Abandoned Underground Mines in Ohio – AUMIRA Database Population Project

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Stantec Consulting Services Inc.
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Appalachian States Coalition for Geohazards in Transportation

Presentation Outline

Abandoned Underground Mines in Ohio – AUMIRA Database Population Project

I. Introduction

II. Site Identification

III. Site Groups

IV. Database Population

V. Remediation Cost Estimating

VI. Results/Statistics

I. Introduction

ODOT Inventory Projects

- Rockfall
- Landslides
- Karst
- Abandoned Mines
  - AUMIRA = Abandoned Underground Mine Inventory and Risk Assessment
  - Process published in 1998 manual

I. Introduction

Why was AUMIRA process developed?

- Eastern Ohio mined extensively for coal
- Problems with past mine subsidences
  - Highway closures
  - High repair costs
- A need to be proactive
  - Public Safety
  - Budgetary Mechanism
  - Informational Resource

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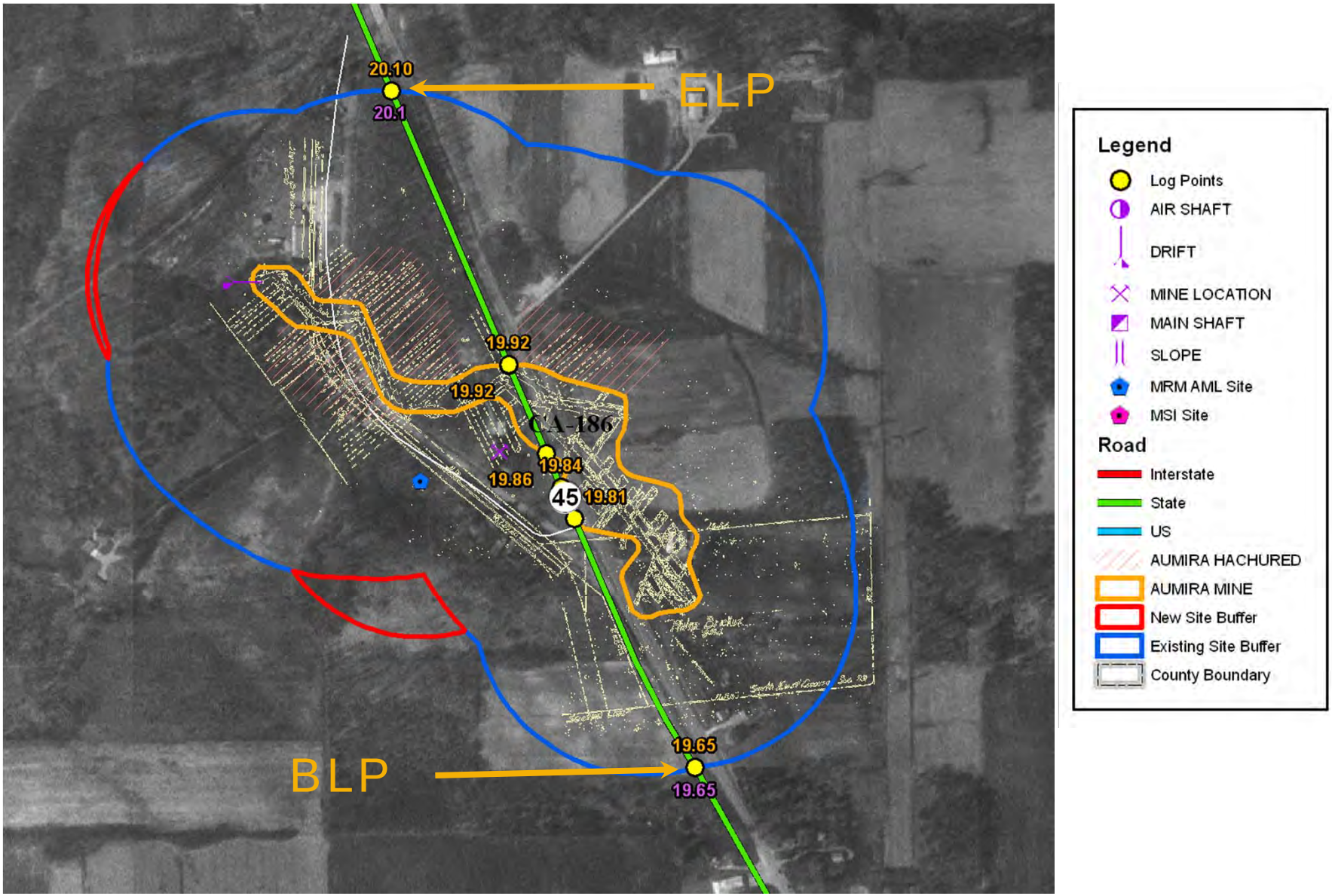
II. Site Identification



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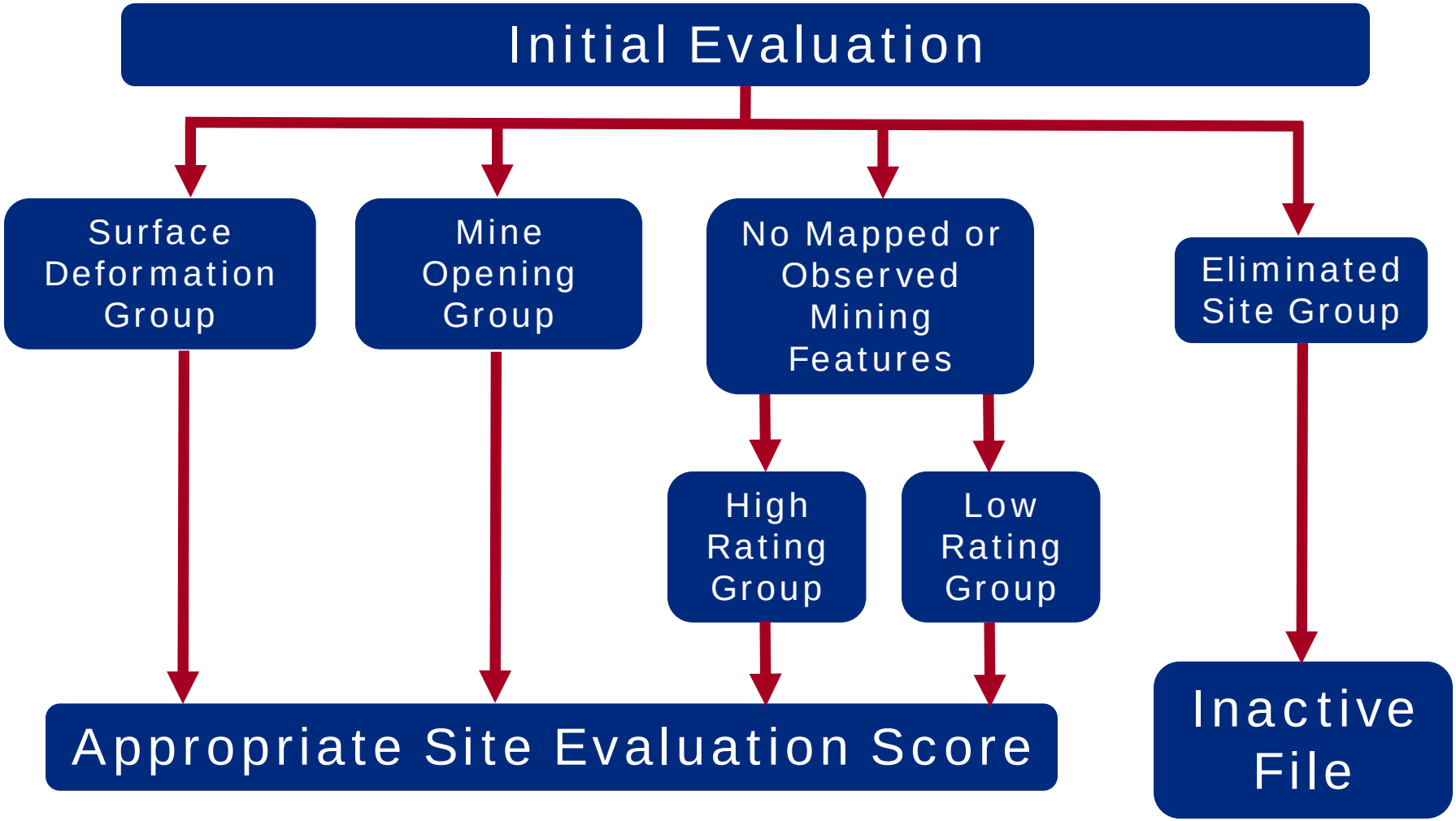
III. Site Groups

