcinogenicity: Based on available data, the classification criteria are not met.
- g) Reproductive toxicity: Based on available data, the classification criteria are not met.
- h) STOT-single exposure: Based on available data, the classification criteria are not met.
- i) STOT-repeated exposure: Based on available data, the classification criteria are not met.
- j) Aspiration hazard: Based on available data, the classification criteria are not met.

# SAFETY DATA SHEET

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## 12. ECOLOGICAL INFORMATION

- 12.1. **Toxicity** - Not relevant
- 12.2. **Persistence and degradability** - Not relevant
- 12.3. **Bioaccumulative potential** - Not relevant
- 12.4. **Mobility in soil** - Negligible
- 12.5. **Results of PBT and vPvB assessment** - Not relevant
- 12.6. **Other adverse effects** - No specific adverse effects known

## 13. DISPOSAL CONSIDERATIONS

### 13.1. Waste treatment methods

#### **Waste from residues/unused products**

Where possible, recycling is preferable to disposal. Can be disposed of in compliance with local regulations.

#### **Packaging**

Dust formation from residues in packaging should be avoided and suitable worker protection assured. Store used packaging in enclosed receptacles. Recycling and disposal of packaging should be carried out in compliance with local regulations. The re-use of packaging is not recommended. Recycling and disposal of packaging should be carried out by an authorized waste management company.

## 14. TRANSPORT INFORMATION

- 14.1. **UN Number:** Not relevant
- 14.2. **UN proper shipping name:** Not relevant
- 14.3. **Transport hazard classes**
  - ADR: Not classified
  - IMDG: Not classified
  - ICAO/IATA: Not classified
  - RID: Not classified
- 14.4. **Packing Group:** Not relevant
- 14.5. **Environmental hazards:** Not relevant
- 14.6. **Special precautions for user:** No special precautions
- 14.7. **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code :** Not relevant

## 15. REGULATORY INFORMATION

### 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National legislation/requirements: - International legislation/requirements:

Regulation 1907/2006 (REACH): No classification

European Directive on Dangerous Substances 67/548: No classification

European Community Labelling: No labelling

Olivine



# SAFETY DATA SHEET

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## 15.2 Chemical safety assessment

Exempted from REACH Registration in accordance with Annex V.7.

## 16. OTHER INFORMATION

### Indication of the changes made to the previous version of the SDS

General product information:

Olivine sand is produced from the rock dunite. In the rock small amounts of fibrous minerals can be found, first of all in the mineral group of inosilicates such as pyroxene and amphiboles. A normal element analysis (chemical) reports the nickel content as NiO, and may therefore be misleading in showing the form nickel appears in the product. In olivine, nickel is relative strongly bounded in the silicate lattice and thus not bio-available.

### Third party materials

Insofar as materials not manufactured or supplied by AGSCO Corporation are used in conjunction with, or instead of AGSCO Corporation materials, it is the responsibility of the customer himself to obtain, from the manufacturer or supplier, all technical data and other properties relating to these and other materials and to obtain all necessary information relating to them. No liability can be accepted in respect of the use of AGSCO Corporation olivine in conjunction with materials from another supplier.

### Liability

Such information is to the best of AGSCO Corporation knowledge and believed accurate and reliable as of the date indicated. However, no representation, warranty or guarantee is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use.

### Training

Workers must be trained in the proper use and handling of this product as required under applicable regulations.

## Section 1 Chemical Product and Company Identification

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Boreal Science  
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St. Catharines, Ontario  
L2S 3T4 Canada  
Tel: (800) 387-9393

**CHEMTREC 24 Hour Emergency USA**  
**Phone Number (800) 424-9300**  
For laboratory and industrial use only.  
Not for drug, food or household use.

**Product** BUFFER SOLUTION, PH4 (RED COLOR CODED)

**Synonyms** Standard Buffer Solution, pH 4.00

## Section 2 Hazards Identification

**Signal word:** WARNING  
**Pictograms:** None required  
**Target organs:** None known

**GHS Classification:**  
Skin irritation (Category 3)  
Eye irritation (Category 2B)

**GHS Label information: Hazard statement(s):**  
H316: Causes mild skin irritation.  
H320: Causes eye irritation.

**Precautionary statement(s):**

P264: Wash hands thoroughly after handling.  
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P332+P313: If skin irritation occurs: Get medical attention.  
P337+P313: If eye irritation persists: Get medical attention.

**Hazards not otherwise classified:**

Health hazards not otherwise classified (HHNOC) - Not Known  
Physical hazards not otherwise classified (PHNOC) - Not Known

## Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Water	7732-18-5	98.52%	231-791-2
Acetic acid, glacial	64-19-7	0.99%	231-913-4
Sodium acetate	127-09-3	0.49%	215-185-5
FD&C Red #40 (C.I.No. 16035)	25956-17-6	Trace	247-368-0

## Section 4 First Aid Measures

**INGESTION:** Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.

**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**EYE CONTACT:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

**SKIN ABSORPTION:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

## Section 5 Fire Fighting Measures

**Suitable Extinguishing Media:** Use any media suitable for extinguishing supporting fire

**Protective Actions for Fire-fighters:** In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool.

**Specific Hazards:** During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

## Section 6 Accidental Release Measures

**Personal Precautions:** Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.

**Environmental Precautions:** Avoid runoff into storm sewers and ditches which lead to waterways.

**Containment and Cleanup:** Absorb with inert dry material, sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.

**Precautions for Safe Handling:** Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale vapors, spray or mist. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

**Conditions for Safe Storage:** Store in a cool, well-ventilated area away from incompatible substances.

## Section 8 Exposure Controls / Personal Protection

Exposure Limits:	Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Acetic acid	TWA: 10 ppm ; 25 mg/m <sup>3</sup>	TWA: 10 ppm ; 25 mg/m <sup>3</sup>	TWA: 10 ppm ; 25 mg/m <sup>3</sup>

**Engineering controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

**Respiratory protection:** None should be needed in normal laboratory handling at room temperatures. If misty conditions prevail, work in fume hood or wear a NIOSH/MSHA-approved respirator.

## Section 9 Physical &amp; Chemical Properties

<b>Appearance:</b> Clear, red liquid.	<b>Evaporation rate ( Water = 1):</b> <1	<b>Partition coefficient:</b> Data not available
<b>Odor:</b> Vinegar-like odor.	<b>Flammability (solid/gas):</b> Data not available.	<b>Auto-ignition temperature:</b> Data not available
<b>Odor threshold:</b> Data not available.	<b>Explosion limits: Lower / Upper:</b> Data not available	<b>Decomposition temperature:</b> Data not available.
<b>pH:</b> 4.0	<b>Vapor pressure (mm Hg):</b> 14 (water)	<b>Viscosity:</b> Data not available.
<b>Melting / Freezing point:</b> Approximately 0°C (32°F) (water)	<b>Vapor density (Air = 1):</b> 0.7 (water)	<b>Molecular formula:</b> Mixture
<b>Boiling point:</b> Approximately 100°C (212°F) (water)	<b>Relative density (Specific gravity):</b> Approximately 1.0 (water)	<b>Molecular weight:</b> Mixture
<b>Flash point:</b> Data not available	<b>Solubility(ies):</b> Complete in water.	

## Section 10 Stability &amp; Reactivity

**Chemical stability:** Stable

**Hazardous polymerization:** Will not occur.

**Conditions to avoid:** Excessive temperatures which cause evaporation.

**Incompatibilities with other materials:** Oxidizing agents, such as hydrogen peroxide, nitric acid, perchloric acid or chromium trioxide. Strong alkalies such as sodium hydroxide.

**Hazardous decomposition products:** Carbon oxides.

## Section 11 Toxicological Information

**Acute toxicity:** Data not available

**Skin corrosion/irritation:** Data not available

**Serious eye damage/irritation:** Data not available

**Respiratory or skin sensitization:** Data not available

**Germ cell mutagenicity:** Data not available

**Carcinogenicity:** Data not available

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity:** Data not available

**STOT-single exposure:** Data not available

**STOT-repeated exposure:** Data not available

**Aspiration hazard:** Data not available

**Potential health effects:**

Inhalation: May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

Skin: May cause mild irritation.

Eyes: May cause mild irritation.

**Signs and symptoms of exposure:** To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Specific data is not available. Exercise appropriate procedures to minimize potential hazards.

**Additional information:** RTECS #: Data not available

## Section 12 Ecological Information

**Toxicity to fish:** No data available

**Toxicity to daphnia and other aquatic invertebrates:** No data available

**Toxicity to algae:** No data available

**Persistence and degradability:** No data available

**Bioaccumulative potential:** No data available

**Mobility in soil:** No data available

**PBT and vPvB assessment:** No data available

**Other adverse effects:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

## Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

## Section 14 Transport Information (US DOT / CANADA TDG)

**UN/NA number:** Not applicable

**Shipping name:** Not Regulated

**Hazard class:** Not applicable

**Packing group:** Not applicable

**Reportable Quantity:** No

**Marine pollutant:** No

**Exceptions:** Not applicable

**2016 ERG Guide #** Not applicable

## Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERCLA (RQ)	RCRA code	DSL	NDSL	CA Prop 65
Acetic acid	Listed	5,000 lbs (2,270 kg)	D001 ; D002	Listed	Not listed	This product does not contain any chemicals known to the State of California to cause cancer or reproductive toxicity.
Sodium acetate	Listed	Not listed	Not listed	Listed	Not listed	

## Section 16 Other Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 L'identification de produit chimique et de compagnie

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Tel: (800) 387-9393

**CHEMTREC 24 Numéros De Téléphone De  
Secours D'Heure (800) 424-9300**

Pour l'usage industriel et de laboratoire seulement.  
Pas pour l'usage de drogue, de nourriture ou de ménage.

Produit	SOLUTION DE TAMPON PH4 (COULEUR ROUGE CODÉ)
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Synonymes	Solution tampon standard, pH 4.00
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## Section 2 Identification De Risques

**Mention d'avertissement:** AVERTISSEMENT

**Pictogrammes:** Aucune requise

**Les organes cibles:** Aucun connu.

**Classification par le GHS:**

Skin irritation (Category 3)

Eye irritation (Category 2B)

**Renseignements sur l'étiquette GHS: Mention de danger(s):**

H316: Provoque une légère irritation cutanée.

H320: Provoque une irritation des yeux.

**Déclarations de précaution(s):**

P264: Se laver les mains soigneusement après manipulation.

P305+P351+P338: EN CAS DE CONTACT AVEC LES YEUX: Rincer avec précaution à l'eau pendant plusieurs minutes. Enlever les lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer.

P332+P313: En cas d'irritation cutanée: Obtenir des soins médicaux.

P337+P313: Si l'irritation oculaire persiste: Obtenir des soins médicaux.

**Dangers non classés autrement:**

Dangers pour la santé non classés ailleurs (HHNOC) - pas connu

Dangers physiques non classés autrement (PHNOC) - pas connu

## Section 3 Composition / Information Sur Des Ingrédients

Nommé Chimique	# CAS	%	EINECS
L'eau	7732-18-5	98.52%	231-791-2
Acide acétique, glaciale	64-19-7	0.99%	231-913-4
Acétate de sodium	127-09-3	0.49%	215-185-5
FD&C rouge #40 (C.I.No. 16035)	25956-17-6	Trace	247-368-0

## Section 4 Mesures De Premiers Soins

**INGESTION:** Appeler un médecin ou un centre antipoison immédiatement. Provoquer le vomissement seulement si elle est informée par le personnel compétent médicaux. Ne jamais rien donner par la bouche à une personne inconsciente.

**INHALATION:** Sortir au grand air. Si elle ne respire pas, pratiquer la respiration artificielle. Si la respiration est difficile, donner de l'oxygène. Obtenir des soins médicaux.

**CONTACT AVEC LES YEUX:** Vérifier et enlever les lentilles de contact. Rincer abondamment à l'eau pendant au moins 15 minutes, en soulevant les paupières inférieures et supérieures de temps en temps. Obtenez une attention médicale immédiate.

**ABSORPTION PAR LA PEAU:** Enlever les vêtements contaminés. Rincer soigneusement avec du savon doux et d'eau. En cas d'irritation, consulter un médecin.

## Section 5 Mesures De Lutte Contre l'Incendie

**Moyens d'extinction:** Utilisez des supports adaptés pour éteindre le feu à l'appui.

**Actions de protection pour les sapeurs-pompiers:** En cas d'incendie, porter un appareil respiratoire NIOSH / MSHA approuvé autonome et un équipement complet de protection. Utiliser un jet d'eau pour maintenir incendie refroidir les conteneurs exposés.

**Dangers spécifiques:** En cas d'incendie, des gaz irritants et très toxiques peuvent être générés par la décomposition thermique ou la combustion.

## Section 6 Mesures De Déchargement Accidentel

**Précautions personnelles:** Évacuer le personnel vers la zone sûre. Utiliser un équipement de protection personnelle comme indiqué dans la Section 8. Assurer une ventilation adéquate.

**Précautions environnementales:** Éviter tout ruissellement vers les égouts pluviaux et les fossés qui aboutissent aux voies navigables.

**Confinement et de nettoyage:** Absorbent avec le matériel sec inerte, balayez ou nettoyez à l'aspirateur vers le haut et placez dans un récipient approprié pour la disposition appropriée. Laver la zone de déversement avec du savon et de l'eau.

**Précautions pour la manutention en toute sécurité:** Lire l'étiquette sur le contenant avant d'utiliser. Ne pas porter de lentilles cornéennes lorsque vous travaillez avec des produits chimiques. Tenir hors de portée des enfants. Éviter tout contact avec les yeux, la peau et les vêtements. Ne pas inhaler les vapeurs, les embruns ou le brouillard. Utiliser avec une ventilation adéquate. Éviter l'ingestion. Bien se laver après la manipulation. Retirer et laver les vêtements avant de les réutiliser.

**Conditions de stockage:** Stocker dans un endroit frais et bien aéré, loin des substances incompatibles.

## Section 8 Commandes D'Exposition / Protection Personnelle

Limites d'exposition:	Nommé Chimique	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Acide acétique	TWA: 10 ppm ; 25 mg/m <sup>3</sup>	TWA: 10 ppm ; 25 mg/m <sup>3</sup>	TWA: 10 ppm ; 25 mg/m <sup>3</sup>

**Contrôles d'ingénierie:** Les installations d'entreposage ou d'utilisation de ce matériel doit être équipé d'une douche oculaire et une douche de sécurité et le matériel d'extinction d'incendie. Le personnel doit porter des lunettes de sécurité, des lunettes, ou un écran facial, une blouse de laboratoire ou tablier, des gants protecteurs appropriés. Utiliser une ventilation adéquate pour maintenir les concentrations atmosphériques faible.

**Protection respiratoire:** Aucun ne devrait être nécessaire dans le laboratoire normal manipulant aux températures ambiantes. Si les conditions brumeuses prévaloir, travailler dans la hotte ou de porter un masque respiratoire approuvé NIOSH / MSHA.

## Section 9 Propriétés Physiques Et Chimiques

<b>Apparence:</b> Clair, liquide rouge.	<b>Taux d'évaporation (Eau = 1):</b> <1	<b>Coefficient de partage:</b> Données non disponibles
<b>Odeur:</b> Odeur de vinaigre.	<b>Inflammabilité (solide / gaz):</b> Données non disponibles.	<b>Auto-inflammation:</b> Données non disponibles
<b>Seuil de l'odeur:</b> Données non disponibles.	<b>Limites d'explosivité: Bas / Max:</b> Données non disponibles	<b>Température de décomposition:</b> Données non disponibles.
<b>pH:</b> 4,0	<b>Pression de vapeur (mm Hg):</b> 14 (eau)	<b>Viscosité:</b> Données non disponibles.
<b>Point de fusion / congélation:</b> Environ 0°C (32°F) (eau)	<b>Densité de vapeur (Air = 1):</b> 0.7 (eau)	<b>Formule moléculaire:</b> Mélange
<b>Point d'ébullition:</b> Environ 100°C (212°F) (eau)	<b>Densité relative (gravité spécifique):</b> Environ 1.0 (eau)	<b>Poids moléculaire:</b> Mélange
<b>Point d'éclair:</b> Données non disponibles	<b>Solubilité (s):</b> Complet dans l'eau.	

