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File: 2499.004

New York State Department of Environmental Conservation  
Bureau of Resource Management & Development  
Division of Mineral Resources  
625 Broadway, Third Floor  
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Attention: Mr. Matthew Podniesinski  
Chief, Resource Development Section  
Bureau of Resource Management &  
Development

Subject: Annual Report Review - 2015  
Cayuga Mine, Cargill, Inc.  
Seneca and Tompkins Counties, New York

Gentlemen:

John T. Boyd Company (BOYD) received a CD and cover letter<sup>1</sup> from Cargill Deicing Technology (Cargill) on January 14, 2016, which was post-marked January 12, 2016. A cover letter was dated January 11, 2016. The CD included, the Annual Report<sup>2</sup>, maps as AutoCAD® or Adobe Acrobat® files, extensometer and closure readings as Excel® files, and consultant reports. Consultant reports included were from ESG, RESPEC, and Rocktec Solutions reports.

On February 15, 2006, Mr. Steven M. Potter, then the Director, Bureau of Resource Management & Development, New York State Department of Environmental Conservation (NYSDEC), requested that BOYD review all documents, digital data, and annual reports received by BOYD starting with the 2006 Annual Report.

<sup>1</sup> Plumeau, David B., 2016, untitled letter from Cargill Deicing Technology to Vincent A. Scovazzo, John T. Boyd Company, January 11.

<sup>2</sup> Cargill Deicing Technology, 2015, "Annual Report for Mine File #709-3-29-0052; Cayuga Salt Mine Permit ID#0-9999-00075-00001," with cover letter from Shawn G. Wilczynskito to Matthew Podniesinski of New York State Department of Environmental Conservation, November 24. File was created and last modified on December 1, 2015.

The recently received documents were reviewed for their adherence to conditions of the revised Permit<sup>3</sup>. §12.8 of this revised permit limit cost for review of annual reports by Consulting Services to \$15,000. For this annual review, BOYD is providing the Consulting Services. It is noted that "Funding relating to permit modifications or alterations requiring consultant review shall be not be capped due to the varying nature of potential future applications. Cargill shall fund the cost of the annual meeting/underground inspections, and will share the cost of joint inspections with American Rock Salt Co., LLC."

The Cargill 2015 Annual Report is accepted. BOYD requests the following be developed and provided:

- A map showing the 1,000 ft set back from the Frontenac Point Anomaly.
- Updated Excel file, UG Pond Volume Calculation DATE.xls. This spreadsheet was not included with the latest Annual Report.
- A prudent mine subsidence monitoring plan, which includes survey, survey frequency, data assessment, and monument installation schedules.

### **Discussion of Annual Report**

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

#### **Condition 3**

Condition 3 requires all reports required by the permit to be submitted to Region 7.

#### **Condition 9.a.**

Condition 9.a. requires investigation into the disturbed salt zone and this investigation to be completed and submitted before mining proceeds into the area. Based upon the additional seismic survey and consultant reports, Cargill will maintain the planned 1,000 ft setback around the Frontenac Point Anomaly. Further investigation shall be completed and submitted to the Department for review and approval prior to mining within this 1,000 ft buffer.

#### **Condition 9.b.**

Condition 9.b. requires investigations and reports on the adequacy of the thin rock overburden where the solid rock overburden is thinner, the glacial till and lake sediments thicken, and lake depth increases. The thin rock overburden and Frontenac Point

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<sup>3</sup> New York State Department of Environmental Conservation, Region 7, 2007, "Permit" DEC ID 0-9999-00075, expiration December 31, 2012, December 31, Modification # 1 Effective Date: November 8, 2013.

Anomaly may overlap. These Additional investigations and reports have not been performed, and mining in this area should be avoided until reviewed and approved by the NYSDEC.

In the 2015 Annual Report, a series of reports by ESG Canada Inc. and Alpha were included:

- ESG Solutions, 2015, "Remote Data Processing, Seismicity & System Health Analysis Report," prepared for Cargill Corp., covering all 12 months of 2015.
- ESG Solutions, 2015, Cayuga Mine Seismic Data Reprocessing and Analysis, Version: 1, Reference Number: 2016-0052, prepared for Cargill Corp., February 2015.

