

November 1, 2021

Project No. 123-93309-10

Kevin O'Hara

Ohio Environmental Protection Agency
Division of Environmental Response and Revitalization
Southeast District Office
2195 Front Street
Logan, OH 43138

**WORKPLAN FOR DECOMMISSIONING MONITORING WELL RBH-02
SATRALLOY SITE (JEFFERSON COUNTY, OHIO)**

Dear Mr. O'Hara:

On behalf of Cyprus Amax Minerals Company (CAMC), Golder is submitting this workplan for the decommissioning of Monitoring Well RBH-02. The purpose of this well, combined with RBH-01 and RBH-03, was to vertically profile bedrock at the Site as described in the Draft Remedial Investigation Report (RI Report) submitted (June 28, 2021). Because the well is located on property not owned by CAMC and can no longer be accessed, RBH-02 will be decommissioned.

1.0 SCOPE OF WORK

1.1 Well Decommissioning

RBH-02 will be decommissioned in accordance with the OEPA Division of Drinking and Ground Waters Technical Guidance Manual (TGM) for Hydrogeologic Investigations and Ground Water Monitoring, Chapter 9, Sealing Boreholes and Decommissioned Monitoring Wells (September 2016). RBH-02 was drilled and constructed by Golder in October 2013, as described in the Draft RI Report (June 2021). A copy of the drilling log and well construction log is provided in Attachment 1. The well is constructed with one 4.5' vertically screened interval in a single aquifer with solid casing and a pressure grouted annulus from approximately 182 feet below ground to the surface. Well construction was visually observed on June 30, 2021 and found to be in good condition.

RBH-02 will be sealed in-place as follows:

- The PVC well casing will be pressure grouted using a pump and tremie tube (i.e., from the bottom up) to approximately 20 feet below ground surface.
- After the grout is set according to the manufacturer recommendations, the upper 20 feet of the unconsolidated and weathered bedrock original borehole will be over drilled with 10-inch diameter sonic casing, shallow PVC well casing removed, and the borehole backfilled with a cement/bentonite grout. All surface elements (bollards, concrete, etc.), will be removed.

- The ground surface will be graded with existing surface materials.

1.2 Report

A Golder geologist will monitor well decommissioning and prepare a letter report summarizing the work. This report will include:

- Photo documentation.
- A copy of the well decommissioning report prepared by the driller for submittal to the Ohio Department of Natural Resources.

2.0 CLOSING

We request your expedited review of this workplan in order to ensure the timely initiation of well decommissioning scheduled to begin the week of November 8, 2021. If you have any questions, please contact Barbara Nielsen at (480) 313-2895.

Sincerely yours,

Golder Associates Inc.



Lee K. Holder, PE

Associate Engineer, Project Manager

LKH/ND/sb

Attachments: Attachment 1: Record of Borehole (RBH-2)

cc: Barbara Nielsen, Cyprus Amax Minerals Company

[https://golderassociates.sharepoint.com/sites/143623/project files/5 technical work/130 - work plan/final/satralloy-1-rev0-rbh-2 decommissioning plan phase 2_110121.docx](https://golderassociates.sharepoint.com/sites/143623/project%20files/5%20technical%20work/130%20-%20work%20plan/final/satralloy-1-rev0-rbh-2%20decommissioning%20plan%20phase%202_110121.docx)

ATTACHMENT 1

Record of Borehole (RBH-2)

DEPTH SOIL DRILL: 20
DEPTH ROCK CORE: 200
TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

RBH-2

PROJECT: Satralloy
PROJECT NUMBER: 12393309
PHASE: RBH
LOCATION: Mid-way up ridge
CLIENT: Cyprus Amax Minerals Company
AZIMUTH: n/a INCLINATION: -90

RECORD OF BOREHOLE RBH-2

DATUM: OH St. PL. North
NORTHING: N: 240,816.60
EASTING: E: 2,477,934.00
GS ELEVATION: 992.23
TOC ELEVATION: 994.9

SHEET 2 of 10
START DATE/TIME: 10/29/2013 / 13:30
END DATE/TIME: 11/07/2013 / 16:30
WEATHER: 40Deg F Partly cloudy
DEPTH SOIL DRILL: 20
DEPTH ROCK CORE: 200
TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

