ARCH COAL, INC.

Arch Western Resources, LLC

Arch Western Bituminous Group, LLC.

West Elk Mine Overview

MSHA Belt Air Technical Panel Visit

May 15, 2007

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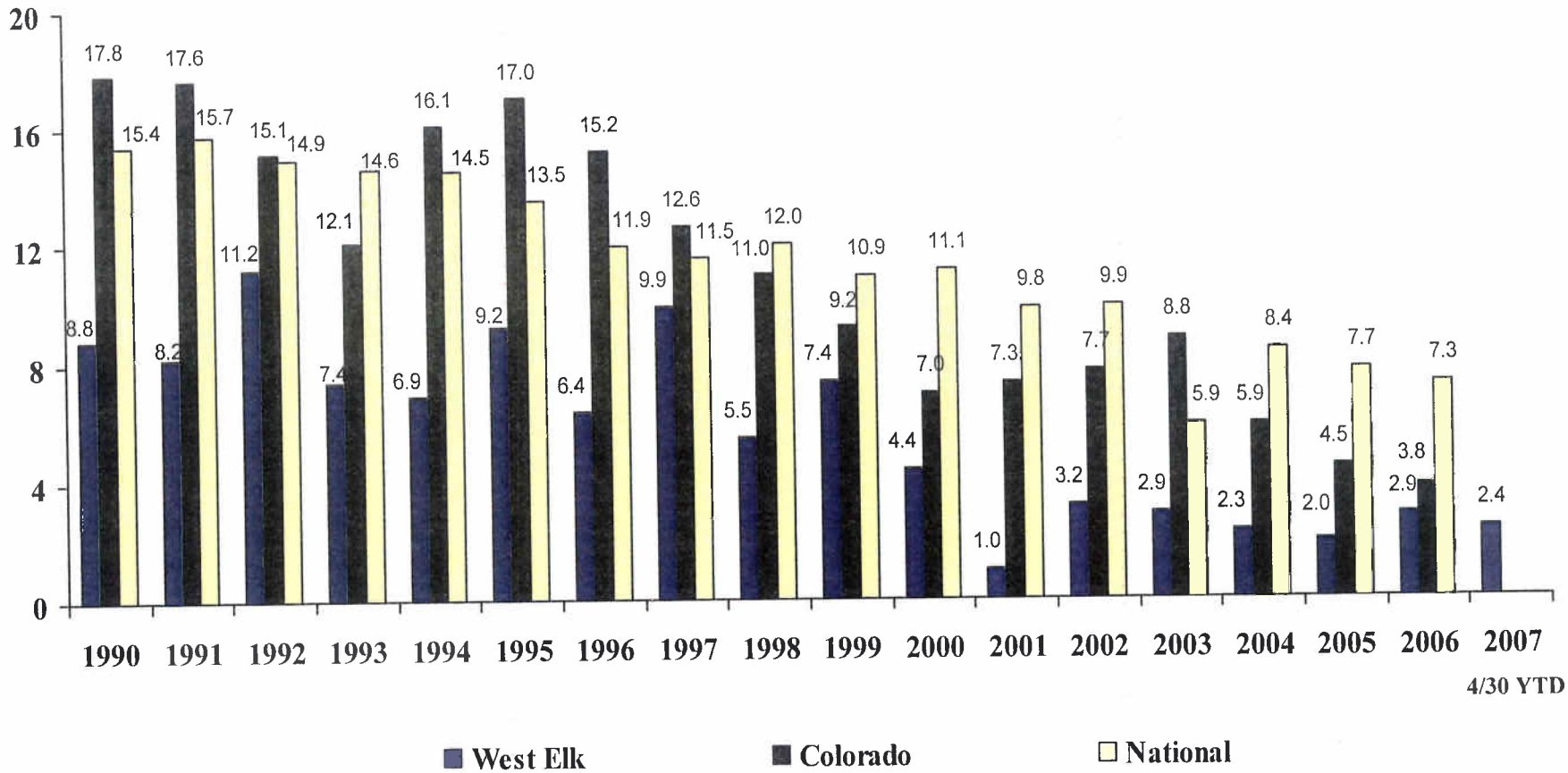
West Elk Safety Performance

MSHA REPORTABLE INJURY INCIDENT RATE COMPARISON 1990 - 2007

Underground Bituminous Coal Mines



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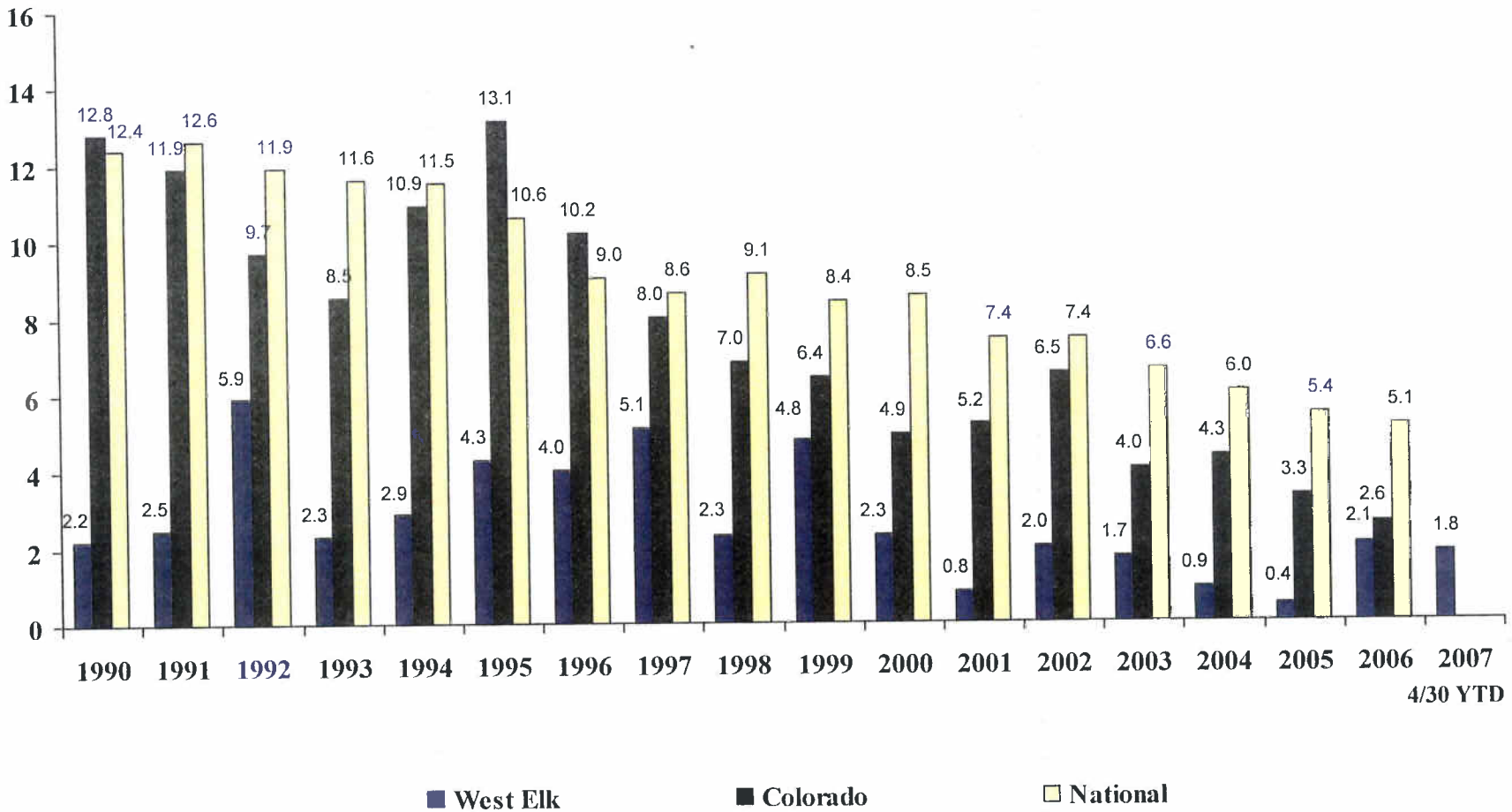
West Elk Safety Performance
MSHA LOST TIME
INCIDENT RATE COMPARISON
1990 - 2007
Underground Bituminous Coal Mines



