

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. _____

WASTE DISCHARGE REQUIREMENTS
FOR
HOWARD ESTATE AND UNIMIN CORPORATION
UNIMIN CORPORATION IONE PLANT
TAILINGS IMPOUNDMENTS
AMADOR COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Water Board) finds that:

1. Unimin Corporation operates a silica sand and clay mining operation near Ione. The Howard Estate owns the property on which the mine is located. Unimin Corporation and Howard Estate are hereafter jointly Discharger. The facility was previously regulated by Waste Discharge Requirements (WDRs) Order No. 5-01-169.
2. The facility has been in continuous operation since 1955. WDRs Order No. 5-01-169 required the first groundwater monitoring at the site. The Discharger's groundwater monitoring analytical results detected waste constituents in groundwater that degraded waters of the state. Based on these results, the facility will be regulated under the requirements in Title 27, California Code of Regulations. On 26 January 2007, the Discharger submitted a Report of Waste Discharge in response to staff's request and in compliance with Title 27. These WDRs classify untreated mining waste as Group B and require treatment and management to achieve Group C classification and to protect water quality.
3. The Discharger's Ione Plant is about two miles south of Ione on State Highway 124. The facility is in Sections 35 and 36, T6N, R9E, and Sections 1 and 2, T5N, R9E, MDB&M, as shown on Attachment A, which is incorporated herein and made a part of this order. The facility is on Assessor's Parcel Numbers 05-130-012, -033, -034 and -051, 05-150-007 and -008, 05-160-003, -004, -009, -010, -012, -014 and -015, and 05-190-021.
4. The Discharger extracts silica sand and white clay from the Ione Formation by open pit mining. The mining operation produces two grades of fine to medium grained silica sand, an unoxidized pyrite and lignite bearing sand and an oxidized iron oxide and iron carbonate sand. The sand is used by the glass industry. White clay is currently discharged as part of the tailings, in the future some white clay may be sold as product. The mine has been in continuous operation since 1955. Unimin has operated the facility since July 2000.

5. The facility uses previously mined, unlined excavations for tailings ponds and a storm water retention pond. The ponds and mine units are shown on Attachment B, which is incorporated herein and made part of this order. The status of current and former mine units is summarized below:

Mine Unit	Status
Ponds I and K	Active Tailings Ponds
Ponds J and J-1	Storm water Retention Ponds
Mill and Lime Ponds	Process makeup water
Ponds C, D, F and G	Reclaimed and closed
Ponds H, H+ and Area F	Previously closed

6. Pond F is ready to be reclaimed. Pond H and Pond H+, which will be used for the storage of thickener reject sand, has been partially reclaimed. The reject sand may be sold offsite as fill or used for onsite reclamation.
7. Currently, mining is taking place in the South Pit. Approximately 60 to 125 feet of overburden is stripped off to expose the lower lone sand layer. Overburden is stockpiled for use in pond embankments; reclamation activities and mine pit backfill. The lone sand is mined to either to the pre-lone sand or to the laterite layer developed on greenstone bedrock.
8. Mined out pits are backfilled with clay and silt rejects, float rejects, wet screen rejects and overburden fill. The mining rate is dependent on mining yield, annual sales demand and plant capacity. Mining is done with a dozer-slurry transport mining system.
9. Excavated clay-sand ore is mixed with water to produce slurry for processing. The slurry is passed through a series of screens to remove oversize material. Then the clay and silt are removed. Sand is extracted from the slurry for wet processing with a double flotation process. The first flotation removes aluminum silicates and refractory heavy minerals; the second flotation removes the desirable quartz sand from undesirable iron minerals. The quartz sand is drained in an outdoor stockpile; fed to a gas-fired dryer; and further processed by dry screening and magnetic separation.

10. A sand concentrate may be produced periodically and stockpiled on site for later re-processing, sale or use onsite as fill.

11. The following chemical products are used for ore processing:

Chemical	Est. Concentration at 12.6 mgd discharge
Hydrochloric Acid (HCL)	4.2 mg/l
Tallow diamine	3.9 mg/l
Tall-Oil Fatty Acid	50.4 mg/l
Sodium dodecylbenzene sulfonate, ethylene oxide and non ionic detergent blend	2.9 mg/l
Sodium Hydroxide (NaOH)	Variable
Lime	Variable
Magnesium hydroxide	Variable
Calcium carbonate	Variable
Anionic flocculent (proposed)	Variable
Cationic flocculent (proposed)	Variable

12. Currently, the facility discharges up to 3,300 and averages 2,200 tons per day of solid wastes and about 12.6 million gallons per day (mgd) of process water to the tailings ponds. Much of the water is re-circulated through the plant in a closed loop process.

