

Abandoned Underground Mines in Ohio – An Update of the AUMIRA Database Population

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OTEC



One Team. Infinite Solutions



Presentation Outline

Abandoned Underground Mines in Ohio – An Update of the AUMIRA Database Population

I. Introduction

II. Site Identification

III. Site Groups

IV. Database Population

V. Statistics

VI. Remediation Cost Estimates

VII. UVIRA

I. Introduction

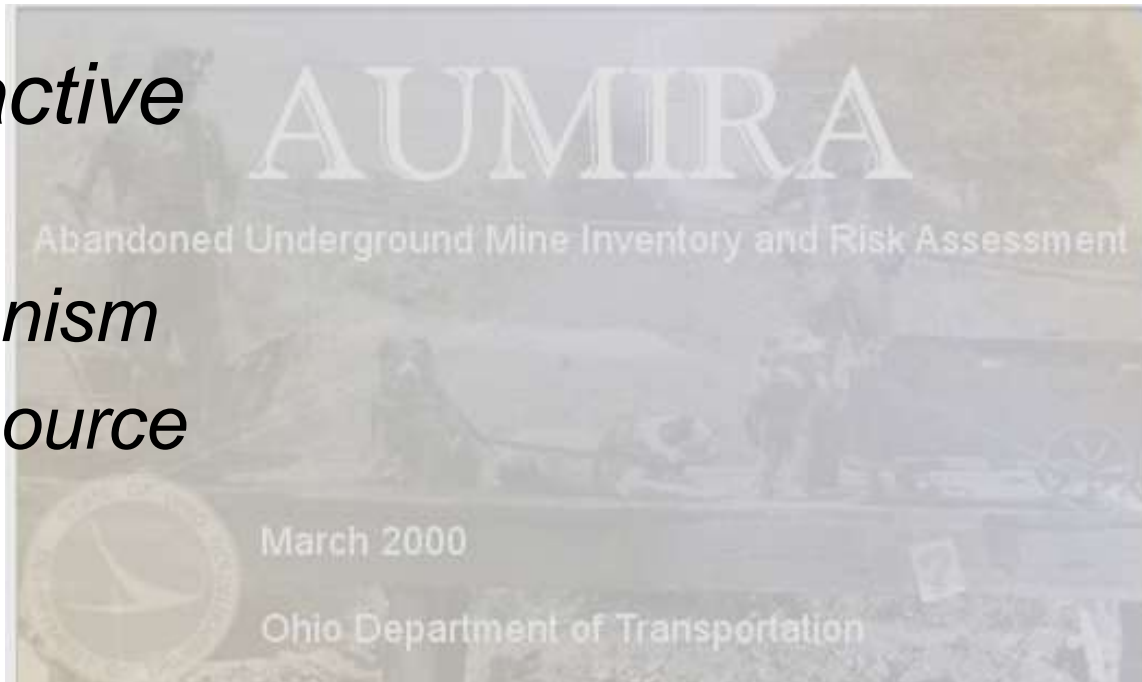
ODOT Inventory Projects

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

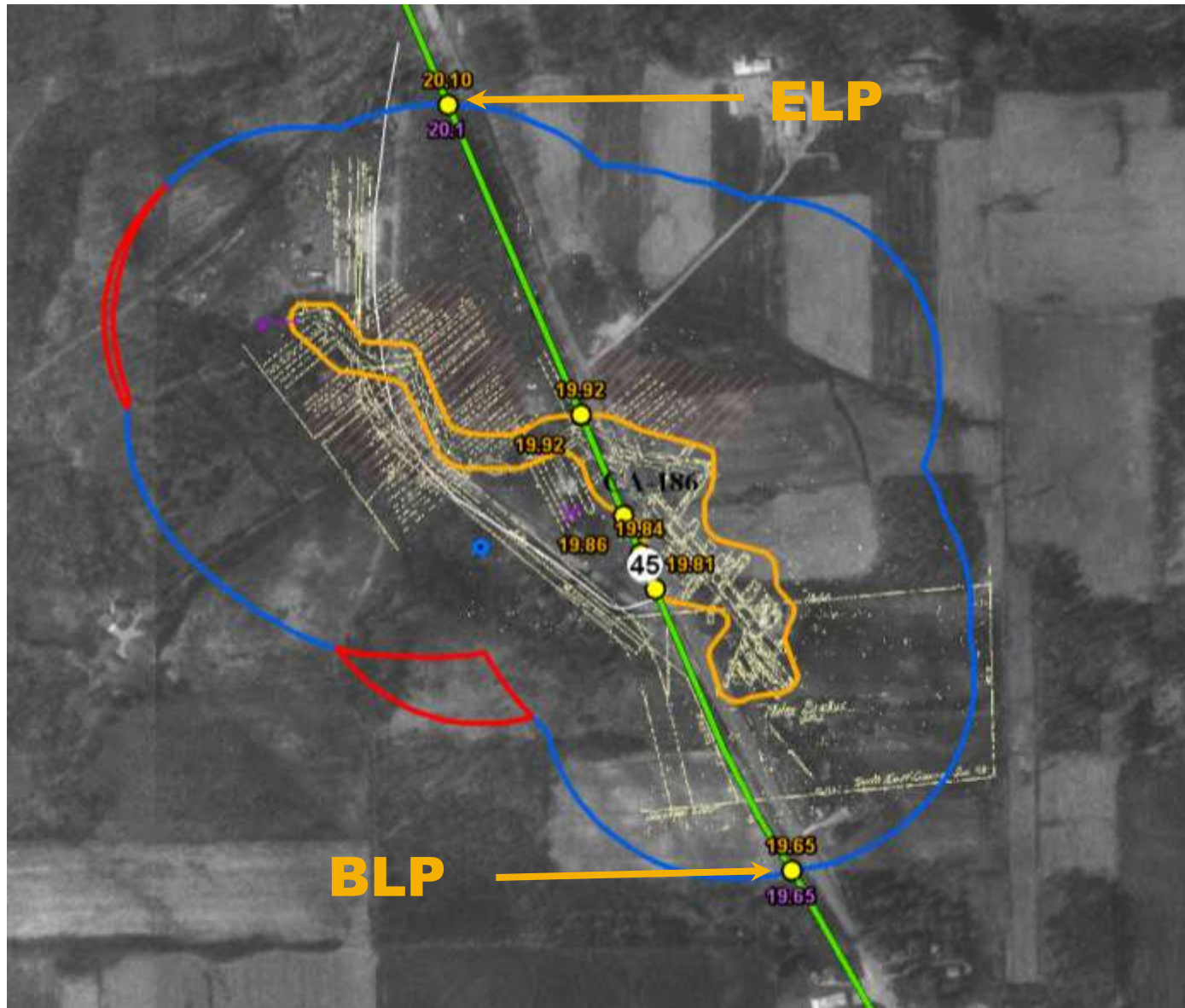
I. Introduction

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*

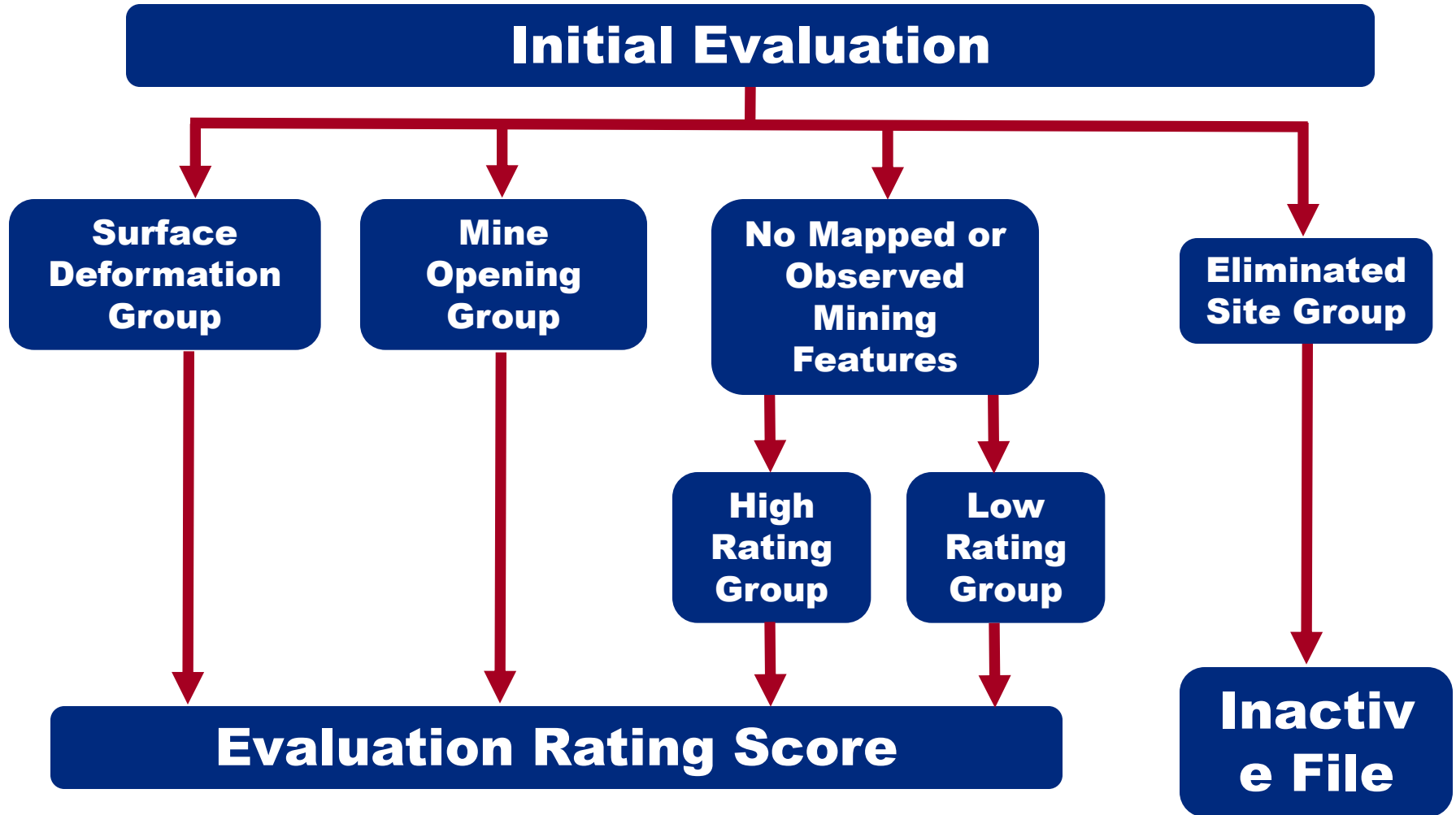


II. Site Identification



III. Site Groups

Simplified AUMIRA Process



III. Site Groups

Surface Deformation Group



III. Site Groups

Surface Deformation Group



III. Site Groups

Mine Opening Group



III. Site Groups

Mine Opening Group



III. Site Groups

Mine Opening Group



IV. Database Population

Site Features – GPS Points

Site Feature

Date: 10/30/2006
Time: 4:58:57 PM
Type: Point
Line Feature: Springs/Seeps
Description: seep from opening

Point Number: 1
Latitude: 40 ° 3 ' 40.672866 N
Longitude: 81 ° 17 ' 57.564208 W
Elevation: 1083.100
Zone: 3402
Northing: 753002.859
Easting: 2336085.032

Delete Clear Update Point

No.	Latitude	Longitude	Elevation
1	40 3'40.672866 N	81 17'57.564208 W	1083.100

Delete Feature Site Centroid Clear Update Feature

No.	Date	Time	Type	Description
1	05/17/2007	00:00	Point	B-170-2.23
2	05/17/2007	00:00	Point	E-170-2.46
3	10/30/2006	16:58	Point	seep from opening
4	10/30/2006	16:56	Point	location of drift entry collapsed

Reset Import Export Display Features