## Section 10 Stabilité Et Réactivité

**Stabilité chimique:** Stable

**Polymérisation dangereuse:** N'aura pas lieu.

**Conditions à éviter:** Les températures excessives qui causent l'évaporation.

**Incompatibilités avec d'autres matériaux:** Oxydants, tels que peroxyde d'hydrogène, acide nitrique, acide perchlorique ou trioxyde de chrome. Alcalis fort tels que hydroxide de sodium.

**Produits de décomposition dangereux:** Oxydes de carbone.

## Section 11 L'Information Toxicologique

**Toxicité aiguë:** Données non disponibles

**La corrosion de la peau et l'irritation:** Données non disponibles

**Des lésions oculaires graves / irritation:** Données non disponibles

**Respiratoire ou sensibilisation de la peau:** Données non disponibles

**Mutagenicité des cellules germinales:** Données non disponibles

**Cancérogène:** Données non disponibles

**NTP:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène reconnu ou présumé par NTP.

**IARC:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène probable, possible ou confirmé par IARC.

**OSHA:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène ni comme cancérogène possible par OSHA.

**Reproductive toxicity:** Données non disponibles

**STOT-exposition unique:** Données non disponibles.

**STOT-une exposition répétée:** Données non disponibles

**Risque d'aspiration:** Données non disponibles

**Effets d'une surexposition:**

Inhalation: Peut être nocif en cas d'inhalation.

Ingestion: Peut être nocif en cas d'ingestion.

Peau: Peut causer une légère irritation.

Yeux: Peut causer une légère irritation.

**Les signes et les symptômes de l'exposition:** Pour le meilleur de notre connaissance les propriétés chimiques, physiques et toxicologiques n'ont pas été étudiées à fond.

Les données spécifiques n'est pas disponible. Exercice des procédures appropriées afin de minimiser les dangers potentiels.

**Informations complémentaires: RTECS #:** Données non disponibles

## Section 12 L'Information Écologique

**Toxicité pour les poissons:** Pas de données disponible

**Toxicité pour les daphnies et autres invertébrés aquatiques:** Pas de données disponible

**Toxicité pour les algues:** Pas de données disponible

**Persistence et dégradabilité:** Pas de données disponible

**Potentiel de bioaccumulation:** Pas de données disponible

**Mobilité dans le sol:** Pas de données disponibles

**Évaluation PBT et vPvB:** Pas de données disponibles

**Autres effets indésirables:** Un danger pour l'environnement ne peut pas être exclu dans l'éventualité d'une manipulation ou d'élimination.

## Section 13 Considérations De Disposition

Ces lignes directrices sont destinées à l'élimination de la disposition d'un catalogue de taille seules les quantités. Les règlements fédéraux peuvent s'appliquer aux contenants vides. Des réglementations nationales et / ou local peut être différent. Éliminer conformément à toutes les réglementations locales, provinciales et fédérales ou d'un contrat avec une agence élimination des produits chimiques sous licence.

## Section 14 L'Information De Transport (US DOT / CANADA TMD)

**Numéro UN / NA:** Non applicable

**Nom d'expédition:** Non réglé

**Classe de danger:** Non applicable

**Groupe d'emballage:** Non applicable

**Quantité à déclarer:** Non

**Polluant marin:** Non

**Exceptions:** Non applicable

**2016 ERG Guide #:** Non applicable

## Section 15 L'Information De Normalisation

Un produit chimique est considéré comme inscrit si le numéro CAS pour la forme anhydre est sur la liste d'inventaire.

Composant	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL
Acide acétique	Listed	5,000 lbs (2,270 kg)	D001 ; D002	Listed	Not listed
Acetate de sodium	Listed	Not listed	Not listed	Listed	Not listed

## Section 16 L'autre Information

Les informations contenues dans ce document sont fournis sans garantie d'aucune sorte. Les employeurs devraient considérer cette information seulement comme complément à d'autres informations recueillies par eux et doivent prendre des décisions indépendantes de la pertinence et l'exhaustivité de l'information de toutes les sources afin d'assurer une utilisation correcte de ces matériaux et de la sécurité et la santé des employés. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 Chemical Product and Company Identification

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5100 West Henrietta Rd  
PO Box 92912  
Rochester, NY 14692-9012  
Tel: (800) 962-2660

Boreal Science  
399 Vansickle Road  
St. Catharines, Ontario  
L2S 3T4 Canada  
Tel: (800) 387-9393

**CHEMTREC 24 Hour Emergency USA**  
**Phone Number (800) 424-9300**  
For laboratory and industrial use only.  
Not for drug, food or household use.

Product	BUFFER SOLUTION, PH7 (YELLOW COLOR CODED)
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Synonyms	Standard Buffer Solution, pH 7.00
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## Section 2 Hazards Identification

**Signal word:** WARNING  
**Pictograms:** None required  
**Target organs:** None known

**GHS Classification:**  
Skin irritation (Category 3)  
Eye irritation (Category 2B)

**GHS Label information: Hazard statement(s):**  
H316: Causes mild skin irritation.  
H320: Causes eye irritation.

**Precautionary statement(s):**

P264: Wash hands thoroughly after handling.  
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P332+P313: If skin irritation occurs: Get medical attention.  
P337+P313: If eye irritation persists: Get medical attention.

**Hazards not otherwise classified:**

Health hazards not otherwise classified (HHNOC) - Not Known  
Physical hazards not otherwise classified (PHNOC) - Not Known

## Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Water	7732-18-5	99.15%	231-791-2
Potassium phosphate, monobasic	7778-77-0	0.72%	231-913-4
Sodium hydroxide	1310-73-2	0.13%	215-185-5
FD&C yellow #5	1394-21-0	trace	None assigned

## Section 4 First Aid Measures

**INGESTION:** Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.

**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**EYE CONTACT:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

**SKIN ABSORPTION:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

## Section 5 Fire Fighting Measures

**Suitable Extinguishing Media:** Use any media suitable for extinguishing supporting fire

**Protective Actions for Fire-fighters:** In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool.

**Specific Hazards:** During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

## Section 6 Accidental Release Measures

**Personal Precautions:** Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.

**Environmental Precautions:** Avoid runoff into storm sewers and ditches which lead to waterways.

**Containment and Cleanup:** Absorb with inert dry material, sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.



**Precautions for Safe Handling:** Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale vapors, spray or mist. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

**Conditions for Safe Storage:** Store in a cool, well-ventilated area away from incompatible substances.

## Section 8 Exposure Controls / Personal Protection

Exposure Limits:	Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Potassium phosphate	None established.	None established.	None established.

**Engineering controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

**Respiratory protection:** None should be needed in normal laboratory handling at room temperatures. If misty conditions prevail, work in fume hood or wear a NIOSH/MSHA-approved respirator.

## Section 9 Physical &amp; Chemical Properties

<b>Appearance:</b> Clear, yellow liquid.	<b>Evaporation rate ( Water = 1):</b> <1	<b>Partition coefficient:</b> Data not available
<b>Odor:</b> No odor.	<b>Flammability (solid/gas):</b> Data not available.	<b>Auto-ignition temperature:</b> Data not available
<b>Odor threshold:</b> Data not available.	<b>Explosion limits: Lower / Upper:</b> Data not available	<b>Decomposition temperature:</b> Data not available.
<b>pH:</b> Data not available	<b>Vapor pressure (mm Hg):</b> 14 (water)	<b>Viscosity:</b> Data not available.
<b>Melting / Freezing point:</b> Approximately 0°C (32°F) (water)	<b>Vapor density (Air = 1):</b> 0.7 (water)	<b>Molecular formula:</b> Mixture
<b>Boiling point:</b> Approximately 100°C (212°F) (water)	<b>Relative density (Specific gravity):</b> Approximately 1.0 (water)	<b>Molecular weight:</b> Mixture
<b>Flash point:</b> Data not available	<b>Solubility(ies):</b> Complete in water.	

## Section 10 Stability &amp; Reactivity

**Chemical stability:** Stable

**Hazardous polymerization:** Will not occur.

**Conditions to avoid:** Excessive temperatures which cause evaporation.

**Incompatibilities with other materials:** Acids, alkalies, and air will change the buffer's ability.

**Hazardous decomposition products:** Thermal decomposition will yield phosphates and sodium oxide and/or hydroxides.

## Section 11 Toxicological Information

**Acute toxicity:** Oral-rat LD50: 3,200 mg/kg [Potassium phosphate]

**Skin corrosion/irritation:** Data not available

**Serious eye damage/irritation:** Data not available

**Respiratory or skin sensitization:** Data not available

**Germ cell mutagenicity:** Data not available

**Carcinogenicity:** Data not available

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity:** Data not available

**STOT-single exposure:** Data not available

**STOT-repeated exposure:** Data not available

**Aspiration hazard:** Data not available

**Potential health effects:**

Inhalation: May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

Skin: May cause mild irritation.

Eyes: May cause mild irritation.

**Signs and symptoms of exposure:** To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Specific data is not available. Exercise appropriate procedures to minimize potential hazards.

**Additional information: RTECS #:** TC661500 [Potassium phosphate]

## Section 12 Ecological Information

**Toxicity to fish:** No data available

**Toxicity to daphnia and other aquatic invertebrates:** No data available

**Toxicity to algae:** No data available

**Persistence and degradability:** No data available

**Bioaccumulative potential:** No data available

**Mobility in soil:** No data available

**PBT and vPvB assessment:** No data available

**Other adverse effects:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

## Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

## Section 14 Transport Information (US DOT / CANADA TDG)

**UN/NA number:** Not applicable

**Shipping name:** Not Regulated

**Hazard class:** Not applicable

**Packing group:** Not applicable

**Reportable Quantity:** No

**Marine pollutant:** No

**Exceptions:** Not applicable

**2016 ERG Guide #** Not applicable

## Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERCLA (RQ)	RCRA code	DSL	NDSL	CA Prop 65
Potassium phosphate	Listed	Not listed	Not listed	Listed	Not listed	This product does not contain any chemicals known to the State of California to cause cancer or reproductive toxicity.
Sodium hydroxide	Listed	1,000 lbs (454 kg)	D002	Listed	Not listed	

## Section 16 Other Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 L'identification de produit chimique et de compagnie

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**CHEMTREC 24 Numéros De Téléphone De  
Secours D'Heure (800) 424-9300**

Pour l'usage industriel et de laboratoire seulement.  
Pas pour l'usage de drogue, de nourriture ou de ménage.

Produit	SOLUTION DE TAMPON PH7 (COULEUR JAUNE CODÉ)
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Synonymes	Solution tampon standard, pH 7.00
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## Section 2 Identification De Risques

**Mention d'avertissement:** AVERTISSEMENT

**Pictogrammes:** Aucune requise

**Les organes cibles:** Aucun connu.

**Classification par le GHS:**

Skin irritation (Category 3)

Eye irritation (Category 2B)

**Renseignements sur l'étiquette GHS: Mention de danger(s):**

H316: Provoque une légère irritation cutanée.

H320: Provoque une irritation des yeux.

**Déclarations de précaution(s):**

P264: Se laver les mains soigneusement après manipulation.

P305+P351+P338: EN CAS DE CONTACT AVEC LES YEUX: Rincer avec précaution à l'eau pendant plusieurs minutes. Enlever les lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer.

P332+P313: En cas d'irritation cutanée: Obtenir des soins médicaux.

P337+P313: Si l'irritation oculaire persiste: Obtenir des soins médicaux.

**Dangers non classés autrement:**

Dangers pour la santé non classés ailleurs (HHNOC) - pas connu

Dangers physiques non classés autrement (PHNOC) - pas connu

## Section 3 Composition / Information Sur Des Ingrédients

Nommé Chimique	# CAS	%	EINECS
L'eau	7732-18-5	99.15%	231-791-2
Phosphate de potassium, monobasique	7778-77-0	0.72%	231-913-4
Hydroxyde de sodium	1310-73-2	0.13%	215-185-5
FD&C jaune #5	1394-21-0	trace	None assigned

## Section 4 Mesures De Premiers Soins

**INGESTION:** Appeler un médecin ou un centre antipoison immédiatement. Provoquer le vomissement seulement si elle est informée par le personnel compétent médicaux. Ne jamais rien donner par la bouche à une personne inconsciente.

**INHALATION:** Sortir au grand air. Si elle ne respire pas, pratiquer la respiration artificielle. Si la respiration est difficile, donner de l'oxygène. Obtenir des soins médicaux.

**CONTACT AVEC LES YEUX:** Vérifier et enlever les lentilles de contact. Rincer abondamment à l'eau pendant au moins 15 minutes, en soulevant les paupières inférieures et supérieures de temps en temps. Obtenez une attention médicale immédiate.

**ABSORPTION PAR LA PEAU:** Enlever les vêtements contaminés. Rincer soigneusement avec du savon doux et d'eau. En cas d'irritation, consulter un médecin.

## Section 5 Mesures De Lutte Contre l'Incendie

**Moyens d'extinction:** Utilisez des supports adaptés pour éteindre le feu à l'appui.

**Actions de protection pour les sapeurs-pompiers:** En cas d'incendie, porter un appareil respiratoire NIOSH / MSHA approuvé autonome et un équipement complet de protection. Utiliser un jet d'eau pour maintenir incendie refroidir les conteneurs exposés.

**Dangers spécifiques:** En cas d'incendie, des gaz irritants et très toxiques peuvent être générés par la décomposition thermique ou la combustion.

## Section 6 Mesures De Déchargement Accidentel

**Précautions personnelles:** Évacuer le personnel vers la zone sûre. Utiliser un équipement de protection personnelle comme indiqué dans la Section 8. Assurer une ventilation adéquate.

**Précautions environnementales:** Éviter tout ruissellement vers les égouts pluviaux et les fossés qui aboutissent aux voies navigables.

**Confinement et de nettoyage:** Absorbent avec le matériel sec inerte, balayez ou nettoyez à l'aspirateur vers le haut et placez dans un récipient approprié pour la disposition appropriée. Laver la zone de déversement avec du savon et de l'eau.



**Précautions pour la manutention en toute sécurité:** Lire l'étiquette sur le contenant avant d'utiliser. Ne pas porter de lentilles cornéennes lorsque vous travaillez avec des produits chimiques. Tenir hors de portée des enfants. Éviter tout contact avec les yeux, la peau et les vêtements. Ne pas inhaler les vapeurs, les embruns ou le brouillard. Utiliser avec une ventilation adéquate. Éviter l'ingestion. Bien se laver après la manipulation. Retirer et laver les vêtements avant de les réutiliser.

**Conditions de stockage:** Stocker dans un endroit frais et bien aéré, loin des substances incompatibles.

## Section 8 Commandes D'Exposition / Protection Personnelle

Limites d'exposition:	Nommé Chimique	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Phosphate de potassium	Aucun établi.	Aucun établi.	Aucun établi.

**Contrôles d'ingénierie:** Les installations d'entreposage ou d'utilisation de ce matériel doit être équipé d'une douche oculaire et une douche de sécurité et le matériel d'extinction d'incendie. Le personnel doit porter des lunettes de sécurité, des lunettes, ou un écran facial, une blouse de laboratoire ou tablier, des gants protecteurs appropriés. Utiliser une ventilation adéquate pour maintenir les concentrations atmosphériques faible.

**Protection respiratoire:** Aucun ne devrait être nécessaire dans le laboratoire normal manipulant aux températures ambiantes. Si les conditions brumeuses prévaloir, travailler dans la hotte ou de porter un masque respiratoire approuvé NIOSH / MSHA.

