

SUB-SECTION 4T.11

**PUYALLUP TRIBE ALL HAZARD MITIGATION PLAN
ABANDONED UNDERGROUND MINES HAZARD**

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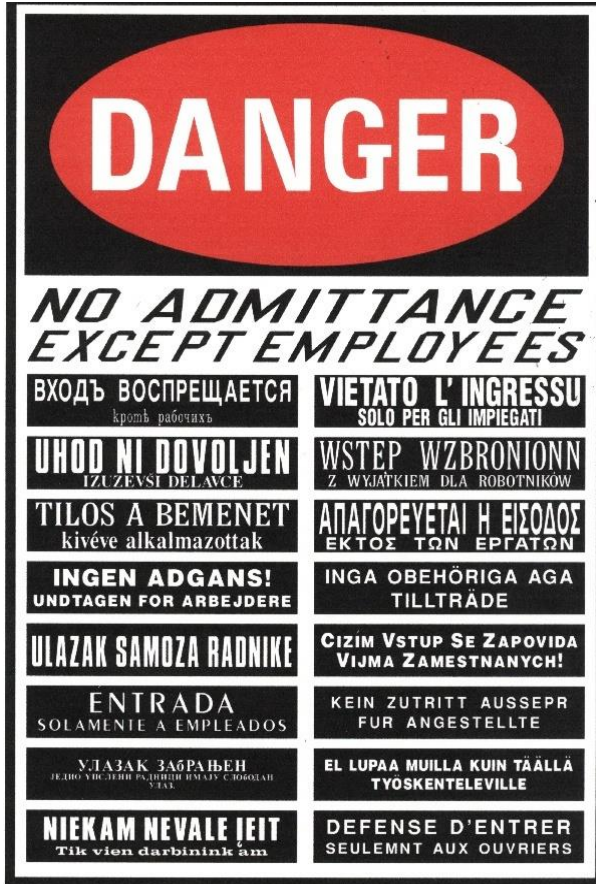
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Identification Description

Definition

Abandoned underground mines are any excavation, under the surface of the earth, formerly used to extract metallic ores, coal, or other minerals, and that are no longer in production.

Figure 4.11-1 Warning Sign Posted at Mine



Types

Abandoned mines pose two different problems for the citizens of Pierce County. First is the problem of access to the mines themselves. While most people think of access being through original entrances, many mines can also be accessed through airshafts or even areas where a roof has collapsed due to a tunnel having been dug close to the surface that has collapsed since then. Most of the known mines that are closed have either had their entrances barricaded or sealed to prevent trespassing into what is increasingly hazardous terrain. These closures were commonly done with plugs of mine waste, land-clearing debris, or even sometimes old car bodies. These “unengineered” caps may eventually fail, especially if the original slope is near or above 35 degrees.

Unengineered caps pose another problem. It is possible that some of them may plug old mine openings from which water used to flow. Many mines were originally built with

the entrance on a downhill slope so water would not pool inside. Pumps were sometimes used to remove any water accumulating in the lower portions of the mine. If the plug is not done correctly it could block the natural flow of water from the mine allowing it to back up behind the plug creating the potential for an unexpected and sudden outburst of water. If the plug is strong enough to hold the water it could develop another path to the surface, possibly at an unanticipated location.

Old shoring and columns of un-mined material left to support the roof of the mine eventually deteriorate, either due to age for the wooden shoring or compression by the weight of the rock above.

Related to the issue of access is the problem of hazardous gasses given off by the remaining coal pooling in areas within the mine itself. During mining operations these gasses are vented to the outside. When the mine is shut down, the venting ceases and the gasses can then pool increasing the potential for asphyxiation for individuals entering the mine.

Either way, due to the deteriorating structure in the mine itself, or to the pooling of hazardous gasses, the interiors of old mines become more dangerous over time.

