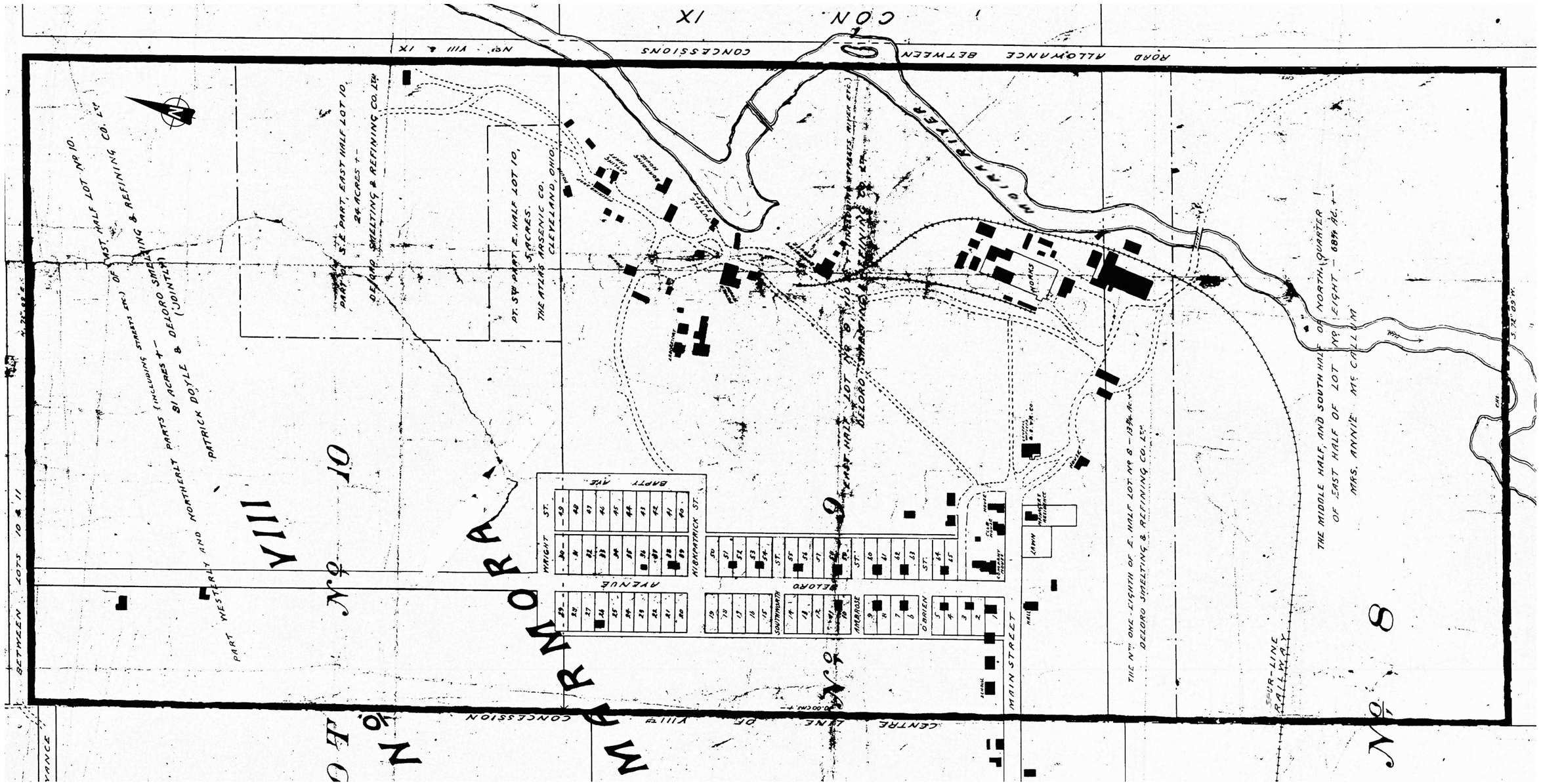


PLAN

TO SHEW

PROPOSED CORPORATE BOUNDS

-of the-

VILLAGE OF DELORO,

-LOCATED ON-

EAST HALVES OF LOTS 8, 9 & 10.

IN THE

EIGHTH CONCESSION,

TP. MARMORA,

CO. HASTINGS,

ONT.

REFERENCE

DRAWING BASED ON ONTARIO LAND SURVEYOR. PROVIDED BY THE MINISTRY OF THE ENVIRONMENT, *DELORO PROJECT COLLECTION*, KINGSTON, ONTARIO.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

NOTED UNITS ON PLAN ARE IMPERIAL.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

CULTURAL HERITAGE EVALUATION REPORT
DELORO MINE SITE
TOWNSHIP OF MARMORA AND LAKE
HASTING COUNTY, ONTARIO

TITLE

PROPOSED VILLAGE OF DELORO, 1918

Golder Associates
LONDON, ONTARIO

PROJECT No. 11-1126-0037			FILE No. 1111260037-4000-R06001
			SCALE NTS REV.
CADD	DCH	Apr. 20/12	
CHECK			

FIGURE 19

Drawing file: 1111260037-4000-R06001.dwg Apr 20, 2012 - 10:12am

Plate 68: Canada Consolidated office building and Director's Residence, built c1882; later, under the charge of Canada Goldfields, it was used as a residence for staff. Photo c1900.

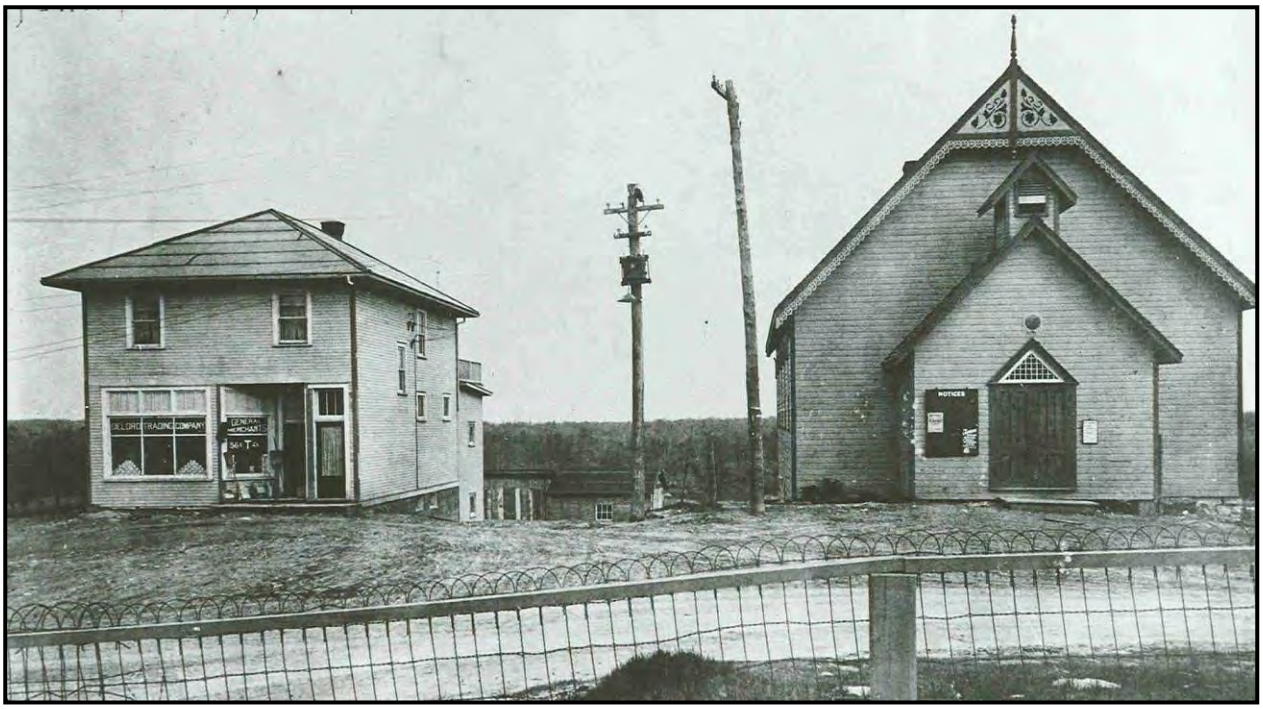


Plate 69: Company store (left) and former Canada Goldfields church, men's hall and village hall.