Simplified AUMIRA Process



III. Site Groups

Surface Deformation Group

III. Site Groups

Surface Deformation Group

III. Site Groups

Mine Opening Group – Drift Entry

III. Site Groups

Mine Opening Group – Slope Entry

III. Site Groups

Mine Opening Group – Air Shaft

III. Site Groups

Mine Opening Group – Main Shaft

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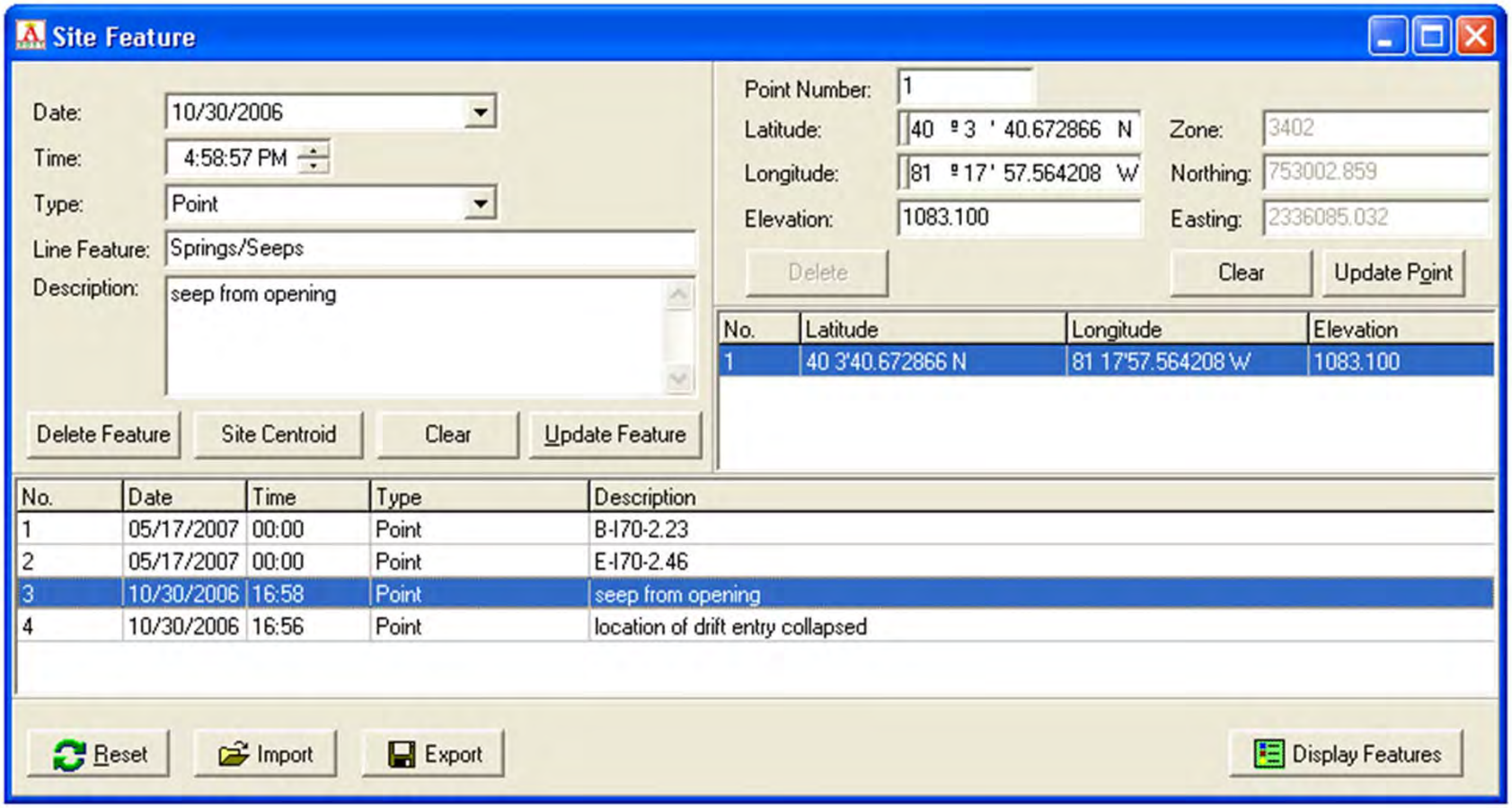
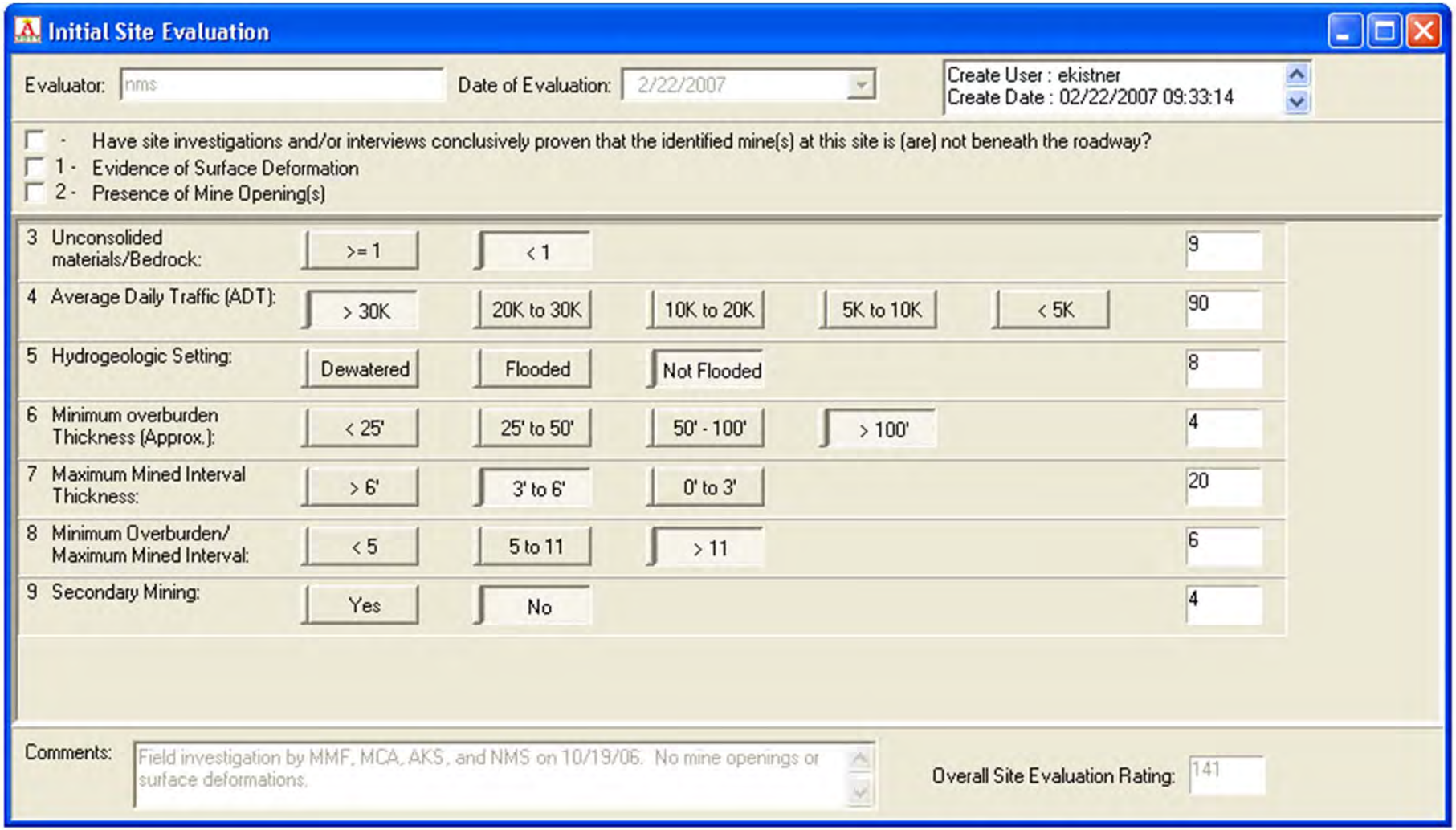
IV. Database Population

