



John T. Boyd Company
Mining and Geological Consultants

March 8, 2012

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New York State Department of Environmental Conservation
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Attention: Mr. Matthew Podniesinski
Chief, Resource Development Section
Bureau of Resource Management &

Development

Subject: Annual Report Review - 2011
Cayuga Mine, Cargill, Inc.
Seneca and Tompkins Counties, New York

Gentlemen:

On December 30, 2011, Mr. Matthew Podniesinski, Chief, Resource Development Section, Bureau of Resource Management & Development, Division of Mineral Resources, New York State Department of Environmental Conservation (NYSDEC), received the Annual Report¹ from Cargill Deicing Technology (Cargill). John T. Boyd Company (BOYD) received a letter² and CD from Mr. David Plumeau on February 11, 2011. This CD included electronic copies of maps as AutoCAD® files, extensometer and closure readings, and consultant reports from Rock Mechanics Assist (RMA)^{3,4,5}, RESPEC^{6,7,8,9} and Itasca¹⁰.

¹ Cargill Deicing Technology, 2011, "Annual Report for Mine File #709-3-29-0052; Cayuga Salt Mine, Permit ID#0-9999-00075-00001," from Russell Givens to Matthew Podniesinski of NY Bureau of Resource Development Section, December 27.

² Plumeau, David, 2012, untitled letter to Vincent A. Scovazzo, John T. Boyd Company, January 28.

³ Rock Mechanics Assist, 2011, an untitled Draft Report from Gary Petersen to Dave Plumeau of Cargill Deicing Technology, July 29.

⁴ Rock Mechanics Assist, 2011, an untitled letter from Gary Petersen to Dave Plumeau of Cargill Deicing Technology, April 29.

On February 15, 2006, Mr. Steven M. Potter, then Director of the NYSDEC, requested that BOYD review all documents, digital data, and annual reports received by BOYD starting with the 2006 Annual Report.

The documents were reviewed for their adherence to conditions of the Permit¹¹ and in regard to discussions held at the Cayuga Mine among NYSDEC, Cargill, and BOYD on September 15, 2011. The Cargill 2011 Annual Report is accepted; however, the report does not include the following maps as Mr. Plumeau² noted that these "... maps are not ready yet.":

- Cargill Deicing Technology, 2008, "Cayuga Mine Closure (Inches) Sep-2009," showing closure of the 6 Level as file; "Cayuga Mine Contour 2009 Closure September 2009."
- Cargill Deicing Technology, 2008, "Cayuga Mine Closure Rate (Inches/Year) Sep 2009," showing closure of the 6 Level as file; "Cayuga Mine Contour 2009 Rate September 2009."

Also, no information was included on the subsidence survey of the west shore of Cayuga Lake performed in 2011. It is BOYD's understanding that this data is being evaluated.

⁵Rock Mechanics Assist, 2011, an untitled letter from Gary Petersen to Dave Plumeau of Cargill Deicing Technology, September 23.

⁶RESPEC Engineering, 2011, "Draft – Carbonates Bedrock Strength Reduction Modeling at the Cayuga Mine," Topical Report RSI-2204 by Marc C. Loken and Sam J. Voegeli for Cargill Deicing Technology, August.

⁷RESPEC Engineering, 2011, Untitled letter by Kerry L DeVries to Russ Givens of Cargill Salt, Project File 1803, August 4.

⁸RESPEC Engineering, 2011, "Task 2: Revised Geomechanical Study of Asymmetric Mains at Cayuga Mine," External Memoranda from Marc C. Loken to David Plumeau of Cargill Deicing Technology, January 14. (Previously Reviewed)

⁹RESPEC Engineering, 2011, "Task 3: Revised Northern Reserves Mine Design Analysis," External Memoranda from Marc C. Loken to David Plumeau, January 14. (Previously Reviewed)

¹⁰ITASCA Consulting Canada, Inc., 2011, "Microseismicity Update for Sept. 2010 thru Feb. 2011, Cargill's Cayuga Mine," March.

