APPENDIX A: STEERING COMMITTEE MEMBERSHIP

Robert Tremain, Supervisor/Curator, Lambton County Museums (Chair)
Connie Bell, Manager, Oil Museum of Canada
Martin Dillon, Petrolia Heritage Committee
Charles Fairbank, Fairbank Oil Properties
Dawn Marie Gates, Oil Springs Heritage Advisory Committee
John Dickson, General Manager, Tourism Sarnia-Lambton
Mary-Pat Gleeson, Petrolia Town Council
Ruth Kernohan, Lambton County Historical Society
Duncan McTavish, Clerk-Administrator, Enniskillen Township
Gordon Perry, Mayor, Village of Oil Springs
Christine Poland, Clerk, Village of Oil Springs
Dave Posliff, Manager of Planning and Development Services, County of Lambton
Betty Lou Snetselaar, Lambton County Historical Society
Charles Fisher, Revenue Development Officer, County of Lambton
April James, Manager of Libraries, Museums and Galleries, County of Lambton
Robert Cochrane (deceased), Cairnlins Resources

APPENDIX B: EQUIPMENT INVENTORY OF FAIRBANK FIELD

LIST OF HEADINGS

STUDY INVENTORY- PURPOSE AND METHOD

The purpose of undertaking a field inventory was to identify the non-movable components of the Oil Springs Oil Field, and record their location, from which the Study Team could determine which features are of relevance to the proposed Heritage Conservation District. The inventory was undertaken by Christopher Andreae, Senior Built Heritage Specialist, and Lashia Jones, Built Heritage Technician, of Golder Associates Ltd. with the assistance of two volunteers from the Oil Museum, Meaghan Nelligan and Steve Loxton.

The findings of this inventory are organized by the processes of oil extraction: the first section examines the methods of pumping wells. The second section covers oil storage, while the third discusses maintenance and operations. The fourth section identifies some of the ways in which oil production has affected the landscape – and visa-versa. Analysis of the field and its features has been provided, documenting areas that may be considered 'better' than others because of visibility, or historical integrity. In addition, some analysis of the field's technological evolution, variety of landscapes, and the condition of certain key features was completed. Over 700 individual features were inventoried.

Sites were identified by a pedestrian survey of the fields on the Fairbank Oil Property (Figure B-1). Typically, one photograph was taken per feature. Permission was not obtained from the other Oil Springs oil producers to inventory their properties. Features examined in this inventory included, but were not limited to**:** pump jacks, jerker lines, power sources, in-ground tanks and auxiliary services such as a blacksmith shop and receiving stations. The location of non-well features were plotted by their approximate relationship to the location of known wells (Figure B-2).

All resources in fields owned by Fairbank Oil Properties in 2002 were plotted using 1:2,500 well-location maps provided by Fairbank Oil. Resources found on fields purchased after 2002 were mapped using high quality aerial images provided by Lambton County.

The 1:2,500 map depicted 11 named fields owned by Fairbank Oil Properties. The Fairbank Field (labelled FS on the map) is the original 19th century Fairbank family property. The other fields were named after significant owners of the former properties. The fields are as follows: James Field (J), Byers South Field (BS), North Byers Field (NB), Demers Field (DM), Barnes Field (BN), Evoy Field (EV), Morningstar Field (M), George Bernard Shaw Field (GBS), the Woods Field (W) and Irving-Byers (IV).

Each operating well has a unique identification number. The forerunner of this numbering system was introduced on the Fairbank field sometime around 1911, and introduced to the other fields at the time of their various purchase dates.