Site Features – GPS Points



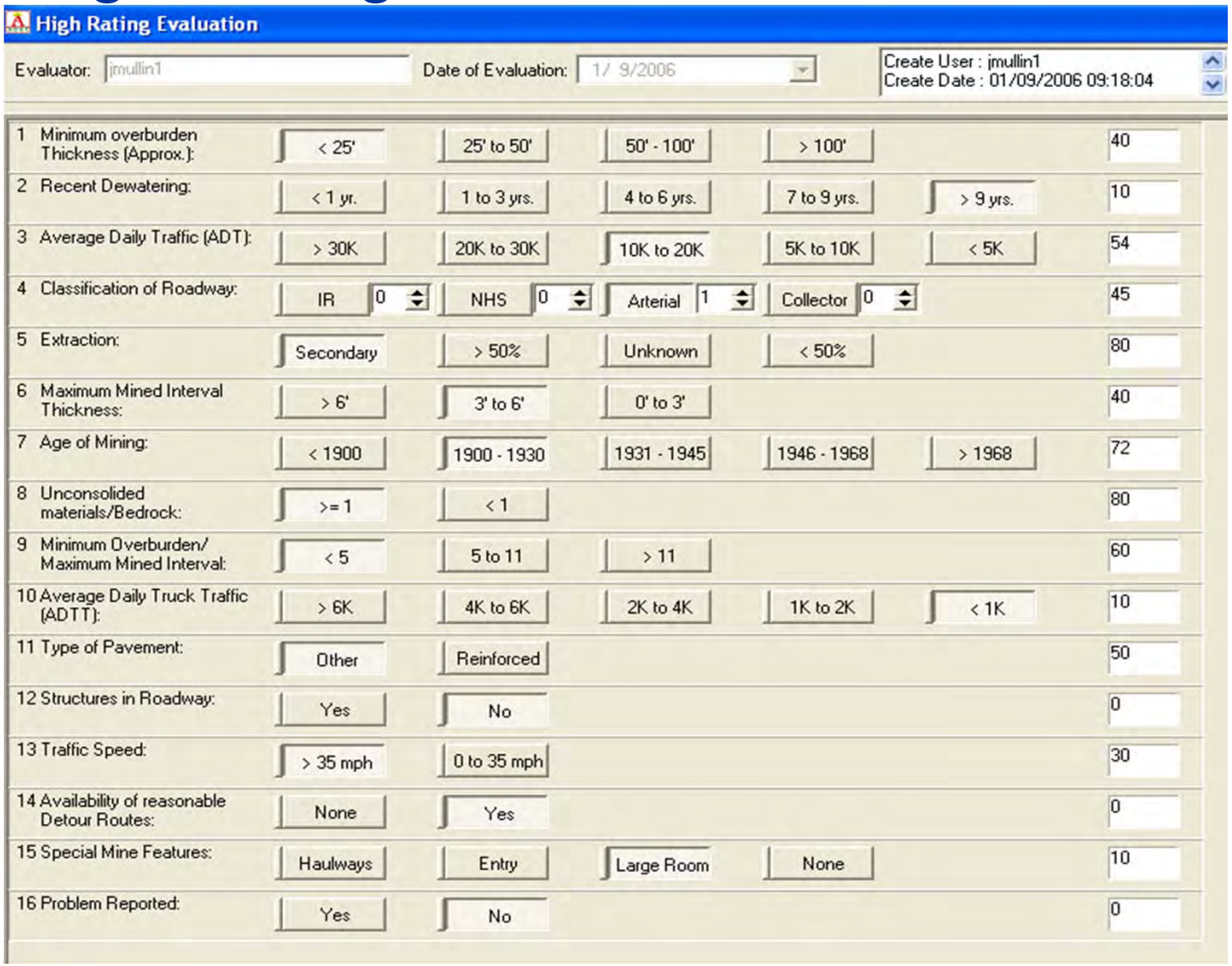
IV. Database Population

Initial Site Evaluation



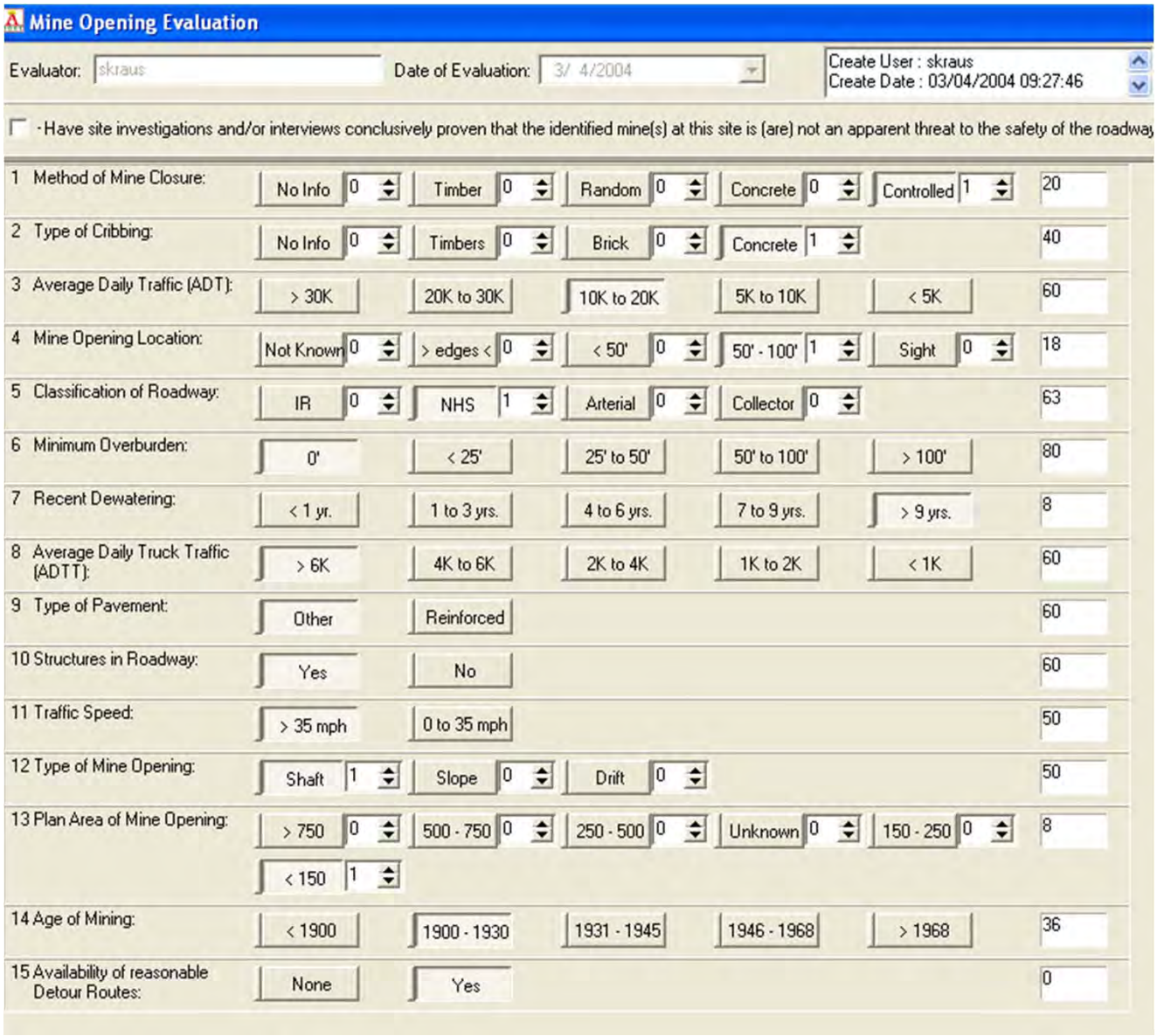
IV. Database Population

High Rating Evaluation



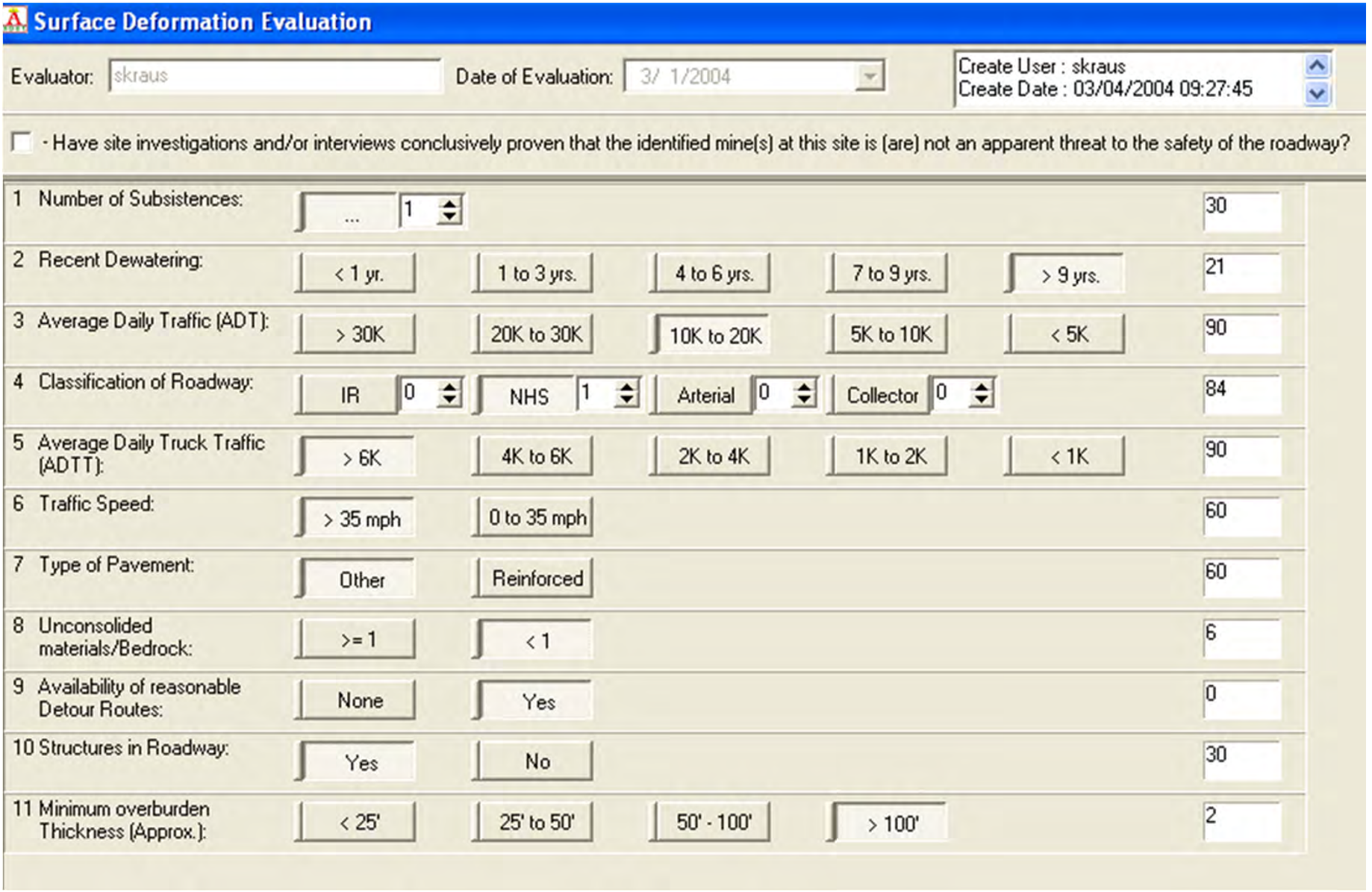
IV. Database Population

Mine Opening Evaluation



IV. Database Population

Surface Deformation Evaluation



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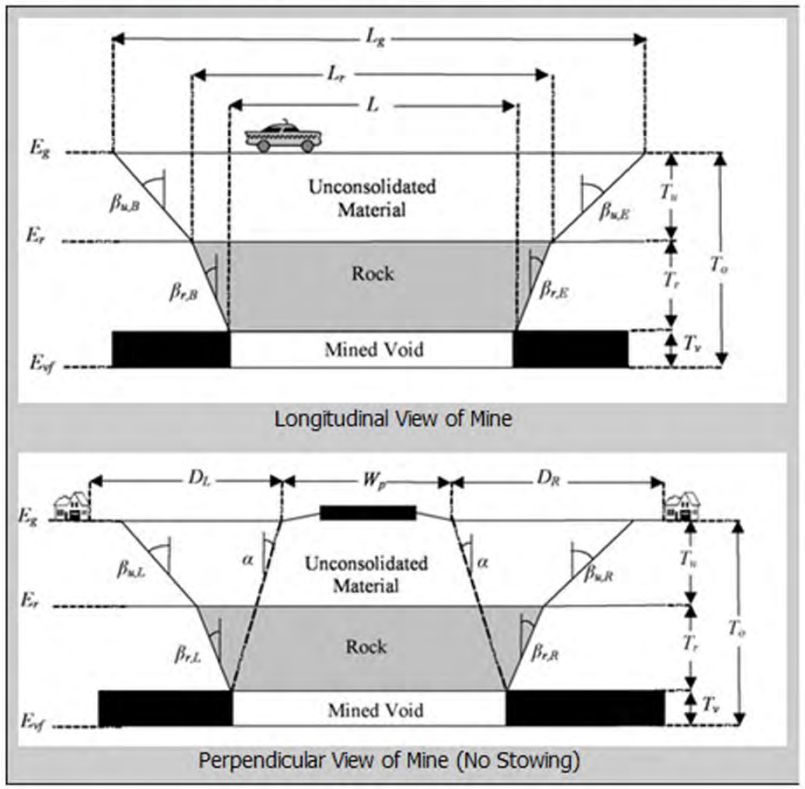
V. Remediation Cost Estimating

