

TABLE OF CONTENTS

Five-Year Report

The Effects of Subsidence Resulting from Underground Bituminous Coal Mining on Surface Structures and Features and Water Resources

EXECUTIVE SUMMARY

Section I: THE CONTEXT OF THIS REPORT

I.A. Overview

I.B. The Nature of This Report

I.C. Requirements of the Amended Bituminous Mine Subsidence and Land Conservation Act of 1966

I.D. Memorandum of Understanding between the Department of Environmental Protection and California University of Pennsylvania

I.E. Coal Caucus of the General Assembly Sponsored Meeting of 8 February

I.F. Brief Statement on Mining Methods and Their Effects on Natural and Artificial Surface Features and Processes

I.G. Brief Statement on the Surface Effects of Mining

I.H. Primer on Mining and Subsidence in the First Act 54 Report (1999)

I.I. Regional Geologic and Hydrological Contexts of the Study Area

Section II: SCOPE OF THE STUDY

II.A. Overview

II.B. Temporal Delineation of the Study

II.C. Impacts on Ground Water

II.D. Impacts on Structures

II.E. Impacts on Streams

II.F. Impacts on Wetlands

II.G. Impacts on the Land Surface

II.H. Impacts on Infrastructure

II.I. Impacts on the Economy of Pennsylvania

II.J. Review of the Commissioned Reports Germane to This Study

Section III LIMITATIONS OF THE STUDY

III.A. Overview

III.B. Time

III.C. Data on Water Sources

III.D. Data on Structures

III.E. Fieldwork

III.F. Anecdotal Information

III.G. Nonjudgmental Reviews of Commissioned Reports

III.H. Section 18.1 and the "Five-Year Period"

III.I. No Base Level Studies of Affected Sites

III.J. Record-Keeping

III.K. Intensity and Extent of Mining Methods and Their Effects

III.L. Scale

Section IV: EFFECT OF MINING ON WATER SUPPLIES

- IV.A. Overview and Methodology
- IV.B. Direct Mining Water Loss Claims
- IV.C. Seasonality of Water Loss Claims
- IV.D. Precipitation and Temperature
- IV.E. No Liability Determination
- IV.F. Water Loss Claims by Mining Type
- IV.G. Water Loss Claims by Water Source
- IV.H. Water Supply Density/Acres Mined
- IV.I. Water Supply Replacement
- IV.J. Time to Final Resolution
- IV.K. Resolution Pending
- IV.L. Water Loss Due to Mine Flooding
- IV.M. Spirit of Act 54
- IV.N. Findings
- IV.O. Recommendations

Section V: WATER INFLOW TO LONGWALL MINES

- V.A. Overview
- V.B. Hydrogeologic Setting
- V.C. Data Collection and Analysis
- V.D. Conceptual Ground Water Model
- V.E. Distance from Mining: Data Collection and Analysis
- V.F. Overburden Thickness: Data Collection and Analysis
- V.G. Intra-Panel Surface Subsidence: Data Collection and Analysis
- V.H. Angle of Hydrologic Influence: Data Analysis
- V.I. Evaluation of PA DEP's "No Liability" Determination: Data Analysis
- V.J. Water Supply Recovery
- V.K. Longwall Impacts on Wells and Springs
- V.L. Findings
- V.M. Recommendations
- V.O. Bibliography for Section V

Section VI: EFFECTS OF MINING ON STRUCTURES

- VI.A. Overview
- VI.B. Data Sources
- VI.C. Number of Structures Undermined and Impacted
- VI.D. Determination of Impact Magnitude
- VI.E. Mitigation
- VI.F. Problems with Time until Resolution and with Data
- VI.G. Findings

Section VII: EFFECTS OF MINING ON STREAMS

VII.A. Overview and Methodology

VII.B. Streams Undermined during the Assessment Period and Assessed after they were Undermined

VII.C. Bailey Mine

VII.C.1. Crabapple creek

VII.C.2. Tributary 32518 to Crabapple Creek

VII.C.3. Enlow Fork

VII.C.4. Kent Run

VII.D. Dilworth Mine

VII.D.1. Pumpkin Run

VII.D.2. Tributary 40312 to South Fork of Little Ten Mile Creek

VII.D.3. Tributary 40322 to South Fork of Little Ten Mile Creek

VII.E. 84 Mine

VII.E.1. Tributary 36989 to Little Chartiers Creek

VII.F. Emilie 4 Mine

VII.F.1. Cherry Run

VII.G. Emerald Mine

VII.G.1. Laurel Run

VII.H. Enlow Fork Mine

VII.H.1. Robinson Fork

VII.H.2. Templeton Fork

VII.I. Streams Undermined between 1993 and 1998 and Listed for Further Study in the 2001 Supplement

VII.I.1. Bailey Mine

VII.I.1.a. Enlow Fork

VII.I.2. Blacksville 2 Mine

VII.I.2.a. Hoover's Run (Hoovers Run)

VII.I.2.b. Tom's Run (Toms Run)