ESG reported on improvements in the velocity model. The location precision has increased from an average of 66 ft (Standard Deviation of 56 ft, excluding outliers) to 63 ft (Standard Deviation of 49 ft, excluding outliers) and data quality has improved.

The velocity model was upgraded and now contains 17 sedimentary layers with a strike of 79 degrees and a dip of 0.6 degrees. These improvements were demonstrated using wave arrival times, source location accuracy, and wider depth-range.

- ESG Solutions, 2015, Cayuga Mine North Zone – Source Parameter Analysis, Version: 2, Reference Number: 2016-0230, prepared for Cargill Corp., February 2015.

ESG reported on the North Zone spatial-temporal distribution patterns of 2014's seismic data.

Increased source  $E_s/E_p$  ratio occurred before a series of seismic events with moment magnitude greater than 0.7. Noting that "[i]nduced events with relatively high Apparent Stress were observed in seismicity clusters above U62B, U31-39 along NW1, and U34-40." and "Induced events with relatively large Source Radii were found above U62 and U40B areas." "Apparent expansion of (shear-type) induced event cluster with high  $E_s/E_p$  was observed above U62B."

"Induced event clusters appeared to have migrated toward northwest during the study period, where higher seismic strain rates were observed in the first and fourth quarters. At places in the North Zone, seismic strain accumulation patterns observed above the mine workings appeared to closely follow the tunnel geometry."

"The sudden increase in induced 'Event' rate for October – December 2014 above U62B was spatially and temporally correlated to the observed 'Blast' rate increase in the area."

- Dupee, Matt, 2015, Microseismic Data Analysis, Alpha Geoscience, Cargill Deicing Technology, November 6

Alpha reported on the temporal and spatial relationships of micro-seismic data to geologic and mining parameters finding the following correlations:

- “[A] concentration of events along the Oriskany contact;
- [A] concentration of events in the carbonate bedrock, particularly where exposed in the central trough of the lake (deepest glacial scour);
- [A] linear concentration of events sub-parallel to the axis of the lake and;
- [T]emporal propagation of events in a linear trend that may be indicative of hydrofracking.”

**Condition 12.a.**

Condition 12.a. requires an Annual Report to be submitted by Cargill in response to 12.a. sub-conditions 1 through 8 and Condition 12.b through g. These conditions and Cargill’s responses are summarized below.

Condition 12.a.1.

Condition 12.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 §12.a.1. and the certification sent to NYSDEC was signed by Mr. Shawn G. Wilczynski, Mine Manager, on December 2, 2015. This certification notes “...that all mining activities, to the best of my knowledge, conducted during the reporting period from November 1, 2014 to present were in conformance with the DEC Permit # 0-9999-00075/00001 and the approved plans. No variances occurred and none were reported.” This should have read November 24, 2015.

Condition 12.a.2.

Condition 12.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, NYSDEC, 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 12.a.2. that "[t]he Cayuga Mine is not aware of any non-routine incidents associated with the mining, processing, or other mine related activities that would have adversely affected any of the following:

- Mine stability.
- Ground and surface water.
- Natural resources.
- Health, safety, welfare or property of the general public."

Condition 12.a.3.

Condition 12.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 12.a.3. that "[t]he Cayuga Mine is currently operating in the northern region of the mine. Active mining is located in panels U-63E to the east under the land, U-74 and U-76 to the west, and NW-3 to the northwest."

Mine maps as AutoCAD or Adobe Acrobat files were supplied by Cargill to fulfill this condition. All AutoCAD maps supplied were stand alone, overlays, and a base map. The base map was included as basemap with rock layer roof rock floor rock rolls(updated12-29-15).dwg, which was last modified December 29, 2015, and includes a map entitled "Cayuga Mine, 6 Level Workings," by Cargill Deicing Technology. Also included on this map are roof and floor rolls. Other maps provided are:

- The AutoCAD file, Complete Mine Overlay w Surface Subsidence(8-2015).dwg, last modified December 22, 2015, and containing untitled, undated map, which shows subsidence monument locations, shore line, and the 1st, 4th, and 6th Level workings.
- The AutoCAD file, ROYALTY.dwg, last modified December 09, 2015, and containing the Cargill Deicing Technology, 2015, "Cayuga Mine, Mine Royalty Map, 2015/2016 Fiscal Yr." November. Map shows fiscal year production areas from June 1, 1984 through May 31, 2015.
- The AutoCAD file, Baker update U38-36 Dust fill map.dwg, modified December 23, 2015, containing an undated map, "Intake Air for Dust Pit" and shows U38 areas filled.

