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The Westray Story

A Predictable Path to Disaster

Report of the Westray Mine Public Inquiry

Justice K. Peter Richard, Commissioner

Volume One

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Cover: Sketch of Westray mine by Elizabeth Owen

"The most important thing to come out of a mine is the miner."

Frédéric Le Play (1806–1882)
French sociologist and inspector general of mines of France

At 5:20 am on 9 May 1992 the Westray mine exploded taking the lives of the following 26 miners.

John Thomas Bates, *56*	Trevor Martin Jahn, *36*
Larry Arthur Bell, *25*	Laurence Elwyn James, *34*
Bennie Joseph Benoit, *42*	Eugene W. Johnson, *33*
Wayne Michael Conway, *38*	Stephen Paul Lilley, *40*
Ferris Todd Dewan, *35*	Michael Frederick MacKay, *38*
Adonis J. Dollimont, *36*	Angus Joseph MacNeil, *39*
Robert Steven Doyle, *22*	Glenn David Martin, *35*
Remi Joseph Drolet, *38*	Harry A. McCallum, *41*
Roy Edward Feltmate, *33*	Eric Earl McIsaac, *38*
Charles Robert Fraser, *29*	George S. James Munroe, *38*
Myles Daniel Gillis, *32*	Danny James Poplar, *39*
John Philip Halloran, *33*	Romeo Andrew Short, *35*
Randolph Brian House, *27*	Peter Francis Vickers, *38*

This Report is dedicated to their memory.

In the early morning of 9 May 1992 a violent explosion rocked the tiny community of Plymouth, just east of Stellarton, in Pictou County, Nova Scotia. The explosion occurred in the depths of the Westray coal mine, instantly killing the 26 miners working there at the time. On 15 May 1992, I was appointed by Order in Council to inquire into and report on this disaster.

During the formative days of this Inquiry, as my understanding of the underground coal mining industry developed, I was struck by two notions that have persisted throughout. The industry is very close-knit with an interdependence, camaraderie, and fellowship that may be unique in modern-day business. And people in the industry, at all levels, regard what occurred at Westray as a personal matter affecting them as if it had happened in their own backyard. It is for them a family tragedy. I suspect that these attitudes have deep historic roots. There are few industries in which one's safety, indeed one's very survival, is so inextricably linked to the attitudes, practices, concerns, and behaviour of fellow workers. Truly, in the underground coal mining environment, you are "your brother's keeper." The miner who sneaks a smoke while underground is risking the lives of his fellow miners. On 7 December 1992, the flick of a cigarette lighter underground caused the death of eight miners at the Southmountain Coal Company in Virginia.

The Westray tragedy is regarded in the industry as a black mark against coal mining in general rather than as a merely localized event. As a result, I received a remarkable degree of cooperation from the industry, which, while being most encouraging, underscored the solemn responsibility I had assumed. The coal industry – miners, managers, operators, and regulators – is most anxious to determine what can be learned as a result of this tragedy and what can be done to prevent another.

The 1981 Report of the Joint Federal-Provincial Inquiry Commission into Safety in Mines and Mining Plants in Ontario (the Burkett Report) is aptly entitled *Towards Safe Production*. As its title suggests, the entire thrust of the report is to increase and to promote safe practices in mines. The only completely safe mine is a closed mine. By the same token, the only completely safe aircraft is on the ground with the engines off. The only truly safe automobile is the one parked in the garage. Once a mine is open, there begins the constant process of trade-off between production and safety. From the chief executive officer to the miner at the working face, the objective must be to operate the mine in a manner that ensures the personal safety of the worker over the economic imperatives of increased production. The two seemingly competing concepts – safety and production – must be so harmonized that they can co-exist without doing harm to each other. It is here that the regulator must assume the role of monitor and aggressively ensure that the balance is understood and maintained. In this sense, the function of the regulator is both instructive and supervisory. As one provincial mine inspector in Ontario told me, "Ideally, if we perform our duties properly we will eventually work ourselves out of a job." As I read *Towards Safe Production*, I was impressed with the clarity and wisdom of this regulatory role.

The Order in Council that established this Inquiry gives me power to "inquire into . . . whether the occurrence was or was not preventable." Of course it was. For this Report we have chosen the title *The Westray Story: A Predictable Path to Disaster* to convey that message. The message is that the Westray tragedy was predictable and, therefore, preventable. The Report contains recommendations and suggestions aimed at avoiding a similar occurrence in the future.

Anyone who hopes to find in this Report a simple and conclusive answer as to how this tragedy happened will be disappointed. Anyone who expects that this Report will single out one or two persons and assess total blame for the tragedy will be similarly disappointed. The *Westray Story* is a complex mosaic of actions, omissions, mistakes, incompetence, apathy, cynicism, stupidity, and neglect. Some well-intentioned but misguided blunders were also added to the mix. It was clear from the outset that the loss of 26 lives at Plymouth, Pictou County, in the early morning hours of 9 May 1992 was not the result of a single definable event or misstep. Only the serenely uninformed (the wilfully blind) or the cynically self-serving could be satisfied with such an explanation.

This Report has been written with the benefit of hindsight, which, as the saying goes, provides 20/20 vision. Many of the incidents that now appear to fit into the mosaic might at the time, and of themselves, have seemed trivial. Viewed in context, these seemingly isolated incidents constitute a mind-set or operating philosophy that appears to favour expediency over intelligent planning and that trivializes safety concerns. Indeed, management at Westray displayed a certain disdain for safety and appeared to regard safety-conscious workers as the wimps in the organization. To its discredit, the management at Westray, through either incompetence or ignorance, lost sight of the basic tenet of coal mining: that safe mining is good business. As one mining executive remarked to me in June 1996 during a mine visit to Alabama, "We could not afford to operate an unsafe mine, due to the high cost of accidents and downtime." Certainly, the validity of this concept was never more obvious than in the horrible aftermath of Westray.

The tale that unfolds in the ensuing narrative is the *Westray Story*. It is a story of incompetence, of mismanagement, of bureaucratic bungling, of deceit, of ruthlessness, of cover-up, of apathy, of expediency, and of cynical indifference. It is a tragic story, with the inevitable moments of pathos and heroism. The *Westray Story* concerns an event that, in all good common sense, ought not to have occurred. It did occur – and that is our unfortunate legacy.

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November 1997

To His Honour
The Lieutenant Governor

By Order in Council dated 15 May 1992, I was appointed a Commissioner under the *Public Inquiries Act* and a Special Examiner under the *Coal Mines Regulation Act* to inquire into, report, and make recommendations respecting the tragic Westray mine explosion, which occurred on 9 May 1992.

I am pleased to report that I have now completed my mandate as set out in the Order in Council and, as directed, I hereby submit my report to you and to the people of Nova Scotia.

Respectfully submitted,

K. Peter Richard, Justice
COMMISSIONER

Preface

From the very outset of this Inquiry, the massive amount of documentary and testimonial evidence created logistical as well as evidentiary problems. The determination of which of the evidence was the most relevant and which was not essential to the completion of the Inquiry mandate was a formidable but necessary undertaking. This approach was necessary in order to keep the Report a reasonable size without sacrificing content. Each chapter of the Report was directed, as closely as possible, to specific directions in the Terms of Reference. The reader will note that each chapter begins with a marginal note indicating the particular term or terms of the Order in Council most germane to the discussion to follow. This focus enabled us to concentrate on the evidence most pertinent to each aspect of the mandate of the Inquiry.

The Terms of Reference

One of the most difficult decisions faced by members of the Inquiry research staff and myself was when to say "enough." During each phase of our investigation and research, we had to make a conscious decision to discontinue those efforts and direct our attention towards the preparation of this Report. There was always the lure of the unread research paper or the bit of testimony that might have placed a slightly different slant on something. The determining factor was always the Inquiry Terms of Reference and whether additional effort would help to fulfil my mandate as set out there.