## Section 9 Propriétés Physiques Et Chimiques

<b>Apparence:</b> Clair, liquide jaune.	<b>Taux d'évaporation (Eau = 1):</b> <1	<b>Coefficient de partage:</b> Données non disponibles
<b>Odeur:</b> Aucun odeur.	<b>Inflammabilité (solide / gaz):</b> Données non disponibles.	<b>Auto-inflammation:</b> Données non disponibles
<b>Seuil de l'odeur:</b> Données non disponibles.	<b>Limites d'explosivité: Bas / Max:</b> Données non disponibles	<b>Température de décomposition:</b> Données non disponibles.
<b>pH:</b> Données non disponibles	<b>Pression de vapeur (mm Hg):</b> 14 (eau)	<b>Viscosité:</b> Données non disponibles.
<b>Point de fusion / congélation:</b> Environ 0°C (32°F) (eau)	<b>Densité de vapeur (Air = 1):</b> 0.7 (eau)	<b>Formule moléculaire:</b> Mélange
<b>Point d'ébullition:</b> Environ 100°C (212°F) (eau)	<b>Densité relative (gravité spécifique):</b> Environ 1.0 (eau)	<b>Poids moléculaire:</b> Mélange
<b>Point d'éclair:</b> Données non disponibles	<b>Solubilité (s):</b> Complet dans l'eau.	

## Section 10 Stabilité Et Réactivité

**Stabilité chimique:** Stable

**Polymérisation dangereuse:** N'aura pas lieu.

**Conditions à éviter:** Les températures excessives qui causent l'évaporation.

**Incompatibilités avec d'autres matériaux:** Acides, alcalis, et l'air changera la capacité de l'amortisseur.

**Produits de décomposition dangereux:** La décomposition thermique rapportera les phosphates et l'oxyde et/ou les hydroxydes de sodium .

## Section 11 L'Information Toxicologique

**Toxicité aiguë:** Oral-rat LD50: 3,200 mg/kg [Phosphate de potassium]

**La corrosion de la peau et l'irritation:** Données non disponibles

**Des lésions oculaires graves / irritation:** Données non disponibles

**Respiratoire ou sensibilisation de la peau:** Données non disponibles

**Mutagenicité des cellules germinales:** Données non disponibles

**Cancérogène:** Données non disponibles

NTP: Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène reconnu ou présumé par NTP.

IARC: Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène probable, possible ou confirmé par IARC.

OSHA: Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène ni comme cancérogène possible par OSHA.

**Reproductive toxicity:** Données non disponibles

**STOT-exposition unique:** Données non disponibles.

**STOT-une exposition répétée:** Données non disponibles

**Risque d'aspiration:** Données non disponibles

**Effets d'une surexposition:**

Inhalation: Peut être nocif en cas d'inhalation.

Ingestion: Peut être nocif en cas d'ingestion.

Peau: Peut causer une légère irritation.

Yeux: Peut causer une légère irritation.

**Les signes et les symptômes de l'exposition:** Pour le meilleur de notre connaissance les propriétés chimiques, physiques et toxicologiques n'ont pas été étudiées à fond.

Les données spécifiques n'est pas disponible. Exercice des procédures appropriées afin de minimiser les dangers potentiels.

**Informations complémentaires: RTECS #:** TC661500 [Phosphate de potassium]

## Section 12 L'Information Écologique

**Toxicité pour les poissons:** Pas de données disponible

**Toxicité pour les daphnies et autres invertébrés aquatiques:** Pas de données disponible

**Toxicité pour les algues:** Pas de données disponible

**Persistence et dégradabilité:** Pas de données disponible

**Mobilité dans le sol:** Pas de données disponibles

**Autres effets indésirables:** Un danger pour l'environnement ne peut pas être exclu dans l'éventualité d'une manipulation ou d'élimination.

**Potentiel de bioaccumulation:** Pas de données disponible

**Évaluation PBT et vPvB:** Pas de données disponibles

## Section 13 Considérations De Disposition

Ces lignes directrices sont destinées à l'élimination de la disposition d'un catalogue de taille seules les quantités. Les règlements fédéraux peuvent s'appliquer aux contenants vides. Des réglementations nationales et / ou local peut être différent. Éliminer conformément à toutes les réglementations locales, provinciales et fédérales ou d'un contrat avec une agence élimination des produits chimiques sous licence.

## Section 14 L'Information De Transport (US DOT / CANADA TMD)

**Numéro UN / NA:** Non applicable

**Nom d'expédition:** Non réglé

**Classe de danger:** Non applicable

**Groupe d'emballage:** Non applicable

**Quantité à déclarer:** Non

**Polluant marin:** Non

**Exceptions:** Non applicable

**2016 ERG Guide #:** Non applicable

## Section 15 L'Information De Normalisation

Un produit chimique est considéré comme inscrit si le numéro CAS pour la forme anhydre est sur la liste d'inventaire.

Composant	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL
Phosphate de potassium	Listed	Not listed	Not listed	Listed	Not listed
Hydroxyde de sodium	Listed	1,000 lbs (454 kg)	D002	Listed	Not listed

## Section 16 L'autre Information

Les informations contenues dans ce document sont fournis sans garantie d'aucune sorte. Les employeurs devraient considérer cette information seulement comme complément à d'autres informations recueillies par eux et doivent prendre des décisions indépendantes de la pertinence et l'exhaustivité de l'information de toutes les sources afin d'assurer une utilisation correcte de ces matériaux et de la sécurité et la santé des employés. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 Chemical Product and Company Identification

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Tel: (800) 387-9393

**CHEMTREC 24 Hour Emergency USA**  
**Phone Number (800) 424-9300**  
For laboratory and industrial use only.  
Not for drug, food or household use.

Product	BUFFER SOLUTION, PH10 (BLUE COLOR CODED)
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Synonyms	Standard Buffer Solution, pH 10.00
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## Section 2 Hazards Identification

**Signal word:** WARNING  
**Pictograms:** None required  
**Target organs:** None known

**GHS Classification:**  
Skin irritation (Category 3)  
Eye irritation (Category 2B)

**GHS Label information: Hazard statement(s):**  
H316: Causes mild skin irritation.  
H320: Causes eye irritation.

**Precautionary statement(s):**

P264: Wash hands thoroughly after handling.  
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P332+P313: If skin irritation occurs: Get medical attention.  
P337+P313: If eye irritation persists: Get medical attention.

**Hazards not otherwise classified:**

Health hazards not otherwise classified (HHNOC) - Not Known  
Physical hazards not otherwise classified (PHNOC) - Not Known

## Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Water	7732-18-5	99.08%	231-791-2
Potassium chloride	7447-40-7	0.40%	231-211-8
Boric acid	10043-35-3	0.33%	233-139-2
Sodium hydroxide	1310-73-2	0.19%	215-185-5
FD&C blue #1 (C.I. No. 42090)	3844-45-9	trace	223-339-8

## Section 4 First Aid Measures

**INGESTION:** Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.

**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**EYE CONTACT:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

**SKIN ABSORPTION:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

## Section 5 Fire Fighting Measures

**Suitable Extinguishing Media:** Use any media suitable for extinguishing supporting fire

**Protective Actions for Fire-fighters:** In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool.

**Specific Hazards:** During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

## Section 6 Accidental Release Measures

**Personal Precautions:** Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.

**Environmental Precautions:** Avoid runoff into storm sewers and ditches which lead to waterways.

**Containment and Cleanup:** Absorb with inert dry material, sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.

**Precautions for Safe Handling:** Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale vapors, spray or mist. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

**Conditions for Safe Storage:** Store in a cool, well-ventilated area away from incompatible substances.

## Section 8 Exposure Controls / Personal Protection

Exposure Limits:	Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Potassium chloride	None established.	None established.	None established.

**Engineering controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

**Respiratory protection:** None should be needed in normal laboratory handling at room temperatures. If misty conditions prevail, work in fume hood or wear a NIOSH/MSHA-approved respirator.

## Section 9 Physical &amp; Chemical Properties

<b>Appearance:</b> Clear, blue liquid.	<b>Evaporation rate ( Water = 1):</b> <1	<b>Partition coefficient:</b> Data not available
<b>Odor:</b> No odor.	<b>Flammability (solid/gas):</b> Data not available.	<b>Auto-ignition temperature:</b> Data not available
<b>Odor threshold:</b> Data not available.	<b>Explosion limits: Lower / Upper:</b> Data not available	<b>Decomposition temperature:</b> Data not available.
<b>pH:</b> 10.0	<b>Vapor pressure (mm Hg):</b> 14 (water)	<b>Viscosity:</b> Data not available.
<b>Melting / Freezing point:</b> Approximately 0°C (32°F) (water)	<b>Vapor density (Air = 1):</b> 0.7 (water)	<b>Molecular formula:</b> Mixture
<b>Boiling point:</b> Approximately 100°C (212°F) (water)	<b>Relative density (Specific gravity):</b> Approximately 1.0 (water)	<b>Molecular weight:</b> Mixture
<b>Flash point:</b> Data not available	<b>Solubility(ies):</b> Complete in water.	

## Section 10 Stability &amp; Reactivity

**Chemical stability:** Stable **Hazardous polymerization:** Will not occur.

**Conditions to avoid:** Excessive temperatures which cause evaporation.

**Incompatibilities with other materials:** Acids, alkalies, and air will change the buffer's ability.

**Hazardous decomposition products:** Boron oxide and chlorine gas.

## Section 11 Toxicological Information

**Acute toxicity:** Data not available

**Skin corrosion/irritation:** Data not available

**Serious eye damage/irritation:** Data not available

**Respiratory or skin sensitization:** Data not available

**Germ cell mutagenicity:** Data not available

**Carcinogenicity:** Data not available

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity:** Data not available

**STOT-single exposure:** Data not available

**STOT-repeated exposure:** Data not available

**Aspiration hazard:** Data not available

**Potential health effects:**

Inhalation: May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

Skin: May cause mild irritation.

Eyes: May cause mild irritation.

**Signs and symptoms of exposure:** To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Specific data is not available. Exercise appropriate procedures to minimize potential hazards.

**Additional information: RTECS #:** Data not available

## Section 12 Ecological Information

**Toxicity to fish:** No data available

**Toxicity to daphnia and other aquatic invertebrates:** No data available

**Toxicity to algae:** No data available

**Persistence and degradability:** No data available

**Bioaccumulative potential:** No data available

**Mobility in soil:** No data available

**PBT and vPvB assessment:** No data available

**Other adverse effects:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

## Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

## Section 14 Transport Information (US DOT / CANADA TDG)

**UN/NA number:** Not applicable

**Shipping name:** Not Regulated

**Hazard class:** Not applicable

**Packing group:** Not applicable

**Reportable Quantity:** No

**Marine pollutant:** No

**Exceptions:** Not applicable

**2016 ERG Guide #** Not applicable

## Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERCLA (RQ)	RCRA code	DSL	NDSL	CA Prop 65
Potassium chloride	Listed	Not listed	Not listed	Listed	Not listed	This product does not contain any chemicals known to the State of California to cause cancer or reproductive toxicity.

## Section 16 Other Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 L'identification de produit chimique et de compagnie

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Boreal Science  
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L2S 3T4 Canada  
Tel: (800) 387-9393

**CHEMTREC 24 Numéros De Téléphone De  
Secours D'Heure (800) 424-9300**

Pour l'usage industriel et de laboratoire seulement.  
Pas pour l'usage de drogue, de nourriture ou de ménage.

Produit	SOLUTION DE TAMPON PH10 (COULEUR BLEU CODÉ)
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Synonymes	Solution tampon standard, pH 10.00
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## Section 2 Identification De Risques

**Mention d'avertissement:** AVERTISSEMENT

**Pictogrammes:** Aucune requise

**Les organes cibles:** Aucun connu.

**Classification par le GHS:**

Skin irritation (Category 3)

Eye irritation (Category 2B)

**Renseignements sur l'étiquette GHS: Mention de danger(s):**

H316: Provoque une légère irritation cutanée.

H320: Provoque une irritation des yeux.

**Déclarations de précaution(s):**

P264: Se laver les mains soigneusement après manipulation.

P305+P351+P338: EN CAS DE CONTACT AVEC LES YEUX: Rincer avec précaution à l'eau pendant plusieurs minutes. Enlever les lentilles de contact si la victime en porte et si elles peuvent être facilement enlevées. Continuer à rincer.

P332+P313: En cas d'irritation cutanée: Obtenir des soins médicaux.

P337+P313: Si l'irritation oculaire persiste: Obtenir des soins médicaux.

**Dangers non classés autrement:**

Dangers pour la santé non classés ailleurs (HHNOC) - pas connu

Dangers physiques non classés autrement (PHNOC) - pas connu

## Section 3 Composition / Information Sur Des Ingrédients

Nommé Chimique	# CAS	%	EINECS
L'eau	7732-18-5	99.08%	231-791-2
Chlorure de potassium	7447-40-7	0.40%	231-211-8
Acide borique	10043-35-3	0.33%	233-139-2
Hydroxyde de sodium	1310-73-2	0.19%	215-185-5
FD&C bleu #1 (C.I. No. 42090)	3844-45-9	trace	223-339-8

## Section 4 Mesures De Premiers Soins

**INGESTION:** Appeler un médecin ou un centre antipoison immédiatement. Provoquer le vomissement seulement si elle est informée par le personnel compétent médicaux. Ne jamais rien donner par la bouche à une personne inconsciente.

**INHALATION:** Sortir au grand air. Si elle ne respire pas, pratiquer la respiration artificielle. Si la respiration est difficile, donner de l'oxygène. Obtenir des soins médicaux.

**CONTACT AVEC LES YEUX:** Vérifier et enlever les lentilles de contact. Rincer abondamment à l'eau pendant au moins 15 minutes, en soulevant les paupières inférieures et supérieures de temps en temps. Obtenez une attention médicale immédiate.

**ABSORPTION PAR LA PEAU:** Enlever les vêtements contaminés. Rincer soigneusement avec du savon doux et d'eau. En cas d'irritation, consulter un médecin.

## Section 5 Mesures De Lutte Contre l'Incendie

**Moyens d'extinction:** Utilisez des supports adaptés pour éteindre le feu à l'appui.

**Actions de protection pour les sapeurs-pompiers:** En cas d'incendie, porter un appareil respiratoire NIOSH / MSHA approuvé autonome et un équipement complet de protection. Utiliser un jet d'eau pour maintenir incendie refroidir les conteneurs exposés.

**Dangers spécifiques:** En cas d'incendie, des gaz irritants et très toxiques peuvent être générés par la décomposition thermique ou la combustion.

## Section 6 Mesures De Déchargement Accidentel

**Précautions personnelles:** Évacuer le personnel vers la zone sûre. Utiliser un équipement de protection personnelle comme indiqué dans la Section 8. Assurer une ventilation adéquate.

**Précautions environnementales:** Éviter tout ruissellement vers les égouts pluviaux et les fossés qui aboutissent aux voies navigables.

**Confinement et de nettoyage:** Absorbent avec le matériel sec inerte, balayez ou nettoyez à l'aspirateur vers le haut et placez dans un récipient approprié pour la disposition appropriée. Laver la zone de déversement avec du savon et de l'eau.

**Précautions pour la manutention en toute sécurité:** Lire l'étiquette sur le contenant avant d'utiliser. Ne pas porter de lentilles cornéennes lorsque vous travaillez avec des produits chimiques. Tenir hors de portée des enfants. Éviter tout contact avec les yeux, la peau et les vêtements. Ne pas inhaler les vapeurs, les embruns ou le brouillard. Utiliser avec une ventilation adéquate. Éviter l'ingestion. Bien se laver après la manipulation. Retirer et laver les vêtements avant de les réutiliser.

**Conditions de stockage:** Stocker dans un endroit frais et bien aéré, loin des substances incompatibles.

## Section 8 Commandes D'Exposition / Protection Personnelle

Limites d'exposition:	Nommé Chimique	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Chlorure de potassium	Aucun établi.	Aucun établi.	Aucun établi.