- The AutoCAD file, Basemap planning for MLRP.dwg, modified November 19, 2015, and containing the map Cargill Deicing Technology, 2015, "Cayuga Mine, 3 Yr Mine Plan, 2015/2016 Fiscal Yr.", November. This map shows planned expansion through fiscal year 2018.
- The AutoCAD file, 4 Level Pond Map MLRP Version 18Nov15 Draft.Dwg, modified December 04, 2015, and containing the map, 2015, "Cayuga Mine, 4 Level Pond Map, Updated: 18 Nov 2015," January. This map shows filled levels to December, 2015, and remaining potential pond area.
- AutoCAD file 4 Level Convergence Map.dwg, modified December 23, 2014 and contains an untitled and undated map showing closure station locations.
- The AutoCAD file, 4A Level for JT Boyd.dwg, modified December 23, 2014 containing undated, "4A Level Instrumentation Map." This map shows closure station's locations.
- A hard copy map, undated and untitled, scale 1 in. = 50 ft and AutoCAD file, PAMELPASS.DWG, modified December 23, 2014, and contains the map "4 Level, Pamel Pass – 13 Belt." This map shows locations of extensometers along 13 belt.
- An untitled AutoCAD file, Screen Plant Horizontal Roof Ext.dwg, modified December 23, 2014, and 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, modified December 23, 2014 and containing map undated, "Unit # 5 Screenplant," showing instrument locations in and around the screen plant gallery.
- The AutoCAD file, undated, "Current Surge Bin Instrumentation Map as of 9-09" and AutoCAD file, Surge Bin instrument Map to JT Boyd.dwg, modified December 23, 2014, and 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 with basemap 2015.dwg, modified December 29, 2015, and containing the map Cargill Deicing Technology, undated, "Cayuga Mine, 6 Level Workings, Convergence Stations" This map shows the locations of convergence stations.
- Adobe Acrobat file 1-4-16 closure totals.pdf modified January 4, 2016 and containing the undated map "Cayuga Mine Closure (Inches) Dec-2015."
- Adobe Acrobat file 1-4-16 closure rates.pdf modified January 4, 2016 and containing the undated map "Cayuga Mine Closure Rate (Inches/Year) Dec-2015."

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, total closure, closure rate, and instrument locations.

Condition 12.a.4.

Condition 12.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 are 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 on page 2 and 3, Section 12.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 U12 areas. Since backfill placement in the U40B 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 and both areas show a decreasing rate trend at this time."

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 Rocktec Solutions (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.

BOYD reviewed the 339 closure stations read in 2015 (331 in Level 6, five in Level 4A, and three in Level 4). This is fewer than 34 stations than last year, all on the 6 Level. Of these, 155 (47%) had the highest closure rate of the year on the last calculated rate of the year, up from 41%. This is the reverse of a decreasing trend noted over the past several years by BOYD. BOYD's review of weather data for Ithaca, New York does not show a wetter or hotter average temperature than normal for the last quarter of 2015, thus, increased mine humidity is likely not the reason for these increases.

None of these 339 closure stations showed readings that exceeded 230 in. per year. Below is a list of the 10 highest measured closure rates in 2015 for areas of recent mining defined as areas within 1,000 ft of mining that occurred since October of 2014.

Top 10 Closure Rates in Areas of Recent Mining			
Closure Station	Rate of Closure (in./yr)	Last Recorded Rate of Closure (in./yr)	Notes
U63EPIN#11	94.326	10.898	Initial Reading
U72PIN#9	85.653	1.796	Initial Reading
U74PIN#11	83.324	21.744	Initial Reading
U63EPIN#7	83.220	11.376	Initial Reading
U63EPIN#12	74.825	8.291	Initial Reading
U63EPIN#8	74.460	9.943	Initial Reading
U62BPIN#9	73.487	1.736	Initial Reading
U72PIN#12	72.479	1.299	Initial Reading
U62BPIN#8	64.094	19.449	Initial Reading
U63EPIN#15	58.765	58.765	Initial and only Reading

These rates are higher than the comparable rates for 2014. All of these rates substantially dropped over time showing that the ground is stable or stabilizing. All 10 of



these stations are located in the most northern part of the mine where all production is located, with five stations located in U-63 East, two in U-72, and two in U-63B.