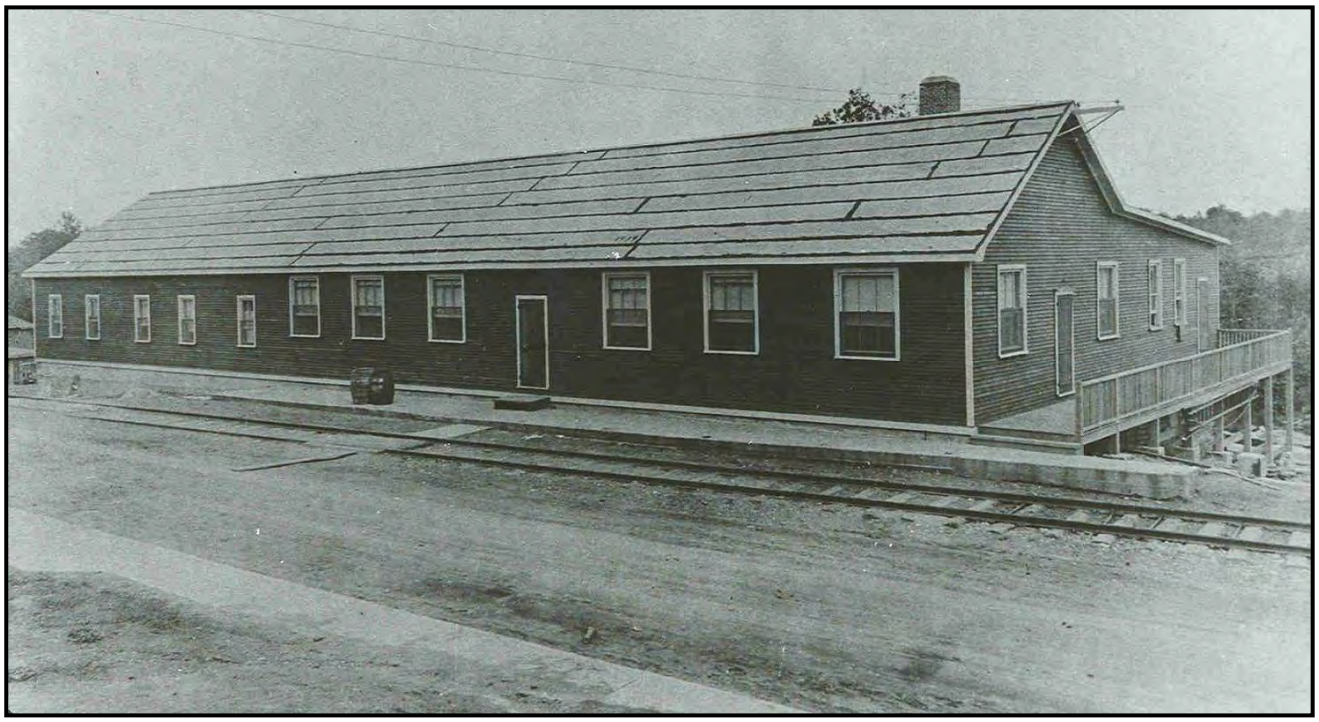


Plate 70: The new Hub sometime after 1919. The track in the foreground led to the primary treatment building ore yard.

Plate 71: Bunk House, c1919. Marmora Historical Society

Plate 72: Deloro Hospital.

Plate 73: Bunkhouse ruin, 2011.

Plate 74: View from water tower of Deloro Village showing boardwalk over the wet land to the refinery complex.

Plate 75: Looking across the site of the Hub showing concrete footings. The rail line/service road is in the left where the car is sitting.

Plate 76: Ruins of former Kitchen located near the Hub.

10.0 REMEDIATION

10.1 MOE Acquisition of the Property

In 1961 the Deloro Mining and Smelting Company closed its plant at Deloro. On June 16, 1970, the company changed its name to Deloro Stellite Limited. The surface and mining rights of this new company were transferred to Erikson Construction Company Limited. The remaining assets of Deloro Stellite were sold to the Canadian Oxygen Company (a subsidiary of British Oxygen). Canadian Oxygen later became known as BOC Canada Limited which continues to operate. Deloro Stellite Limited was amalgamated into BOC in 1980 and no longer exists as a corporation.

Another company, Deloro Stellite Inc., still operates in 2011 in Belleville, Ontario. The relationship of this company to the Deloro Smelting and Refining Company Limited, and to the former Deloro Stellite Limited, could not be determined in this study.

Erikson Construction conducted some site rehabilitation of the Deloro plant until 1979 at which time it declared itself insolvent. The Ontario Ministry of the Environment (MOE) then assumed the care and control of the property due to failure of Erikson to control environmental hazards on the property. The property escheated to the Crown in 1987.[206]

The factors that lead to MOE acquiring the site actually began in the 1950s and 1960s. This started with a rising societal awareness in North America of the environmental degradation caused by historic human industrial activities. Books such as Rachel Carson's *Silent Spring* (1962) popularized the concern over the environment. The deteriorating state of global environment led to a public demand for action. Media coverage of environmental issues also increased. Collectively these actions put pressure on various levels of government to act on environmental problems.[207] The unacceptable legacy of arsenic and low-level radioactive waste at Deloro was a manifestation of this awareness.

10.2 Remediation Work to 2011

10.2.1 Arsenic and Tailings, 1980s

When MOE stepped in as a regulator in 1979 to do specific work to deal with immediate environmental issues, it immediately addressed the two highest risks of the site: arsenic contamination of the Moira River and the inadequacy of the tailings pond design. Arsenic contamination came from waste material in former industrial area and was carried by ground water into the river. The other source came from arsenic leaching into the ground water flowing through the former mines.

A variety of approaches were used to deal with these problems. Abandoned buildings associated with arsenic manufacture were removed. In 1982 an arsenic treatment plant was put in operation in the former Deloro research lab building.

[206] *Escheat* is a common law doctrine which in this situation pertains to the re-assigning the legal title of unclaimed or abandoned land to the province.

[207] Bouillon, "Developments in Emission Control Technologies/Strategies," 275-85

Ground water collection wells were bored and the former Tuttle Shaft was adapted as a sump for contaminated water from the mines. Water was pumped from the shaft into an equalization storage basin for treatment (Plate 23). These changes reduced the arsenic loading in the Moira River by 80 percent.[208]

The former tailings on the east bank of the river presented different problems. For almost 50 years it had been collecting the toxic residue of the refining of cobalt ores. The eight hectares of red mud tailings were capped in 1987 with a cover of a half a metre of crushed limestone.[209]

10.2.2 Shaft Closures, 1990s

In the 1990s, the focus of the work shifted to on-site physical hazards. During 1993 various methods of investigation were used to find voids and other site risks. On the basis of this information backfilling of identified shafts, pits, stopes and adits commenced in October 1993 and continued until January 1994. The objective of this closure plan was to permanently close the mine workings to eliminate them as public hazards.[210]

Addressing the immediate risks associated with the mine workings was undertaken between 1992 and 1995. In addition to the work described below, all known historic pits, shafts and mines were surveyed and marked with steel posts, painted blue and each numbered with a unique MS # (Appendix F). At that time no restoration of the land was done. The work plans developed in the early 21st century were designed to restore the mine areas back to the native conditions of the surrounding landscape.[211]

Gatling/Tuttle/Red Shaft Area

By the early 1990s most of the major openings had been bulldozed in. Two cave-ins had occurred in the previous decade. The most recent one happened in May 1986 at the former A Shaft and was likely created by the unstable nature of the underground workings as water was pumped out and frost left the ground. The caved-in area was open to the surface but surrounded by security fencing. In the 1990s the existing collars of the Gatling and Tuttle Shafts were excavated and proper shaft caps installed. The A Shaft was backfilled and a concrete bulkhead installed. The top of a narrow vein slope was sealed with an engineered rock plug. [212]

Red Shaft Area

In the summer of 1963 the Red shaft had been backfilled by a tractor using existing available material. In December 1993 a nine by nine metre section of the backfilled shaft collapsed about 30m following a heavy rain. To secure the site, the crown pillar of the stope was blasted in January 1994. Later a backhoe was to be brought in to fill in the voids. A half metre clay cover was spread and compacted on top of the broken muck. [213]

---

[208] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994; CH2M Hill, "*Deloro Cleanup; Mine Area*, August 2004.p.1-1