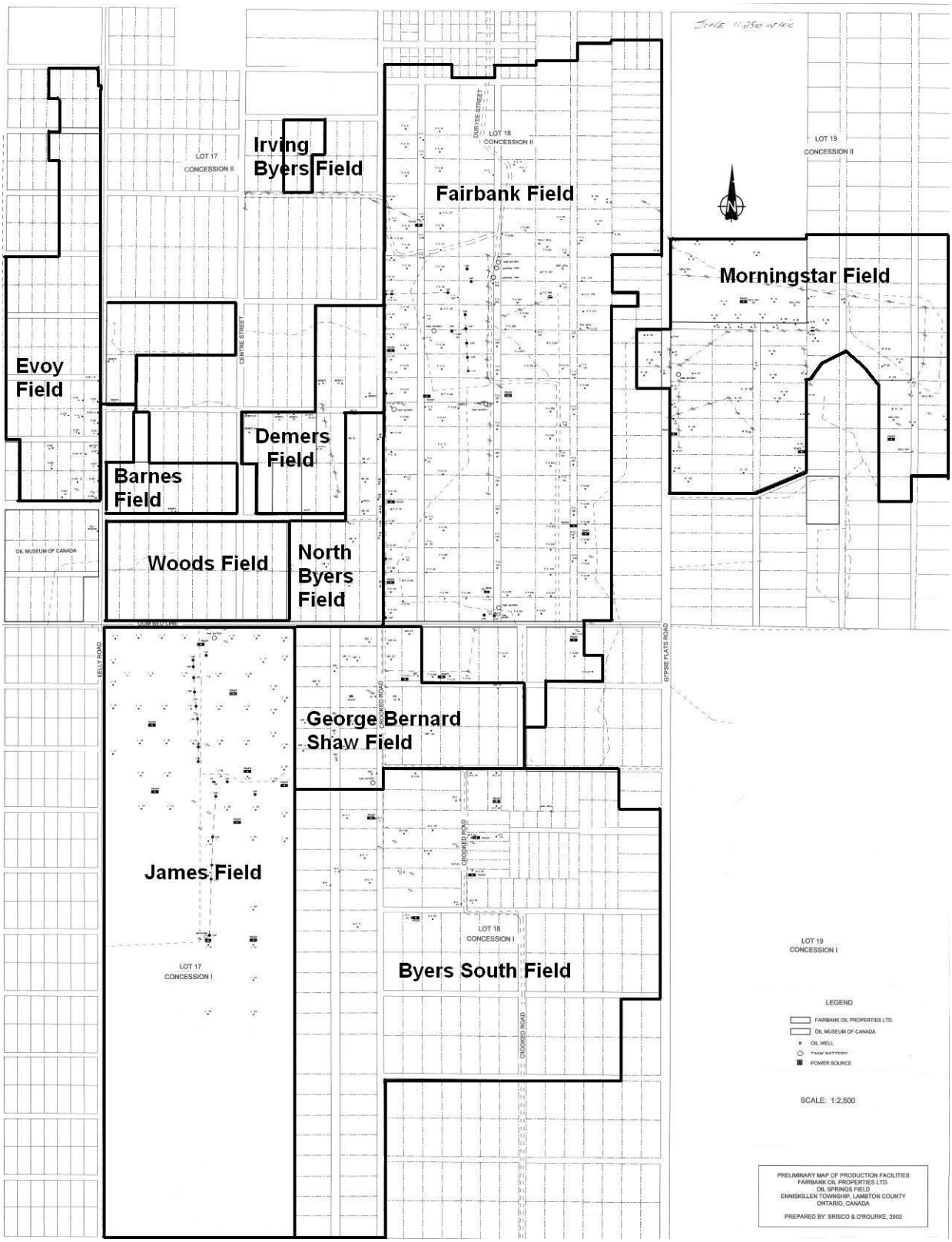

Figure B-1: Map of Inventoried Fields

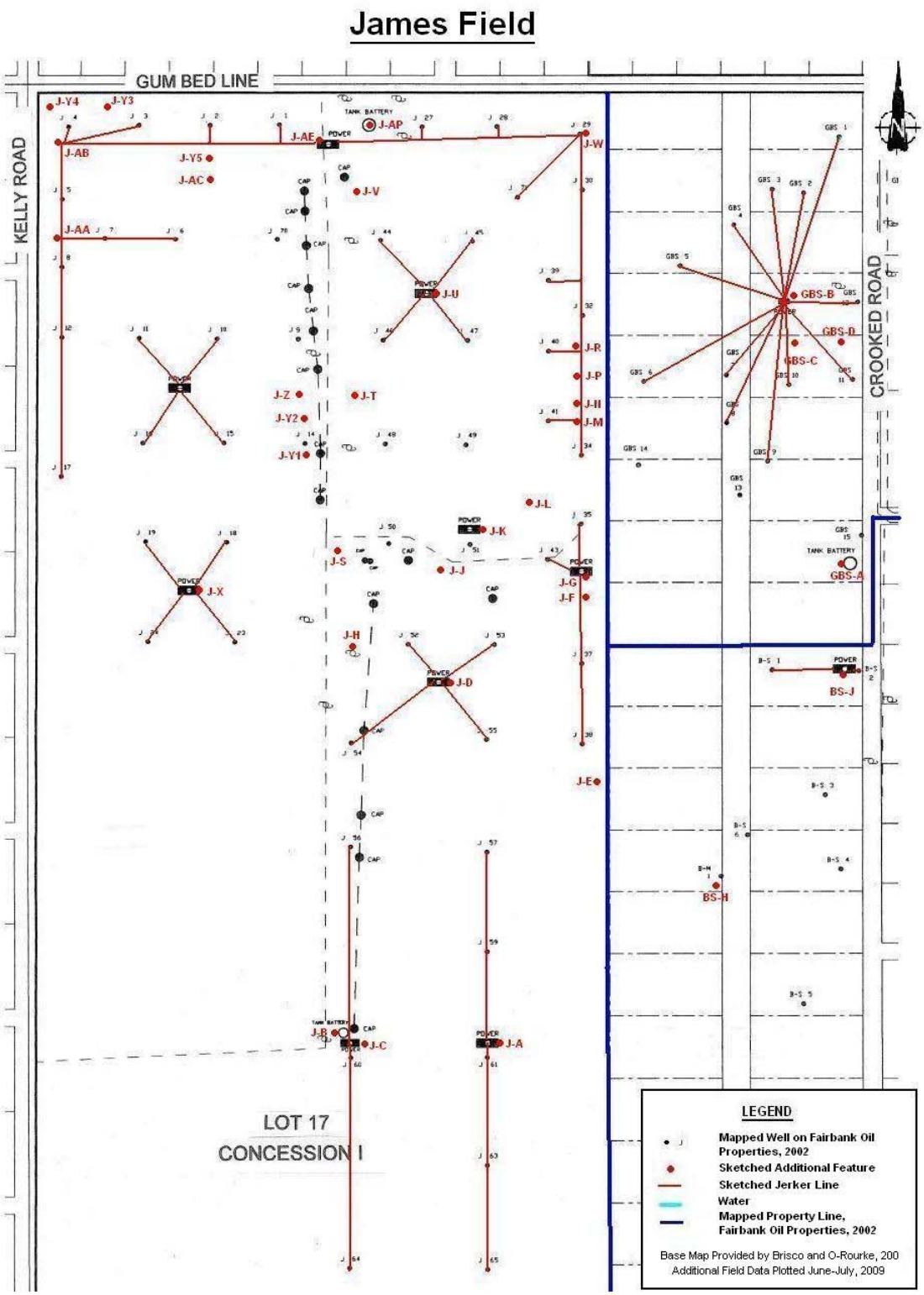

Figure B-2: Example of inventory map Note: Portion of 1:2500 plan showing the James Field with it well numbers and sites of central powers. The jerker line system has been sketched onto the plan.

PUMPING SYSTEMS

CANADIAN JERKER LINE SYSTEM

The Canadian jerker line system was developed in the 1860s by John Henry Fairbank to provide an economical way to pump multiple oil wells from a single power source. The design has not changed substantially since then. The system is particularly evident on the James and Fairbank Fields. The system is comprised of three elements:

- Central Power
- Field Lines
- Wells

The Canadian jerker line system incorporates several varieties of technology. Powerhouses tend to be constructed of painted wood or sheet metal, and most were found to be in good condition. The Fairbank and James Fields exhibit powerhouses in very good condition, especially those visible from the road. The Byers South Field contains a wooden power house that has been abandoned and is in a state of advanced decay. Some of the systems transfer power via wooden jerker lines, others from steel rods or cables. For the majority of operating wells, these lines are in good condition, as necessary for operation. The majority of pump jacks, while they may look old and worn, are in fine operating condition. There are some examples of the Canadian system that are better than others, primarily due to their condition or visibility. The Fairbank Field and the north portion of the James field display the best examples of operating Canadian jerker line system using the most historic technology.