The second problem impacts the land over the individual mine. As the weight of gravity compresses the un-mined material forming the columns left to keep the mine shaft open, called a room-and-pillar system,² the surface of the land may subside, or settle, causing damage to buildings, facilities or infrastructure on or near the surface. The depth of a mine and the structural stability of the overlying rock dictate the ability of the overlying material to limit the impact of subsidence on surface structures.

Profile

Location and Extent

Underground coal mines are the largest abandoned mine hazard in Washington, not only because of the great extent of some of these mines, but also because population centers have tended to develop around them. Pierce County is included in the list of counties possessing the majority of coal mines in the state.

Maps of Pierce County’s 40 -some known mines are possibly incomplete. These mines are located in the eastern part of the county in the foothills around the towns of Buckley, Carbonado and Wilkeson and north of the community of Ashford. The first coal discovered in the state was in what is now Cowlitz County in 1833. However coal mining appears to have begun in Washington in either 1853 or 1854. Within a few years the mining had expanded to Pierce County beginning in the Wilkeson and Carbonado areas.³ It was not until after 1887 that mines began to file maps yearly under a newly imposed law. The main tunnel systems for the majority of the large mines are relatively well documented on these old maps. Many companies filed their updated maps

Table 4.11-1, Some Pierce County Named Coal Mines¹

Apex Coal Co. Mine
Bonato Coal Co. Mine
Burnett Mine
Burn-it Coal Co.’s Mine No. 2
Carbonado Mine
Carbon Hill Coal Co.’s Mine
Coast Coal Co.’s Mines (Spiketown Mines)
Commercial Coal Co.’s Mine, No. 5 Seam
Crocker Mine
Dependable Coal Co. Mine, No. 4 Seam
Douty Mine
Electric Mine
Fairfax Mine (New)
Fairfax Mine (Old)
Gale Creek Coal and Coke Co. Mine
Henry Bartoy’s Acme Gem Mine
Henry Bartoy’s Mine (aka Harry Rotoy’s Mine)
Kelly Coal Co.’s Mine
Kranko Queen Mine (aka Kranko & Wilson Queen Mine)
Mashell Coal and Coke Co. Mine
Melmont Mine
Melmont-Wilkeson- Carbonado Mines
Miller Mine
Montezuma Mine
Northwestern Improvement Co.’s Prospect Holes
Peanut Mine
Queen Mine
Skookum Mine
South Willis Mines
Wilkeson Coal and Coke Co. Mines
Wilkeson-Wingate Coal Co. Mine, No. 4 Seam
Wingate Mine

annually as required. However, once the businesses closed any shafts constructed that final year went undocumented because no final map was ever filed with the mine inspection office. Therefore, even the most updated maps may not adequately reflect either extensions of tunnels or excavating done during the final year of any mine's operations.

In addition a number of abandoned mining sites, usually small, have been inadvertently discovered for which there are no maps on record with either the Department of Natural Resources or Pierce County. Some of these may predate the filing of mine maps and some of them may just have ignored the law. The potential exists that there may be many more located in the north/south band of coal bearing rock threat runs intermittently from King County to the Nisqually River.