[209] MOE, Deloro Mine Workings Closure Plan by J.D.C. Dupont, 1994)

[210] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994

[211] CH2M Hill, "*Deloro Cleanup; Mine Area*, August 2004.p.3-14, 3-15

[212] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994

[213] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994

Five Acres Shaft Area

A cave-in occurred at the site in the late 1950s in a stope located in the southeast corner of the property. This had been backfilled in the early 1960s and no surface evidence was visible at the time. In the 1990s a shaft cap was installed over the main shaft. In addition the shaft MS #24, #36 and #45 were excavated and backfilled with granular material.[214]

Hawkeye Shaft Area

Three shafts, Craig Shaft (MS #14), Hawkeye #2 Shaft MS #15 and Hawkeye #1 Shaft (MS #16) were backfilled with a tractor using existing available material by the Deloro Smelting and Refining Company in 1963. By the 1990s the fill in the Craig Shaft had subsided and the shaft was open. The Keswick D Shaft (MS #52) was a shallow shaft that by the 1990s was partly overgrown with vegetation and appeared to be partly backfilled. A large waste dump in the area indicated that an undetermined amount of underground development had been completed at some time in the past. [215]

The remediation of the site included five activities. The Keswick D shaft was excavated and backfilled with granular material and the crown pillar of the stope was blasted. A concrete shaft cap was installed over the Craig shaft. The crown pillar of the stope in the Hawkeye #1 shaft was blasted to collapse the underground void. The Hawkeye #2 shaft was excavated and backfilled with granular material. The crown pillar of the stope was subsequently blasted. [216]

Cook Shaft Area

By 1994 the shafts and adits had been protected with barbed wire fencing but were otherwise open and considered hazardous. The Main #1 shaft had a small building on it appeared ready to fall in. The shaft was reported to be 179 feet (roughly 55m) deep with an incline of 25°. Another shaft was located approximately 250 feet (roughly 75m) southeast of the #1 Shaft had an incline of 45°. The #4 Shaft was excavated to a depth of 120 feet (36.5m) along a 45° incline. A very steep incline of about 60° was located about 80 feet (24m) west of the main shaft.

Unfortunately the remediation report did not provide a link between the mine name and the MS # used in the remediation survey. A concrete shaft cap was placed on MS #27. Another shaft, MS #67, was southeast of the main group of shafts and was excavated with a backhoe and backfilled with waste rock from the shaft. Further along the Cooks Mine Road a pit, MS #66 and shaft at MS #65 were excavated with a backhoe and backfilled with granular material. A 15m adit (MS #64) trending southeast was found 21m northeast of the main shaft. By 1994 the adit had been previously backfilled with granular material.[217] The site of the Cook Mine was used as a waste rock dump and buried in 2011 as part of the tailings pond remediation.

[214] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994
[215] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994
[216] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994
[217] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994

Pearce Shaft Area

By the early 1990s the opening to the Pearce Mine had been bulldozed and a barbed wire fence enclosed the old shaft. MS #76 and #77 were two pits that had steep rock walls approximately 4.5m to 6m deep. The shafts and pits were backfilled with granular material.[218] The site of the Pearce Shaft was re-graded and the surface re-naturalized in 2011 as part of the tailings pond remediation.

10.3 Current Closure Plan

In the 21st century remediation of the Deloro Mine Site was designed to provide greater security to both chemical and physical hazards on the property.

In 2004 the Ministry's engineering consultant completed a draft integrated cleanup plan for the site that described the program that would be used to undertake the final cleanup of the Deloro Mine Site. The plan, *Deloro Mine Site Cleanup Integrated Cleanup Plan* (Prepared by CH2M Hill) described the program that would be used to undertake the final cleanup of the Deloro Mine Site. This document states that the "*overall objective of the Deloro Mine Site cleanup is to successfully rehabilitate the mine site to mitigate, within reason, any unacceptable impacts on human health or the environment*." The mitigation activities have been refined since then as a result of further public consultation and stakeholder review but the fundamental strategy remains.[219]

In 2010-11 remediation work focused on the east bank of the Moira River. A comprehensive engineered cover was put in place on the tailings area (tailings pond). (Plate 77). Additional work was also undertaken at the former Cook and Pearce Mine Shafts. Construction of the final engineered cover for the tailings area began in 2011. The final remediation of the Tailings Area is anticipated to be completed in 2012.

Plate 77: Looking across the Moira River to the Tailings Pond remediation, 2011.

[218] MOE, *Deloro Mine Workings Closure Plan* by J.D.C. Dupont, 1994

[219] MOE, *Deloro Mine Site Cleanup Integrated Cleanup Plan.* Prepared by CH2M Hill (2004) .p.1-5, 1-6

11.0 CULTURAL HERITAGE LANDSCAPE

11.1 Definition

The Ontario Provincial Policy Statement (PPS), which provides direction to the *Ontario Heritage Act*, defines a "Cultural Heritage Landscapes" as:

> *"a defined geographical area of heritage significance which has been modified by human activities and is valued by a community. It involves a grouping(s) of individual heritage features such as structures, spaces, archaeological sites and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements or parts. Examples may include, but are not limited to, heritage conservation districts designated under the Ontario Heritage Act; and villages, parks, gardens, battlefields, mainstreets and neighbourhoods, cemeteries, trailways and industrial complexes of cultural heritage value."*

The *Ontario Heritage Toolkit* states that in 1992 the UNESCO World Heritage Committee defined three types of cultural heritage landscapes: designed, evolved and associative. The definitions are widely accepted by heritage agencies, including the Ontario Ministry of Tourism Culture and Sport. According to the UNESCO definitions, *Evolved Landscapes* are:

> *those which have evolved through the use by people and whose activities have directly shaped the landscape or area. This can include a 'continuing' landscape where human activities and uses are still on-going or evolving e.g. residential neighbourhood or mainstreet; or in a 'relict' landscape, where even though an evolutionary process may have come to an end, the landscape remains historically significant e.g. an abandoned mine site or settlement area.*

The Deloro Mine Site is indeed an *evolved landscape* but this definition does not truly capture the character of the property. A *derelict landscape* is a much more evocative and appropriate description for the Deloro Mine Site than an *evolved landscape.* The Deloro Mine Site is a seriously contaminated site that requires remediation in order to contain dangerous materials and prevent the discharge of contaminants off-site. The property will remain a closed, controlled, hazardous waste facility and, at least in the short term, inaccessible to the general public.

The Deloro Mine Site is not a *Brownfield property* in that this term as used by MOE and others applies to "*former industrial lands that are now vacant or underused but have the potential to be redeveloped for new uses*". The British typically use the term *Derelict Land* defined as "*land so damaged by industrial and other development that it is incapable of beneficial use without treatment*."[220] The term "damaged" implies the physical hazards and chemical contamination often found on such lands. The Deloro Site is so damaged that public access to the property will be tightly controlled for the foreseeable future. Since no one has "used" the land since 1960 when the plant closed, a distinct ecology has evolved on the damaged land of ruins, pits, dumps and waterlogged areas caused by changes in natural drainage.

The dictionary definition of "derelict" means to abandon or leave without an owner. The term *escheated* to describe the process by which Ontario acquired the Deloro Mine Site in 1987 further conveys this idea of abandonment.

[220] E.M Bridges, *Surveying Derelict Land,* 1987

Abandoned is a figurative concept when applied to land ownership since all land in Ontario is either publicly or privately owned. However, from a visual or landscape perspective, closed mines or ruined factories can appear as if they do not have an owner. This is the case with the Deloro Mine Site. Sometimes people may live on the site, or as in the case of Deloro village, adjacent to the property.

Given this litany of visual and chemical devastation, appreciating the cultural value of derelict landscapes is generally a challenge to most viewers. In theory industrial dereliction should be appreciated with the same interest as any shown for more traditional cultural environments - historic towns, cemeteries, or farming landscapes. In practice, derelict lands are often complex landscapes created by unfamiliar processes resulting in a visual environment that engender negative feelings in many viewers. The challenge to appreciating a derelict landscape is to separate the underlying cultural values of the property from personal opinions (or tastes). The structure of Regulations 9/06 and 10/06 ensures that only definable cultural values and not personal taste are evaluated.

