Both Structures-750 GPM HANDOUT #17

PRE-INCIDENT SURVEY

Building Name: F. Ray Moore Oil Co. Survey #: 66

Street Address: _____

City, State, Zip: _____

Primary Use: _____ Construction Type: Wood Frame Brick

Possible Entry: _____

Possible Occupancy: Office A.M. 8 P.M. _____ 8-5

Known Handicapped Personnel: _____

NOTIFY IN CASE OF EMERGENCY

Name: F. Ray Moore Name: Greg Deans / David Main

Phone: 944 5231 Phone: 944 5566 / 402 7582

BUILDING CONSTRUCTION

Roof Type: Shingles Floor Construction: Slab

Roof Construction: Wood rafters

Basement Construction Type: — Height of Basement: —

Number of Stories: 1 Height of Each Story: _____

Length: 72 Width: 40 Height: 10

Attic Area: _____ Size: L_____ X W_____ X H_____

UTILITY TYPES

Gas: _____ Type: _____

Gas Shut Off Valve Location: _____

Electric: _____ Phase: _____

Panel Location: _____

Alarm Location: _____

EXPOSURES

North: _____FT. West: _____FT. South: _____ FT. East: _____

Type: _____ Type: _____ Type: _____ Type: _____

SUPPRESSION CRITERIA

Needed Fire Flow: _____ Total Water Supply: _____

Fuel Load: _____ Rate of Flow: _____

HYRANT LOCATIONS

(1) _____ Flow: _____ Unit: _____

(2) _____ Flow: _____ Unit: _____

(3) _____ Flow: _____ Unit: _____

(4) _____ Flow: _____ Unit: _____

OTHER WATER RESOURCES

(1) _____

(2) _____

(3) _____

SPECIAL RESOURCES

(1) _____

(2) _____

(3) _____

MUTUAL AID

(1) _____ Assignment: _____

(2) _____ Assignment: _____

(3) _____ Assignment: _____

STAGING AREA

Primary: _____

Secondary: _____

MISCELLANEOUS INFORMATION

Sprinkler Connection: _____

Standpipe Connection: _____

April 28, 2004

FIRE SAFETY ANALYSIS

FOR LP-GAS STORAGE

Reference: National Fire Protection Association Pamphlet No. 58, LP Gas Code 2001 edition

Type of Facility: Bulk Propane Storage Facility

Facility:	F. Ray Moore Oil Company, Inc.
Street Address:	185 Cherry Lane Road
City, State, Zip:	Washington, North Carolina 27889
Office Phone:	(252) 946-9061
Main Office Address	

MANAGEMENT APPROVAL

Authorized Agents Name: F. Ray Moore, Jr. Title: President

Signature: F Ray Moore Jr

Signature indicates compliance with the contents of this plan and authority to carry out these requirements.

The undersigned certifies and attests (1) that he is familiar with this Regulation, (2) that he has visited and examined the site, (3) that the Fire Safety Analysis has been prepared in accordance with good engineering practice and with the requirements of this regulation, (4) that he has reviewed any and/or all construction documents, (5) the Fire Safety Analysis is adequate for the above-named facility. Signature does not relieve owner/operator of their responsibility of implementing the requirements of this code. This engineer did not test for proper operation of any electrical/mechanical/safety equipment, overfill devices, vents, emergency venting, valves, corrosion control systems and any other equipment systems not specifically mentioned.

Prepared by:
Name: Timothy L. Laughlin, PE # 022012
NCPMA, 7300 Glenwood Ave., Raleigh, NC 27612, Phone 919-782-4411

Signature:

Date: April 28, 2004

A Fire Safety Analysis (FSA) may be required by the North Carolina Department of Agriculture's (NCDA-CS) Standards Division for the installation of LP-Gas storage tank(s) having an aggregate water capacity of more than 4,000 gallons subject to exposure from a single fire. The NCDA-CS will review and approve the Fire Safety Analysis by policies set forth in their department. The NCDA-CS approval should be accomplished before construction/modification of the LP-Gas storage system(s). The guidelines used to prepare this analysis are the American Petroleum Institute (API) publication No. 2510 "Design and Construction of LPG Installations", API publication No. 2510A "Fire-Protection Consideration for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities", and (most importantly) the National Fire Protection Associations (NFPA) Pamphlet No. 58 "LP Gas Code". EPA's Risk Management Plan regulations and Landview 5 Environmental Mapping Software were also used. This Fire Safety Analysis is contingent upon the proper installation of all equipment in accordance with 2001 edition of NFPA 58.