CENTRAL POWER

Powerhouse: The power supply was originally provided by steam engines, today electric motors are used. The speed was reduced by belts that were connected to cranks that imparted a reciprocating motion to connecting rods. Figures B-3 and B-4 are an example of the standard metal design developed in the 1930s or 1940s for electric power.

In total there are eight operating powerhouses of various constructions operating in the fields; five on Fairbank, one on the James Field and one on the George Bernard Shaw Field. The best examples of operating powerhouses are found on the Fairbank Field. One particularly well maintained and visually appealing structure is located in the south portion of the Fairbank field, just visible from Gum Bed Line through the forest brush (Figures B-3 and B-4). This powerhouse is constructed of board-and-batten siding and painted deep red with white trim. The internal machinery provides power to two bull wheels and nine pump jacks. It is situated near large abandoned tank batteries, as well as the interpretative metal sculptures depicting workers and operations from the oil field's history.

Figure B-3: Powerhouse FS-D1, South Fairbank Field

Figure B-4: Interior of Powerhouse FS-D1, South Fairbank Field

In addition five 19th and early 20th century powerhouses are abandoned. Most are in ruins but some have been moth-balled. These structures include the nearly collapsed wooden powerhouse on the Byers South field (Figure 5), one on North Byers and two on the Morningstar Field.

The fifth powerhouse near the centre of the Fairbank field was the former "Big Rig" which contained a large steam engine that pumped all of the Fairbank wells. The advent of

electric power, combined with the risk of complete shut-down by having the steam engine break, lead to the construction of smaller electric power powerhouses scatted throughout the field. A portion of the former Big Rig has been converted to part of the blacksmith shop.

Figure B-5: Power house BS-B on the Byers South Field

The powerhouses represent both the use of traditional, early technology on the field, as well as the processes of evolution and change. They provide power to the bull wheels and often wooden jerker lines, technology present from the field's origins. They also demonstrate the embrace of technological change, now operating off electric power rather than steam.

Bull Wheel: The bull wheel is a heavy cast iron wheel in a timber frame that distributed the motion from the central power source to the field lines (Figure B-6).

Figure B-6: Bull wheel at Orchard Rig (FS-M) with connecting roads leading from powerhouse on left side. A double field line runs diagonally from upper left to lower right while a single line extends to the centre/back of the photo

Connecting Lines: Wooden rods were originally used to transmit the power from the central powerhouse to the wells. Several such lines have been maintained on the

Fairbank and James Fields (Figure B-7). Eventually, metal rods were substituted for wood, and some lines used steel cable. Special connections were required to change the direction of travel, such as the field wheel in Figure B-8.

Figure B-7: Connecting line on the James Field, Feature J-AA.
In the background beside the person is a metal triangle to divert the line 90° to a well.

Figure B-8: Field wheel J-AB on James Field to divert the line 90°

Several examples of wooden rod technology are evident in the fields. Fairbank and James, in particular, have maintained extensive wooden jerker line systems. On the Fairbank Field, the majority of the lines are wooden, the rest being steel cable. The north portion of the James Field uses wooden lines, with steel cables towards the south. The condition of the wooden jerker lines tends to be very good, as they are a strong historic asset to the field and are subject to regular maintenance and upkeep. Steel cables also tend to be kept in good condition, as the jerker lines are extremely important in the daily operations of the oil field.

Where jerker lines are present on the Morningstar field, GBS and Byers South, they are almost always steel cable. The North Byers, Demers and Barnes Fields do not contain any jerker lines since all wells are individually powered. The Evoy Field has no pumps, and all wells have been capped.

Where the jerker line system has been abandoned, some evidence usually remains of hanger posts and field wheels. In areas of recent abandonment, parts of the line itself may still be found on the ground.

In addition to jerker lines, features identified as "triangles" are important devices for transferring power to the pump jacks. There are several varieties of triangle mechanisms. Some are constructed of wood with metal hinging, and allow the line to change direction, or allow an offset to connect to a well. Others, constructed of metal tubes, serve the same function (Figure B-6). An axle triangle (Figure B-9) uses a rotating metal disc to solve the problem of snow build-up that could jam other triangle designs.

Figure B-9: Feature FS-G, Fairbank designed the axle triangle,
to solve the problem of snow build-up on previous triangle constructions

Wells: A timber walking beam – rotating on an iron bearing on top of a post – is connected by chains to the field line and to the pump sucker rod. Although not technically part of the jerker line system, each well had a timber, in-ground storage tank to hold the oil until a tank wagon removed it to a shipping point. All well storage tanks have been abandoned and oil is pumped by pipeline to a central receiving station

Figure B-10: Feature J-45, pump jack and storage tank

These wooden pump jacks are distinctive to the Canadian Jerker Line System. There were some variations on the pump jacks, which used a wooden triangle instead of a metal chain and pulley to connect to the jerker line.

An additional type of pump jack was found on some of the steel cable jerker lines. Named the Jones and Hammond pump jack, after its manufacturer, they are constructed of metal tubing in a pyramid shape with a triangular frame head for pumping (Figure B-11).

Figure B-11: Feature FS-75 Jones and Hammond pump jack on steel cable jerker line

The condition of the wooden wells, both operating and abandoned, is generally quite good. This could be, in part, due to the coating of oil the beams have collected over their lifetimes, protecting the wood from pests and exposure to the elements.

PENNSYLVANIA JERKER LINE SYSTEM

The "Pennsylvania System" was similar in function to that of the "Canadian" system. The main difference is that it used steel cables- apparently characteristic of the Pennsylvania jerker system- rather than rigid poles. The system is found primarily on the Morningstar

Field. Pennsylvania pump jacks on the Morningstar Field are found in several designs. They include wooden posts from a previous wooden jack, with steel walking beams, or vice-versa.

Not much is known about the Pennsylvania system at Oil Springs, other than that the technology and some parts were brought from Pennsylvania oil fields. The system uses an electric motor and central wheel located in the centre of a group of wells (Figure B-12). The wheel provides power to a number of wells distributed in a web-like pattern, rather than linear connections. The example at Oil Springs seems to contain key elements of the Pennsylvania system, but the somewhat chaotic look of the equipment makes it difficult to appreciate the design and operation.