11.2 Landscape Components

11.2.1 Structures and Ruins

Mining features include:

- Two ruined powder magazines. One consists of partially collapsed stone walls situated on top of a ridge of rock overlooking former mines. A second one had been identified in the Commonwealth Report as an incinerator and consists of a poorly constructed low stone foundation.
- Three stamp mill ruins that are most visible as the shelves cut into the hill sides that once housed milling equipment. The most prominent mill ruins are those associated with the Twenty-Stamp Mill.

Refining landscape features include:

- A former Research Lab constructed of brick and concrete, currently used as an arsenic treatment facility, which and will continue in that use for the foreseeable future.
- The Primary Treatment Building Trestle consists of a run of concrete piers that once supported a railway track. The rest of the building is in ruins.
- The Casting Building is a partially ruined brick building with a very low pitch gable roof. The blast furnace slag field extends close to two sides of the building.
- A concrete block Transformer Building built in 1909 when the company began to purchase electricity.

Features associated with labour include:

- Ruins of the “Hub” and Kitchen.
- Concrete footings of three buildings used as Bunkhouses.
- Offsite presence of the former village of Deloro.

11.2.2 Earthworks

A Hydraulic Raceway consists of man-made improvements to a natural valley extending from the Moira River above the falls and back to the river below. The raceway was partially completed but never used for water power. The main cultural features include an Intake Cutting from the River defined by vertical rock walls. An Earth Causeway across the cutting to carry a road on top, and a long Raceway Dyke consisting of a low stone wall backed with an earth berm in order to raise the height of the headpond. The size of this raceway contributes to the mining landscape of the property. Vegetative evidence of this raceway includes hydrophilic plant materials established within the low lying areas.

A blast furnace Slag Field extends westward from the Primary Treatment building ruins.

The oldest pits and mounds identified is the “Powder House Vein”. It consists of a long, narrow vein in which ore has been removed from between the host rock. The walls of the vein dip at the angle of the ore body. Although one of numerous prospecting pits, this one has been specifically documented.

As well, the historic pattern of mine shafts is visible in the concrete caps and vent pipes of remediated mines along with steel survey posts that identify the location of 109 known mine shafts and test pits located through the forested mining areas (Appendix F).

11.2.3 Transportation

Mining Roads provided connections between the mining and refining areas and have existed since mining began in c.1870. These roads were opportunistically built, relocated, and abandoned as dictated by mining needs. These roads typically were quite narrow, generally two metres (seven to eight feet) or less, and contained steep grades and sharp curves. Four surviving historic alignments have been identified as the *Twenty Stamp Mill Road, Hawkeye Mine Road, Lower Hawkeye Road,* and the *“Deloro” Road*.

Timothy grass was noted in several areas along the roads. This species, a common hay, may be a link back to the horses that once passed on these roads, the seeds sown as they travelled up and down their lengths. In this way, vegetation again helps to define the cultural heritage of the site.

A Tramway Embankment at the edge of the Moira River consists of c.1880 rubble stone retaining walls which carried a mine tramway. Along with the Powder Magazine, this is oldest surviving mining structure on the Deloro Mine Site.

The only evidence of the former Railway Line is visible as the Primary Treatment Building Trestle and the access road from the Industrial Area to the main Mine Area. This vehicular road is characterized by the gentle curvature and low gradients typical of rail lines.

11.2.4 Vegetation

The mining, refining, closure and site remediation operations at the Deloro Mine Site have altered or displaced the forest and former wetland vegetation on the site in a variety of ways including:

- repeated logging of the forests;
- the infilling of historic wetlands for the disposal of wastes;
- the displacement of terrestrial vegetation for the disposal of slag and waste rock;
- the removal of forest and riparian vegetation for the construction of industrial structures, storage areas and transportation facilities; and,
- the recent displacement of a large wetland for the installation of the equalization pond to aid in the remediation of the groundwater at the site.

By comparison, remediation plantings have initiated a process of soil remediation and plant succession that will aid in the gradual restoration of ecological function to areas that have been radically transformed by historic uses.

The predominant plant cover in the Mining Area is deciduous forest. Most trees in the forest are young, not more than 50 – 60 years old indicating that the forest has regenerated from one or more historic disturbances that may have occurred much earlier. Plate 50 illustrates that in 1935 much of the Mining Area had sparse tree cover that included isolated open-grown trees. The large open-grown maple and oak trees observed in 2011 were estimated to be at least 125 years old. Mining at the Gatling, Tuttle, and Red shafts had ended by 1902 and the land was still largely devoid of tree cover in 1935. The lands between the Dining Hall and the Moira River were also largely free of tree cover in 1935. The oldest trees in the present-day forest are also typically less than 75 years old. This pattern of forest cover implies that the Mining Area had been clear-cut by 1900 and had remained relatively open until sometime after 1935. The absence of tree regeneration in the vicinity of the open-grown trees suggests that the lands in the north half of the Mining Area may have been used for pasture for horses or cattle following logging since the removal of the forest canopy typically results in the release and rapid growth of the young saplings and seedlings on the forest floor. The presence of ore exploration pits and mounds within this area suggests that the cleared areas were not ploughed for agricultural use.

The large open-grown trees observed in 2011 were Sugar Maple, Red Oak and White Oak. This assemblage of species also comprises the dominant cover in the canopy of the present-day forest and suggests that the ecological dominants in the pre-settlement forest were not altered by the extensive logging that took place. Based on these observations, the pre-settlement forest on these lands was likely a maple – oak forest.

The Ecoplans analysis suggests that while extensive logging of the site in the late 19th century has significantly altered the stand structure of the forest, it has not altered the composition of the apparent ecological dominants in the pre-settlement forest. As such it represents a young surrogate for the forest which occupied the site at the time of the discovery of gold in 1866.

11.2.5 Viewsheds

The elements of a landscape combine to create a distinctive visual character as well as defined viewscapes, which affect how the landscape is experienced and valued. The underlying landforms, the vegetation, the built form, circulation systems and waterscapes all contribute to the views that help to define the Deloro site, and establish its heritage value.

Much of the Mining Area landscape character is defined by forested areas, and rolling topography obscuring or eliminating long views. Many access roads to the mine sites are long overgrown, and wind their way through the topography to the former mines around rock outcrops and wetland depressions. Most viewscapes created by these access roads are narrow and often framed by forest on either side. The former mine shafts are indicted by open meadows created by the levelling of all structures, mounds and pits and the establishment of early successional or volunteer species on thin substrate. The visual effect in these spaces is a wider field of vision, but here too views are terminated by forests.

By 1900 the main mines sites consisted of dense collections of buildings that were quite visible due to the lack of forest cover. Today, these areas are a series of flat fields with ground cover placed during the safe stabilization of the mine shafts. Although the fields are visually open, they bear no relationship to the former mining landscape.

The landscape character of the Industrial Area has a predominantly flat character and the absence of significant vegetation afford long and open views across much of the site. Visual connections can be made between many of the buildings and ruins. The Research Laboratory, Casting Building, and ruin of the Primary Treatment Building are all within field of view. The ruins of the trestles at the Primary Treatment building are strong vertical elements within a predominantly horizontal landscape, providing an iconic element within the landscape, and a frame of visual reference from much of the Industrial Area.

The sludge lagoons in the south of the site, situated there due to their low-lying nature, are bounded by the dense forest to the south, and naturally succeeding vegetation to the north. Views here are short and closed, and there is limited visual connection to the rest of the site. The slag pile creates an artificial plateau that provides an interesting vantage overlooking the Castings Building. East of the slag field the view opens up to a more fulsome view of the southerly portion of the site, the river, and the remediated lands on the east side of the river.

The Arsenic Treatment Plant, formerly the Research Laboratory overlooks what is now the equalization pond and calcium arsenate pile. To the north, a rock outcrop provides a high vantage point which affords views across this landscape, providing an interesting connection between much of the process and change that has occurred on the landscape.

11.3 Landscape Boundary

The cultural heritage landscape boundaries of the study area are defined by both man-made and natural features. The perimeter security fence is made more prominent by the rough inspection trail that parallels the fence. The Moira River defines the eastern boundary of the study area. The main cultural features of the historic era are found within these boundaries.

A secondary landscape boundary encompasses the entire 200 ha Deloro Mine Site. The primary resource is the pattern of former mines and test pits that have been identified by survey stakes and listed in Appendix F. The east side of the Moira River, has had a far less complex land use history than the “industrial area” and mining area” on the west bank. The vestiges of one mining road remain was identified in 2011. The three principal historic complexes, the Pearce Mine, Cook Mine and the Tailings Pond have been remediated.

