

# GROUND WATER QUALITY DISCHARGE PERMIT UGW450012

## STATEMENT OF BASIS

US Magnesium LLC  
Rowley, Utah  
April, 2020

### Introduction

The Director of the Division of Water Quality (Director) under the authority of the Utah Ground Water Quality Protection Rules<sup>1</sup> (Ground Water Rules) issues ground water discharge permits to facilities which have a potential to discharge contaminants to ground water<sup>2</sup>. As defined by the Ground Water Rules, such facilities include milling and metallurgical operations and ponds and lagoons whether lined or not. As defined in Utah Admin. Code R317-6-1, US Magnesium is considered an existing facility because it was under operation before February 10, 1990. The Ground Water Rules are based on an anti-degradation strategy for ground water protection as opposed to non-degradation; therefore, discharge of contaminants to ground water may be allowed provided that current and future beneficial uses of the ground water are not impaired and the other requirements of Rule 317-6-6.4.C are met<sup>4</sup>. Following this strategy, ground water is divided into classes based on its quality<sup>5</sup>; and higher-quality ground water is given greater protection<sup>6</sup> due to the greater potential for beneficial uses.

The Director has developed permit conditions consistent with Rule 317-6 and appropriate to the nature of the wastewater, facility operations, maintenance, discharge minimization technology<sup>7</sup> and the hydrogeologic and climatic conditions of the site, to ensure that the operation not contaminate ground water.

### Basis for Permit Issuance

Under Rule 317-6-6.4A, the Director may issue a ground water discharge permit for an existing facility if:

- 1) The applicant demonstrates that the applicable class TDS limits, ground water quality standards and protection levels will be met;
- 2) The monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;
- 3) The applicant utilizes treatment and discharge minimization technology commensurate with plant process design capability and similar or

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<sup>1</sup> Utah Admin. Code Rule 317-6

<sup>2</sup> [https://deq.utah.gov/ProgramsServices/programs/water/groundwater/docs/2008/08Aug/GWQP\\_PermitInfo.pdf](https://deq.utah.gov/ProgramsServices/programs/water/groundwater/docs/2008/08Aug/GWQP_PermitInfo.pdf)

<sup>4</sup> Preamble to the Ground Water Quality Protection Regulations of the State of Utah, sec. 2.1, August, 1989

<sup>5</sup> Utah Admin. Code Rule 317-6-3

<sup>6</sup> Utah Admin. Code Rule 317-6-6.4

<sup>7</sup> Utah Admin. Code Rule 317-6-6.4(C)(3)

equivalent to that utilized by facilities that produce similar products or services with similar production process technology; and,

- 4) There is no impairment of present and future beneficial uses of ground water.

### **Permit Modification and New Construction**

Groundwater discharge permit UGW450012, originally issued and effective on December 19, 2018, is undergoing a modification based on current and future construction activities. US Magnesium prepared the “Retrofitted Waste Pond Phase 1 Basis of Design Report - US Magnesium Facility, Revision B” dated June 25, 2019 that describes the Phase 1 permit modifications and required construction activities. The Retrofitted Waste Pond (RWP) will be designed in four phases. Phase 1 is construction of an earthen barrier around the perimeter of the RWP, Phase 2 is construction of a vertical hydraulic barrier wall (VHBW), Phase 3 is additional embankment height construction to final crest elevation, and these activities will be followed by Phase 4, which is monitoring system design and installation. Because the Phase 1 berm construction is extensive and includes additional features, the groundwater discharge permit is being modified.

### **Background**

#### DESCRIPTION OF FACILITY

US Magnesium and prior entities have operated at this site in Tooele County on the west shore of the Great Salt Lake since 1972. The facility is located in the Lakeside Valley, a northern extension of Skull Valley, and is at an elevation of 4220 feet (Figure 1).

Wastewater streams that are produced by the various steps in the manufacturing process are identified on the Process Flow Diagram as shown in US Magnesium’s ground water discharge permit application and Figure 2.

The facility uses a series of evaporation ponds to bring water from the Great Salt Lake to a magnesium chloride brine concentration of 9% by weight. When the target magnesium concentration is achieved, the brine is pumped to holding ponds (“Star Pond”) which can store up to a three year supply of brine.

Concentrated magnesium chloride ( $MgCl_2$ ) brine is pumped from the holding ponds to a series of reaction tanks in the production plant where sulfate is removed and then to another series of tanks where boron is removed. The resulting brine is then heated and spray-dried to convert it to a dry  $MgCl_2$  powder.

These process steps generate the wastewater flows identified as gypsum stack drainage, boron plant strip water, spent liquor from air emission control systems on the spray driers cooling tower blowdown and area wash-down water. The gypsum stack drainage contains chlorinated hydrocarbon compounds. The boron plant strip water is acidic and contains low (<0.04%) concentrations of decanol and kerosene, used in the boron removal process. The spray drier scrubber spent liquor and area wash-down water are acidic.

The spray-dried powder is stored in bins until it is fed to a cell feed preparation step referred to as the “Reactor” process. Here, the powder is melted and further purified with chlorine and carbon to remove magnesium oxide (MgO) and water. The refined and purified molten salt is moved to holding cells where the temperature is kept at 900 C (1550 F).

The Reactor process generates the wastewater flows identified in the Process Flow Diagram as reactor building air emission control system, wet scrubber spent liquor, boiler blowdown, vacuum pumps, process seal leg water, process upset quench water (including Chlorine Reduction Burner deluge), cooling tower blowdown and reactor building wash-down water. The reactor building air emission control system, wet scrubber spent liquor, process seal leg water, process upset quench water and reactor building wash-down water are acidic. The reactor building spent liquor, Chlorine Reduction Burner deluge water and reactor building wash-down water contain chlorinated hydrocarbons.