The George Bernard Shaw Field contains a hybrid jerker line system which utilizes a Canadian System bull wheel and an enclosed power system of a much smaller scale than the other powerhouses (Figure B-13).

Figure B-12: Feature M-X, Pennsylvania System field wheel and lines, Morningstar Field

Figure B-13: Hybrid system of geared, enclosed electric motor with a Canadian system bull wheel.

FIELD MOTOR SYSTEM

Most of the field motor jerker lines on the Fairbank Oil Properties are relatively small systems operating two to six wells. The function is identical to that of the Canadian system except that power is obtained from unenclosed, electric motors with reduction gearing rather than using the massive belt system and cranks. Two types of motor designs are most common (Figures B-14, B-15).

Figure B-14: Feature M-Q, low field motor on the Morningstar Field

Figure B-15: Feature FS-A1, field motor on south Fairbank Field

The field motor system is found frequently on the Morningstar, Byers and Fairbank Fields. Many of the motors are quite small and low to the ground. They are often invisible in areas of thick grass and brush. Small field motors also serve wells in groups of four arranged in an X shape, with the motor situated in the middle and lines connecting outward to the wells (Figure B-16).


Figure B-16: Field motor with X shape well arrangement

The areas with these field motors again demonstrate the historic evolution and adaptation within the Oil Field. They allow a more compact, cost efficient operating system that, in turn, allowed for the continued operation of the historic oil field. This arrangement is common on the James Field. Small field motor on James Field, serves wells in an X arrangement.

INDIVIDUALLY POWERED WELLS

Individually powered pump jacks have replaced the central power system in locations where a closed well or field has been brought back into production, when the jerker-line system has worn out, or when running a jerker line has failed to be cost effective. Most individually powered wells are assumed to have been introduced since the Second World War.

The designs of the steel pumps vary slightly, but they are uniformly recognizable by the small motor located at the base of the jack, which connects to an electric source nearby for power (Figure B-17). These pumps are found throughout the Fairbank Oil Properties.

Figure B-17: Feature M-32, individually powered steel well on the Morningstar Property

The individually powered wells are not currently of significant historic value, being recent additions to replace older features. They do, however, contribute to the landscape of an operating oil field and enable the field to remain an economic producer.

OIL STORAGE/HANDLING

STORAGE TANKS

In addition to abandoned day tanks adjacent to active wells, there are numerous small, timber, in-ground tanks scatted throughout the properties. Since they are of similar size to the existing day tanks, it is assumed that wells once operated at the same sites.

The majority of the tanks rise less than a foot above ground, are about three-feet in diameter and have earth banked against them (Figure B-18). Most have a circular wooden cover that includes one or two raised square boxes with bottoms open to the well, and lids that can be removed. Some tanks are larger and uncovered. These day tanks received oil from the adjacent well. Tank wagons came periodically to empty the tank and take the oil to large storage tanks.

Figure B-18: Feature FS-X, small in-ground day tank on Fairbank Property, with old piping still attached

Two immense in-ground wood tanks still remain on the Fairbank Field that was originally used for oil storage. Today they are used as part of the oil well brine disposal system (Figure B-19).

Figure B-19: Feature FS-AG, large wooden tank in background used for brine disposal system

Most tanks have been abandoned, and are in poor condition with rotting wood sides. Those that have been abandoned for a long time are marked by a circular growth of reeds. Other tanks are in excellent condition, having been fitted with new wooden tops.

These in-ground tanks have been replaced by underground pipelines that run from each well to receiver tanks. In addition to receiver tanks there are large, steel storage tanks scattered throughout the field. Some tanks have been decoratively painted, while others have been left to rust (Figure B-20).

Figure B-20: Scattered throughout the property are very large steel tanks that may have been used for oil storage but are now abandoned.

RECEIVING STATIONS

Originally oil was brought from individual wells by tank wagons to a central receiving station (Figure B-21). Today this is done by pipes. Until the 1950s oil was shipped by rail from the receiving station at the intersection of Kelley Road and Gum Bed Line (Figure B-22). Today there is several truck receiving stations on the Fairbank Oil Property (Figure B-23).


Figure B-21: Feature J-Y (3), oil tank wagon on James Field

Figure B-22: Pump room at former receiving station at Kelley Road and Gum Bed Line

Figure B-23: Receiving tanks on South Byers field.

WELL MAINTENANCE

Few features pertaining to well maintenance are still present in the fields. One original three-pole derrick remains on the Byers South field (Figure B-24).These were used to handle tools used in well maintenance. Reconstructions of derricks have been placed on the South Byers and the Fairbank fields to mark particularly important well sites such as the Black & Matheson Gusher Well of 1862. Also on the South Byers field stands the last remaining horse barn (Figure B-25), which housed some of the horses used to haul tank wagons to the receiving tanks and operate the derricks.

Figure B-24: Feature BS-F, last standing original three-pole derrick in the Oil Springs oil field. (located in the South Byers Field)

Figure B-25: Last standing horse barn in the Oil Springs oil field (located on the South Byers Field)

The blacksmith shop (Figure B-26), located on the Fairbank field is no longer used on a regular basis. Blacksmithing was once critical to maintenance of the wells. As new tools and materials have been developed over time they have replaced earlier maintenance systems. Metal hangers for example, that once supported the wooden jerker lines have in many cases been replaced with nylon rope for ease of maintenance.

Figure B-26: Site of former "Big Rig" and later blacksmith shop.
This area is the maintenance depot of the oil field today

ENVIRONMENTAL PROTECTION

The oil extracted at Oil Springs contains a high concentration of brine. Until the 1990s this brine was dumped into surface holding ponds and watercourses. Provincial environmental regulations were introduced in 1990 to prohibit the discharge of wastewater into surface streams. The brine had to be pumped back underground into a rock formation below the oil bearing strata. (Figure B-27) Since all of the Oil Springs wells had been drilled before good core sampling techniques had been developed, drilling brine disposal wells in 1988 provided the first good geological data of the field.