¹¹New York State Department of Environmental Conservation, Region 7, 2007, "Permit" DEC ID 0-9999-00075, expiration December 31, 2012, December 31.

Discussion of Annual Report

The Permit has several conditions that affect the Annual Report and its review including:

Condition 4—Requires all reports required by the permit to be submitted to Region 7.

Condition 10.a.—Requires investigation into the disturbed salt zone and this investigation to be completed and submitted before mining proceeds into the area.

Condition 13.a.—Requires the Annual Report submitted by Cargill and response to 13.a. sub-conditions 1 through 8 and Condition 13.b through g. These conditions and Cargill's responses are summarized below:

Condition 13.a.1.—Requires the inclusion of the Mine Manager's signed certification that "all mining related activities...were in conformance with this permit and the approved plans, or that variances have been reported and managed."

A certification was included on page 2, section 13.a.1 which was signed by Mr. Givens, Mine Manager, on December 28, 2011. This certification notes "... that all mining activities, to the best of my knowledge, conducted during the reporting period from January 1, 2011 to present were in conformance with the DEC Permit ..."

Condition 13.a.2.—Requires "A summary of all non-routine mining incidents as defined in Special Conditions Part b. ..." Condition 13.b. defines non-routine as "incidents during mining, processing, or other mine related activities that may adversely affect mine stability, ground and surface water or other natural resources, or the health, safety, welfare or property of the general public." During a meeting held on August 17, 2004, with Cargill, NYDEC, and BOYD, it was agreed that statements will be included in the Annual Report "to point out known, encountered, or discovered geologic and geotechnical anomalies and mine action to address such anomalies."

Cargill included a statement in the Annual Report page 2, Section 13.a.2 that "[t]he Cayuga Mine is not aware of any non-routine incidents "... that would affect mine stability, ground and surface water, natural resources, and the general public. Noting that "[o]n occasion ... rock structures ... delay or hinder our mining plan." and "The Cayuga Mine continues to encounter a rock formation when mining to the east from the southern development (E-8 and E-9)." And "... mining has been temporarily suspended in the southern workings pending evaluation of atypical microseismic noises heard there during July." However, RMA⁴ reports on this non-routine mining incident that resulted in Gary Petersen's mine visit on July 28, 2011, noting "The visit was prompted by more than

usual "pops" heard in the S3 area ... at about 5:30 a.m. on July 15th These pops were heard about one to two minutes apart. Twenty-four pops were noted. Cargill decided to vacate the area and mining was suspended in the south. RMA speculates that "One likely reason for the unusual number of pops in S3 is mining is causing movement along the pre-existing fault lines." or "Another reason for the numerous pops could be because there is an active seismic linear similar to the northern linears over this area." (See seismicity discussion under Condition 13.a.4.) "Or possibly the intersection of these two features could be the reason for so much seismic activity."

RMA notes that "The worst situation would be re-activating the fault lines which might cause them to become conduits of fresh water from the lake sediments into the mine." Which, according to RMA, may require a "massive concrete bulkhead." "The second worst scenario would be if the closure rates begin to increase in the area it would require it to be backfilled ... The third worst scenario would be if the area remains seismically active and Cargill decides not to risk a Scenario 1 or 2 and permanently abandons the S3 area." RMA recommends microseismic monitoring of this area. These conditions should be discussed further between Cargill, NYDEC, and BOYD at the upcoming site meeting.

RESPEC⁷ also addressed these 'pops' noting that the southern area of the mine is typically quiet. RESPEC recommended increasing the frequency of the closure measurements to biweekly at the mine face and monthly for stations beyond two or three entries away from the faces. Also, moisture sampling is recommended to alert Cargill of water bearing structures.

If measurements show that closure rates are accelerating, abnormal microseismic events are occurring, or moisture content of the salt is high, mining should be stopped and a reassessment of mine stability is warranted.