One such example may be illustrative of this problem. In the Terms of Reference, I was empowered to "*inquire into . . . whether any neglect caused or contributed to the occurrence.*" Following the 9 May 1992 explosion, there were the inevitable finger-pointing and accusations in the media and elsewhere. Allegations of political interference or intervention during the planning stages of the Westray mine were common. Suggestions were made that Premier John Buchanan and his successor, Premier Donald Cameron, might have exerted influence that resulted in decisions not consistent with good business practice. Nova Scotia Labour Minister Leroy Legere was criticized for the conduct of his department during the weeks following the disaster. There were subtle suggestions that these ministers of the crown must accept some responsibility for the lack of vigilance and planning that might have contributed to the accumulation of circumstances leading to this disaster. In my view, it is evident that the nature and the extent of a cabinet minister's responsibility was widely misunderstood. Rooted as it is in the British parliamentary system, ministerial responsibility has a long and complex history. It has been the subject of much learned writing over the years, both in the United

Kingdom and in Canada. I felt that the issue ought to be canvassed in this Report, at least to the extent of placing the actions of the various ministers in the proper constitutional context. With the assistance of Dr Peter Clancy, professor of political science at St Francis Xavier University, I have included a brief analysis of this concept and how it applies in the context of Westray. It is not dispositive of the subject, but it may give the reader some insight into the concept of ministerial responsibility and its implications in a particular set of circumstances.

In much the same way as decisions were made respecting the investigation and research aspect of this Inquiry, we also had to draw the line on how much revising, editing, and refining of text were to be done. This is especially difficult when preparing a report on very technical and somewhat arcane subject matters and attempting to have the text accessible to the average reader. This Report cannot be seen as a technical paper on coal mine operation and safety. My aim from the outset has been to prepare a report that addresses the questions either expressed or implied in the Terms of Reference as set out in the Order in Council, and to do so in as readable and non-technical a manner as the subject matter allows.

The Process and the Report

After some deliberation about the most effective way to present the results of the Inquiry, we decided to divide the discussion into four parts, contained in two volumes. A Reference volume and an Executive Summary complete the package. In Part One, Prelude to the Tragedy, I look at Westray from the point of view of how the mine came to be and how it functioned. In Part Two, The Explosion, I analyse what happened on 9 May 1992 and examine the various technical problems involved in mining coal in Pictou County, as well as how Westray handled them. In Part Three, The Regulators, I examine provincial responsibilities, and in Part Four, The Aftermath, I relate what happened after the explosion.

I have tried to keep the Report free of all but a minimum of technical language or jargon. That has been done only to the extent that it would not distort the meaning. The Glossary of Coal Mining Terminology, located in the Reference volume, is meant to assist where the use of technical language was essential.

The Reference volume of the Report also contains many of the photographs referred to in the text, as well as a number of mine plans and associated material. This volume is spiral-bound for convenience. It permits the reader to consult a photograph or plan while reading the text relating to it.

We have made a conscious effort throughout this Report to provide authority for any statements or conclusions. This is to ensure that there is a sound basis for them, whether it be in the testimony of witnesses or the findings of experts, or our many exhibits. This documentation may also be useful to the reader wishing to pursue any particular aspect of the Report. During the course of this Inquiry, we have amassed a considerable library of materials relating to coal mining and to industrial safety, both in coal mines and elsewhere. A bibliography has been prepared and is included in the Reference volume.

In the interest of economy of space, I may not refer to each piece of testimony or every document in support of a particular finding or conclusion. If 20 witnesses have testified to excessive amounts of coal dust in the mine, I may refer to only two or three such witnesses as representative of the evidence on which I have based my findings or conclusions. This is consistent with our practice during the investigative stage of the Inquiry and at the hearings. For instance, although 120 Westray miners and draegermen were interviewed, only 30 were actually called to the hearings, simply to avoid needless repetition. Inquiry Exhibit 74, Interview Abstracts – Post-Explosion Conditions, is a summary of extracts from post-explosion interviews; it is included in this Report as Appendix J. This summary was prepared by Inquiry staff to help determine which of the 120 miners would be asked to give testimony at the hearings. It provides a convenient, though cryptic, source of information respecting many post-explosion observations. The circled numbers on map 1 in the Reference volume are keyed to this appendix.

For those who wish access to Inquiry documents, including transcripts, exhibits, research materials, and copies of this Report, all are at the library of St Francis Xavier University, Antigonish, Nova Scotia. A complete set of exhibits and transcripts, along with the Report, is also on file at the Nova Scotia provincial archives in Halifax.

I have relied on much more than the documents, exhibits, and hearing testimony in formulating the opinions and conclusions contained in this Report. I gained useful insights during visits to several underground coal mines in Canada and the United States. These visits are more fully described in Chapter 16, The Inquiry. In addition, I have met informally with mine operators and executives, and with mining inspection personnel in British Columbia, Alberta, Ontario, and Washington, DC. I have talked to Labour Canada mine inspectors and visited the CANMET equipment certification laboratory at Bells Corners, Ontario, and the Cape Breton Coal Research Laboratory at Sydney, Nova Scotia. As well as studying Canadian federal legislation and provincial legislation for British Columbia, Alberta, and Ontario, Inquiry staff have studied legislation from jurisdictions including South Africa, the United Kingdom, Australia, the United States, and the states of Utah and West Virginia. Many of the more progressive measures from those jurisdictions have been included in the legislative recommendations incorporated into this Report. I am of the view that legislative changes respecting workplace safety ought not be disaster driven, although the sad fact is that they usually are.

The legislative recommendations are set out throughout the Report in the related subject areas. These recommendations do not constitute a complete legislative regime but rather are suggestive of a regulatory direction. As will become apparent in the Report, I favour the highly detailed approach to regulations as exemplified by Title 30 of the *Code of*

Federal Regulations (CFR) in the United States. What approach is finally adopted in Nova Scotia will depend on the further deliberations of experts and the outcome of federal-provincial negotiations respecting a cooperative approach to mine safety regulation. Also, the choice of the appropriate legislative regime will determine whether many of the recommendations will be adopted or be subject to modification to fit the regime so selected.

As a matter of style, and for reader convenience, the Report is structured so that all findings and recommendations are set out as they are made, relevant to the matters being discussed. The findings and recommendations are also set out in their entirety in a concluding section of this Report as well as in the Executive Summary. Also, for reader convenience, there is some duplication throughout the Report. For example, I have attempted to make Chapter 6, The Explosion, as complete as possible to avoid the inconvenience for readers of flipping back and forth to other sections or chapters in order to pick up the thread of continuity. Since many of the elements of the explosion are matters relating to mine ventilation, Chapter 7, Ventilation, further discusses these elements.

Throughout this Report I have attempted, so much as possible, to keep the narrative free of comment. In most cases the narrative speaks for itself, but at times comments, which I have generally placed in footnotes, seem appropriate.

Acknowledgements

It would not have been possible to complete this Report without the assistance and cooperation of many people. I was continually amazed by the sincerity, goodwill, and genuine interest demonstrated by everyone in the international mining community with whom I had contact. Whether I reached them by phone, letter, or personal visit, the response of each was immediate and generous. I realized early in my study that the members of the mining community form a close-knit group, with a genuine interest and empathy for others in the community. They were always eager to assist in any way – especially where safety is concerned. In particular, I wish to acknowledge the assistance of the following persons:

Kevin Burkett, Ontario labour arbitrator, who chaired the Ontario mining inquiry and who authored the report *Towards Safe Production*. Burkett built upon the concept of "internal responsibility" first articulated by James M. Ham in the 1976 Report of the Royal Commission on the Health and Safety of Workers in Mines. This concept has gained recognition in other parts of Canada.

Glen Zumwalt, Skyline mine, Helper, Utah, for arranging my first visit to an underground coal mine. *Craig Hilton*, vice-president operations, who gave me my first briefing in underground coal mine safety and acted as my guide through the Skyline mine. *Ben Bringhurst*, safety director for Skyline, who impressed upon me the singular importance of safety in the mine; I was especially struck by Ben's thoughtful and "no nonsense" approach to mine safety.

Bob Cooper, vice-president, finance, Devco, for consultations and for providing materials on training. *Reg McIntyre*, vice-president operations, Devco, for arranging a tour of the Phalen colliery and providing much assistance by way of interviews and conferences. Reg also provided valuable insights into the Westray rescue operation, of which he was a valued participant.

Bruce Campbell, now retired executive director of the Ontario Mining Association, and his successor, *Michael Green*, both of whom provided valuable insights into the mining industry. Bruce also provided a valuable perspective into the practical application of Ontario mining legislation.

Mary Tate, director of the Occupational Health and Safety Branch of the Ontario Ministry of Labour, for arranging meetings with Ontario mine inspectors and providing an overview of the Ontario mine safety administration.