**Contrôles d'ingénierie:** Les installations d'entreposage ou d'utilisation de ce matériel doit être équipé d'une douche oculaire et une douche de sécurité et le matériel d'extinction d'incendie. Le personnel doit porter des lunettes de sécurité, des lunettes, ou un écran facial, une blouse de laboratoire ou tablier, des gants protecteurs appropriés. Utiliser une ventilation adéquate pour maintenir les concentrations atmosphériques faible.

**Protection respiratoire:** Aucun ne devrait être nécessaire dans le laboratoire normal manipulant aux températures ambiantes. Si les conditions brumeuses prévaloir, travailler dans la hotte ou de porter un masque respiratoire approuvé NIOSH / MSHA.

## Section 9 Propriétés Physiques Et Chimiques

<b>Apparence:</b> Clair, liquide bleu.	<b>Taux d'évaporation (Eau = 1):</b> <1	<b>Coefficient de partage:</b> Données non disponibles
<b>Odeur:</b> Aucun odeur.	<b>Inflammabilité (solide / gaz):</b> Données non disponibles.	<b>Auto-inflammation:</b> Données non disponibles
<b>Seuil de l'odeur:</b> Données non disponibles.	<b>Limites d'explosivité: Bas / Max:</b> Données non disponibles	<b>Température de décomposition:</b> Données non disponibles.
<b>pH:</b> 10.0	<b>Pression de vapeur (mm Hg):</b> 14 (eau)	<b>Viscosité:</b> Données non disponibles.
<b>Point de fusion / congélation:</b> Environ 0°C (32°F) (eau)	<b>Densité de vapeur (Air = 1):</b> 0.7 (eau)	<b>Formule moléculaire:</b> Mélange
<b>Point d'ébullition:</b> Environ 100°C (212°F) (eau)	<b>Densité relative (gravité spécifique):</b> Environ 1.0 (eau)	<b>Poids moléculaire:</b> Mélange
<b>Point d'éclair:</b> Données non disponibles	<b>Solubilité (s):</b> Complet dans l'eau.	

## Section 10 Stabilité Et Réactivité

**Stabilité chimique:** Stable

**Polymérisation dangereuse:** N'aura pas lieu.

**Conditions à éviter:** Les températures excessives qui causent l'évaporation.

**Incompatibilités avec d'autres matériaux:** Acides, alcalis, et l'air changera la capacité de l'amortisseur.

**Produits de décomposition dangereux:** Oxyde de bore et gaz de chlore.

## Section 11 L'Information Toxicologique

**Toxicité aiguë:** Données non disponibles

**La corrosion de la peau et l'irritation:** Données non disponibles

**Des lésions oculaires graves / irritation:** Données non disponibles

**Respiratoire ou sensibilisation de la peau:** Données non disponibles

**Mutagenicité des cellules germinales:** Données non disponibles

**Cancérogène:** Données non disponibles

**NTP:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène reconnu ou présumé par NTP.

**IARC:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène probable, possible ou confirmé par IARC.

**OSHA:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène ni comme cancérogène possible par OSHA.

**Reproductive toxicity:** Données non disponibles

**STOT-exposition unique:** Données non disponibles.

**STOT-une exposition répétée:** Données non disponibles

**Risque d'aspiration:** Données non disponibles

**Effets d'une surexposition:**

Inhalation: Peut être nocif en cas d'inhalation.

Ingestion: Peut être nocif en cas d'ingestion.

Peau: Peut causer une légère irritation.

Yeux: Peut causer une légère irritation.

**Les signes et les symptômes de l'exposition:** Pour le meilleur de notre connaissance les propriétés chimiques, physiques et toxicologiques n'ont pas été étudiées à fond.

Les données spécifiques n'est pas disponible. Exercice des procédures appropriées afin de minimiser les dangers potentiels.

**Informations complémentaires: RTECS #:** Données non disponibles

## Section 12 L'Information Écologique

**Toxicité pour les poissons:** Pas de données disponible

**Toxicité pour les daphnies et autres invertébrés aquatiques:** Pas de données disponible

**Toxicité pour les algues:** Pas de données disponible

**Persistence et dégradabilité:** Pas de données disponible

**Potentiel de bioaccumulation:** Pas de données disponible

**Mobilité dans le sol:** Pas de données disponibles

**Évaluation PBT et vPvB:** Pas de données disponibles

**Autres effets indésirables:** Un danger pour l'environnement ne peut pas être exclu dans l'éventualité d'une manipulation ou d'élimination.

## Section 13 Considérations De Disposition

Ces lignes directrices sont destinées à l'élimination de la disposition d'un catalogue de taille seules les quantités. Les règlements fédéraux peuvent s'appliquer aux contenants vides. Des réglementations nationales et / ou local peut être différent. Éliminer conformément à toutes les réglementations locales, provinciales et fédérales ou d'un contrat avec une agence élimination des produits chimiques sous licence.

## Section 14 L'Information De Transport (US DOT / CANADA TMD)

**Numéro UN / NA:** Non applicable

**Nom d'expédition:** Non réglé

**Classe de danger:** Non applicable

**Groupe d'emballage:** Non applicable

**Quantité à déclarer:** Non

**Polluant marin:** Non

**Exceptions:** Non applicable

**2016 ERG Guide #:** Non applicable

## Section 15 L'Information De Normalisation

Un produit chimique est considéré comme inscrit si le numéro CAS pour la forme anhydre est sur la liste d'inventaire.

Composant	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL
Phosphate de potassium	Listed	Not listed	Not listed	Listed	Not listed

## Section 16 L'autre Information

Les informations contenues dans ce document sont fournis sans garantie d'aucune sorte. Les employeurs devraient considérer cette information seulement comme complément à d'autres informations recueillies par eux et doivent prendre des décisions indépendantes de la pertinence et l'exhaustivité de l'information de toutes les sources afin d'assurer une utilisation correcte de ces matériaux et de la sécurité et la santé des employés. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 Chemical Product and Company Identification

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L2S 3T4 Canada  
Tel: (800) 387-9393

**CHEMTREC 24 Hour Emergency USA**  
**Phone Number (800) 424-9300**  
For laboratory and industrial use only.  
Not for drug, food or household use.

Product	POTASSIUM CHLORIDE, 1 MOLAR SOLUTION
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Synonyms	Potassium Chloride, Water Solution
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## Section 2 Hazards Identification

**Signal word:** WARNING**Pictograms:** No symbol required**Target organs:** None known**GHS Classification:**

Acute toxicity, oral (Category 5)

**GHS Label information: Hazard statement(s):**

H303: May be harmful if swallowed.

**Precautionary statement(s):**

P312: Call a POISON CENTER or doctor if you feel unwell.

**Hazards not otherwise classified:**

Health hazards not otherwise classified (HHNOC) - Not Known

Physical hazards not otherwise classified (PHNOC) - Not Known

## Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Water	7732-18-5	92.55%	231-791-2
Potassium chloride	7447-40-7	7.45%	231-211-8

## Section 4 First Aid Measures

**INGESTION:** Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.**EYE CONTACT:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.**SKIN ABSORPTION:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

## Section 5 Fire Fighting Measures

**Suitable Extinguishing Media:** Use any media suitable for extinguishing supporting fire**Protective Actions for Fire-fighters:** In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool.**Specific Hazards:** During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

## Section 6 Accidental Release Measures

**Personal Precautions:** Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.**Environmental Precautions:** Avoid runoff into storm sewers and ditches which lead to waterways.**Containment and Cleanup:** Absorb with inert dry material, sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.



**Precautions for Safe Handling:** Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale vapors, spray or mist. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

**Conditions for Safe Storage:** Store in a cool, well-ventilated area away from incompatible substances.

## Section 8 Exposure Controls / Personal Protection

Exposure Limits:	Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Potassium chloride	None established.	None established.	None established.

**Engineering controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

**Respiratory protection:** None should be needed in normal laboratory handling at room temperatures. If misty conditions prevail, work in fume hood or wear a NIOSH/MSHA-approved respirator.

## Section 9 Physical &amp; Chemical Properties

<b>Appearance:</b> Clear, colorless liquid.	<b>Evaporation rate ( Water = 1):</b> <1	<b>Partition coefficient:</b> Data not available
<b>Odor:</b> No odor.	<b>Flammability (solid/gas):</b> Data not available.	<b>Auto-ignition temperature:</b> Data not available
<b>Odor threshold:</b> Data not available.	<b>Explosion limits: Lower / Upper:</b> Data not available	<b>Decomposition temperature:</b> Data not available.
<b>pH:</b> Data not available	<b>Vapor pressure (mm Hg):</b> 14 (water)	<b>Viscosity:</b> Data not available.
<b>Melting / Freezing point:</b> Approximately 0°C (32°F) (water)	<b>Vapor density (Air = 1):</b> 0.7 (water)	<b>Molecular formula:</b> Mixture
<b>Boiling point:</b> Approximately 100°C (212°F) (water)	<b>Relative density (Specific gravity):</b> Approximately 1.0 (water)	<b>Molecular weight:</b> Mixture
<b>Flash point:</b> Data not available	<b>Solubility(ies):</b> Complete in water.	

## Section 10 Stability &amp; Reactivity

**Chemical stability:** Stable **Hazardous polymerization:** Will not occur.

**Conditions to avoid:** Excessive temperatures which cause evaporation.

**Incompatibilities with other materials:** Strong acids.

**Hazardous decomposition products:** Hydrochloric acid.

## Section 11 Toxicological Information

**Acute toxicity:** Potassium chloride: Oral-rat LD50: 2,600 mg/kg

**Skin corrosion/irritation:** Data not available

**Serious eye damage/irritation:** Data not available

**Respiratory or skin sensitization:** Data not available

**Germ cell mutagenicity:** Data not available

**Carcinogenicity:** Data not available

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity:** Data not available

**STOT-single exposure:** Data not available

**STOT-repeated exposure:** Data not available

**Aspiration hazard:** Data not available

**Potential health effects:**

Inhalation: May be harmful if inhaled.

Ingestion: May be harmful if swallowed.

Skin: May cause mild irritation.

Eyes: May cause mild irritation.

**Signs and symptoms of exposure:** To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Specific data is not available. Exercise appropriate procedures to minimize potential hazards.

**Additional information:** RTECS #: TS8050000 [Potassium chloride]

## Section 12 Ecological Information

**Toxicity to fish:** Gambusia affinis (fish, fresh water), LC50 = 10,000 mg/L/24 hours

**Toxicity to daphnia and other aquatic invertebrates:** Daphnia magna (Crustacea), EC100 = 1,010 mg/L/24 hours

**Toxicity to algae:** Scenedesmus subspicatus (Algae), EC50 = 2,500 mg/L/72 hours

**Persistence and degradability:** No data available

**Bioaccumulative potential:** No data available

**Mobility in soil:** No data available

**PBT and vPvB assessment:** No data available

**Other adverse effects:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

## Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

## Section 14 Transport Information (US DOT / CANADA TDG)

**UN/NA number:** Not applicable

**Shipping name:** Not Regulated

**Hazard class:** Not applicable

**Packing group:** Not applicable

**Reportable Quantity:** No

**Marine pollutant:** No

**Exceptions:** Not applicable

**2016 ERG Guide #** Not applicable

## Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERCLA (RQ)	RCRA code	DSL	NDSL	CA Prop 65
Potassium chloride	Listed	Not listed	Not listed	Listed	Not listed	This product does not contain any chemicals known to the State of California to cause cancer or reproductive toxicity.

## Section 16 Other Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 L'identification de produit chimique et de compagnie

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Pour l'usage industriel et de laboratoire seulement.  
Pas pour l'usage de drogue, de nourriture ou de ménage.

Produit	CHLORURE DE POTASSIUM, SOLUTION DE 1 MOLAIRE
---------	--

Synonymes	Chlorure de potassium, solution de l'eau
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## Section 2 Identification De Risques

**Mention d'avertissement:** AVERTISSEMENT

**Pictogrammes:** Aucun symbole n'est demandé

**Les organes cibles:** Aucun connu

**Classification par le GHS:**

Acute toxicity, oral (Catégorie 5)

**Renseignements sur l'étiquette GHS: Mention de danger(s):**

H303: Peut être nocif en cas d'ingestion.

**Déclarations de précaution(s):**

P312: Appeler un CENTRE ANTIPOISON ou un médecin en cas de malaise.

**Dangers non classés autrement:**

Dangers pour la santé non classés ailleurs (HHNOC) - pas connu

Dangers physiques non classés autrement (PHNOC) - pas connu

## Section 3 Composition / Information Sur Des Ingrédients

Nommé Chimique	# CAS	%	EINECS
L'eau	7732-18-5	92,55%	231-791-2
Chlorure de potassium	7447-40-7	7,45%	231-211-8

## Section 4 Mesures De Premiers Soins

**INGESTION:** Appeler un médecin ou un centre antipoison immédiatement. Provoquer le vomissement seulement si elle est informée par le personnel compétent médicaux. Ne jamais rien donner par la bouche à une personne inconsciente.

**INHALATION:** Sortir au grand air. Si elle ne respire pas, pratiquer la respiration artificielle. Si la respiration est difficile, donner de l'oxygène. Obtenir des soins médicaux.

**CONTACT AVEC LES YEUX:** Vérifier et enlever les lentilles de contact. Rincer abondamment à l'eau pendant au moins 15 minutes, en soulevant les paupières inférieures et supérieures de temps en temps. Obtenez une attention médicale immédiate.

**ABSORPTION PAR LA PEAU:** Enlever les vêtements contaminés. Rincer soigneusement avec du savon doux et d'eau. En cas d'irritation, consulter un médecin.

## Section 5 Mesures De Lutte Contre l'Incendie

**Moyens d'extinction:** Utilisez des supports adaptés pour éteindre le feu à l'appui.

**Actions de protection pour les sapeurs-pompiers:** En cas d'incendie, porter un appareil respiratoire NIOSH / MSHA approuvé autonome et un équipement complet de protection. Utiliser un jet d'eau pour maintenir incendie refroidir les conteneurs exposés.

**Dangers spécifiques:** En cas d'incendie, des gaz irritants et très toxiques peuvent être générés par la décomposition thermique ou la combustion.

## Section 6 Mesures De Déchargement Accidentel

**Précautions personnelles:** Évacuer le personnel vers la zone sûre. Utiliser un équipement de protection personnelle comme indiqué dans la Section 8. Assurer une ventilation adéquate.

**Précautions environnementales:** Éviter tout ruissellement vers les égouts pluviaux et les fossés qui aboutissent aux voies navigables.

**Confinement et de nettoyage:** Absorbent avec le matériel sec inerte, balayez ou nettoyez à l'aspirateur vers le haut et placez dans un récipient approprié pour la disposition appropriée. Laver la zone de déversement avec du savon et de l'eau.



**Précautions pour la manutention en toute sécurité:** Lire l'étiquette sur le contenant avant d'utiliser. Ne pas porter de lentilles cornéennes lorsque vous travaillez avec des produits chimiques. Tenir hors de portée des enfants. Éviter tout contact avec les yeux, la peau et les vêtements. Ne pas inhaler les vapeurs, les embruns ou le brouillard. Utiliser avec une ventilation adéquate. Éviter l'ingestion. Bien se laver après la manipulation. Retirer et laver les vêtements avant de les réutiliser.

**Conditions de stockage:** Stocker dans un endroit frais et bien aéré, loin des substances incompatibles.

## Section 8 Commandes D'Exposition / Protection Personnelle

Limites d'exposition:	Nommé Chimique	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Chlorure de potassium	Aucun établi.	Aucun établi.	Aucun établi.

**Contrôles d'ingénierie:** Les installations d'entreposage ou d'utilisation de ce matériel doit être équipé d'une douche oculaire et une douche de sécurité et le matériel d'extinction d'incendie. Le personnel doit porter des lunettes de sécurité, des lunettes, ou un écran facial, une blouse de laboratoire ou tablier, des gants protecteurs appropriés. Utiliser une ventilation adéquate pour maintenir les concentrations atmosphériques faible.