The purified molten salt, containing about 94% MgCl<sub>2</sub>, is then transported to electrolytic cells that separate it into molten magnesium metal and chlorine gas. The magnesium metal is cast into ingots of various sizes and sold to customers. The chlorine is sold as elemental merchant grade chlorine or converted to hydrogen chloride or iron chlorides and sold to customers.

The electrolytic process generates the minor wastewater flows identified as electrolytic building vacuum pumps and cooling tower blowdown. These wastewaters are essentially neutral pH and do not contain organic compounds. Handling of magnesium and chlorine generates cast machine cooling water, cooling tower blowdown, and chlorine plant water wash column. The water wash column wastewater is acidic.

US Magnesium has substantially completed construction of and is in the process of finalizing permitting its lithium carbonate production process that will be located on the western side of the existing magnesium production plant, which is within the Retrofitted Waste Pond containment area. The new production plant will reprocess cell salt (also referred to as “smut”) to recover lithium carbonate. The plant will produce two byproduct solids: filter cakes and two primary wastewater streams. One wastewater stream, consisting of dilute solution of magnesium, calcium and iron brine from backwashing ion exchange beds will be recycled to the front of the process and used as digesting water. The estimated volume of this wastewater stream is about 70,000 gallons per day (gpd) with a maximum intermittent flow of about 200 gallons per minute (gpm). The second wastewater stream will consist of a high purity sodium and potassium chloride brine that US Magnesium intends to recycle to its solar evaporation ponds (100,000 gpd or 70 gpm on average) that will be used in solar evaporation. There will also be area wash-down water that will be routed to the Current Waste Pond.

#### PERMITTED FACILITIES

Existing facilities at the US Magnesium plant site are comprised of:

- 1) The Current Waste Pond, a diked, unlined impoundment of approximately 525 acres located northeast of the US Magnesium plant site, constructed in 1985, and

currently receiving wastewater discharges from a piping system effective on February 20, 2019 with ditch capping to be completed in July 2020 (Figure 3);

- 2) The Old Waste Pond, a diked, unlined area of approximately 800 acres that was constructed in the 1970s and abandoned in 1984 when it was inundated by high water levels in the Great Salt Lake (Figure 3). Maintenance of the north and east embankments was completed on November 26, 2019 to preserve the function of the Old Waste Pond;
- 3) The earthen berm separating the Current Waste Pond and the Old Waste Pond, that currently maintains wastewater elevation difference between the impoundments;
- 4) A pipe installed by US Magnesium in November, 2017 to convey wastewater from the Current Waste Pond to the Old Waste Pond in order to maintain lower water levels and minimize hydraulic head on the pond dikes and decrease the possibility for wastewater to escape the ponds by underground or surface flow (Figure 4).
- 5) Any other US Magnesium plant facilities or activities at the site that could cause a discharge of contaminants to ground water.

These facilities will be covered under this permit. As US Magnesium completes the investigations and submits plans for the construction required in the Compliance Schedule, the permit may be re-opened to cover the following new facilities and potential sources of discharge to ground and surface water:

- 1) The Retrofitted Waste Pond (RWP). US Magnesium intends to eventually construct a new pond on the site of the Current Waste Pond and Old Waste Pond to contain wastewater and minimize its discharge to ground water (Figure 5). The Retrofitted Waste Pond will incorporate a vertical hydraulic barrier wall (VHBW) keyed into a clay layer underlying the pond site and dikes to provide surface containment for the wastewater. The Retrofitted Waste Pond barrier wall will enclose the full extent of the Current and Old Waste Ponds.

Future revisions of this permit to cover the permitted facility will be made in accordance with applicable administrative requirements. The permit is being revised now to include construction of Phase I of the RWP, the embankment on the north, east and south sides of the pond's perimeter. A vertical hydraulic barrier wall (VHBW) will be constructed through this embankment in future phases of RWP construction.

#### HYDROGEOLOGIC AND SITE CONDITIONS

The US Magnesium plant is located in the Lakeside Valley, a down-dropped graben filled with sediments, and within three to five miles of the current shoreline of the Great Salt Lake. The site is semi-arid and receives around seven inches of precipitation annually. Maximum topographic relief at the site is eight feet.

Sediments present at the US Magnesium site include calcareous clays, silts and fine sands, oolitic (calcareous) sands, algal reefs and saline precipitates, all indicative of deposition in a saline lake and lake shore environment.

Strata under the site generally slope from west to east. As reported in US Magnesium's

December 15, 2017 ground water discharge permit application, the stratigraphy of these sediments affects ground water flow.

An Upper Aquifer Zone exists approximately from ground surface to 35 feet below ground surface (bgs), in fine-grained sand, silty sand, silty clay and minor oolitic sand and cemented gravel. Horizontal hydraulic conductivity measured in pump tests is 14-30 ft/day, vertical hydraulic conductivity measured in the lab is on the order of  $10^{-5}$  to  $10^{-8}$  cm/sec.

Below the Upper Aquifer Zone, approximately 35 to 55 feet bgs, sampling data identify a Deeper Silty Clay unit, a low to medium plasticity clay to silty clay layer. Vertical hydraulic conductivity measured in the lab on samples from this layer is in the range of  $10^{-7}$  to  $10^{-8}$  cm/sec. The Deeper Silty Clay unit appears to be continuous and will prevent leakage from occurring.