Ian Plummer, recently retired provincial coordinator of mining, Occupational Health and Safety Branch, Ontario Ministry of Labour, for his continued assistance and advice on matters of mine safety and the administration of safety legislation. Ian also provided assistance in the formulation of the section on internal responsibility and its administration in Ontario.

Charles Byrer, project manager, Coalbed Methane, U.S. Department of Energy, who provided advice and literature on many aspects of underground mining, as well as much of the research material used to prepare the section on coal mine degasification.

Hall Chamberlin, formerly of the British Columbia Mining Association, for sharing his expertise and insights into various aspects of the Canadian underground coal mining industry. I also acknowledge the assistance of *Gary Livingstone*, president of the association.

Dr William Hustrulid, strata control engineer, formerly of the Colorado School of Mining, for direction and assistance in ground control matters. Dr Hustrulid also produced and edited the valuable text on underground coal mining *Underground Mining Methods Handbook*, which has been an important research tool for the Inquiry.

Barbara Dygert, of the Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, who secured several research volumes for the Inquiry and kindly consented to the use of charts and diagrams in this Report.

Dave Forrester, director of the Sydney Coal Laboratory (CANMET), for a very informative day of instruction at the laboratory there. I am also indebted to *Gary Bonnell*, methane specialist, and *Dave Young*, who came to Stellarton and provided a most graphic demonstration of the explosive properties of methane and coal dust. I also acknowledge the assistance of *Dan Kennedy*, research scientist, and *George Klinowski*, ventilation specialist.

Dr John Udd, director of CANMET, Bells Corners, Ontario, for his cooperation and assistance in arranging and conducting a tour of the CANMET facilities at Bells Corners, and for providing insights into technical assistance available to the mining industry in Canada. Dr Udd arranged for my visit to the Sydney Coal Laboratory.

Davitt McAteer, assistant secretary of the U.S. Department of Labor, *Ed Hugler*, counsel, and *Madison McCulloch* and *Bob Elam*, deputy directors of MSHA, Washington, DC, for cooperation and hospitality in arranging a tour of their facility at Arlington, Virginia. (Bob Elam was on site during the days following the Westray disaster to assist on behalf of MSHA.) I am particularly indebted to *Glenn Tinney*, then manager of safety services, for arranging an intensive and informative tour of the various safety offices within the agency and to *Cheryl McGill*, mining inspector, for her "hands on" review of mine safety practices and enforcement.

Tom Kessler, superintendent, *Don Farley*, assistant superintendent, and instructors *Dave Friley*, *Dennis Hartsog*, *Cliff Lindsay*, all of the National Mine Health and Safety Academy at Beckley, West Virginia, who freely gave of their time and expertise. I have relied on their interest and cooperation on several occasions during the course of this Inquiry. While at Beckley, I had the privilege of spending some time with *Jim Rutherford*, now retired assistant director at MSHA, as well as with *William "Bolts" Willis*, director of mine safety, West Virginia Department of Mines.

Bill Carr, president of Jim Walter Resources, Inc., of Brookwood, Alabama, for giving so freely of his time and resources to make my visit to JWR as productive as possible. *Charles Dixon*, senior vice-president, engineering, JWR, for arranging a tour of the training facility and one of the underground coal mines. I am thankful for the continuing support and assistance that Mr Dixon has provided. *G. Willis Coates*, recently retired JWR general manager of safety and training, and training supervisor, *Dale Byram*, his successor, along with *Ralph Ausborn*, safety instructor, *Wyatt Andrews*, safety supervisor, and *Reggie Lamons*, underground manager, provided safety instruction and guided me through an underground mine at Brookwood.

Local manager *Bill Whitefield* of *MSA Canada Inc.*, who kindly loaned various pieces of mine safety equipment to the Inquiry for instructional and display purposes during the hearings.

Bob Bone, PEng, mining engineer and inspector with the British Columbia Ministry of Energy, Mines and Petroleum Resources, and inspector of the underground coal mine at Campbell River – a room-and-pillar operation quite similar to Westray – who has been particularly helpful during the course of the Inquiry. *Tom Carter*, manager, mechanical and electrical engineering, Mine Health and Safety Branch, who, along with Bob Bone, provided a very instructive day in the operation of the BC mining inspectorate.

Greg P. Isenor, of Sydney, Nova Scotia, who, in the very early stages of the Inquiry provided valuable insights into the history of methane exploitation testing at the Pictou coalfield. Mr Isenor had been a consultant in the Algas project.

Trudie Richards, freelance writer and journalist, who provided the Inquiry with an insightful commentary on the interrelationship among the media, rescuers, and families during the time following the disaster.

George Vooro, president and chief executive officer of Quinsam Coal Corporation, Campbell River, British Columbia, who supplied the Inquiry with detailed and current mine and ventilation plans for the Quinsam mine. This material provided valuable comparative data on room-and-pillar mine layout and planning.

John Chisholm, president of Nova Construction of Antigonish, Nova Scotia, and developer of the open-pit mine in Stellarton/Westville, who

invited me to tour the open-pit mine. Through this visit I was able to get some first-hand appreciation of the geological configuration of the Foord seam.

Members of the judiciary were also forthcoming and eager to offer advice on the conduct of public inquiries and other matters. Justices *Horace Krever*, *Sam Grange*, and *Lloyd Houlden*, commissioners of inquiries in Ontario, were always available to provide valuable assistance and support concerning inquiry procedures and practices.

Finally, although my appreciation to Inquiry counsel and staff is expressed in Chapter 16, I would now like to thank all those who devoted their talents to the work of the Inquiry. I am grateful to each of them for their contribution.

PART ONE

Prelude to the Tragedy

History, Development, and Operation

1 History of Coal in Pictou County

The Westray mine at Plymouth was the only operating underground coal mine in Pictou County at the time it exploded on 9 May 1992. This belies the fact that much of the social and economic fabric of Pictou County was woven around the coal mining industry and the Pictou coalfield. I was surprised at how much of the history of coal mining in Pictou County has been recorded. Libraries at St Francis Xavier University in Antigonish, the Town of New Glasgow, and the Nova Scotia Museum of Industry in Stellarton have sections devoted to the Pictou coalfield. As I reviewed this material, the name of James M. Cameron kept appearing. I was impressed by the prodigious research he carried out into almost all phases of the history of industrial Pictou County. His detailed history, *The Pictonian Colliers*, is the seminal work on the Pictou coal mining industry.[1] The bibliography to this Report includes a number of historical materials, compiled for the most part by Judith Hoegg Ryan, another student of Pictou County coal mining.[2]

Historians think the first settlers of what became Pictou County must have known of the presence of coal as early as 1767 because the local Indians knew of the escaping methane gas. They told of fires caused by lightning striking trees and the burning trees then igniting the outcropping of coal in what is now the Stellarton area.[3] The historian the Reverend George Patterson, in discussing the origin of the county's name, wrote that "there can be little doubt that . . . [the name Pictou] is formed from the Indian name . . . Pictook." He went on to write that Silas Rand (compiler of the first dictionary of Micmac) "ascribes the word to the Indian word 'Pict' meaning any explosion of gas and suggests the name is descriptive of the escape of gas (methane) from coal lying beneath the surface around the East River."[4] The history of the "industrial" part of Pictou County is largely the history of coal mining. Early coal mining was labour intensive, and the population of the county grew as employees and service industries were attracted to the area. That growth continued as other businesses and industries, drawn by the proximity of a good source of fuel, settled in the communities of industrial Pictou County.

I decided that a sketch of the history of coal mining in Pictou County would be a fitting introduction to this Report. By this means, I hope to give the reader some insight into the historical, social, and economic

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1 James M. Cameron, *The Pictonian Colliers* (Halifax: Nova Scotia Museum, Province of Nova Scotia, 1974).

2 Much of what follows is the work of Judith Hoegg Ryan, who has an abiding interest in, and a long family association with, the Pictou County coal industry. She was retained at the early stages of the Inquiry as its historian.