IV. Database Population

Initial Site Evaluation

Initial Site Evaluation

Evaluator: Date of Evaluation: Create User : ekistner
Create Date : 02/22/2007 09:33:14

- Have site investigations and/or interviews conclusively proven that the identified mine(s) at this site is (are) not beneath the roadway?
 1 - Evidence of Surface Deformation
 2 - Presence of Mine Opening(s)

3 Unconsolidated materials/Bedrock:	<input type="text" value=">= 1"/>	<input type="text" value="< 1"/>	<input type="text" value="9"/>			
4 Average Daily Traffic (ADT):	<input type="text" value="> 30K"/>	<input type="text" value="20K to 30K"/>	<input type="text" value="10K to 20K"/>	<input type="text" value="5K to 10K"/>	<input type="text" value="< 5K"/>	<input type="text" value="90"/>
5 Hydrogeologic Setting:	<input type="text" value="Dewatered"/>	<input type="text" value="Flooded"/>	<input type="text" value="Not Flooded"/>	<input type="text" value="8"/>		
6 Minimum overburden Thickness (Approx.):	<input type="text" value="< 25'"/>	<input type="text" value="25' to 50'"/>	<input type="text" value="50' - 100'"/>	<input type="text" value="> 100'"/>	<input type="text" value="4"/>	
7 Maximum Mined Interval Thickness:	<input type="text" value="> 6'"/>	<input type="text" value="3' to 6'"/>	<input type="text" value="0' to 3'"/>	<input type="text" value="20"/>		
8 Minimum Overburden/ Maximum Mined Interval:	<input type="text" value="< 5"/>	<input type="text" value="5 to 11"/>	<input type="text" value="> 11"/>	<input type="text" value="6"/>		
9 Secondary Mining:	<input type="text" value="Yes"/>	<input type="text" value="No"/>	<input type="text" value="4"/>			

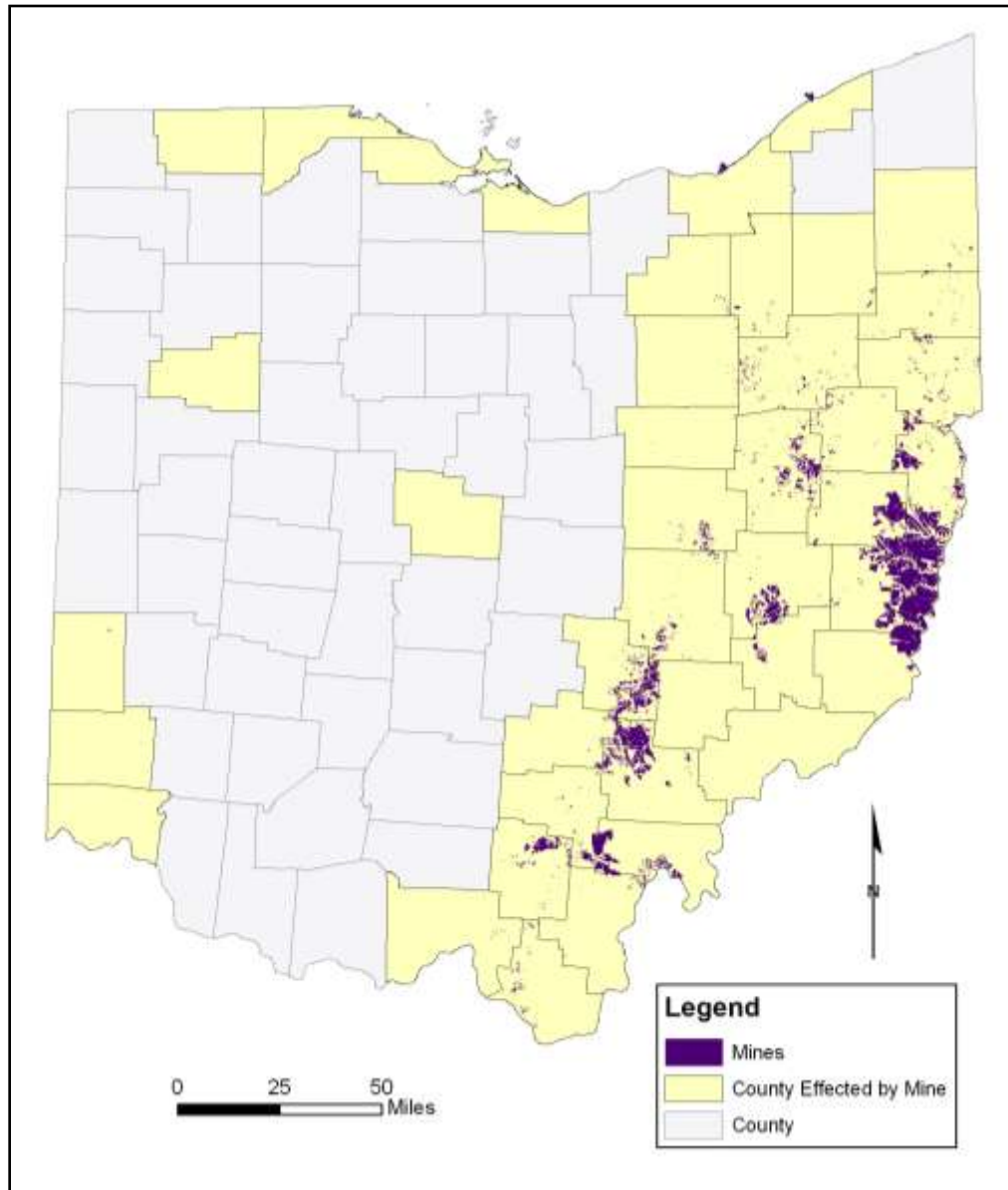
Comments:

Overall Site Evaluation Rating:

IV. Database Population (Detailed Eval.)

1 Method of Mine Closure:	No Info 2	Timber 0	Random 0	Concrete 0	Controlled 0	200
2 Type of Cribbing:	No Info 2	Timbers 0	Brick 0	Concrete 0		200
3 Average Daily Traffic (ADT):	> 30K	20K to 30K	10K to 20K	5K to 10K	< 5K	80
4 Mine Opening Location:	Not Known 0	> edges < 0	< 50' 0	50' - 100' 0	Sight 2	18
5 Classification of Roadway:	IR 1	NHS 0	Arterial 0	Collector 0		90
6 Minimum Overburden:	0'	< 25'	25' to 50'	50' to 100'	> 100'	40
7 Recent Dewatering:	< 1 yr.	1 to 3 yrs.	4 to 6 yrs.	7 to 9 yrs.	> 9 yrs.	8
8 Average Daily Truck Traffic (ADTT):	> 6K	4K to 6K	2K to 4K	1K to 2K	< 1K	60
9 Type of Pavement:	Other	Reinforced				60
10 Structures in Roadway:	Yes	No				0
11 Traffic Speed:	> 35 mph	0 to 35 mph				50
12 Type of Mine Opening:	Shaft 0	Slope 0	Drift 2			60
13 Plan Area of Mine Opening:	> 750 0	500 - 750 0	250 - 500 0	Unknown 0	150 - 250 0	16
	< 150 2					
14 Age of Mining:	< 1900	1900 - 1930	1931 - 1945	1946 - 1968	> 1968	28
15 Availability of reasonable Detour Routes:	None	Yes				20

V. Statistics – Roadway Miles Underlain by Mines



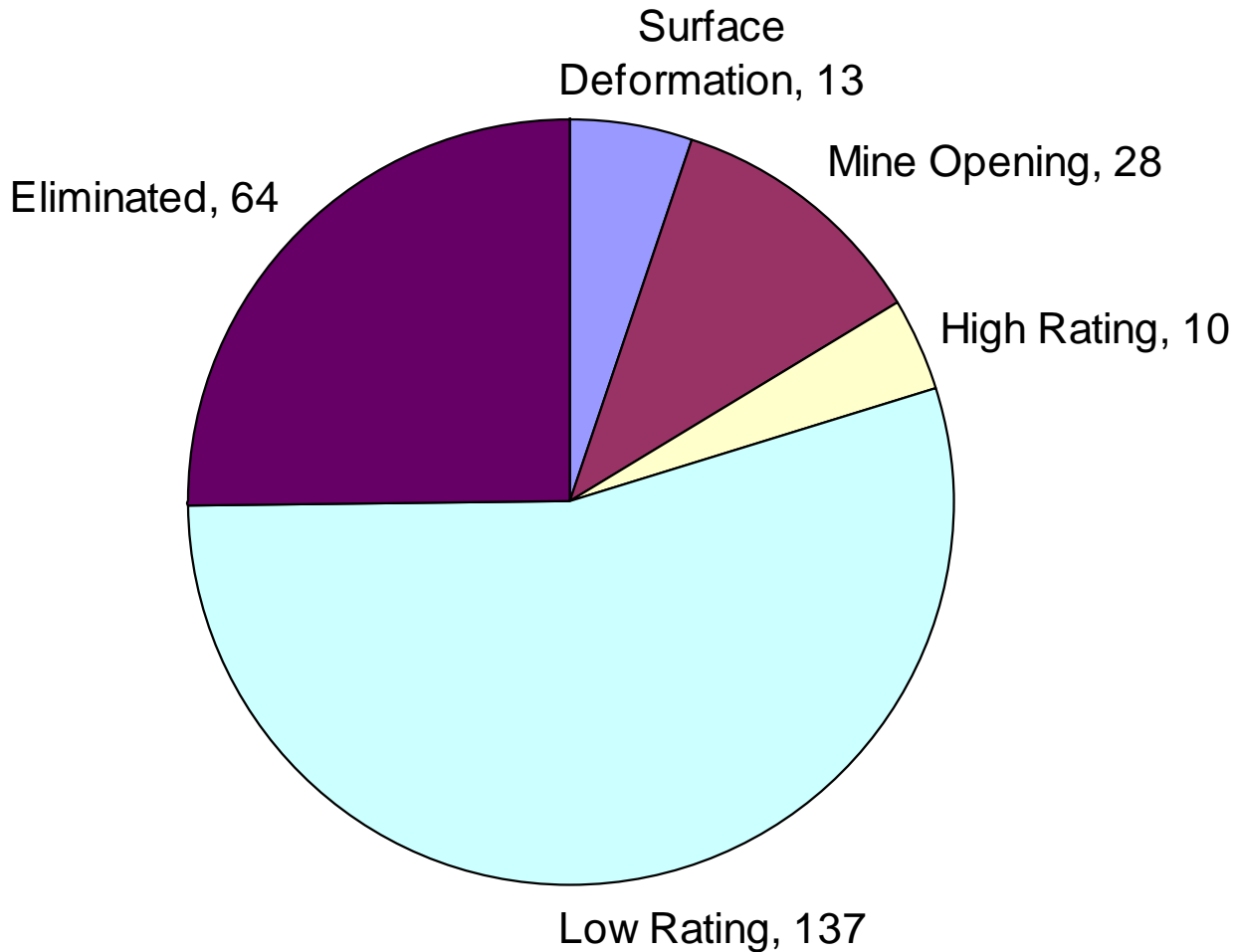
COUNTY	Total Miles	Total Miles Underlain by Mines	Miles Underlain by 500-foot Mine Buffer
Allen	184	0	0
Athens	221	21	46
Belmont	280	76	129
Butler	236	0	0
Carroll	152	2	7
Columbiana	299	8	25
Coshocton	213	2	8
Cuyahoga	473	1	1
Delaware	210	0	0
Erie	178	1	1
Fulton	167	0	0
Gallia	199	0	1
Guernsey	245	15	39
Hamilton	297	0	1
Harrison	165	22	34
Hocking	168	3	11
Holmes	175	1	1
Jackson	168	11	22
Jefferson	173	31	53
Lake	207	1	1
Lawrence	190	1	6
Lucas	229	0	0
Mahoning	293	3	10
Medina	248	1	2
Meigs	196	8	21
Monroe	213	7	13
Morgan	189	2	4
Muskingum	267	1	8
Noble	216	8	16
Ottawa	141	1	1
Perry	189	9	34
Portage	271	1	2
Preble	190	0	1
Scioto	201	0	1
Stark	323	4	17
Summit	281	1	6
Trumbull	367	2	6
Tuscarawas	215	4	15
Vinton	157	6	15
Washington	272	0	1
Wayne	251	1	3

