



Cargill Deicing Technology
Cayuga Mine
P.O. Box B
191 Portland Point Rd.
Lansing, NY 14882

September 9, 2016

Steve Army
Region 8 Mining Program Supervisor
NYS DEC
6274 East Avon-Lima Road
Avon, NY 14414-9519

RE: Update on Mine Design Adaptation

Dear Mr. Army:

Cargill, Incorporated's Cayuga Salt Mine at Lansing, NY is proposing to adapt portions of its mine from the "Yield Pillar Panel" (YPP) mining layout to a "Tributary Load Pillar" (Large Pillar) mining layout. The change is for areas of the mine where the bedrock geology could support the presence of water in zones closer to the mine horizon. It is suspected that the long term stress relieved zones associated with the YPP mining may not be compatible with those conditions so a conventional Large Pillar layout is proposed for those areas of concern.

The change in mine design is necessitated by changing geologic conditions as the mine advances through its northern reserves. The bedrock above the mine in the center of the lake is deeply incised and it is suspected that there are geologic anomalies present as well. If ground water is present in these geologic conditions it possibly could create different rock stresses above the panels. These situations are only believed to exist in the northern mine reserves. Therefore Cargill wants to take a proactive and conservative approach to mining the reserves in question by using the Large Pillar configuration.

With the Large Pillar design, each pillar is sized to safely carry the entire weight of overburden for more than the life of the mine. This design causes less disturbance to the overlying strata than the YPP design and is felt to be the most prudent design for the suspected geologic conditions. Large Pillar designs are considered "conventional" and are the standard for salt mines across the globe. The Cayuga Mine has extensive experience with the Large Pillar design having used it through the 70's. Cargill also has much experience with this design at its Whiskey Island Mine in Cleveland, OH.

The initial Large Pillar dimensions are based on engineering salt creep calculations (based on Dr. Leo Van Sambeek's equations for salt creep), extensive computer modeling, and experience at both the Cayuga and the Cleveland Mines. The Large Pillar design is intended to be used only in select regions where it is believed to be necessary. It must be kept in mind that the specific dimensions of the pillars used may need to change as the mine gains experience with the roof conditions of the Large Pillar areas in order to insure the safety of personnel. The initial dimensions being used in the test area are preliminary only and are intended to give safe ground conditions while gaining the mine some experience with tunnel behavior. **Cargill is balancing long term global mine stability and short term local (tunnel) stability.** Areas not using this design will continue to use the established YPP design as it is deemed appropriate. A full explanation and supporting data will be submitted to Dr. Vince Scovazzo of the John T. Boyd Company for his assessment.

The changes being proposed will have no effect on the surface and will not influence fauna or flora, ground water, or the residents of the State of New York. Because all the changes are beneath the surface by almost 2,000 feet they will be invisible to anyone outside the mine tunnels. Note that there will be no change to the method of extracting the salt – drilling and blasting will continue as in the past. All the mining activities will continue to take place on previously permitted lands and as per Cargill's MLRP of June 2, 2015.

If you have any questions or need any other information, please don't hesitate to call or e-mail me at 607-533-3736, or dave_plumeau@cargill.com