Figure B-27: Feature NB-N, brine separating system.
Since the 1980s, the brine must be separated from the oil and injected back into the ground

LANDSCAPE ELEMENTS

AGRICULTURE

Evidence of agricultural practices is still evident on the oil fields. A few houses and barns remain, such as feature J-V, former farmhouse on the James Field (Figure B-28). The Orchard Rig on the Fairbank Field was named so because of the pear orchard that once covered the field. The abandoned horse stable on the Byers South Field, and the others that have since been destroyed would have housed hundreds of horses. Some of these would have been used for agricultural purposes, though their primary function was transporting oil. Just off the boundaries of the Fairbank Oil Property sits another horse barn, though it has mostly collapsed.

Figure B-28: Former Farm house on James Field

Currently, larger barns in good condition house sheep and other farm animals on the Fairbank Field (Figure B-29). Sheep and llamas can be seen on several parts of the field, and exist both for Oil Field and commercial use. Their primary task within the field is to feed on the grasses which, if allowed to grow too much, can obstruct the jerker lines.

Some commercial crop fields can be found on the property, such as the soybean patches on the James property. The land surrounding the Oil Field and much of the surrounding rural area has, and continues to be, primarily agricultural property.

Figure B-29: Feature FS-A, animal barn on Fairbank Field

SETTING OF OIL WELLS

Wooded Black Creek Valley: The wooded valley areas of Black Creek contain naturalized vegetation, tall trees, vines and valley slopes, making pumps and lines difficult to see. Most jerker lines are able to run close to the ground through vegetation, however, some are elevated and run overhead of the pump-jacks in order to cross the creek. This landscape is found primarily on the Morningstar Field (Figure B-30). The creek and vegetative obstructions provide unique features in the position and technological adaptations of the wells and jerker lines (Figure B-31).


Figure B-30: Pump jack in valley on Morningstar Field, with elevated jerker line

Figure B-31: Bridge for maintenance crews to inspect jerker line over Black Creek on Fairbank Field.

Open fields: Most of the Oil Springs oil field consists of open fields defined by flat land, rough grasses and few trees. Long views of jerker line systems are evident in this landscape. Some fields tend towards scrub hawthorn thistle, which may reduce visibility of jerker lines and wells, but do not completely hide them. Jerker line systems have no difficulty navigating in this terrain (Figure B-32), and their patterns in these areas tend to be fairly low and linear (Figure B-33). These fields, such as the James and south Fairbank, can be perceived to have higher prevalence of historic technology, likely because of their unobstructed views of entire power and jerker line connections.

Figure B-32: Tree growing around jerker line on James Field

Figure B-33: Open area and linear jerker lines on the James Field

Wooded Fields: The areas of wooded fields contain naturalized vegetation and mature trees. These require access roads and clearings for wells. There are no vistas present in this type of landscape, and jerker line systems are not immediately visible. Wooded fields can be found primarily on the Byers South Field (Figure B-34).

Figure B-34: Byers South Field

Disturbed Drainage: The combination of the heavy clay of Lambton County combined with the slow collapse of in-ground tanks has created semi-permanent small circular wetlands in many places in the oil field (Figure B-35).

Figure B-35: Rushes indicating the location of former in-ground tank

Earthworks: Much of land along Black Creek in the Fairbank Field shows low pits and mounds that are indicative of early well sites (Figure B-36). The East Gum bed is a wooded area covered with pits and mounds dating from the 1860s oil boom (Figure B-37). Much of the area is obscured by vegetation. It was in this area that the Tripp Brothers began to mine the gum, or tar, to sell as asphalt.

A railway line that once crossed the west side of the oil field has largely disappeared due to agricultural activities. There may still be a few trees that once lined the right-of-way on the Evoy Field. A portion on the earthworks has been saved on the Oil Museum property.

Figure B-36: Pit with mound indicating site of former well

Figure B-37: Photograph depicting water-filled dug well in the East Gum Bed, April 2009

ANALYSIS

Certain areas of the various inventoried fields can be considered "better" than others in terms of continued use of historic technology, condition and visibility. Some fields still make use of the Canadian jerker line system, the original technology used to pump in the mid 19th century when the field came into production. The Fairbank Field is the best example of having kept this technology running. The majority of wells on this field are pumped by the Canadian jerker line system. As designed in the 1800s, the jerker lines were constructed from hardwood rods and many continue to operate on the Fairbank Field. This is, in part, due to the interest of the field's owner, who as a fourth-generation family member to run Fairbank Oil, acknowledges the traditions and technologies introduced by his ancestors. These sentiments have also led him to preserve original technologies on other fields that have been acquired over the years.

The James Field, located to the southwest of Fairbank Field, also maintains use of the Canadian jerker line system. While much of the field runs off steel cable lines, the north portion of the field, that which is visible to the road, has maintained its original use of wooden lines. This visual appeal adds to the heritage tourism potential which is promoted by the Oil Museum of Canada.

EQUIPMENT

In addition to the Canadian jerker line system, other elements of 19th century technology are evident on the fields. Wooden pump jacks, cast iron bull wheels, powerhouses with operating machinery, horse stables, blacksmith shop, receiving station, wooden storage tanks and in-ground tanks all exist in the fields. The fact that these remain, and that many are still used, speaks to the ingenuity of the first generation of oil men as they designed a system uniquely suited for the needs of Oil Springs.

The condition of the historic features varies. Some, such as the majority of pump jacks, powerhouses and jerker line systems on the Fairbank field are in excellent condition. Every field contains some abandoned well sites, often with the abandoned pump jacks left in varying degrees of decay. On the Byers South Field, one wooden powerhouse is in very poor condition. It had become very weathered, the roof has been removed, and the structure is barely standing.

Nineteenth century technology does not occur in all operations of the greater Fairbank Oil Property. Many wells have been equipped with steel, individually-operated electric pump jacks that do not run from a jerker line. Other wells, though run from jerker lines, are powered by small uncontained field motors, rather than the large bull wheel and powerhouse mechanisms. These replacements, however, should not be dismissed as unimportant in contribution to the area's historic character. Rather, it demonstrates the technological evolution and innovation over time, to adapt to changes and embrace a variety of operations that give the field a unique quality, and also allow it to continue to be efficient and economically feasible. The individually-powered jacks pump a larger volume

of oil that allows for the preservation and maintenance of the perhaps less-efficient, historic elements.