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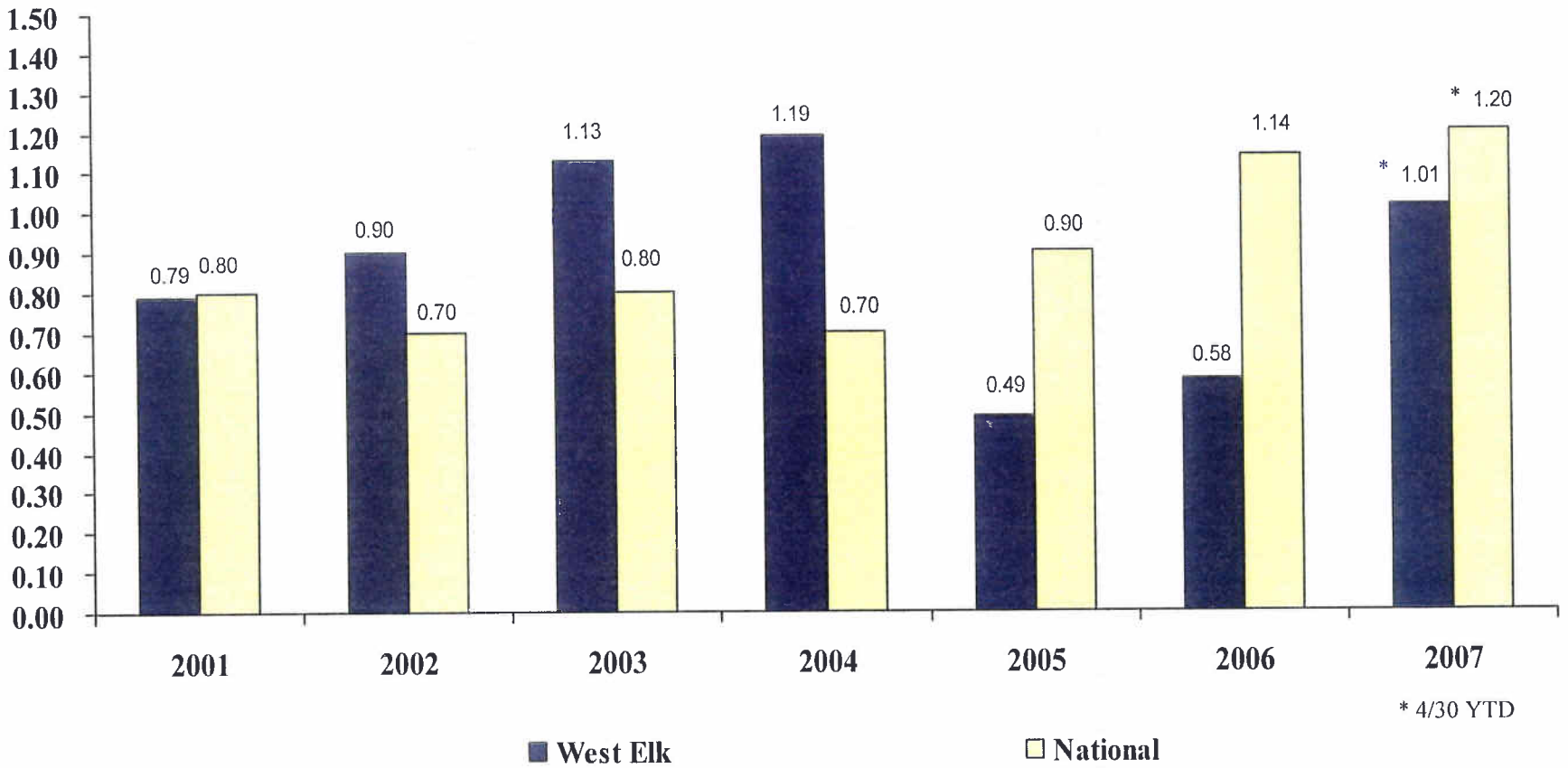
West Elk Citation Performance

MSHA Citations Per Inspector Shift Comparison
2001 - 2007
Underground Bituminous Coal Mines