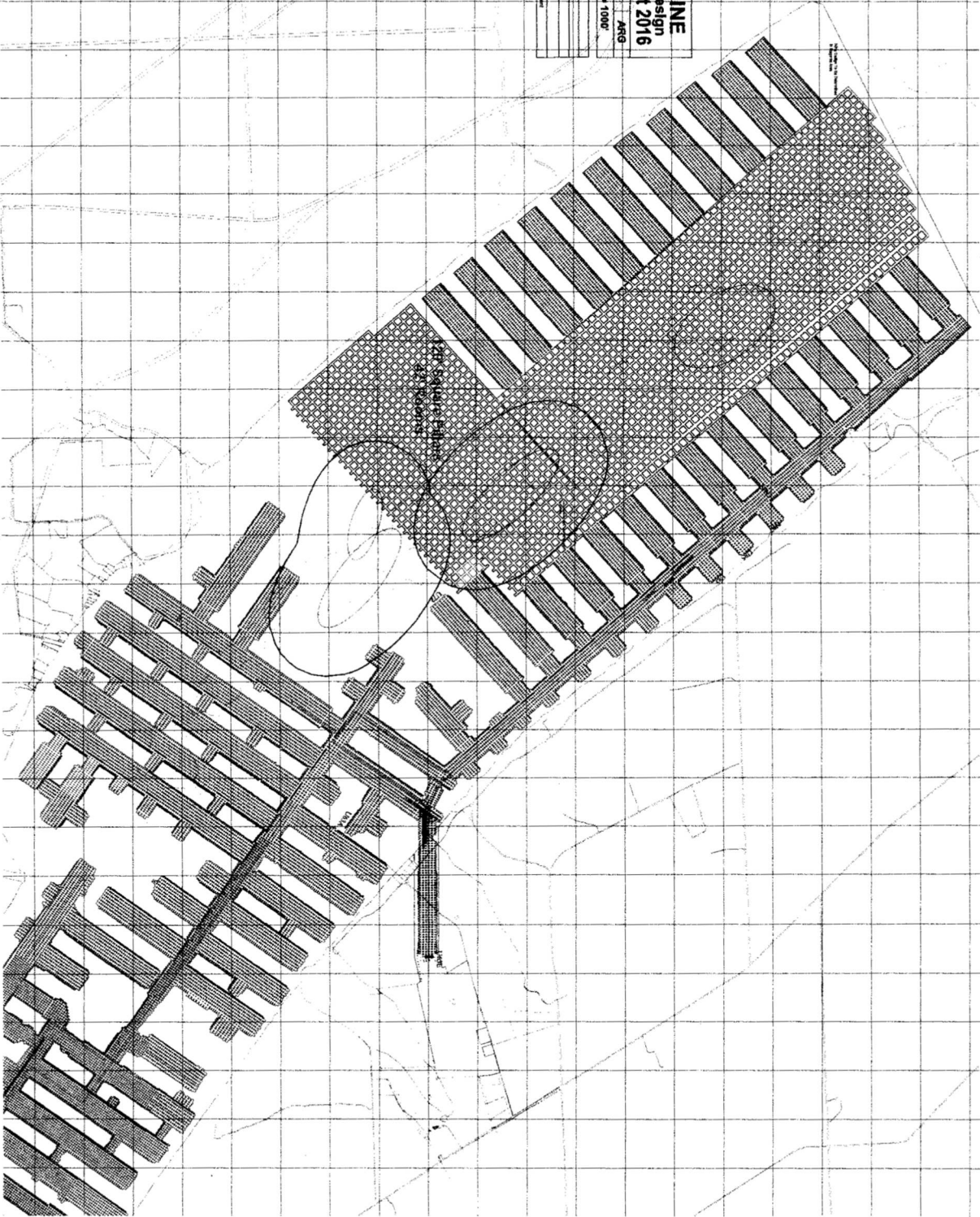
With best regards,

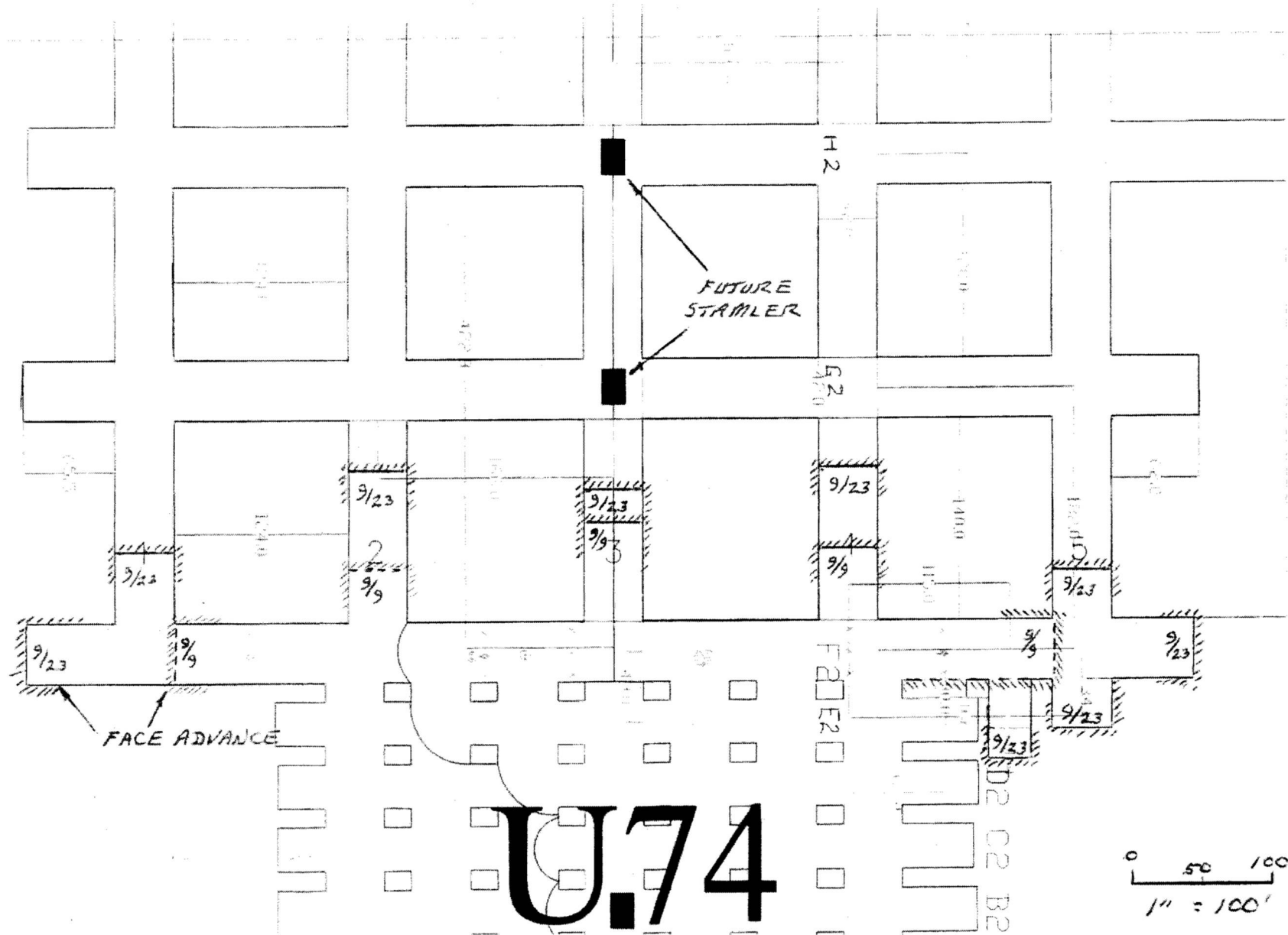
David Plumeau,

Business Unit Senior Mine Engineer

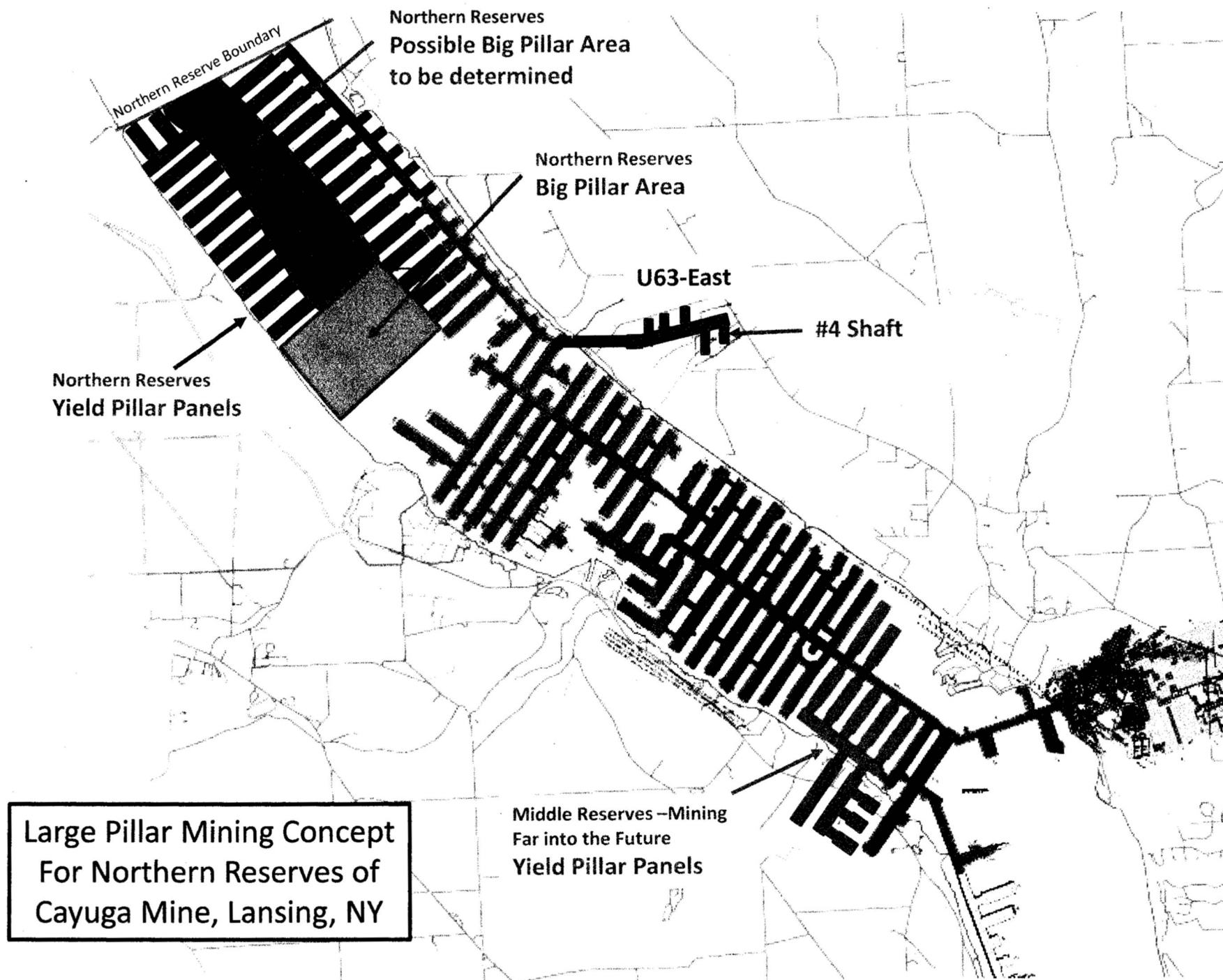
CC: Shawn Wilczynski, Mine Manager
Dr. Vince Scovazzo, John T. Boyd Company

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|--|------------|
| CAYUGA MINE | |
| Big Pillar Mine Design | |
| Updated: 22 Sept 2016 | |
| PROJECT: Big Pillar Mine Design | ANS |
| DATE: Sept 2016 | 1" = 1000' |
| DRAWN BY: [Blank] CHECKED BY: [Blank] DESIGNED BY: [Blank] CAYUGA MINE DESIGN | |



