OPTIMIZATION OF SHALE USAGE AT ACME'S TULSA PLANT

Dr. Garth Tayler

ACerS/NBRC meeting

Salt Lake City

5/14/2013

Operational Goals

- **To achieve quality consistency**
- **To achieve color consistency**
- **Maximize first grade quality yield**
- **Minimize bat loss**
- **Optimize the raw material reserve**

The Brick Maker's Reality:

"Over 80% of the Brick Makers success lies with his raw material and how he uses it"

Garth Tayler

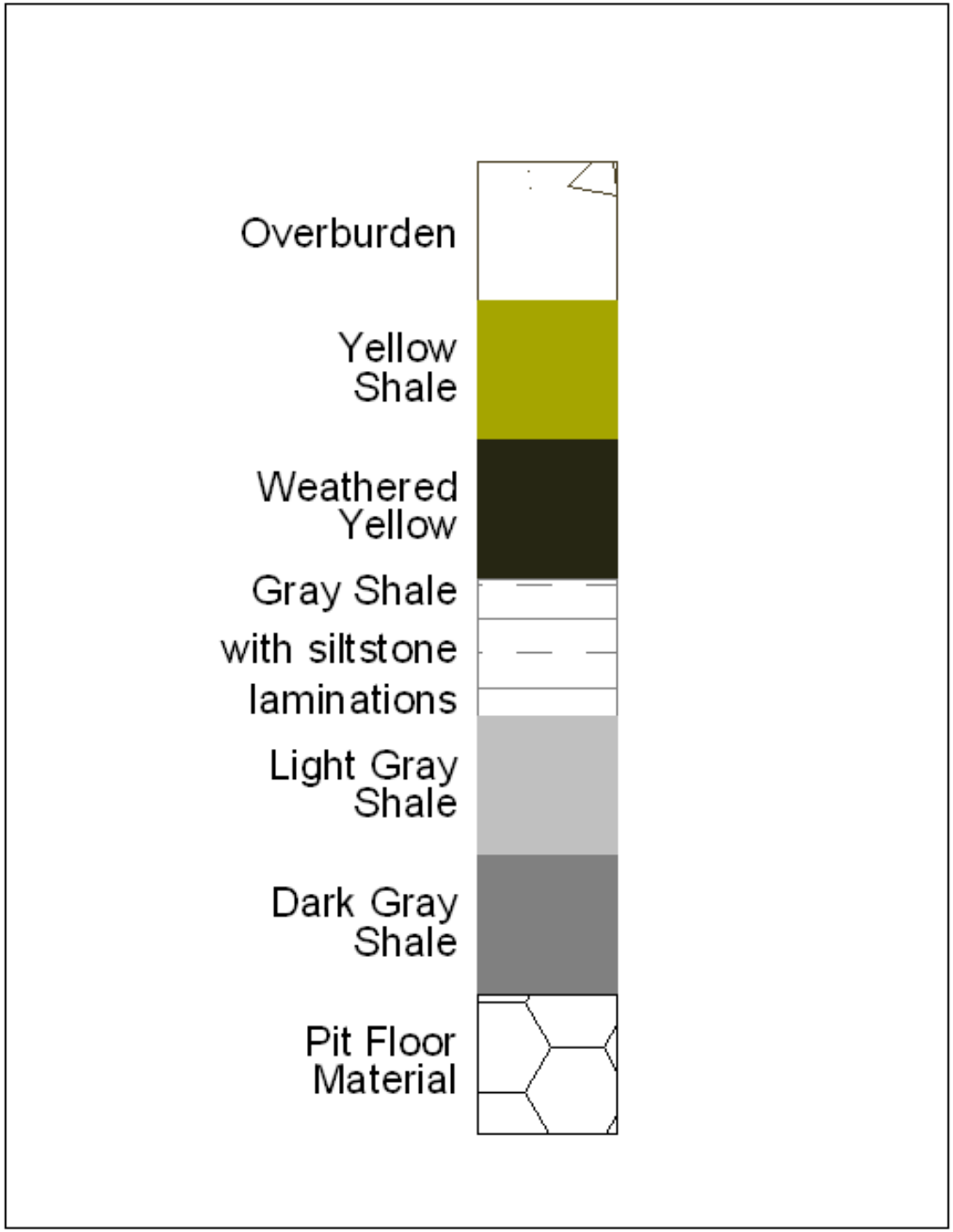
05/06/2013

Optimization process…..

- Exploration/**drilling**
- Lab **analyses**/Characterization
- Quantify useable reserve and **in-ground ratios**
- Define mining **composite(s)**
- Determine mining **plan**
- Mining and **stockpiling**
- Lab work to develop optimum **body mix**
- **Draw trial** studies
- Large batch **firing simulations**
- Plant **trials**
- Finalize plant **operational conditions**
- **Product** acceptance

Tulsa Plant
Holland Pit

Weathered Pennsylvania Shale layers.



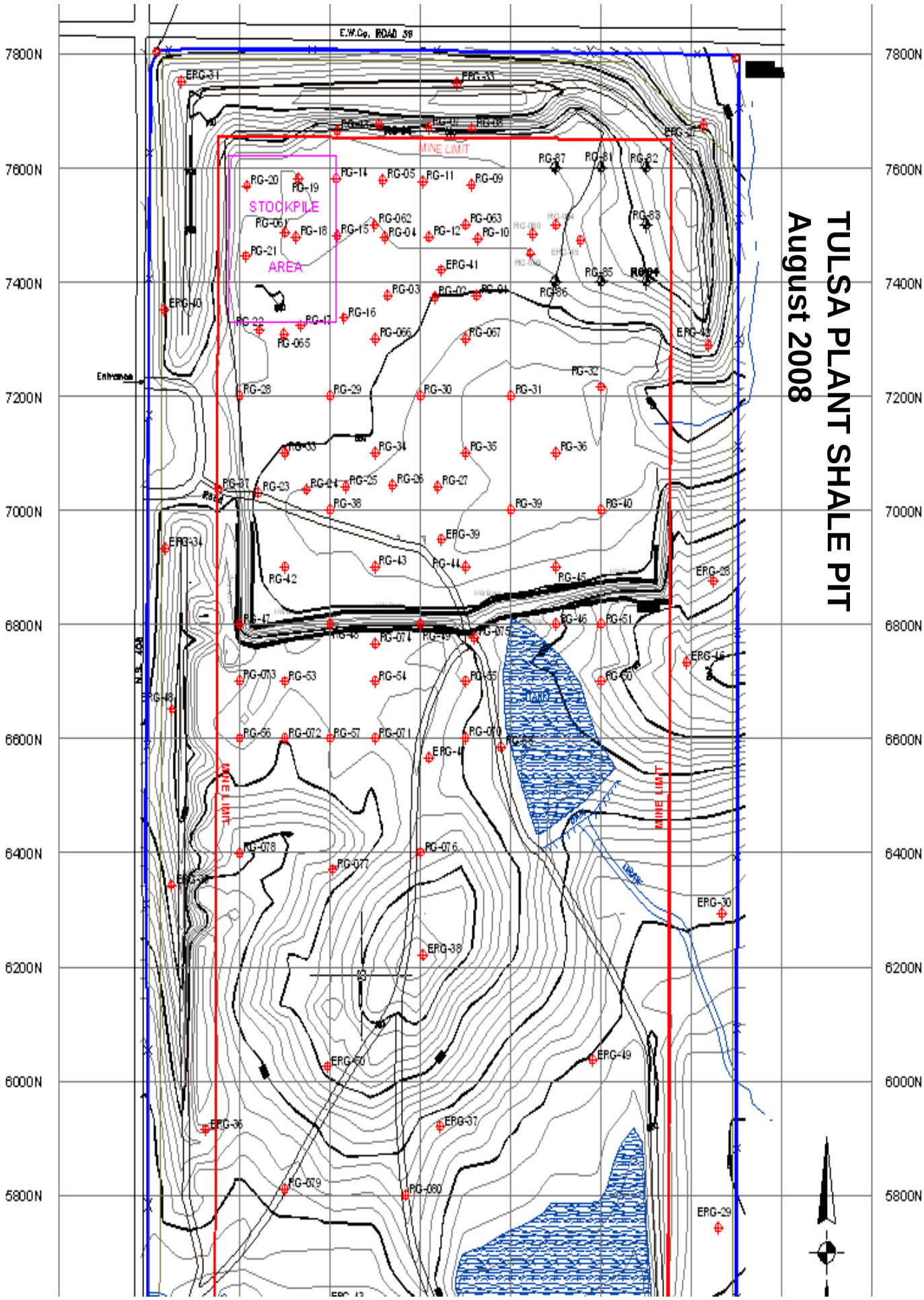
Tulsa Shale: Mineralogy

Free quartz	**31%**
Muscovite	**20.3%**
Potassium Felspar	**3.9%**
Plagioclase	**8.7%**
Kaolinite	**5.6%**
Amorphous clay	**21.3%**