V. Statistics – Belmont County



V. Statistics

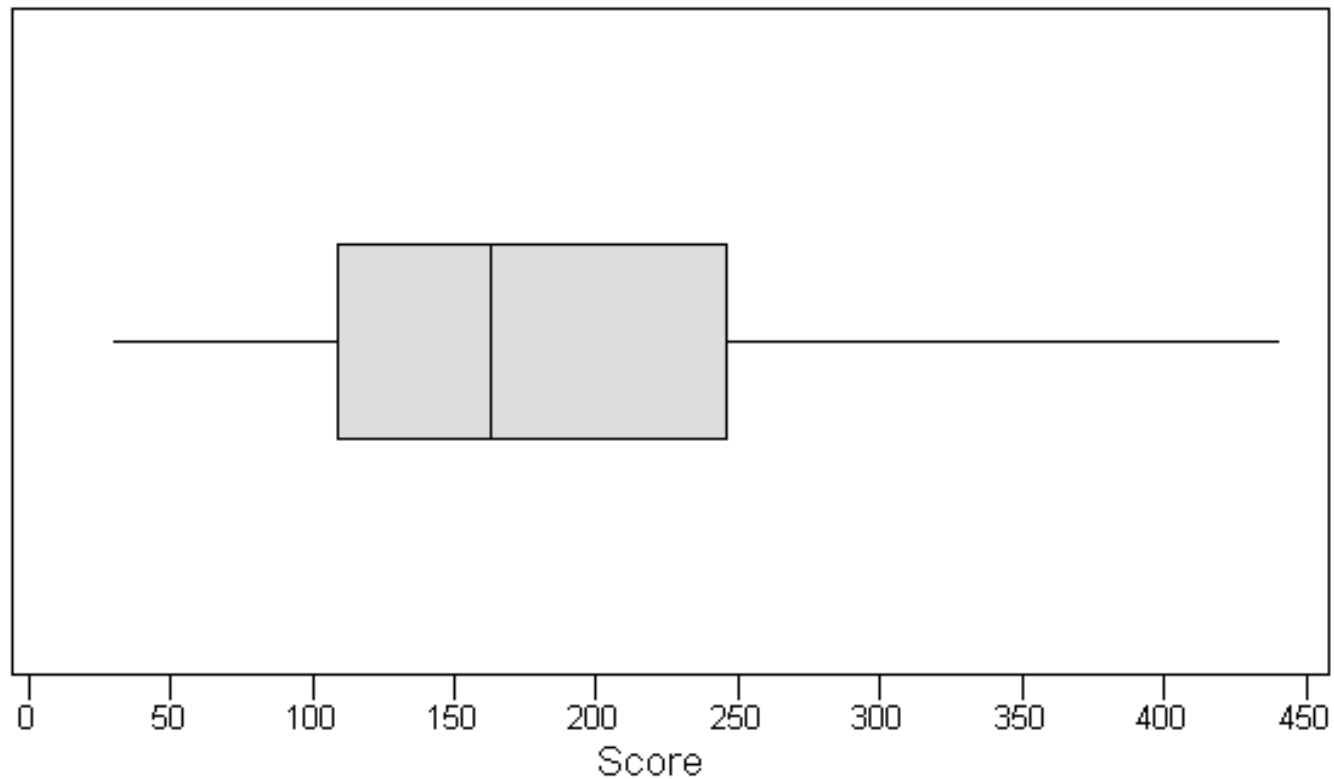
Belmont County - Site Group Breakdown



V. Statistics

Statewide – Initial Evaluations

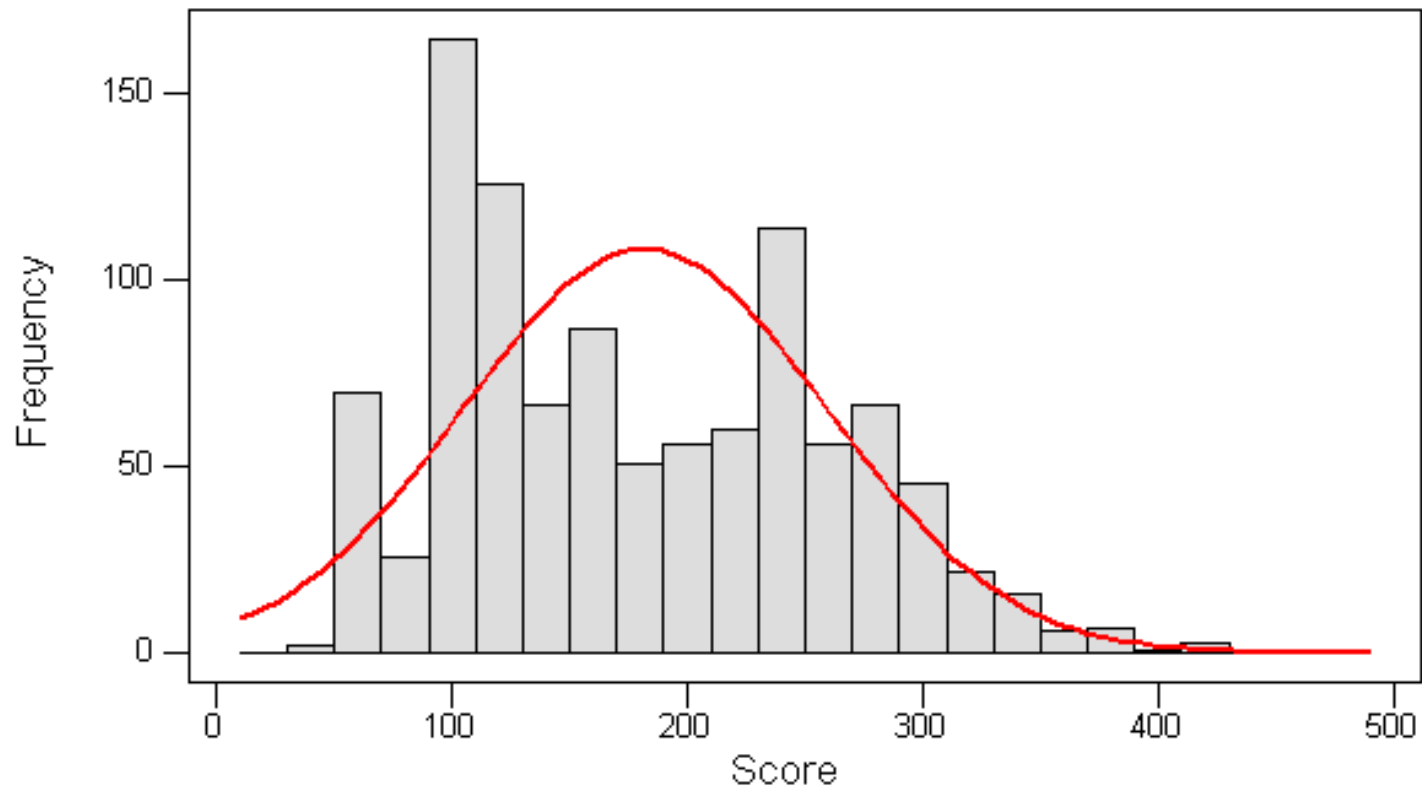
Boxplot of Initial Evaluation Rating



V. Statistics

Statewide – Initial Evaluations

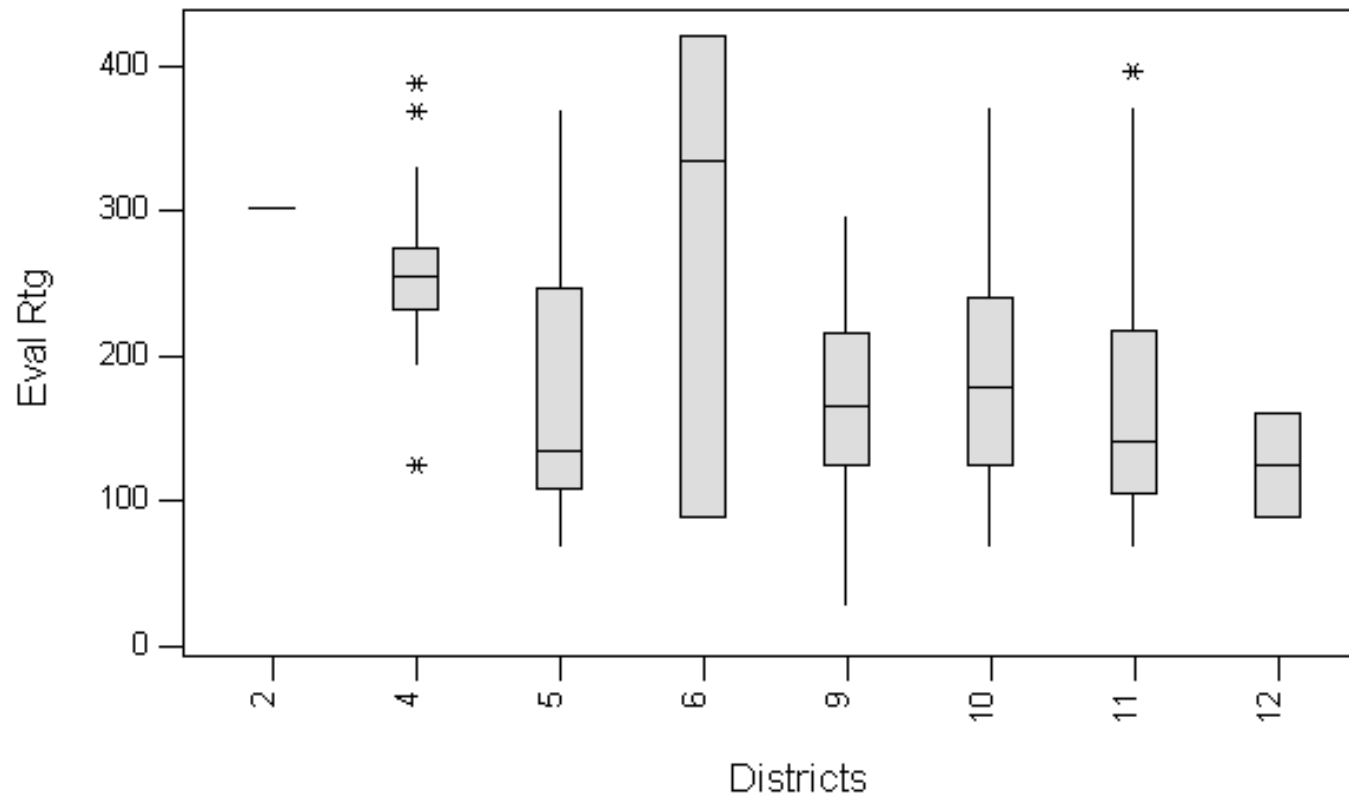
Histogram of Initial Evaluation Rating,
with Normal Curve