Also determined are the top 10 closure rates away from recent mining activity as shown below:

Top 10 Closure Rates Away from Recent Mining			
Closure Station	Rate of Closure (in./yr)	Last Recorded Rate of Closure (in./yr)	Notes
U68PIN#1	1.043	0.584	
U12PIN#32	0.991	0.991	Final reading
U40BPIN#8	0.989	0.856	
U12PIN#28	0.925	0.925	Final reading
U40B Digital 2B	0.910	0.842	
U12PIN#107	0.876	0.876	Final reading
U60PIN#29	0.865	0.717	
U40BPIN#14	0.825	0.716	
U60PIN#26	0.817	0.794	
W1PIN#4	0.800	0.747	

These rates are lower than the comparable rates for 2014. Rates dropped for seven of these stations over 2015. Rates did not drop in three stations although increases are minimal. The rate drop indicates the ground is stable.

- Three of these readings (U60PIN#26, U60PIN#29, and U68PIN#1) occurred close to two but just outside the 1,000 ft limit for recent mining.
- Three high-rate stations are clustered in U-12 areas near the U-12A sub-panel, which are the same stations that have been included over the last four years. U-12 areas have been frequently visited in the past by BOYD and NYSDEC to observe conditions and each time the area appears globally stable.
- Three in the U-40 fill area.

Data from 28 extensometers were evaluated. Extensometers were installed in various manners including vertically into the roof, at low angle (near horizontal), an angle that resulted in the extensometer being installed over the pillars, vertically into the roof and horizontally into pillars. In addition, extensometers were installed in levels 4 and 6. Thus, four populations exist. These data are further complicated by the varying rod and bay lengths. (Bay length is the length difference between rods except for the first bay which is the length of the shortest rod.) Nevertheless, BOYD attempted to ascertain anomalies within these data.

A measurement of 0.00030 in. per day is often accepted as a convenient point in examining vertical extensometer data, as this value is close to, but normally less than the value required for bed separation (opening of bedding planes). Horizontal roof extensometers are installed at 5 degrees to 15 degrees from the horizontal as measured in the AutoCAD drawings. This angle would multiply any bed separation, thus the trigger used for horizontal extensometers is 0.02 in. per day. No extensometer readings were considered alarming.

Extensometer – Accumulated Extension (Highest extensions are in bold)				
Extensometer Location	Station	1 <sup>st</sup> Bay, in.	2 <sup>nd</sup> Bay, in.	3 <sup>rd</sup> Bay, in.
Roof Horizontal – Level 6				
Screen Plant	1A	<b>1.031</b>	-0.955	1.042
	2A	0.094	0.335	1.158
	2B	0.087	<b>0.370</b>	1.367
	1B	0.009	0.008	0.984
	3A	0.055	0.042	0.486
	3B	0.073	0.037	0.309
	4A	-0.059	0.076	3.732
	4B	0.074	0.024	<b>3.840</b>
Pillar – Level 6				
Screen Plant	G Pillar, Hole B1	<b>3.049</b>	-1.617	-0.742
	H Pillar, Hole A1	3.036	-1.102	-0.588
	H Pillar, Hole A3	0.302	<b>0.491</b>	<b>2.242</b>
	I Pillar, Hole B1	1.526	-0.060	-0.838
	J Pillar, Hole B1	1.936	-0.172	-1.438
Roof – Level 4				
Pamel Pass	No. 1	0.138	0.041	0.022
	No. 2	0.025	-0.013	-0.010
	No. 3	0.249	0.027	-0.035
	No. 4	0.560	0.072	0.030
	No. 5	0.664	0.101	0.011
Pillar – Level 4				
Surge Bin	No. 20	0.712	0.286	0.088
	No. 25	<b>1.958</b>	1.304	-0.093
	No. 50	1.097	0.769	0.172
	GA-No. 10	-	0.764	0.051
	GA-No. 22	-	2.213	<b>0.222</b>
	GA-No. 27	-	<b>2.880</b>	0.150
	GA-No. 60	-	0.676	0.133
	GA-No. 80	-	0.001	0.045
	GA-No. 90	-	0.131	0.019
	GA-No. 100	-	0.043	0.015

*Consultant Reports Concerning Conditions 12.a.4.*

- Petersen, Gary, 2015, Draft, Cayuga Mine Rock Mechanics Evaluation, RockTec Solutions, prepared for Cargill Deicing Technology, February 23.