3 Cameron, *Pictonian Colliers*, 16.

4 George Patterson, *A History of Pictou County*, 2nd ed. (Belleville, Ont.: Mika Studio, 1972), 22.

significance of coal mining in this area. The roots of Westray extend back to the first attempts to mine the Pictou coalfields, and elements of the disaster rest in the nature of those coalfields with their "thick, gassy seams," which were "prone to spontaneous combustion and explosion."[5] This sketch begins with a description of the Pictou coalfield and then outlines briefly the history of mining in the county from its rudimentary beginnings to World War II and the postwar mechanized era. This history is marked by fire, explosion, and death.

The Pictou Coalfield

The Pictou coalfield lies within a land area measuring roughly 18 km from east to west and 6 km from north to south, and encompasses approximately 25 seams of bituminous coal. These coal seams lie beneath each other, separated by rock strata. All the seams outcrop in a half-moon fashion east and west, and all slope downwards, or pitch, towards the north. The farther west, the steeper the pitch of the seams becomes. At the west outcrop, the pitch is approximately 26 degrees. Moving east, it flattens to approximately 18 degrees, as at the Westray mine. These seams of the Pictou coalfield exist in six coal members of the Stellarton group, which are distinct from each other according to when they were deposited, and which are divided by faults. The three members with minable seams are, from youngest to eldest, the Thorburn, the Albion, and the Westville members. Figure 1.1 shows the coalfield and the locations of some of the mines mentioned below.

The Thorburn member contains five workable seams of coal, four of which have been mined. The fifth, averaging less than 1 m thick, has not been mined. The Albion member, containing 16 seams, is separated from the Thorburn by masses of shale. A former Nova Scotian coal mine supervisor, Francis Gray, has described the Albion: "At its maximum the deposit consists of some 1500 feet of strata containing sixteen coal-seams aggregating in total thickness 270 feet."[6] At least seven of these seams have been worked. One thousand feet (305 m) of strata are estimated to lie between the Albion and the Westville members. The top seams of the Westville – the Acadia and the Scott – have been mined; the two lower ones were considered too inferior to develop.

Of the three members, the Albion contains the richest seams and has been the most heavily exploited, despite its very complicated geology. Gray wrote that "no other coal-field in North America has the drift origin characteristics possessed by the Albion-Stellarton coal-seams." Because the coal accumulated in deep hollows, the seams here evidence "quick lateral variations in thickness and quality. The Foord seam, for example, changes within a short distance from over 30 feet of clean coal to a thickness of over 50 feet of intermingled sheets of coal and shale, finally

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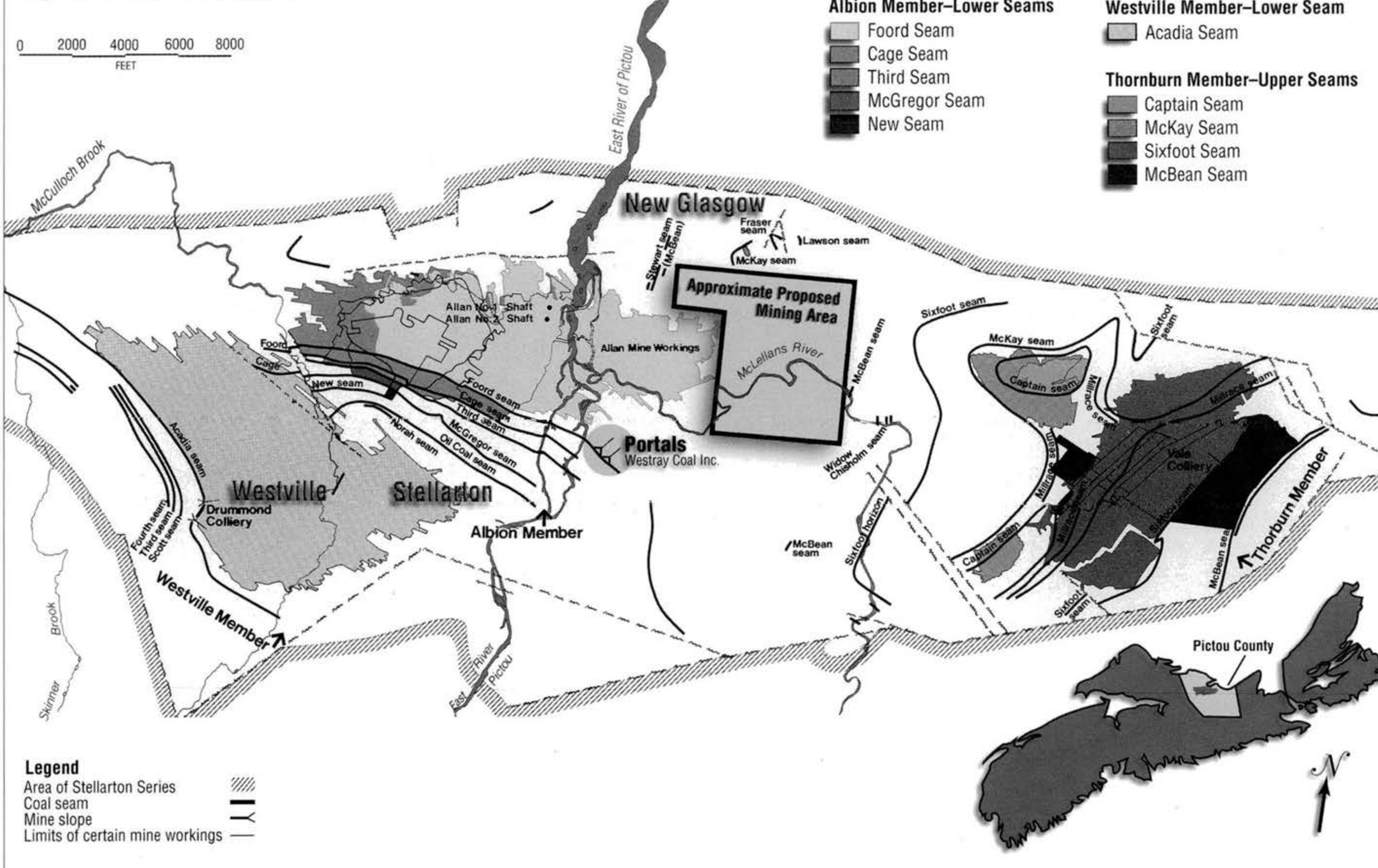
5 Hugh A. Halliday and Judith Hoegg Ryan, "Mining Disasters," *The 1996 Canadian Encyclopedia Plus*, CD-ROM (Toronto: McClelland and Stewart, 1995).

6 F.W. Gray, "The Saga of a Coalfield," *Dalhousie Review* 24, no. 1 (1944): 51–59.

Figure 1.1 The Pictou Coalfield



Source: Exhibit 4, Figure 2.3.

splitting up and fingering out into barren strata." Gray also described the whole stratigraphic column as "carbonaceous, gaseous, and prone to spontaneous combustion." Most mining has been in the Foord seam, which is the closest significant seam to the surface. Over 14 m at its thickest, the Foord was once considered to be the thickest seam of bituminous coal to be mined in the world. Over time, the Foord has hosted at least eight mines, the most productive being the Allan from 1904 to 1951.

Underlying the Foord seam is the Cage seam, approximately 11 m at its thickest. The Cage pit operated from 1853 to 1880, and later the Cage seam was mined through the Allan, Acadia No. 7, and particularly the Albion mines. Next is the Third seam, where the Albion slope (or inclined roadway) was sunk. Following, in descending order, are the Purvis seam (unmined), the Fleming seam, and the McGregor seam, with a small band of stone separating the last two. The McGregor slope was sunk in the McGregor seam (thickness, 6 m), and the Fleming seam (thickness, 2 m) was also worked from the McGregor mine. Underlying the McGregor is the Acadia No. 1 (or New) seam, and a slope by the same name was sunk in it in the mid-1910s and closed in the mid-1920s. The seam was worked afterwards from tunnels in the McGregor mine. Below the Acadia No. 1 lies the Norah seam. A slope was sunk part-way down this seam but was not developed owing to the poor quality of coal, and seams below this have not been considered worth mining. Figure 1.2 presents a basic stratigraphic section of the area.

Stellarton took its name from a small seam of oil coal known as "Stellarite" because it seemed to throw off stars when it was burned. Coal from this seam was mined from 1863 to 1867 and sold in the United States until its oil coal was supplanted by cheap Pennsylvania oil. In 1937, George Rice, a consulting engineer and internationally recognized expert on coal mining, reported on the Stellarton coal seams: "The most striking features of the coal seams and enclosing strata are the irregular folds and numerous faults in different directions which together with the rapid variation in thickness makes the most difficult mining conditions your investigator has observed in any of the coalfields of North America or in Europe."[7] The history that follows bears out Rice's findings.