- ODOT RCDA – Remediation Cost Database Application
- Web based tool developed for ODOT by OSU
- Mine remediation, landslides, rockfall
- High Rating, Mine Opening, or Surface Deformation Sites
- There are three scenarios for the RCDA Application:
    - Excavate and Fill – less than 40 feet overburden
    - Drill and Grout – overburden between 40 and 100 feet
    - Land Bridge – overburden greater than 40 feet Surface Deformation sites
- Can be used separately or in conjunction with one another

V. Remediation Cost Estimating

Excavate and Fill Scenario



Excavate and Fill

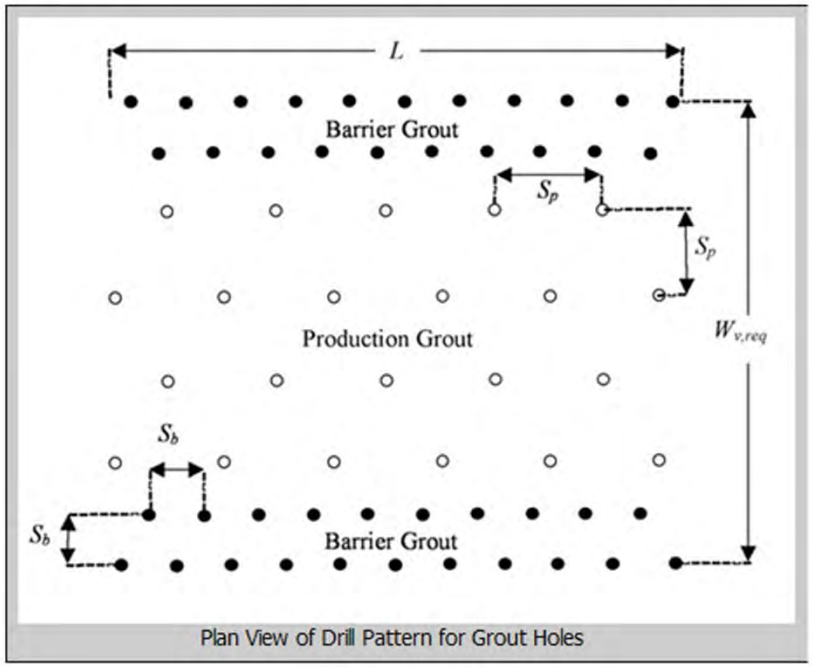
Input Parameters:

- Average roadway elevation
- Average elevation of top of rock
- Average elevation of mine void floor
- Average mine void thickness
- Angle of draw
- Width of pavement
- Length of highway above mine void
- Primary mining percentage removal
- Secondary mining percentage removal
- Lateral distance of excavation
- Soil cut angle
- Rock cut angle

V. Remediation Cost Estimating

Drill and Grout Scenario

Drill and Grout Scenario Report



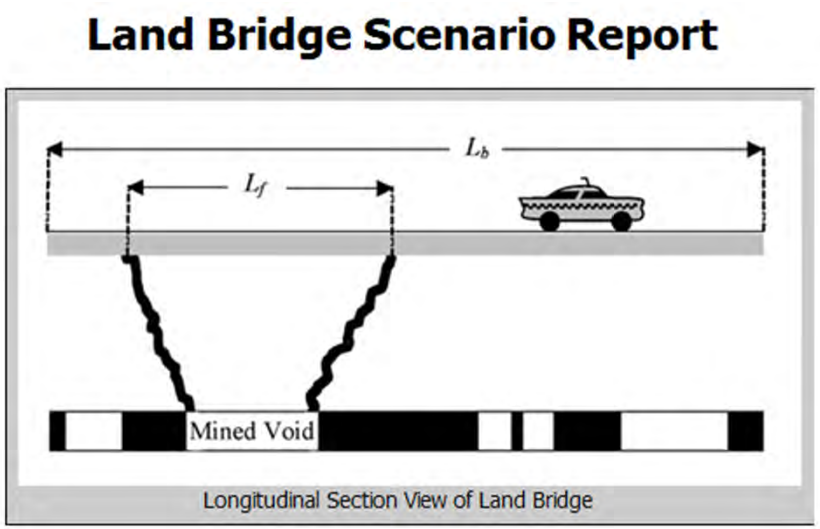
Drill and grout

Input Parameters:

- Average roadway elevation
- Average elevation of top of rock
- Average elevation of mine void floor
- Average mine void thickness
- Angle of draw
- Width of pavement
- Length of highway above mine void
- Primary mining percentage removal
- Secondary mining percentage removal
- Barrier grout hole spacing
- Production grout hole spacing
- Percent of grouting by pressure/tremmie feed
- Percent of grouting fluid/air /sonic rotary method
- Percent of grouting by inclined methods

V. Remediation Cost Estimating

Land Bridge Scenario



Land bridge

Input Parameters:

- Average roadway elevation
- Average elevation of top of rock
- Average elevation of mine void floor
- Average mine void thickness
- Angle of draw
- Width of pavement
- Length of highway above mine void
- Primary mining percentage removal
- Secondary mining percentage removal
- Total bridge length
- Total bridge width
- Maximum ground collapse length
- Thickness of bridge slab
- Length of grouted areas (if needed)

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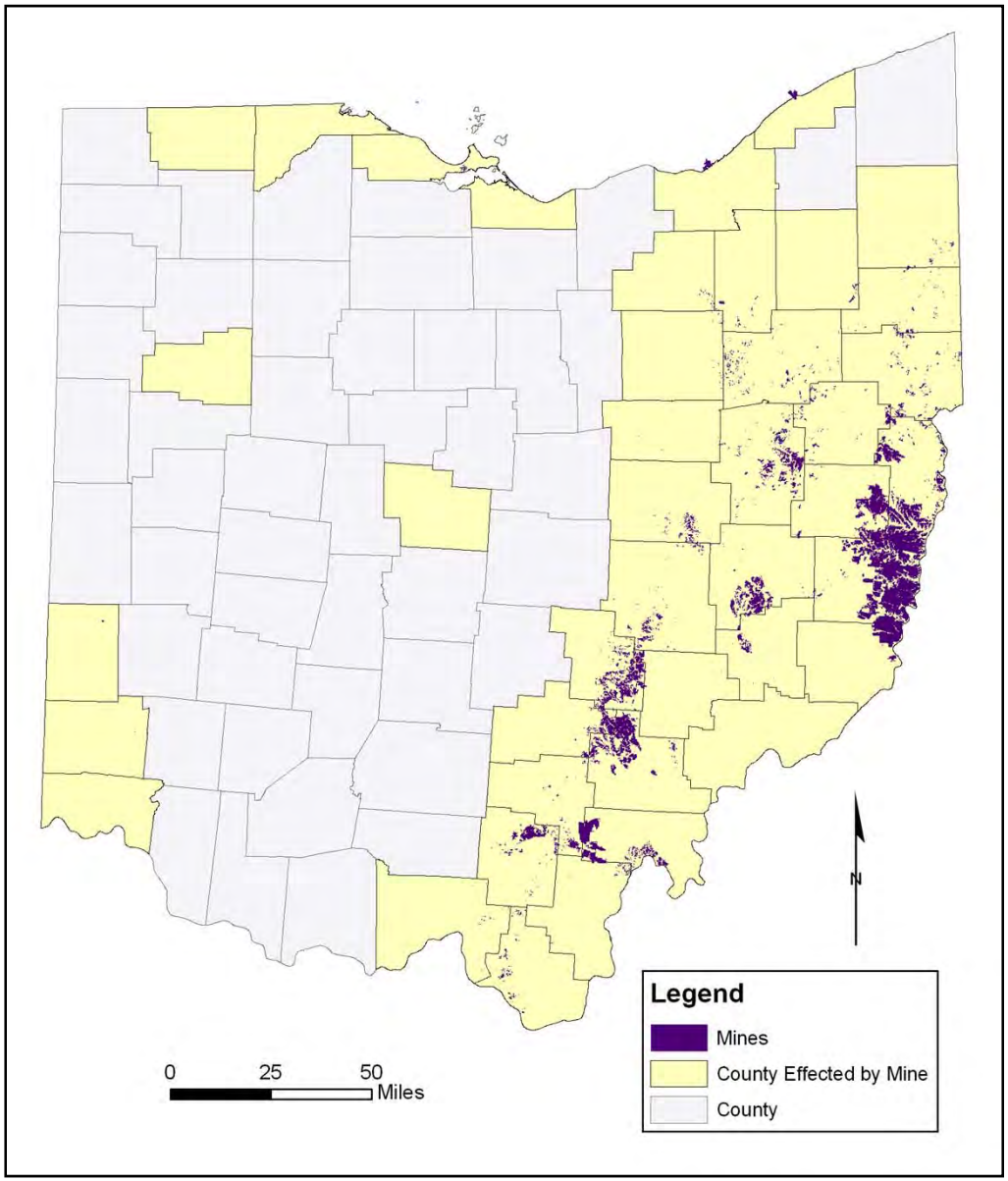
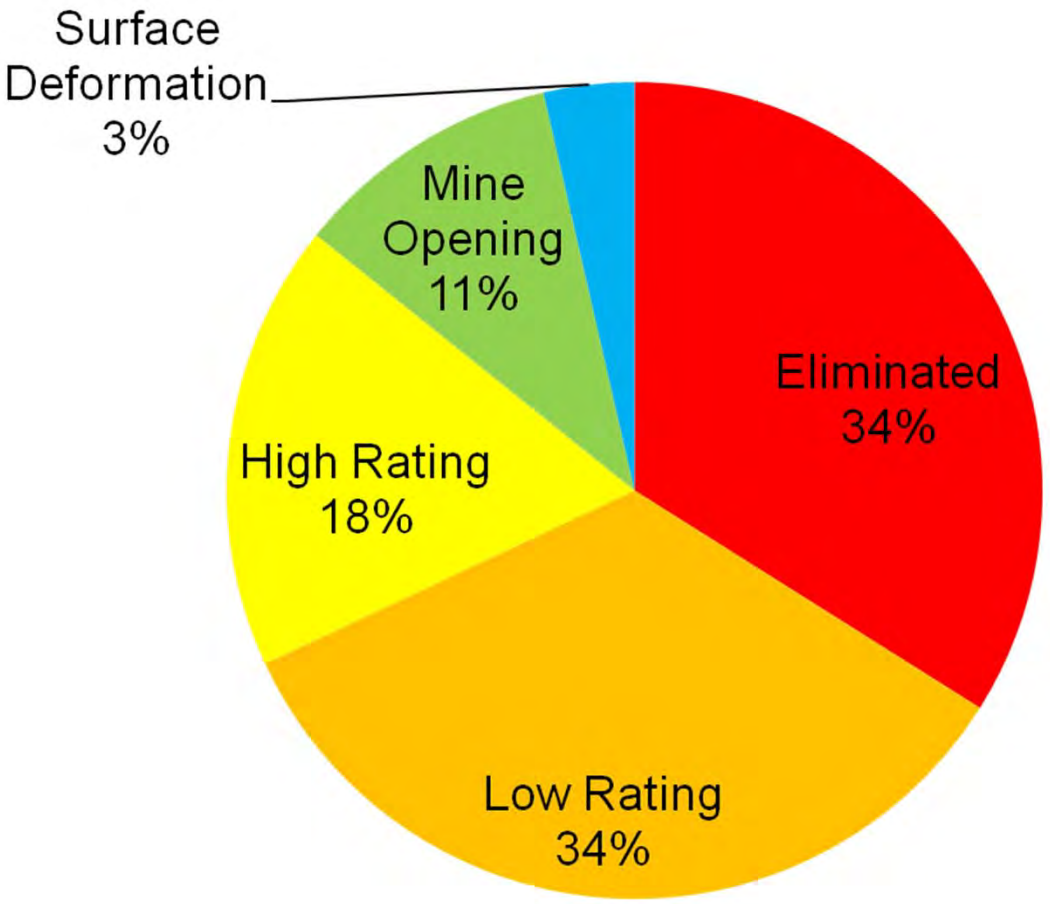
VI. Results/Statistics – Roadway Miles Underlain by Mines