RESPEC notes that "If the microseismic and closure data produce favorable results during the next 2 months (i.e., seismicity is relatively low and located hundreds of feet above the mine back and the closure rates are decreasing at a normal rate based on historical measurements) ..." mining can resume in the south.

RESPEC⁷ addressed mining in the vicinity where "... evidence suggests that the carbonate layer may have undergone thinning above the Northern Reserves because of lake scouring." And RESPEC modeling "...suggested that modifications to the mine design may be warranted under this 'zone of thinning carbonate' to maintain its stability."

The carbonate rock is typically 300 ft thick but in this eroded zone likely is fractured with the possibility of formation collapse due to the removal of salt beneath the carbonates.

To address this problem, RESPEC numerically modeled these conditions using a three-dimensional, finite difference code FLAC3D¹² and considered the effects of in situ stress, of reduced shale's modulus, and of reduced carbonate strength. RESPEC also examined the effect of sequential excavation.

The effects of in situ stress were previously modeled by using the stress field in the salt derived from overburden load with no time adjustment. Allowing the stress field within the salt to adjust before the model is run addresses the salts inability to maintain shear. These two models showed a difference over the short term but the difference diminishes over time as a result of salt creep. RESPEC concluded that "the inhomogeneous nature of the in situ stress state within the salt does not significantly affect the long-term creep solutions."

Models were also completed with the shale moduli reduced by 0%, 50%, 75%, and 90%. When closure within the panel is compared from models with 0% adjustment to decreased modulus of 50% and 90%, closure increased by 50% and then 300%. These results indicate that the assumed shale stiffness significantly affects panel closure.

The structural stability of the carbonates bedrock was assessed using laboratory determined parameters for the Mohr-Coulomb failure criterion. The cohesion and friction angle were reduced by 50% and 75% in the models. The models showed a 75% reduction in carbonate bedrock shear safety factor to a minimum "... greater than 1.4 through 100 years, indicating that the formation should remain structurally stable."

In addition, the panel was modeled in one-month and two-month mine advances with the panel being completed in one year. The models showed the long-term stability of the carbonates bedrock is independent of how mining is modeled. Interestingly, the models showed "... that the structural integrity of the carbonates bedrock increases at all locations ahead of the mining face and decreases above any portions of the mined panel." RESPEC recommended a stand-off distance from the 'zone of thinning carbonate' of 500 ft."

¹² Itasca Consulting Group, Inc., 2009, "FLAC3D Version 4.0".

Mr. Plumeau² notes that "The microseismic data has been processed by ESG Canada Inc. (ESG) and the results have been analyzed by Itasca Consulting Canada." (ITASCA)¹⁰ slide presentation of this analysis was reviewed. Of interest is ITASCA's Global Observations:

- "The events continue to locate along the linear features (in an XY plane), but new patterns related to the improved vertical location of the events have emerged:
 - The majority of the events are concentrating in the stiffer units (Sandstones, Dolomites, and Limestones) which are located > 700 ft above the mine and in the layers directly beneath the lake sediments; - 64% of the 3031 events are occurring in the Heldeberg (Limestones) formation.
 - Large events seem to be locating more consistently, i.e., re-occurring set of events on the Syracuse/Camillus contact.
 - Complete absence of events in the Syracuse/Salina (Salts and Dolomites), however, we are not sure if this is real or simply a system limitation (very small events in salt cannot be detected by the current system).
- As previously observed, activity increases (rate/magnitude) as mining approaches the planar features, and tends to continue to be active after mining has traversed the planar features, albeit at lower rates/magnitudes.
- Seismic parameters (Es/Ep and Moment Magnitude), along with the diurnal analyses (time of day), tend to suggest the events are related to slip along structures or contacts.
- As with previous analyses, one cluster (NW) is coincident with nearby mining, whereas the second cluster (SE) continues to be seismically active, with no accompanying mining nearby."

Condition 13.a.3.—Requires "[a]n updated Mining Plan Map depicting the current extent of mining activities, and the proposed advancement of the working face for the subsequent three years." At the August 2004 meeting, it was agreed that in addition "[a] mine map showing instrumentation location and type and shore line..." will be included in the Annual Report.