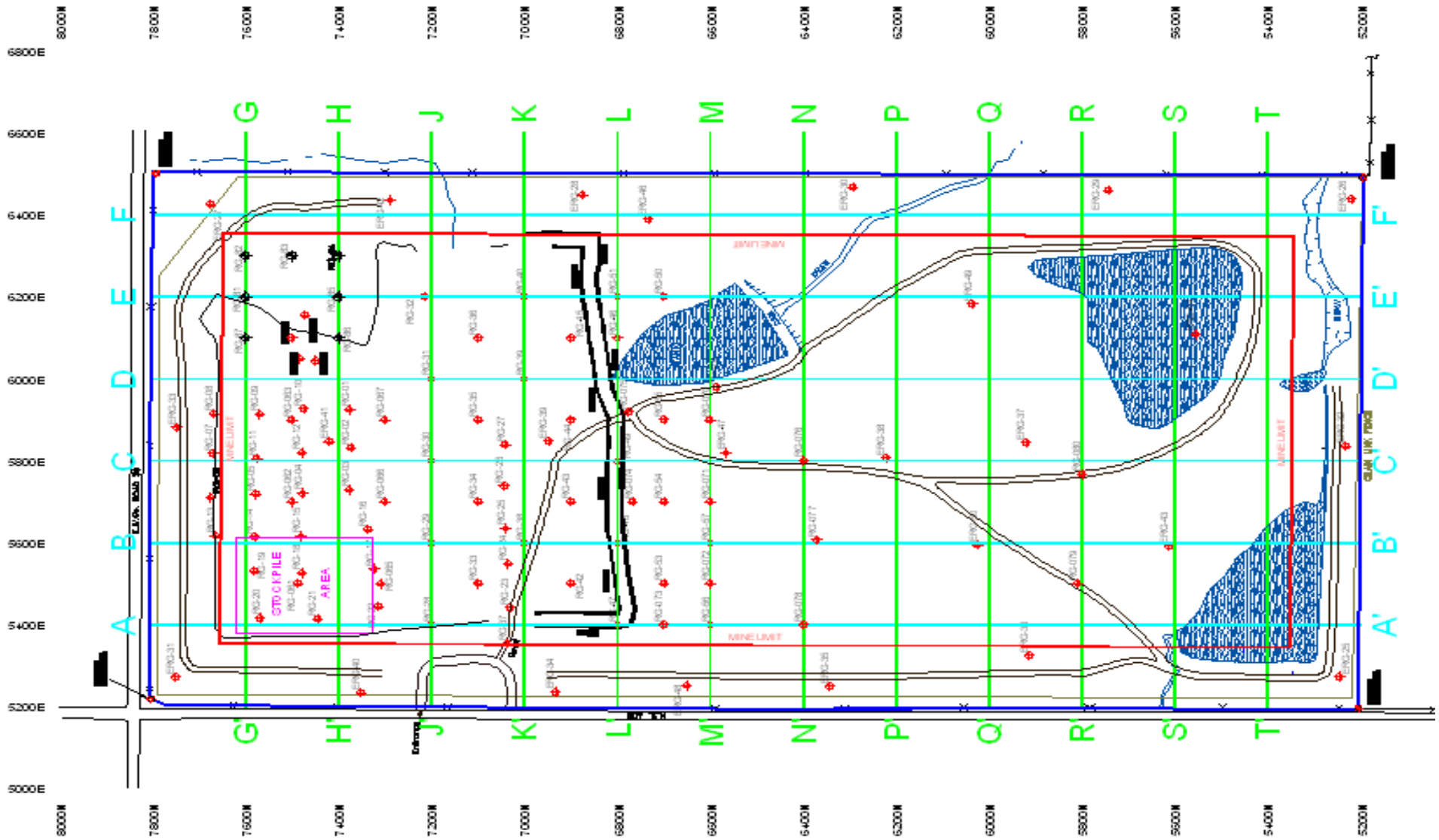
Carbon and Sulfur with 5 ft depth increments

Typical:	**Sulfur**	**Carbon**
Sample 1	0.0514	0.3172
Sample 2	0.0483	0.3118
Sample 3	0.0987	1.1502
Sample 4	0.0658	1.1473
Sample 5	0.0733	0.9430
Sample 6	0.0676	0.9266
Sample 7	0.0613	1.0461
Sample 8	0.1041	1.0738
Sample 9	0.1077	1.1094
Average:	**0.0753**	**0.8917**
Std Dev:	0.0226	0.337
CV:		37.7%