Community members and those closely involved in the operations of the oil field expressed that while it was certainly important to focus on the preservation of historic attributes, the necessity for change and innovation should not be overlooked in a conservation designation. Nor should owners be encumbered by a preference for antique features, but should be encouraged to seek out alternative technologies to bring the field's production forward into its second century. It is these very processes that make the field what it is today.

Though over 700 built features were inventoried, the variety of landscapes present in the field contributes equally to its unique and historic character. The East Gum Bed, though not easily visible due to thick vegetation, consists of a series of mounds and pits that are indicative of early diggings and well sites. This area was where bitumen had been dug and sold as asphalt, and where the beginnings of the oil field lie, though one might not guess this given the unassuming appearance of the area. Most of the wells are situated on open fields, without obstruction from thick vegetation or elevation, allowing for easy access and good visibility. These landscapes also allow for distinct low-lying jerker line patterns with enough space to support long, linear and webbed connections.

In areas that may be open, but still subject to elevation or floodplain, unique means of supporting jerker lines have been constructed. In the Fairbank Field a long, narrow bridge has been built over Black Creek to allow the jerker line to cross the creek without being disrupted by flooding, as well as to allow field workers access to the line for maintenance reasons. On the Morningstar Field, one location avoids a patch of dense vegetation by placing the field motor centrally, near the outskirts of the brush patch, constructing tripods to elevate the cable jerker line to run overhead of the wells. Another location on the Morningstar Field (Figure 29) elevates a small connection of jerker line to allow it to cross a segment of Black Creek. The use of these mechanisms once again speaks to the innovation and ingenuity of the field operators, and adds variety and uniqueness to the field.

Other landscape features demonstrate the forces of change and abandonment present within the field. Many abandoned in-ground tanks are evident only from the perfectly circular growth of reeds within their perimeter.

Numerous pits and mounds are present on the fields, indicating early well sites, and possibly excavations of pre-European, aboriginal origin. The identification of such sites, relative to their description recently found in primary source materials of the 1860s, represents an area of considerable potential and interest for future academic inquiry and field work.

APPENDIX C: CONSERVATION ASSESSMENT OF FAIRBANK FIELD
LIST OF HEADINGS

INTRODUCTION

The conservation of the oil field artifacts will be influenced by four issues. For the purposes of this conservation assessment historic objects and operational equipment are collectively referred to as artifacts. The term artifact is used to indicate a material object rather than specifically imply historic significance.

Preponderance of Wood Artifacts: In terms of both visual presence and volume, the oil field is dominated by operating wooden jerker lines, pump jacks, abandoned frame buildings and jerker lines. Wood is not permanent and requires constant maintenance and replacement.

Environmental Impact on Artifacts: Most of the historic oil field equipment is outdoors. Motors powering the large jerker line fields are the only equipment contained in buildings. Therefore virtually everything is exposed to the weather. Open-air artifacts are far more difficult to conserve than objects housed in a building.

Operational Impact on Artifacts: As private operations, Oil Springs producers operate their fields as economically as possible. This requires a trade-off between maintaining the historic and economic operation of the field. At the present time, the historic method of working the field with jerker lines is also the most economic. In the future, the balance between historic operation and economic operation may change.

Abandoned-in-place Artifacts: A characteristic of the field's operation is that equipment is often abandoned-in-place. The benefit of this action is that historic components are not sold as scrap and can thus be documented in the future. The disadvantage is that once abandoned, an otherwise intact artifact may begin to deteriorate rapidly.

CONSERVATION APPROACHES

This report provides an overview of conservation needs and range of materials found in the field, without specifying any individual method of treatment. The Parks Canada *Standards and Guidelines for the Conservation of Historic Places in Canada* provides general guidance for engineering works. A conservator with experience in industrial equipment will be required to provide the knowledge to develop a regimen of treatment for specific artifact types.

Visual evidence in this field suggests that regular exposure to crude oil has served as an effective wood preservative. The value of using crude oil as an acceptable conservation method should be investigated.

PRIORITY OF CONSERVATION ACTIVITIES

The Fairbank Oil Properties contains an immense collection of material objects pertaining to the history and operation of the oil field. The inventory conducted for the proposed

HCD identified over 700 features. This conservation assessment focuses on fixed items and not movable objects. A comprehensive inventory would include thousands of items.

Given the immense number of artifacts and structures located within the proposed HCD, conservation should be undertaken on a priority basis as resources become available. The three tiered ranking system prepared for the HCD (See Section 5.0) should be used as a method for allocating resources:

Rank 1: Primary Historic Resources

- Canadian Jerker Line System of pumping
- Historic Wells
- Maintenance (Three Pole Derrick; Horse barn/Stable)
- Transportation

Rank 2: Secondary Historic Resources

- Historic technology that was essential to oil industry but not specific to the Lambton County oil industry:
- Pennsylvania 'waterflood' system
- Modern modifications to jerker line system
- Maintenance (well-puller vehicles)

Rank 3: Supporting Resources

Features inventoried on the Fairbank Oil property may have cultural significance not directly associated with historic oil production:

- Farming
- Abandoned steel tanks within the fields.
- Steel Sculptures: local folk-art created and installed to animate and interpret the industry
- Brine disposal system of 1990s.

MATERIAL TYPES:

WOOD

OPERATING EQUIPMENT: The primary wooden operating equipment includes jerker lines and pump jacks. These are replaced as necessary either because they have reached the end of their useful life or because of environmental decay. This rebuilding of wood equipment has been an ongoing historic process.

Conservation Issues: Replacement timber should attempt to maintain historic proportions and materials. A record of dimensions should be maintained for items that are replaced on a regular basis – such as jerker rods. Large dimension timbers, such as used in pump beams may be too expensive to replace in-kind and a record of the historic sizes should be maintained. Ideally, the original timber species should be used; however this may not always be possible.