DEPTH (ft)	DRILL METHOD	ROCK TYPE		GRAPHIC LOG	J-Fault F-Fault B-Bedding FI												FO-Foliation PL-Planar C-Curved U-Undulating												ST-Stepped I-Irregular P-Polished K-Slickensided												SM-Smooth R-Rough VR-V Rough FR-Fracture												CA-Calcite CL-Clay CT-Contact RD-Redrilled Fe-Iron Oxides												LABORATORY TEST AND DRILLING NOTES	DOWNHOLE HYDROLOGY		WELL CONSTRUCTION AND WATER LEVELS RBH-2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		DESCRIPTION	ELEV. DEPTH (ft)		RUN NO.	CORE RECOVERY	ROD % 80 60 40 20	FRAC- TURES PER FOOT	DISCONTINUITY DATA	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	ISRM W3 WEATHERING INDEX	ISRM R4 STRENGTH INDEX	GAMMA LOG	TEST NOTES	TEST RESULTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
20	Rock Core	20.0 - 22.2 Slightly weathered, thickly laminated, olive, very fine-grained, weak to medium strong, SANDSTONE/SILTSTONE, with iron stained bedding (assumed core loss)	20.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						

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DEPTH SCALE: 1 in to 2.5 ft
DRILLING CONTRACTOR: Sonic Drilling Services
DRILLER: Dave S.

LOGGED: D. Regalbuto
CHECKED: J. Nasrallah
CHECKED DATE: 8/29/2016

RBH-2

DATUM: OH St. PL. North
NORTHING: N: 240,816.60
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GS ELEVATION: 992.23
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TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

[illegible]

SATRA-ROCK+LAB+WLAB+WELL+HYDROTEST LOGS WIP.10.21.2016.GPJ DUL.GOLDER.GDT 10/27/16



DEPTH SCALE: 1 in to 2.5 ft
 DRILLING CONTRACTOR: Sonic Drilling Services
 DRILLER: Dave S.

LOGGED: D. Regalbuto
CHECKED: J. Nasrallah
CHECKED DATE: 8/29/2016

RBH-2

PROJECT: Satralloy
PROJECT NUMBER: 12393309
PHASE: RBH
LOCATION: Mid-way up ridge
CLIENT: Cyprus Amax Minerals Company
AZIMUTH: n/a INCLINATION: -90

RECORD OF BOREHOLE RBH-2

DATUM: OH St. PL. North
NORTHING: N: 240,816.60
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SHEET 4 of 10
START DATE/TIME: 10/29/2013 / 13:30
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WEATHER: 40Deg F Partly cloudy
DEPTH SOIL DRILL: 20
DEPTH ROCK CORE: 200
TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

DEPTH (ft)	DRILL METHOD	ROCK TYPE		CORRELATION										GAMMA LOG	LABORATORY TEST AND DRILLING NOTES	DOWNHOLE HYDROLOGY		WELL CONSTRUCTION AND WATER LEVELS RBH-2	
		DESCRIPTION	GRAPHIC LOG	J-Joint F-Fault B-Bedding FI		FO-Foliation PL-Planar C-Curved U-Undulating		ST-Stepped I-Irregular P-Polished K-Slickensided		SM-Smooth R-Rough VR-V. Rough Fr-Fracture		CA-Calcite CL-Clay CT-Contact RD-Redrilled Fe-Iron Oxides				TEST NOTES	TEST RESULTS		
				ELEV. DEPTH (ft)	RUN NO.	CORE RECOVERY	RQD %	FRACTURES PER FOOT	DISCONTINUITY DATA	ISRM WEATHERING INDEX	ISRM STRENGTH INDEX								
60	Rock Core	60.0 - 68.0 SHALE/MUDSTONE, as above, weak from 60-61, then fresh surface medium strong to 68 ft, no indication of natural fracturing			5	6.70 8.20													
65																			
		68.0 - 70.0 Fresh, thickly bedded, light gray, strong, LIMESTONE, micritic, reacts with HCL		924.2 68.0	6	1.20 1.80													
70		70.0 - 71.5 Inferred core loss		922.2 70.0															
		71.5 - 77.5 SHALE/MUDSTONE, as above, from 61'-68', becoming laminated to thinly bedded below 75', no fractures. Texture becomes increasingly silty with few rip-up mud clasts below 76.5'		920.7 71.5															
75					7	8.50 10.00													

SATRA-ROCK+LAB+WL+LAB+WELL+HYDROTEST LOGS WIP: 10.21.2016.GPJ DUL GOLDER.GDT 10/27/16



DEPTH SCALE: 1 in to 2.5 ft
DRILLING CONTRACTOR: Sonic Drilling Services
DRILLER: Dave S.