Below approximately 55 feet bgs, sampling data identify a Lower Aquifer unit composed of silty sand and fine-grained sand interbedded with lenses and layers of low to medium plasticity clay and clayey silt. Vertical hydraulic conductivity in this unit, as measured on samples in the lab, is comparable to the Upper Aquifer unit. Horizontal hydraulic conductivity, as measured in pump tests, is approximately 0.7 to 4 ft/day.

A 48-hour pumping test was conducted at monitor well MW-22B, screened in the Lower Aquifer Zone (see well location map Figure 3-1a in the December 15, 2107 ground water discharge permit application). The objective of the pumping test is to estimate the aquifer transmissivity and storativity for the region of influence and evaluate vertical flow under stressed conditions. No drawdown was observed in nearby monitor wells PZ-10, PZ-6 or MW-13A, screened in the Upper Aquifer Zone. A drawdown of 0.24 feet was observed in MW-22A, a well at the same location as MW-22B but screened in the Upper Aquifer Zone just above the Deeper Silty Clay.

Ground water in the Upper Aquifer Zone flows southwest to northeast due in part to ground water mounding caused by US Magnesium facilities including the Star Pond and the now closed wastewater diversion ditches. Although, ground water flow direction and gradient has changed with the implementation of the wastewater piping system installed in February 2019. Calculation of ground water gradient based on observed ground water elevations in wells screened in the Upper Aquifer Zone yields a value of 0.00096; however, dissolved-solids content of the ground water varies significantly across the site, and a density correction calculation results in a hydraulic gradient of 0.00081. Ground water flow in the Lower Aquifer Zone is generally from west to east.

Observation of ground water elevations in wells screened in the Upper and Lower Aquifer Zones indicates that a slight upward hydraulic gradient exists between the two aquifers.

Areas of standing water outside and adjacent to the diked area of the Current Waste Pond indicate that shallow ground water discharges to the surface. Areas north of the Current Waste Pond and the earthen berm separating the CWP and OWP have shown indications

of dissolution of the carbonate-containing sediments. This indicates that ground and surface water have been influenced by low-pH wastewater.

#### BACKGROUND GROUND WATER QUALITY

Ground water beneath the permitted facilities has total dissolved solids (TDS) content greater than 10,000 mg/l, which is Class IV according to Utah Admin. Code R317-6-3.7. There are also areas classified as Class IC ground water, which is ecologically important groundwater and protected as a source for potentially affected wildlife habitat. Ground water sampled across the site in 2017 ranged from 17,000 to 190,000 mg/l, with higher TDS concentrations generally occurring in the Lower Aquifer zone.

#### RELEASE HISTORY

The Old Waste Pond was constructed in the mid-1970s and was permitted under a National Pollutant Discharge Elimination System (NPDES) permit issued in April 1979. NPDES permits are concerned with surface water and do not address ground water. Seepage was observed from the eastern dike, and a second dike was constructed around the Old Waste Pond in 1980. The channel between the two dikes was filled with brine to create a hydraulic barrier to discharges. The NPDES permit was renewed in 1989; however, it was not renewed by the State of Utah when it expired in 1994. The Utah Division of Water Quality in the non-renewal letter stated they were not permitting 'no-discharge' facilities.

Rising levels of the Great Salt Lake inundated the Old Waste Pond in April, 1984. Wastewater was diverted to a holding area while dikes were repaired. The repaired dike sections were breached in June, 1984, and wastewater was diverted to Pond 1 West, a solar evaporation pond. In June, 1985, lake water breached the solar ponds, and wastewater was diverted to the Current Waste Pond. The Old Waste Pond was inundated until the early 1990s, at which time its dikes were repaired. Wastewater was not discharged to the Old Waste Pond again until November, 2017.

On November 21, 2016 the Director issued a Warning Letter of Violation based on evidence of an ongoing, unpermitted discharge of pollutants to waters of the state from the US Magnesium facility. The letter requested US Magnesium to submit an application for a ground water discharge permit.

#### **RCRA Litigation**

On January 16, 2001, the United States Department of Justice, on behalf of the EPA, filed a complaint in the United States District Court for the District of Utah (RCRA Litigation) against the Magnesium Corporation of America (Mag Corp), the owner and operator of the facility, and its corporate parents, alleging, among other things, that they violated Subtitle C of the Resource Conservation and Recovery Act (RCRA) with respect to five waste streams (the Complaint Wastes). The complaint sought injunctive relief and penalties.

On August 1, 2001, Mag Corp filed a petition for reorganization under Chapter 11 of the Bankruptcy Code in the United States Bankruptcy Court for the Southern District of New York (Bankruptcy Case). The Bankruptcy Court approved MagCorp's request to sell the magnesium facility and substantially all of its other assets to US Magnesium, LLC (US Magnesium), a Utah limited liability company. Shortly after the sale, the Mag Corp Bankruptcy Case was converted to Chapter 7 liquidation and a Chapter 7 trustee was appointed. On December 5, 2002, DOJ filed a Second Amended Complaint in the RCRA Litigation adding US Magnesium as a defendant, among other things. A Bankruptcy Settlement Agreement with the US Environmental Protection Agency was signed on July 15, 2019.

The United States (US EPA and US DOJ) and US Magnesium are currently negotiating the terms of a consent decree to settle the RCRA litigation.

### **CERCLA Listing**

On September 3, 2008, EPA proposed the US Magnesium facility for inclusion on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List, and on November 4, 2009, EPA added the site to the final NPL.