- State: 8,425 Roadway miles; 495 miles (13%) underlain by mines.
- County values range from less than less than one percent to 40 percent.
- Belmont County: 291 roadway miles; 116 miles (40%) underlain by mines.
- Jefferson County: 175 roadway miles; 48 miles (27%) underlain by mines.

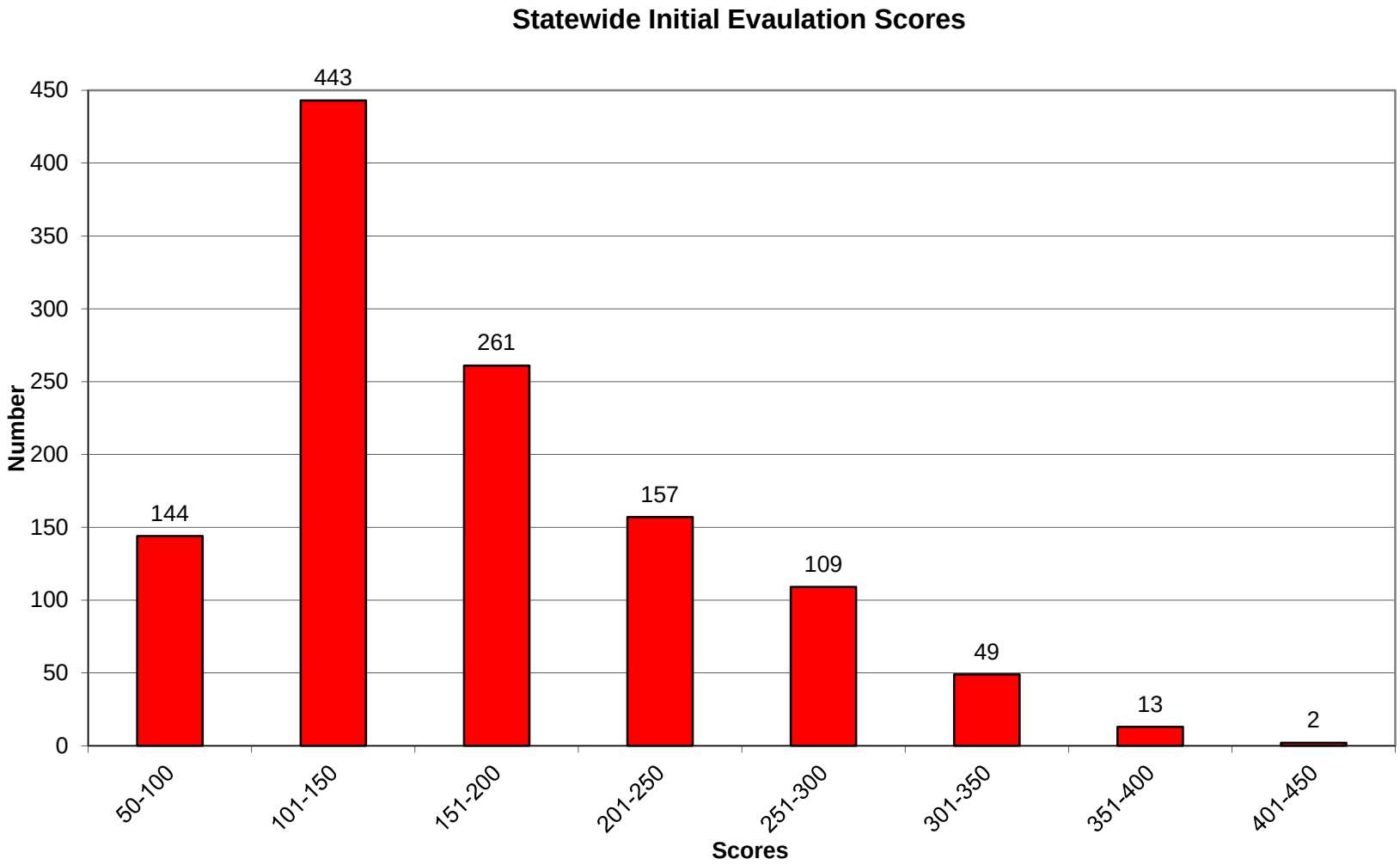
VI. Results/Statistics

Statewide - Site Group Breakdown



VI. Results/Statistics

Statewide – Initial Evaluations



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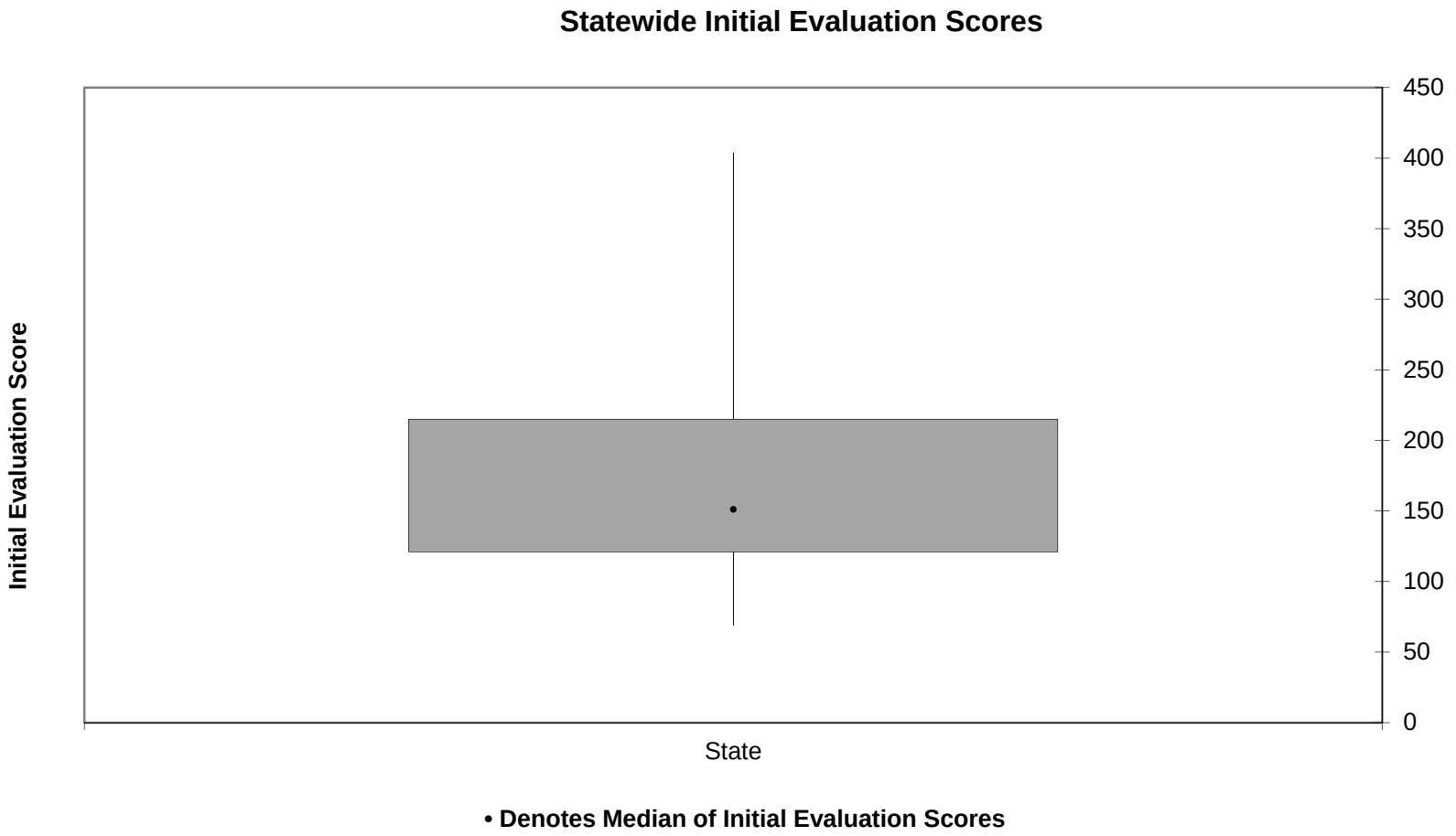
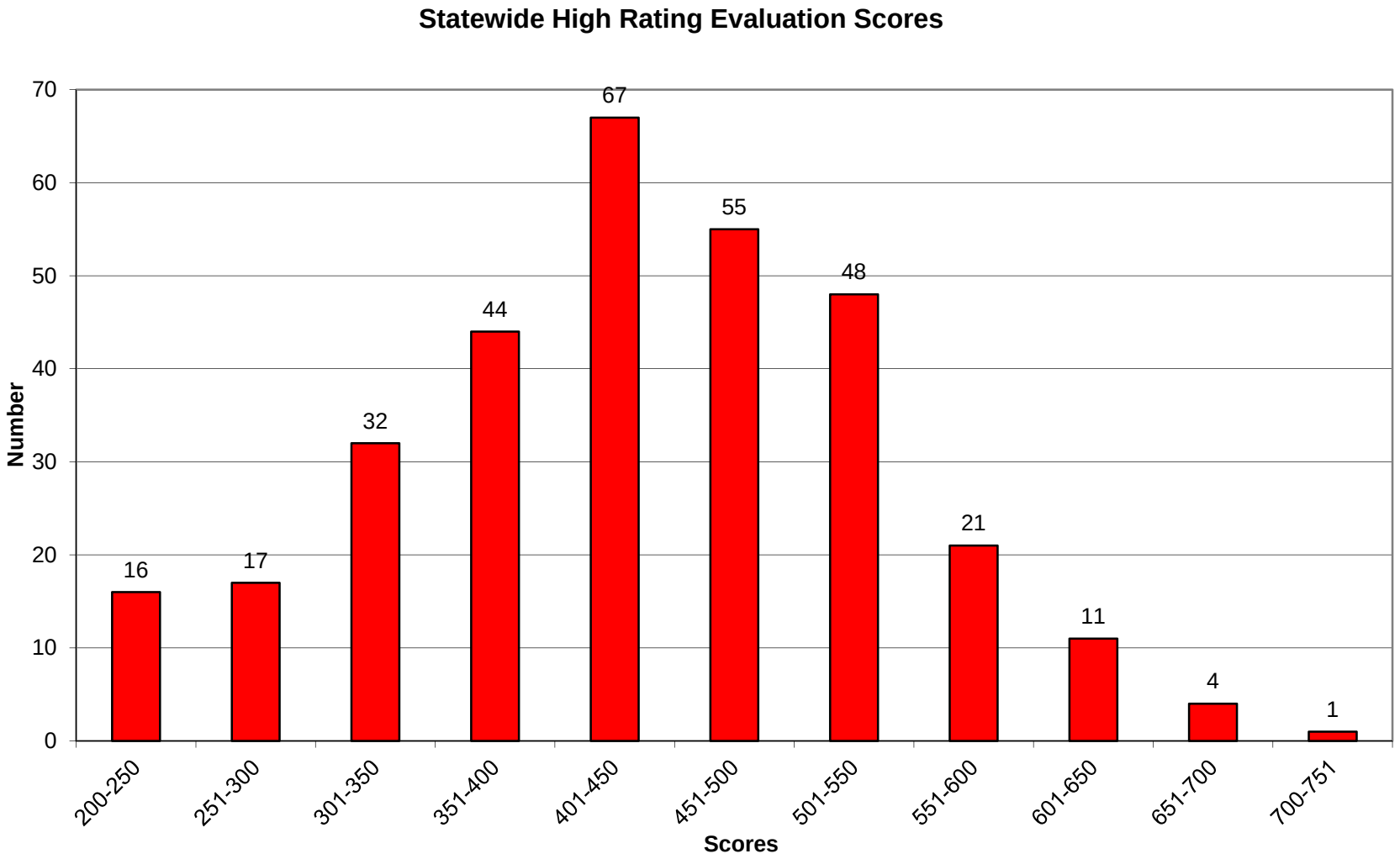
Statewide – Initial Evaluations