Mining in Pictou County to World War II

Mining began in Pictou County around 1800. Early small mines sold coal to the surrounding population and even shipped to Halifax, and despite financial hardship and difficult mining conditions yearly production came to average about 2500 chaldrons.[8] The coal was raised by horsepower and sold mostly at the mouth of the mines, which were located on the west side

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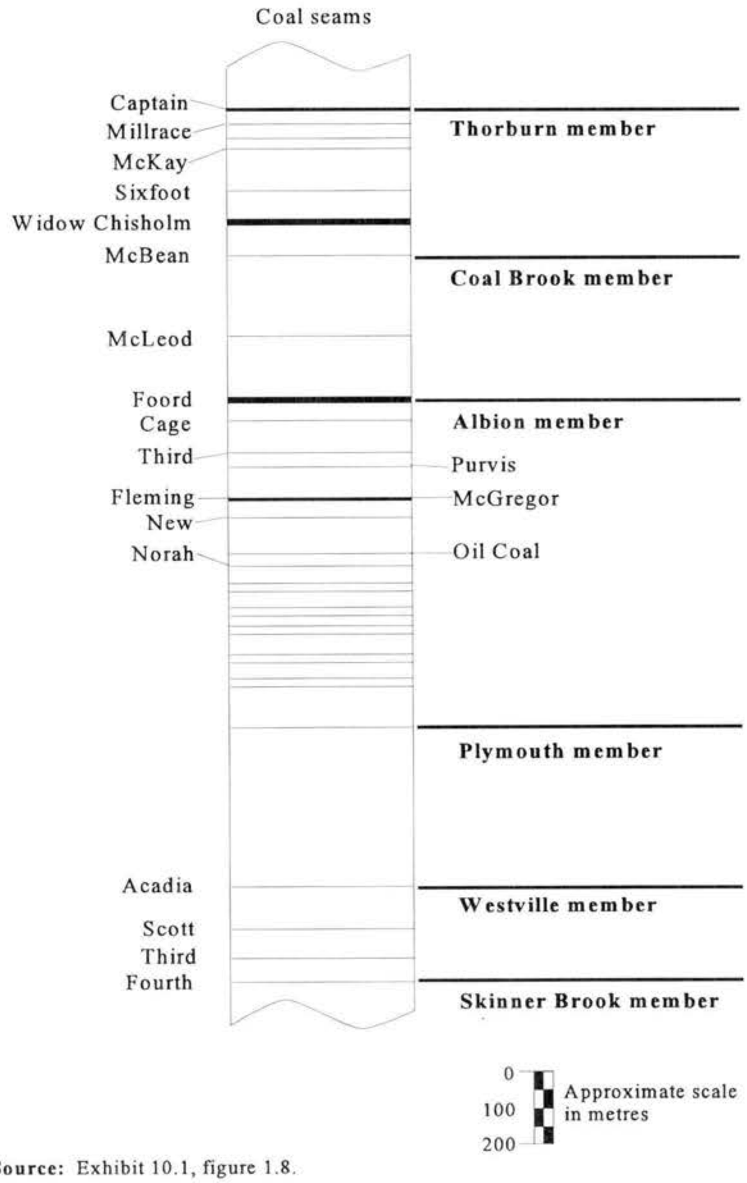
7 George S. Rice, "Report on Pictou Coal Field," prepared for the Royal Commission on Acadia Coal Company Limited (1937), pp. 1–2.

8 A chaldron, equal to about 1.2 m^3, was a unit of dry measure formerly used in England for measuring coal. Twenty-five hundred chaldrons would equal about 2,200 tonnes of bituminous coal.

Figure 1.2 Coal Seams of the Pictou Coalfield



Source: Exhibit 10.1, figure 1.8.

of the East River. These first pits were rudimentary, their owners lacking technical skill and money for modern equipment.

The General Mining Association

In 1826, the General Mining Association (GMA) of England came into possession of all the mineral rights in the province, and its surveyor recommended mining coal at what are today Stellarton and Sydney Mines. The well-capitalized GMA arrived in the province armed with knowledge of the latest advances in coal mining in England, political clout, and access to the most up-to-date machinery. In June 1827 the *Margaret Pilkington*, carrying machinery and collier families from England, sailed into Pictou harbour, and Albion Mines (now Stellarton) was founded on the west bank of the East River.

Within three months of sinking the Storr pits 240 feet to the Foord seam, the GMA was producing coal. By December 1827, it had erected the first steam engine in the province, displacing horse gins for pumping water and hoisting. To support its industry it constructed coke ovens, brickworks, offices, a store, employee housing, and the first steamship in Nova Scotia, its engine coming from the GMA's own foundry. At first, coal was transported along a one-and-a-half-mile horse tramway downriver, where it was loaded into small boats for carriage to cargo ships. In 1839, the company opened the Albion Railroad to carry coal to piers at Abercrombie. This railway's English-made locomotives were the first to run on iron rails in Canada.

Joseph Howe reported in 1830 that the GMA employed 80 men and 14 horses on the surface, while 50 men with seven horses were producing coal underground in a room-and-pillar system.[9] In 1832, these Storr pits caught fire, killing 14 horses. The pit mouths had to be sealed and later flooded to extinguish the fire, which investigation proved had been arson. After almost a year, the mine reopened, producing until 1834, when it exploded. Recovered, it exploded again in 1836. The last explosion in 1839 was so severe that the workings were permanently deserted.

The Bye pits were then sunk in the Foord seam, 200 yards west of the Storr pits. A powerful steam-pumping engine allowed the GMA to go deeper than previously, while two 25-horsepower winding engines, made in the Albion foundry, hoisted the coal. The mine was ventilated by a furnace. In 1842, the Bye pit workings were described "in as perfect a state as I suppose to be possible. There is ample provision for drainage, for ventilation, and for clearing off the gas."[10] However perfect, within a year of opening, a fire broke out in the new mine. Fire and small explosions continued to plague the operation, until an explosion in 1861 took three lives. The next six years brought another fire, another explosion, and in 1867, an inferno so severe that the pit had to be abandoned.

Between 1850 and 1869, the GMA sank three more mines in the Foord seam – the Dalhousie, the Foster, and the Foord. The Cage pit was sunk to the Cage seam in 1852. By 1880, all these mines (by then owned by the Halifax Company) had been permanently closed by fire and explosion, which were believed caused by accidental flaming of methane. The sparks that ignited the gas probably resulted from careless use of open-flame lamps, from leaky safety lamps, from blasting coal in places where gas was present, or from spontaneous combustion. The exception was the Foster pit, which caught fire from burning hay that ignited as it was being brought down the shaft to feed horses. Compounding the problem was the

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9 *Nova Scotian* (Halifax), 21 July 1830.

10 Public Archives of Nova Scotia (PANS), RG1, vol. 463, doc. 44 (Early Government Records 1815–93).

GMA's practice of connecting the pits below ground, so that a fire or an explosion in one mine usually affected another.

Of particular interest in this era is the Foord pit, started by the GMA in 1866. This landmark new mine employed the most up-to-date technology, including a Cornish pumping system, which allowed it to mine deeper than previously (the Foord's 1,000-foot (305 m) shafts were the deepest of their time on this continent). The large steam-driven exhaust fan provided the first fan ventilation in a Nova Scotia mine. The most powerful winding engines in the province easily could raise a double-decked cage holding more than 2 tons of coal.[11] When in full working order, the mine could produce 1,000 tons of coal per day. After a methane-fired explosion in 1869, only safety lamps were used, and no blasting was allowed until a new fan was installed and found to be totally effective. Instead of blasting, the coal was torn out by a new system consisting of a series of wedges driven into the coal by hydraulic pressure. Inaccurate surveying was probably to blame for Foord pit miners twice breaking into old workings in the fall of 1880. The flooding that ensued killed nine horses in the first instance, and six men in the second. In November, the pit exploded, killing 44 men in the east side of the mine. Miners from the west side managed to escape through the interconnected Cage pit. Subsequently there were two more explosions, which spread to the Cage, and both mines had to be flooded and closed. Attempts to reopen the Foord over the following years were foiled by fire, and the pit was permanently given up in 1897.