LOGGED: D. Regalbutto
CHECKED: J. Nasrallah
CHECKED DATE: 8/29/2016

RBH-2

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TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

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PROJECT: Satralloy
PROJECT NUMBER: 12393309
PHASE: RBH
LOCATION: Mid-way up ridge
CLIENT: Cyprus Amax Minerals Company
AZIMUTH: n/a INCLINATION: -90

RECORD OF BOREHOLE RBH-2

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SHEET 6 of 10
START DATE/TIME: 10/29/2013 / 13:30
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DEPTH SOIL DRILL: 20
DEPTH ROCK CORE: 200
TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

DEPTH (ft)	DRILL METHOD	ROCK TYPE		DISCONTINUITY DATA										GAMMA LOG	LABORATORY TEST AND DRILLING NOTES	DOWNHOLE HYDROLOGY		WELL CONSTRUCTION AND WATER LEVELS RBH-2	
		DESCRIPTION	GRAPHIC LOG	J-Joint F-Fault B-Bedding FI		FO-Foliation PL-Planar C-Curved U-Undulating		ST-Stepped I-Irregular P-Polished K-Slickensided		SM-Smooth R-Rough VR-V. Rough Fr-Fracture		CA-Calcite CL-Clay CT-Contact RD-Reddrilled Fe-Iron Oxides				TEST NOTES	TEST RESULTS		
				ELEV.	RUN NO.	CORE RECOVERY	ROD %	FRAC- TURES PER FOOT	DISCONTINUITY DATA	GRAPHIC LOG	ISRM WEATHERING INDEX	ISRM STRENGTH INDEX							
													DEPTH (ft)						
100	Rock Core	SANDSTONE, same as above, becoming fine-grained and with fewer black streaks below 99.7', micaceous 88.7 - 106.0 Fresh, thickly laminated, massive, gray, very fine-grained, medium strong, SANDSTONE, with abundant black silty rip-up clasts from 88.7 to 90.0'. Most bedding occurs at 85-88 degrees with respect to core axis. Max 80 degrees, frequently thin black streaks below 90 degrees, micaceous, with no fractures <i>(Continued)</i>													100' stop for week, leave pressure transducer in hole overnight.				
105		SANDSTONE, same as above, with thin COAL streak at 105.1', occasional micaceous parting 106.0 - 110.0 Fresh, thickly bedded, reddish brown, medium-grained, medium strong, SANDSTONE, with sharp color change gray to reddish-brown at 105.9-106.0', with no fractures		10	10.00 10.00														
				886.2 106.0															
110		110.0 - 119.0 SANDSTONE, same as above, with thin COAL streaks becoming frequent below 111.0' (3 to 6 inch intervals) and 1/4-inch COAL at 117.3'. Streaks commonly associated with lenticular reddish brown inclusions, bedding is 85-88 degrees with respect to core axis		882.2 110.0										2 2	1 1				
115				11	9.00 10.00														
120		119.0 - 120.2 Inferred core loss		873.2 119.0															

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DEPTH SCALE: 1 in to 2.5 ft
DRILLING CONTRACTOR: Sonic Drilling Services
DRILLER: Dave S.

LOGGED: D. Regalbuto
CHECKED: J. Nasrallah
CHECKED DATE: 8/29/2016

RBH-2

PROJECT: Satralloy
PROJECT NUMBER: 12393309
PHASE: RBH
LOCATION: Mid-way up ridge
CLIENT: Cyprus Amax Minerals Company
AZIMUTH: n/a INCLINATION: -90

RECORD OF BOREHOLE RBH-2
DATUM: OH St. PL. North
NORTHING: N: 240,816.60
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SHEET 7 of 10
START DATE/TIME: 10/29/2013 / 13:30
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WEATHER: 40Deg F Partly cloudy
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DRILL RIG: 8140LC

DEPTH (ft)	DRILL METHOD	ROCK TYPE		DISCONTINUITY DATA												GAMMA LOG	LABORATORY TEST AND DRILLING NOTES	DOWNHOLE HYDROLOGY		WELL CONSTRUCTION AND WATER LEVELS RBH-2
		DESCRIPTION	GRAPHIC LOG	ELEV. DEPTH (ft)	RUN NO.	CORE RECOVERY	RQD %	FRACTURES PER FOOT	DIP W/1 CORE AXIS	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	ISRM W3 WEATHERING INDEX	ISRM R4 STRENGTH INDEX	TEST NOTES	TEST RESULTS					
120	Rock Core	120.2 - 144.4 Fresh, medium bedded, massive, light gray, fine-grained, medium strong, SANDSTONE, with minor thin COAL streaks between 122.2 and 123.6', with reddish brown lenses and coloration from 122.2-123.1'		872.0 120.2																
125				12	9.80 10.00															
130		SANDSTONE, same as above, with thin COAL streaks at 130.9 and 133.5'										2 2	1 1							
135		SANDSTONE, as above without coal streaks 135.8 to 141.0'			13	10.50 10.00														
140																				

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SATRA-ROCK+LAB+WLAB+WELL+HYDROTEST LOGS WIP: 10.21.2016 GPJ DUL GOLDER.GDT 10/27/16



DEPTH SCALE: 1 in to 2.5 ft
DRILLING CONTRACTOR: Sonic Drilling Services
DRILLER: Dave S.