On August 4, 2011, the EPA entered into a CERCLA Administrative Order on Consent (AOC) with US Magnesium for the performance of a remedial investigation (RI) and feasibility study (FS). The AOC provides that US Mag will conduct the RI/FS for the site in accordance with EPA direction, procedures and subject to EPA oversight. US Magnesium has for the most part completed the first phase of site characterization activities, and expects to complete both the ecological and human health risk assessments in 2020. Subsequent phases of the RI are ongoing.

### **Regulatory Coordination**

The Director anticipates coordinating with the CERCLA and RCRA programs and US EPA where issues of overlapping authority and agency involvement may occur. For example, the Director may allow the submission and use of data collected and reported under CERCLA or RCRA authority to also support ground water permitting.

### **Basis for Specific Permit Conditions**

#### PERMITTING APPROACH

Permit No. UGW450012 is being issued to insure that existing facilities at US Magnesium are operated and monitored to minimize the discharge of contaminants from the operation. This permit version also contains a Compliance Schedule which lists site investigations that will be completed at future dates, and also scheduled dates for submittal of a proposed Phase-based design for a Retrofitted Waste Pond that will incorporate a stable earthen barrier and a low-permeability subsurface barrier wall to minimize discharge of wastewater.

As work continues on design and construction of the Retrofitted Waste Pond and new information from completed studies related to potential discharges to ground water becomes available, future modifications of this permit will be issued to accommodate the new facilities and new information, as necessary. The eventual goal of this permit is containment of US Magnesium's wastewater to minimize environmental harm, and to monitor the performance of containment structures and also monitor potential discharges. Protection levels for uncontaminated ground and surface water will be protective of the environment, as defined by the Human Health and Ecological Risk Assessments, or a statistically-significant increase in contaminant concentrations over background levels.

Because the site of US Magnesium's wastewater ponds is an area of upward ground water gradient and discharge, the most important beneficial use of the site's ground water is as a source of surface water that supports ecosystems in the salt flats environment and possibly the Great Salt Lake as well. Therefore, the primary focus of this permit will be to protect surface water from contaminants introduced by surface discharge of ground water affected by US Magnesium's permitted facilities.

#### PERMIT CONDITIONS FOR EXISTING FACILITIES

The Utah Ground Water Protection Rules require that permitted existing facilities utilize discharge minimization technology similar to facilities that produce similar products with similar production process technology.

Existing discharge minimization technology at the US Magnesium site consists of the diked Current Waste Pond and Old Waste Pond, and the pipe that connects them. Optimum performance of this control technology will be insured by the inspection and monitoring plans described below.

#### REMEDIAL ACTIONS CURRENTLY UNDERWAY

Pursuant to a RCRA Administrative Order on Consent from the US Environmental Protection Agency, US Magnesium has installed a wastewater discharge piping system to replace the existing unlined ditches that convey wastewater to the Current Waste Pond and Old Waste Pond. The unlined ditches have been backfilled and will be capped with clean soil as a permanent closure as cited in the January 21, 2020 "Ditch Closure Project Notice of Completion," submitted by US Magnesium as part of the RCRA Carve-out Cleanup Project Administrative Order on Consent. A sanitary lagoon located between the Central Ditch and Chlorine Ditch has been refurbished.

As part of resolving the RCRA case, US Magnesium and EPA are negotiating a consent decree under which US Magnesium would construct a filtration plant to remove organic constituents from the plant's wastewater before it is discharged to the wastewater ponds.

Upon issuance of this version of the permit, US Magnesium shall begin construction of the RWP embankment according to the plans and specifications cited in Part I of this permit.



## INSPECTION AND INTERIM COMPLIANCE MONITORING PLAN

Until the Retrofitted Waste Pond is constructed, US Magnesium shall inspect the perimeter of the Current and Old Waste Ponds for any evidence of discharge visible from the surface, according to the Inspection and Monitoring Plan for Current Wastewater Pond Embankments contained in Appendix A. Any loss of pond water containment visible at the surface will be reported to the Director and containment will be restored in accordance with Appendix A: Inspection and Monitoring Plan approved by the Director.

Ground and surface water will be sampled according to the Interim Compliance Monitoring Plan contained in Appendix B. Because of the difficulty in interpreting parameters such as major ions, pH or metals as evidence for influence from pond wastewater at this site, the plan proposes to use five organic compounds that are at relatively high concentrations in the wastewater, are absent in unaffected ground and surface water, and mobile in the subsurface. The compounds chosen are trichloroacetic acid, bromoform, chloroform, dibromodichloromethane and bromodichloromethane. Water samples will also be tested for the field parameters of temperature, pH, specific conductivity, dissolved oxygen, oxidation reduction potential (ORP), turbidity and field chlorine. The plan designates nine wells (4 screened above the Deeper Silty Clay and 5 screened below it) and six locations for sampling surface water. Samples collected from each selected sampling location will be analyzed once for the full suite of analytical parameters listed in Table 4-3 of Appendix B, unless these analyses have already been performed for a particular monitoring location. The results for the full suite of analytes will be compared to the analytical results for the five organic tracers to evaluate the suitability of using one or more of the full suite analytes for the final Compliance Monitoring Plan. Hydraulic barrier ditches along the east and north sides of the Old Waste Pond, that are filled with brine that is denser than the wastewater or ground water to impede any discharge from the pond, will be sampled to evaluate potential discharges of pond water.