Other Early Mining Operations

In spite of all this misfortune, Pictou County was for a number of years the greatest coal producer in British North America, according to Patterson.[12] The GMA monopoly over Nova Scotia's mineral wealth was subject to extensive lobbying, and was finally revoked in 1858. Thus its competitors also made numerous attempts to mine coal in Pictou County. Over the next few decades the unsuccessful pulled up stakes, while others consolidated. The GMA sold its Pictou County properties to the Halifax Company in 1872. The Halifax amalgamated with the Acadia and the Thorburn-oriented Vale companies in 1886, to form the new Acadia Coal Company, and, in 1891, Acadia Coal took over the Black Diamond mines in Westville. Henceforth, Acadia Coal was synonymous with the coal industry in Pictou County, although throughout the years others were also in business.

The most successful of these others was the Intercolonial Coal Company, which began the Drummond mine in Westville's Acadia seam in 1867. After only four years, annual production reached 102,000 tons.

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11 Because of the historical nature of this chapter, references to the weight of coal will be in tons, as reported in the literature. Most references are probably to the long ton, which is similar in weight to the metric ton (tonne).

12 Patterson, *History*, 398.

In 1873, the first recorded mine disaster in the new Dominion of Canada occurred when a fire followed by a gas explosion destroyed the Drummond, killing 60 men. The mine was recovered within a year and was mostly prosperous until after World War I. Intercolonial sold out to a private operator in 1954. Smaller companies ran mines, such as the Marsh and the Greenwood, in the Thorburn area at different times.

Acadia Coal operated the Acadia mine in Westville from 1867 to 1914. In Stellarton, it sank the Albion slope in the Third seam and the McGregor slope in the McGregor seam in 1880. Served by the same bankhead, these side-by-side mines produced until the mid-1950s. Both the Cage and Foord seams were also worked from the Albion, but the Third seam was the major producer. The Fleming and the Acadia No. 1 seams were connected underground by stone tunnels and worked from the McGregor mine. Nearby, the Acadia No. 7 mined the Cage and Third seams from 1936 until it was closed by fire in 1947.

In Thorburn, the Sixfoot mine, originally sunk by the Vale Company and renamed Acadia No. 3 after the amalgamation, operated from 1872 until 1914 and from 1918 until 1938.

Acadia Coal was bought by the Nova Scotia Steel and Coal Company (NSSC) in 1919, which in turn was taken over by the British Empire Steel Corporation in 1921. The British Empire Steel Corporation reorganized in 1928 as the Dominion Steel and Coal Corporation (DOSCO). As well as Acadia Coal, DOSCO owned most of the mines in Springhill and on Cape Breton Island.

Mining and Miners

By 1900, the coal industry's significant advances were reflected in Pictou County mines. The capacity of hoisting, pumping, and ventilation systems had kept pace with deeper and more extensive mine development; machines for undermining the coal were supplanting picks; dynamite-derived explosives were replacing gunpowder for blasting; and compressed air–driven engines were augmenting ballast and haulage by horse underground. Safety lamps that both tested for methane and provided light without open flame were the only lights used in the Stellarton and Westville mines by 1890, although open lights continued to be used in the Thorburn mines (which produced less methane).

In 1911, Acadia Coal acquired breathing apparatus that would permit rescue workers to enter gas-filled mines after explosions to free trapped men and also to save the colliery. The company recruited and trained first-class miners to serve on the Acadia Rescue Corps, an elite squad that over the years earned an international reputation for skill and courage.

Through the efforts of the Provincial Workmen's Association, the quality of life underground slowly improved. By 1873, mining legislation provided for inspection of mines by a government inspector. Legislation in 1881 required certification for miners and officials, making night school and examinations essential for promotion. The 1900 *Coal Mines*

Regulation Act set some additional standards for safety in underground mining operations.

Over the first 75 or so years of the industry, emigrants from the British Isles, Europe, Newfoundland, and elsewhere in the Maritimes moved to Pictou County to work underground. They brought up their families in company-owned housing near the pits. Paternalism by the coal companies was well rewarded, as these mining ghettos brought forth generation after generation of boys to work their mines. A young man started underground on "boy's work," such as driving a horse, trapping (opening and closing ventilation doors to permit transportation of coal), or helping the track layer. Although some went on to work for a daily wage as "company hands," operating haulage, brushing roadways, or timbering, for example, most boys were anxious to get on the coal. After a year underground, a young man could go before the Examining Board for his second-class miner's papers. This certificate allowed him to produce coal at the face under the direction of a first-class miner. A year there qualified him to be tested by the Examining Board for his first-class certificate. He could then take charge of a working coal face, and be paid according to the boxes of coal he could put out.

Although technically his tutelage started his first day underground, a boy's apprenticeship actually started the day he was born in a company house in a mining community. Listening to his father talk pit with his buddies, he came to know that he would follow in his father's pitboots, and learn the craft of mining by his side at the coal face. Coal mining was more than just a job in Stellarton, Westville, and Thorburn; it was a way of life.

The Allan Mine

In 1904, Acadia Coal turned the sod for a new mine in the Foord seam. These were industrial boom times in Pictou County, and the new Allan mine symbolized an optimistic future of coal-fuelled prosperity. Like its predecessor, the Foord pit, the Allan was in the vanguard of engineering and technology, and is still considered to have been a superb piece of planning and engineering. It was designed to produce 1,000 tons of coal a day, with close attention being paid to every facet of its operation. On site was a thermal plant, which generated electricity from Allan coal. Both mine and plant were located on North Foord Street, where in 1997 Sobeys, a major locally based corporation, had offices.

The shafts of the Allan mine struck the Foord coal at 1,204 feet. However, at 476 feet and 962 feet from the surface, "stone drifts" were driven from the shaft through rock until they struck the Foord seam. Levels were driven east and west and the Foord seam was worked off these passages. At "the 1,200," levels were driven horizontally east and west. A long slope was driven down off the 1,200-foot level; off that slope was driven the 1,500-foot level. The slope, now called the Foord East sinking, continued down to the 1,750 level, which was considered to be very close to the basin of the Foord seam. Not much development was done or coal extracted from this 1,750 section because of ground control problems and unsuitable coal. Tunnels driven south off the 1,200 levels connected at the Cage seam and also at the Third seam. All three seams yielded coal in the Allan, with the Foord seam being the most productive.

In the late 1920s, headings were driven breaking into the east side of the old Foord workings. Some of the bodies lost in the explosion of 1880 were then recovered, and in 1941 the rest of those bodies were recovered when a further entry was made into the Foord. The advancement of the southeast 1,200 in the Allan Mine was discontinued in the late 1930s owing to hazardous conditions.

Mining in the Allan was almost exclusively by room-and-pillar panels, so sections could be quickly closed off when fire broke out, as it frequently did. As the face retreats, the roof caves in behind, and this area of waste coal and rock is known as the gob or crush. In the 1930s, because of crushing that closed off rooms before they could be mined and for economic reasons, retreating longwalls were tried in the Allan between the southeast 1,500 and 1,200 levels.[13] Blasting was prohibited on these retreating longwalls because the mine's suction ventilation fan would pull the gas from the gob, increasing the risk of fire. The coal was mined with air-driven coal-cutting machines and mechanical air-driven hand tools.

All hauling engines, fans, and other machines were operated by compressed air. In the workings, the tools were air-driven radial coal cutters and pneumatic picks. Coal was transported by horse and compressed air–driven main-and-tail rope haulage. Electric-powered equipment was considered too dangerous. Electricity was used for lighting at the bottom of the shaft. Water was pumped from the 1,750 level by stages using compressed air–operated duplex pumps to an electric master pump at the 962. Located at about 400 feet in the 1,200 southeast level, at the Foord sinking landing, was an electrically operated engine for lifting coal from the 1,750 and the 1,500 to the 1,200. This was as far as electricity went in the mine. This use of compressed air–driven equipment applied to all Stellarton and Westville mines. Apart from a few lights at the slope bottom, no electricity at all was used in the Albion mine. All the water from the Albion drained down to the McGregor mine, and at the McGregor slope bottom an electric pump discharged all the water from both mines.