LOGGED: D. Regalbutto
CHECKED: J. Nasrallah
CHECKED DATE: 8/29/2016

RBH-2

PROJECT: Satralloy
PROJECT NUMBER: 12393309
PHASE: RBH
LOCATION: Mid-way up ridge
CLIENT: Cyprus Amax Minerals Company
AZIMUTH: n/a INCLINATION: -90

RECORD OF BOREHOLE RBH-2

DATUM: OH St. PL. North
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SHEET 8 of 10
START DATE/TIME: 10/29/2013 / 13:30
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WEATHER: 40Deg F Partly cloudy
DEPTH SOIL DRILL: 20
DEPTH ROCK CORE: 200
TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

DEPTH (ft)	DRILL METHOD	ROCK TYPE		GRAPHIC LOG	CORRELATION ELEVATION: 847.8										GAMMA LOG	LABORATORY TEST AND DRILLING NOTES	DOWNHOLE HYDROLOGY		WELL CONSTRUCTION AND WATER LEVELS RBH-2
		DESCRIPTION	ELEV. DEPTH (ft)		RUN NO.	CORE RECOVERY	RQD %	FRACTURES PER FOOT	DISCONTINUITY DATA				ISRM WEATHERING INDEX	ISRM STRENGTH INDEX			TEST NOTES	TEST RESULTS	
									TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	DIP W1	W2							
140	Rock Core	120.2 - 144.4 Fresh, medium bedded, massive, light gray, fine-grained, medium strong, SANDSTONE, with minor thin COAL streaks between 122.2 and 123.6', with reddish brown lenses and coloration from 122.2-123.1' (Continued)	847.8																
			144.4	14	9.10 10.00														
145		144.4 - 167.5 Fresh, thickly bedded, gray, medium strong, SHALE, with possible bioturbation at 147.0 to 148.0'																	
150																			
155																			
160																			

Log continued on next page



DEPTH SCALE: 1 in to 2.5 ft
DRILLING CONTRACTOR: Sonic Drilling Services
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LOGGED: D. Regalbuto
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CHECKED DATE: 8/29/2016

RBH-2

PROJECT: Satralloy
PROJECT NUMBER: 12393309
PHASE: RBH
LOCATION: Mid-way up ridge
CLIENT: Cyprus Amax Minerals Company
AZIMUTH: n/a INCLINATION: -90

RECORD OF BOREHOLE RBH-2

DATUM: OH St. PL. North
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SHEET 9 of 10
START DATE/TIME: 10/29/2013 / 13:30
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TOTAL DEPTH: 200
DRILLING METHOD: Sonic
DRILL RIG: 8140LC

DEPTH (ft)	DRILL METHOD	ROCK TYPE		J-Joint F-Fault B-Bedding FI		FO-Foliation PL-Planar C-Curved U-Unfoliating		ST-Stepped I-Irregular P-Polished K-Slickensided		SM-Smooth R-Rough VR-V. Rough FR-Fracture		CA-Calcite CL-Clay CT-Contact RD-Redrilled Fe-Iron Oxides		GAMMA LOG	LABORATORY TEST AND DRILLING NOTES	DOWNHOLE HYDROLOGY		WELL CONSTRUCTION AND WATER LEVELS RBH-2
		DESCRIPTION	GRAPHIC LOG	ELEV. DEPTH (ft)	RUN NO.	CORE RECOVERY	ROD %	FRAC- TURES PER FOOT	DISCONTINUITY DATA	TYPE AND SURFACE DESCRIPTION	GRAPHIC LOG	ISRM W3 WEATHERING INDEX	ISRM R4 STRENGTH INDEX			TEST NOTES	TEST RESULTS	
160	Rock Core	144.4 - 167.5 Fresh, thickly bedded, gray, medium strong, SHALE, with possible bioturbation at 147.0 to 148.0' (Continued)																
165																		
170		167.5 - 179.9 Fresh, very thinly bedded, massive, light gray, fine-grained, medium strong, SANDSTONE, with occasional micaceous parting, with bedding 82-85 degrees with respect to core axis		824.7 167.5								2 to 2	1 to 1					
175																		
180		SANDSTONE, as above, with grayish streaks 176.0 to 178.0'																
		Log continued on next page		812.3														

SATRA-ROCK+LAB+WLAB+WELL+HYDROTEST LOGS WIP: 10.21.2016 GPJ DUL GOLDER.GDT 10/27/16



DEPTH SCALE: 1 in to 2.5 ft
DRILLING CONTRACTOR: Sonic Drilling Services
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SHEET 10 of 10
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RBH-2