Cargill included a statement in the Annual Report, page 2, Section 13.a.3 that "The Cayuga Mine is currently operating in the northern region of the mine. The mining is located in panels U-60 and U-62 to the west and U-63 and U-65 (NW-3) to the east. Upon completion of U-60 mining will be started in U-67. The U-65 panel has turned to the Northwest and is now the NW-3 main development. This unit will be pushed north to open up future mining panels."

Mine maps as AutoCAD files were supplied by Cargill to fulfill this condition. All AutoCAD maps supplied were overlays and a base map. The base map was included as basemap with rock layer roof rock floor rock rolls.dwg, which was created on January 31, 2012 and includes a map entitled "Cayuga Mine, 6 Level Workings," by Cargill Deicing Technology. Also included on this map are roof and floor rolls as of December 31, 2011. Other maps provided are:

- The AutoCAD file: Complete Mine Overlay w Surface Subsidence.dwg, created January 30, 2012, containing Cargill Deicing Technology, undated, "Complete Mine Overlay Map, Cayuga Mine, 6 Level Workings," which shows subsidence monument locations, shore line, and the 6 Level workings.
- The AutoCAD file: ROYALTY.dwg, created January 24, 2012, containing the map Cargill Deicing Technology, 2012, "Cayuga Mine, Mine Royalty Map, 2011/2012 Fiscal Yr." January. Map shows fiscal year production areas from June 1, 1964 through December 31, 2011.
- The AutoCAD file: U40A Dust fill map.dwg, created January 30, 2012, containing an untitled map dated December 9, 2011 shows areas filled and to be filled for U-40, U-40A, and U-40B.
- The AutoCAD file: U38-U36 Dust fill map.dwg, created January 30, 2012, containing an untitled undated map shows areas filled and to be filled for U-38.
- The AutoCAD file: Basemap planning for MLRP.dwg, created January 31, 2012, containing the map Cargill Deicing Technology, 2011, "Cayuga Mine, 3 YR Mine Plan, 2011/2012 Fiscal Yr." This map shows planned expansion through fiscal year 2014 to 2015.
- The AutoCAD file: 4 Level Pond Map MLRP Version 28Nov11.Dwg, created December 21, 2011, containing the map Cargill Deicing Technology, 2012, "Cayuga Mine, 4 Level Pond Map, Updated: 28 Nov 2011," January. This map shows filled levels to January 1, 2012, and remaining potential pond area.
- AutoCAD file: 4 Level Convergence Map.dwg, created January 27, 2011. This untitled and undated map shows closure station locations.
- The AutoCAD file: 4A Level for JT Boyd.dwg, created January 27, 2011, containing undated, "4A Level Instrumentation Map." This map shows closure stations locations.
- The AutoCAD file: W1 1 Tunnel 8 Door Insp to JT Boyd.dwg, created January 31, 2012, containing undated and untitled map. This map shows extensometer locations.

- The AutoCAD file: 20 Belt Area.dwg, created January 12, 2012, containing undated map "B-20 Belt Drift Mined in 1984." This map shows extensometer locations.
- A hard copy map: undated and untitled, scale 1 in. = 50 ft and AutoCAD file; PAMELPASS.DWG, created January 31, 2012, contains the map "4 Level, Pamel Pass – 13 Belt." Map shows locations of extensometers along 13 belts.
- An untitled AutoCAD file: Screen Plant Horizontal Roof Ext.dwg, created January 31, 2012, showing map and cross-section view of installation locations of near horizontal extensometers in the roof of the screen plant gallery.
- The AutoCAD file: Screen Plant Instrumentation.dwg, created January 31, 2012, containing map undated, "Unit # 5 Screenplant," showing instrument locations in and around the screen plant gallery.
- The AutoCAD file: U31 Powder Mag 2009.dwg, created January 31, 2012, containing map undated, an untitled and undated map showing instrument locations in and around the powder magazine.
- The AutoCAD file: undated, "Current Surge Bin Instrumentation Map as of 9-09" and AutoCAD file: Surge Bin instrument Map to JT Boyd.dwg, created January 31, 2012, containing undated, "Current Surge Bin Instrumentation Map as of 9-09," showing instrument locations in and around the screen plant gallery.
- AutoCAD file: Convergence Map w-Basemap Outline 2010.dwg, created January 30, 2012,, containing the Map Cargill Deicing Technology, undated, "Cayuga Mine, 6 Level Workings, Convergence Stations," This map shows the locations of convergence stations.