VII.I.3. Cumberland Mine

VII.I.3.a. Patterson Run

VII.I.4. Dilworth Mine

VII.I.4.a. Muddy Creek

VII.I.5. 84 Mine

VII.I.5.a. Tributary 36989 to Little Chartiers Creek

VII.I.5.b. Tributary 36999 to Little Chartiers Creek

VII.I.6. Emerald Mine

VII.I.6.a. Smith Creek

VII.I.6.b. Pursley Run

VII.I.7. Enlow Fork Mine

VII.I.7.a. Rocky Run

VII.I.7.b. Templeton Fork

VII.J. Streams That Were Undermined Prior to the First Five-Year Act 54 Report

- VII.J.1. Cambria 33 Mine
 - VII.J.1.a. Howells Run
 - VII.J.1.b. Roaring Run
- VII.K A Report on an Impacted Stream that had been Undermined in the 1980s
 - VII.K.1. South Branch of Two Lick Creek
- VII.L. Investigations of Impacted Streams Conducted by the California District Mining Office during the Assessment Period
 - VII.L.1. Shriver Run
 - VII.L.2. Dyers Fork
 - VII.L.3. Tributary 32653 to Robinson Fork
 - VII.L.4. Unnamed and Unnumbered Tributary to Dunkard Fork
 - VII.L.5. Tributary 32511 to Dunkard Fork
 - VII.L.6. Stone Coal Run
 - VII.L.7. Tributary 32652 to Robinson Fork
 - VII.L.8. Tributary 32653 to Robinson Fork
 - VII.L.9. Unnamed and Unnumbered Tributary to Robinson Fork
 - VII.L.10. Unnamed and Unnumbered Tributary to Mingo Creek
 - VII.L.11. Robert's Run
- VII.M. Assessments That Were Not Performed
- VII.N. Findings
- VII.O. Recommendations
- VII.P. Bibliography for Section VII

Section VIII: EFFECT OF MINING ON WETLANDS

- VIII.A. Overview
- VIII.B. Choice of NWI Wetlands
- VIII.C. Information Sources
- VIII.D. Fieldwork and Classification
- VIII.E. Wetland Codes Used in This Study
 - VIII.E.1. System
 - VIII.E.2. Subsystem
 - VIII.E.3. Class
 - VIII.E.4. Water Regime
 - VIII.E.5. Special Modifiers
 - VIII.E.6. NWI Classifications Included in This Report
- VIII.F. Wetlands over Longwall Mines
 - VIII.F.1. Bailey Mine
 - VIII.F.2. Blacksville No. 2 Mine
 - VIII.F.3. Cumberland Mine
 - VIII.F.4. Dilworth Mine
 - VIII.F.5. Emerald No. 1. Mine
 - VIII.F.6. Enlow Fork Mine
 - VIII.F.7. High Quality (New Century) Mine
 - VIII.F.8. Maple Creek Mine

VIII.F.9. 84 Mine
VIII.F.10. Shoemaker Mine
VIII.G. Findings
VIII.H. Recommendations

Section IX: EFFECT OF MINING ON LAND

IX.A. Overview
IX.B. Land Problems by Type of Mine
IX.C. Findings

Section X: EFFECT OF MINING ON INFRASTRUCTURE: Impact on Major Pipelines, Water Lines, Roads, and Railroads

X.A. Overview
X.B. Impacts to Major Gas Transmission Lines
X.C. Impacts on Water Lines
X.D. Impacts on Roads
X.E. Impacts on Railroads
X.F. Findings
X.G. Recommendation

Section XI: BRIEF SUMMARIES OF REPORTS GERMANE TO THIS STUDY

XI.A. Overview
XI.B. Summary of "Remote Sensing of Forestland above Longwall Mines: Washington and Greene Counties, Pennsylvania" (Authorship: D'Appalonia)
XI.B.1. Purpose
XI.B.2. Procedure
XI.B.3. Results
XI.B.4. Recommendation
XI.C. Summary of "Study of the Effects of Longwall Mining on Streams, Wetlands, and Riparian Areas: Robinson Fork, Southern Washington County, Pennsylvania (Authorship: Earth Science Consultants, Inc.)
XI.C.1. Purpose
XI.C.2. Background
XI.C.3. Procedure
XI.C.4. Results
XI.C.4.a. Flora and Fauna
XI.C.4.b. Fish
XI.C.4.c. Benthic Macroinvertebrates
XI.C.4.d. Riparian Vegetation
XI.C.4.e. Wetlands
XI.C.5 Summary
XI.C.6. Recommendations
XI.D. Summary of "Effects of Longwall Mining on Real Property Value and the Tax Base of Greene and Washington Counties, Pennsylvania"
XI.D.1. Introduction
XI.D.2. Purpose

XI.D.3. Procedure

XI.D.4. Results

XI.E. Summary of "Effects of Undermining Interstate Route 70 South Strabane Township, Washington County, Pennsylvania" (Authorship: GeoTDR, Inc.)

XI.E.1. Background

XI.E.2. Purpose

XI.E.3. Procedure

XI.E.4. Results

Section XII: ACTIONS TAKEN BY THE CALIFORNIA DISTRICT MINING OFFICE

XII.A. Overview

XII.B. Resolution Time for the First and Second Five-Year Period Compared

XII.C. Actions of the California District Mining Office Germane to Act 54

XII.D. Findings

Section XIII: OTHER RECOMMENDATIONS

Section XIV: CONCLUSIONS

APPENDIX A

PLATES:

Executive Summary: Plates 01 thru 04

Section I: Plates 01 thru 25

Section IV: Plates 01 thru 18

Section V: Plate 01

Section VI: Plates 01 thru 09

Section VII: Plates 01 thru 12

Section VIII: Plates 01 thru 11

Section X: Plates 01 thru 35