Although very rare, propane tank system failures and explosions do happen. The risks associated with propane fires and explosions have undeniably been reduced with advent of modern emergency control systems and installation codes. However, in order to determine hazards of this installation, a worst case scenario will be analyzed.

EMERGENCY CONTROL OBJECTIVES

The emergency control objectives consist of three operational phases:

1) Stopping or slowing down the rate of LP-Gas release
2) Dissipating LP-Gas vapors and/or presenting flammable gas-air mixtures from reaching ignition sources and entering structures.
3) Keeping fire exposed containers and equipment cool.

Attaining these objectives requires the application of both equipment arrangement and human performance.

THE EFFECTIVENESS OF TOTAL PRODUCT CONTROL MEASURES

Experience has shown that the most frequent cause of accidents leading to leaks and fires in LP-Gas facilities are associated with liquid transfer operations. All (Total Product Control) equipment, piping, valves, excess flow valves, emergency pull stations & valves (ESVs), tank(s), and back check valves are installed in accordance with NFPA 58 at time of installation. The safety valves and manual breech stations will provide for propane flow shut down in the event of pipe/valve failure and bobtail truck pull away. The liquid line is approximately 2.5 inches in size and the vapor line is 1.25 inches.

Most causes of LPG Fires are: Leakage of LP-Gas transfer pump seals, valve stem seals, flange gaskets, sampling or drawing water and leaking transfer piping/storage tank containers due to poor maintenance (corrosion). Other causes are tank overfilling, truck pull away and vehicular collision.

In many cases, the evaluation of the total product control system can conclude the FSA. NFPA 58 section 3.2.19.7 states "Emergency shutoff valves and backflow check valves required in this section shall be tested annually for proper operation". The results of the test shall be documented."

LOCAL CONDITIONS OF HAZARDS WITHIN THE CONTAINER SITE

F. Ray Moore Oil Company has safely operated propane facilities for many years. This facility has an existing installation of Two-30,000 gallon LP-Gas tank(s). The existing LP-Gas tank(s), piping, valves, bulkheads, loading/unloading systems and emergency shut-off systems are installed in compliance with NFPA 58 at time of installation. Unloading petroleum liquids by truck transports is accomplished by using truck mounted PTO pumps or stationary mounted pumps while the driver/attendant stands by. The loading/unloading bulkheads are on the west side of the tank(s). The public is not allowed on the property. There is bulk storage of petroleum fuels on this property.

Minimum safe fire fighting approach distance is considered 300 feet from tank sides. The long axis (direction NW by SE) of the LP-Gas tank(s) does point to one fire control staging area and access point. API 2510 requires a minimum separation distance of 50 feet between tank(s) and high voltage power lines.

EXPOSURE TO AND FROM OTHER PROPERTIES

The worst case scenario of a propane vapor cloud explosion of 30,000 gallons of propane could cause 2nd degree burns and 1 psi overpressure over a circular radius of approximately 0.40 miles (2,100 feet) from center with a fireball duration of approximately 15 to 17 seconds. Census software (year 2000) indicates approximately 110 people (48 homes) live within the 0.40 mile radius area.

The closest residential home(s) is south southwest of the property approximately 1500 feet. Residential areas are also to the north and east on the outskirts of the 1.0 overpressure radius of 0.40 miles. Commercial business and warehouses are approximately 800 feet east and southeast of the tank(s). The long axis (direction NW by SE) of the LP-Gas tank(s) points to a warehouse. Fields and woods are adjacent to the property on the southwest and northwest of the property.

If the event of a fire at the tank(s), bulkheads, or petroleum tanks, each individual fire on site, could feasibly impact the other equipment/tanks in the worst possible way. The fire department and other emergency personnel must be prepared for evacuating all areas in the event of a fire of significant magnitude, i.e. evacuating the residential areas, and closing highways, city streets and other roadways.

This site is not located in what the 2001 edition of NFPA-58, section 3-2.2.3 refers to as a "heavily populated or congested area". However, this site is required to have a Fire Safety Analysis completed to conclude if the site will be classified as a "serious hazard category" under NFPA 58 sections 3.3 & 3.10.