Reports on Mr. Petersen's visit to the Cayuga Mine on January 14 and 15, 2015. The anomalies north of mining were discussed and noted that "... not much is known about the severity of these anomalies." He suggested that "It may be prudent to mine beneath the anomalous zones and the 1000' standoffs with a relatively low extraction big pillar design, which is not nearly as susceptible to attracting fluid flow." He also notes that NW2 Panel has mined beyond this 1,000 ft "... with no apparent negative results so far."

From closure station data review Mr. Petersen notes with exceptions that "...all indicating very stable conditions."

In reference to U40B Panel he notes that "Although we do not fully understand what caused the increasing and decreasing trends, we are no longer concerned with excessive closure occurring in this area."

In reference to U12/SW2 and U12/U12A intersection, he notes "Both areas are declining in rates or the rates have leveled off ...". In reference to U24 Panel, closure rates have been declining.

In reference to the surge bin roof, he notes the extensometers have shown that expansion occurs in the first 12 ft of the roof and expansion rates have increased since 2007. This increase has occurred in the brow. It is his opinion that the roof is well supported and noted that that bolts in the brow have not failed recently. Concluding that "As long as the roof support system is intact there is no need for alarm." But "I recommend that a more thorough investigation be made."

- Petersen, Gary, 2015, Draft, Cayuga Mine Rock Mechanics Evaluation, RockTec Solutions, prepared for Cargill Deicing Technology, August 8.

Reports on Mr. Petersen's visit to the Cayuga Mine on June 23 and 24, 2015. "The key issues addressed in this report are the unexplained rate increase that we have been monitoring in U40B, U12A, U12/SW2, and U24." "The rates in these areas continue to decrease except for U12/SW2 where rates are slightly up." A program of drilling is suggested with possible dewatering.

Mr. Petersen notes that the surge bin's roof "... has been expanding at about 1/4 of an inch per year, which was slowly increasing from 2007. In late 2014 the rates started to sharply increase to 0.4 in/yr and then fell to 0.2 in/yr ..." theorizing that "... the lower section of the sagging roof beam detached from the roof and is now being supported by the bolts."

He reports "... concern with the dissolution of the #2 Shaft and shaft bottom where the undersaturated water is entering." and recommends periodic inspection of the shaft.

Condition 12.a.5.

Condition 12.a.5. requires the Annual Report include a "summary of subsidence monitoring data required by Part e. of this Special Condition." Condition 12.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 12.a.4.

Cargill included a statement in the 2015 Annual Report page 3, Section 12.a.5 that "Subsidence surveys of the surface were completed during the year." Cargill includes a statement "The measurements indicate that the mine is behaving as expected with no anomalous subsidence zones." The following subsidence reports were included in the submittal:

- Kincaid, Charles H., 2015, Subsidence Survey, Spectra Engineering, Architecture and Surveying, P.C., prepared for Cargill Inc., March.

This report contains survey data, field notes, and comparison to previous surveys. It is reported that survey accuracy is  $\pm 0.1$  ft.

- Petersen, Gary, 2015, Draft, Cayuga Mine East Shoreline Subsidence, RockTec Solutions, prepared for Cargill Deicing Technology, May 19.

This report compares November 2007 to December 2014 subsidence surveys on the east shoreline of Cayuga Lake. The maximum measured subsidence between these dates was approximately 3.6 in. and 10.8 in. since 1983. The current subsidence rate is estimated at 0.4 in./yr.

- Petersen, Gary, 2015, Draft, Cayuga Mine East Side Subsidence, RockTec Solutions, prepared for Cargill Deicing Technology, May 19.

Subsidence in this area has been measured from 1979 to December 2007. The maximum vertical measured movement was 14.4 in. The rate of movement reduced from an initial rate of less than 0.5 in. per year to around 0.25 in. per year.

- Petersen, Gary, 2015, Draft, Cayuga Mine West Shoreline Subsidence, RockTec Solutions, prepared for Cargill Deicing Technology, May 19.