13. The Discharger currently discharges tailings to Ponds I and K with an estimated capacity of 2,342 acre-feet. When the dewatering process becomes operational the Discharger will operate a single smaller tailings pond. After dewatering, the return water will be discharged to the Mill Pond for reuse. Raw water, supplied by Amador Water Agency, is currently added to the Mill Pond to replace water lost to processing and evaporation. In the future, on approval of the Executive Officer, the Amador Water Agency may replace all or part of the raw water supply with disinfected tertiary recycled water.

14. The Discharger submitted a water balance that indicated the pond system has the capacity to hold precipitation for the average annual rainfall.

15. Ione Minerals, an adjacent facility, may withdraw up to 1,000 gpm from the Mill Pond for clay processing.

WASTE CLASSIFICATION

16. The facility waste stream consists of solid tailings waste mixed with water discharged to unlined impoundments. The following summarizes water quality data from testing of the tailing solids, water in the tailings pond, process water from the Mill Pond and groundwater from upgradient monitoring wells.

Table 1. Waste Classification Data

Constituent	Tailings Solids ⁽¹⁾	Tailings Pond ⁽²⁾	Mill Pond ⁽³⁾	Background Groundwater ⁽⁴⁾	Water Quality Goals ⁽⁵⁾
pH (units)	4.4	3.9	5.6	5.8	6.5 – 8.5
Aluminum (ppb)	1,080	11,000	na	9,200	600
Lead (ppb)	na	60	na	42	15
Nickel (ppb)	113	72	na	25	100
Sodium (ppb)	6,180	187,000	200,000	60,500	20,000
Sulfate (ppb)	55,500	520,000	500,000	172,000	500,000

⁽¹⁾ Leachable concentrations from tailings solids extracted using the USGS Field Leach test protocol (roughly equivalent to the California DI WET test).

⁽²⁾ Average concentrations from water in the tailings Pond G, collected between 2002-04.

⁽³⁾ Concentrations from a single sampling event of process water in the Mill Pond.

⁽⁴⁾ Average concentrations in groundwater collected from upgradient monitor wells between 2002-04.

⁽⁵⁾ From Marshack, "A Compilation of Water Quality Goals".

17. Leachable concentrations from tailings solids exceed water quality goals for aluminum, iron, lead, and sodium. The pH is below the water quality goal. The leachate exceeds background groundwater concentrations for nickel.

18. The water in the tailings ponds exceeds water quality goals and background groundwater concentrations for aluminum, lead, and sodium. Tailings pond pH is below the water quality goal.

19. The Discharger proposes to dewater and discharge future tailings as a paste like material containing 40 to 60% solids. Pilot testing indicates that dewatered tailings

will consolidate 33% and will have a final hydraulic conductivity of approximately 10^{-7} cm-sec. The discharge locations will change every two weeks to allow the tailings to consolidate between successive discharge events. Dewatering will eliminate the need for settling ponds.

20. Title 27 of the California Code of Regulations (CCR) Section 22480(b)(2)(B) states in part the following: "...**Group B** — mining waste of Group B are: "...mining wastes that consist of or contain nonhazardous soluble pollutants of concentrations which exceed water quality objectives for, or could cause, degradation of waters of the state..." Therefore, the untreated tailings solids and leachate are classified as Group B mining waste stream.
21. Title 27 (CCR) Sections 22480 (c)(3) and (d) state respectively: "**Classification Considerations** — In reaching decisions regarding classification of a mining waste as a Group B or Group C waste, the RWQCB can consider the following: ... (3) whether, because of its intrinsic properties, the waste is readily containable by less stringent measures."; and "(d)**Treatment** — Mining waste shall be treated or neutralized whenever feasible to minimize the threat to water quality and minimize the need to install waste containment structures." Therefore, because the dewatered tailings have a very low hydraulic conductivity and groundwater impacts from previous operations have not migrated beyond the immediate proximity of the tailings impoundments the Board finds that dewatered tailings are classified Group C mining waste.