The supplied maps show the extent of mining, proposed mine plan, subsidence monument locations, shorelines of both the 4 Level flooding and of Cayuga Lake, and instrument locations and movements. However, maps illustrating recorded mine closure for the reporting period were not provided. Mr. Plumeau² noted that these "... maps are not ready yet." Similar type maps received in the past were:

- Cargill Deicing Technology, 2008, "Cayuga Mine Closure (Inches) Sep-2009," showing closure of the 6 Level as file; "Cayuga Mine Contour2009 Closure Sep-2009."
- Cargill Deicing Technology, 2008, "Cayuga Mine Closure Rate (Inches/Year) Sep-2009," showing closure of the 6 Level as file; "Cayuga Mine Contour2009 Rate Sep-2009."

Condition 13.a.4.—requires the annual report to include a “summary of in situ measurements of rock mechanics required by Part f. of this Special Condition” Condition 13.f. requires the measurement and collection of in situ rock mechanics data “in accordance with the approved Mined Land Use Plan.” The data is to include “plots of relevant graphs. ...” Furthermore, “[e]xceptions to anticipated trends in rock behavior shall be noted and explained. ...”

At the August 2004 meeting, it was agreed that “[a]ll rock mechanics data” would be incorporated in the Annual Report, “including, but not limited to, all instrumentation readings and observations from the initial readings to present. Data for subsidence, closure, and extensometers are to be provided electronically. These electronic files are to include raw and processed data, graphs, and explanations of any inconsistencies and anomalous readings including reasons for abandonment, reinstallation, etc., along with applicable observation in the vicinity of the instrument such as floor heave, water inflow, etc. Future reports are to contain comment on whether, in the opinion of Cargill, the instrument readings support or conflict with prior stability models especially in areas employing new mine, panel, or main configurations.”

Cargill included a statement in the Annual Report page 3, Section 13.a.4 that “Evaluations of weekly and quarterly convergence data indicate that no unusual trends have been identified and the mine is behaving as expected, with the exception of the U-40B and U-12 areas. Since backfill placement in the U-40B area has been completed the convergence rates have slowed and are trending back toward historical rates. The U-12 panel also shows higher than normal closure near the breakthrough with SW-2 and near the U-12A sub-panel. These areas are being monitored more frequently as we try to understand why the rates are increased. Both of these areas in U-12 were backfilled during the 1990’s.”

Closure measurements can be evaluated to indicate possible instability in three ways:

1. By studying the graphs of the rate of closure over time. The shape of these graphs indicates areas of instability, areas of concern, and areas of stability. Mr. Petersen of RMA (Cargill geotechnical consultant) evaluated the closure in this manner.
2. By establishing trigger values for total closure. This method is applicable in harder, less viscous rock but is not applicable for the Cayuga Mine, as stable closure in salt will continue until the openings are closed.
3. By establishing trigger values for long-term closure rates. Since this is not being completed by the other investigators, BOYD applied such trigger rates in its evaluation of the closure readings.

Closure rate data are significant because they offered insight into the collapses and the inundation of the Retsof Mine. Sustained closure rates of 15 in. per year or less were measured in stable areas of the Retsof Mine, while in the failure areas, closure was regularly measured with sustained rates over 230 in. per year with onset of failure around 600 in. per year. Although Retsof and Cayuga mines have different overburden and material properties, in the general sense, a comparison seems warranted for a relative indicator of stability.