Yet a third cultural landscape occurs outside the Deloro Mine Site. The former Village of Deloro is adjacent to the property and a visually significant component of the cultural landscape of the Mine Site. The Ackerman Property, outside of the Deloro Mine Site property. on the south side of Highway 7 contains the only largely untouched mine site left of the former mines at Deloro.

12.0 CULTURAL HERITAGE VALUE OF THE DELORO MINE SITE

12.1 Overview

The CHER study area of the Deloro Mine Site contains numerous individual historically significant cultural resources. Sections 3 to 11 of this report assess their individual cultural heritage value. All of these properties were determined to have local or regional cultural heritage value according to O.Reg. 9/06.

Since the Deloro Mine Site is a provincially owned property, having been escheated to the Crown in 1987, the Mine Site has been evaluated in this Section 12 according to O.Reg. 10/06 to determine if it has provincial cultural heritage value. This CHER has determined that although individual sites are of only local or regional significance, collectively these sites and their relationship to one another on the land make the Deloro Mine Site a provincial heritage property of provincial significance.

The following Statement of Cultural Heritage Value is prepared as a standalone document. The Ministry of Tourism Culture and Sport notes that the Statement should provide sufficient information to explain the core aspects of the property's cultural heritage value and describe the character defining features of the property. The information in the Statement is reinforced by the detailed property history contained in Sections 3-11 of this CHER.

12.2 Statement of Cultural Heritage Value or Interest

12.2.1 Description of Historic Place

The Deloro Mine Site has been under the care and control of the Ontario Ministry of the Environment (MOE) since 1979. The 202 ha Mine Site is located adjacent to Highway 7 where it crosses the Moira River about 65 km east of Peterborough. The nearest population centres are Marmora, approximately five kilometres to the west and Madoc, approximately ten kilometres to the east (Figure 1).

The Deloro Mine Site is grossly contaminated with arsenic and arsenical compounds, refining slag, mine tailings, laboratory wastes, lead, cobalt, nickel, copper, mercury and other metals and low-level radioactive wastes as a result of the mining and refining activities that took place at the site. For over 30 years MOE has been responsible for the cleanup of this mining and industrial complex. The objective of the final cleanup is to isolate and contain the waste to make the site safe for people and the environment for hundreds of years. The final remediation engineering is scheduled to be completed in 2012.

The study area of this Cultural Heritage Evaluation Report (CHER) consists of 48 ha containing a wide range of heritage resources including two buildings, numerous ruins of buildings and structures, and earthworks (road, rail, pits, dumps). In addition, the ecology of the property has been modified by human activities. The property contains numerous debris scatters of mining ruins and artifacts. The following resources are the primary cultural features on the property:

- Two powder magazine ruins.
- Hundreds of mine prospecting earthworks of which the "Powder House Vein" has been specifically documented.
- Three ore stamp mill archaeological sites.

- A large hydraulic power complex of channels and dykes.
- Transportation routes consisting of a mine tramway, four confirmed mining roads, and remnant railway earthworks.
- Two intact buildings, the Research Lab and Transformer Building.
- Identifiable ruins of a primary treatment building and casting building in association with the slag field and debris fields of other building ruins associated with refining operations.
- The historic pattern of mine shafts that are preserved as concrete caps and vent pipes of remediated mines along with steel survey posts that identify the location of 109 known mine shafts and pits. The Hawkeye Mine is the least remediated of the former sites.

12.3 Statement of Provincial Significance

The Deloro Mine Site has cultural heritage value of provincial significance according to O. Reg. 10/06 Category (1):

- The property represents or demonstrates a theme or pattern in Ontario's history.

The cultural value of the Deloro Mine Site falls into three eras of historic land use; mining, processing and remediation. Each era of human intervention in the land constructed features which created distinctive patterns of land use associated with natural resource extraction.

12.3.1 Mining Era

The first 36 years of operation consisted of *the mining era* from the 1866 "Gold Rush" to the flooding of the Gatling Mine in 1902. The Deloro Mines were among the first hard-rock mines in Ontario. Gold attracted a variety of interests ranging from the "heroic" individual miner, to the America speculators of Canada Consolidated, and finally the scientific mining undertaken by British investors in the Canadian Goldfields. Removing the arsenic found in the gold ore initially defeated the early miners. Yet the arsenic was also a valuable by-product and Deloro produced arsenic commercially on an intermittent basis from approximately 1880 until 1904. Until 1901 it was the only arsenic producing plant in North America. By 1900 collaboration between the mine engineer and Queens University geologists developed a refining process that could separate arsenic from the gold ore, thereby opening a wide range of Canadian arsenical ores to commercial exploitation. It was a fascinating era of mining development in Ontario. But, if natural resources were the only value of the property, Deloro would have remained a small story in a much bigger economic history of Ontario's industrial development.

12.3.2 Silver/cobalt Refining Era

During the 54 years from 1907 to 1961 Deloro Smelting became a world player in refining cobalt ore and marketing cobalt metal. The refining technology developed at the end of the mining era enabled the company to pioneered metallurgical techniques in refining arsenical cobalt ore. Deloro was no longer a mining property and silver/cobalt ore was imported by rail form the newly opening mining district around Cobalt, Ontario.

The company acquired the Canadian/British rights to Stellite; a cobalt alloy especially useful in high speed machining. During the two World Wars, cobalt was a strategic metal and the company was especially profitable. Between the Wars the company engaged in a cartel with Belgium, German and French companies to try to control the global prices for cobalt. Until the mid-20th century arsenic continued to be a valuable by-product but as its markets shrank after the Second World War, the element became a waste material. As a mining site, the operation never employed much more than 100 people who lived in accommodations scatted around the mine site and the surrounding farms. The new refining operation required a few hundred people and as a result a company town grew up beside the industrial complex. Changing world markets after the Second World War lead to the ultimate closure of the operation. The huge scale of operations, spanning 50 years, created considerable toxic waste particularly arsenic and refinery tailings.

12.3.3 Site Remediation Era

The *site remediation era* began in 1979 and is still underway. However, the origins of this era began in the 1950s with the increasing public awareness in North America of environmental degradation caused by industry. That site remediation has taken more than thirty years to complete – the same length of time as the mining era – is indicative of the difficulty in shifting public opinion, understanding the nature of the problems and finding suitable remediation technologies. When this third era of restoration is finished in a few years, one of Ontario's most contaminated sites will be as environmentally safe as modern technology can make it. A new fourth era of land use activity will then commence. The material survival is closely linked to the societal attitude to industrialization that existed prior to the environmental awareness of the 1960s and later. Until then, owners could walk away from their property and leave the property derelict. Deloro Stellite still exists today as a component of an international concern but without any connection to the property.

12.4 Heritage Value

12.4.1 Historic and Associative Value

- Several well know people were associated with the different historic eras at Deloro. The more prominent included E.J. Chapman, professor of Mineralogy University of Toronto, Stafford Kirkpatrick, School of Mining, Queens University, and Henry Vennor, Geological Survey of Canada who conducted geological work on the property and worked to solve the refining problems of arsenical ores. Ontario industrialist M.J. O'Brien was a major mine speculator at Cobalt and financed the expansion of the refining capacity at Deloro.
- The Deloro Mine Site was of the most successful properties of the 1866 Gold Rush; likely due to financially sound investors. Along with iron mining that began at the time, Deloro helped to identify Eastern Ontario as a hard-rock mining area.

- As was common with so much 19th century industrial development in Ontario, financing in the Mining Era came from foreign sources. The first unsuccessful attempt in 1880 was American financed. The successful operation of the 1890s was a British investment.
- When mines opened at Cobalt, Ontario, Deloro became the main refining site for the silver/cobalt ore.
- The company continued metallurgical improvements of Stellite; a steel/cobalt/tungsten and chromium alloy that had been developed in the United States in 1907; between the two World Wars, the company engaged in a marketing cartel with Belgium, German and French companies to try to control the global prices for cobalt.
- Arsenic compounds were widely used in the 19th and early 20th centuries. Most of Canada's supply was imported from Europe but the Deloro production was seen as having great potential. Deloro was the only commercial producer, albeit on an intermittent basis, of arsenic in North America prior to 1901.
- The demand to clean up the environmental degradation at Deloro was part of the broader North American concern that had started after World War Two. Although Deloro was identified as one of the most seriously contaminated sites in Ontario it never garnered the same public attention as other contemporary sites such as the coal tar deposits in Kitchener/Waterloo and Ottawa found in the early 1980s.