TULSA HOLLAND PIT
E-390 Rd
S 4080 Rd
Holland Pit
© 2013 Google

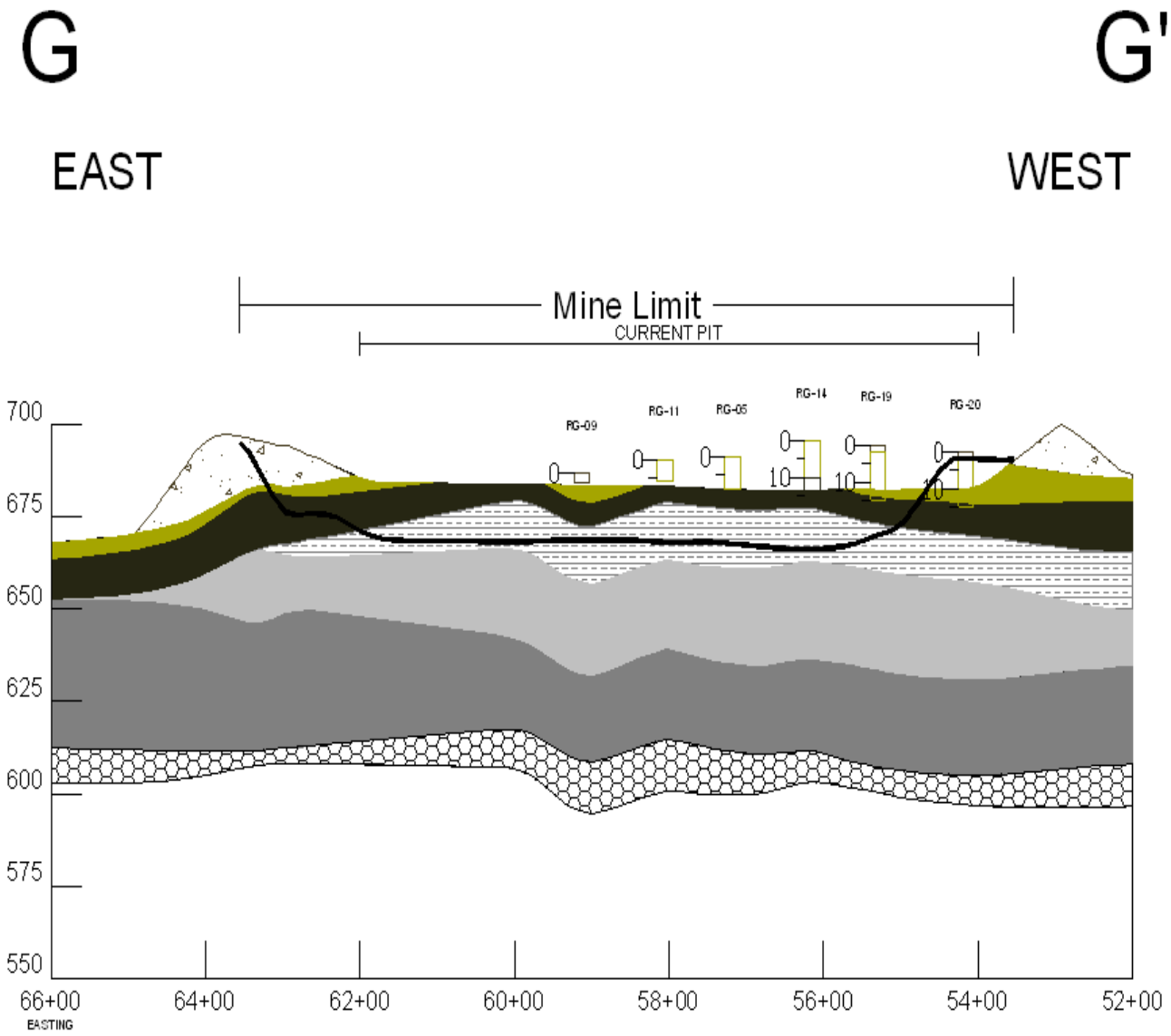

TULSA PLANT SHALE PIT
August 2008
E.W.Co. ROAD 59
MINE LIMIT
STOCKPILE
AREA
Entrance
N.S. ROAD
7800N
7600N
7400N
7200N
7000N
6800N
6600N
6400N
6200N
6000N
5800N

TULSA PLANT SHALE PIT
August 2008



TUP Holland Cross Section G-G'

Cross Section



Lithology

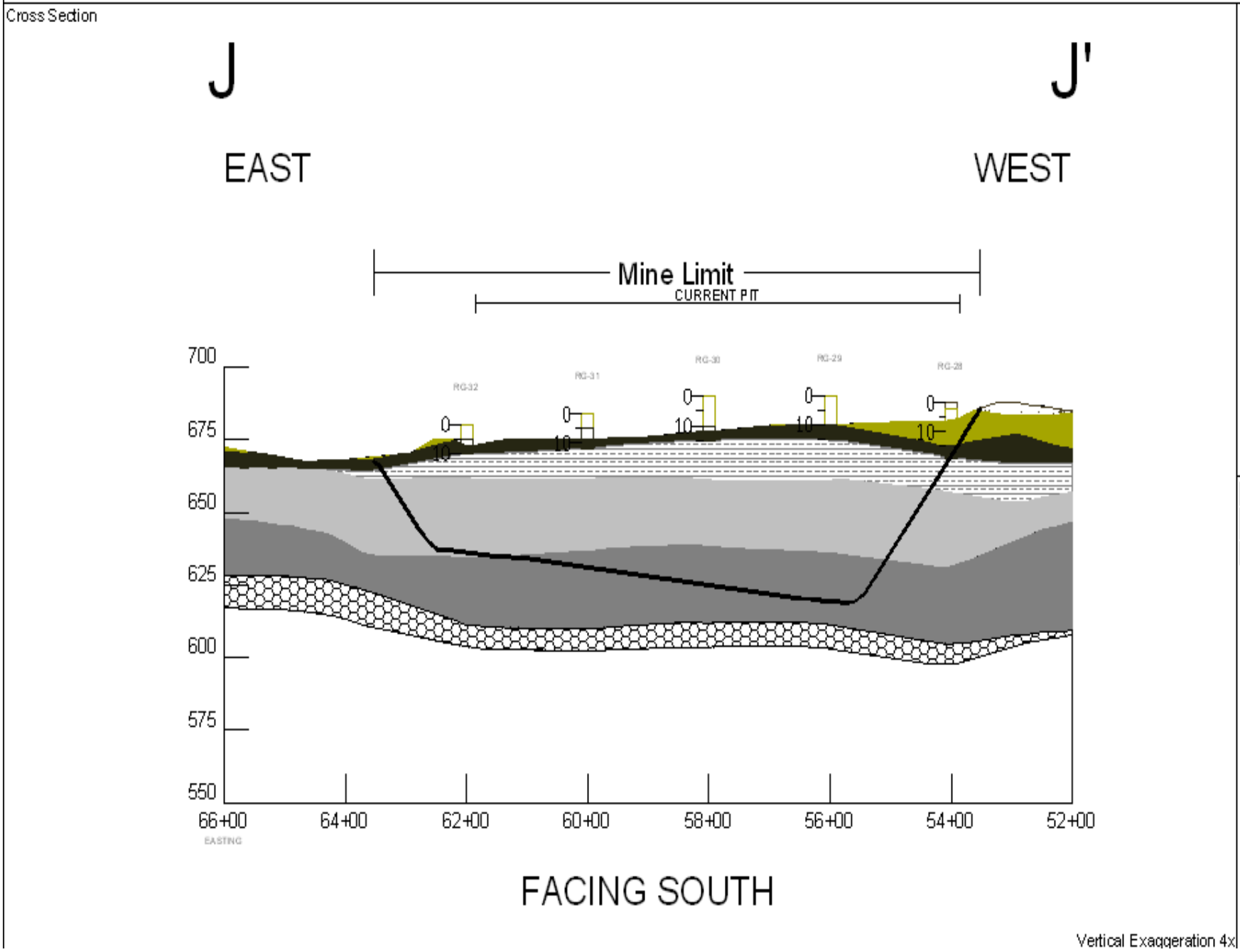
- Overburden
- Yellow Shale
- Weathered Yellow
- Gray Shale with siltstone laminations
- Light Gray Shale
- Dark Gray Shale
- Pit Floor Material

Drillholes are appended to the cross section if they are within 30' of either side of the section (North or South, East or West depending on section orientation).
Also, since the drillholes are not always located directly on the section line, the sampled intervals might not appear to match the section information.
Furthermore, only material within the mine limit has been considered for property reserves.

Vertical Exaggeration 4x

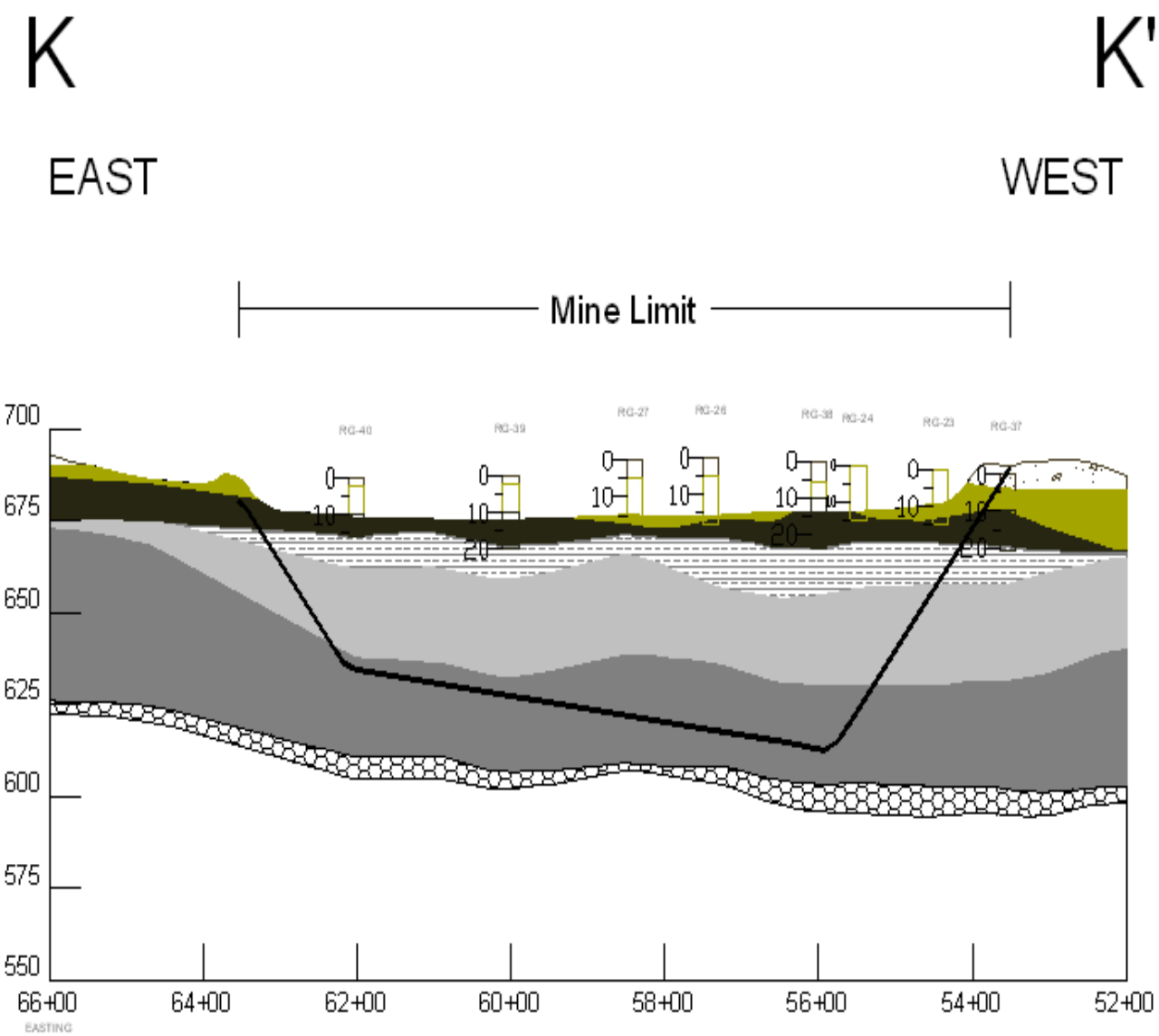
TUP Holland Cross Section J-J'