Mr. Plumeau² noted that "... all active stations are being read quarterly." It was also noted that, "Closure in the abandoned No. 6 level east workings was last read in October 2008 so that data is not included. It is unlikely that these stations will ever be read again due to deteriorating ground conditions."

BOYD's review of the closure stations readings for 2011, showed that none of the readings exceeded 230 in. per year. Below is a list of the 10 highest measured closure rates in 2011 for areas of recent mining defined as areas within 1,000 ft of mining that occurred in 2010 or 2011.

Top 10 Closure Rates in Areas of Recent Mining

Closure Station	Rate of Closure (in./yr)	Last Recorded Rate of Closure (in./yr)	Notes
Initial Rate	111.69	2.52	Initial Rate
Initial Rate	109.87	14.24	Initial Rate
Initial Rate	96.36	5.16	Initial Rate
Initial Rate	76.65	8.20	Initial Rate
Initial Rate	73.85	3.95	Initial Rate
Initial Rate	72.42	1.04	Initial Rate
Initial Rate	72.32	7.46	Second Rate
Initial Rate	72.17	2.46	Initial Rate
Initial Rate	71.81	2.48	Initial Rate
Initial Rate	70.81	10.34	Initial Rate

These rates are 9.45 in. per year higher than last year. All rates substantially dropped over time showing that the ground is stable or stabilizing. All 10 of these stations are located in the most northern parts of the mine with eight stations located in

the same vicinity at the extent of U-60 and U-62. Also determined are the top 10 closure rates away from mining.

Top 10 Closure Rates Away from Recent Mining

Closure Station	Rate of Closure (in./yr)	Last Recorded Rate of Closure (in./yr)	Notes
U-56PIN#5	1.68	0.53	
NW-2PIN#29	1.47	0.47	
U-12PIN#28	1.37	1.26	
NW-2PIN#41	1.32	0.56	
U-12PIN#107	1.20	1.03	
U-12PIN#32	1.20	1.16	
2-B	1.12	0.98	Backfill Area
U-40BPIN#8	1.11	0.88	Backfill Area
S-3PIN#29	1.10	0.32	
U-40BPIN#14	1.01	0.81	Backfill Area

These rates are 1.4 per year less than last year's. All rates dropped over time showing that the ground is stable. These high rate stations are clustered in three areas, U-40B (three stations) and U-12 areas (three stations) near the U-12A sub-panel, which are areas noted as having high closure by Cargill, and three stations in or close to NW-2 between rooms N3 and S4. All three of these areas have been frequently visited in the past by BOYD and NYDEC to observe condition and each time the area appears globally stable.

Mr. Plumeau² notes that "The U-40B area convergence continues to trend in a positive fashion with decreasing rates. Backfilling in the U-40 and U-40A areas have been discontinued since the available space has been filled. Back filling has moved to U-38 at this time, and will continue there for the coming 6 – 8 years." In general the closure rates throughout the mine are slowing. This indicates the mine is global stability.

In discussing U-40B, RMA⁴ also notes that "Currently the area shows signs of becoming more stable as suggested by the decreasing closure rates." RMA⁴ also notes the high closure rates in U-12 and in another document, RMA summarizes closure history in U-12 "The rates (in U12) were in a decline as SW2 advanced away from the U12 until around 2008 when rates began to increase. There was an odd spike in the rates in early 2009 and then a fall off ..., then another increase in rate in the summer of 2009, which follows the humidity trend. Recently the rates have been steadily decreasing, which is encouraging to see. The rates in the U12/U12A intersection jumped in 2009 for no apparent reason ... stations showed that the increase is pretty much limited to the

intersection of U12/U12A ... The rates appear to have peaked in 2010 and are now leveled off at just under 1.25 inches per year."

Two closure stations were monitored on 4 Level and have closure rates of 0.255 to 0.494 in. per year. Four closure stations were monitored on 4A Level and ranged from 0.111 to 0.333 in. per year. All rates from levels 4 and 4A are lower than last year.