12.4.2 Design and Architectural/Engineering Value

The mining technology of shafts and stamp mills used at Deloro was in keeping with technology of the era. Several miners erected experimental furnaces during the 19th century to attempt to separate arsenic from the gold ore.

Energy was an important consideration in 19th century mining and refining. The site relied on steam power until the 20th century when it was replaced with electricity. An extensive waterpower system was partially constructed and then abandoned in the 1880s in favour of steam power.

12.4.3 Contextual Value

The Deloro Mine Site is at the southern boundary of the Canadian Shield and the property is characterized by rock outcrops, thin soils and wetlands in low lying poorly drained areas. The Moira River flows through the property and most of the historic mining and subsequent cobalt refining took place on the west side of the river. Combined with the rolling topography these land characteristics dictated that all large industrial facilities hugged the limited amount of flat land along the west river bank.

The sharp relief was utilized for gravity feed of the various stamp mills that cascaded down the slopes. Conversely, mine roads had to follow circuitous routes to obtain the lowest grades for heavy, horse hauled wagons.

The vegetation displays a sequence of deforestation due to mining and a subsequent re-establishment of forest cover starting in the 1930s. Waste dumps of slag and calcium arsenate create stark industrial nodes in an otherwise vegetated property.

Ore prospecting in the 19th century relied heavily on test pits and shallow exploration shafts. The forest understory is pockmarked with these remnant features.

The former village of Deloro is adjacent to the Mine Site. At the beginning of the 20th century it evolved from a collection of houses into a company town. The street layout and location of the main buildings was directed by the company's labour requirements.

12.5 Description of the Heritage Features

Prior to undertaking the present report, previous historic and archaeological studies had identified the following significant heritage features:

- An 1870s *Powder Magazine* consisting of stone, partially collapsed walls.
- *Bunkhouse ruins* consisting of the concrete footings of two buildings.
- The *Five Acres Stamp Mill* consisting of a stone wheel-pit, timber stamp frame beam; shelves excavated into valley wall to support equipment.
- A c1900 *Powder Magazine* (*Incinerator)* poorly constructed of low stone foundation; originally identified in 1988 as an incinerator and now considered to be a powder magazine.
- A *Transformer Building* constructed of rusticated concrete blocks with a flat roof. It is one of only two intact buildings on the property.
- A former *Research Lab* constructed of brick and concrete and the second intact building on the property. It is currently used as an arsenic treatment facility and will continue in that use for the foreseeable future.
- The *Primary Treatment Building Trestle* consists of a series of concrete piers that once supported a railway track.
- The *Casting Building* is a partially ruined brick building with a very low pitch gable roof. The blast furnace slag field extends close to two sides of the building.

During the 2011 built heritage investigation of the property the following additional features were also identified as having cultural value:

A *Tramway Embankment* at the edge of the Moira River consists of c.1880 rubble stone retaining walls carry mine tramway. Along with the Powder Magazine and Five Acres Stamp Mill, this is oldest surviving mining structure on the Deloro Mine Site.

A *Hydraulic Raceway*, covering several hectares, consists of man-made improvements to a natural valley extending from the Moira River above the falls and back to the river below. The raceway was partially completed but never used for water power. The main cultural features include an intake cutting from the River defined by vertical rock walls, an earth causeway across the cutting to carry a road on top, and a long raceway dyke consisting of a low stone wall backed with an earth berm in order to raise the height of the headpond. The size of this raceway contributes to the mining landscape of the property.

There are several key *Mine Workings* sites. The oldest is the *"Powder House Vein"* and consists of a long, narrow vein in which ore has been removed from between the host rock. The walls of the vein dip at the angle of the ore body. Although one of numerous prospecting pits, this one has been specifically documented.

The *Twenty-Stamp Mill* was much larger than the Gatling Mill mentioned above and consequently the shelves excavated into the hillside are prominent features. Other associated components are timber posts from one of the stamp mill batteries, line shafting and an engine base for power house. This mill is the largest surviving feature outside of the ruins of the industrial area. The *Twenty-Stamp Mill Road* is a landscape feature but also an engineered structure. The road was built with a surveyed grade and made level with rubble stone retaining walls.

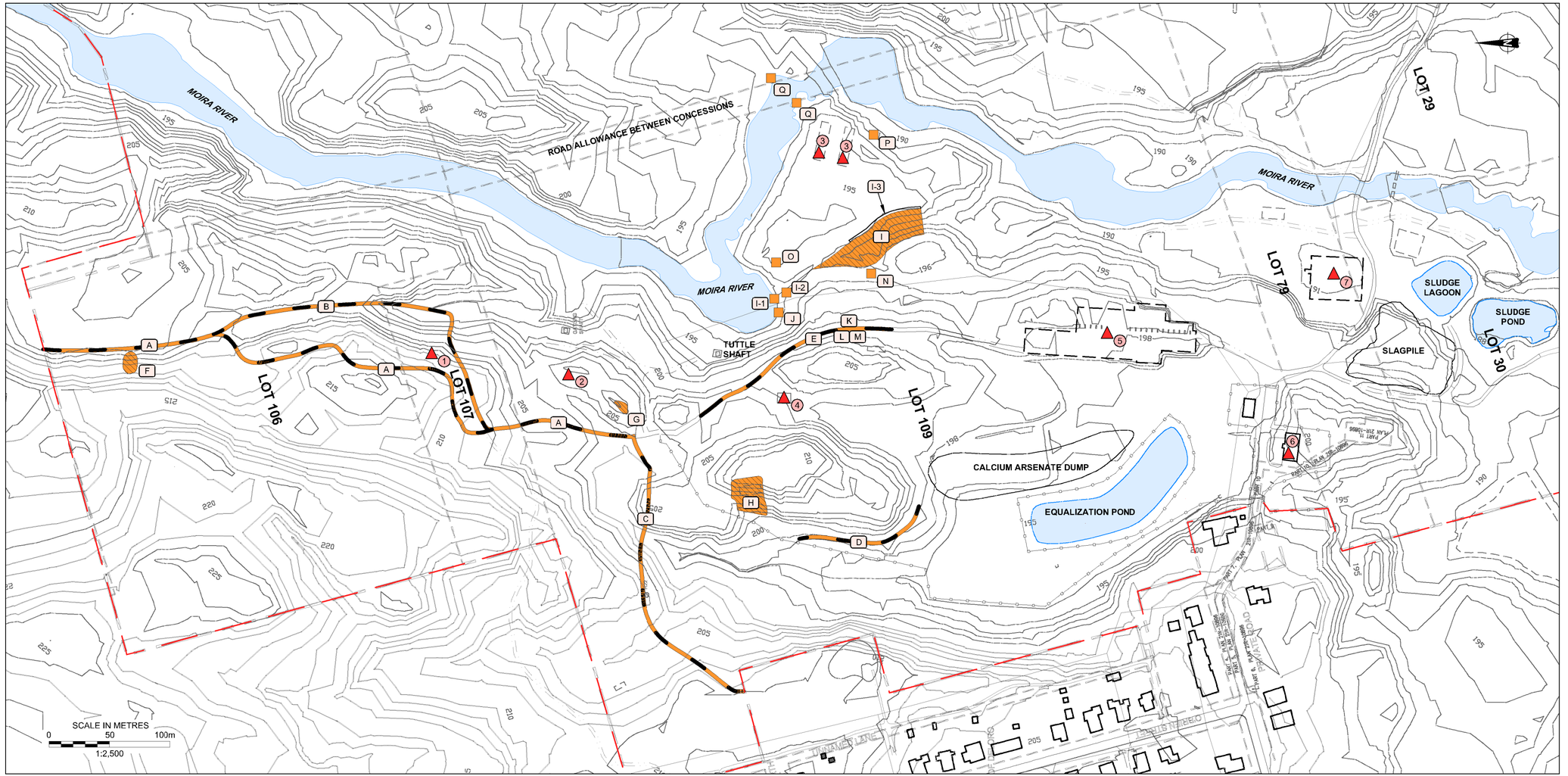
12.5.1 Cultural Landscapes

Mining Roads provided connections between the mining and refining areas and have existed since mining began in c.1870. These roads were opportunistically built, relocated, and abandoned as dictated by mining needs. These roads typically were quite narrow, generally two metres (seven to eight feet) or less, and contained steep grades and sharp curves. Four surviving historic alignments have been identified as the *Twenty-Stamp Mill Road, Hawkeye Mine Road, Lower Hawkeye Road,* and the *"Deloro" Road*

The only evidence of the former *Railway Line* is visible as the Primary Treatment Building Trestle and the access road from the Industrial Area to the main Mine Area. This vehicular road. Is characterized by the gentle curvature and low gradients typical of rail lines.