Death and Destruction in the Pictou Coalfield

Death was a fact of life in the Pictou coalfield, particularly in the Albion seams. In the early decades, records were not kept, but historian James Cameron has calculated that 576 deaths occurred between 1866 and 1972,

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13 Modern retreat longwall is now the most productive and the safest form of mining. See the section on mining methods in Chapter 10, Ground Control, for descriptions of different coal mining methods. See also the section on mine visits in Chapter 16, The Inquiry, for my personal observations of these various methods.

and has estimated that 625 to 650 died "from colliery misadventure in Pictou County" since the industry's debut.[14] The 1992 Westray explosion adds 26 more names to that roster.

Most single lives were lost by falls of rock or coal from the roof or high coal faces. Accidents involving machinery, particularly coal trips (coal-transporting equipment), took a large toll. Methane inhalation and blasting also took lives. Poor lighting contributed to many accidents until the 1920s, when battery-operated cap lamps began to be used. Flooding of the sort that drowned six men in the Foord pit was infrequent. However, in the McGregor mine in 1955, water broke out from behind an old brick stopping and rushed down the slope. It gathered momentum, accumulating debris as it ripped out tracks, and wrecked an ascending riding rake, or man carrier. Eventually the debris compacted, plugging up the slope and trapping more than 75 men below at the same time as it stopped their ventilation. The men were rescued in the nick of time through a cross-cut from an adjoining slope.

The greatest dangers were explosion and fire. The disasters that took most lives were the explosions, and all but one were underground. Cameron has calculated that the Pictou field suffered 48 major fires.[15] That number would not include the frequent "fire smells" that required an area to be walled off. The fear was that fire would ignite methane – the gas given off naturally during coal mining. Pure methane will not burn, but an air mixture containing 5 to 15 per cent of this "firedamp" is explosive, with 9.5 per cent its most volatile point.

By 1927, Nova Scotia mining laws dictated that, when methane at a concentration of 2.5 per cent or more was detected in a working place, the men had to be withdrawn, and a notice board indicating the danger put up not less than 100 feet from where the gas was detected. No one was allowed to enter the area until sufficient air was applied to dilute and sweep away the gas. Air with as little as 0.5 per cent concentration of methane was removed from a working section by increased ventilation. No coal could be blasted if *any* methane was found. A flame safety lamp was used to test for methane, and areas were thoroughly inspected for methane before blasting was permitted. Every measure possible was taken to prevent a spark that might ignite a fire. Electricity was limited to the shaft or slope, and all equipment was operated by compressed air. Once a week miners were searched; if matches were found in their clothing, the men were sent to the surface and fined. Nevertheless, the fires in the Stellarton mines have almost always been deemed to have started as spontaneous combustion of coal in the crush.

In the early years, many mines had to be flooded to put out fires. The severe 1913 fire in the Albion was started by the friction of rope rubbing on a wooden bullwheel. That fire burned for 16 days before being extinguished by draegermen and miners using water. However, fires in the

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14 Cameron, *Pictonian Colliers*, 187.

15 Cameron, *Pictonian Colliers*, 170.

crush were usually both prevented and fought by walling off the affected area with airtight stoppings. By the mid-1920s, these stoppings were being constructed of wood blocks mortared together like bricks. Test pipes were installed in fire stoppings during their construction, so that gas samples could be taken later. A sample can be taken from behind a sealed stopping only when the barometer is low and atmospheric pressure is at its lowest, because that is when a mine produces the most gas. Conversely, when the barometer is high, the atmospheric pressure would cause these pipes to draw in rather than push out. When oxygen was found in a sample, it meant that air was leaking in, threatening spontaneous combustion. Carbon monoxide indicated the presence of fire. When these stoppings were tight, the only gas behind them was methane and there was no danger of fire. When a sample was bad, grout (liquid portland cement) was pumped into the cracks around the stoppings to make them as airtight as possible. It has been said that grouting saved the mines in Pictou County in their last 20 or 25 years, because of the mines moving so much – bumping and creeping – particularly at night when cooler, denser air raises the atmospheric pressure.

Sometimes emergency stoppings were put in behind the mining as it advanced. These stoppings had openings only large enough for coal boxes to go through. In the event of fire the affected area could then be closed off quickly, without losing the coal in interconnecting rooms. After a section was worked, the doorways were filled in and the stoppings made airtight and permanent. This system was common in the Stellarton mines.

When methane explodes in a coal mine, coal dust fuels the explosion as it rips through the mine towards the main air intake. The most effective method of preventing explosions from travelling throughout the mine proved to be limestone dusting, called stonedusting, which was introduced in the late 1920s. Stonedust is non-combustible, and so in the event of an explosion it acts to choke the flames, preventing the explosion from spreading. The *Coal Mines Regulation Act* came to state that the roof at all working coal faces had to be supported within four feet, and stonedusting had to be within 15 feet of a working coal face. Throughout the mines, stonedust shelves were built close to the roof. The force of any explosion would blow the staging down, causing the stonedust to fall into the fire. Dust samples were taken regularly to ensure a minimum of 65 per cent incombustible content.

George Rice reported in 1937 that stonedusting in Stellarton:

> is a vital precaution in these mines which produce an unusual amount of very fine particle sized coal dust from a naturally friable coal. The dust dribbles from the roof and faces and comes from cars in haulage. The hazard is shown by the many serious explosions in this district in the past, before rock dusting was understood. Although these explosions chiefly emanated from gas ignition caused by fires or other flames, undoubtedly they were rendered violent and far-spreading by coal dust.[16]

16 Rice, "Report," p. 14.

Almost all the mines in Stellarton were closed by fire or explosion. On an idle workday in 1888, the Albion mine exploded so violently that the blast travelled up the main slope and burned several surface facilities. Although the cause was never proven, the explosion is believed to have originated as spontaneous combustion in old Cage seam workings. Most Albion fires were in the Cage seam, the second thickest seam, and include fires in 1910, 1920, 1945, 1947, and 1951. In 1917, a fire in a walled-off section emerged through a stopping in the Albion's Third seam workings, necessitating that the pit be sealed at the surface for six months. Reports in the Devco papers mention that seven fires in the Albion between 1925 and 1936 resulted in closed sections.[17] Consequently, all that potential coal was lost.

Three separate fires in the Acadia No. 7 Mine in 1944 hastened its closure in 1947. The most serious result of fire in the McGregor mine was the 1952 explosion. Draegermen built temporary stoppings over a hot and smoky fire, which had started spontaneously. Then miners were engaged to build permanent stoppings. An explosion occurred, killing these 19 men. As a result of the inquiry into this disaster, mining legislation was changed to require that men be taken out for 24 hours after temporary stoppings are built. Safe air samples must then be obtained before permanent stoppings can be erected.

The Westville mines also had an unenviable record of fires and explosions. The Drummond explosion of 1873 originated with a shot fired in an area unsafe for blasting because of methane. In 1893, lightning struck the headframe of the Scott pit and travelled down the steel hoisting ropes to ignite the gas underground, which exploded and started a fire. The Drummond mine was threatened by three crush fires in the winter of 1913, one of which required 51 stoppings to be built "by 100 men working round the clock for three months." There was a small gas explosion in the Drummond in November 1915. There were several more fires between 1913 and 1941, while fires in the 1950s required the closing of two levels.[18]

The Thorburn field experienced fewer fires; its seams were thin and could be mined from stone to stone.[19] The 1885 Vale and 1930 Greenwood mine explosions were both deemed to have been caused by an open lamp meeting a pocket of methane.

Fire and Explosions in the Allan Mine

The Allan produced coal for more than 40 years. "Experts considered the Allan Shaft the most dangerous mine in the world" because of the nature

17 Beaton Institute, University College of Cape Breton, Sydney, Devco Papers, MG 14, 13, 8B (q), box 137 #2.

18 Cameron, *Pictonian Colliers*, 176–84.

19 Being able to mine a seam leaving no coal, only solid rock, at the roof and at the floor creates fewer sources for methane emission.

of the coal.[20] Over its lifespan, the Allan experienced eight methane explosions, at least six of which were believed caused by spontaneous combustion in the crush. The Allan's first explosion occurred in 1914, on a Sunday morning when no men were working. However, two men who rashly went down to investigate were killed by carbon monoxide. That explosion was deemed to have been caused by spontaneous fire in sealed Foord seam workings. The second explosion, on 23 January 1918, was the worst in Pictou County's history. Eighty-eight men were killed; all the men in the mine died, except nine who escaped from the 500 section before the carbon monoxide wafted up from the deeper workings. At this time, Canada was at war and sabotage was alleged, but not proven. The jury in the coroner's inquest agreed with the suggestion that the explosion was probably started by a shot that flamed and ignited gas.