Figure 4.11-2 Lady Wellington Mine Tipple⁴



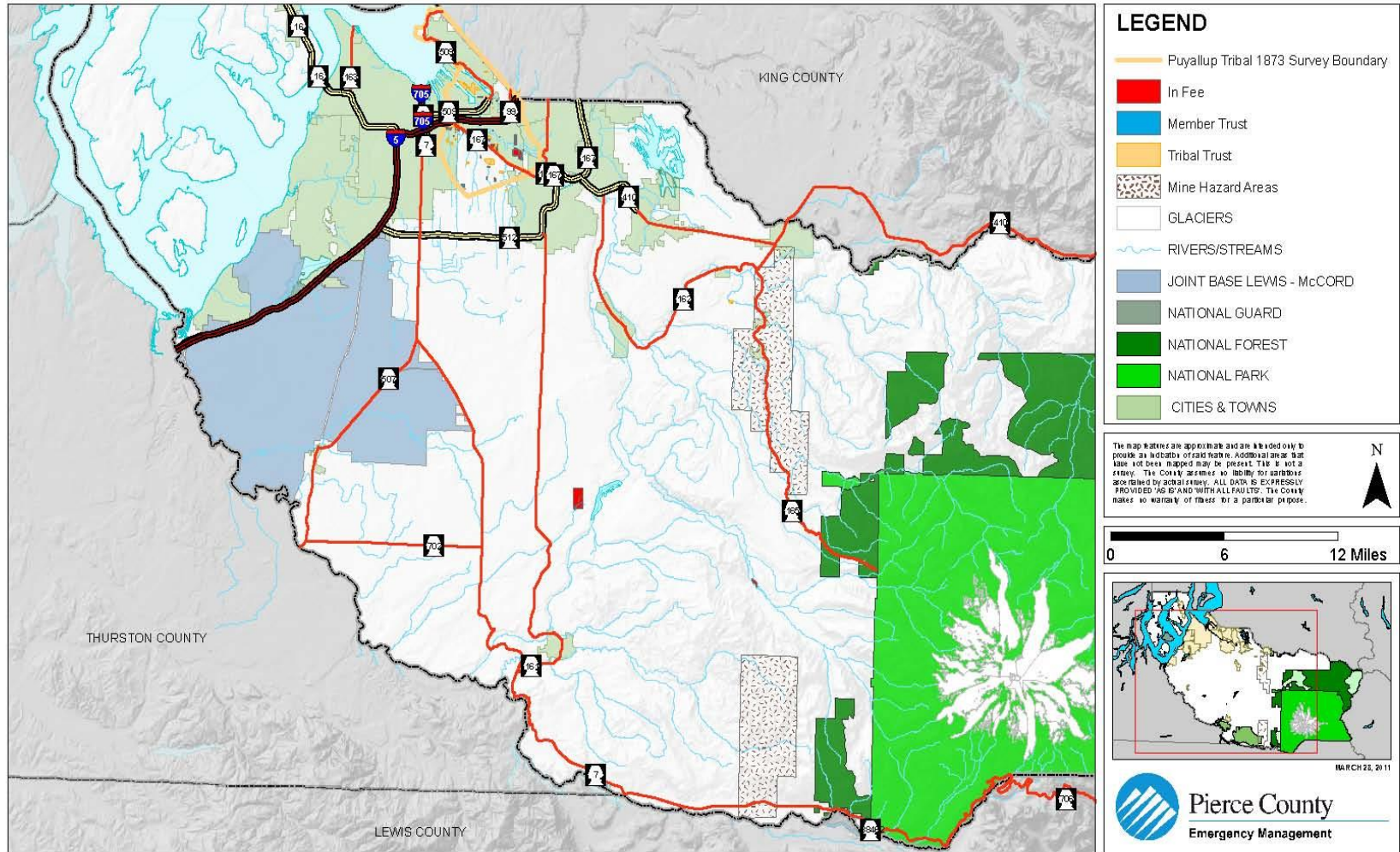
Compounding the problem is that a number of the mines changed hands many times over the course of their existence and therefore changed names. In some areas, even the name of the now defunct towns changed as different companies moved in or out of an area. This can be seen in the area two miles northeast of Wilkeson, originally called Pittsburg. Named to emulate the coal and steel center of Pennsylvania, the name only lasted for twenty years from 1889 to 1909. In 1909 the name was changed to Spiketon and then to Morrystown in 1917 by the Washington State Legislature.

This lasted until 1927 when the mines in the area closed for good. Today much of the area is once again called Spiketon by the locals⁵.

While most maps developed by the coal companies were extremely accurate as to the mapped features under the surface of the ground, they were not always accurate in relation to surface features. This problem has been exacerbated due to changes in surface topography, loss of buildings, new construction, grading, etc. Much of the information we do have is on old paper which has been deteriorating for, in some cases, over 100 years. The Department of Natural Resources has attempted to save and consolidate this information before it disappears completely.