V. Statistics

Statewide – Initial Evaluations

Boxplots of Initial Evaluation Ratings by District

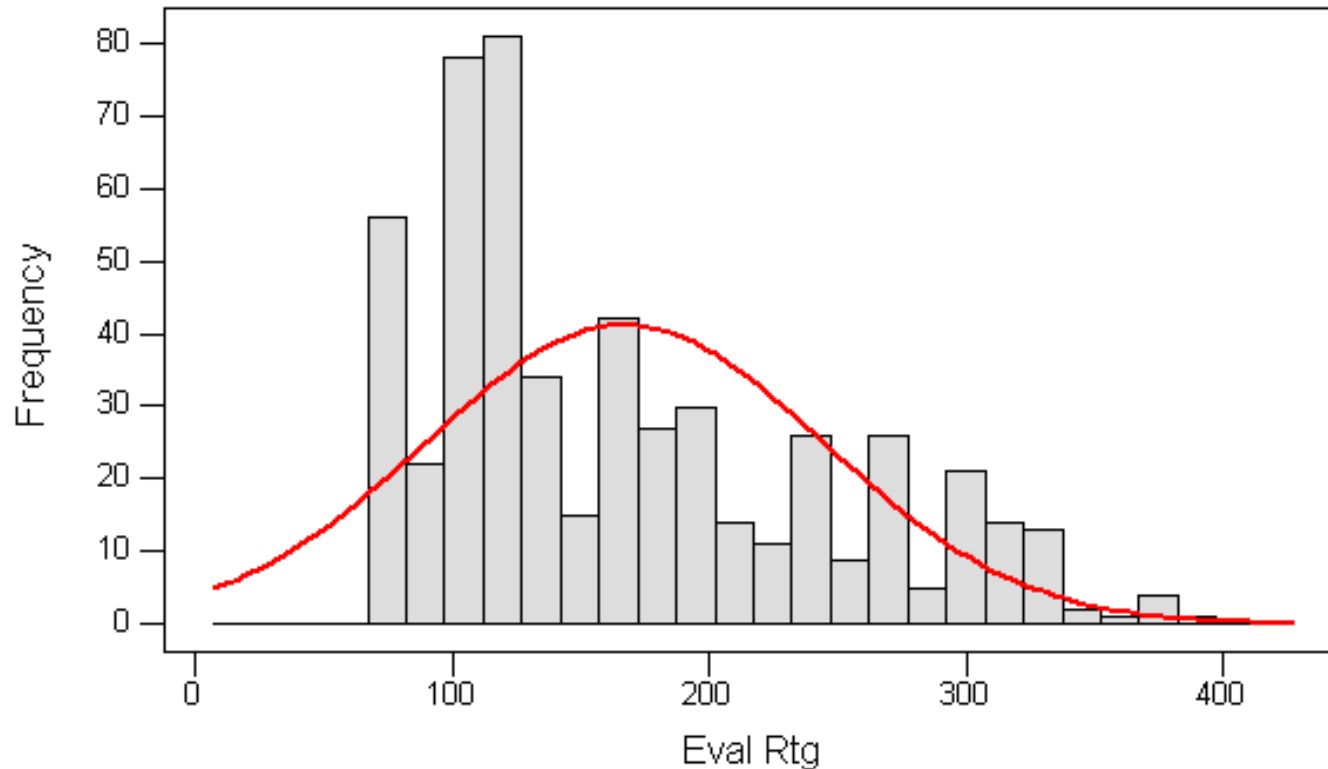


V. Statistics

District 11 – Initial Evaluations

Histogram of Eval Rtg, with Normal Curve

(District = 11)

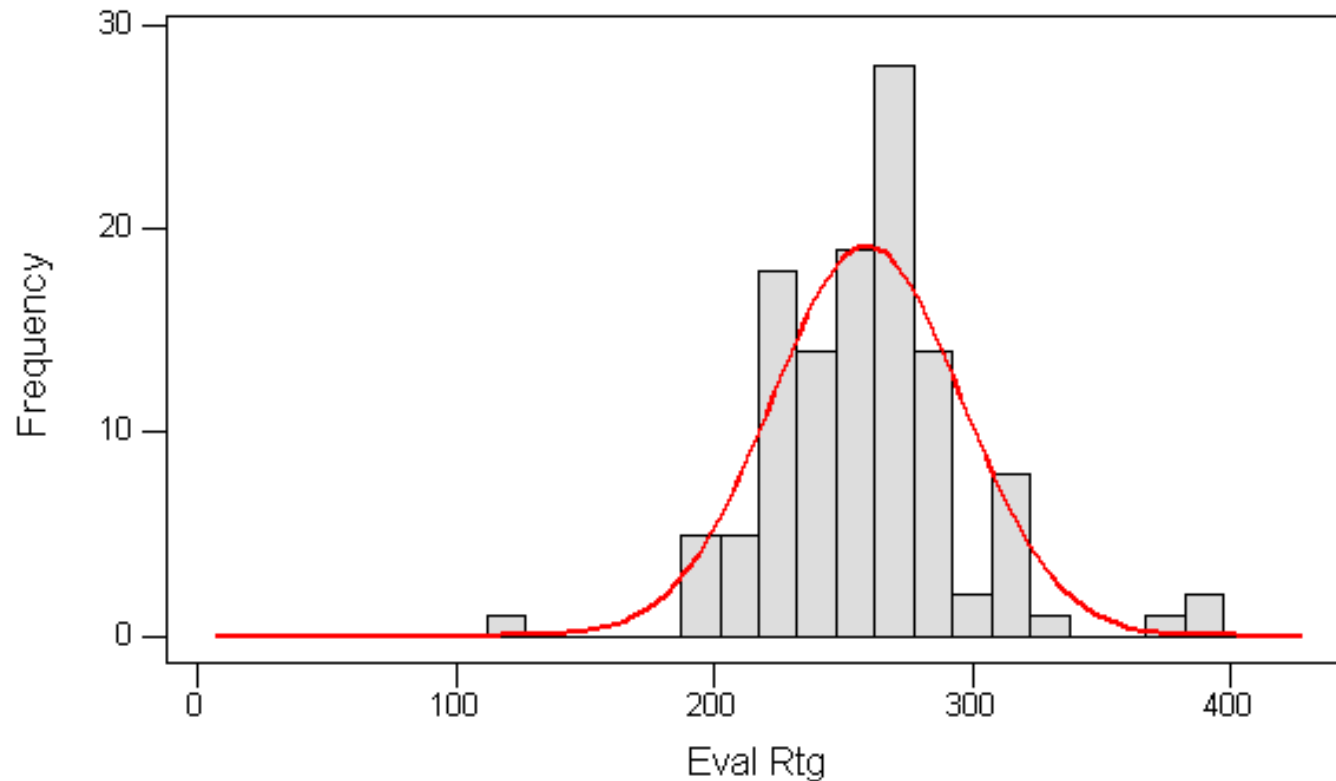


V. Statistics

District 4 – Initial Evaluations

Histogram of Eval Rtg, with Normal Curve

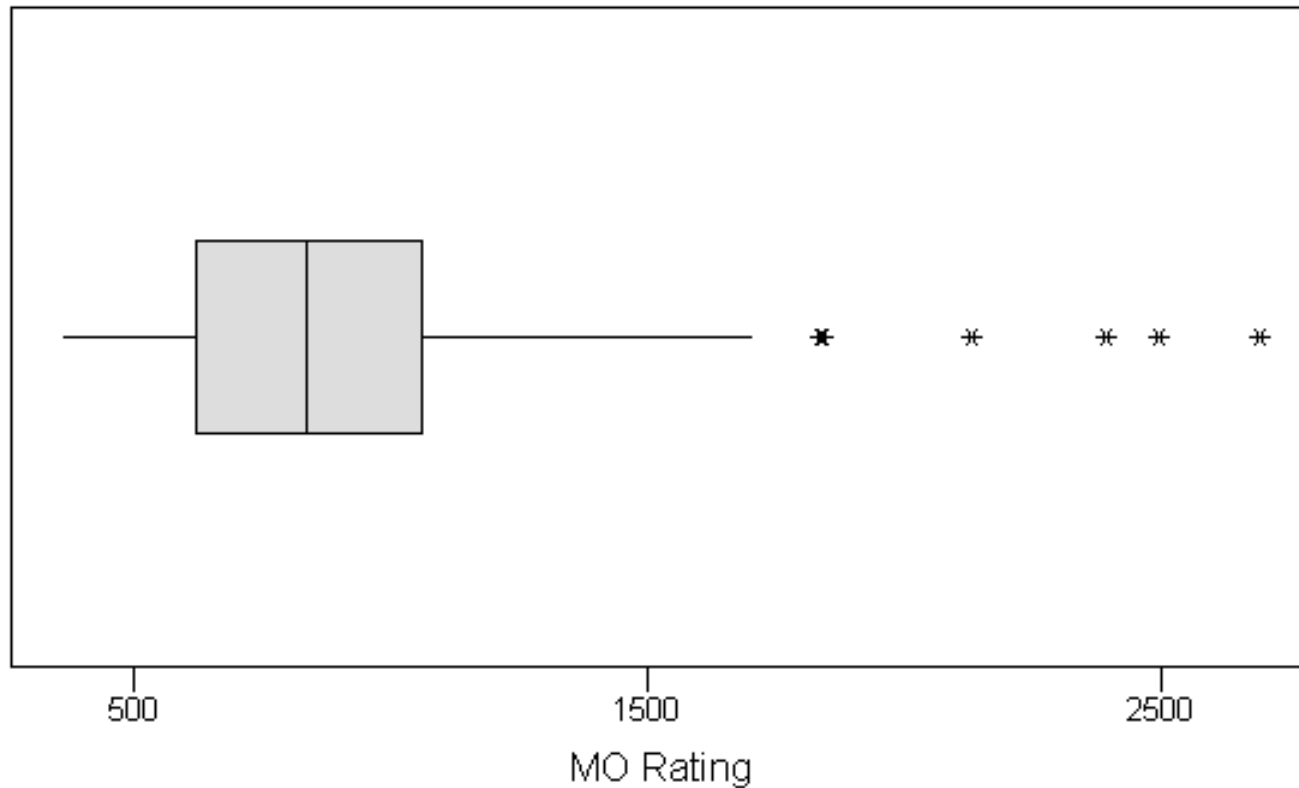
(District = 4)