GROUNDWATER DEGRADATION

22. Groundwater immediately downgradient of the Mill Pond (process water), former Ponds G and F (tailings), and Pond J (storm water) contain concentrations of TDS, sulfate, chloride, sodium, aluminum and iron greater than background. The following Table is a summary of groundwater impacts associated with current or former ponds:

Table 2. Groundwater Impacts

Constituent	MW-J ⁽¹⁾ (Background) (mg/l)	MW-E ⁽²⁾ (Mill) (mg/l)	MW-F ⁽³⁾ (Pond G) (mg/l)	MW-G ⁽⁴⁾ (Pond F) (mg/l)	MW-I ⁽⁶⁾ (Storm water) (mg/l)
TDS	296	766	1,431	1,224	661
Sulfate	122	505	1,039	821	75
Chloride	25	58	32	33	223
Sodium	30	95	94	138	68.3
Aluminum	4.6	10	13	11.1	12
Iron	11	34	34	26	29

- (1) MW-J is an upgradient well representative of background groundwater conditions.
- (2) MW-E is immediately downgradient of the Mill Pond.
- (3) MW-F is immediately downgradient of Pond G.
- (4) MW-G is immediately downgradient of Pond F.
- (5) MW-I is immediately downgradient of Pond J and J-1.

37. Groundwater immediately downgradient from process water pond, tailings ponds and storm water pond is impacted with increased concentrations of TDS, sulfate, sodium and iron. Because of the low hydraulic conductivity of the lone formation, groundwater impacts appear to be confined to the area immediately adjacent to the ponds.

CORRECTIVE ACTION

38. Because of the low hydraulic conductivity of the lone Formation and fine grain nature of tailing, closing the former tailings impoundments in compliance with the approved Reclamation Plan is considered sufficient to prevent further migration of leachate from these units to groundwater.

39. The Discharger has proposed changes to tailings handling protocols (dewatering of tailings) to reduce the threat to groundwater quality.

DESIGN OF WASTE MANAGEMENT UNITS

40. Title 27 §22480(c) states: “Mining waste shall be treated or neutralized whenever feasible to minimize the threat to water quality and minimize the need to install waste containment structures.” The Discharger proposes to treat their Group B Mine Waste tailings by dewatering the tailings and discharge a paste with approximately 40 to 60% solids. The treated tailings are classified Group C mining waste and will be discharged into an unlined impoundment. The tailings will be deposited in thin layers to allow rapid loss of excess water and consolidation. Pilot tests indicate that dewatered tailings will consolidate by 33% in two weeks and have an approximate hydraulic conductivity of 10^{-7} cm/sec. Clarified water from the dewatering process will be discharged to the Mill Pond for reuse.
41. Section 13360(a)(1) of the California Water Code allows the Regional Board to specify the design, type of construction, and/or particular manner in which compliance must be met in waste discharge requirements or orders for the discharge of waste at solid waste disposal facilities.
42. The Discharger proposes a treatment and disposal method to prevent migration of wastes from the Unit to adjacent natural geologic materials, groundwater, or surface water during disposal operations, closure, and the postclosure maintenance period in accordance with the criteria set forth in Title 27. The dewatered tailings will contain little free draining water and after consolidation the dewatered tailings will have a hydraulic conductivity equivalent to an engineered clay liner. Because of these properties the de-watered tailings are classified Group C mining waste and may be discharged to an unlined tailings facility. Installation of a prescriptive liner would be an unnecessary expense and would not effectively protect water quality better than the Discharger’s plan to treat the tailings by dewatering. The Discharger has demonstrated that the proposed treatment alternative is consistent with the performance goals of for Group C mining waste.

SITE DESCRIPTION

23. The measured hydraulic conductivity of the native soils underlying the site ranges between 1.4×10^{-6} and 8.1×10^{-6} cm/sec.
24. Land uses within 1,000 feet of the facility are ranching and mining.
25. There are seven domestic, industrial, or agricultural groundwater supply wells within one mile of the site.
26. The facility receives an average annual precipitation of 22 inches and an average annual pan evaporation of 59.88 inches as measured at the Camp Pardee Station (weather station #041428).

27. The 100-year, 24-hour precipitation event is estimated to be 4.32 inches, based on Department of Water Resources' Engineering Meteorology website Rainfall Depth-Duration-Frequency Table for Ione, updated to include data through 2000.
28. The facility is not within a 100-year flood plain based on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map.

SURFACE AND GROUND WATER CONDITIONS

29. The Water Quality Control Plan for the Sacramento River and San Joaquin River Basin, Fourth Edition (hereafter Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin.
30. Surface drainage is toward Dry Creek in the Sutter Creek Hydrologic Area (531.11) of the San Joaquin River Basin. Dry Creek drains to the Mokelumne River, which drains to the San Joaquin River.
31. The designated beneficial uses of the Mokelumne River - Camanche Reservoir to Delta, as specified in the Basin Plan, are irrigation, stock watering, contact and non-contact water recreation, warm and cold freshwater habitat, warm and cold migration, warm and cold spawning, and wildlife habitat.
32. However, the hydrogeology report demonstrates that the lower Ione formation is a low yield aquifer and any groundwater impacts will migrate very slowly from the source.
33. The first encountered groundwater in the Ione Formation ranges from approximately 41 to 54 feet below the native ground surface. Groundwater is unconfined and groundwater elevations range from 190 to 350 feet above mean sea level (msl). The depth to groundwater fluctuates seasonally as much as 4 feet.
34. Monitoring data indicates background groundwater quality has total dissolved solids (TDS) concentrations ranging between 217 and 440 mg/l with a mean of 296 mg/l.
35. The direction of groundwater flow is toward the south southwest. The average groundwater gradient is about 0.0344 feet per foot. The average groundwater velocity is 1.1 feet per year.
36. The designated beneficial uses of the groundwater, as specified in the Basin Plan, are domestic and municipal, agricultural, and industrial supply.