ABANDONED-IN-PLACE

Artifacts that have been abandoned in-place account for the largest amount of wood features in the oil field. These items cannot be put under cover because the cover such a large area of the field. Any kind of roofing would destroy the historic context of the field. For conservation purposes, these artifacts can be categorized as:

- *Classes of Equipment* (tanks, jerker lines, wells, etc)
- *Unique equipment*

Classes of Equipment

Day-storage tanks appear to constitute the largest class of abandoned-in-place artifacts. They are found beside operating wells and alone in open fields where wells have been abandoned. The tanks were built of wood staves. Some are almost completely buried while some are almost completely out of the ground. Metal hoops are used to hold the above ground portion of the tanks together. The condition of these wooden tanks varies from almost completely intact to vestiges of wood staves in the bottom of a pit typically partially filled with water.

Figure C-1: Abandoned day tank on Woods Property

Remnants of *former jerker line corridors* are another large "class" of equipment. This consists of wood posts that supported the hangers and jerker lines. These abandoned corridors also contribute to the visual character. However, they are particularly important in tracing out former patterns of power corridors. Because the posts are rotting, the location of the corridor is becoming less distinct over time.

Conservation Issues: Survey patterns of location of tanks and jerker lines so that a record is maintained if these resources disappear.
Undertake *in situ* preservation of tanks, perhaps using crude oil as a preservative.

Unique Equipment

Some types of equipment were once very common in the oil field but now only rare survivors remain. The best example is the three pole derrick. Although hundreds were once found in Oil Springs, only one remains at present. In recent years, new derricks have been erected to mark important wells and re-establish this visually prominent aspect of the historic landscape.

Wood was also once used for well casings. Although vestiges are still evident, these have largely disappeared on the surface but may remain as archaeological resources.

Conservation Issues: Undertake *in situ* preservation using best available practice.

Figure C-2: Last standing original 3-pole derrick in the Oil Springs oil field, located on the South Byers field.

METAL

Ferrous metals at Oil Springs include steel (structural shapes, sheet, cable), wrought iron and cast iron. Throughout the 20th century steel has been available in standard shapes and quality. It is not known to what extent the quality of steel or available shapes has changed over the last 100 years.

Iron castings were once commonly used. Today it is often cheaper to build up a shape through welded components or to machine the piece. Castings can only be made if the original pattern still exists.

Wrought iron is no longer manufactured and the supply at Oil Springs consists of recycled historic supplies. The last major use was to individually forge metal hangers for jerker lines.

Figure C-3: Field motor on steel frame with steel jerker rods on the James Field

Other metals used at Oil Springs include brass for well pump fittings. Babbitt is still used as a bearing material in a few machines.

Conservation Issues: Unless there is a special reason, worn or corroded steel should be replaced with modern steel of the same dimensions. Castings and wrought iron from abandoned field equipment should be stock-piled for selective reuse in the field.

CONCRETE

Concrete is found at Oil Springs as mass, reinforced and pre-cast types. The Big Rig enginehouse is an early example of concrete building construction. It appears likely, but not confirmed that it was built without reinforcement. It is also assumed that most of the engine mounts were mass concrete. Reinforced concrete seems to have been used in some experimental jerker line posts.

Figure C-4 Experimental concrete jerker line post

Figure C-5: Concrete block enginehouse on the James Field

Conservation Issues: From a conservation perspective, it is unlikely that the block moulds still exist. Unused concrete blocks should be stock piled for repairs in future years.

The conservation of historic concrete can be technically difficult. Concrete artifacts should be monitored for spalling or crumbling concrete and the appropriate specialist retained.

LEATHER

Leather is used in some of the operating equipment. Leather belts connect electric motors and the reduction gears in the powerhouses. Leather cups are used in the pump valves in the wells. No historic leather items were noted.

Conservation Issues: At the present time both belting and cups are still commercially available. This may not always be the case in the future.

PLASTIC

Plastic is not yet a "historic" material at Oil Springs but is increasingly part of the operation and landscape. The most extensive, although invisible, use of plastic is for the buried network of PVC pipe that transports oil from the wells to storage tanks. Nylon rope is widely used in place of metal hangers to support jerker rods. Much of the brine separation equipment is made of plastic.

Conservation Issues: If (when?) future planners consider plastic to be historic, it may be difficult to find methods to repair, replicate, or conserve these complexes.

Figure C-6: Feature NB-N, Brine separating system on the North Byers Field.

ARTIFACTS WITH MULTIPLE MATERIALS

Much of the oil field equipment contains multiple materials. The timber jerker lines are connected together with metal plates. Steel barrel hoops hold the wooden staves together.

Conservation Issues: In most cases, best-practice conservation methods can be followed in dealing with the materials.

In some cases, such as field wheels, the original choice of materials may accelerate decay. When abandoned, the weight of the field wheel will cause the frame to collapse. In situations such as this, the weaker material must be braced when the component is abandoned.

EARTHWORKS

Possibly the most historic earthworks at Oil Springs are the East Gumbed pits. Elsewhere, especially along the valley wall of Black Creek, the landscape is dotted with 19th century earthworks of pits and mounds from old oil workings. A portion of the railway right-of-way embankment survives on the Oil Museum Property.

Conservation Issues: Earthworks are an often overlooked material on industrial sites. Identification of the feature and description of its historical significance is a critical first step to avoid casually or inadvertent destruction. Erosion inevitably causes slumping of the earthwork slopes and overtime the feature becomes less distinct. Ploughing and trees growth should be avoided. Foot traffic impacts should be monitored and appropriate action taken.

Figure C-7: Cast iron field wheel with collapsed timber frame in Woods Field.

MOVABLE EQUIPMENT

Heritage Conservation District guidelines are applicable only to fixed, real property. Therefore conservation of wagons and other portable equipment is not strictly part of Conservation District studies.

The former tanker wagons are the most visible, and possibly the most historic, moveable equipment on the field. The bodies are made entirely of wood with some metal fittings; some have wooden wheels while others were cut down to rubber tires or converted to steel wheels.

Conservation Issues: Tanker wagons should be moved out of the weather. For interpretative purposes they could be replaced in the field with steel sculptures. If necessary use appropriate wood preservative and leave out doors.