In 1924, an explosion occurred in the west 962 workings of the Foord seam and travelled through the Third seam section before blowing itself out. Four of 11 men trapped behind a fall suffocated; seven stayed alive by sucking air from a broken compressed air pipe, and the workforce in other sections of the mine escaped. The origin of the explosion could not be ascertained but was believed to have been spontaneous combustion.[21] Severe explosions occurred in both 1929 and 1932, but, fortunately, both occurred on holidays when the mine was idle. The pits were sealed at the surface. In 1929, instead of the fires burning out, they caused a second explosion, while in 1932 the water gauge indicated that five minor explosions occurred within five hours of the mine being sealed. The 1929 explosion was the most destructive of all, but even so, had the mine not been completely stonedusted, the damage would have been worse. The mine was cleaned up over two years and gradually returned to production.

The *Coal Mines Regulation Act* required that all coal faces be undermined before blasting. In 1935 a shotfirer in the southeast 1,500 fired a shot in the coalface without prior undermining. The shot flamed, igniting gas hanging at the roof line, and the subsequent explosion blew in 300 feet of the level. This rockfall and the heavy stonedusting of the section helped to localize this explosion and, except for seven men killed in the explosion area, all 200 men in the mine escaped.

In 1941 or 1942, an explosion occurred behind a line of stoppings in a crush area of the southeast 1,200. The area was badly shaken, but no lives were lost. The mine was sealed for a short period of time. On 28 April 1950, in the southeast 1,200 section, a gas explosion occurred after

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20 Halliday and Ryan, "Mining Disasters."

21 James Cameron (*Pictonian Colliers*, 239–40) writes that in the affected area "only two shots had been fired that day . . . but the men were positive fire had not been started by the shots, and equally positive gas was not in the place." The special examiner was unable to ascertain the cause of this explosion. "The Nova Scotia Department of Mines reported: 'The general opinion was and is that the explosion was the result of fire resulting from the two shots fired in the 962 workings that afternoon, but the evidence was so strong that the places were thoroughly examined after the shots were fired that the actual cause must remain unproven.' " Judith Hoegg Ryan told me that over the years everybody she has questioned about this, including someone who was an overman at the Allan in 1924, has attributed this explosion to spontaneous combustion.

spontaneous combustion. Thanks to heavy stonedusting it did not travel too far, nor was it severe in the area where men were employed. Seven men were rescued from the explosive area, some badly burned. Shortly after the shaft was sealed, a change in the water gauge at the fan drift indicated that another explosion had taken place. After three months, the Allan was reopened. The following March, three spontaneous fires occurred in three different locations in the mine. The pit was again sealed and it was decided to close the mine permanently.

These explosions proved the mettle of the Acadia Rescue Corps. Encumbered by heavy breathing gear, draegermen laboured in front of hot, smoky, and threatening fires, building stoppings to extinguish the burning that could otherwise destroy their workplace. After explosions, the rescue men struggled through wrecked mines in gas and volatile atmospheres searching for their comrades. When a seal was taken off a pit mouth, they were the first down, investigating conditions in air that was 98 per cent methane, with only a nose clip and mouthpiece separating them from eternity. The contribution of the Acadia Rescue Corps to their community and the industry was invaluable.

The Post-World War II Era

After the grim years of the 1930s Depression, World War II revitalized the industry, as coal was desperately needed for the war effort. The war boom created a feeling of optimism for the future of the industry, and mechanization was thought to be the key. In 1945, DOSCO contracted with Paul Weir, an American mining engineer, to "report upon the economic possibility, if any, of increased mechanization of the mines, whether by increasing investment in machines of any of the present standard types, or by the development of special designs applicable to the conditions of the Nova Scotia field, as one means of reducing that disparity (in production per man-day between Nova Scotia and the competitive fields in the USA)." Weir's findings were tersely negative regarding the Acadia collieries: "We have no recommendations to make. The lack of a reasonable amount of virgin coal with proven uniform conditions of occurrence, in our judgement, precludes any mechanization except that of a minor and piecemeal nature."[22]

Weir's opinion is not surprising, in light of George Rice's conclusions about the Stellarton mines eight years earlier. "The difficulties in natural conditions have made the orderly laying out of workings an almost unsolvable problem for obtaining low or even moderate cost of production of the coal. This even more than the difficulty of support of a weak roof of soft friable coal ribs, is the principal reason for the lower rate of production per man-shift of all workers than in any coal fields known to the writer, and a higher cost of production."[23] Expanding on these adverse conditions, Rice blamed the irregularity of the coal beds, the thickness of

[22] Beaton Institute, Devco Papers, MG 14, 13, 8B (q), box 10 #21.

[23] Rice, "Report," Introductory Statement.

the coal, the irregularity of coal thickness, and the ash content. Further, the soft and friable character of most of the coal and the roof strata made roof support difficult and caused the ribs to squeeze in. Rice believed that, although "the amount of fire damp . . . is not unusual on the basis of tons of coal produced . . . owing to the irregularities of the workings, ventilation is a more difficult problem than is found in most mines either of the Province or of other coal fields of North America, and it necessitates great care in the matter of preventing sources of ignition." The "liability to spontaneous combustion . . . produces a particular difficulty . . . in combatting fire, where fire-walls have to be erected to great heights to reach up into compact roof above the coal. Some fire-walls as high as fifty feet have been erected and 'cementation' has had to be employed . . ." He continued: "[T]he combination of all the factors mentioned above makes the planning of the mine developments the most difficult the writer has ever seen."[24]

Acadia Coal's Stellarton workforce persevered, producing coal by outdated and inefficient methods, regularly losing time and coal to fire. Meanwhile, DOSCO's Cape Breton mines were equipping for the future with mining and loading machines, locomotive haulage, and electrically operated tools to make mining easier and more cost efficient. Stellarton's mines could not keep up in an increasingly competitive industry. The Allan was producing its capacity of 1,000 tons a day, but more tonnage was needed to meet increased costs. When three fires broke out at once in 1951, the mine was sealed, and the "million dollar mine" of 1904 was not reopened. The Albion mine closed in 1955; it had been worked out. Two years later, a spontaneous fire in the McGregor could not be contained, and the mine was sealed at the surface and never worked again. Mining was finished in Stellarton, the town that had been dependent on coal since 1827.

Unemployed miners, and their sons after them, were given preference in hiring at Acadia's remaining mine – the McBean, in Thorburn – which reopened in 1946 after being closed by fire in 1889. The McBean was the first and only mechanized underground mine in Pictou County until Westray opened in Plymouth in 1991. The conditions that precluded mechanization in Stellarton did not apply in the Thorburn mine. The erratic Stellarton geology described by Weir and Rice was not characteristic of the McBean seam, a thin vein of coal averaging four and a half feet in thickness, with strong, hard stone strata overlying and underlying the seam. The regularity of the coal seam within hard strata meant that the coal could be extracted from stone to stone. In the McBean, all coal cutting machines and haulage equipment were run electrically. This mechanization was a relief for Pictou County miners, freeing them from much heavy labour. Instead of being paid by the tonnage produced, they received daily rates for different jobs. Average daily output was 900 tons.

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24 Rice, "Report," p. 6.

When DOSCO pulled out of coal mining in 1968, the McBean continued operating under the Pictou County Research and Development Commission (PICORD), but was run by the Cape Breton Development Corporation (Devco). Over the years, the mine had been heavily subsidized by the federal government, but in 1972 that financial support was stopped and the mine closed, leaving 174 miners without work. Meanwhile, the small, privately owned Drummond mine in Westville continued producing coal from the Scott pit seam. Mining was room and pillar, extracting pillars from rooms mined earlier and taking some untouched coal near the surface. The coal was hand cut, shot, and loaded into mine cars that were hauled by small air-driven engines until they were picked up by the main surface hoist. In 1984, an unfightable fire closed the mine, putting about 40 men out of work. Although a strip mine was operating in Westville, there was no underground coal mining in Pictou County after the Drummond closed until the Westray mine began producing coal in 1991.