Because the full extent of the ground water plume affected by US Magnesium's discharges has not been defined yet, and because the source of ground water contamination will not be contained until construction of the Retrofitted Waste Pond is complete, ground water monitoring will not be used to determine permit compliance at this time. For the initial versions of the permit, ground and surface water monitoring will be done primarily to define background conditions and the extent of water affected by discharges from the wastewater ponds in existing wells. Following construction of the Retrofitted Waste Pond and completion of the Contamination Investigation required in the Compliance Schedule (pp. 11 to 13 of this Statement of Basis), a new compliance monitoring plan will be developed. Monitoring wells will be constructed surrounding the Retrofitted Waste Pond, including the open west end of the RWP, and protection levels will be developed for each well for contaminants associated with the wastewater. Permit compliance will meet regulatory requirements so as to not exceed protection levels, i.e., no horizontal or vertical expansion of the plume of contaminated ground water.

The first and second versions of the Ground Water Discharge Permit require US Magnesium to not exceed maximum pool levels of 4217.0 feet elevation in the Current

Waste Pond and 4207.5 feet in the Old Waste Pond to prevent any surface discharge of wastewater. Elevations that exceed 4216.5 in the Current Waste Pond and 4207.4 in the Old Waste Pond will be action levels which will require US Magnesium to take actions to prevent further increases in the levels of wastewater in the ponds. The combination of visual inspections done according to the plan in Appendix A and sampling and analysis of the hydraulic barrier ditches adjacent to the Old Waste Pond according to the plan in Appendix B will minimize the potential for discharge of pond water to surface water.

#### COMPLIANCE REQUIREMENTS

Compliance with the terms of this permit requires the following:

1. Regular inspections of the pond perimeters are conducted according to the plan contained in Appendix A, and any indications of discharge of wastewater to the surface are reported to the Director as described in the Interim Compliance Monitoring Plan in Appendix B.
2. Ground and surface water sampling are conducted according to the Interim Compliance Monitoring Plan in Appendix B and the results reported to the Director according to permit conditions.
3. Maximum pool elevations in the Current Waste Pond and Old Waste Pond are not exceeded, and if action level elevations are exceeded, US Magnesium immediately takes actions to prevent further exceedance of maximum pool elevations and decrease water level elevations to below action levels.
4. US Magnesium meets the stated deadlines for construction of the Retrofitted Waste Pond and completion of the permit's other Compliance Schedule items, or obtains DWQ approval for extending those deadlines.
5. Construction or modification of any new or existing facility must be permitted in accordance with Utah Code Ann. § 19-5-107(3)(b) and Utah Admin. Code R317-1.

#### COMPLIANCE SCHEDULE

1. Human Health and Ecological Risk Assessments

As part of the CERCLA Remedial Investigation/Feasibility Study required by EPA, US Magnesium will evaluate risk to human and ecological receptors that may be exposed to ground or surface water affected by discharge of contaminants. The risk assessments are expected to meet the requirements of the Baseline Risk Assessment completed for the CERCLA Remedial Investigation/Feasibility Study. US Magnesium shall report the results of the risk assessments to the Director within two years of initial permit issuance, which would be December 19, 2020. The report to the Director shall evaluate levels of contaminant concentrations in US Magnesium's wastewater which may have *de minimis* effects on human and ecological receptors.

2. Contamination Investigation

Under the provisions of Utah Admin. Code R317-6-6.15D, within two years of initial permit issuance on December 19, 2018, US Magnesium shall submit a Contamination Investigation report to the Director for DWQ approval. The investigation shall evaluate the extent and severity of ground and surface water contamination from US Magnesium's activities, and pathways for contaminant migration. Information required by Utah Admin. Code R317-6-6.15D that has already been collected to satisfy other state and federal requirements may be incorporated into the Contamination Investigation report by reference. Information required by Utah Admin. Code R317-6-6.15D may be submitted in stages to coordinate with investigations required by other Federal and State agencies.

### 3. Final Retrofitted Waste Pond Configuration and Design Justification

US Magnesium shall construct Phase 1 of the Retrofitted Waste Pond according to the construction permit issued as Part I of this current modified ground water discharge permit. At least two months before anticipated start of construction any alternative schedule and design must be approved by DWQ. US Magnesium shall submit plans and specifications for construction of subsequent phases of RWP construction. This permit shall be re-opened to incorporate the new construction and it shall be made available for a 30-day public comment period. Submission of proposed construction plans and specifications shall continue annually or according to an alternative schedule approved by DWQ through submittal of the final phase design and specifications. Design of the proposed structures must be justified given known site conditions, interim monitoring data obtained to date, other investigations and/or studies, and the ground water flow model, including any appropriate modifications to the model.

### 4. Monitoring Plan

Within six months following DWQ approval of the Contamination Investigation report, US Magnesium shall propose a Compliance Monitoring Plan for use after all planned containment structures have been constructed. The plan shall continue monitoring of pool elevation in the Retrofitted Waste Pond and inspection of the pond perimeter for potential releases of contaminated ground water to surface water, and monitor performance of the subsurface barrier wall by measurement of ground water elevations in pairs of piezometers on either side of the RWP containment system. The plan shall evaluate potential discharge of wastewater to ground water based on the Contamination Investigation Report. If groundwater contamination extends beyond the perimeter of the Retrofitted Waste Pond, the plan shall monitor any expansion of the area underlain by ground water affected by discharge of wastewater outside the Retrofitted Waste Pond.