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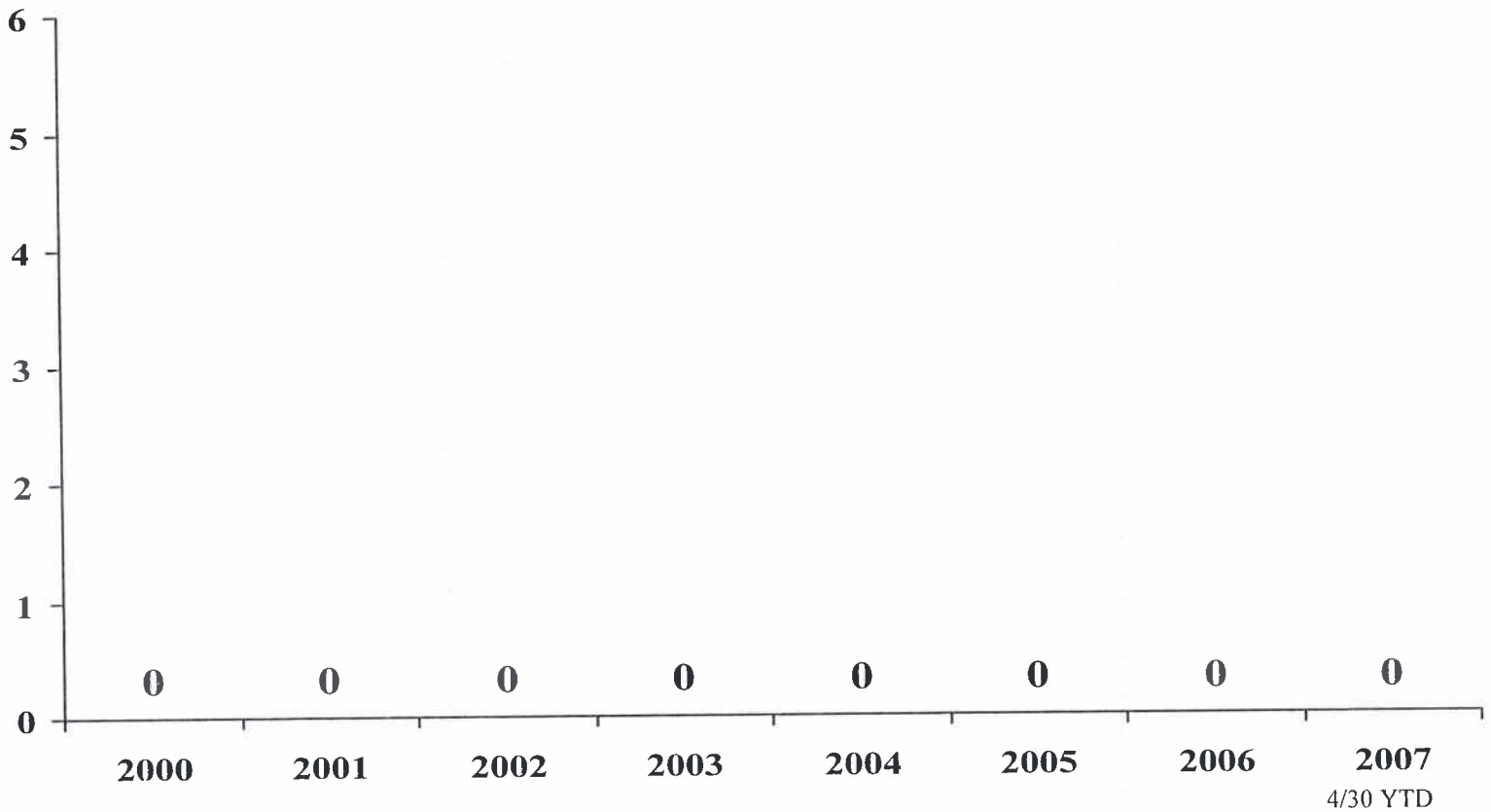
West Elk Environmental Performance

NOTICES OF VIOLATION
2000 - 2007



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West Elk

Safety Is A Value

- **A Non Compromising Commitment to Achieve An Injury Free and Environmentally Responsible Workplace.**
- **West Elk Mine Considers Maintaining Healthy Work Conditions, Ensuring the Safety of Its People, and Protection of the Environment To Be Core Values.**
- **Core Belief Is That All Injuries Can Be Prevented.**
- **Focus On Behavior – Currently Implementing Behavioral Injury Prevention Process**
- **Monthly Standup For Safety Meetings Have Been A Key Element To Safety Success**

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West Elk History

1969 First Coal Lease Acquired

1976 Reserve Drilling Started

1981 Permits Approved/Initial Construction

1982 Initial F Seam Production

1990 Initial B Seam Production

1992 Longwall Commissioned

1994 Jumbo Mountain Lease Acquired

1994 Longwall Extended to 950 Feet Wide

1995 Box Canyon Lease Acquired

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West Elk History

1995 East Mains Development Initiated

1997 Sylvester Gulch Ventilation Facilities Started

1998 Acquired by Arch Coal, Inc.

1999 Sly Gulch Facilities Commissioned

2000 Spontaneous Combustion Event

2001 High Methane Encountered

2002 North Reserve Area Developed

2004 Started E Seam Development

2005 Spontaneous Combustion Event

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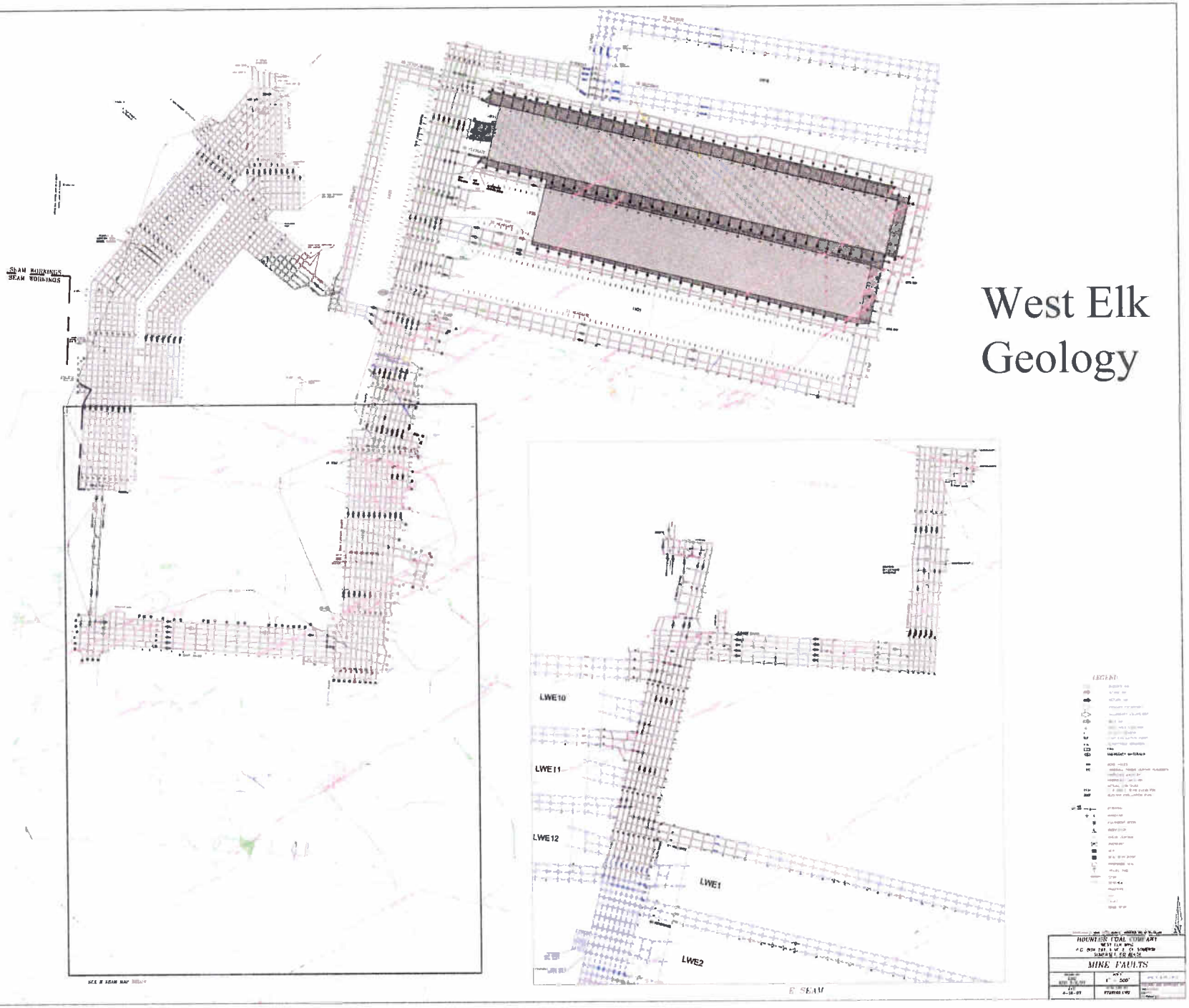
West Elk
Geological Challenges