For these reasons, the mine maps on record are not completely reliable as to information about the location of Pierce County coal mines and the hazard they pose to the county's citizens. Pierce County has, through its developmental regulations, attempted to address this problem by delineating the areas of Pierce County where the mines were located as a Critical Area in the Developmental Regulations⁶. Properties within this area are required to have a geotechnical assessment done to evaluate any potential threat to structures built on the site.

PUYALLUP TRIBE ABANDONED MINES HAZARD AREA



Occurrences

There have been no deaths in Pierce County reported from accidents relating to abandoned mines, and no known cases of subsidence from the mines directly affecting current homes or businesses in the County.

Recurrence Rate

The Pierce County Sheriff's Department reports that they have had very few incidents of citizens entering the abandoned mines in eastern Pierce County. Two of the three incidents reported involved younger people who it was later discovered had not entered the mines after all. The third incident involved a missing suicidal woman who was reported to have entered one of the mines. Her body was never found.⁷ With the mine entrances closed in most instances, it is unlikely that there will be a regular recurrence of accidents or searches for missing citizens in the future.

Subsidence on the other hand could become a developing problem over time. With the County's growing population expanding into the less populated areas of the County, property in those areas that are traditional mining areas may appear desirable. Anecdotal evidence points to subsidence having occurred at different times. In many cases the posts supporting the ceilings were blown as the mining moved out allowing much of the land to subside quickly. In other cases where the supports were not blown, the subsidence actually showed as a line or grid system, depending on the underlying pattern of tunnel construction, on the overlying land. This could be seen on hillsides denuded due to logging. As new growth has grown up, the patterns are no longer recognizable.⁸ A similar report comes from Burnett, where a family reports that a portion of their pasture sank precipitously, forming a hole thirty feet wide that went down diagonally for approximately 650 feet from the surface.⁹

Vulnerability

With the abandoned mines located in the eastern portion of Pierce County the vulnerability to the Planning Area is non-existent, see Map 4.11-1. Although the Tribal Fish Hatchery located on Wilkeson Creek is near some of the identified mines the hatchery located on the creek is not vulnerable to the possible subsidence from the mines.

Planning Area

The Planning Team determined that Planning Area is not vulnerability to the abandoned mine hazard because of the Planning Area's proximity to mines. In the entire Planning Area, over 16,000 acres are not located near the identified abandoned mines and are not vulnerable to mine entrance or subsidence.

Impacts

Underground coal mines are the largest abandoned mine hazard in Washington, not only because of the great extent of some of these mines, but also because population centers have tended to develop either around or near them. Pierce County is included in the list of counties possessing the majority of coal mines in the state.

In each of the areas of impact there are the dual problems of entering the mine and subsidence. Each is treated independently.

Health and Safety of Persons in the Affected Area at the Time of the Incident

Interior Mine Hazard

Persons entering an abandoned mine are at threat of injury and possibly death. These can be due to falling into unmarked shafts, collapse of the ceiling or part of the support structure, or asphyxiation from gasses that have pooled in the interior of the mine. There is also the possibility that someone outside the mine could fall into an old airshaft that may not be closed. There are reports that some of these may still exist in the mine hazard area¹⁰.

Subsidence Mine Hazard

Subsidence can occur over time with a gradual or sudden and dramatic sinking of the land over old mine shafts. The actual threat to the public is not so much to individuals since any subsidence, even if sudden, will be of a limited amount, but rather to the homes and infrastructure that may be built on top of the subsiding area. Homes could be destroyed, water and sewer lines broken, and roads unusable. Anyone living, working or recreating beyond the subsidence could be isolated for from a few days to a week or more until a repair can be arranged depending on the amount of damage and the stability of the underlying material.

Health and Safety of Personnel Responding to the Incident

Interior Mine Hazard

Response personnel entering an abandoned mine are at threat of injury and possibly death in the same manner of those whom they are attempting to find or rescue. These can include falling into unmarked shafts including old abandoned air shafts on the surface, collapse of the ceiling or part of the support structure, or asphyxiation from gasses that have

Figure 4.11-3 Pacific Coast Coal Mine Tipple, Carbonado¹¹



pooled in the interior of the mine.