Some of the *Mine Workings* sites that are landscape features have been identified in previous sections above. Other sites include the *Hawkeye Mine Tip* which is today the last visible mine site. Although the property was partially remediated along with the other mines in the 1990s, it still retains the steep rock slopes with projecting fingers of rock dumps. As well the historic *Pattern of Mine Shafts* is visible in the concrete caps and vent pipes of remediated mines along with steel survey posts that identify the location of 109 known mine shafts and test pits located through the forested mining areas.

Although much of the industrial area is in ruins, the landscape associated with the Cobalt Refining era is seen in the ruins of the industrial buildings. Three buildings – the *Casting House, Primary Treatment Building,* and the *Research Lab (Arsenic Treatment building)* described above – help to define how this area once looked. The *Casting House* had a particularly dramatic setting because of its proximity to the slag field.



LEGEND

- FEATURE TO BE RETAINED

RESOURCES TO BE FIELD EVALUATED:

- SITE/STRUCTURE
- LANDSCAPE
- ROAD/RAIL RIGHT-OF WAY
- DELORO MINE SITE PROPERTY/BOUNDARY

RETAINED STRUCTURES:

- (1) ATLAS ARSENIC MILL
- (2) POWDER MAGAZINE
- (3) BUNKHOUSE RUINS
- (4) TRANSFORMER BUILDING
- (5) PRIMARY TREATMENT BUILDING TRESTLE
- (6) RESEARCH LAB
- (7) CASTING BUILDING

RIGHT-OF-WAYS/LANDSCAPE/STRUCTURES:

- [A] HAWKEYE MINE ROAD
- [B] LOWER HAWKEY ROAD
- [C] "DELORO" ROAD
- [D] 20-STAMP MILL ROAD
- [E] RAILWAY SPUR
- [F] HAWKEYE MINE DUMP
- [G] POWDERHOUSE VEIN
- [H] 20 STAMP MILL
- [I] HYDRAULIC MILL
  - [I-1] INTAKE
  - [I-2] CAUSEWAY
  - [I-3] DYKE
- [J] TRAMWAY EMBANKMENT
- [K] HUB
- [L] LOADING DOCK
- [M] KITCHEN
- [N] "INCINERATOR"
- [O] CONCRETE RUIN
- [P] BUNKHOUSE RUIN
- [Q] IRON BOLTS

REFERENCE

DRAWING BASED ON MMM GROUP LIMITED,
DWG FILE "Drawing 1-1 (2008)", JANUARY 2009.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

CULTURAL HERITAGE EVALUATION REPO RT
DELORO MINE SITE
TOWNSHIP OF MARMORA AND LAKE
HASTING COUNTY, ONTARIO

TITLE

LOCATION OF CULTURAL RESOURCES

Golder Associates
LONDON, ONTARIO

PROJECT No.	11-1126-0037			FILE No.	1111260037-4000-R06020
				SCALE	AS SHOWN
CADD	DCH	Feb. 1/12		REV.	
CHECK					

FIGURE 20

Drawing file: 1111260037-4000-R06020.dwg Apr 20, 2012 - 10:14am

12.6 Description of the Cultural Heritage Landscape

Today the area of the Deloro Mine Site evaluated in this report can be described as an evolved cultural landscape, or more specifically as a derelict industrial landscape. The ground is covered in earthworks of embankments, mounds, pits, and wetlands produced from 100 years of mining and refining activities. Ruins of buildings litter the site. The vegetation displays a sequence of deforestation due to mining and a subsequent re-establishment of forest cover starting in the 1930s. Waste dumps of slag and calcium arsenate create stark industrial nodes in an otherwise vegetated property.

Such a landscape conveys many impressions. The pattern of historic features create a *Mining and Refining Landscape* that reflects some of the 19th century values of economic and social growth of Ontario and views of how land could be treated. The feeling that preoccupies the property today is one of failure. A century of misuse has created a landscape disfigured with stark, man-made alterations to landforms and vegetation and poisoned with industrial contamination.

The goal of MOE is to securely contain the on-site contamination and isolate it from the environment. This will be done by building two engineered covers and one engineered containment cell. The site will remain a closed, controlled hazardous waste site. Since the 1990s, the Deloro Mine Site has slowly been changing from a *Landscape of Failure* into a *Landscape of Remediation*. This new landscape shows how much our attitudes to the environment have changed.

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Christopher Andreae, Ph.D.
Associate, Senior Built Heritage Specialist

ORIGINAL SIGNED

Hugh Daechsel, M.A.
Principal, Senior Archaeologist

CAA/MNR/HJD/slc

\\lon1-s-filesrv3\data\active\projects - other offices\ottawa\11-1126-0037 deloro\rpts\1111260037-4000-r06\11- 1126-0037-4000-r06 apr 20 12 final moe chra deloro mine hastings.docx

13.0 SOURCES

13.1 Archival Sources

Trent University Archives Peterborough

Various Dates *Ontario Deloro Collection*. Deloro Social History Research Material Finding Aid, compiled by Professor Roy T. Bowles.

Community Archives of Belleville and Hastings County

Various Dates *Hastings County Historical Society Photograph Collection*. Photographed by Richard Lumbers for the Hastings County Historical Society in 1967 courtesy of Deloro Stellite, owner of the original photographs.

Queen's University Special Collections - Canada Consolidated Gold Mining Company

1880 *Report upon the Property of the Canada Consolidated Gold Mining Company at Marmora, Ontario*. Prepared by Richard Rothwell. New York.

1881 *Report of Progress to the Shareholders*. Prepared by Richard Rothwell and James W. Loveridge. New York.

1883 *Reports on the Present Condition of the Canada Consolidated gold Mining Company's Property and on the Treatment of its ores at Deloro, Ontario*. New York.

13.1.1 Unpublished Reports

Baldwin, Nancy

1988 *Working – and Living – in a Company Town; a History of Deloro, Ontario.*

Bowdidge Consulting Geologists

1987 *Malone Gold Prospect. Marmora Township, Eastern Ontario; Report on Geological Mapping, VLF Electromagnetic Survey and Magnetic Survey*." February. Copy on file with Mining Lands Section, Geological Survey.

Commonwealth Historic Resource Management Limited

1988 *An Historical Analysis of the Deloro Site*. Prepared for J.L. Richards & Associates, Ottawa.

Newell, Dianne,

1981 *Technological Change in a New and Developing Country: A study of mining technology in Canada West – Ontario, 1841-1891*. University of Western Ontario, PHD Thesis.

Park, Ian G.

1983 *Report on Gold Mineralization at the Gatling and Gawley Properties, Marmora Township, Ontario.* Prepared for Goldbrook Explorations Inc. On file with the Mining Lands Section of the Geological Survey.

St. Martin, Isabelle

1979 "*A chronology of social patterns, technological innovations and business conditions relating to the Deloro Smelting and Refining Company.*" Prepared for Roy Bowles, Trent University. Copy on deposit at Ministry of the Environment, Kingston.

13.2 Government Documents

Canada. Department of Mines

1927 *Arsenic Bearing Deposits in Canada*. Prepared by M. E. Hurst, Economic Geology Series No.4.

1954 *Cobalt in Canada.* Prepared by R.J. Jones. Mines Branch Report 847.

1936 *Gold Occurrences of Ontario East of Lake Superior*. By E.D. Kindle. Memoir 192.

1908 *Report of the Mining and Metallurgical Industries of Canada, 1907-1908*. Prepared by the Mine Branch. Ottawa.

Canada. Geological Survey of Canada

1869 "*Report to Sir William Logan, 1869,*" in the *Report of Progress 1866-1869*. Prepared by Henry Vernnor.

1872 "*Progress report of exploration and surveys in the Counties of Leeds, Frontenac and Lanark,*" in the *Report of Progress for 1871-1872*. Prepared by Henry G. Vennor.

Canada. Parks Canada

2010 *Standards and Guidelines for the Conservation of Historic Places in Canada.* Second edition.