Extensometer data was also evaluated. Extensometers were installed in various manners including vertically into the roof, at low angle (near horizontal) into the roof, and into pillars. In addition, Extensometers were installed in Levels 4 and 6. Thus, four populations exist but the number of samples for each population is too small to generate a high confidence statistic. This data is further complicated by the varying rod lengths between extensometers. Still BOYD attempted to ascertain anomalous expansion rate readings based on the mean plus one standard deviation.

Extensometer Anomalous Rates
(anomalous rates are highlighted)

Extensometer Location	Station	Rod 1, in/day	Rod 2, in/day	Rod 3, in/day
Roof – Level 6				
B-20 Belt Drift	7C	0.0007	0.0007	0.0007
B-20 Belt Drift	3C	0.0005	0.0004	0.0005
Roof Horizontal – Level ^				
Sreen Plant	1A	0.0001	0.0003	0.0003
Sreen Plant	4A	0.0000	0.0006	0.0001
	4B	0.0000	0.0000	0.0006
Pillar – Level 6				
Sreen Plant	H Pillar, Hole A	0.0003	0.0004	0.0006
Roof – Level 4				
Pamel Pass	#4	0.0003	0.0003	0.0003
Pamel Pass	#5	0.0003	0.0003	0.0003

A measurement of 0.0020 in. per day is often accepted as a convenient point in examining extensometer data, as this value is close to, but normally less than, the value required for bed separation (opening of bedding planes). Thus, none of the extensometer readings were alarming.

In the 2010 Annual Report, a series of reports as ESG, 2011, "Remote Data Processing Seismicity Report, Cayuga Mine," Kingston, Ontario, included:

- January 1 to January 31, February 7.
- February 1 to February 28, March 4.
- March 1 to March 31, April 6.
- April 1 to April 30, May 4.
- May 1 to May 31, June 3.
- June 1 to June 30, July 7.
- July 1 to July 31, August 10.
- August 1 to August 31, September 2.
- September 1 to September 30, November 2.
- October 1 to October 31, November 3.
- November 1 to November 30, December 9.
- December 1 to December 31, January 12, 2012.

These reports show that seismic events favoring a linear feature or features that extend south from U-58 to the furthest northern extent of U-40B. According to an undated slide presentation "Cayuga Mine Advanced Microseismic Analysis – Phase 3" by ESG, the seismic activities occur along coherent linearly planar zones with some features appearing to cut through each other. And that most events apparently occur at the shale-dolomite layer.

Condition 13.a.5.—requires the Annual Report include a "summary of subsidence monitoring data required by Part e. of this Special Condition." Condition 13.e. requires "[s]ubsidence monitoring shall be conducted in accordance with the approved subsidence monitoring plan contained within the approved Mine Land Use Plan." Furthermore, "[e]xceptions to the trends shall be noted and explained...". Points applicable to this condition were agreed upon at the August 2004 meeting and are noted above under Condition 13.a.4.

Mr. Plumeau² notes that "Subsidence data has been taken along the west shore during December 2011 and is being analyzed at this time. The results will be sent to you when they are ready."

Cargill included a statement in the Annual Report page 3, Section 13.a.5 that "Plans are being made to conduct subsidence surveys of the east shore line in the 2012 calendar year. Past measurements indicate that the mine is behaving as expected with no anomalous subsidence zones."

BOYD, in its 2007 annual review, examined the last presented subsidence data discussed in the 2008 Annual Report. These measurements were completed in December 2007, concluding that this data supported an option that the mine is stable.

Section 13.a.5 of the Annual Report noted that "A survey of the west shore of Cayuga lake was performed this year and the data is being evaluated now. Plans are being made to conduct subsidence surveys of the east shore line in the 2012 calendar year. Past measurements indicate that the mine is behaving as expected with no anomalous subsidence zones.."