THE PROBABLE EFFECTIVENESS OF PLANT FIRE BRIGADES

This section will deal with the emergency response actions of the employees of this facility or the employees of LP-Gas tanker delivery trucks to accomplish the Emergency Control Objectives. The employee's role must be able to meet Emergency Control Objectives 1 and 2. The employees are much more responsive to shutting off or stopping an LP-Gas leak than anyone else not immediately at the accident scene. The primary focus of employee LP-Gas safety training must focus on stopping or slowing the rate of LP-Gas releases. As far as Objective No. 2 is concerned, employees must shut down all sources of probable ignition of the propane gas that has escaped. The responsibility of each employee can be rehearsed with safety training. Examples would include turning off all equipment, which could be a possible ignition source, closing windows and doors, and turning off exposed electric motors, etc. In the event of a propane gas emergency, the owner or his designated employees shall ensure that all sources of ignition be shut-off and extinguished. Probable sources of ignition could be motor vehicles directly in front of the (northwest) property on Cherry Lane Road.

It is the requirement of this FSA that the owner provide, emergency response training to specified employees and other necessary personnel. Every LP-Gas facility must have a written emergency response plan (OHSA 1910.38) which includes actions to accomplish Objectives 1 and 2. The written emergency response plan should be reviewed as part of this Fire Safety Analysis. Written operations and maintenance instructions must also be provided in accordance with NFPA 58 Chapter 11, 2001 edition. F. Ray Moore Oil Company shall appoint emergency action employees to ensure all sources of ignition are shut down in the event of an LP-Gas leak/spill during transfers. Emergency evacuation plans shall be revised to reflect this.

LOCAL FIRE DEPARTMENT CAPABILITY AND AVAILABLE WATER SUPPLY

The Clarks Neck Volunteer Fire Department has a station approximately 3.5 miles from this site. Probable response time from the onset of the fire alarm would be under the allowed 10 minutes. The Clarks Neck Volunteer FD does have the proper fire fighting equipment. Clarks Neck FD personnel have been trained in LP-Gas fires and emergencies. F. Ray Moore Oil Co. shall conduct a fire-evacuation and emergency fire drill with local Fire Departments within a reasonable time frame (1-year) upon completion of this FSA. Education and training on controlling and extinguishing an LP-Gas fire for fire department personnel must be conducted on a regular basis. The prevailing wind is from the west, southwest to the east, northeast and does impact probable ignition sources (motor vehicles on Cherry Lane Road on the northwest side of the property).

The availability of water to cool or extinguish an LP-Gas fire is crucial for the fire department to effectively manage and control the LP-Gas fire/leak. There is available water for fire fighting purposes for this site. One Fire Hydrant exists (see map) approximately 1,000 feet from the LP-Gas tanks. The hydrant is located on Cherry

Lane Road southwest of the tanks. Beaufort County has determined that the Fire Hydrant has water flow rates at 480 gpm. To control an LP-Gas emergency, the Fire Department water flow rates must be 250 to 500 gallons per minute.

Clarks Neck Volunteer Fire Department needs at least one safe entrance point to the tank. API publication No. 2510A recommends two entry points not in line with the tanks long axis (ends). Failure to provide two safe right of entry points to the tank will lower the Fire Departments capability to effectively control a LP-Gas fire/leak and could cause a serious hazard to exist. Upon review of the property, there is two safe fire fighting access points to the tank(s).

The Fire Department must "control and not extinguish" the LP-Gas fire. If fire department cannot "control and not extinguish" then public safety officials should limit their emergency response to control of onlookers and evacuation of the blast over pressure area.

CONCLUSION OF ANALYSIS

Any future LP-Gas storage tank installations are not considered in this analysis. This engineer visited this site on April 27, 2004.