V. Statistics

Statewide – Mine Opening Evaluations

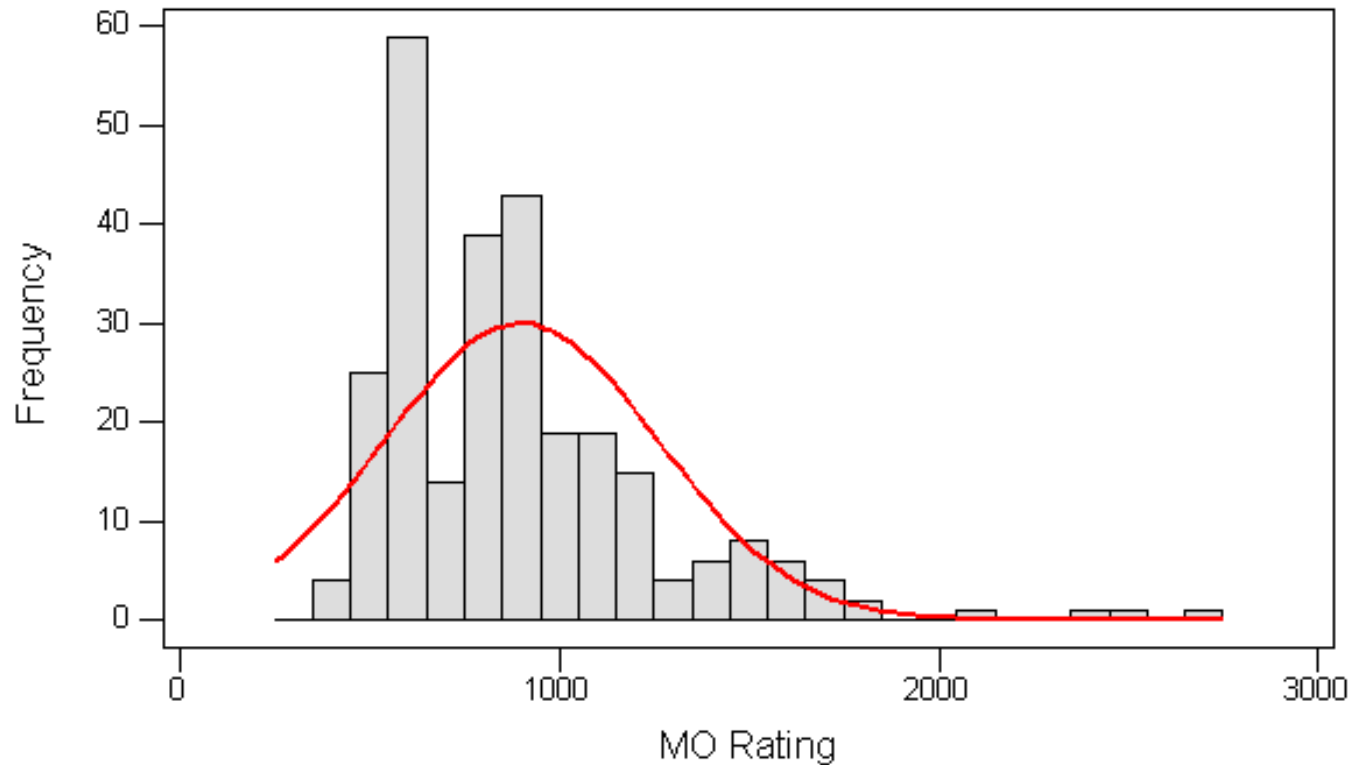
Boxplot of MO Rating



V. Statistics

Statewide – Mine Opening Evaluations

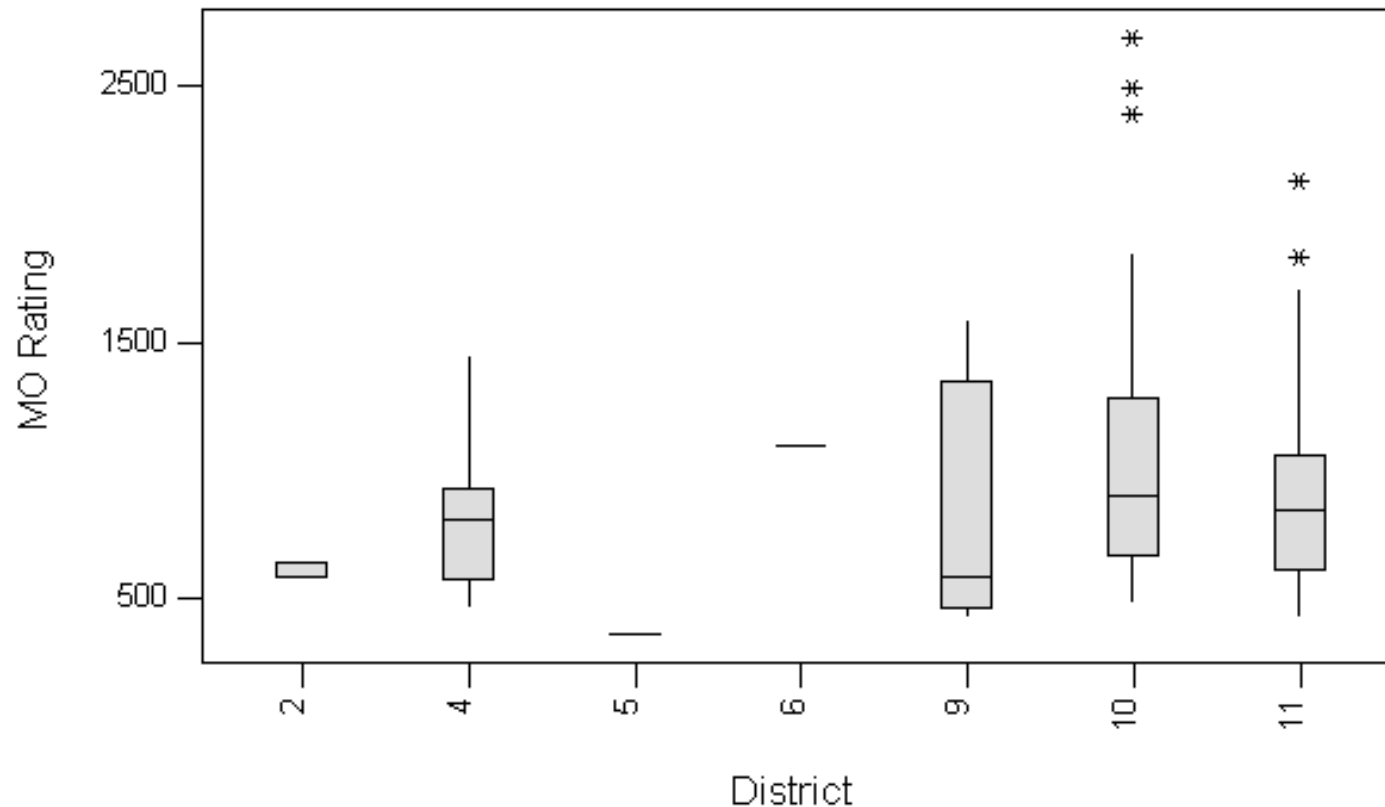
Histogram of MO Rating, with Normal Curve