Cross Section



TUP Holland Cross Section K-K'

Cross Section



Lithology

- Overburden
- Yellow Shale
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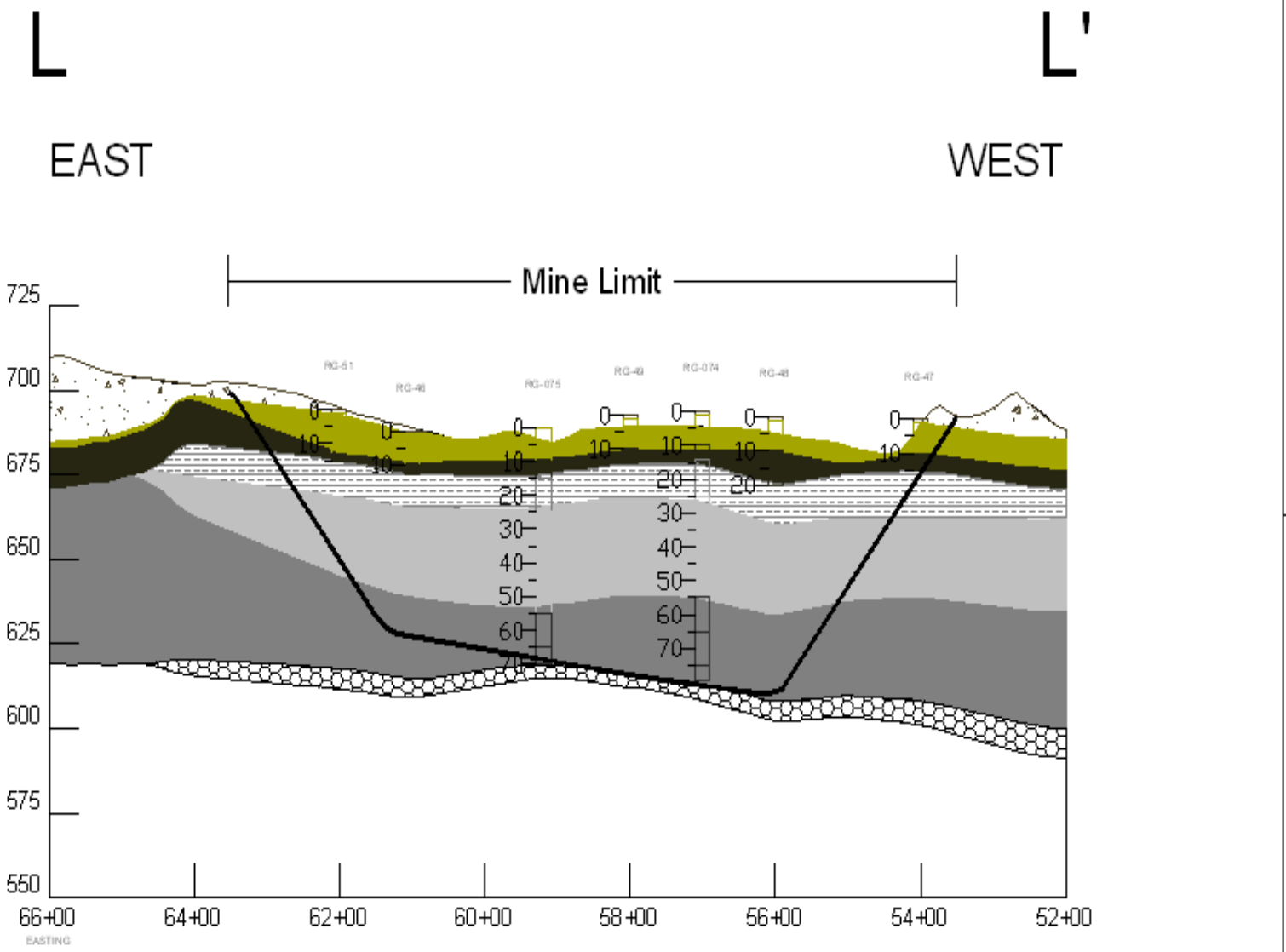
- Light Gray Shale
- Dark Gray Shale
- Pit Floor Material

TUP Holland Cross Section L-L'

Cross Section



Lithology

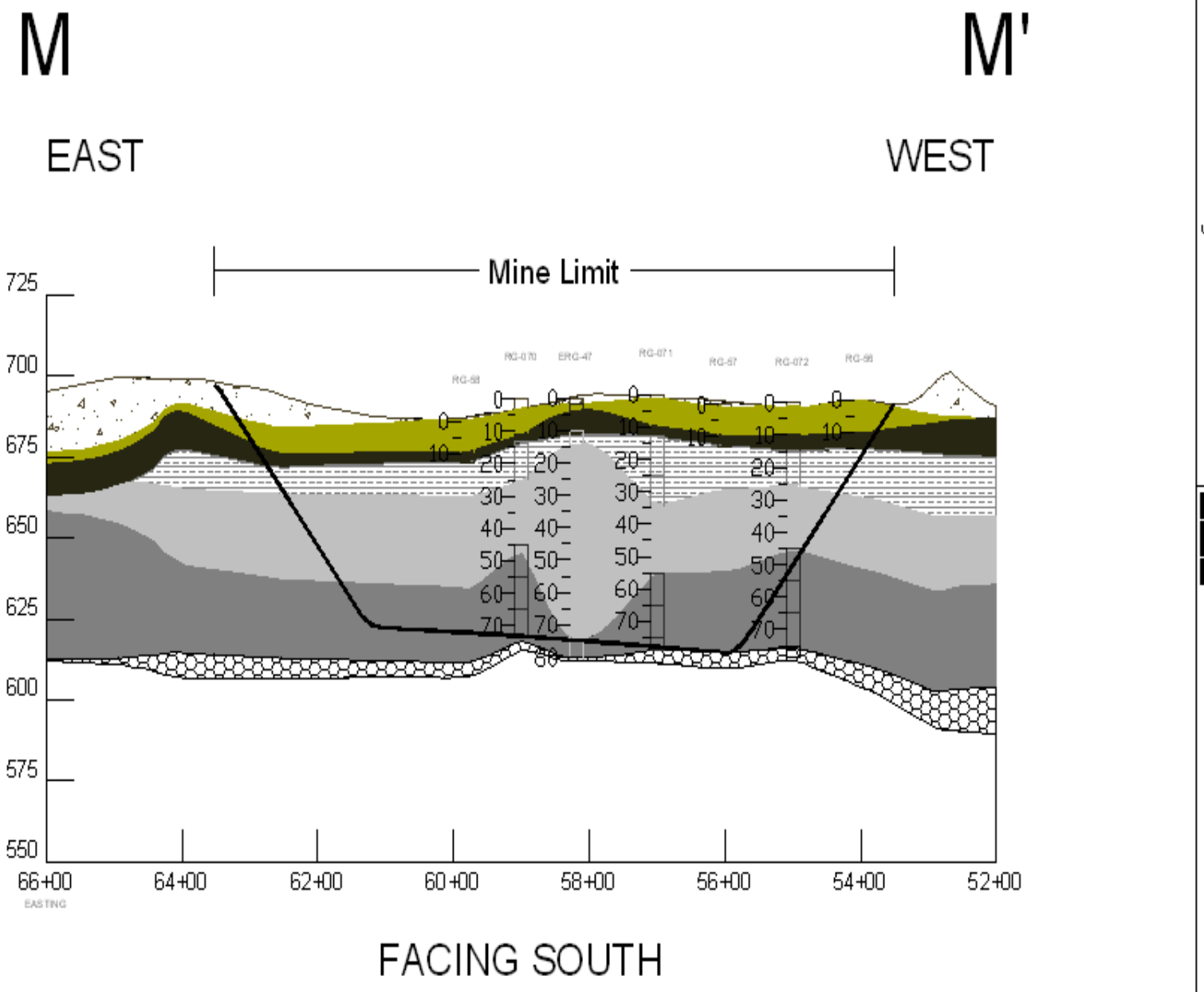
- Overburden
- Yellow Shale
- Weathered Yellow
- Gray Shale with siltstone laminations
- Light Gray Shale
- Dark Gray Shale
- Pit Floor Material