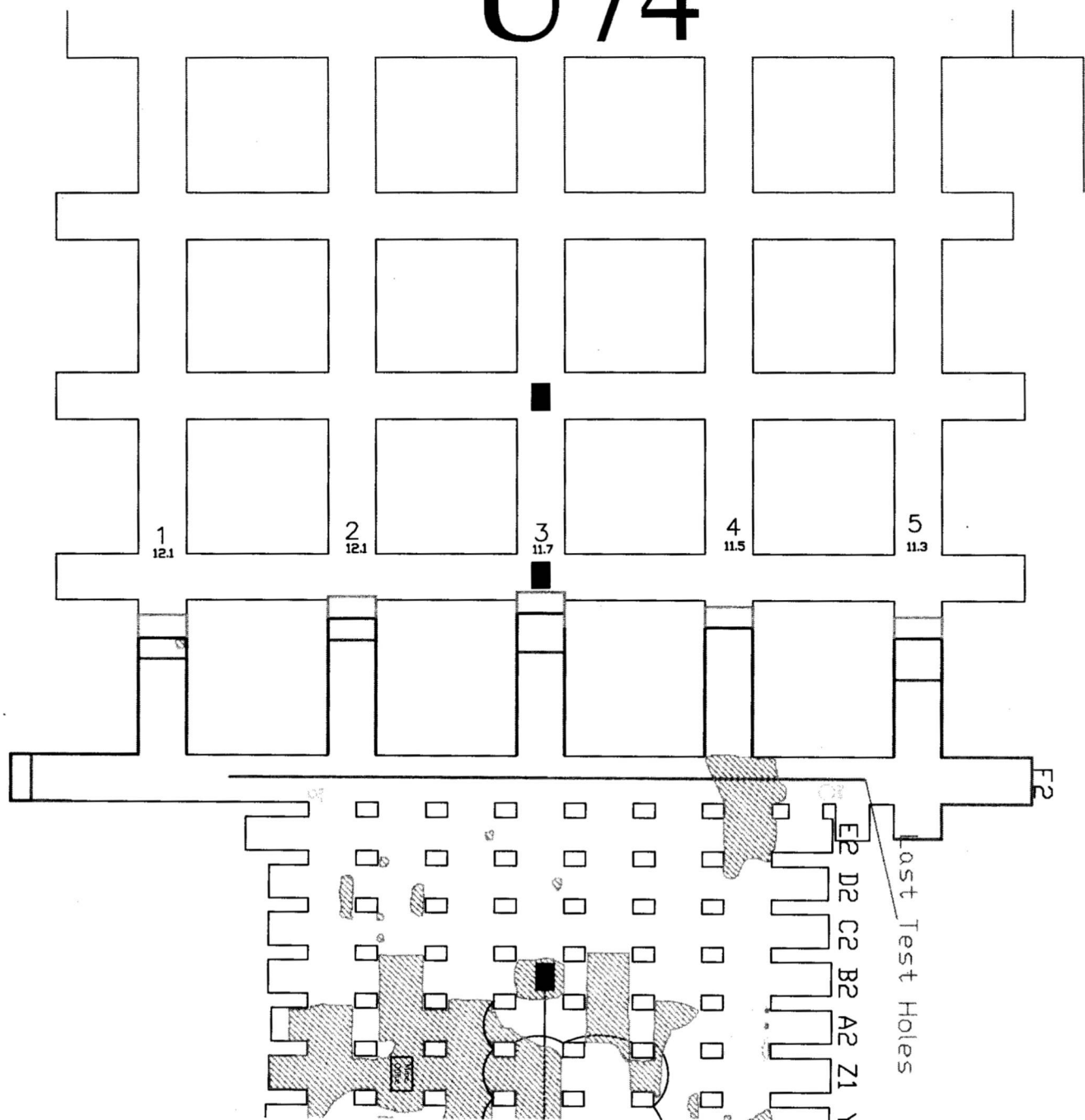


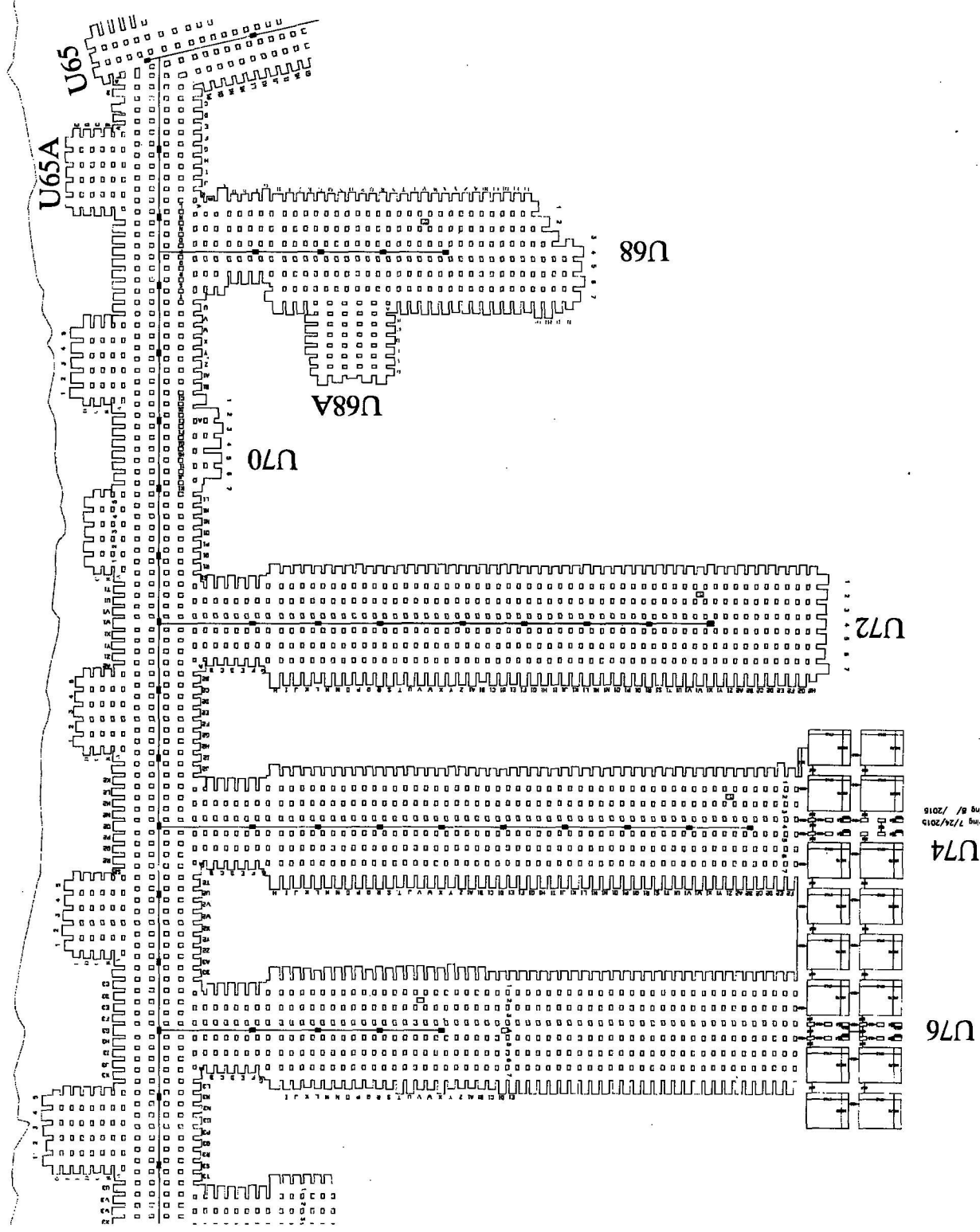
CAYUGA MINE
 LANSING, NY
 LARGE PILLAR SECTION ADVANCE
 AS OF 9/23/2016



WEEKLY FACE ADVANCE
WEEK OF :
10/10/16 - 10/16/16
UNIT# U74
STOCKPILE = 0 Tons
■ = STAMLER
▨ = ROCK ROOF
\$=150 TONS OF STOCK