Figure C-8: Tanker wagon with rubber tires on the James Field

BUILDINGS

Buildings are a special case at Oil Springs. The largest class of buildings are powerhouses. Some are in use; others have been abandoned-in-place. Other building types include a horse barn, blacksmith shop in the remnant of the Big Rig building, and the pump room of the Receiving Station at the intersection of Kelly Road and Gum Bed Line. In addition there is a farm house and barns which are not considered in this conservation assessment.

The operating powerhouses are well maintained. Two former powerhouses have been mothballed in stable condition. The Receiving Station pump room, although abandoned, is designated as a historic structure and has been conserved. The remaining powerhouses have been abandoned in place and are at risk.

Conservation Issues: The immediate, short-term conservation issue is maintaining the roof. Once that fails, the rest of the building can deteriorate quickly. At the present time the horse barn is in stable condition but the roof condition should be monitored.

Figure C-9: Abandoned-in-place power house on the Byers South Field

APPENDIX D: MINUTES OF MEETING WITH MINISTRY OF NATURAL RESOURCES (MNR)

Date: November 9, 2009
Location: Petroleum Resources Centre, London
Attending: Christopher Andreae, Golder Associates
MNR Petroleum Resources Centre:
Dan Elliott, Manager
Terry Carter, Chief Geologist
Lindsay Furan, Petroleum Inspector
Frank Bailey, Petroleum Compliance Supervisor
Sandra Gilbert, Policy and Program Officer

Carter opened the meeting by stating that the Petroleum Resources Centre operates with two guidelines: public safety and environmental integrity. Andreae noted that these guidelines are equally applicable to the proposed Oil Springs Heritage Conservation District.

Andreae then explained the purpose and operation of Heritage Conservation Districts and the findings, to date, for the Oil Springs study. The rest of the meeting was spent discussing opportunities and constraints that the Ministry might have with regards to the proposed district.

Historical Oil Field Status: The MNR has included standards for Historical Oil Fields as Section 14 of the *Oil Gas and Salt Resources of Ontario Provincial Operating Standards* (2002). Section 14 applies to only the Bothwell, Oil Springs and Petrolia fields. To be designated, the well had to be producing on December 31, 1996. At the present time, the designation covers only in-ground tanks.

Relevant Legislation: In the opinion of the MNR, *Ontario Oil, Salt, and Gas Act* prevails over the *Ontario Heritage Act*. Other discussions with the Ministry of Tourism and Culture indicate that they are willing to work with the MNR and the County of Lambton to ensure that a balance of interests is maintained. The Ministry of Labour and the Ministry of Health may also have issues and concerns with any heritage designation of historic oil fields.

Further Action: The Petroleum Resources Centre would like to be informed about the recommendations for the Oil Springs Heritage Conservation District. The Centre would like to work with the producers and the Heritage Conservation District status to ensure the continued viability of the Oil Springs field.

The Ministry is legally bound to enforce legislation and regulations currently in effect. If a future Heritage Conservation District committee believes that the *Provincial Operating Standards* conflict with the goals of the Heritage Conservation District, the committee should consult with representatives from both ministries.

APPENDIX E: OIL GAS AND SALT RESOURCES OF ONTARIO PROVINCIAL OPERATING STANDARDS (2002)

Section 14. Historical Oil Field Standards

The following standards shall apply to oil field production operations having historical oil field status. Where conflict arises between this Part and other Parts of the Standard this Part shall prevail with respect to historical oil field status operations only. This section does not apply to:

(a) any well drilled after January 1, 1980;
(b) any new works added to an oil field with historical status;
(c) a historical oil field without historical oil field status; or
(d) an oil field with historical oil field status that has ceased production for 24 or more months after it has been registered with the Ministry.

14.1 Definitions

"historical oil field" means an oil field that is:

(a) part of the Bothwell-Thamesville, Oil Springs or Petrolia fields; and
(b) produced from wells drilled to a depth less than 200 metres into formations of Devonian age.

"historical oil field status" means an oil production operation:

(a) located in a historical oil field;
(b) still producing oil on December 31,1996; and
(c) registered with the Ministry by December 31, 1997.

14.2 Underground Storage Tanks

Where an underground tank is installed, the operator shall:

(a) construct a dike surrounding the tank that is capable of containing any overflow from the tank;
(b) prevent access to the tank by:
    (i) constructing and maintaining a cover on the tank and construct such covers in accordance with floor and roofing load requirements of the Building Code and provide adequate ventilation; or
    (ii) constructing a chain link fence 152 cm in height, completely surrounding the tank at a perimeter that is setback 2 meters from the edge of the tank and of adequate construction to prevent access to the tank; and
(c) install a ladder securely fixed in a vertical position inside the tank with rungs no greater than 15 centimetres from the wall and spaced at regular intervals and extending to the lowermost fluid level in the tank; and
(d) install a prominent warning sign on the fence or cover as the case may be.

14.3 Oil Field Fluid Storage

Where formation water is stored in an earthen pond, pit or underground tank the operator shall:

(a) ensure that the fluid cannot create or constitute a hazard to public health or safety, run into or contaminate any fresh water horizon or body of water or run over or damage any land, road, building or structure;

(b) ensure that any pond, pit or tank does not leak into the surrounding soil and is suitable for the fluid being stored;

(c) construct a chain link fence 152cm in height that completely surrounds the pit, pond or tank at a perimeter that is setback 2 metres from the edge of the pit, pond or tank, and is of adequate construction to prevent access to the pit, pond or tank;

(d) construct any gates on the fence to a height of 152 centimetres and ensure that they are closed and locked;

(e) install prominent warning signs on all gates and at regular intervals on the perimeter fence;

(f) install for every pond, a platform, ladder, or other means of safe egress; and

(g) install rescue and life-saving equipment such as poles, safety rings, and flotation devices inside the fenced area of every pond, and this equipment shall be clearly visible and readily accessible at all times.

14.4 Well Servicing

An operator of a well being serviced shall ensure that a diverter valve and piping are installed on the well prior to being serviced and connected to proper containment to prevent any fluids flowing onto the surface.

14.5 Suspended Wells

The operator of a suspended well shall:

(a) cap it at surface; and

(b) permanently mark the site with a steel post with an attached well name sign and maintain such sign; but

(c) where the well is capable of flow to surface, it shall not be left suspended and the well shall be plugged.

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