Vertical Exaggeration 4x

Printed by: R Murphy	Date: 01-03-08	Acme Brick Clay Exploration Department Denton, TX	Plant: TUP	Property: Holland	Printed on:

TUP Holland Cross Section M-M'

Cross Section



Lithology

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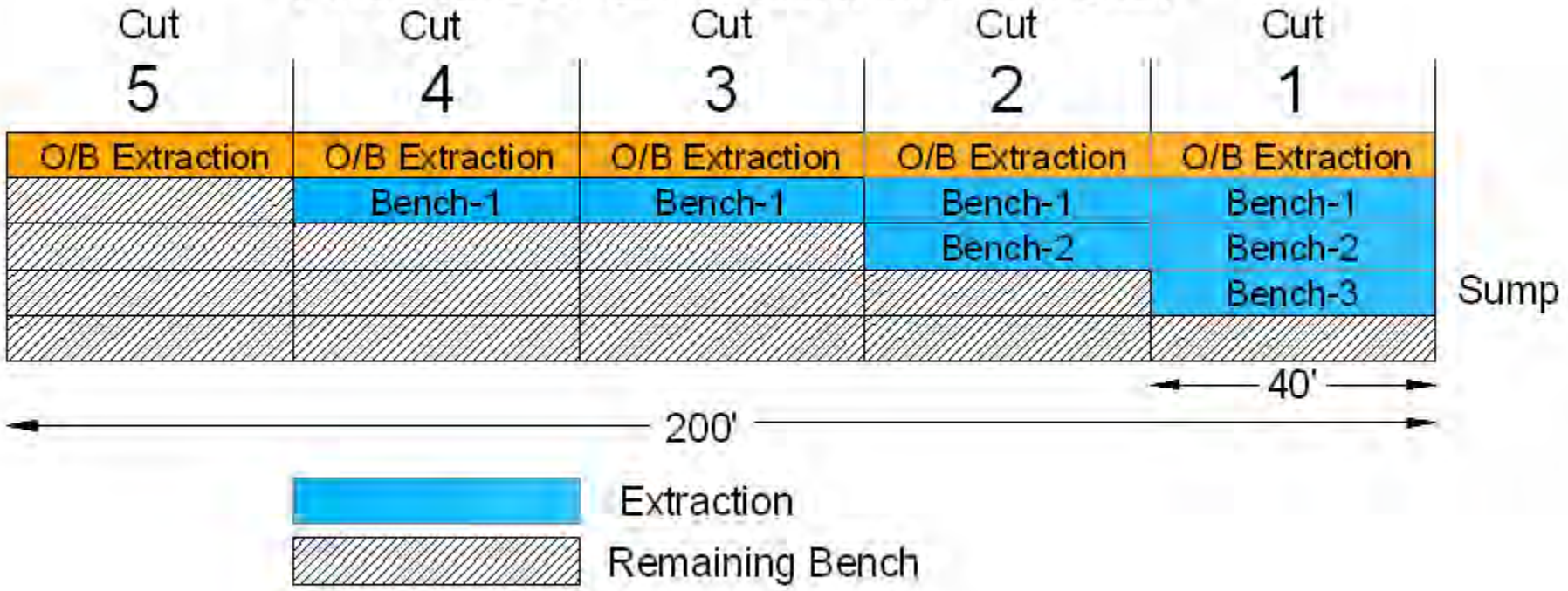
[redacted]

Revised Extraction Order




F150


DEERE


LOAD KING

DRAW TRIALS:

Matrix: 2, 4, 6, 8 hours at 1500ºF, 1600ºF, 1700ºF, and 1800ºF

- 80% Blue 20% Yellow
- 50% Blue 50% Yellow
- 100% Blue
- 100% Yellow

ACME BRICK TECHNICAL CENTER

DRAW TRIALS TEST KILN

ACME BRICK TECHNICAL CENTER

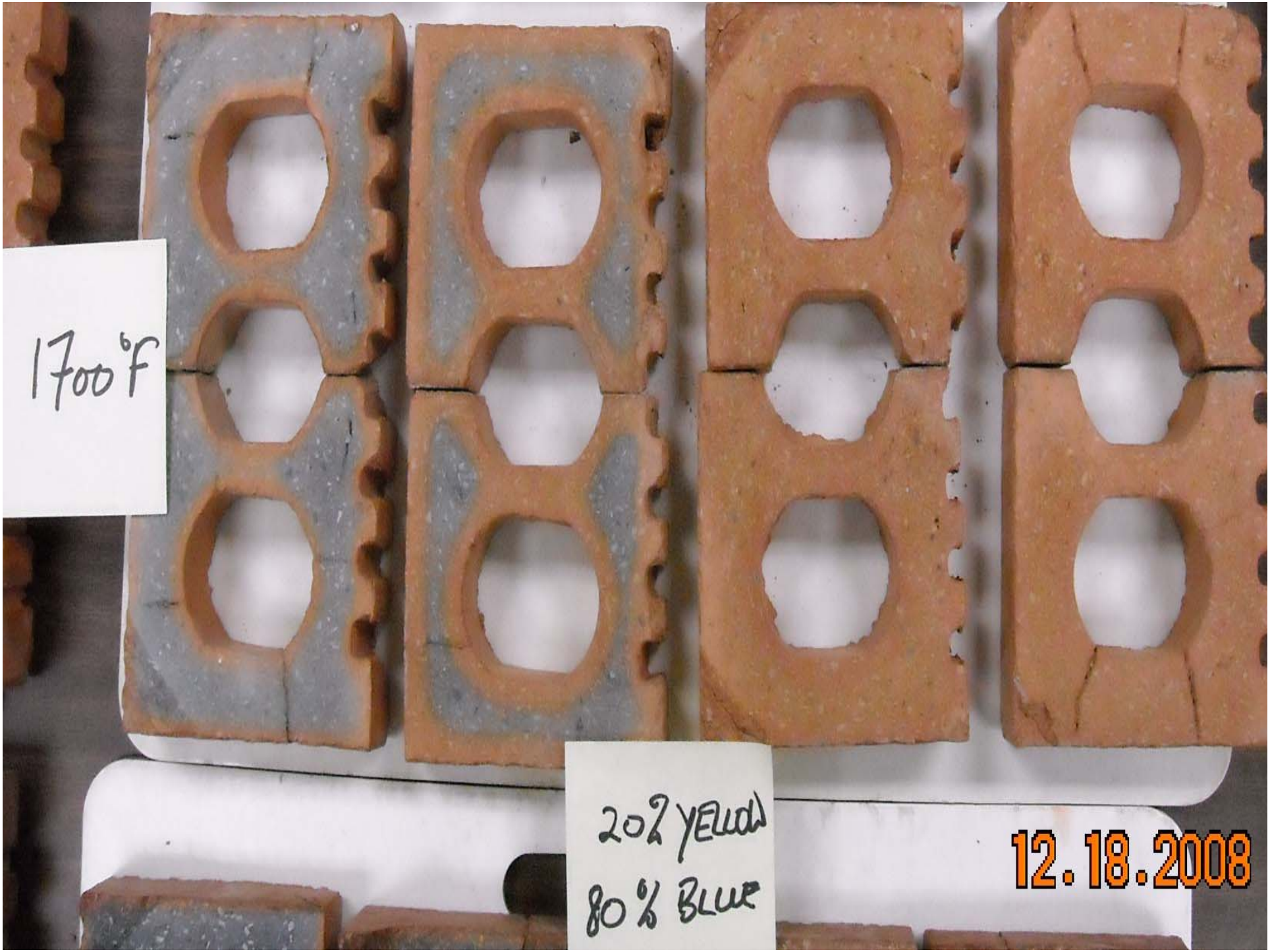
DRAW TRIAL TEST KILN

TULSA OPTIMIZATION STUDY

DRAW TRIAL


2hrs
4hrs
6hrs
8hrs.
500°F
20% YELLOW
80% BLUE
12.18.2


1600°F
20% YELLOW
80% BLUE
12.18.200


1700°F
20% YELLOW
80% BLUE
12.18.2008


1800°F


2hrs
4hrs
6hrs
8hrs
50% YELLOW
50% BLUE
12.18.200


1600°F
50% YELLOW
50% BLUE
12.18.2008 15:0


1700°F
50% YELLOW
50% BLUE


1800°F


2hrs
4hrs
6hrs
8hrs
1500°F
100%
BLUE
12.18.20


1600°F
100%
BLUE
12.18.2008


1700°F
100%
BLUE
12 18 2008 15:

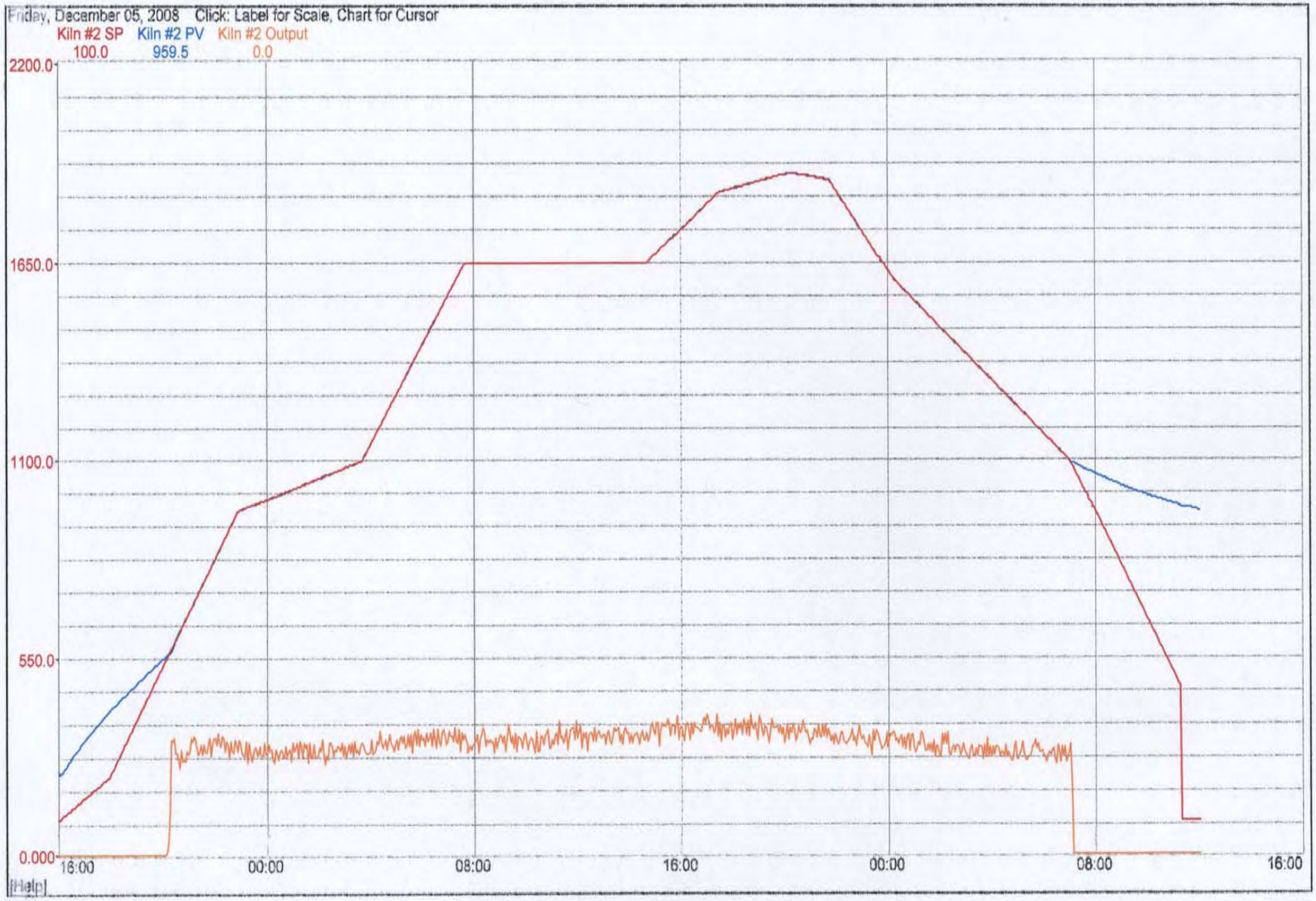
1800°F

OPTIMUM CURVE

Kiln #2 Trend

Back to Main Screen | Toggle Full Screen Mode

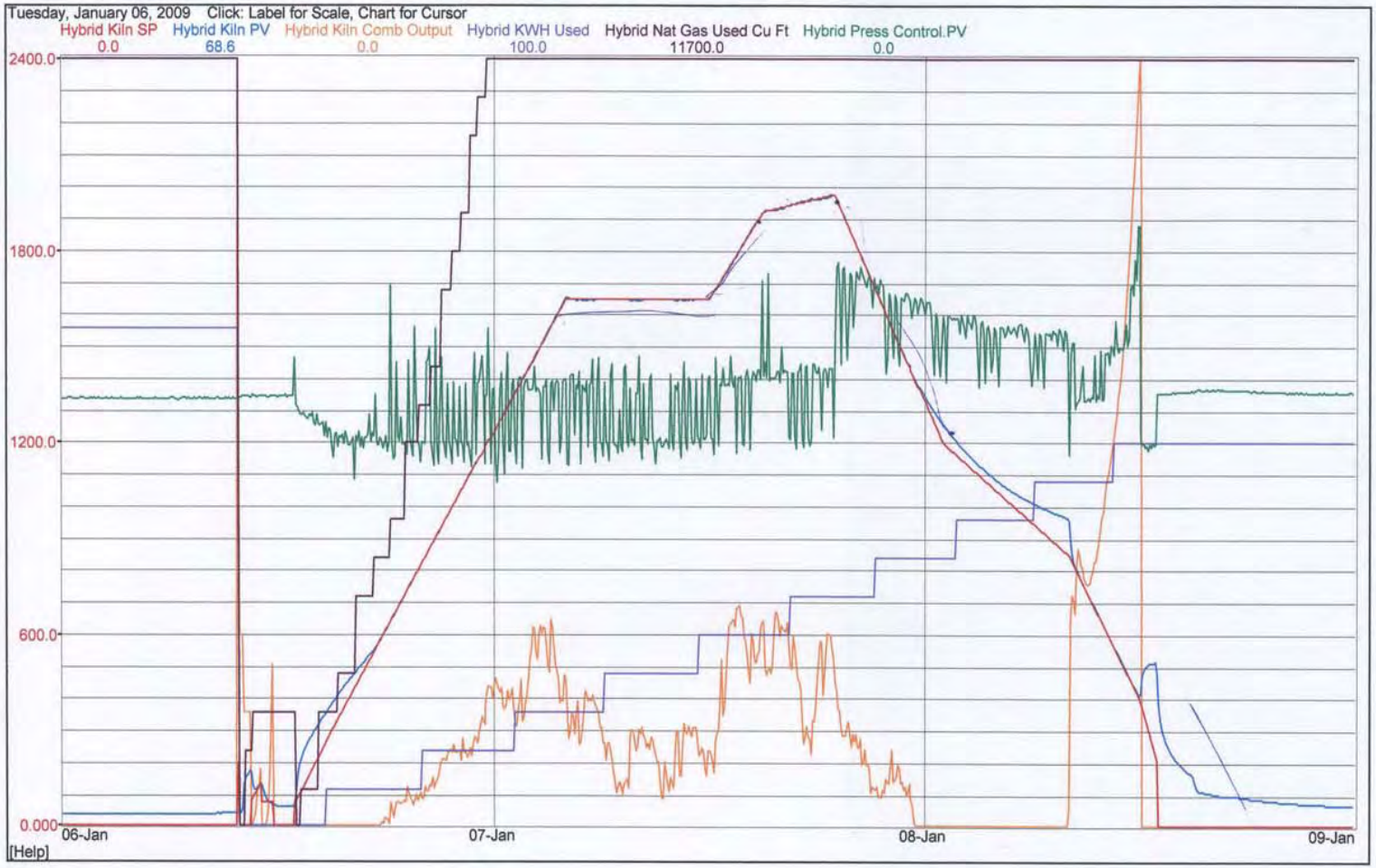
TUP



Large Batch firings……

Hybrid Kiln Basic Trends

Back to Hybrid Kiln Screen | Toggle Full Screen Mode



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Finalize plant operating conditions:

Kiln improvements…..