### 5. Isotope Study

In anticipation of a future time when a filtration plant will remove organic constituents from the plant's wastewater, US Magnesium conducted a study on the feasibility of using stable isotopic composition of water to distinguish uncontaminated water at the plant site from water that is influenced by the plant's

wastewater. Because the source of the wastewater is ultimately brine that has undergone prolonged evaporation in the evaporation ponds, the study was predicated on the expectation that the wastewater would have a different isotopic signature than naturally-occurring ground and surface water. US Magnesium conducted Phase I of the study according to the plan contained in Appendix C and submitted the Isotope Study Phase I, Proof-of-Concept Sampling Report to DWQ on February 14, 2020. The Phase I study results did not indicate a distinct isotopic signature between facility wastewater and groundwater in compliance wells and did not support proceeding with the Isotope Study Phase II. However, isotope analyses may be worth reevaluating as a component of the final Compliance Monitoring Plan after the RWP construction is completed and is in operation. Future versions of this permit may use isotopic composition of water samples to evaluate permit compliance.

6. Contingency Plan

Concurrent with submittal of final plans for the Retrofitted Waste Pond, US Magnesium shall propose conceptual plans which would be followed if monitoring reveals that assumptions made in designing the containment structures turn out to not be true in practice, particularly if wastewater is found to discharge through the Deeper Silty Clay layer or out the open western side of the subsurface barrier wall. Plans must be based on known site conditions, interim monitoring data obtained to date, other investigations and/or studies, and the ground water flow model, including any appropriate modifications to the model.

7. Closure Plan

US Magnesium shall submit a final closure plan for the site in compliance with the expected future RCRA Consent Decree, discussed above under RCRA Litigation and sufficient to establish a basis for compliance with the NCP and delisting of the NPL Site.

8. Geochemical Evaluation of Sediment Acid Neutralization Potential and Water Balance Estimation

Within one year of permit issuance and as part of the justification for the Phase 1 design and specifications submitted to DWQ on June 26, 2019, US Magnesium re-calculated the acid neutralization potential of the sediments underlying the Retrofitted Waste Pond and the pond water balance for the Retrofitted Waste Pond, using calculation methods comparable to those used for the "Geochemical Evaluation of Sediments Beneath the CWP (Current Waste Pond)" and the "Water Balance Model and Results," contained in US Magnesium's December 15, 2017 Ground Water Discharge Permit Application. US Magnesium shall also re-evaluate the acid neutralizing potential of sediments underlying the impounded area using soil sample collection and analysis, and calculation methods comparable to the above-referenced Geochemical Evaluation document one year before the end of the current permit term.

## PERMIT LIMITS FOR NEW WELLS

After the completion of the Contaminant Investigation, and the final phase of the Retrofitted Waste Pond Design and Design Justification, required by the permit as Compliance Schedule items, if groundwater contamination extends beyond the perimeter of the Retrofitted Waste Pond, new wells will be located along the perimeter of the plume of ground water affected by discharges of US Magnesium's wastewater, immediately downgradient of the plume boundary. Permit protection levels for these wells will be set based on the greater of a statistically significant increase in contaminants associated with the wastewater that are present in the background (mean plus 2 x standard deviation), or on levels of contaminants that would have *de minimis* effect on the environment, based on the risk assessments. These wells would be monitored to evaluate any expansion of the plume of contaminated ground water outside the Retrofitted Waste Pond.

## LIST OF FIGURES

- 1) Site Map
- 2) US Magnesium Process Flow Diagram
- 3) Old and Current Waste Pond
- 4) Overflow Pipe into Old Waste Pond
- 5) Extent of Proposed Retrofit Waste Pond

## REFERENCES

Groundwater Discharge Permit Application, US Magnesium Facility, Rowley, Utah; December 15, 2017 DWQ-2017-012861