Subsidence Mine Hazard

Response personnel may find that not all the land has subsided and that a portion of it could still sink from under nearby buildings, forested areas or even under their rescue vehicles. This could damage equipment and cause injury to response personnel.

Continuity of Operations

Interior Mine Hazard

There should be no breakdown in the continuity of operations for any agency due to an accident or search or rescue from an abandoned mine. There would be no loss of infrastructure and only a very limited use of County resources in this situation.

Subsidence Mine Hazard

Subsidence of a section of land overlying an abandoned mine could damage any road or other surface infrastructure that might cross it. Due to the very limited area that these old mines underlie in what is mostly wilderness area today, it is expected that any impact the continuity of operations in a very small geographic area until such time as the damaged infrastructure can be repaired.

Delivery of Services

Interior Mine Hazard

There should be no breakdown in the delivery of services for any agency due to an accident or search or rescue from an abandoned mine. There would be no loss of infrastructure and only a very limited use of County resources in this situation.

Subsidence Mine Hazard

Subsidence of a section of land overlying an abandoned mine could damage any road or other surface infrastructure that might cross it. The loss or decrease of normal services to any area beyond the subsidence is possible until such time as the damaged infrastructure can be repaired. The few County resources currently accessed by roads or other infrastructure in the mine hazard area is very limited and should not impact any services of significance to more than the very small population residing in those areas.

Property, Facilities, and Infrastructure

Interior Mine Hazard

There should be no damage to property, facilities or infrastructure from interior mine hazards.

Subsidence Mine Hazard

There is considerable threat to property, facilities and infrastructure built on land containing abandoned mines. However, due to the rural character of the area where the mines are located and the very limited population that lives there, it is unlikely that there would be much damage to infrastructure from any one section of mine shaft or mine collapsing today. It is possible that there could be some road damage and there could be utility disruption from broken power and water lines. However, none of that will have an effect on a significant population. Due to the localized damage from the subsidence, returning the damaged infrastructure to functionality should be a quick and easy project.

Environment

Interior Mine Hazard

Environmental impacts from the coal mines that dot the landscape in eastern Pierce County decreased to negligible with the end of the coal mining industry. Debris from the mines dumped near the entrances and occasionally in the rivers and streams that flow through the coal fields that went on as much as 150 years ago can continue to impact the environment with material that leaches into the soil and streams. Continued environmental impacts from the mines themselves will be very limited and there should be no increase due to a mine-related search or rescue incident.

Subsidence Mine Hazard

Subsidence by itself should cause little or no environmental damage. Having a piece of land sink a few feet by itself may not make any difference in the rest of the environment. However, there could be ancillary damage from the damaged infrastructure. Broken water lines, until turned off, could cause limited erosion. Broken power lines from a dropped pole in the subsidence area could start a fire.

Economic and Financial Condition

Interior Mine Hazard

In dealing with an incident involving entering an abandoned mine, costs should be in the normal range for search and rescue activities on the surface. SAR expenses are a normal budget item for the response agencies.

Subsidence Mine Hazard

Any collapse of mine tunnels impacting the surface will only impact a small portion of the mine hazard area of the County. With very little development within the mine hazard area, there will be little if any economic impact from a subsidence event. As long as development is restricted, that will continue to be the case. Similarly, the drain on County finances should be very limited

if at all. The largest financial impact could be to any homeowner who happens to have property where a subsidence incident takes place. Current restrictions on building in the mine hazard areas will limit future subsidence costs, however there are a small number of homeowners who have homes in the area built prior to current controls. A collapse of a mine tunnel under one of these homes could destroy it, with a major financial impact to the homeowner.

Public Confidence in the Jurisdiction's Governance

Interior Mine Hazard

There should be little or no decrease in the public's confidence in the jurisdiction due to an incident within a mine.