**Protection respiratoire:** Aucun ne devrait être nécessaire dans le laboratoire normal manipulant aux températures ambiantes. Si les conditions brumeuses prévaloir, travailler dans la hotte ou de porter un masque respiratoire approuvé NIOSH / MSHA.

## Section 9 Propriétés Physiques Et Chimiques

<b>Apparence:</b> Clair, liquide incolore.	<b>Taux d'évaporation (Eau = 1):</b> <1	<b>Coefficient de partage:</b> Données non disponibles
<b>Odeur:</b> Aucun odeur.	<b>Inflammabilité (solide / gaz):</b> Données non disponibles.	<b>Auto-inflammation:</b> Données non disponibles
<b>Seuil de l'odeur:</b> Données non disponibles.	<b>Limites d'explosivité: Bas / Max:</b> Données non disponibles	<b>Température de décomposition:</b> Données non disponibles.
<b>pH:</b> Données non disponibles	<b>Pression de vapeur (mm Hg):</b> 14 (eau)	<b>Viscosité:</b> Données non disponibles.
<b>Point de fusion / congélation:</b> Environ 0°C (32°F) (eau)	<b>Densité de vapeur (Air = 1):</b> 0.7 (eau)	<b>Formule moléculaire:</b> Mélange
<b>Point d'ébullition:</b> Environ 100°C (212°F) (eau)	<b>Densité relative (gravité spécifique):</b> Environ 1.0 (eau)	<b>Poids moléculaire:</b> Mélange
<b>Point d'éclair:</b> Données non disponibles	<b>Solubilité (s):</b> Complet dans l'eau.	

## Section 10 Stabilité Et Réactivité

**Stabilité chimique:** Stable

**Polymérisation dangereuse:** N'aura pas lieu.

**Conditions à éviter:** Les températures excessives qui causent l'évaporation.

**Incompatibilités avec d'autres matériaux:** Acides fortes.

**Produits de décomposition dangereux:** Acides hydrochlorique.

## Section 11 L'Information Toxicologique

**Toxicité aiguë:** Chlorure de potassium: Oral-rat LD50: 2,600 mg/kg

**La corrosion de la peau et l'irritation:** Données non disponibles

**Des lésions oculaires graves / irritation:** Données non disponibles

**Respiratoire ou sensibilisation de la peau:** Données non disponibles

**Mutagenicité des cellules germinales:** Données non disponibles

**Cancérogène:** Données non disponibles

**NTP:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène reconnu ou présumé par NTP.

**IARC:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène probable, possible ou confirmé par IARC.

**OSHA:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérogène ni comme cancérogène possible par OSHA.

**Reproductive toxicity:** Données non disponibles

**STOT-exposition unique:** Données non disponibles.

**STOT-une exposition répétée:** Données non disponibles

**Risque d'aspiration:** Données non disponibles

**Effets d'une surexposition:**

Inhalation: Peut être nocif en cas d'inhalation.

Ingestion: Peut être nocif en cas d'ingestion.

Peau: Peut causer une légère irritation.

Yeux: Peut causer une légère irritation.

**Les signes et les symptômes de l'exposition:** Pour le meilleur de notre connaissance les propriétés chimiques, physiques et toxicologiques n'ont pas été étudiées à fond.

Les données spécifiques n'est pas disponible. Exercice des procédures appropriées afin de minimiser les dangers potentiels.

**Informations complémentaires: RTECS #:** TS8050000 [Chlorure de potassium]

## Section 12 L'Information Écologique

**Toxicité pour les poissons:** Gambusia affinis (fish, fresh water), LC50 = 10,000 mg/L/24 hours

**Toxicité pour les daphnies et autres invertébrés aquatiques:** Daphnia magna (Crustacea), EC100 = 1,010 mg/L/24 hours

**Toxicité pour les algues:** Scenedesmus subspicatus (Algae), EC50 = 2,500 mg/L/72 hours

**Persistence et dégradabilité:** Pas de données disponible

**Potentiel de bioaccumulation:** Pas de données disponible

**Mobilité dans le sol:** Pas de données disponibles

**Évaluation PBT et vPvB:** Pas de données disponibles

**Autres effets indésirables:** Un danger pour l'environnement ne peut pas être exclu dans l'éventualité d'une manipulation ou d'élimination.

## Section 13 Considérations De Disposition

Ces lignes directrices sont destinées à l'élimination de la disposition d'un catalogue de taille seules les quantités. Les règlements fédéraux peuvent s'appliquer aux contenants vides. Des réglementations nationales et / ou local peut être différent. Éliminer conformément à toutes les réglementations locales, provinciales et fédérales ou d'un contrat avec une agence élimination des produits chimiques sous licence.

## Section 14 L'Information De Transport (US DOT / CANADA TMD)

**Numéro UN / NA:** Non applicable

**Nom d'expédition:** Non réglé

**Classe de danger:** Non applicable

**Groupe d'emballage:** Non applicable

**Quantité à déclarer:** Non

**Polluant marin:** Non

**Exceptions:** Non applicable

**2016 ERG Guide #:** Non applicable

## Section 15 L'Information De Normalisation

Un produit chimique est considéré comme inscrit si le numéro CAS pour la forme anhydre est sur la liste d'inventaire.

Composant	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL
Chlorure de potassium	Listed	Not listed	Not listed	Listed	Not listed

## Section 16 L'autre Information

Les informations contenues dans ce document sont fournis sans garantie d'aucune sorte. Les employeurs devraient considérer cette information seulement comme complément à d'autres informations recueillies par eux et doivent prendre des décisions indépendantes de la pertinence et l'exhaustivité de l'information de toutes les sources afin d'assurer une utilisation correcte de ces matériaux et de la sécurité et la santé des employés. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

# Safety Data Sheet

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Revision date: 29.11.2022

Version: 6.1

Print date: 29.11.2022

## SECTION 1: Identification

### Product identifier

Trade name/designation:	Buffer, Reference Standard pH 7.00 ± 0.01 at 25 °C (Color Coded Yellow)
Product No.:	BDH5046
Synonyms:	none
CAS No.:	not applicable

### Relevant identified uses of the substance or mixture and uses advised against

Recommended use	For Further Manufacturing Use Only
Uses advised against	Not for Human or Animal Drug Use

### Details of the supplier of the safety data sheet

#### Supplier

##### VWR International LLC

Street	100 Matsonford Road Radnor Corporate Center, Building One, Suite 200 P. O. Box 6660
Postal code/City	Radnor, PA 19087
Telephone	+1-800-932-5000 toll-free within US/Canada +1-610-386-1700
Telefax	+1-610-728-2103

**Emergency phone number**

Telephone +1-800-424-9300 (Chemtrec, 24 hrs/day, 7 days/week, USA)

**Preparation Information**

VWR International - Product Information Compliance

E-mail SDS@avantorsciences.com

**SECTION 2: Hazard identification****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910.1200 (OSHA HCS)**

This mixture is classified as not hazardous according to regulation 29 CFR 1910.1200 (OSHA HCS).

**2.2 Label elements****Labelling in accordance with 29 CFR 1910.1200 (OSHA HCS)**

According to regulation 29 CFR 1910.1200 (OSHA HCS) the product does not have to be labelled.

**Hazard(s) not otherwise classified (HNOC)**

none

**SECTION 3: Composition / information on ingredients****3.1 Substances**

not applicable

**3.2 Mixtures**

This mixture does not contain any substances presenting a health or environmental hazard within the meaning of regulation 29 CFR 1910.1200 (OSHA HCS)

**SECTION 4: First aid measures****4.1 Description of first aid measures****General information**

When in doubt or if symptoms are observed, get medical advice. Change contaminated, saturated clothing. Wash contaminated clothing before reuse. Do not leave affected person unattended.

**In case of inhalation**

Remove casualty to fresh air and keep warm and at rest. Obtain medical attention if symptoms appear.

**In case of skin contact**

Gently wash with plenty of soap and water. In case of skin reactions, consult a physician.

**After eye contact:**

Rinse immediately carefully and thoroughly with eye-bath or water. Obtain medical attention if symptoms appear.

**In case of ingestion**

Rinse mouth thoroughly with water. Call a doctor if you feel unwell.

**Self-protection of the first aider**

First aider: Pay attention to self-protection!

**4.2 Most important symptoms/effects, acute and delayed**

No known symptoms to date.

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

No special information on medical attention and special treatment available.

**SECTION 5: Fire fighting measures****5.1 Extinguishing media****Suitable extinguishing media**

Co-ordinate fire-fighting measures to the fire surroundings.

Water spray.

Dry extinguishing powder.

Alcohol resistant foam.

Carbon dioxide (CO<sub>2</sub>).

**Extinguishing media which must not be used for safety reasons**

Full water jet.

**5.2 Specific hazards arising from the chemical**

In case of fire and/or explosion do not breathe fumes.

Do not allow run-off from fire-fighting to enter drains or water courses.

In case of fire: Evacuate area.

In case of fire may be liberated:

Pyrolysis products, toxic

**5.3 Advice for firefighters**

The product itself does not burn.

Do not breathe gas/fume/vapor/spray.

Fight fire with normal precautions from a reasonable distance.

Protective equipment and precautions for firefighters:

Wear a self-contained breathing apparatus and chemical protective clothing.

**Additional information**

no data available

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

For non-emergency personnel: Remove victim out of the danger area. First Aid, decontamination, treatment of symptoms.

## 6.2 Environmental precautions

No special environmental measures are necessary.

## 6.3 Methods and material for containment and cleaning up

Take up mechanically, placing in appropriate containers for disposal. Dispose according to legislation.

## 6.4 Additional information

Personal protection equipment (PPE): see section 8 Disposal information: see section 13

# SECTION 7: Handling and storage

## 7.1 Precautions for safe handling

Advices on safe handling

No special measures are necessary.

Measures to prevent fire, aerosol and dust generation

No special measures are necessary.

Measures required to protect the environment

No special measures are necessary.

Wash hands before breaks and after work. Avoid contact with eyes and skin. When using do not eat, drink or smoke. Provide eye shower and label its location conspicuously.

## 7.2 Conditions for safe storage, including any incompatibilities

Recommended storage temperature: 4-30 °C

Keep container tightly closed and in a well-ventilated place.

## 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

# SECTION 8: Exposure controls/personal protection

## 8.1 Control parameters

Does not contain substances above concentration limits fixing an occupational exposure limit.

## 8.2 Engineering controls

### Appropriate engineering controls

Technical measures and the application of suitable work processes have priority over personal protection equipment. If handled uncovered, arrangements with local exhaust ventilation have to be used.

### Personal protection equipment (PPE)

Wear suitable protective clothing. When handling with chemical substances, protective clothing must be worn.

#### *Eye/face protection*

Eye glasses with side protection

#### *Skin protection*

Wear suitable gloves. When handling with chemical substances, protective gloves must be worn. In the case of wanting to use the gloves again, clean them before taking off and air them well. Check leak tightness/impermeability prior to use.

By short-term hand contact

Suitable material:	NBR (Nitrile rubber)
Thickness of the glove material:	0,12 mm
Breakthrough time:	> 480 min

By long-term hand contact

Suitable material:	NBR (Nitrile rubber)
Thickness of the glove material:	0,12 mm
Breakthrough time:	> 480 min

*Respiratory protection*

Usually no personal respirative protection necessary.

*Additional information*

Wash hands before breaks and after work. Avoid contact with eyes and skin. When using do not eat, drink or smoke. Provide eye shower and label its location conspicuously.

*Environmental exposure controls*

no data available

## SECTION 9: Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

(a) Appearance	
Physical state:	liquid
Color:	yellow
(b) Odor:	no data available
(c) Odor threshold:	no data available

#### Safety relevant basic data

(d) pH:	7.00 (25 °C) ± 0.01
(e) Melting point/freezing point:	no data available
(f) Initial boiling point and boiling range:	no data available
(g) Flash point:	no data available
(h) Evaporation rate:	no data available
(i) Flammability (solid, gas):	not applicable
(j) Flammability or explosive limits	
Lower explosion limit:	no data available
Upper explosion limit:	no data available
(k) Vapor pressure:	no data available
(l) Vapor density:	no data available
(m) Density:	no data available
(n) Solubility(ies)	
Water solubility:	no data available
(o) Partition coefficient: n-octanol/water:	no data available
(p) Auto-ignition temperature:	no data available
(q) Decomposition temperature:	not applicable
(r) Viscosity	
Kinematic viscosity:	no data available
Dynamic viscosity:	no data available
(s) Explosive properties:	not applicable
(t) Oxidising properties:	not applicable
(u) Particle characteristics:	does not apply to liquids

### 9.2 Other information

Bulk density:	no data available
Refraction index:	no data available
Dissociation constant:	no data available
Surface tension:	no data available
Henry's Law Constant:	no data available

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

This material is non-reactive under normal conditions.

## 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature).

## 10.3 Possibility of hazardous reactions

No further relevant information available.

## 10.4 Conditions to avoid

No further relevant information available.

## 10.5 Incompatible materials

No further relevant information available.

## 10.6 Hazardous decomposition products

Decomposition products in case of fire: see section 5.

## 10.7 Additional information

no data available

# SECTION 11: Toxicological information

## 11.1 Information on toxicological effects

### Acute effects

*Acute oral toxicity:*

no data available

*Acute dermal toxicity:*

no data available

*Acute inhalation toxicity:*

no data available

### Irritant and corrosive effects

*Primary irritation to the skin:*

not applicable

*Irritation to eyes:*

not applicable

*Irritation to respiratory tract:*

not applicable



**Respiratory or skin sensitization**

In case of skin contact: not sensitizing

In case of inhalation: not sensitizing

**STOT-single exposure**

not applicable

**STOT-repeated exposure**

not applicable

**CMR effects (carcinogenicity, mutagenicity and toxicity for reproduction)****Carcinogenicity**

No indication of human carcinogenicity.

**Germ cell mutagenicity**

No indications of human germ cell mutagenicity exist.

**Reproductive toxicity**

No indications of human reproductive toxicity exist.

**Aspiration hazard**

not applicable

**Other adverse effects**

no data available

**Additional information**

no data available

## SECTION 12: Ecological information

### 12.1 Ecotoxicity

**Fish toxicity:**

no data available

**Daphnia toxicity:**

no data available

**Algae toxicity:**

no data available

**Bacteria toxicity:**

no data available

### 12.2 Persistence and degradability

no data available

### 12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water: no data available

**12.4 Mobility in soil:**

no data available

**12.5 Results of PBT/vPvB assessment**

not applicable

**12.6 Endocrine disrupting properties**

This product does not contain a substance that has endocrine disrupting properties with respect to the environment.

**12.7 Other adverse effects**

no data available

**SECTION 13: Disposal considerations****13.1 Waste treatment methods****Appropriate disposal / Product**

Dispose according to legislation. Consult the appropriate local waste disposal expert about waste disposal. Before discharge into sewage plants the product normally needs to be neutralised.

Waste code product: no data available

**Appropriate disposal / Package**

Dispose according to legislation. Handle contaminated packages in the same way as the substance itself.

**Additional information**

no data available

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

No dangerous good in sense of this transport regulation.

**Sea transport (IMDG)**

No dangerous good in sense of this transport regulation.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code  
not relevant

**Air transport (ICAO-TI / IATA-DGR)**

No dangerous good in sense of this transport regulation.

## SECTION 15: Regulatory information

**Safety, health and environmental regulations/legislation specific for the substance or mixture**

### **National regulations**

#### **Toxic Substances Control Act (TSCA)**

- Sodium phosphate dibasic anhydrous - CAS No.: 7558-79-4
- Potassium phosphate monobasic - CAS No.: 7778-77-0
- Water - CAS No.: 7732-18-5

#### **OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)**

Does not contain listed substances.

#### **SARA 313 Components**

Does not contain listed substances.