V. Statistics

Statewide – Mine Opening Evaluations

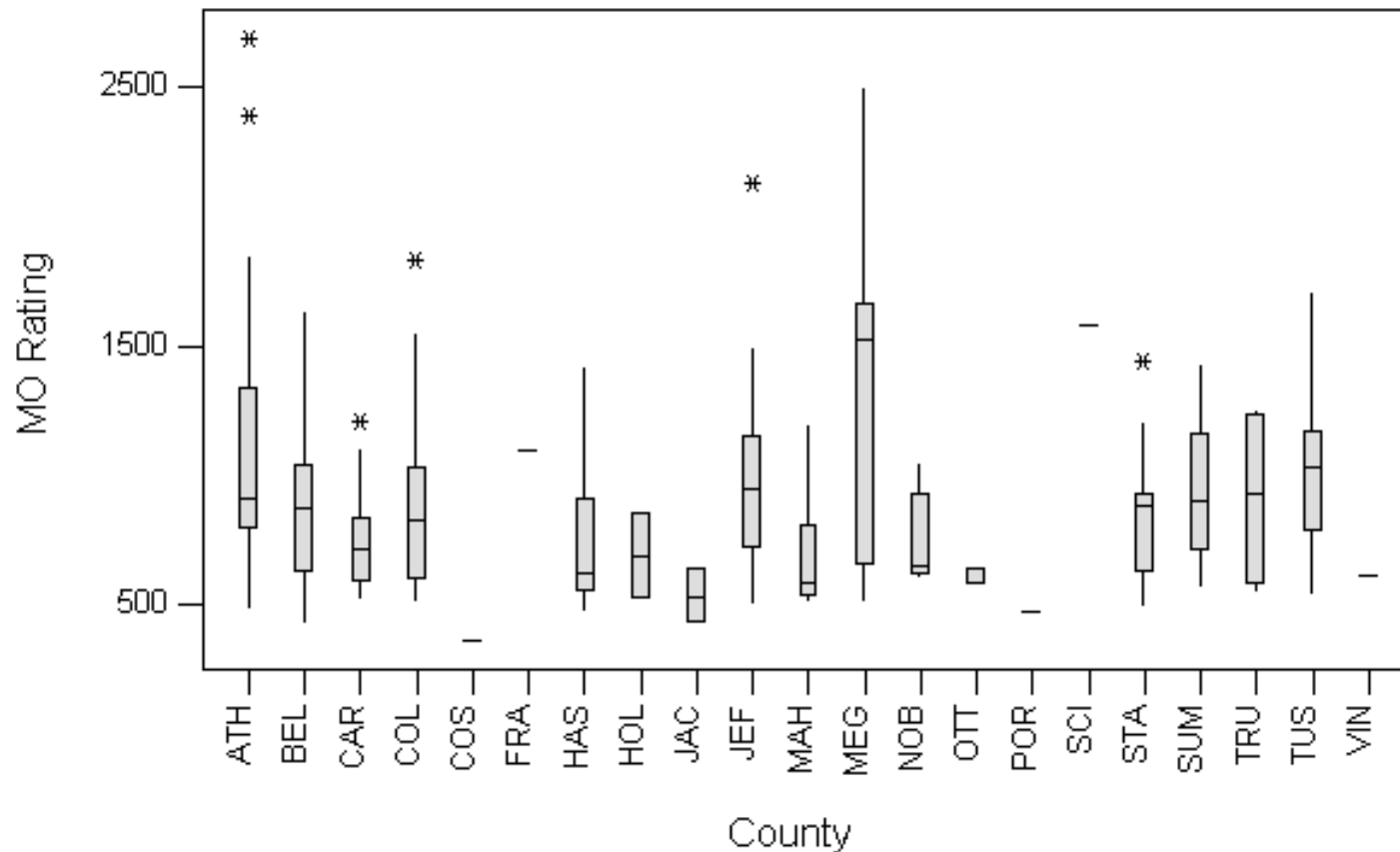
Boxplots of MO Rating by District



V. Statistics

Statewide – Mine Opening Evaluations

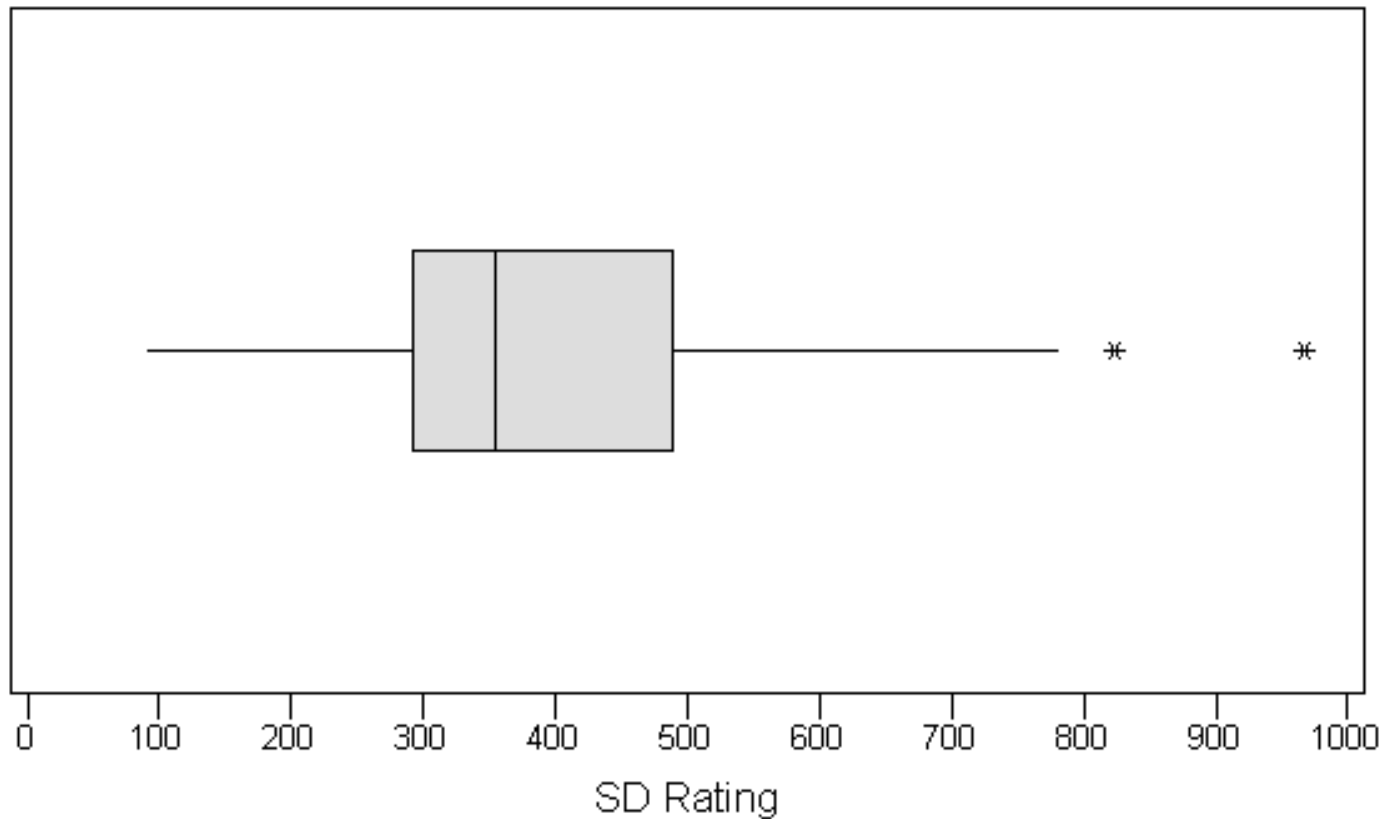
Boxplots of MO Rating by County



V. Statistics

Statewide – Surface Deformation Evaluations

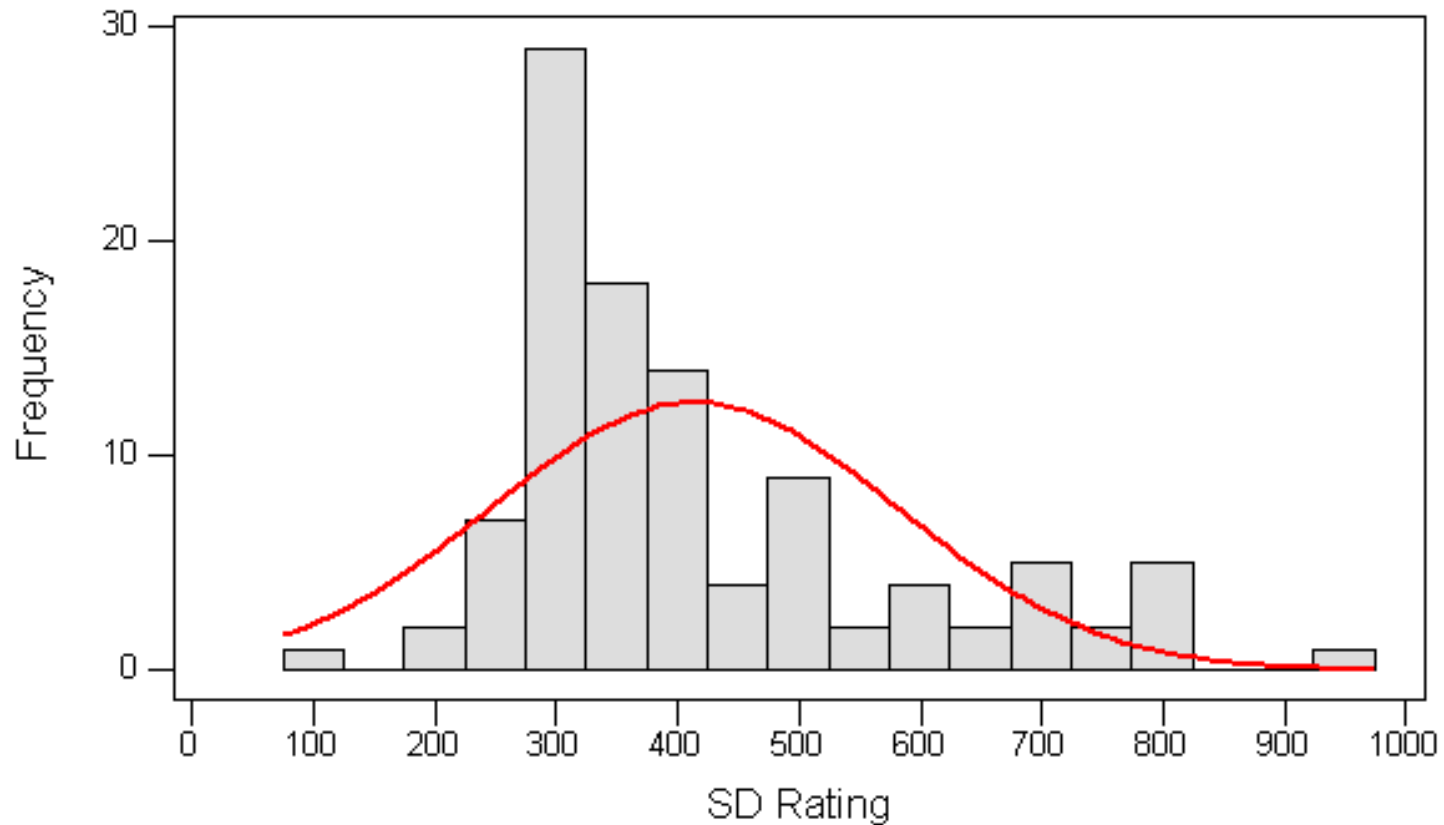
Boxplot of SD Rating



V. Statistics

Statewide – Surface Deformation Evaluations

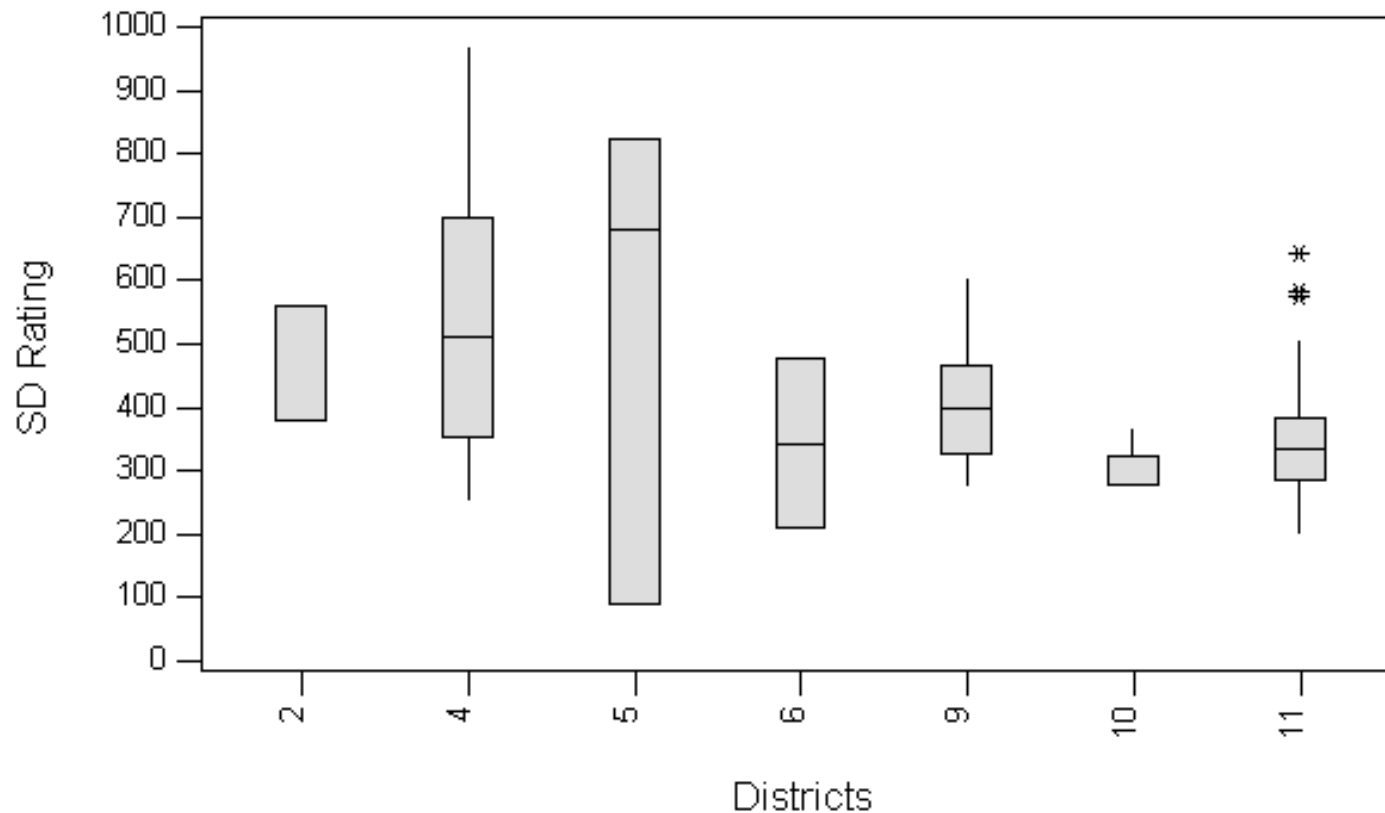
Histogram of SD Rating, with Normal Curve



V. Statistics

Statewide – Surface Deformation Evaluations

Boxplots of SD Rating by District



V. Statistics

Statewide – High Rating Evaluations

High Rated Sites

Site Nbr	Eval Typ	County	District	High Rating
638	HR	STA	4	1041
103	HR	MUS	5	693
1183	HR	MUS	5	672
1222	HR	BEL	11	666
624	HR	MUS	5	657
522	HR	STA	4	643
41	HR	GUE	5	636
39	HR	GUE	5	636
240	HR	STA	4	627
238	HR	STA	4	621

VI. Remediation Cost Estimates

AUMIRA Linked to Cost Remediation Database

Assumptions

- *Treat entire length (BLP to ELP)*
- *Three alternative treatments:*
 - *Drill and grout*
 - *Excavate and fill (if depth < 25 feet)*
 - *“Land Bridge”*
- *Primary mining extracted 60% of seam*

VI. Remediation Cost Estimates

Belmont County Example

<i>Number of Sites</i>	<i>30</i>
<i>Total Lane Miles</i>	<i>49.24</i>
<i>Total Remediation Cost</i>	<i>\$299,346,000</i>