This is a report on the west shoreline of Cayuga Lake that compares May 2011 and December 2014 subsidence surveys although some comparisons are made with a previous survey completed in 1999. Maximum measured subsidence from 2011 to 2014 was approximately 2.4 in.

- Belzer, Brett E., 2015, External Memorandum Subsidence Analysis for 5-Level Test Panel at the Cargill Cayuga Mine, RESPEC, prepared for Cargill Deicing Technology, September 4.

This memo presented:

- An update of previous RESPEC subsidence analysis by taking into account the planned mining of a test panel in the Retsof 5 Seam (5 Level).
- A preliminary analysis of the December 2014 subsidence survey.

Concluding:

- The model's predicted subsidence along the shoreline is approximately 0.3 ft after 20 years, 0.6 ft after 100 years, and ultimately approximately 2.0 ft.
- The ultimate predicted subsidence is 2.5 ft to 3.5 ft without the test panel.
- The test panel will add 0.42 ft to 0.33 ft.
- The increase in strain and tilt from 5 Level Test Panel will be small, "... and is not expected to adversely affect surface structures near the shoreline ..."
- Measured subsidence compared favorably with the modeled prediction giving confidence to the model.

#### Condition 12.a.6.

Condition 12.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 Level 4 would be included in the Annual Report, noting: "Updates of Level 4 filling including data on shore line advance." However in 2012 it was noted that "Access to view the pond is not possible due to ground conditions." However, RESPEC appears to have viewed the site in 2014.

On page 3 of the Annual Report, Mr. Plumeau notes that "All of the water is directed to a settling pond located on the 4-level of the mine. The water is then pumped from the settling pond to abandoned areas at the far east end of 4-level as well as to various areas of the active mine for dust control. Recent volume calculations indicated that at our current rate of storage (about 18,000,000 gallons per year) we have approximately

6.5 years of storage life remaining on 4-level." This is up from 2014 which noted about 16,800,000 gallons per year and 7.9 years of storage life and from 2013 which noted about 12,000,000 gallons per year and 13 years of storage life.

Cargill again notes that an "Action plans are in place to continue to reduce the inflow into the mine. A system for collecting the #1 shaft water inflow and for pumping it to surface for processing has been installed and is being optimized now. Once the processing system is optimized it is expected to reduce inflow by an additional 3 gpm." Later stating "During late August, grouting in the #1 shaft was completed achieving a reduction of inflow of 10 gpm. This reduces the volume of water to be stored by about 5,300,000 gallons per year. Investigations are under way to determine how to reduce the inflows at the #2 shaft and plans are being made for further grouting of the #1 shaft during the summer of 2016."

Typically, Cargill included Excel file, UG Pond Volume Calculation DATE.xls. This spreadsheet was not included with the latest Annual Report.

Condition 12.a.7.

Condition 12.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 12.a.7. that "There were four exceedances of the SPDES limits for the stormwater outfalls, and zero exceedances for the Waste Water Treatment Plant to report during the past year." An included Excel spreadsheet, 2015 MLRP outfall summary of DMRs.xlsx last modified November 23, 2015, provides information on outfall water quality including cyanide, chloride, zinc, total dissolved solids, and cooling and treatment water.

SPDES data and a discussion of these data are included in the Annual Report. These data are to be reviewed by NYSDEC.

**Condition 12.b. and c.**

Condition 12.b and c. addresses Mine Safety and Health Administration (MSHA) reporting involving non-routine mining incidents as defined in Condition 12.b. Condition 12.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 12.b. of the Annual Report that "[t]here were no incidents meeting the guidelines for notification as identified in section 12.a.(2)." and section 12.c. of the Annual Report that "[t]he Cayuga Mine has not received any

citations or correspondence from MSHA regarding non-routine mining incidents as identified in section 12.a.(2)." The Annual Report does not note reports or letters from MSHA concerning any non-routine mining incidents.

**Condition 12.d.**

Condition 12.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 in section 12.d. that, "There have been no changes to the Cayuga Mine layout in the past year, with the exception of an experiment to mine a small test panel on the #5 level above the #6 level workings. Several reports and letters of explanation have been previously sent to both the DEC and Dr. Scovazzo of John T. Boyd Company. That experiment will be conducted between December of 2015 and May of 2016."

**Condition 13.g.**

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 "[n]o written complaints from citizens were received since the last report (November 2014)."