### **US State Regulations**

#### **Massachusetts Right To Know Components**

- Sodium phosphate dibasic anhydrous - CAS No.: 7558-79-4

#### **Pennsylvania Right To Know Components**

- Sodium phosphate dibasic anhydrous - CAS No.: 7558-79-4

#### **New Jersey Right To Know Components**

- Sodium phosphate dibasic anhydrous - CAS No.: 7558-79-4

#### **California Prop. 65 Components**

Does not contain listed substances.

## SECTION 16: Other information

### Abbreviations and acronyms

ACGIH - American Conference of Governmental Industrial Hygienists  
 DOT - Department of Transportation  
 IARC - International Agency for Research on Cancer  
 IATA-DGR - International Air Transport Association-Dangerous Goods Regulations  
 ICAO-TI - International Civil Aviation Organization-Technical Instructions  
 IMDG - International Maritime Code for Dangerous Goods  
 LTV - Long Term Value  
 NIOSH - National Institute for Occupational Safety and Health  
 NTP - National Toxicology Program  
 OSHA - Occupational Safety & Health Administration  
 PBT - Persistent, Bioaccumulative and Toxic  
 PEL - Permissible Exposure Limit  
 STV - Short Term Value  
 SVHC - Substances of Very High Concern  
 TDG - Transport of Dangerous Goods  
 TLV - Threshold Limit Value  
 vPvB - very Persistent, very Bioaccumulative

### Key literature references and sources for data

This Safety Data Sheet has been prepared based on information available for public as TOXNET information, European Chemicals Agency (ECHA) substance dossier, papers from international cancer research institutes (IARC Monographs), U.S. National Toxicology Program data, U.S. Agency for Toxic Substances and Disease Control (ATSDR), PubChem websites and SDS from our raw material manufacturers.

Revision date	Version	Print date
29.11.2022	6.1	29.11.2022

### Additional information

Indication of changes      general update

If you need an explanation of the change, contact the supplier (SDS@avantorsciences.com).

*The above information is believed to be correct but does not purport to be all-inclusive and shall be used only as a guidance. The information in this document is based on the present state knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. VWR International and his Affiliates shall not be held liable for any damage resulting from handling.*

# Safety Data Sheet

## SECTION 1: Identification

### 1.1. Product Identifier

**Trade Name or Designation:** Buffer, Reference Standard , pH 10.00 ± 0.02 at 25°C , (Color Coded Blue)

**Product Number:** BDH5070

**Other Identifying Product Numbers:** BDH5070-20ML, BDH5070-20ML

### 1.2. Recommended Use and Restrictions on Use

General Laboratory Reagent

### 1.3. Details of the Supplier of the Safety Data Sheet

**Company:** VWR

**Address:** 100 Matsonford Road  
Suite 200  
Radnor, PA 19087 USA

**Telephone:**

### 1.4. Emergency Telephone Number (24 hr)

CHEMTREC (USA) 800-424-9300  
CHEMTREC (International) 1+ 703-527-3887

## SECTION 2: Hazard(s) Identification

### 2.1. Classification of the Substance or Mixture (in accordance with OSHA HCS 29 CFR 1910.1200)

*For the full text of the Hazard and Precautionary Statements listed below, see Section 16.*

This product is not categorized as hazardous in any GHS hazard class.

### 2.2. GHS Label Elements

**Pictograms:** None required.

**Signal Word:** None required.

**Hazard Statements:** None required.

**Precautionary Statements:** None required.

# Safety Data Sheet

## 2.3. WHMIS Classification

## 2.4. Hazards not Otherwise Classified or Covered by GHS

Data not available.

## SECTION 3: Composition / Information on Ingredients

### 3.1. Components of Substance or Mixture

Chemical Name	Formula	Molecular Weight	CAS Number	Weight%
Water	H <sub>2</sub> O	18.01 g/mol	7732-18-5	99.04%
Sodium Carbonate	Na <sub>2</sub> CO <sub>3</sub>	105.98 g/mol	497-19-8	0.53%
Sodium Bicarbonate	NaHCO <sub>3</sub>	84.00 g/mol	144-55-8	0.40%
Sodium Hydroxide	NaOH	39.99 g/mol	1310-73-2	0.02%
Preservative		Data not available.	PP26628-22-8	0.01%
Blue Dye		Data not available.	PP3844-45-9	0.00%

## SECTION 4: First-Aid Measures

### 4.1. General First Aid Information

**Eye Contact:** May cause slight irritation.

**Inhalation:** Not expected to require first aid. If necessary, remove to fresh air.

**Skin Contact:** May cause slight irritation.

**Ingestion:** Dilute with water or milk. Call a physician if necessary.

### 4.2. Most Important Symptoms and Effects, Acute and Delayed

Does not present any significant health hazards. After contact with skin, wash immediately with plenty of water. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. EYE CONTACT: May cause slight irritation. SKIN CONTACT: May cause slight irritation.

### 4.3. Medical Attention or Special Treatment Needed

Not expected to require special treatment.

## SECTION 5: Fire-Fighting Measures

### 5.1. Extinguishing Media

Use any means suitable for extinguishing surrounding fire.

### 5.2. Specific Hazards Arising from the Substance or Mixture

Not considered to be a fire or explosion hazard.

# Safety Data Sheet

## 5.3. Special Protective Equipment for Firefighters

Use protective clothing and breathing equipment appropriate for the surrounding fire.

## SECTION 6: Accidental Release Measures

### 6.1. Personal Precautions, Protective Equipment and Emergency Procedures

Wear appropriate PPE for the size and nature of the spill. As a general rule, wear safety glasses and gloves.

### 6.2. Cleanup and Containment Methods and Materials

Absorb with suitable material and treat as normal refuse. Small amounts of the liquid may be flushed to the drain with excess water. Always dispose of in accordance with local regulations.

## SECTION 7: Handling and Storage

### 7.1. Precautions for Safe Handling and Storage Conditions

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage.

## SECTION 8: Exposure Controls / Personal Protection

### 8.2. Exposure Controls

**Engineering Controls:** No specific controls are needed. Normal room ventilation is adequate.

**Respiratory Protection:** Normal room ventilation is adequate.

**Skin Protection:** Chemical resistant gloves.

**Eye Protection:** Safety glasses or goggles.

### 8.3. Personal Protective Equipment

Normal room ventilation is adequate. Chemical resistant gloves. Safety glasses or goggles.

# Safety Data Sheet

## SECTION 9: Physical and Chemical Properties

### 9.1. Basic Physical and Chemical Properties

**Appearance:** Clear, blue, odorless

**Physical State:** Liquid

**Odor:** Data not available.

**Odor Threshold:** Data not available.

**pH:** 10

**Melting/Freezing Point:** 0.0°C

**Initial Boiling Point /Range:** 100°C - 100°C

**Flash Point:** Data not available.

**Evaporation Rate:** Data not available.

**Flammability:** Data not available.

**Flammability/Explosive Limits:** Data not available.

**Vapor Pressure:** Data not available.

**Vapor Density:** Data not available.

**Relative Density:** 1.01

**Solubility:** Miscible

**Partition Coefficient (n-Octanol/Water):** Data not available.

**Auto-Ignition Temperature:** Data not available.

**Decomposition Temperature:** Data not available.

**Viscosity:** Data not available.

**Explosive Properties:** Data not available.

**Oxidizing Properties:** Data not available.

## SECTION 10: Stability and Reactivity

### 10.1. Reactivity and Chemical Stability

Stable under normal conditions of use and storage.

### 10.2. Possibility of Hazardous Reactions

Data not available.

### 10.3. Conditions to Avoid and Incompatible Materials

Acids

### 10.4. Hazardous Decomposition Products

Will not occur.



# Safety Data Sheet

## SECTION 11: Toxicological Information

### 11.1. Information on Toxicological Effects

**Acute Toxicity - Oral Exposure:**

Not applicable.

**Acute Toxicity - Dermal Exposure:**

Not applicable.

**Acute Toxicity - Inhalation Exposure:**

Not applicable.

**Acute Toxicity - Other Information:**

LD50, Oral, Rat: 4090 mg/kg (Sodium Carbonate), 4220 mg/kg (Sodium Bicarbonate), details of toxic effects not reported other than lethal dose value.

**Skin Corrosion and Irritation:**

Not applicable.

**Serious Eye Damage and Irritation:**

Not applicable.

**Respiratory Sensitization:**

Not applicable.

**Skin Sensitization:**

Not applicable.

**Germ Cell Mutagenicity:**

Not applicable.

**Carcinogenicity:**

Not applicable.

**Reproductive Toxicity:**

Not applicable.

**Specific Target Organ Toxicity from Single Exposure:**

Not applicable.

**Specific Target Organ Toxicity from Repeated Exposure:**

Not applicable.

**Aspiration Hazard:**

Not applicable.

**Additional Toxicology Information:**

Data not available.

## SECTION 12: Ecological Information

### 12.1. Ecotoxicity

Not applicable.

# Safety Data Sheet

## 12.2. Persistence and Degradability

Data not available.

## 12.3. Bioaccumulative Potential

Data not available.

## 12.4. Mobility in Soil

Data not available.

## 12.5. Other Adverse Ecological Effects

Data not available.

## SECTION 13: Disposal Considerations

### 13.1. Waste Treatment Methods

Data not available.

## SECTION 14: Transportation Information

### 14.1. Transportation by Land - Department of Transportation (DOT, United States of America)

Not regulated according to DOT Regulations.

## SECTION 15: Regulatory Information

### 15.1. Occupational Safety and Health Administration (OSHA) Hazards

Not listed.

### 15.2. Superfund Amendments and Reauthorization Act (SARA) 302 Extremely Hazardous Substances

Not listed.

### 15.3. Superfund Amendments and Reauthorization Act (SARA) 311/312 Hazardous Chemicals

Sodium Hydroxide (CAS # 1310-73-2): 1000 lb final RQ; 454 kg final RQ

### 15.4. Superfund Amendments and Reauthorization Act (SARA) 313 Toxic Release Inventory (TRI)

Not listed.

### 15.5. Massachusetts Right-to-Know Substance List

Sodium Hydroxide (CAS # 1310-73-2): Present

# Safety Data Sheet

## 15.6. Pennsylvania Right-to-Know Hazardous Substances

Sodium Hydroxide (CAS # 1310-73-2): Environmental hazard

Sodium Hydroxide (CAS # 1310-73-2): Present

Water (CAS # 7732-18-5): Present

## 15.7. New Jersey Worker and Community Right-to-Know Components

Sodium Hydroxide (CAS # 1310-73-2): corrosive

Sodium Hydroxide (CAS # 1310-73-2): sn 1706

## 15.8. California Proposition 65

Not listed.

## 15.9. Canada Domestic Substances List / Non-Domestic Substances List (DSL/NDSL)

Sodium Hydroxide (CAS # 1310-73-2): Present

Sodium Bicarbonate (CAS # 144-55-8): Present

Sodium Carbonate (CAS # 497-19-8): Present

Water (CAS # 7732-18-5): Present

## 15.10. United States of America Toxic Substances Control Act (TSCA) List

Sodium Hydroxide (CAS # 1310-73-2): Present

Sodium Bicarbonate (CAS # 144-55-8): Present

Sodium Carbonate (CAS # 497-19-8): Present

Water (CAS # 7732-18-5): Present

## 15.11. European Inventory of Existing Commercial Chemical Substances (EINECS), European List of Notified Chemical Substances (ELINCS), and No Longer Polymers (NLP)

Not listed.

## SECTION 16: Other Information

### 16.1. Full Text of Hazard Statements and Precautionary Statements

### 16.2. Miscellaneous Hazard Classes

**Canadian Carcinogenicity Hazard Class:** Not Applicable.

**Physical Hazards Not Otherwise Classified (PHNOC):** Not Applicable.

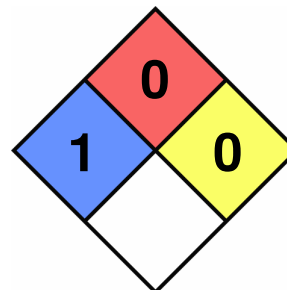
**Health Hazards Not Otherwise Classified (HHNOC):** Not Applicable.

**Biohazardous Infectious Materials Hazard Class:** Not Applicable.

# Safety Data Sheet

## 16.3. National Fire Protection Association (NFPA) Rating

Health: 1  
Flammability: 0  
Reactivity: 0  
Special Hazard:



## 16.4. Document Revision

Last Revision Date: 5/4/2015

### DISCLAIMER

The above information is believed to be correct but does not purport to be all-inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. VWR International and its Affiliates shall not be held liable for any damage resulting from handling.

# SAFETY DATA SHEET

## Section 1: Identification

**Chemical Name/Synonyms:** Sodium Chloride 1%-9%

**Product Name:** Ebb Carbon Brine

**Company:**

Ebb Carbon  
950 Commercial St  
San Carlos, CA 94070  
United States

**In emergency call 911.**

**For Chemical Emergencies Call: 800-468-1760**

## Section 2: Hazard(s) Identification

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

**Hazard Classification:**

Acute toxicity, Oral (Category 6.1)

Eye irritation (Category 6.4A)

**Signal Word(s):**

Warning

**Pictograms:**



**Hazard Statements:**

H303 May be harmful if swallowed

H3316 Causes mild skin irritation

**Precautionary Statements:**

None

**Description of other hazards:** N/A

### Section 3: Composition/ Information on Ingredients

Chemical Name	CAS#	Conc.
Deionized Water	7732-18-5	91-99%
Sodium Chloride	7647-14-5	1-9%

### Section 4: First-Aid Measures

**After skin contact:**

Take off all contaminated clothing. Rinse skin with soap and water / shower. Call a physician if irritation develops.

**After eye contact:**

Rinse out with plenty of water. Call an ophthalmologist. Remove contact lenses

**After inhalation:**

Fresh Air

**After swallowing:**

Make the victim drink water (two glasses at most). Consult doctor.

**Most important symptoms and effects, both acute and delayed:**

See section 2 & 11

**Indication of any immediate medical attention and special treatment needed:**

No data available

### Section 5: Fire-Fighting Measures

**Suitable extinguishing agents:**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. For this mixture no limitations of extinguishing agents are given.

**Special protective equipment for firefighters:**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

**Special Hazards:**

Not considered a fire hazard

**Section 6: Accidental Release Measures****Personal precautions:**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.  
Advice for emergency responders: Protective equipment see section 8. For personal protection see section 8.

**Measures for environmental protection:**

No special precautionary measures necessary.

**Measures for cleaning/collecting:**

Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent and neutralizing material. Dispose of properly (section 13). Clean up affected area.

**Section 7: Handling and Storage****Handling:**

Observe labeling precautions

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

For precautions see section 2.

**Storage:**

Store in a cool, dry place.

Keep in tightly closed container.

**Section 8: Exposure Controls/Personal Protection**

No established airborne exposure limits.

Chemical Name	Value	Control Parameter	Basis

**General protective and hygienic measures:**

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

**Eye protection:**

Safety glasses

**Skin protection:**

Wear gloves and cover exposed skin.

**Body protection:**

Protective clothing

**Respiratory protection:**

Required when vapors/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

### Section 9: Physical and Chemical Properties

**Form:** liquid

**Odor:** odorless

**Odor threshold:** No data available

**pH:** 5.5-9 at 20 C (68F)

**Melting point/melting range:** No data available

**Boiling point/boiling range:** No data available

**Flash point:** No data available

**Evaporation rate:** No data available

**Flammability:** No data available

**Upper/lower flammability or explosive limits:** No data available

**Auto ignition temperature:** No data available

**Danger of explosion:** No data available

**Vapor pressure:** No data available

**Vapor density:** No data available

**Relative density:** No data available

**Solubility in/Miscibility with water:** soluble, 36g/100mL

**Density:** 1.02 g/cm<sup>3</sup> at 20 C (68F)

### Section 10: Stability and Reactivity

**Reactivity:**

Stable under ordinary conditions of use and storage. Hygroscopic

**Chemical stability:**

This chemical is stable under standard ambient conditions (room temperature)



**Conditions to avoid:**

Excessive heat

**Incompatible materials:**

Lithium

Bromine trifluoride

Strong oxidizing agents

**Hazardous decomposition products:**

When heated above 801C (1474F) it emits toxic fumes of chloride and sodium oxide

**Section 11: Toxicological Information****Mixture:****Acute toxicity**

Oral rat LD50 : 3000 mg/kg / Inhalation rat LC50: > 42 gm/m<sup>3</sup> /1H. Skin rabbit LD50: > 10 gm/kg. Investigated as a mutagen, reproductive effector.