GROUNDWATER AND IMPOUNDMENT MONITORING

37. The Discharger proposes the following as a detection groundwater monitoring system: background wells – MW-N and J; lone Formation monitor wells – MW-A, -B, -E, -I, -K, -P, and -Q; and pre-lone Formation monitor wells – MW-L and -M. MW-P and -Q are planned wells not yet installed. Additional wells may be added in the future as needed.
38. The impoundment monitoring system consists of those ponds that contain process water at the time of the sampling event.
39. The Discharger's detection monitoring programs for groundwater and surface water satisfy the requirements contained in Title 27.

FINANCIAL ASSURANCES

43. Title 27 CCR Section 22510(g) states the following: ***“Alternate Financial Assurance — If a lead agency acting under the authority of §2774(a) of the Public Resources Code requires assurances of financial responsibility, these assurances can be used to fulfill all comparable requirements under ¶(f), provided that: (1) the RWQCB approves the assurance; and (2) the RWQCB is named as alternate payee.”*** The Discharger may utilize Financial Assurances established in compliance with SMARA to cover a part of their Financial Assurance requirement and establish a separate, second Financial Assurance to fulfill any remaining requirements.

CEQA AND OTHER CONSIDERATIONS

44. The action to revise waste discharge requirements for this existing facility is exempt from the provisions of the California Environmental Quality Act (CEQA), Public Resource Code §21000, et seq., and the CEQA guidelines, in accordance with Title 14, CCR, §15301.
45. This order implements:
- a. The Water Quality Control Plan for the Sacramento River and San Joaquin River Basin, Fourth Edition and
 - b. The prescriptive standards and performance goals of Title 27 of the California Code of Regulations, effective 18 July 1997, and subsequent revisions.
46. Section 13267 of the California Water Code states, in part, “(a) A regional board, in establishing...waste discharge requirements... may investigate the quality of any waters of the state within its region” and “(b) (1) In conducting an investigation..., the

regional board may require that any person who has discharged, discharges, or is suspected of discharging, or who proposes to discharge within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of discharging, or who proposes to discharge waste outside of its region that could affect the quality of waters of the state within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring these reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify evidence that supports requiring the person to provide the reports.”

47. The technical reports required by this Order and the attached Monitoring and Reporting Program are necessary to assure compliance with these waste discharge requirements. The Discharger is responsible for the discharges of waste at the facility subject to this Order and is, therefore, subject to CWC Section 13267(b).

PROCEDURAL REQUIREMENTS

48. All local agencies with jurisdiction to regulate land use, solid waste disposal, air pollution, and to protect public health have approved the use of this site for the discharges of waste to land stated herein.
49. The Regional Water Board notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge, and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.
50. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.
51. Any person adversely affected by this action of the Regional Water Board may petition the State Water Resources Control Board to review the action. The petition must be received by the State Water Resources Control Board within 30 days of the date of issuance of this Order. Copies of the law and regulations applicable to filing the petition will be provided on request.

IT IS HEREBY ORDERED pursuant to Sections 13263 and 13267 of the California Water Code, Order No. 5-01-169 is rescinded, and that the Howard Estate and Unimin Corporation, their agents, successors, and assigns, in order to meet the provisions of Division 7 of the California Water Code and the regulations adopted thereunder, shall comply with the following:

A. PROHIBITIONS

1. The discharge of 'hazardous waste' at this facility is prohibited. For the purposes of this Order, the terms 'hazardous waste' and 'designated waste' are as defined in Division 2 of Title 27 of the CCR.
2. The discharge of solid waste or liquid waste to surface waters, surface water drainage courses, or groundwater is prohibited.
3. The discharge of wastes outside of a tailings impoundment or portions of a waste management unit specifically designed for their containment is prohibited.
4. The discharge of any wastes other than mining wastes is prohibited.