- **Roof/Rib Control Impacted By**
  - **Depth of Cover**
    - 600 ft to 2,300 ft
  - **High Horizontal Stress**
    - Maximum N65E – 3,507 PSI
    - Minimum N25W – 797 PSI
    - Strongly Anisotropic – Floor Heave, Pillar Crushing
  - **Faults**
    - Displacement 1 ft to 23 ft
    - Numerous fracture zones – no displacement
    - Serve As Conduits For Increased Methane and Water Inflows
    - Concentrates Tectonic and Abutment Stresses
  - **Spars**
    - Thickness inches to 8 ft
    - Hardness > 15,000 PSI
  - **Multi Seam Mining**
    - Stress Distribution / Shadow Influence
    - 3 Seam Interaction F, B, and E Seams

West Elk Geology



West Elk Cover Map

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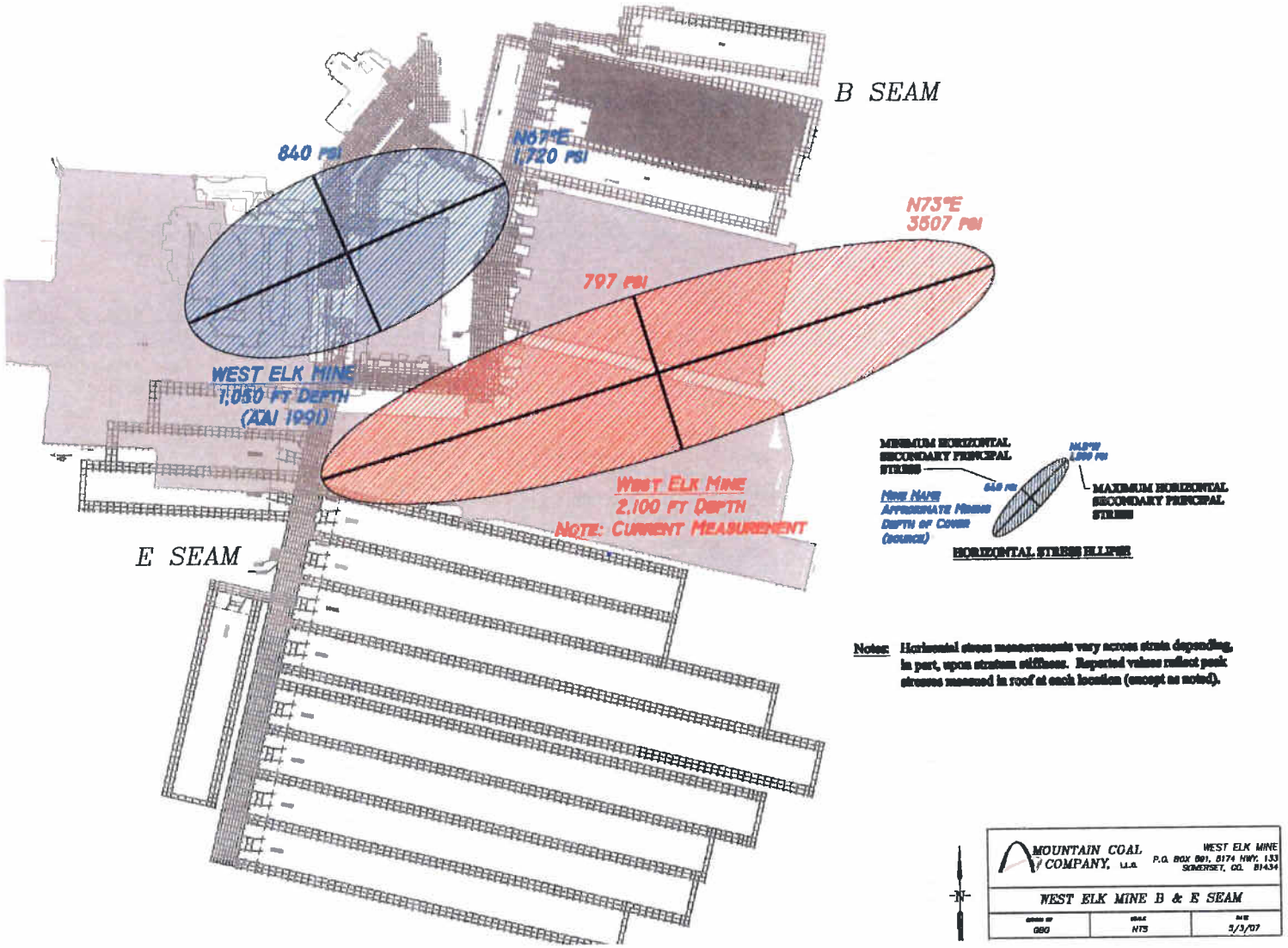
West Elk Mine
Stress Orientation Diagram



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West Elk
Geological Challenges

- **Methane Liberation**
  - **Initial Room and Pillar Mining in F-Seam Resulted in Little to No Methane Liberation.**
  - **Longwall Mining in B-Seam Commenced in August 1992, Resulting In An Increase In Methane Liberation.**
  - **Methane Liberation Gradually Increased In B-Seam, Resulting in MSHA 5-Day Spot Inspections in September 2001.**
    - **Methane Liberation Of 10 million to 20 million Cubic Feet/Day**
  - **Significant Methane Production From Caving On The LW. Methane Stored In Roof Rock Is Liberated By Mining.**
  - **Control With A Combination of Vertical Drainage and High Volume Mine Ventilation System.**