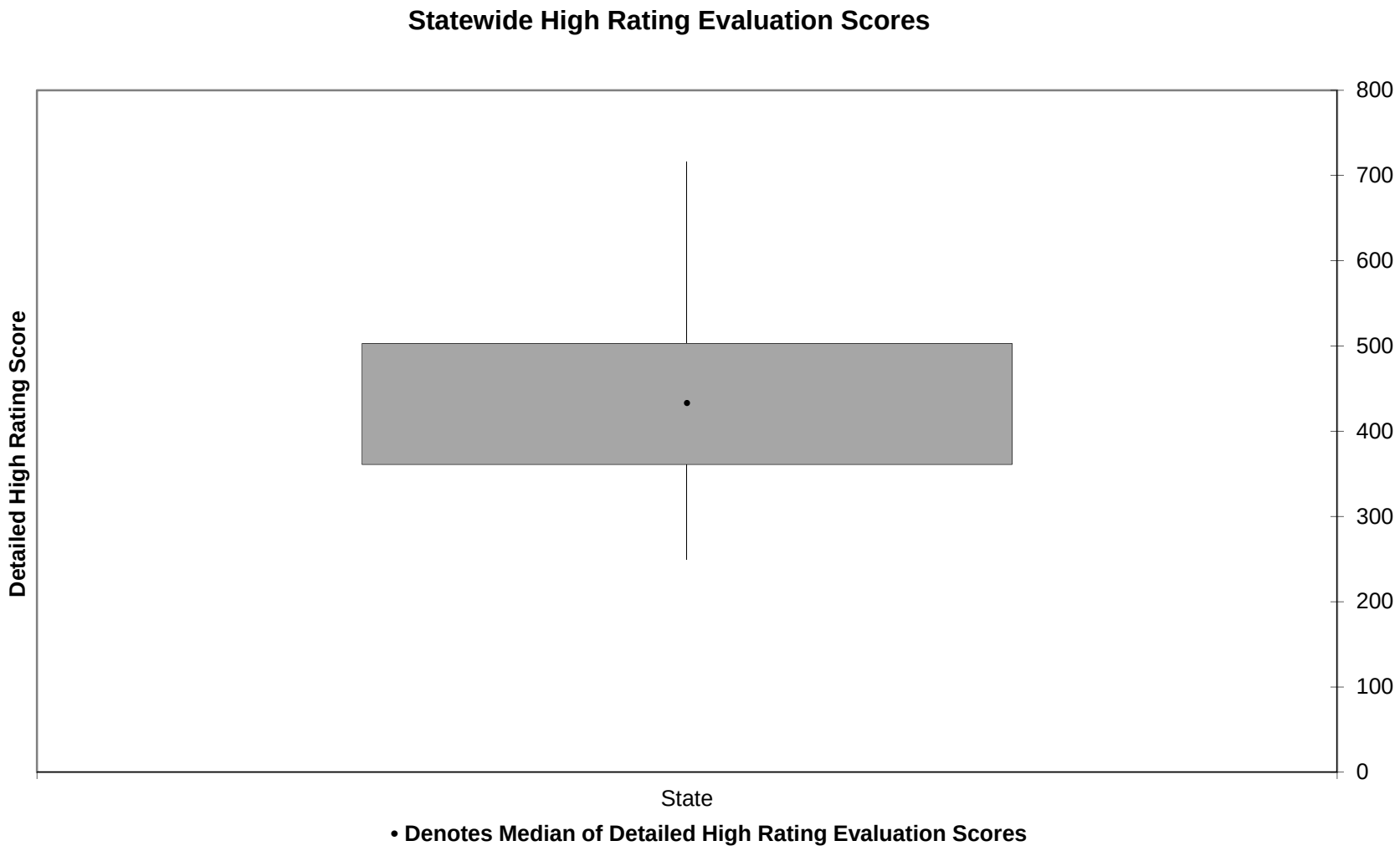
VI. Results/Statistics

Statewide – High Rating Evaluations



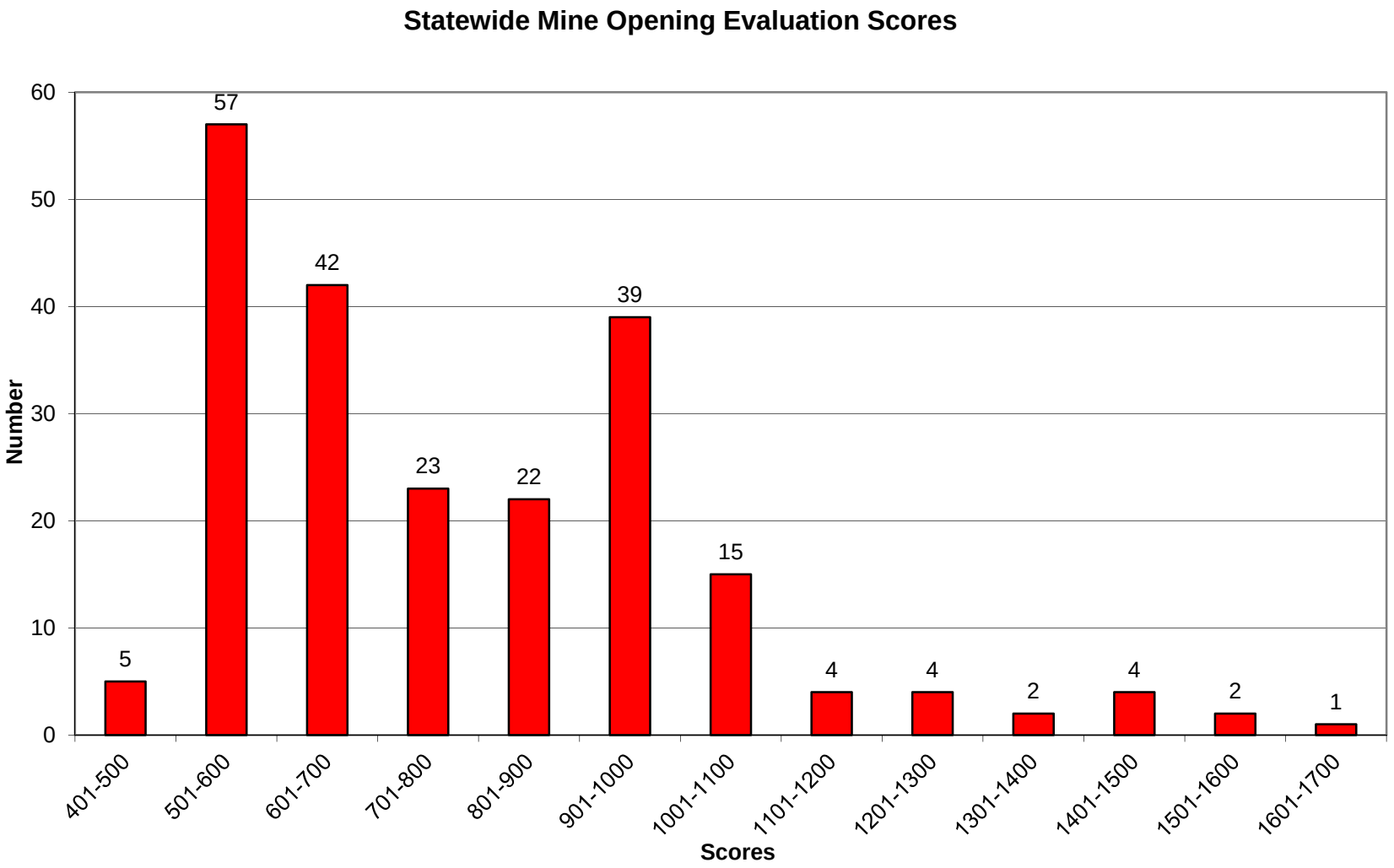
VI. Results/Statistics

Statewide – High Rating Evaluations



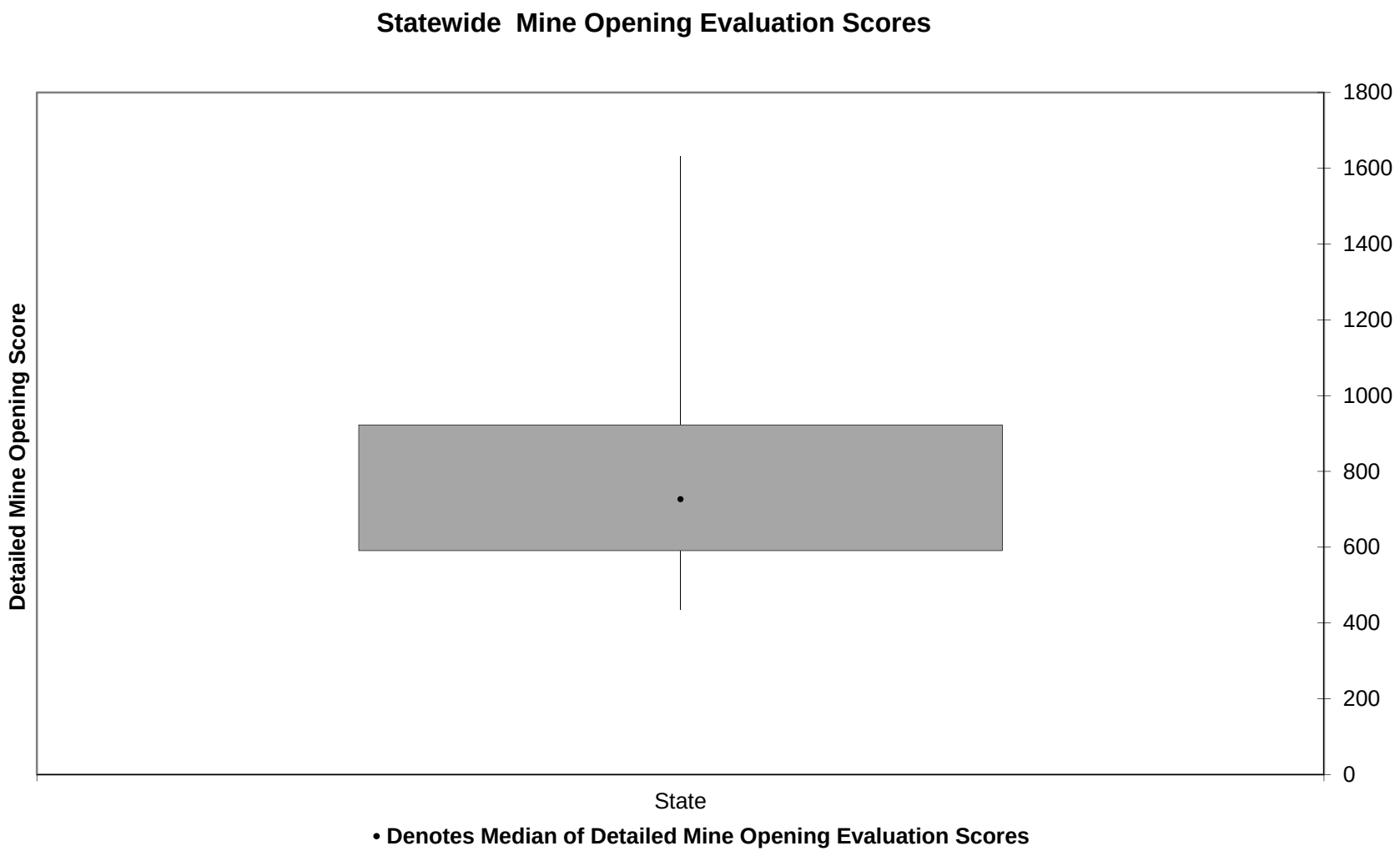
VI. Results/Statistics

Statewide – Mine Opening Evaluations



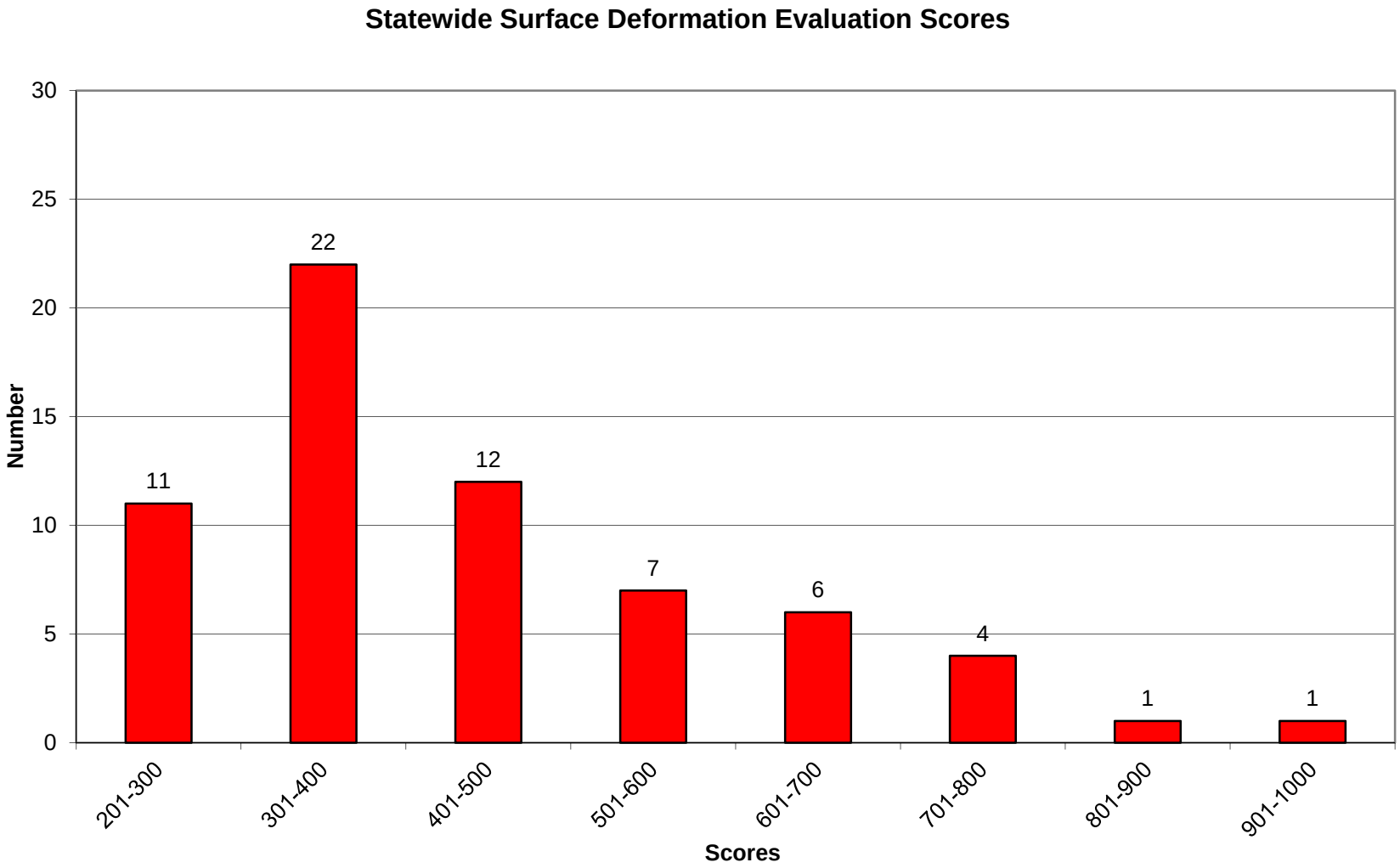
VI. Results/Statistics

Statewide – Mine Opening Evaluations