NFPA-58 states that two conditions must be met for Special Fire Protection to be required, that a serious hazard must exist and that the local fire department be incapable of managing an LP-Gas fire/leak. In my judgement, the above Fire Safety Analysis has concluded that a serious hazard does not apply and therefore special fire protection not be provided. In reaching my conclusions the additional information below was used:

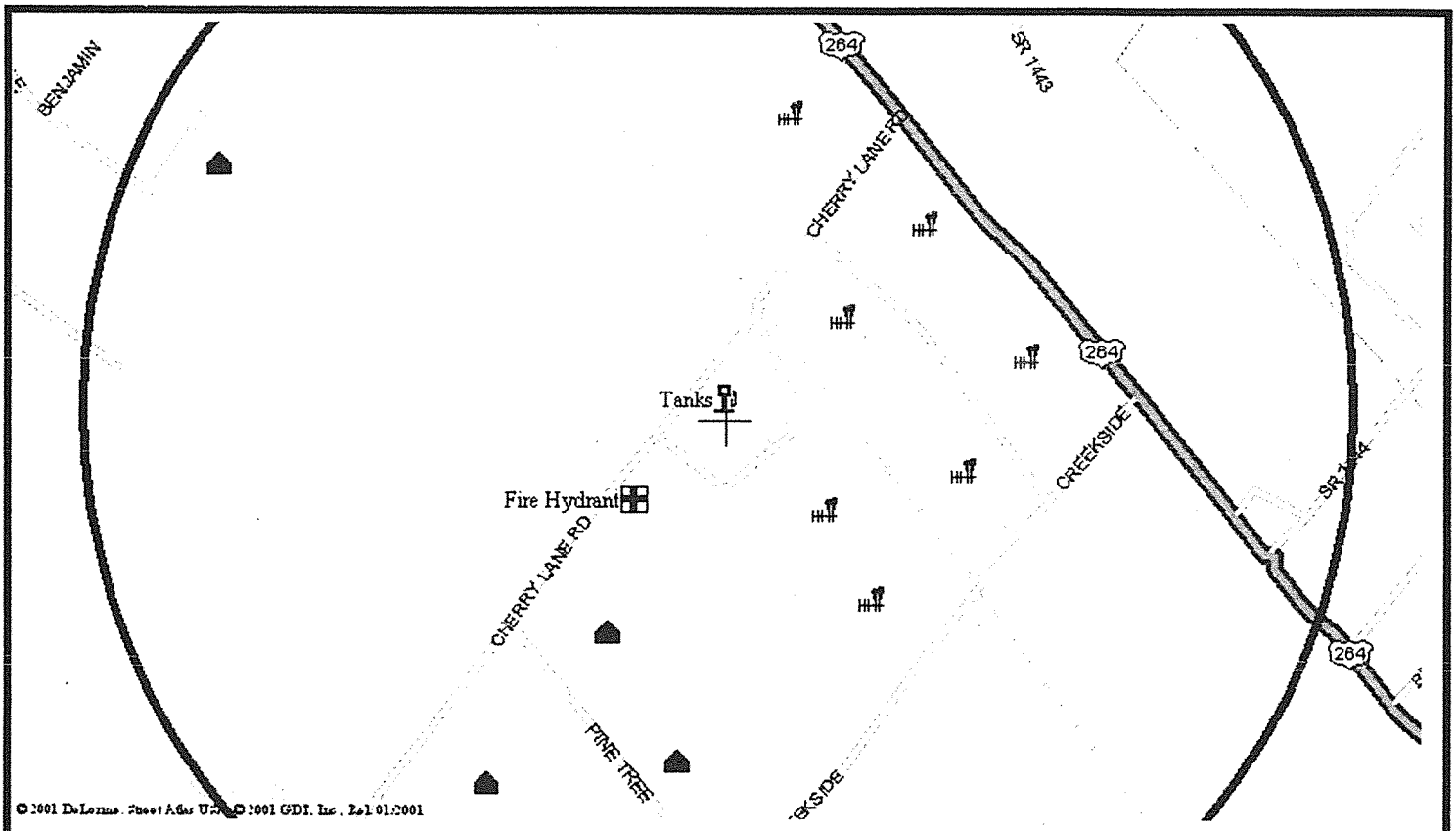
1) The NFPA 58 LP-Gas Code Handbook 2001 edition Supplement 1, "Guidelines for Conducting a Fire Safety Analysis" states the following: "The total product control system can eliminate leakage, prevent flame impingement on storage tanks, and reduce the need for the availability of large volumes of water." In addition, The NCDA-CS has additional requirements on bulkhead construction: 1. Piping must have a shear point on the truck side of the bulkhead. 2. Piping must rise a minimum 12" above the shear point to provide enough leverage. 3. Automatic activation of Emergency Safety Valves (ESV) must be incorporated to activate ESV with a pull in any direction. This does not negate the requirement in NFPA 58 for manual activation. This facility has incorporated all of the above items.