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West Elk
Geological Challenges

- **Spontaneous Combustion**
  - **Combustion Produced In A Substance By The Generation Of Heat Through The Chemical Action Of Its Own Elements, Rather Than Being Initiated By A Flame or External Heating Source.**
  - **Factors Affecting Spon Com**
    - **Fragmentation (Fine Coal)**
    - **Oxygen Availability**
    - **Heat/Oxidation**
    - **Moisture**
    - **High Ventilation Pressure Differentials**
  - **Coal In Both B and E Seam Are Ranked As Having "Moderate" Susceptibly to Spontaneous Combustion**
  - **Historic Problem Areas at West Elk**
    - **Gob Connectors**
    - **Faults/Fractures in Pillars**

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West Elk
Geological Challenges

- **Spontaneous Combustion**
  - **Caused Mine Fires In 2000 and 2005 Resulting In Mine Outages Up to 6 Months.**
  - **Have Experienced Multiple Minor Heating Events In Pillars That Did Not Result In Mine Outages.**
  - **Use of Belt Air Has Allowed Lower Main Fan Operating Points and Ventilation Pressure, Reducing The Risk Of Pillar and Gob Fires.**

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West Elk
Belt Air

- **Petition for Modification For Use of Belt Air Filed In May 1990.**
  - **To Provide Higher Volumes of Air at the Working Face**
    - **Reduce Exposure to Respirable Dust**
    - **Dilute Methane Anticipated In B Seam**
  - **To Reduce The Number of Entries Required**
    - **Reduce Exposure to Injury From Roof & Rib**
  - **To Align Belt Entry Air Flow and Water Flow Direction**
    - **Enable Fire Fighting From Fresh Air Side**

- **Petition Granted in May 1991.**
- **Implemented Petition in June 1992 in Both the Continuous Miner and Longwall Sections.**
- **Petition Stipulations Were Fairly Close to the Requirements of the Current Belt Air Regulations.**

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West Elk
Belt Air

- **Petition Superseded By New Belt Air Regulations in June 2004**
  - **Lowered Alert/Alarm Levels By 5 PPM**
  - **Required CO Monitors In Intake Escapeway**
  - **Limited Air Volume In Belt Entry To <50% Of Total Intake Air Quantity**
  - **Required A Means To Close Point Feed Regulators**
  - **Required Continued Two-way Communication If AMS System Malfunctioned**
  - **Required Separation of AMS Line and Other Communication Lines**

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West Elk Mine
Belt Air Advantages

- **Provides Higher Volumes of Air at the Working Face**
  - **Reduces Exposure to Respirable Dust and Black Lung Disease By Reducing the Level of Dust That Miners Are Exposed To During the Coal Extraction Process**

- **Lowers Main Fan Operating Point and Mine Ventilation System Pressure**
  - **Reduces the Risk of Spontaneous Combustion**
    - **Pillars**
    - **Gob**
  - **Reduces Exposure to Strains, Sprains, Falls, and Contacted-By Injuries Associated With High Pressure Ventilation Doors.**

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West Elk Mine
Belt Air Advantages

- **Provides Air Direction in Belt Entry Toward Working Section**
  - **Facilitates Detection of Fire By Smell in the Event All Other Detection Systems Fail.**
  - **Enables a Fire in the Belt Entry to be Fought From the Fresh Air Side of the Fire.**

- **Provides Lower Air Velocity In Main Travel Way**
  - **Reduces Exposure to Respirable Dust and Black Lung Disease By Reducing the Level of Dust That Miners Are Exposed To in the Travel Way**

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West Elk
Belt Air

- **Safety Precautions**
  - **AMS System Continuously Monitored By Designated Person. Their Primary Job Is Monitoring the System.**
  - **AMS Includes Carbon Monoxide, Methane, Oxygen and Air Velocity Sensors Throughout the Mine.**
  - **Carbon Monoxide (CO) Sensors At**
    - **Each Belt Drive**
    - **Each Tailpiece**
    - **Each Belt Take-up Unit**
    - **Each Transfer Point**
    - **Each Loading Point**
    - **Each Belt Air Split**
    - **Each Point Feed**
    - **Each Primary Escapeway at the Mouth**
    - **At 1,000' Intervals in the Belt Entry.**
  - **Equates to Over 140 CO Sensors At West Elk At Present Time**

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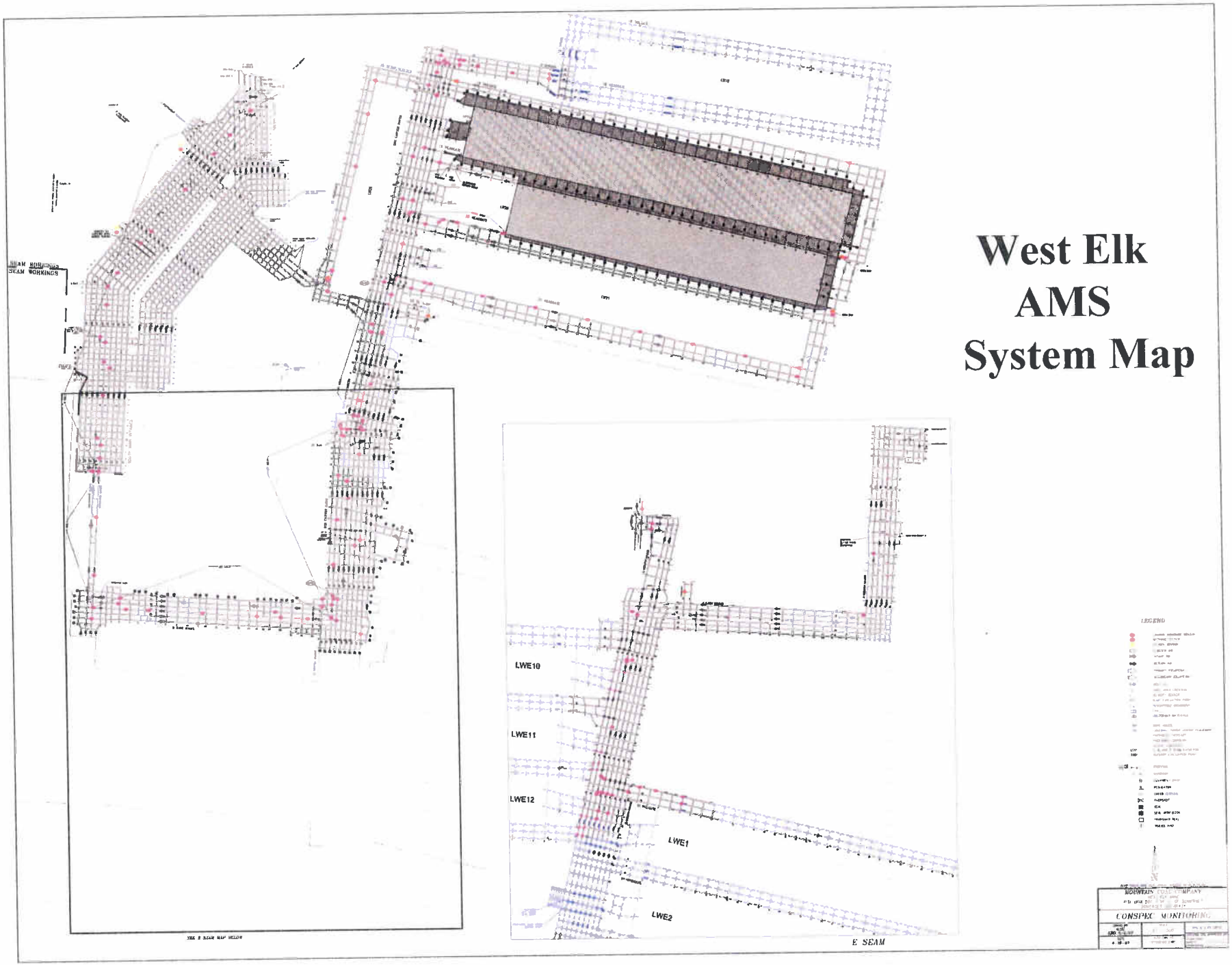
West Elk
Belt Air