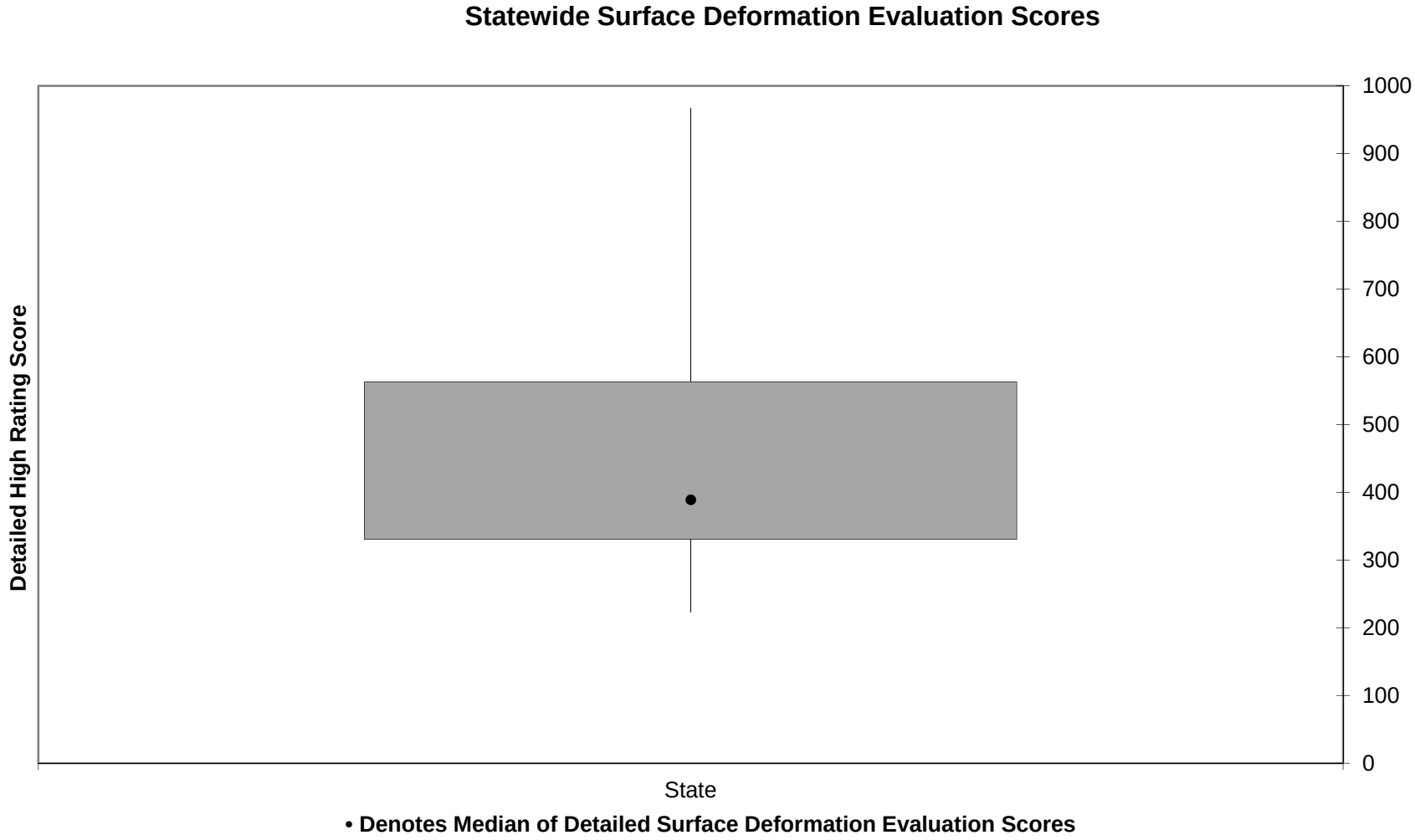
VI. Results/Statistics

Statewide – Surface Deformation Evaluations



VI. Results/Statistics

Statewide – Surface Deformation Evaluations



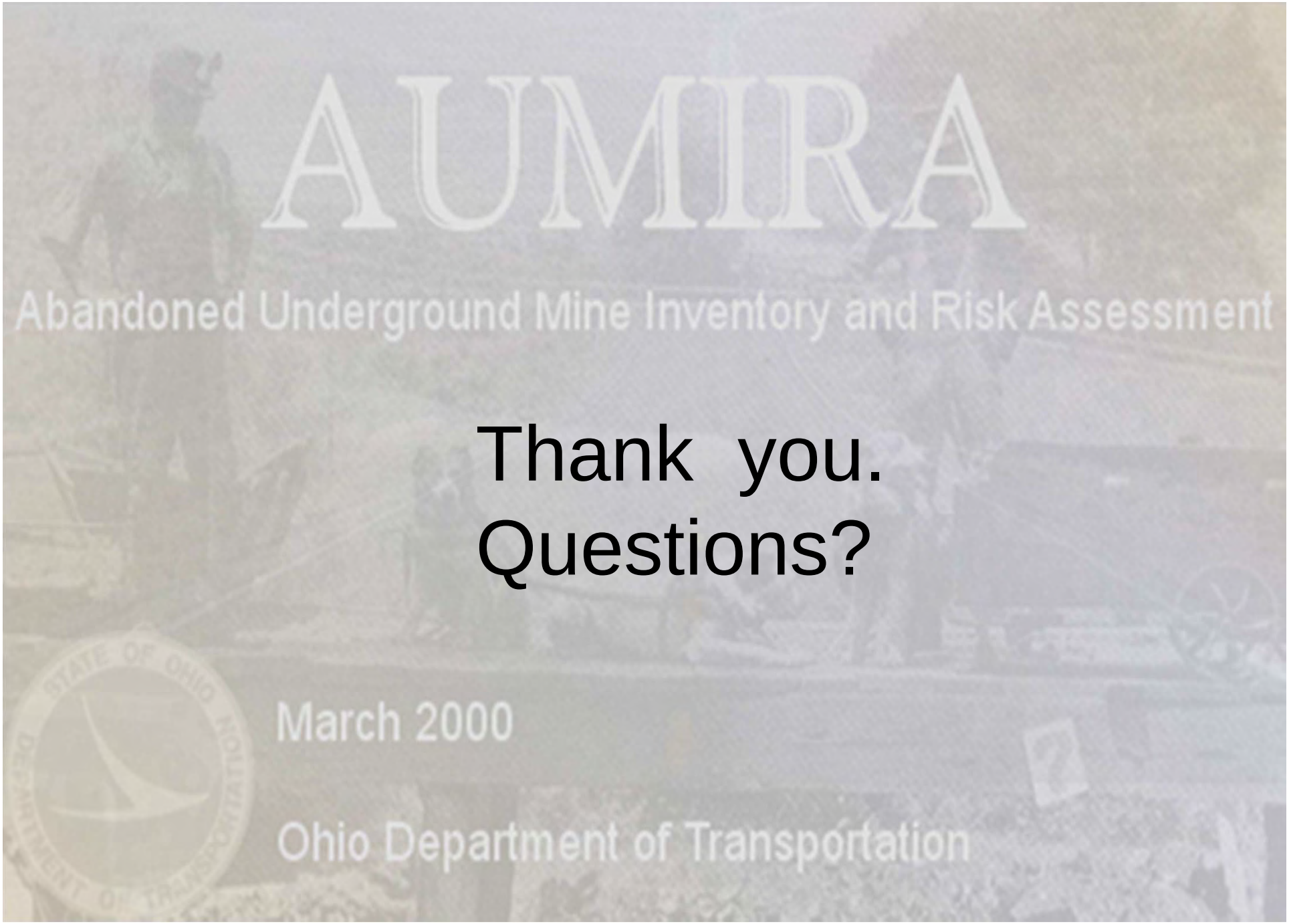
VI. Results/Statistics

Statewide – RCDA Cost Estimates

Scenario	Average Remediation Cost Per Lane Mile (Thousand $)
Excavate and Fill	482
Drill and Grout	2,035
Land Bridge	1,741
Total	**1,602**

Summary

- AUMIRA has been an effective method to inventory mapped abandoned mine sites.
- Sources of error:
  - Presence of unmapped mining
  - Inaccurate mapping/georeferencing
  - Incomplete information about mines
- Cost remediation tool low compared to actual past construction costs
- Status - Inventory process is complete; implementation not started.



Thank you.
Questions?