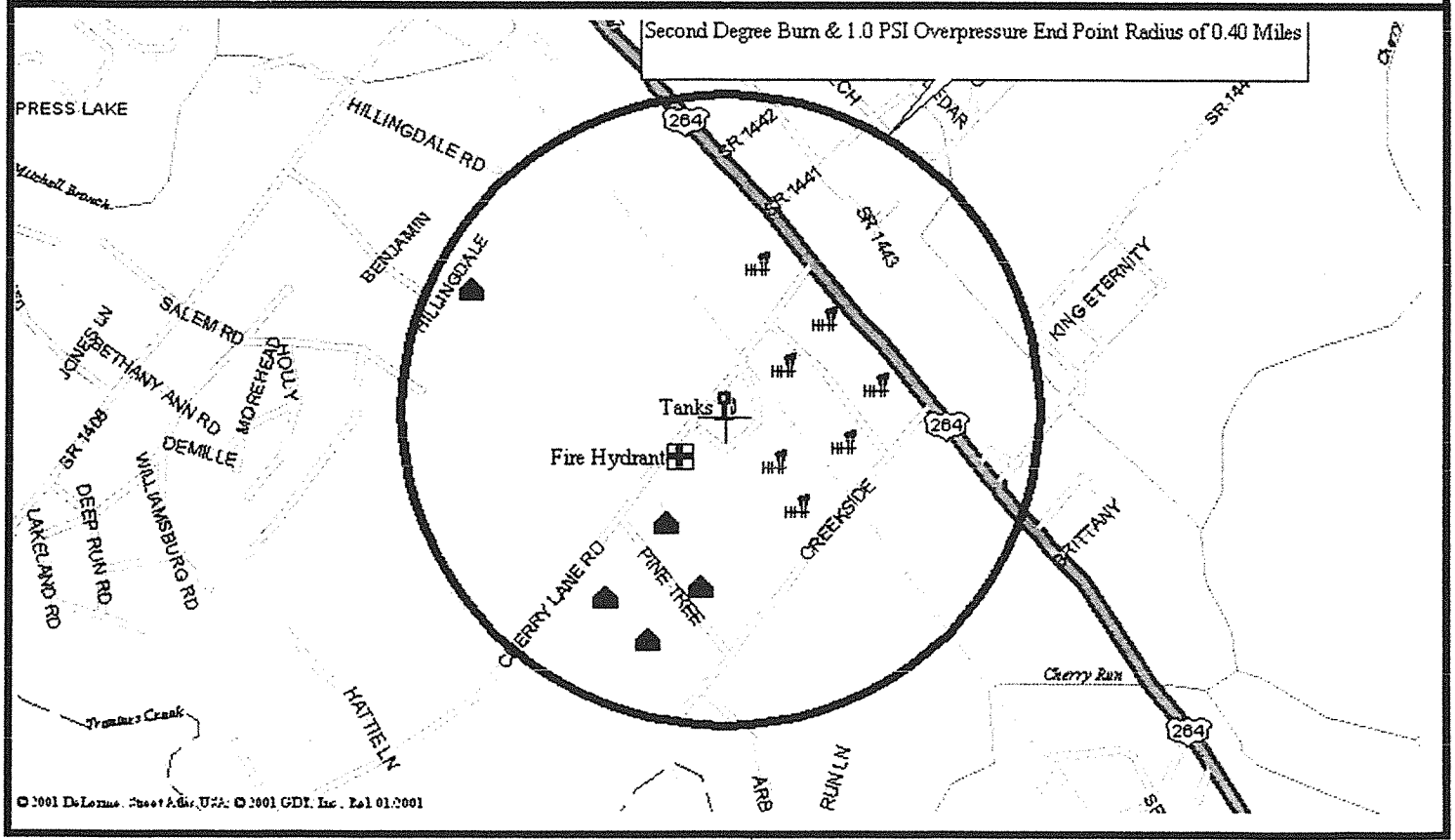
2) NFPA 58 section 4.2.3.2 states, "Sources of ignition shall be turned off during transfer operations, while connections or disconnection's are made, or while LP-Gas is being vented to the atmosphere. (b) Smoking, open flame, metal cutting or welding, portable electrical tools, and extension lights capable of igniting LP-Gas shall not be permitted within 25 ft. of a point transfer while filling operations are in progress...."