<i>Average Cost/Site</i>	<i>\$9,978,200</i>
<i>Average Cost/Lane Mile</i>	<i>\$6,079,326</i>

VII. UVIRA

Introduction of UVIRA

- Underground Void Inventory and Risk Assessment
 - Any void in the subgrade created by man-made activities
 - Underground Mines
 - Highwall Miners and Auger Mining
 - Mine Opening (shafts)
 - Quarry or Railroad Tunnels
 - Does not include man-made excavations related to drainage and utilities

VII. UVIRA

Comparison with AUMIRA process

- Revisions
 - Eliminate duplication of data collection
 - Compile site information electronically as data instead of ranges of numerical values
 - Aggregate data compilation

- **AUMIRA** hierarchy
 - Initial Site Evaluation
 - Surface Deformation
 - Mine Opening
 - High Rated Site

- **UVIRA** hierarchy
 - Tier 1 (Low & High Rated Sites)
 - Tier 2 (Mine Opening)
 - Tier 3 (Surface Deformation)
 - Tier 4 (Emergency)

VII. UVIRA

Features of UVIRA Process

- Web application GIS platform
- Part of Geohazard Management System
- Linked to Remediation Cost Database Application
- All documents are stored with Falcon application
- Supply information for project funding through the Geologic Site Management Program

AUMIRA

Abandoned Underground Mine Inventory and Risk Assessment

<http://www.dot.state.oh.us/Divisions/ProdMgt/Geotechnical/Pages/MineManual.aspx>

March 2000

Ohio Department of Transportation