B. DISCHARGE SPECIFICATIONS

General Specifications

1. Mine tailings shall only be discharged into, and shall be confined to tailings impoundments specifically designed for their containment.
2. Sand concentrate may be temporarily stored within the footprint of the former reclaimed tailings ponds.

Protection From Storm Events

3. Tailings impoundments shall be designed, constructed and operated to prevent inundation or washout due to flooding events with a 100-year return period.
4. Precipitation and drainage control systems shall be designed, constructed and maintained to accommodate the anticipated volume of precipitation and peak flows from surface runoff under 100-year, 24-hour precipitation conditions.
5. Annually, prior to the anticipated rainy season, any necessary erosion control measures shall be implemented, and any necessary construction, maintenance, or repairs of precipitation and drainage control facilities shall be completed to prevent erosion or flooding of the site.

Tailings Impoundments

6. After 31 October 2010, the discharger shall discharge only dewatered tailings as described in Finding 13 to the unlined tailings impoundments. The tailings when

discharged shall range from 40 to 60% solids and after consolidation shall achieve an average hydraulic conductivity of 10^{-6} cm/sec or less.

7. The closure of each tailings impoundment shall be under the direct supervision of a California registered civil engineer or certified engineering geologist.
8. Tailings impoundments shall be closed and maintained in compliance with the approved reclamation plan.

C. RECEIVING WATER LIMITATIONS

Water Quality Protection Standards

The concentrations of Constituents of Concern in waters passing through the Points of Compliance shall not exceed the Concentration Limits established pursuant to Monitoring and Reporting Program No. R5-_____-_____, which is attached to and made part of this Order.

D. FINANCIAL ASSURANCE

1. The Discharger shall demonstrate financial responsibility for closure and post-closure maintenance, and shall submit a report of financial assurances by **April 30th each year** for Executive Officer review and approval. The assurances of financial responsibility shall provide that funds for closure and post-closure maintenance shall be available to the Regional Water Board upon the issuance of any order under California Water Code, Division 7, Chapter 5. The Discharger shall adjust the cost annually to account for inflation and any changes in facility design, construction, or operation.
2. By 30 April 2009, the Discharger shall submit for Regional Water Board approval an assessment of their financial assurance amounts and mechanisms. If the facility SMARA financial assurance is to be used to satisfy part of the obligation, the Discharger shall submit proof that the Regional Water Board has been added as an alternate payee.

E. PROVISIONS

1. The Discharger shall comply with the Standard Provisions and Reporting Requirements, for Discharges of Mining Wastes dated February 2009, which are hereby incorporated into this Order. The Standard Provisions and Reporting Requirements contain important provisions and requirements with which the Discharger must comply. A violation of any of the Standard Provisions and Reporting Requirements is a violation of these waste discharge

requirements.

2. The Discharger shall comply with Monitoring and Reporting Program No. - _____, which is attached to and made part of this Order. This compliance includes, but is not limited to, maintenance of waste containment facilities and precipitation and drainage controls and monitoring groundwater, the unsaturated zone, and surface waters throughout the active life of the waste management units and the post-closure maintenance period. A violation of Monitoring and Reporting Program No. _____ is a violation of these waste discharge requirements.
3. The Discharger shall provide proof to the Regional Water Board **within sixty days after completing final closure** that the deed to the tailings impoundment facility property, or some other instrument that is normally examined during title search, has been modified to include, in perpetuity, a notation to any potential purchaser of the property that the parcel has been used for disposal of mining wastes.
4. The Regional Water Board will review this Order periodically and may revise requirements when necessary.

F. REPORTING REQUIREMENTS

1. The Discharger shall comply with the reporting requirements specified in this Order, in Monitoring and Reporting Program Order No. _____ and in the Standard Provisions and Reporting Requirements for Discharges of Mining Wastes dated February 2009.
2. By **1 July 2009**, the Discharger shall submit a Water Quality Protection Standard Report. The report shall incorporate all water quality data collected prior to June 2009 and shall propose water quality protection standards for each monitor point to detect evidence of future releases.
3. By **31 October 2010**, the Discharger shall revise their tailings waste handling procedures to discharge only dewatered tailings to unlined impoundments.
4. In the event of any change in ownership of this waste management facility, the Discharger shall notify the succeeding owner or operator in writing of the existence of this Order. A copy of that notification shall be sent to the Regional Board.

WASTE DISCHARGE REQUIREMENTS ORDER NO. _____
HOWARD ESTATE AND UNIMIN CORP.
UNIMIN CORP. IONE PLANT
TAILINGS IMPOUNDMENTS
AMADOR COUNTY

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I, Pamela Creedon, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on _____.

PAMELA CREEDON, Executive Officer

Attachments