**Skin irritation**

May irritate damaged skin

**Serious eye damage/irritation**

Causes irritation, redness, and pain

**Respiratory or skin sensitization**

May cause mild irritation of the respiratory tract

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

**Reproductive toxicity**

No data available

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

## Section 12: Ecological Information (non-mandatory)

### **Mixture**

#### **Ecotoxicity:**

Material expected to be toxic to aquatic life at elevated concentrations

#### **Mobility:**

No data available

#### **Biodegradation:**

Expected to be readily biodegradable

#### **Bioaccumulation:**

Not expected to significantly bioaccumulate

## Section 13: Disposal Considerations (non-mandatory)

### **Waste treatment methods:**

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## Section 14: Transport Information (non-mandatory)

### **DOT (US)**

Not regulated

### **IMDG**

Not regulated

### **IATA**

Not regulated

## Section 15: Regulatory Information (non-mandatory)

### **SARA 302 Components**

This material does not contain any components with a section 302 EHS TPQ.

### **SARA 313 Components**

This material does not contain any components with a section 302 EHS TPQ.

### **SARA 311/312**

This material does not contain any components with a section 302 EHS TPQ.

#### Section 16: Other Information

**SDS date of preparation/update:**

Prepared September 2022

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered.

## Section 1 Chemical Product and Company Identification

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5100 West Henrietta Rd  
PO Box 92912  
Rochester, NY 14692-9012  
Tel: (800) 962-2660

Boreal Science  
399 Vansickle Road  
St. Catharines, Ontario  
L2S 3T4 Canada  
Tel: (800) 387-9393

**CHEMTREC 24 Hour Emergency USA**  
**Phone Number (800) 424-9300**  
For laboratory and industrial use only.  
Not for drug, food or household use.

**Product** SODIUM BICARBONATE, ANHYDROUS**Synonyms** Baking Soda / Sodium Hydrogen Carbonate / Carbonic Acid Sodium (1:1) / Indicator Powder

## Section 2 Hazards Identification

**This substance or mixture has not been classified as hazardous according to the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals.**

**Signal word:** Not classified**Pictograms:** Not classified**Target organs:** None known**GHS Classification:** Not classified**GHS Label information: Hazard statement(s):** Not classified**Precautionary statement(s):**

Do not breathe dust. Do not get in eyes, on skin, or on clothing. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Get medical attention if you feel unwell.

**Hazards not otherwise classified:**

Health hazards not otherwise classified (HHNOC) - Not Known

Physical hazards not otherwise classified (PHNOC) - Not Known

## Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%	EINECS
Sodium bicarbonate	144-55-8	100%	205-633-8

## Section 4 First Aid Measures

**INGESTION:** Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.

**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**EYE CONTACT:** Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention.

**SKIN ABSORPTION:** Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.

## Section 5 Fire Fighting Measures

**Suitable Extinguishing Media:** Use any media suitable for extinguishing supporting fire.

**Protective Actions for Fire-fighters:** In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool.

**Specific Hazards:** During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material is commonly used to extinguish fires.

## Section 6 Accidental Release Measures

**Personal Precautions:** Evacuate personnel to safe area. Use proper personal protective equipment as indicated in Section 8. Provide adequate ventilation.

**Environmental Precautions:** Avoid runoff into storm sewers and ditches which lead to waterways.

**Containment and Cleanup:** Sweep or vacuum up and place in a suitable container for proper disposal. Wash spill area with soap and water.

**Precautions for Safe Handling:** Read label on container before using. Do not wear contact lenses when working with chemicals. Keep out of reach of children. Avoid contact with eyes, skin and clothing. Do not inhale dusts. Use with adequate ventilation. Avoid ingestion. Wash thoroughly after handling. Remove and wash clothing before reuse.

**Conditions for Safe Storage:** Store in a cool, dry, well-ventilated area away from incompatible substances. Store away from acids.

## Section 8 Exposure Controls / Personal Protection

Exposure Limits:	Chemical Name	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Sodium bicarbonate	None established	None established	None established

**Engineering controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower and fire extinguishing material. Personnel should wear safety glasses, goggles, or faceshield, lab coat or apron, appropriate protective gloves. Use adequate ventilation to keep airborne concentrations low.

**Respiratory protection:** None should be needed in normal laboratory handling at room temperatures. If dusty conditions prevail, work in fume hood or wear a NIOSH/MSHA-approved respirator.

## Section 9 Physical &amp; Chemical Properties

<b>Appearance:</b> Solid, white crystalline powder.	<b>Evaporation rate ( = 1):</b> Data not available	<b>Partition coefficient:</b> Data not available
<b>Odor:</b> No odor.	<b>Flammability (solid/gas):</b> Data not available.	<b>Auto-ignition temperature:</b> Data not available
<b>Odor threshold:</b> Data not available.	<b>Explosion limits: Lower / Upper:</b> Data not available	<b>Decomposition temperature:</b> Data not available
<b>pH:</b> 8.2 (1% solution)	<b>Vapor pressure (mm Hg):</b> Negligible	<b>Viscosity:</b> Data not available.
<b>Melting / Freezing point:</b> Data not available	<b>Vapor density (Air = 1):</b> Data not available	<b>Molecular formula:</b> NaHCO <sub>3</sub>
<b>Boiling point:</b> Decomposes	<b>Relative density (Specific gravity):</b> 2.16 @ 20°C	<b>Molecular weight:</b> 84.01
<b>Flash point:</b> Non combustible	<b>Solubility(ies):</b> 8.6 g/100 ml water at 20°C	

## Section 10 Stability &amp; Reactivity

**Chemical stability:** Stable **Hazardous polymerization:** Will not occur.  
**Conditions to avoid:** High temperature causes decomposition to sodium carbonate, water and carbon dioxide.  
**Incompatible materials:** Reacts with acids to yield acid salts, water and carbon dioxide.  
**Hazardous decomposition products:** Gaseous carbon dioxide.

## Section 11 Toxicological Information

**Acute toxicity:** Oral-rat LD50: 4220-4400 mg/kg  
**Skin corrosion/irritation:** Skin-rabbit - not irritating  
**Serious eye damage/irritation:** Eye-rabbit - not irritating  
**Respiratory or skin sensitization:** Non sensitizing  
**Germ cell mutagenicity:** Data not available  
**Carcinogenicity:** Data not available  
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.  
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.  
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.  
**Reproductive toxicity:** Data not available  
**STOT-single exposure:** Data not available  
**STOT-repeated exposure:** Data not available  
**Aspiration hazard:** Data not available  
**Potential health effects:**  
Inhalation: Excessive dust may irritate respiratory tract.  
Ingestion: Ingestion may cause gastrointestinal disturbance if ingested.  
Skin: No hazard known.  
Eyes: Contact with eyes may cause very slight irritation.  
**Signs and symptoms of exposure:** See Potential health effects above.  
**Additional information:** RTECS #: VZ0950000

## Section 12 Ecological Information

**Toxicity to fish:** Gambusia affinis (fish, freshwater) LC50: 7550 mg/l/24 hours  
**Toxicity to daphnia and other aquatic invertebrates:** Daphnia magna (Crustacea) EC50: 2350 mg/l/48 hours  
**Toxicity to algae:** Nitzschia linearis (Algae) LC50: 650 mg/l/5 day  
**Persistence and degradability:** No data available **Bioaccumulative potential:** No data available  
**Mobility in soil:** No data available **PBT and vPvB assessment:** No data available  
**Other adverse effects:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

## Section 13 Disposal Considerations

These disposal guidelines are intended for the disposal of catalog-size quantities only. Federal regulations may apply to empty container. State and/or local regulations may be different. Dispose of in accordance with all local, state and federal regulations or contract with a licensed chemical disposal agency.

## Section 14 Transport Information (US DOT / CANADA TDG)

**UN/NA number:** Not applicable **Shipping name:** Not Regulated  
**Hazard class:** Not applicable **Packing group:** Not applicable **Reportable Quantity:** No **Marine pollutant:** No  
**Exceptions:** Not applicable **2016 ERG Guide #** Not applicable

## Section 15 Regulatory Information

A chemical is considered to be listed if the CAS number for the anhydrous form is on the Inventory list.

Component	TSCA	CERCLA (RQ)	RCRA code	DSL	NDSL	CA Prop 65
Sodium bicarbonate	Listed	Not listed	Not listed	Listed	Not listed	This product does not contain any chemicals known to the State of California to cause cancer or reproductive toxicity.

## Section 16 Other Information

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

## Section 1 L'identification de produit chimique et de compagnie

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5100 West Henrietta Rd  
PO Box 92912  
Rochester, NY 14692-9012  
Tel: (800) 962-2660

Boreal Science  
399 Vansickle Road  
St. Catharines, Ontario  
L2S 3T4 Canada  
Tel: (800) 387-9393

**CHEMTREC 24 Numéros De Téléphone De  
Secours D'Heure (800) 424-9300**

Pour l'usage industriel et de laboratoire seulement.  
Pas pour l'usage de drogue, de nourriture ou de ménage.

Produit	BICARBONATE DE SODIUM, ANHYDRE
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Synonymes	Bicarbonate de soude / Carbonate d'hydrogène de sodium / Soude acide carbonique (1:1) / Indicateur poudre
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## Section 2 Identification De Risques

Cette substance ou un mélange n'a pas été classé comme dangereux à ce selon le Système général harmonisé (SGH) de classification et d'étiquetage des produits chimiques.

**Signal word:** Non classé

**Pictograms:** Non classé

**Target organs:** Aucun connu.

**GHS Classification:** Non classé

**GHS Label information: Hazard statement(s):** Non classé

**Déclarations de précaution(s):**

Ne pas respirer les poussières. Éviter tout contact avec les yeux, la peau ou les vêtements. Porter des gants de protection / des vêtements de protection / un équipement de protection des yeux / du visage. Se laver les mains soigneusement après manipulation. Consulter un médecin en cas de malaise.

**Dangers non classés autrement:**

Dangers pour la santé non classés ailleurs (HHNOC) - pas connu

Dangers physiques non classés autrement (PHNOC) - pas connu

## Section 3 Composition / Information Sur Des Ingrédients

Nommé Chimique	# CAS	%	EINECS
Bicarbonate de sodium	144-55-8	100%	205-633-8

## Section 4 Mesures De Premiers Soins

**INGESTION:** Appeler un médecin ou un centre antipoison immédiatement. Provoquer le vomissement seulement si elle est informée par le personnel compétent médicaux. Ne jamais rien donner par la bouche à une personne inconsciente.

**INHALATION:** Sortir au grand air. Si elle ne respire pas, pratiquer la respiration artificielle. Si la respiration est difficile, donner de l'oxygène. Obtenir des soins médicaux.

**CONTACT AVEC LES YEUX:** Vérifier et enlever les lentilles de contact. Rincer abondamment à l'eau pendant au moins 15 minutes, en soulevant les paupières inférieures et supérieures de temps en temps. Obtenez une attention médicale immédiate.

**ABSORPTION PAR LA PEAU:** Enlever les vêtements contaminés. Rincer soigneusement avec du savon doux et d'eau. En cas d'irritation, consulter un médecin.

## Section 5 Mesures De Lutte Contre l'Incendie

**Moyens d'extinction:** Utilisez des supports adaptés pour éteindre le feu à l'appui.

**Actions de protection pour les sapeurs-pompiers:** En cas d'incendie, porter un appareil respiratoire NIOSH / MSHA approuvé autonome et un équipement complet de protection. Utiliser un jet d'eau pour maintenir incendie refroidir les conteneurs exposés.

**Dangers spécifiques:** En cas d'incendie, des gaz irritants et très toxiques peuvent être générés par la décomposition thermique ou la combustion. Ce matériau est couramment utilisé pour éteindre les incendies.

## Section 6 Mesures De Déchargement Accidentel

**Précautions personnelles:** Évacuer le personnel vers la zone sûre. Utiliser un équipement de protection personnelle comme indiqué dans la Section 8. Assurer une ventilation adéquate.

**Précautions environnementales:** Éviter tout ruissellement vers les égouts pluviaux et les fossés qui aboutissent aux voies navigables.

**Confinement et de nettoyage:** Balayez ou nettoyez à l'aspirateur vers le haut et placez dans un récipient approprié pour la disposition appropriée. Laver la zone de déversement avec du savon et de l'eau.

**Précautions pour la manutention en toute sécurité:** Lire l'étiquette sur le contenant avant d'utiliser. Ne pas porter de lentilles cornéennes lorsque vous travaillez avec des produits chimiques. Tenir hors de portée des enfants. Éviter tout contact avec les yeux, la peau et les vêtements. Ne pas inhaler les poussières. Utiliser avec une ventilation adéquate. Éviter l'ingestion. Bien se laver après la manipulation. Retirer et laver les vêtements avant de les réutiliser.

**Conditions de stockage:** Stocker dans un endroit frais, sec et bien aéré, loin des substances incompatibles. Stocker à l'écart des acides.

## Section 8 Commandes D'Exposition / Protection Personnelle

Limites d'exposition:	Nommé Chimique	ACGIH (TLV)	OSHA (PEL)	NIOSH (REL)
	Bicarbonate de sodium	Aucun établi	Aucun établi	Aucun établi

**Contrôles d'ingénierie:** Les installations d'entreposage ou d'utilisation de ce matériel doit être équipé d'une douche oculaire et une douche de sécurité et le matériel d'extinction d'incendie. Le personnel doit porter des lunettes de sécurité, des lunettes, ou un écran facial, une blouse de laboratoire ou tablier, des gants protecteurs appropriés. Utiliser une ventilation adéquate pour maintenir les concentrations atmosphériques faible.

**Protection respiratoire:** Aucun ne devrait être nécessaire dans le laboratoire normal manipulant aux températures ambiantes. Si les conditions poussiéreuses prévaloir, travailler dans la hotte ou de porter un masque respiratoire approuvé NIOSH / MSHA.

## Section 9 Propriétés Physiques Et Chimiques

<b>Apparence:</b> Solide, poudre cristalline blanche. <b>Odeur:</b> Aucune odeur. <b>Seuil de l'odeur:</b> Données non disponibles. <b>pH:</b> 8.2 (Solution de 1%) <b>Point de fusion / congélation:</b> Données non disponibles <b>Point d'ébullition:</b> Se décompose <b>Point d'éclair:</b> Non combustible	<b>Taux d'évaporation ( = 1):</b> Données non disponibles <b>Inflammabilité (solide / gaz):</b> Données non disponibles. <b>Limites d'explosivité: Bas / Max:</b> Données non disponibles <b>Pression de vapeur (mm Hg):</b> Négligeable <b>Point de vapeur (Air = 1):</b> Données non disponibles <b>Densité relative (gravité spécifique):</b> 2.16 @ 20°C <b>Solubilité(s):</b> 8.6 g/100 ml water at 20°C	<b>Coefficient de partage:</b> Données non disponibles <b>Auto-inflammation:</b> Données non disponibles <b>Température de décomposition:</b> Données non disponibles <b>Viscosité:</b> Données non disponibles <b>Formule moléculaire:</b> NaHCO <sub>3</sub> <b>Poids moléculaire:</b> 84.01
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## Section 10 Stabilité Et Réactivité

**Stabilité chimique:** Stable

**Polymérisation dangereuse:** N'aura pas lieu.

**Conditions à éviter:** La température élevées cause la décomposition au carbonate de sodium, à l'eau et à l'anhydride carbonique.