Before

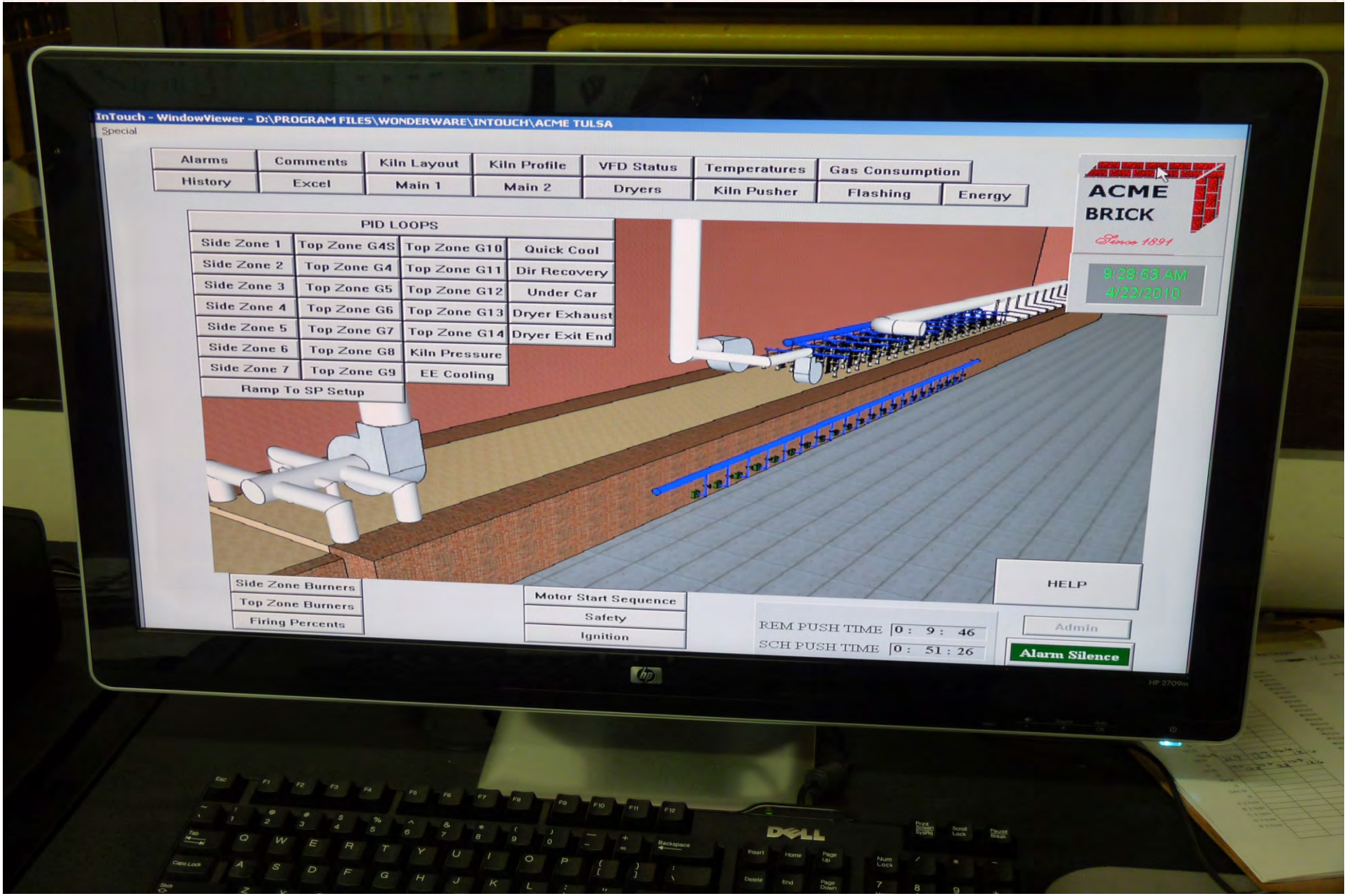
After

Before

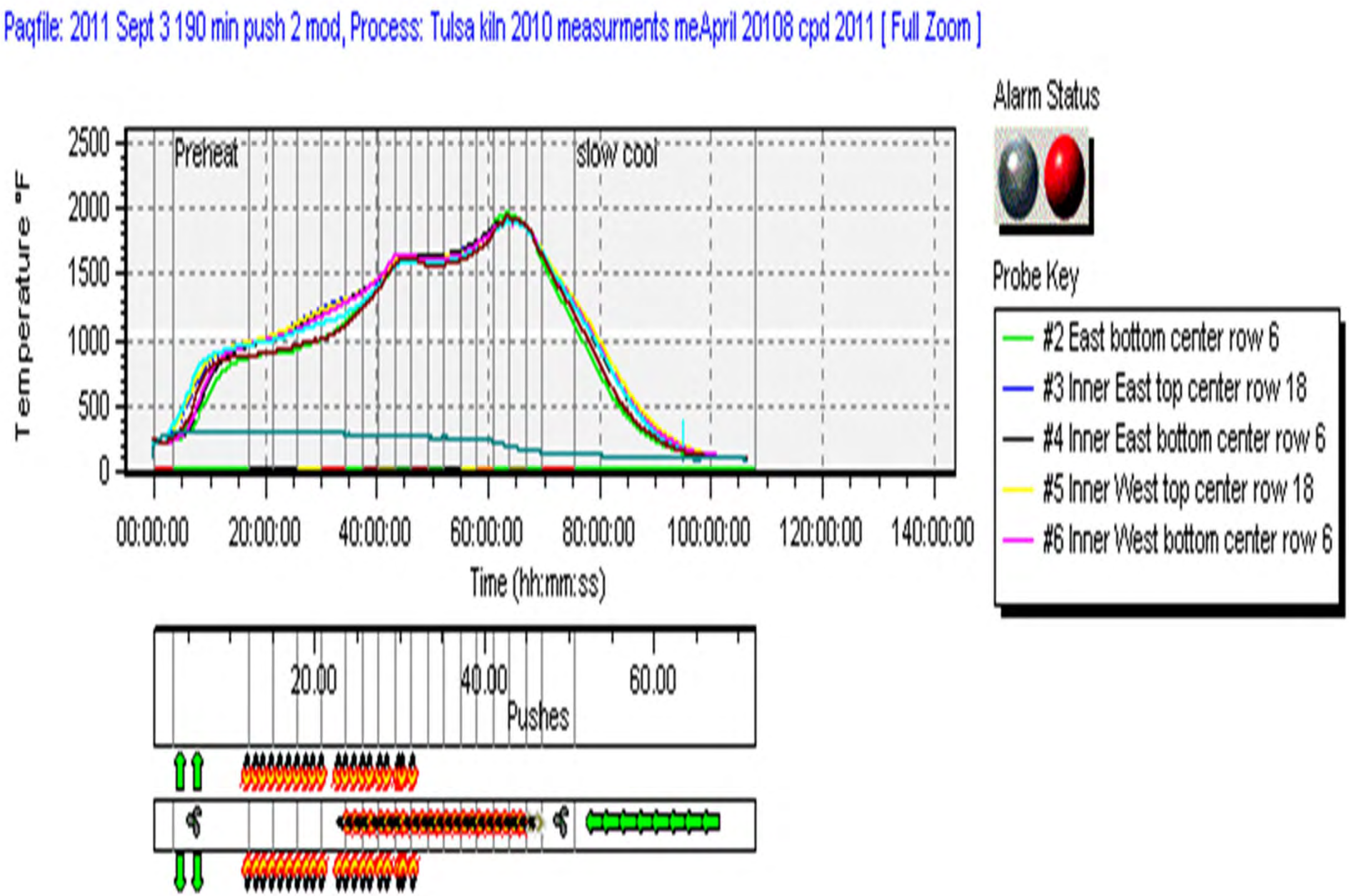
After

After

After

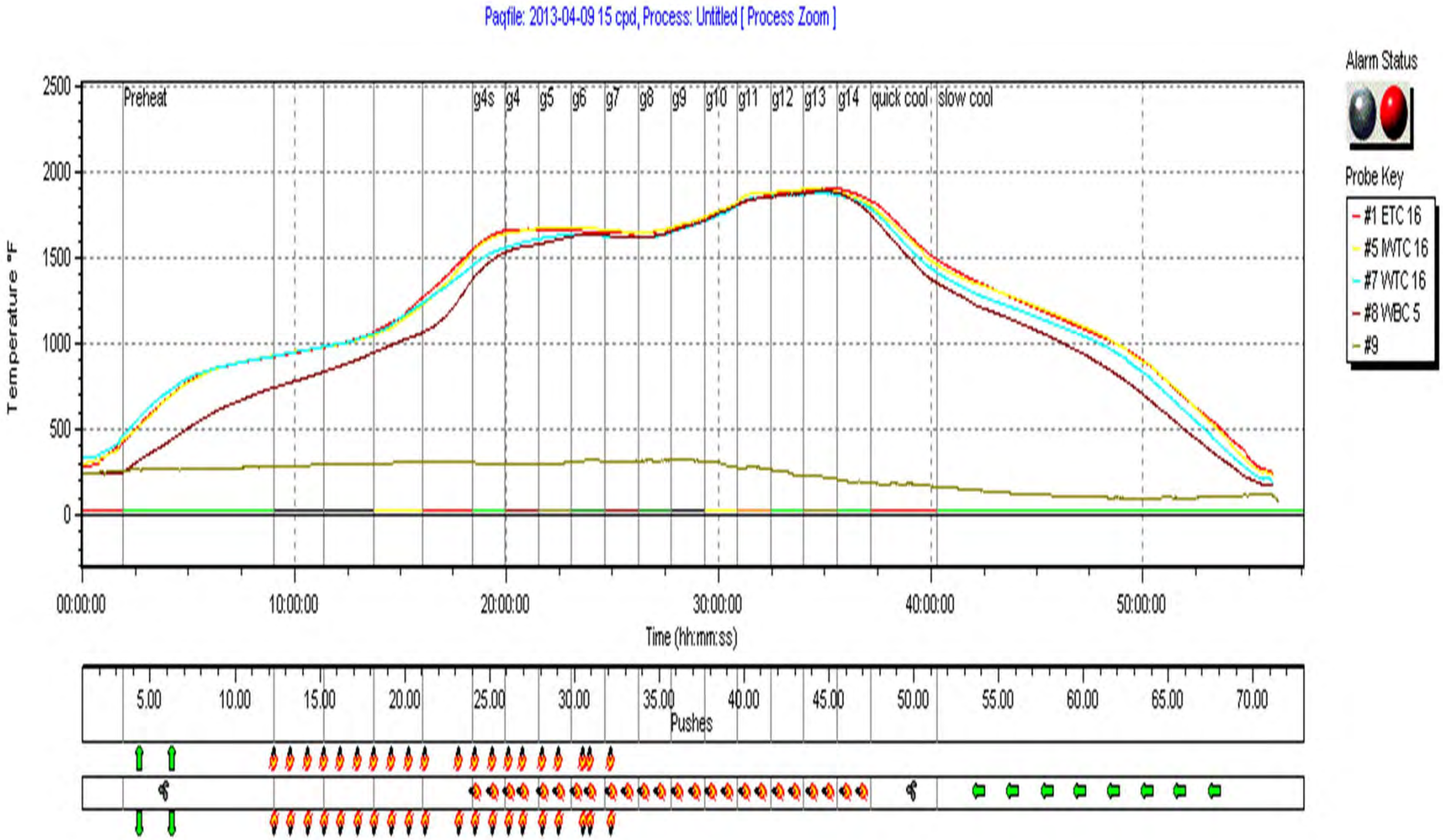

InTouch - WindowViewer - D:\PROGRAM FILES\WONDERWARE\INTOUCH\ACME TULSA
Special
Alarms
Comments
Kiln Layout
Kiln Profile
VFD Status
Temperatures
Gas Consumption
History
Excel
Main 1
Main 2
Dryers
Kiln Pusher
Flashing
Energy
PID LOOPS
Side Zone 1
Side Zone 2
Side Zone 3
Side Zone 4
Side Zone 5
Side Zone 6
Side Zone 7
Top Zone G4S
Top Zone G4
Top Zone G5
Top Zone G6
Top Zone G7
Top Zone G8
Top Zone G9
Top Zone G10
Top Zone G11
Top Zone G12
Top Zone G13
Top Zone G14
Kiln Pressure
EE Cooling
Quick Cool
Dir Recovery
Under Car
Dryer Exhaust
Dryer Exit End
Ramp To SP Setup
ACME
BRICK
Since 1891
9:28:53 AM
4/22/2010
Side Zone Burners
Top Zone Burners
Firing Percents
Motor Start Sequence
Safety
Ignition
HELP
REM PUSH TIME 0 : 9 : 46
SCH PUSH TIME 0 : 51 : 26
Admin
Alarm Silence

Before


Paqfile: 2011 Sept 3 190 min push 2 mod, Process: Tulsa kiln 2010 measurments meApril 20108 cpd 2011 [Full Zoom]
Alarm Status
Probe Key
#2 East bottom center row 6
#3 Inner East top center row 18
#4 Inner East bottom center row 6
#5 Inner West top center row 18
#6 Inner West bottom center row 6
Preheat
slow cool
Temperature °F
2500
2000
1500
1000
500
0
00:00:00
20:00:00
40:00:00
60:00:00
80:00:00
100:00:00
120:00:00
140:00:00
Time (hh:mm:ss)
20.00
40.00
60.00
Pushes

After

TULSA PLANT DATAPAQ FILE: 04/09/2013



Product acceptance….


CONFERENCE
CENTER

Thank you!