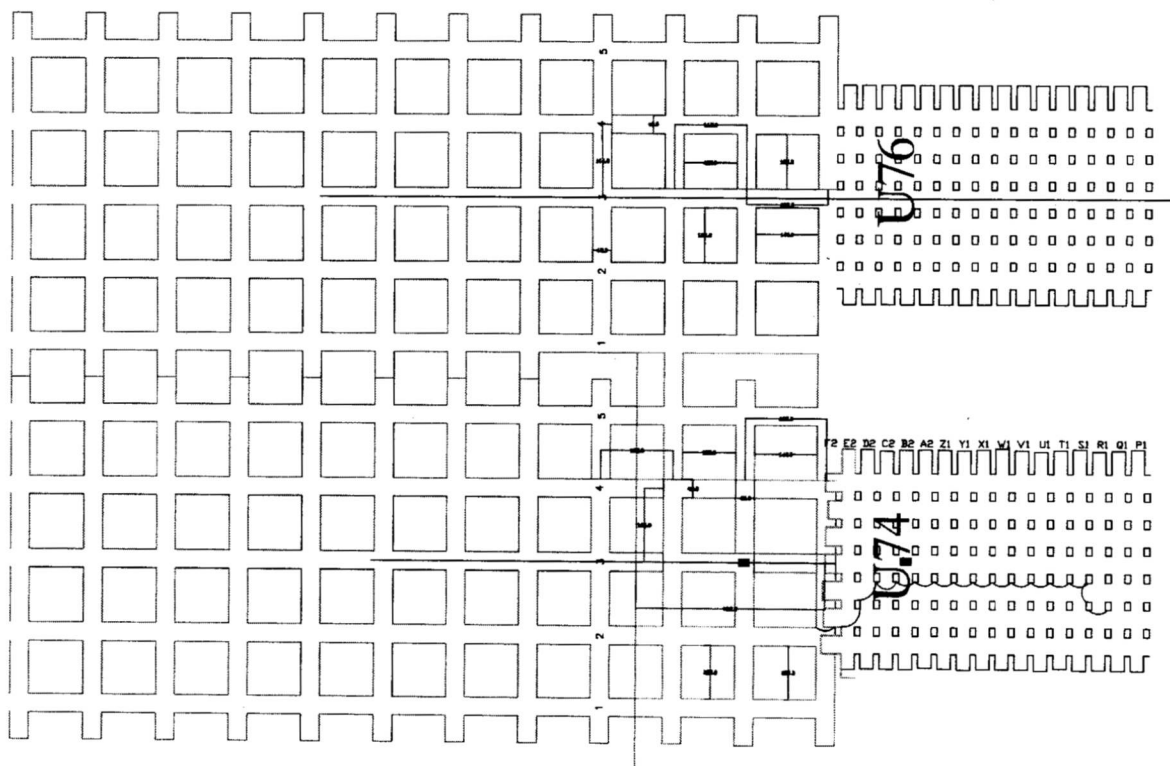
U74





Stopped mining 7/24/2015
Started mining 8/ /2015

Scenario #2 Version 8/18-1 MD

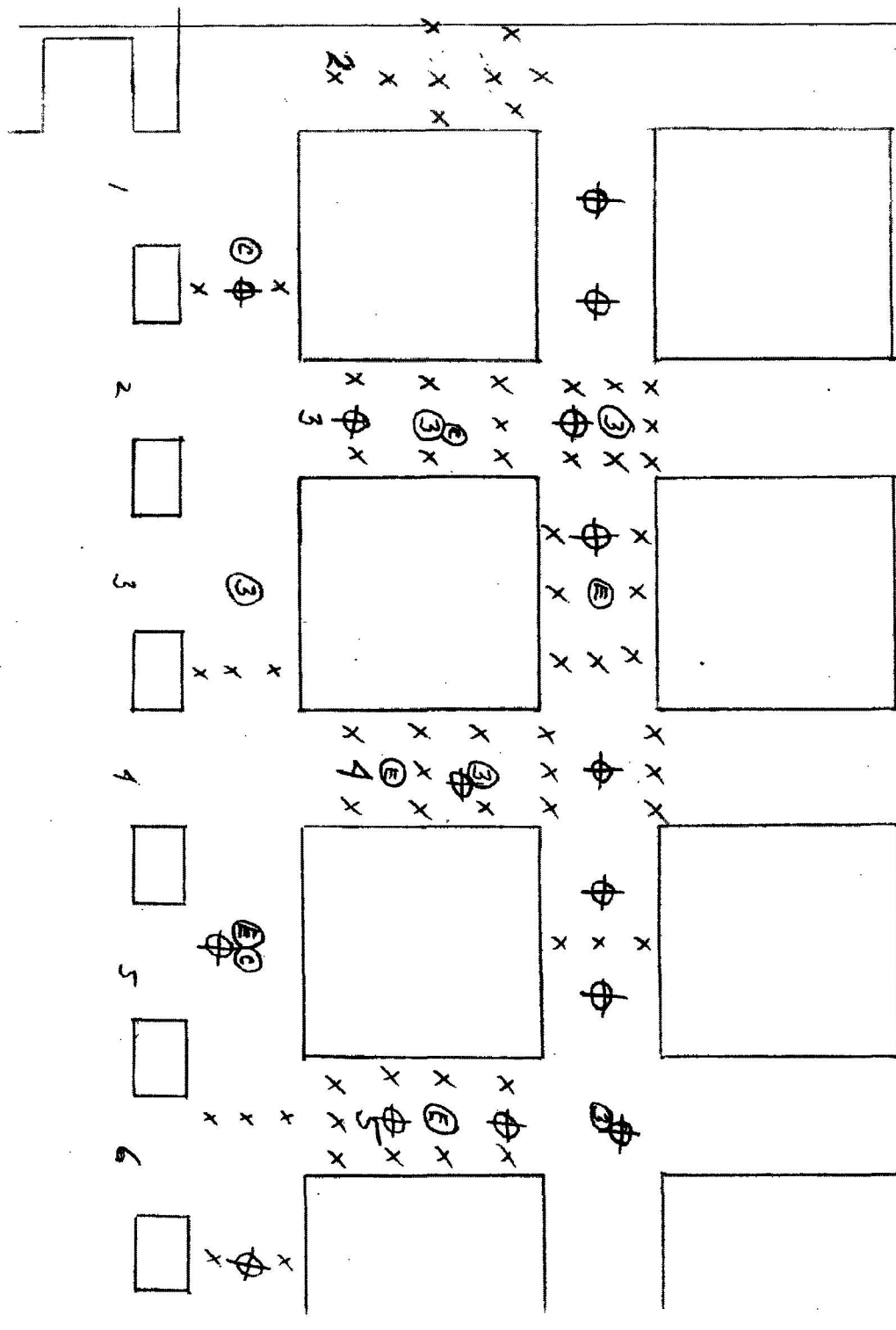


- = mine design experimental panel in U74
- = projected mine design in U74 and U76



358 Main Street
N. Huntingdon, PA 15642
Phone: (724) 515-4993
Fax: (724) 864-7582

Name ROOF INSTRUMENT Date 8/17/16 Project U-74 LARGE PILLAR
Other PLAN - NO SCALE



CLOSURE (C)

3-POINT ROOF
EXTENSOMETER (E)

1 POINT ROOF
EXTENSOMETER (E)

TEST HOLE 5' X

TEST HOLE 10' X

Instrument Plan for U-74

The goal for the first 420' of mining is to learn as quickly as possible how the roof is going to behave among the large pillars.

This will require a large number of instruments and test holes.

The map shows the concept: 5' test holes as often as possible – perhaps 3 across the entry in each round of advance (every 18') which must be snagged or borescoped near the face.

10' test holes need to be close enough together to see how the roof behaves in, near, and between the intersections. Past experience was that intersections were good, between now – so I expect our first problems to show between the pillars.

Extensometers will give us actual movement and rates of movement as the roof deforms. I tried to limit how many 3 point units and use more 1 point units. I would anchor the 3 point units at 3', 6', and 10' for starters. The 1 point units should be anchored at 8' or 10'.

We will want several test holes drilled to 20' centered between intersections for scoping and long term monitoring.

There should be no floor heave. Rib scales will be slow forming and easy to manage so I'm not inclined to install extensometers in the ribs.

I would install a few closure points at 3 point extensometer locations to compare roof separation to room squeeze.

Once we have advanced some, we'll begin to see if we can decrease the number of instruments and test holes. Also, we can begin using "Guardian Angels" once we know how the roof behaves and we can predict how to set the angels to trip.