- **Safety Precautions (Cont'd)**
  - **Carbon Monoxide Sensors Are Much Better In Detecting Fires At The Incipient Stages When Compared To Point-Type Heat Sensors.**
  - **Warning System Automatically Activates At 10 PPM (Alert Level) and 15 PPM (Alarm Level).**
  - **Warning System Provides Audible and Visual Alarms At the AMS Operator Station and At Each Working Section.**
  - **AMS Operator Immediately Initiates Investigation. Nearby Underground Personnel Are Contacted via Radio or Pager to Determine Source of Alarm.**
  - **Source Is Identified and Communicated to AMS Operator.**



West Elk AMS System Map

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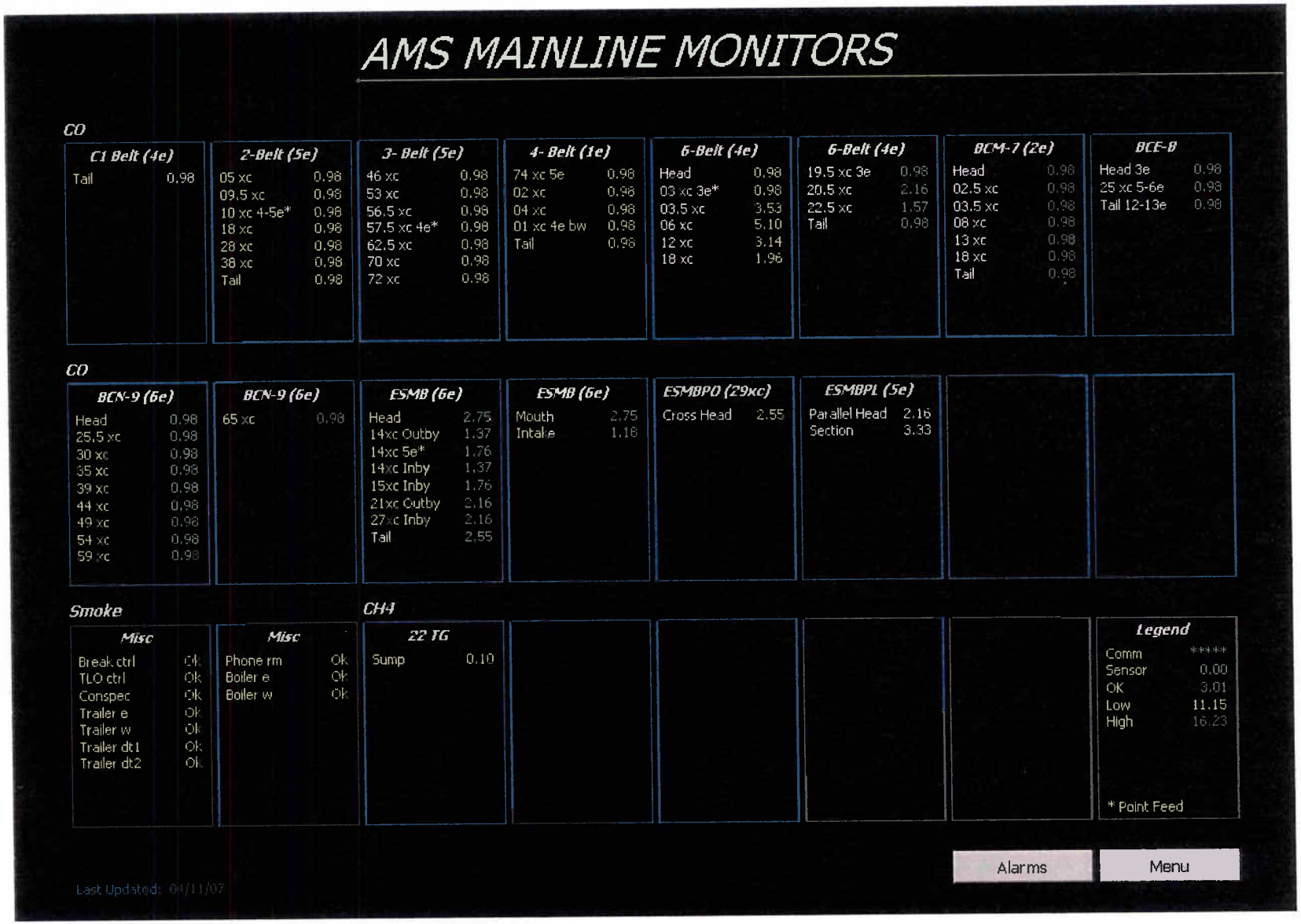
AMS Operator's Screen