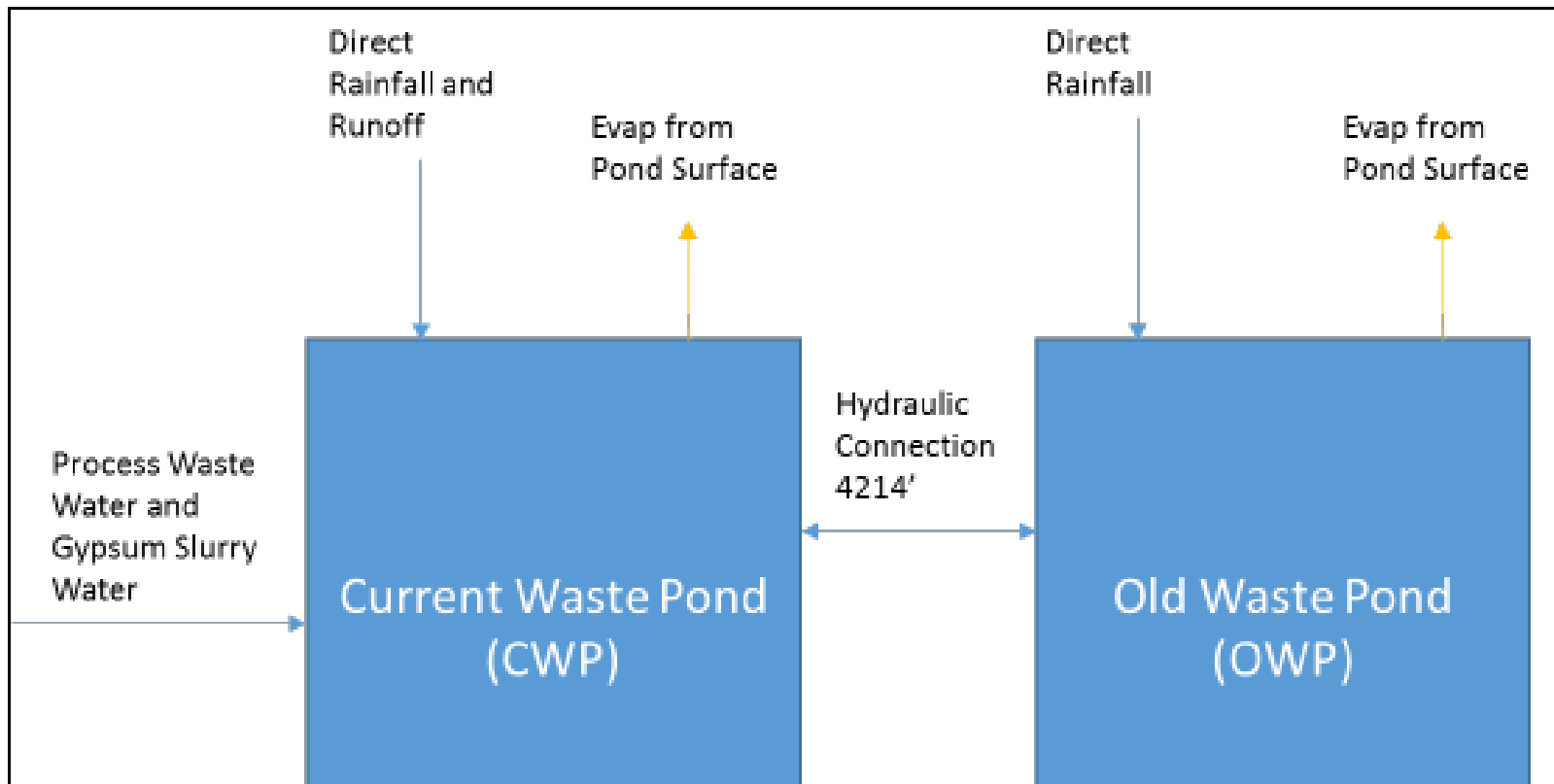
DWQ-2019-016995

**Figure 1**  
**Site Map**



From: Stantec. March 3, 2020. Retrofitted Waste Pond Phase 1 Basis of Design Report - US Magnesium Facility, Revision C. Figure 1-1.

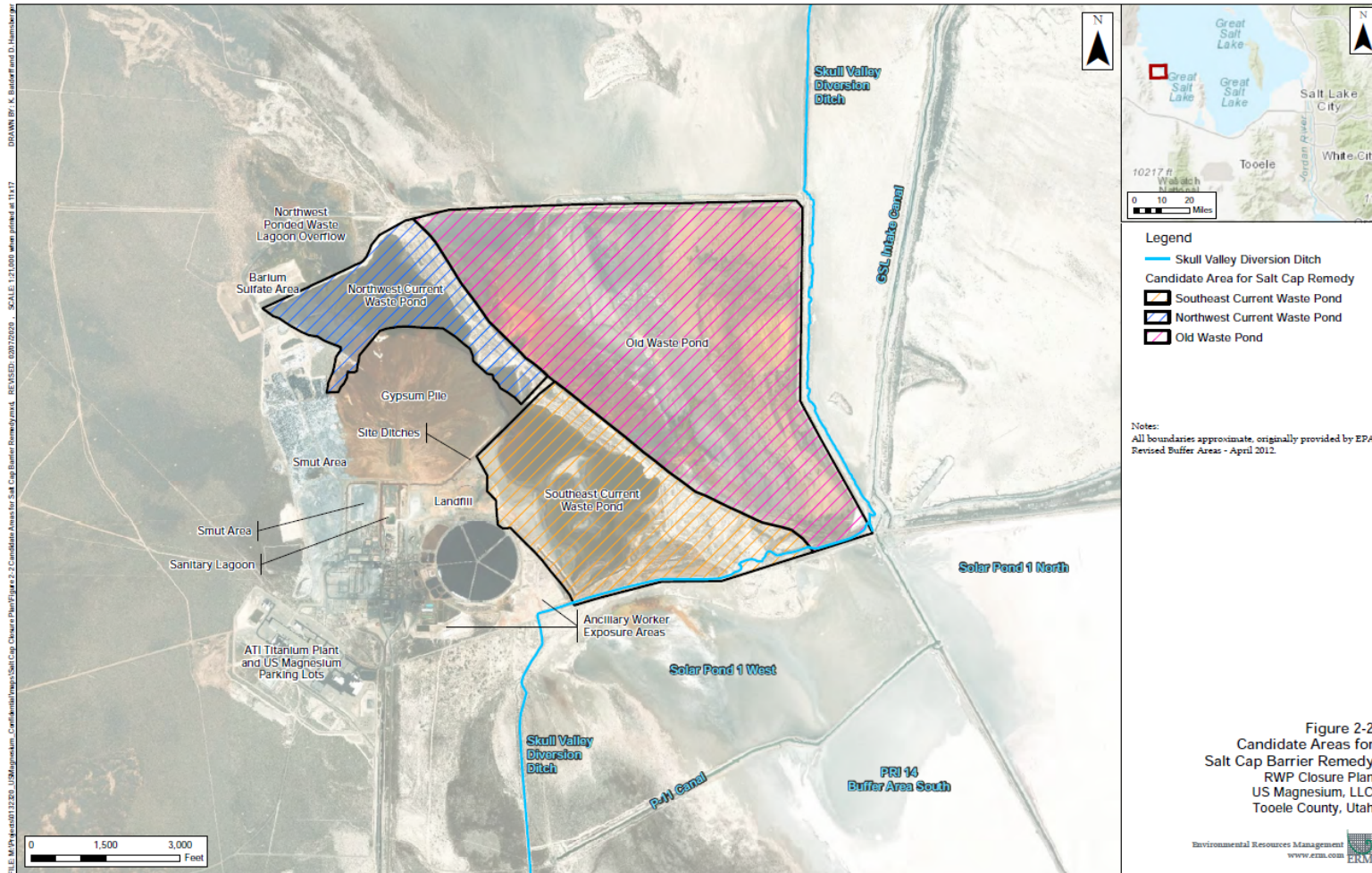
**Figure 2**  
**US Magnesium Water Balance Conceptual Model**