**Matières incompatibles:** Réagit avec des acides aux sels de rendement, à l'eau et à l'anhydride carbonique acides.

**Produits dangereux de décomposition:** Anhydride carbonique gazeux.

## Section 11 L'Information Toxicologique

**Toxicité aiguë:** Oral-rat LD50: 4220-4400 mg/kg

**La corrosion de la peau et l'irritation:** Skin-rabbit - non irritant

**Des lésions oculaires graves / irritation:** Eye-rabbit - non irritant

**Respiratoire ou sensibilisation de la peau:** Non sensibilisant

**Mutagénicité des cellules germinales:** Données non disponibles

**Cancérogène:** Données non disponibles

**NTP:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérigène reconnu ou présumé par NTP.

**IARC:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérigène probable, possible ou confirmé par IARC.

**OSHA:** Aucun composant de ce produit présent à des niveaux supérieurs ou égaux à 0,1% n'a été identifié comme cancérigène ni comme cancérigène possible par OSHA.

**Reproductive toxicity:** Données non disponibles

**STOT-exposition unique:** Données non disponibles

**STOT-une exposition répétée:** Données non disponibles

**Risque d'aspiration:** Données non disponibles

**Effets d'une surexposition:**

Inhalation: Excessive aux poussières peut irriter les voies respiratoires.

Ingestion: L'ingestion peut provoquer des troubles gastrointestinales.

Peau: Aucun danger connu.

Yeux: Contact avec les yeux peut provoquer une irritation très légère.

**Les signes et les symptômes de l'exposition:** Voir les effets sanitaires potentiels ci-dessus.

**Informations complémentaires:** RTECS #: VZ0950000

## Section 12 L'Information Écologique

**Toxicité pour les poissons:** Gambusia affinis (fish, freshwater) LC50: 7550 mg/l/24 hours

**Toxicité pour les daphnies et autres invertébrés aquatiques:** Daphnia magna (Crustacea) EC50: 2350 mg/l/48 hours

**Toxicité pour les algues:** Nitzschia linearis (Algae) LC50: 650 mg/l/5 day

**Persistance et dégradabilité:** Pas de données disponibles

**Potential de bioaccumulation:** Pas de données disponibles

**Mobilité dans le sol:** Pas de données disponibles

**Évaluation PBT et vPvB:** Pas de données disponibles

**Autres effets indésirables:** Un danger pour l'environnement ne peut pas être exclu dans l'éventualité d'une manipulation ou d'élimination.

## Section 13 Considérations De Disposition

Ces lignes directrices sont destinées à l'élimination de la disposition d'un catalogue de taille seules les quantités. Les règlements fédéraux peuvent s'appliquer aux contenants vides. Des réglementations nationales et / ou local peut être différent. Éliminer conformément à toutes les réglementations locales, provinciales et fédérales ou d'un contrat avec une agence élimination des produits chimiques sous licence.

## Section 14 L'Information De Transport (US DOT / CANADA TMD)

**Numéro UN / NA:** Non applicable

**Nom d'expédition:** Non réglé

**Classe de danger:** Non applicable

**Groupe d'emballage:** Non applicable

**Quantité à déclarer:** Non

**Polluant marin:** Non

**Exceptions:** Non applicable

**2016 ERG Guide #:** Non applicable

## Section 15 L'Information De Normalisation

Un produit chimique est considéré comme inscrit si le numéro CAS pour la forme anhydre est sur la liste d'inventaire.

Composant	TSCA	CERLCA (RQ)	RCRA code	DSL	NDSL
Bicarbonate de sodium	Listed	Not listed	Not listed	Listed	Not listed

## Section 16 L'autre Information

Les informations contenues dans ce document sont fournis sans garantie d'aucune sorte. Les employeurs devraient considérer cette information seulement comme complément à d'autres informations recueillies par eux et doivent prendre des décisions indépendantes de la pertinence et l'exhaustivité de l'information de toutes les sources afin d'assurer une utilisation correcte de ces matériaux et de la sécurité et la santé des employés. NTP: National Toxicology Program, IARC: International Agency for Research on Cancer, OSHA: Occupational Safety and Health Administration, STOT: Specific Target Organ Toxicity, SE: Single Exposure, RE: Repeated Exposure, ERG: Emergency Response Guidebook.

# SAFETY DATA SHEET

# spectrum®



Revision date 19-May-2021

Revision Number 2

## 1. Identification

### Product identifier

**Product Name** SODIUM HYDROGEN SULFATE, PURIFIED

### Other means of identification

**Product Code(s)** S1623

**Synonyms** None

### Recommended use of the chemical and restrictions on use

**Recommended use** No information available

**Restrictions on use** No information available

### Details of the supplier of the safety data sheet

#### Supplier Address

Spectrum Chemical Mfg. Corp.  
14422 South San Pedro St.  
Gardena, CA 90248  
(310) 516-8000

### Emergency telephone number

**Emergency Telephone** Chemtrec 1-800-424-9300

## 2. Hazard(s) identification

### Classification

Serious eye damage/eye irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3

### Hazards not otherwise classified (HNOC)

Not applicable

### Label elements

**Danger**

#### Hazard statements

Causes serious eye damage  
May cause respiratory irritation





**Appearance** Crystals or Lumps

**Physical state** Solid

**Odor** Pungent

**Precautionary Statements - Prevention**

Wear eye protection/ face protection

Avoid breathing dust/fume/gas/mist/vapors/spray

Use only outdoors or in a well-ventilated area

**Precautionary Statements - Response**

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Immediately call a POISON CENTER or doctor

IF INHALED: Remove person to fresh air and keep comfortable for breathing

Call a POISON CENTER or doctor if you feel unwell

**Precautionary Statements - Storage**

Store in a well-ventilated place. Keep container tightly closed

Store locked up.

**Precautionary Statements - Disposal**

Dispose of contents/container to an approved waste disposal plant

**Other information**

May be harmful if swallowed.

### 3. Composition/information on ingredients

**Substance**

Chemical name	CAS No	Weight-%	Trade secret
Sodium Bisulfate	7681-38-1	100	*

\*The exact percentage (concentration) of composition has been withheld as a trade secret.

### 4. First-aid measures

**Description of first aid measures**

**General advice**

Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

**Inhalation**

Remove to fresh air. Get medical attention immediately if symptoms occur. IF exposed or concerned: Get medical advice/attention.

**Eye contact**

Get immediate medical advice/attention. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area.

**Skin contact**

Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.

**Ingestion**

Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician.

**Self-protection of the first aider**      Avoid contact with skin, eyes or clothing. Wear personal protective clothing (see section 8).

**Most important symptoms and effects, both acute and delayed**

**Symptoms**      Burning sensation.

**Indication of any immediate medical attention and special treatment needed**

**Note to physicians**      Treat symptomatically.

## **5. Fire-fighting measures**

**Suitable Extinguishing Media**      Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Large Fire**      CAUTION: Use of water spray when fighting fire may be inefficient.

**Unsuitable extinguishing media**      Do not scatter spilled material with high pressure water streams.

**Specific hazards arising from the chemical**      No information available.

**Hazardous combustion products**      Chloroform does not burn, but may decompose upon heating to produce the following if involved in a fire: carbon monoxide, carbon dioxide, hydrogen chloride and chlorine. Sulfur oxides. Produce toxic and/or corrosive substances on contact with water.

**Explosion data**

**Sensitivity to mechanical impact** none.

**Sensitivity to static discharge** none.

**Special protective equipment for fire-fighters**      Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

## **6. Accidental release measures**

**Personal precautions, protective equipment and emergency procedures**

**Personal precautions**      Avoid contact with skin, eyes or clothing. Use personal protective equipment as required. Ensure adequate ventilation. Evacuate personnel to safe areas.

**Other information**      Refer to protective measures listed in Sections 7 and 8.

**Methods and material for containment and cleaning up**

**Methods for containment**      Prevent further leakage or spillage if safe to do so.

**Methods for cleaning up**      Pick up and transfer to properly labeled containers.

## **7. Handling and storage**

**Precautions for safe handling**

**Advice on safe handling**      Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Ensure adequate ventilation. Avoid breathing vapors or mists. In case of insufficient ventilation, wear suitable respiratory equipment.

**Conditions for safe storage, including any incompatibilities**

**Storage Conditions**      Hygroscopic. It absorbs moisture from the air. Protect from moisture. Keep container

tightly closed. Store locked up. Keep out of the reach of children.

## 8. Exposure controls/personal protection

### Control parameters

**Exposure Limits** The following ingredients are the only ingredients of the product above the cut-off level (or level that contributes to the hazard classification of the mixture) which have an exposure limit applicable in the region for which this safety data sheet is intended or other recommended limit. At this time, the other relevant constituents have no known exposure limits from the sources listed here.

### Appropriate engineering controls

**Engineering controls** Showers  
Eyewash stations  
Ventilation systems.

### Individual protection measures, such as personal protective equipment

**Eye/face protection** Tight sealing safety goggles.

**Hand protection** Wear suitable gloves.

**Skin and body protection** Wear suitable protective clothing.

**Respiratory protection** No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

**General hygiene considerations** Avoid contact with skin, eyes or clothing. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product.

## 9. Physical and chemical properties

### Information on basic physical and chemical properties

<b>Physical state</b>	Solid
<b>Appearance</b>	Crystals or Lumps
<b>Color</b>	Colorless; White
<b>Odor</b>	Pungent
<b>Odor threshold</b>	No information available

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
<b>pH</b>	no data available	None known Highly acidic
<b>Melting point / freezing point</b>	315 °C / 599 °F	None known
<b>Boiling point / boiling range</b>	no data available	None known
<b>Flash point</b>	no data available	None known
<b>Evaporation rate</b>	no data available	None known
<b>Flammability (solid, gas)</b>	no data available	None known
<b>Flammability Limit in Air</b>		None known
<b>Upper flammability or explosive limits</b>	No data available	
<b>Lower flammability or explosive limits</b>	No data available	
<b>Vapor pressure</b>	No data available	None known
<b>Vapor density</b>	no data available	None known
<b>Relative density</b>	2.43	None known
<b>Water solubility</b>	Soluble in water	None known
<b>Solubility(ies)</b>	no data available	None known
<b>Partition coefficient</b>	No data available	None known

Autoignition temperature	no data available	None known
Decomposition temperature		None known
Kinematic viscosity	no data available	None known
Dynamic viscosity	No data available	None known

#### Other information

Explosive properties	No information available
Oxidizing properties	No information available
Softening point	No information available
Molecular weight	120.06
VOC Content (%)	No information available
Liquid Density	No information available
Bulk density	No information available

## 10. Stability and reactivity

Reactivity	No information available.
Chemical stability	Stable under recommended storage conditions.
Possibility of hazardous reactions	None under normal processing.
Conditions to avoid	None known based on information supplied.
Incompatible materials	Strong acids. Strong bases. Strong oxidizing agents.
Hazardous decomposition products	None known based on information supplied.

## 11. Toxicological information

### Information on likely routes of exposure

#### Product Information

Inhalation	Specific test data for the substance or mixture is not available. May cause irritation of respiratory tract.
Eye contact	Specific test data for the substance or mixture is not available. Causes serious eye damage. May cause irreversible damage to eyes.
Skin contact	Specific test data for the substance or mixture is not available. May cause irritation.
Ingestion	Specific test data for the substance or mixture is not available. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. May be harmful if swallowed.

### Symptoms related to the physical, chemical and toxicological characteristics

Symptoms	Redness. Burning. May cause blindness.
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### Acute toxicity

#### Numerical measures of toxicity

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Sodium Bisulfate 7681-38-1	= 2490 mg/kg ( Rat )	-	-

### Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	May cause skin irritation.
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<b>Serious eye damage/eye irritation</b>	Classification based on data available for ingredients. Causes burns. Risk of serious damage to eyes.
<b>Respiratory or skin sensitization</b>	No information available.
<b>Germ cell mutagenicity</b>	No information available.
<b>Reproductive toxicity</b>	No information available.
<b>STOT - single exposure</b>	May cause respiratory irritation.
<b>STOT - repeated exposure</b>	No information available.
<b>Aspiration hazard</b>	No information available.
<b>Other adverse effects</b>	No information available.
<b>Interactive effects</b>	No information available.

## 12. Ecological information

### Ecotoxicity

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Sodium Bisulfate 7681-38-1	-	-	-	EC50: =190mg/L (48h, Daphnia magna)

<b>Persistence and degradability</b>	No information available.
<b>Bioaccumulation</b>	Inherently biodegradable.

<b>Other adverse effects</b>	No information available.
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## 13. Disposal considerations

### Waste treatment methods

<b>Waste from residues/unused products</b>	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
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<b>Contaminated packaging</b>	Do not reuse empty containers.
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## 14. Transport information

DOT not regulated

TDG not regulated

MEX not regulated

ICAO (air) not regulated

IATA not regulated

IMDG not regulated

RID not regulated

ADR not regulated

ADN not regulated

## 15. Regulatory information

## **International Inventories**

**TSCA** Complies

<b>DSL/NDSL</b>	Complies
<b>EINECS/ELINCS</b>	Complies
<b>ENCS</b>	This product complies with ENCS:
<b>IECSC</b>	This product complies with China:
<b>KECL</b>	Complies
<b>PICCS</b>	Complies
<b>AICS</b>	All the constituents of this material are listed on the Australian Inventory of Chemical Substances (AICS).

### **Legend:**

**TSCA** - United States Toxic Substances Control Act Section 8(b) Inventory

**DSL/NDSL** - Canadian Domestic Substances List/Non-Domestic Substances List

**EINECS/ELINCS** - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

**ENCS** - Japan Existing and New Chemical Substances

**IECSC** - China Inventory of Existing Chemical Substances

**KECL** - Korean Existing and Evaluated Chemical Substances

**PICCS** - Philippines Inventory of Chemicals and Chemical Substances

## **US Federal Regulations**

### **SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

### **SARA 311/312 Hazard Categories**

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

### **CWA (Clean Water Act)**

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

### **CERCLA**

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

## **US State Regulations**

### **California Proposition 65**

This product does not contain any Proposition 65 chemicals.

### **U.S. State Right-to-Know Regulations**

This product does not contain any substances regulated under applicable state right-to-know regulations

## **U.S. EPA Label Information**

**EPA Pesticide Registration Number** Not applicable

## **16. Other information**

**NFPA****Health hazards** 3**Flammability** 0**Instability** 0**Physical and chemical properties** -**HMIS****Health hazards** 3**Flammability** 0**Physical hazards** 0**Personal protection** X**Key or legend to abbreviations and acronyms used in the safety data sheet****Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value		

**Key literature references and sources for data used to compile the SDS**

Agency for Toxic Substances and Disease Registry (ATSDR)

U.S. Environmental Protection Agency ChemView Database

European Food Safety Authority (EFSA)

EPA (Environmental Protection Agency)

Acute Exposure Guideline Level(s) (AEGl(s))

U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act

U.S. Environmental Protection Agency High Production Volume Chemicals

Food Research Journal

Hazardous Substance Database

International Uniform Chemical Information Database (IUCLID)

Japan GHS Classification

Australia National Industrial Chemicals Notification and Assessment Scheme (NICNAS)

NIOSH (National Institute for Occupational Safety and Health)

National Library of Medicine's ChemID Plus (NLM CIP)

National Library of Medicine's PubMed database (NLM PUBMED)

National Toxicology Program (NTP)

New Zealand's Chemical Classification and Information Database (CCID)

Organization for Economic Co-operation and Development Environment, Health, and Safety Publications

Organization for Economic Co-operation and Development High Production Volume Chemicals Program

Organization for Economic Co-operation and Development Screening Information Data Set

World Health Organization

**Revision date** 19-May-2021**Revision Note** No information available.**Disclaimer**

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.

**End of Safety Data Sheet**