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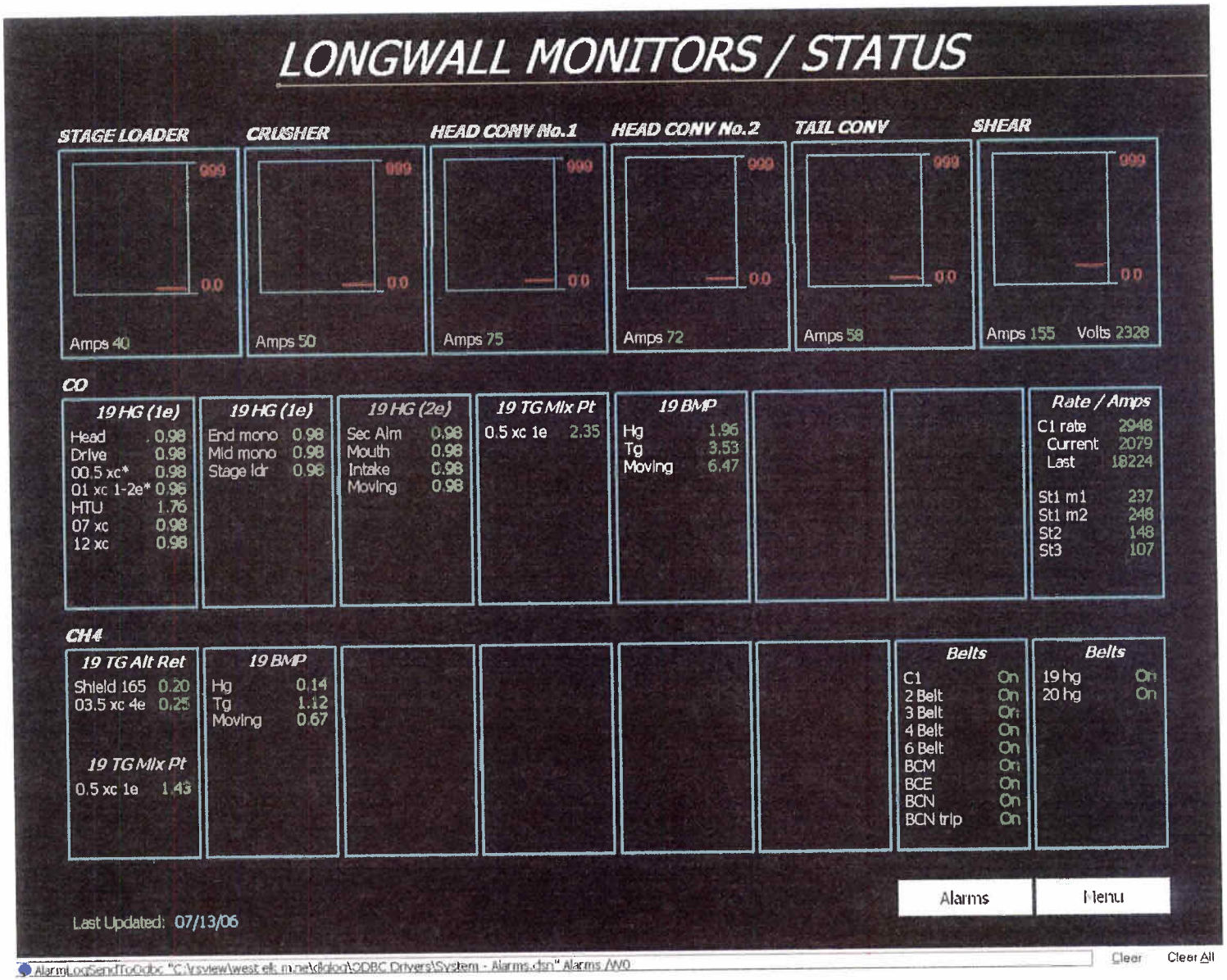
AMS Operator's Screen