**Figure 2. Water Balance Conceptual Model**

From: Stantec. March 3, 2020. Retrofitted Waste Pond Phase 1 Basis of Design Report - US Magnesium Facility, Revision C. Appendix A, Figure 2.

**Figure 3**  
**Old and Current Waste Pond**



**From: ERM. February 7, 2020. Closure Plan for the Retrofitted Waste Pond - US Magnesium Site. Figure 2-2.**

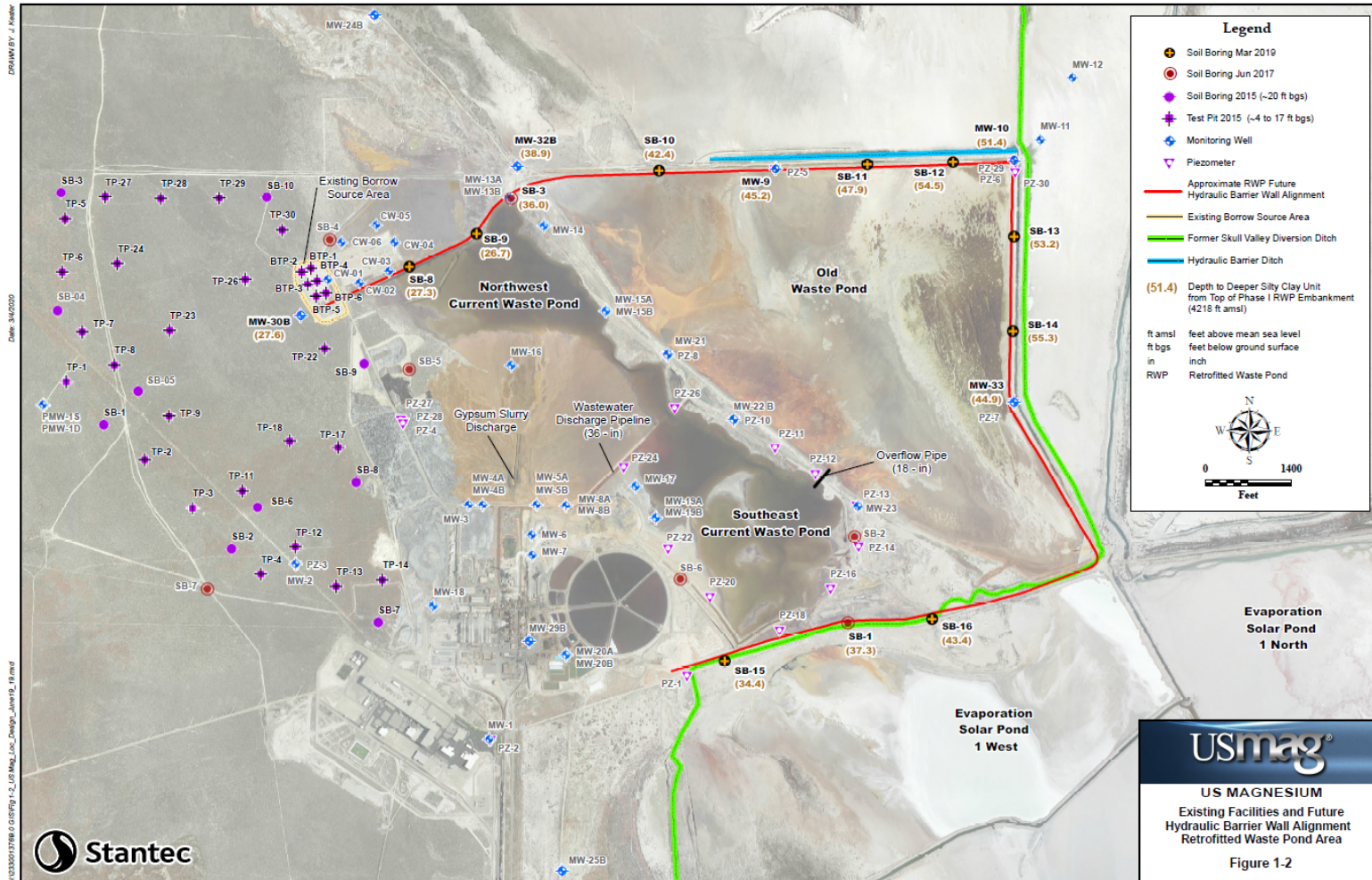


**Figure 4**  
**Overflow Pipe into Old Waste Pond**



From: C. Shope photographs.

**Figure 5**  
**Extent of Proposed Retrofit Waste Pond**



From: Stantec. March 3, 2020. Retrofitted Waste Pond Phase 1 Basis of Design Report - US Magnesium Facility, Revision C. Figure 1-2.