Subsidence Mine Hazard

With proper controls on construction within the mine hazard area, there will be few if any mine subsidence incidents that impact current development. This should result in few if any subsidence incidents that would cause the public to lose confidence in County government.

Resource Directory

Regional

- **Pierce County Department of Emergency Management**
<http://www.co.pierce.wa.us/PC/Abtus/ourorg/dem/abtusdem.htm>
- Schasse, Koler, Eberle, and Christie, The Washington State Coal Mine Map Collection: A Catalog, Index, and User's Guide, Open File Report 94-7, June 1984
- www.dnr.wa.gov/geology

National

- www.osmre.gov

Endnotes

¹ Schasse, Koler, Eberle, and Christie, The Washington State Coal Mine Map Collection: A Catalog, Index, and User's Guide, Open File Report 94-7, June 1984, pps. 93-100

² Gertsch, Richard and Bullock, Richard Lee, editors, Techniques in Underground Mining, Selections from Underground Mining Methods Handbook, Chapter 5, Room-and-Pillar Method of Open-Stope Mining, by Bullock, P. 159 et. seq. as shown at

<http://books.google.com/books?id=s5bcuu3fQoCsC&pg=PA160&lpg=PA160&dq=breast+and+pillar+mining+system&source=bl&ots=DapN0r20VY&sig=b-VY179VR-->

[2CAHCHehL1OynqUI&hl=en&ei=2YpTStz7DIr0sgPyxsHoBw&sa=X&oi=book_result&ct=result&resnum=1](https://www.google.com/search?q=2CAHCHehL1OynqUI&hl=en&ei=2YpTStz7DIr0sgPyxsHoBw&sa=X&oi=book_result&ct=result&resnum=1)

³ Schasse, Koler, Eberle, and Christie, The Washington State Coal Mine Map Collection: A Catalog, Index, and User's Guide, Open File Report 94-7, June 1984, p. 15.

⁴ Photo by Joseph Daniels 09/1914, in The Coal Fields of Pierce County September 1914, from Washington Geologic Survey Bulletin #10, Plate #XXIII. *Courtesy of William Kombol, Palmer Coking Coal Company, Black Diamond, Washington.*

⁵ Coal Mining in an east Pierce County area known as Pittsburg (1989-1909), Spiketon (1910-1916), and finally Morristown (1917-1927), HistoryLink.org Essay 8262,

http://www.historylink.org/index.cfm?DisplayPage=output.cfm&file_id=8262

⁶ Pierce County Code, Developmental Regulations, Chapter 18E.100, Mine Hazard Areas

⁷ Personal conversations with Pierce County Sheriff's Department (PCSD) SAR Coordinator Cyndie Fajardo, and previous PCSD SAR Coordinator Tom Miner, July 08, 2009.

⁸ Personal conversation with Robert Peloli of Wilkeson, who was a miner in a number of the mines in the area bounded by Spiketon on the north and Carbonado on the south, July 08, 2009.

⁹ Initial report by Ella Robertson of Tacoma, confirmed by personal conversation with Walter and JoAnne Bevan of Burnett, March 10, 2010.

¹⁰ Personal conversation with Robert Peloli of Wilkeson, who was a miner in a number of the mines in the area bounded by Spiketon on the north and Carbonado on the south, July 08, 2009.

¹¹ (Pacific Coast Coal 007- No. 1 or 4 (?) Mine tipple; Carbonado, Washington. A Carbonado mine tipple is perched above the Carbon River with the resulting coal slag dumped into the river below. At one time the Carbon Hill Coal Company's Carbonado operations were the largest producing coal mines in Washington. Over seven mine openings were used to recover an average of 200,000 tons per year. In total, the Carbonado mines produced 10.6 million tons from 1884-1973 comprising nearly half of the Pierce County total production. *This photo came from the studios of Frank Jacob and from the collection of Frank Guidetti. Courtesy of William Kombol, Palmer Coking Coal Company.*)