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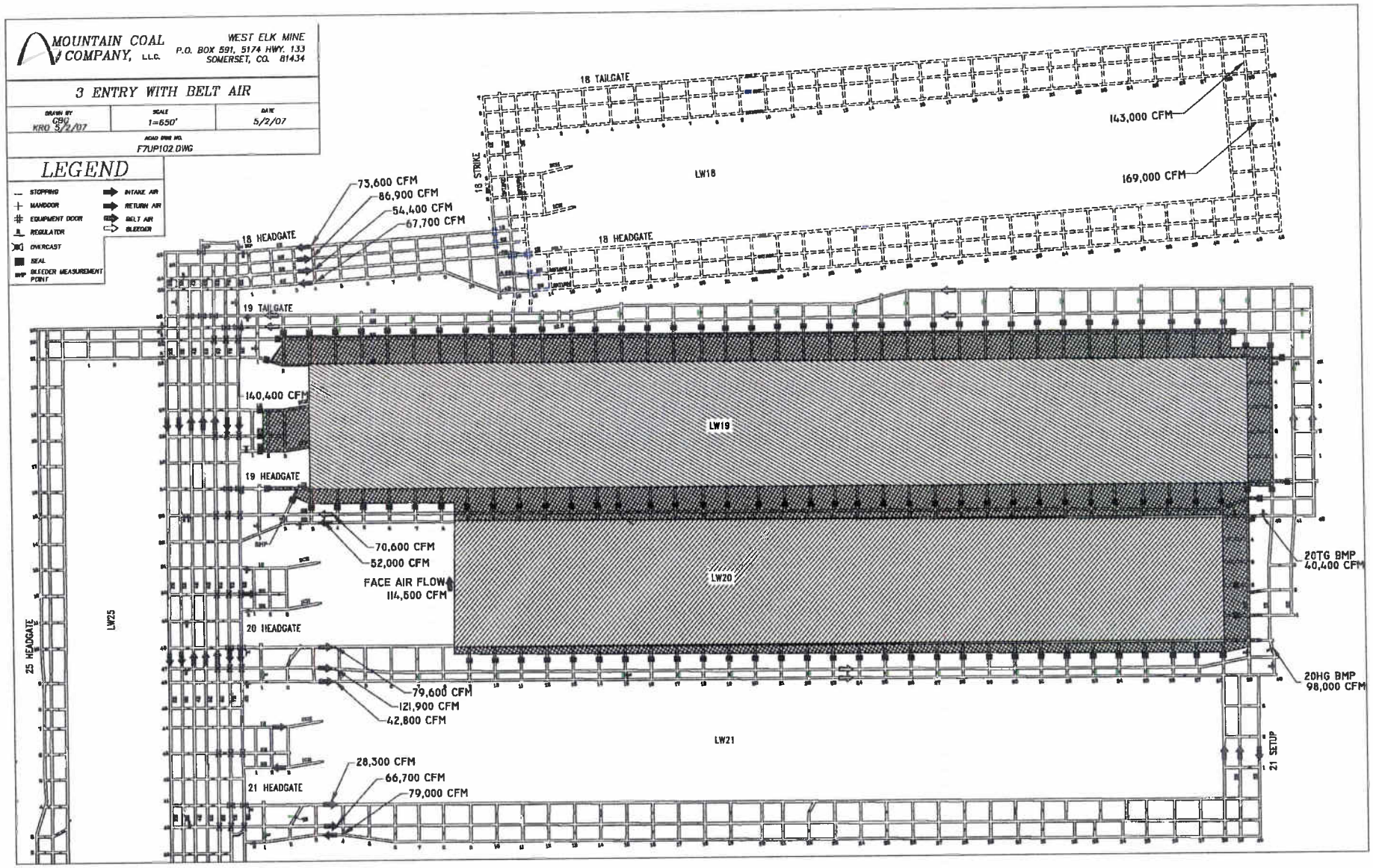
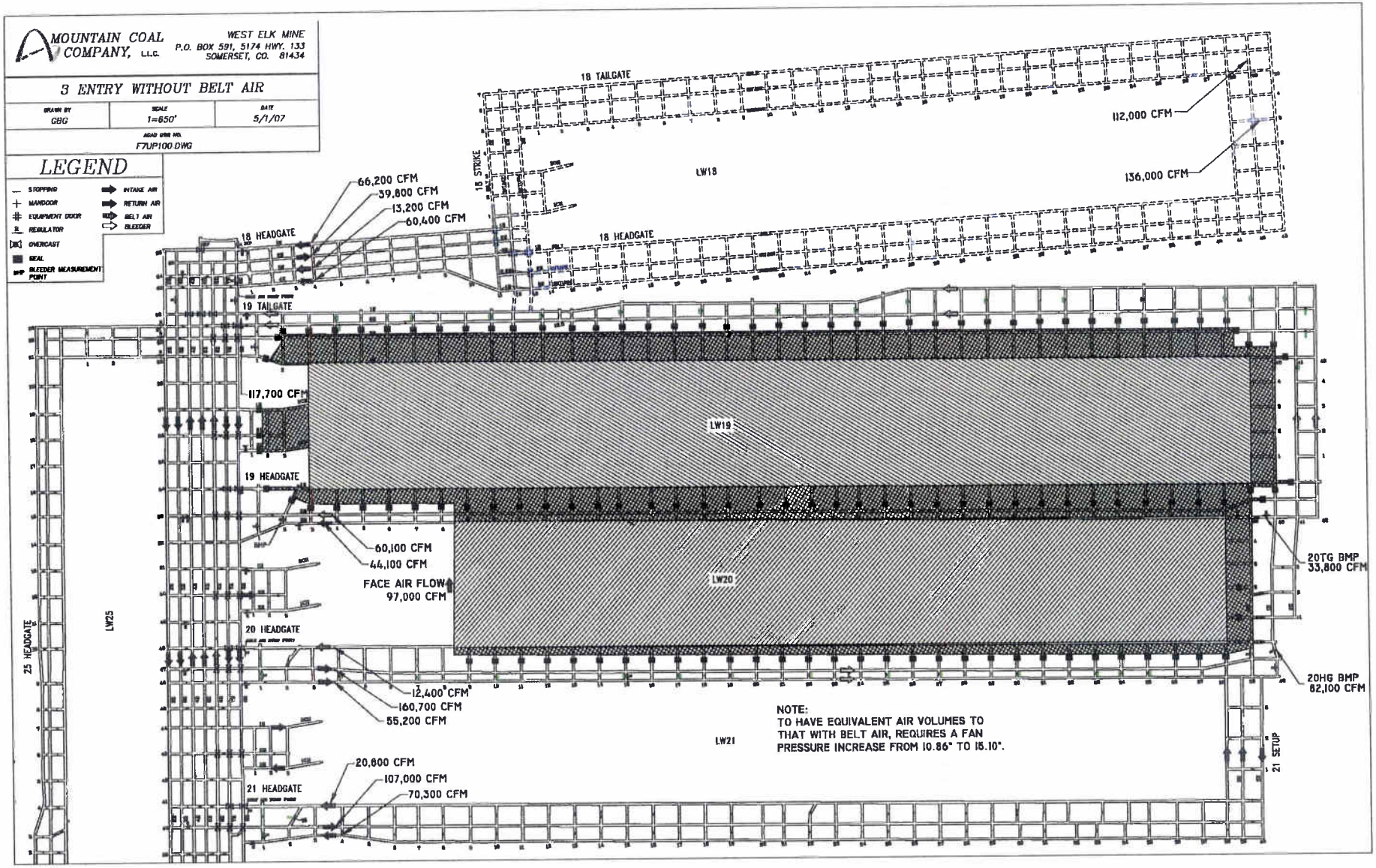
West Elk
Belt Air Summary

- **Belt Air Has Significantly Enhanced Miner Safety at West Elk.**
  - **Use of Belt Air Has Prevented Methane Concentrations in the Working Faces From Significantly Increasing, Resulting In Improved Safety For the Miners.**
  - **Use of Belt Air Has Resulted In Reduced Respirable Dust Concentrations in the Working Faces.**
    - **Over the Past 10 Years, Respirable Dust Standards Have Been Consistently Met At Each MMU and DA (3 Citations Were Issued Over 10 Years)**
  - **The West Elk AMS System Is Reliable and Alerted Us of Problems In January 2000 By Detecting Increasing CO At the Main Fan.**



Current Mining Area
With Belt Air Utilization



Current Mining Area
Without Belt Air Utilization

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West Elk
Belt Air Summary

	AIR VOLUME (CFM)***		METHANE CONCENTRATION (%)	
LOCATION	W/ BELT AIR	W/O BELT AIR	W/ BELT AIR	W/O BELT AIR
Mix Point*	140,400	117,700	1.7	2.0
18TG LOXC**	143,000	112,000	0.8	1.0
18HG LOXC**	169,000	136,000	0.8	1.0

* Methane at the mix point {75.323(e)}must be $\leq$ 2.0%
** Methane in the LOXC must be $\leq$ 1.0%
*** Fan pressure @ 10.86"

- **Without the Use of Belt Air, the Reduced Air Quantities in Each Location Results in Borderline Compliance.**
- **To Maintain Equivalent Methane Concentrations Would Require Fan Pressure To Be Increased To 15.1".**
- **The Increased Fan Pressure Will Result In Diminished Safety Due to Increased Potential For Spontaneous Combustion.**

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West Elk
Belt Air Summary

- **Belt Air Has Significantly Enhanced Miner Safety at West Elk.**
  - **Potential Heatings, Such As Hot Conveyor Rollers, Have Been Detected Through Sense of Smell In The Working Section Prior To Detection By The Sensors. This Early Detection Further Reduces the Potential of Fires in the Belt Entry.**
  - **Fire Fighting Is Enhanced With The Use of Belt Air, Allowing Fire Fighters to Approach the Fire From Upwind.**
  - **We Recommend That Belt Air Usage Be Allowed to Continue.**