**Site Visit**

A site visit to discuss these findings among NYSDEC, Cargill, and BOYD should be arranged. Suggested areas to visit in the mine are U63A and Level 5 Experiment.

Topics for discussion at the meeting should include:

- Subsidence survey schedule.
- Level 5 Experiment



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

P:\ENG\_WP\2499.004\rpm - Annual Review 2015.doc

## **Lucidi, Christopher M (DEC)**

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**From:** Rodriguez, Simone S (DEC)  
**Sent:** Tuesday, February 02, 2016 11:03 AM  
**To:** Army, Steve (DEC); Lucidi, Christopher M (DEC)  
**Cc:** Podniesinski, Matthew J (DEC)  
**Subject:** FW: Annual Report Review - 2015 (BOYD File: 2499.4)  
**Attachments:** Annual Review 2015.pdf

Steve/Chris –

Matt forwarded me a copy of the Annual Report Review.

While I was reading through the document, I came across a couple of paragraphs that I thought I mention to you for clarification since I don't know enough about the site.

On page 3, Permit Condition #9a is mentioned which contains the 1,000 ft setback from the Frontenac Point Anomaly. On page 11, the report summaries Mr. Petersen's report "Draft, Cayuga Mine Rock Mechanics Evaluation" and notes "He also notes that the NW2 Panel has mined beyond this 1,000 ft". This the 1,000 ft setback mentioned on page 11 the same setback identified in condition 9a? If that is the case, then NW2 probably shouldn't have been mined that far without further investigations completed and submitted to the department for review and approval prior to mining within this 1,000 ft buffer (SC9a).

Thanks,  
Simone

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**From:** Podniesinski, Matthew J (DEC)  
**Sent:** Monday, February 01, 2016 7:44 AM  
**To:** Rodriguez, Simone S (DEC)  
**Subject:** FW: Annual Report Review - 2015 (BOYD File: 2499.4)

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**From:** [BOYD COMPANY]Beth M. Mills [<mailto:b-mills@jtboyd.com>]  
**Sent:** Friday, January 29, 2016 4:00 PM  
**To:** Podniesinski, Matthew J (DEC)  
**Cc:** [BOYD COMPANY]Vincent A. Scovazzo  
**Subject:** Annual Report Review - 2015 (BOYD File: 2499.4)

January 29, 2016  
File: 2499.004

Mr. Matthew Podniesinski  
**New York State Department of Environmental Conservation**

Please find attached the following letter:

Annual Report Review - 2015  
Cayuga Mine, Cargill, Inc.  
Seneca and Tompkins Counties, New York

Regards,  
Vince

For  
Vincent A. Scovazzo  
Director of Geotechnical Services  
**JOHN T. BOYD COMPANY**  
4000 Town Center Boulevard, Suite 300  
Canonsburg, PA 15317  
Phone: 724-873-4400  
Fax: 724-873-4401

Bethany M. Mills  
Editorial and WP Support Services

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## **Lucidi, Christopher M (DEC)**

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**From:** Army, Steve (DEC)  
**Sent:** Tuesday, February 02, 2016 11:22 AM  
**To:** Rodriguez, Simone S (DEC); Lucidi, Christopher M (DEC)  
**Cc:** Podniesinski, Matthew J (DEC)  
**Subject:** RE: Annual Report Review - 2015 (BOYD File: 2499.4)

Simone,

You are correct, NW2 was advanced into the 1000' setback, and yes, it is the same setback mentioned in the permit. After reviewing the annual report I discussed a few concerns with Vince, this being one. We have requested a map of the 1000' setback as it relates to existing and projected heading advancements. At that point we'll have a better idea how far the panel extends into the setback, and at what time the panel was advanced. Also, this will be an item for discussion at our annual meeting if we decide it's not something that needs to be addressed sooner.

Steve

Steven Army  
Region 8 Mining Program Supervisor  
Office: 585-226-5372  
Cell: 585-319-1012  
Fax: 585-226-6323

---

**From:** Rodriguez, Simone S (DEC)  
**Sent:** Tuesday, February 02, 2016 11:03 AM  
**To:** Army, Steve (DEC); Lucidi, Christopher M (DEC)  
**Cc:** Podniesinski, Matthew J (DEC)  
**Subject:** FW: Annual Report Review - 2015 (BOYD File: 2499.4)

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Regards,  
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Bethany M. Mills  
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