Condition 13.a.6.—requires the inclusion of "[i]nformation regarding the source and volume of any water inflow into the mine, and the disposition of such water." At the August 2004 meeting, it was agreed that a discussion about water disposal in 4 Level would be included in the Annual Report, noting: "Updates of Level 4 filling including data on shore line advance."

Mr. Plumeau² notes that "Access to view the pond is not possible due to ground conditions. A pumping system is being installed to bring the production shaft water to the ED plant for processing. This will reduce 16 gpm of shaft water inflow to about 7 gpm (at higher concentration) for mine storage, further extending the life of the ponds. It will come on line when the shaft piping is installed.

Cargill included a statement in the Annual Report page 3, Section 13.a.6 that "The following is a list of sources and associated flow rates of water into the Cayuga Mine:

- Production Shaft (No. 1 shaft) – 16 gpm
- Ventilation Shaft (No. 2 shaft) – 4 gpm
- ED Plant Concentrate discharge – 7 gpm
- Total Water Inflow = 27 gpm

Cargill reported the total water inflow to 4 Level was 10,669,680 gallons, down from 8,894,769 gallons in 2010, the first increase in six years. With this lower inflow, Cargill estimates that 16.6 years of storage remain on 4 Level down from 2010 estimate of 21.1 years. Cargill included a 4 Level pond map, as noted above, and an Excel file, UG Pond Volume Calculation 28Nov11.xls, which was created on February 27, 2012.

Condition 13.a.7.—requires the inclusion of "[a] summary of all other monitoring data required under the terms of this permit or Department SPDES permit issued to Cargill."

Cargill included a statement in the Annual Report page 3, Section 13.a.7 that "There were two exceedances of the Chloride limit on outfall 001, in February and in July." And included a spreadsheet Outfall DMR Summary Dec 2010 - Nov 2011.xlsx created December 22, 2011 and includes information on outfall water quality including cyanide, chloride, zinc, total dissolved solids, and cooling and treatment water.

SPDES data and a discussion of this data are included in the Annual Report. This data is to be reviewed by NYSDEC.

Condition 13.c.—Addresses Mine Safety and Health Administration reporting involving non-routine mining incidents as defined in Condition 13.b. Condition 13.c. requires Cargill to submit "all correspondence with the Mine Safety and Health Administration involving non-routine mining incidents..."

Cargill includes a statement on page 4 section 13.c. of the Annual Report that "[t]he Cayuga Mine has not received any citations from MSHA regarding non-routine mining incidence." The Annual Report does not note reports or letters from MSHA concerning any non-routine mining incidents.

Condition 13.d.—Addresses reporting requirements "Prior to undertaking any material change in the approved mining methods or techniques ... Cargill shall submit to the Department a description of such modification ..." This condition does not require the reporting to occur in the Annual Report.

Cargill notes on page 4 section 13.d. of the Annual Report that, "There have been no changes to the Cayuga Mine layout in the past year."

Condition 13.g.—Addresses the reporting and recording of citizen complaints.

Cargill includes a statement on page 4 section 13.g. of the Annual Report that "[o]ne written citizen complaint has been received by Cargill concerning the Cayuga Mine. Your office was notified of this complaint on December 12, and Cargill is investigating the concerns at this time. The complainant alleges that Cargill is mining beneath his property which is outside Cargill's mineral rights area. The nearest mining to the property in question was over 4,500 feet away and was abandoned before 1975."

Site Visit

A site visit to discuss these findings with NYSDEC, Cargill, and BOYD should be arranged. Suggested area to visit in the mine is U-60 between s2 and f4 to U-62 between j2 and x2.

Discussions at this meeting should include the 'pops' heard in the southern area of the mine. Also, clarification is needed in the reporting to the NYDEC of incidents when such events may be an indicator of global mine instability.

Please contact us if you require additional information or if we may be of further service.

Respectfully submitted,

JOHN T. BOYD COMPANY

By:

A handwritten signature in black ink, appearing to read "V.A. Scovazzo", with a long horizontal flourish extending to the right.

Vincent A. Scovazzo
Director of Geotechnical Services

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