Ontario Bureau (Department) of Mines

1918 "*Cobalt; Its occurrences, Metallurgy Uses and Alloys,*" in the *Annual Report*, Volume 27, Part three. Prepared by Charles W. Drury.

Ontario. Ministry of Citizenship, Culture and Recreation

1997 *Conserving a Future for Our Past: Archaeology, Land Use Planning & Development in Ontario*. Ministry of Citizenship, Culture and Recreation, Archaeology and Heritage Planning Unit, Toronto.

Ontario. Ministry of the Environment

1980 *A Remedial Clean-up Program for the Deloro Site*. Prepared by Reid, Crowther and Partners Ltd., Toronto.

1994 *Deloro Mine Workings: Closure Plan*. Prepared by J.G. Ritter, Kingston.

1994 *Deloro Mine Workings: Closure Plan*. Prepared by J.D.C. Dupont.

1995 *Deloro Mine Site Rehabilitation: Summary Report on Mine Closure Activities*. Prepared by J.G. Ritter, Kingston.

2004 *Deloro Mine Site Cleanup Integrated Cleanup Plan.* Prepared by CH2M Hill

Ontario. Ministry of Natural Resources

1976 *Of Mines and Men: Small scale mining in the South Shield Region of Eastern Ontario, 1850-1920*. Kemptville.

Ontario Geological Survey

1979 *Gold Deposits of Ontario*. Prepared by J.B. Gordon, et. al. Mineral Deposits Circular 18, Part 2.

Ontario. Royal Commission

1890 *Report of the Royal Commission on the Mineral Resources of Ontario and Measures for their Development*. Toronto.

Ontario. Temiskaming and Northern Ontario Railway Commission

1914 *The Mining Industry in that part of Northern Ontario served by the Temiskaming and Northern Ontario Railway*. 1912.

United States of America. Department of the Interior

1919 *Mineral Resources of the United States, 1916*. Part 1: Metals. Washington.

1999 *National Register Bulletin #30 - Guidelines for Evaluating and Documenting Rural Historic Landscapes.* Prepared by Linda Flint McClelland, U.S. Department of the Interior, National Park Service, 1989. Revised 1999.

13.2.1 Unpublished Reports

CH2M Hill

2004 *Deloro Mine Site Cleanup: Industrial Area Closure Plan, Final Report*. Prepared for the Ontario Ministry of the Environment.

2004 *Deloro Mine Site Cleanup; Mine Area Closure Plan, Final Report*. Prepared for the Ontario Ministry of the Environment.

National Orphaned and Abandoned Mines Initiative

2003 *Lessons Learned: On Community Involvement in the Remediation of Orphaned and Abandoned Mines, Case Studies and Analysis.*

13.3 Books and Articles

Andreae, Christopher

1997 "*Industry, Dereliction, and Landscapes in Ontario,*" in *Ontario History* 89:2 (June).

1997 *Lines of Country; An Atlas of Railway and Waterway History in Canada*. Stoddart/Boston Mills, Toronto.

Baines, Chris

1980 "*The Value of Derelict Land for Environmental Education,*" in *Reclamation of Contaminated Land*. Society of Chemical Industry, London.

Bothwell, Robert.

1984 *Eldorado: Canada's National Uranium Company*. University of Toronto, Toronto.

Bowles, Roy T.

1982 *Metallurgical developments at Deloro, Ontario: 1868-1919*. CIM Bulletin, March.

Boyce, Gerald

1967 *Historic Hastings*. Hastings County Council, Belleville.

Canadian Mining Review

1896 "*Gold Mining in Ontario*," in *Canadian Mining Review,* Vol. 15, p. 29.

1901 "*Bounty wanted for Arsenic Refining*," in *Canadian Mining Review* 20:1901, 274–75.

1901 "*Gold and Arsenic, Fine Exhibit made by the Canadian Goldfields at Pan-American,*" in *Canadian Mining Review*, Volume 20, p.202-203.

Canadian Mining Journal,

1907 "*The Deloro Mining and Reduction Company,*" in *Canadian Mining Journal*, Vol. 1, #17, 517-22.

Chapman, L. J. and Donald Putnam.

1984 *The Physiography of Southern Ontario.* 3rd edition. Ontario Ministry of Natural Resources, Toronto.

Clouston, Brian.

1980 "*The Role of the Landscape Architect in Landscape Reclamation*," in *Reclamation of Contaminated Land*. Society of Chemical Industry, London.

Crowe, Sylvia.

1958 *The Landscape of Power.* Architectural Press, London.

Cuff, Robert and J.L. Granatstein,

1978 *American Dollars – Canadian Prosperity.* Samuel-Stevens, Toronto.

Encyclopaedia Britannica

1910 "*Gold,*" in *Encyclopaedia Britannica,* 11th edition, volume 12.

1910 "*Mispickel,*" in *Encyclopaedia Britannica,* 11th edition, volume 18.

Envision and André Scheinman.

2006 *Cultural Heritage Landscapes in Waterloo Region: A Framework for Inventory, Assessment and Policy Development*. Prepared for the Region of Waterloo.

Eyles, Nick.

2002 *Ontario Rocks: Three Billion Years of Environmental Change*. Fitzhenry and Whiteside, Markham, Ontario.

Gibson, T.W.

1937 *Mining in Ontario*. Ontario Department of Mines, Toronto.

Hamm, Manfred.

1981 *Dead Tech: A Guide to the Archaeology of Tomorrow*. Sierra Club, San Francisco.

Kierkgaard, Peter

n.d. "*The Harris System of Pumping by Compressed Air, as Applied to the Deloro Mine*," in *Journal of the Canadian Mining Institute*. p. 265–73.

1901 "*Treatment of Auriferous Mispickel Ores*," in *Canadian Mining Review* Vol 20, 1901 p. 50-54.

International Correspondence Schools

1899 *A Textbook on Metal Mining: Preliminary operations at Metal Mines, Metal Mining, etc.* International Correspondence Schools, Scranton, Pa.

1899 *A Textbook on Metal Mining: Preliminary operations at Metal Mines, Steam and steam-boiler, Steam Engines, etc*. International Correspondence Schools, Scranton, Pa.

Lowenthal, David.

1985 *The Past is a Foreign Country.* Cambridge University, Cambridge, Eng.

Miller, W. E.

1902 "*Eastern Ontario: A Region of Varied Mining Industries*," in *Journal of the Canadian Mining Institute,* Vol. 5, p. 333.

Newell, Diane

1986 *Technology on the Frontier: Mining in Old Ontario*. University of British Columbia Press, Vancouver.

Plomer, James and Alan Capon

1979 *Desperate Venture: Central Ontario Railway*. Mika Publishing Co, Belleville.

Rothwell, Richard P.

1881 "*The Gold-Bearing Mispickel Veins of Marmora, Ontario, Canada*,' in *Transactions of the American Institute of Mining Engineers*, Vol. IX.

1883 "*The Treatment of Gold Bearing Arsenical Ores at Deloro, Ontario, Canada*,' in *Transactions of the American Institute of Mining Engineers*, Vol. XI.

Smith, Philip

1986 *Harvest From the Rock: A History of Mining in Ontario*. MacMillan, Toronto.

Snell, Rendoll

1901 *Mines and Mining in Eastern Ontario*. Murray Printing Co., Toronto.

Tandy, Cliff.

1975 *Landscape of Industry*. Leonard Hill, London.

Tuan, Yi-fu.

1973 "*Visual Blight: Exercises in Interpretation*," in *Visual Blight in America*. Association of American Geographers, resource paper #23. Washington, D.C.

Wells, J. Walter

1897 "*The Mispickel Gold Ores of Deloro, Ontario*," in the *Journal of the Canadian Mining Institute*, Vol 2, 127-33.

Whorton, James C.

2010 *The Arsenic Century*. Oxford University Press, Oxford, UK.

Wallwork, Kenneth L.

1974 *Derelict Land.* Newton Abbot: David & Charles.

Wright, Sidney B.

1901 "*Treatment of Auriferous Mispickel Ores at Deloro*," in *Canadian Mining Review*, 20, 53-6.

1901 "*The Treatment of Auriferous Mispickel Ores at Deloro, Ontario*," in *Journal of the Canadian Mining Institute*, Vol. IV.

Young, Scott & Astrid Young

1967 *O'Brien: From Water Boy to One Million a Year.* Ryerson Press, Toronto.