3) The Local Fire Departments of the City of Washington and Beaufort County have stated that they will be able to handle a propane fire-emergency. They have been trained, have the proper amount of available cooling water via Fire Hydrant, and have the proper equipment and proper hazardous materials training. Clarks Neck FD also has mutual aid with other Fire Departments.

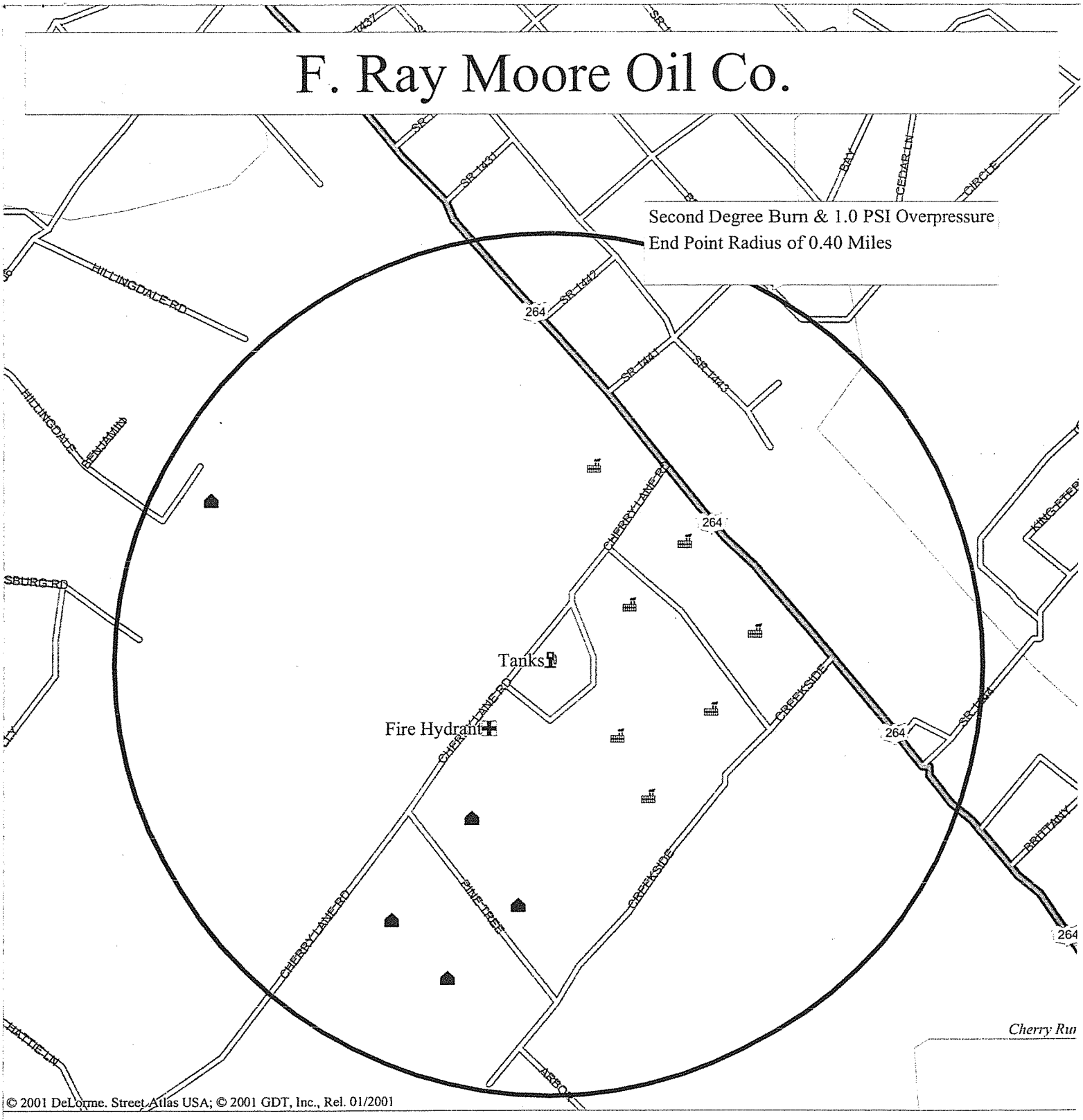
MAP DATA

N ↑ GPS Data 35° 34' 36"-N; 77° 05' 23"–W





F. Ray Moore Oil Co.



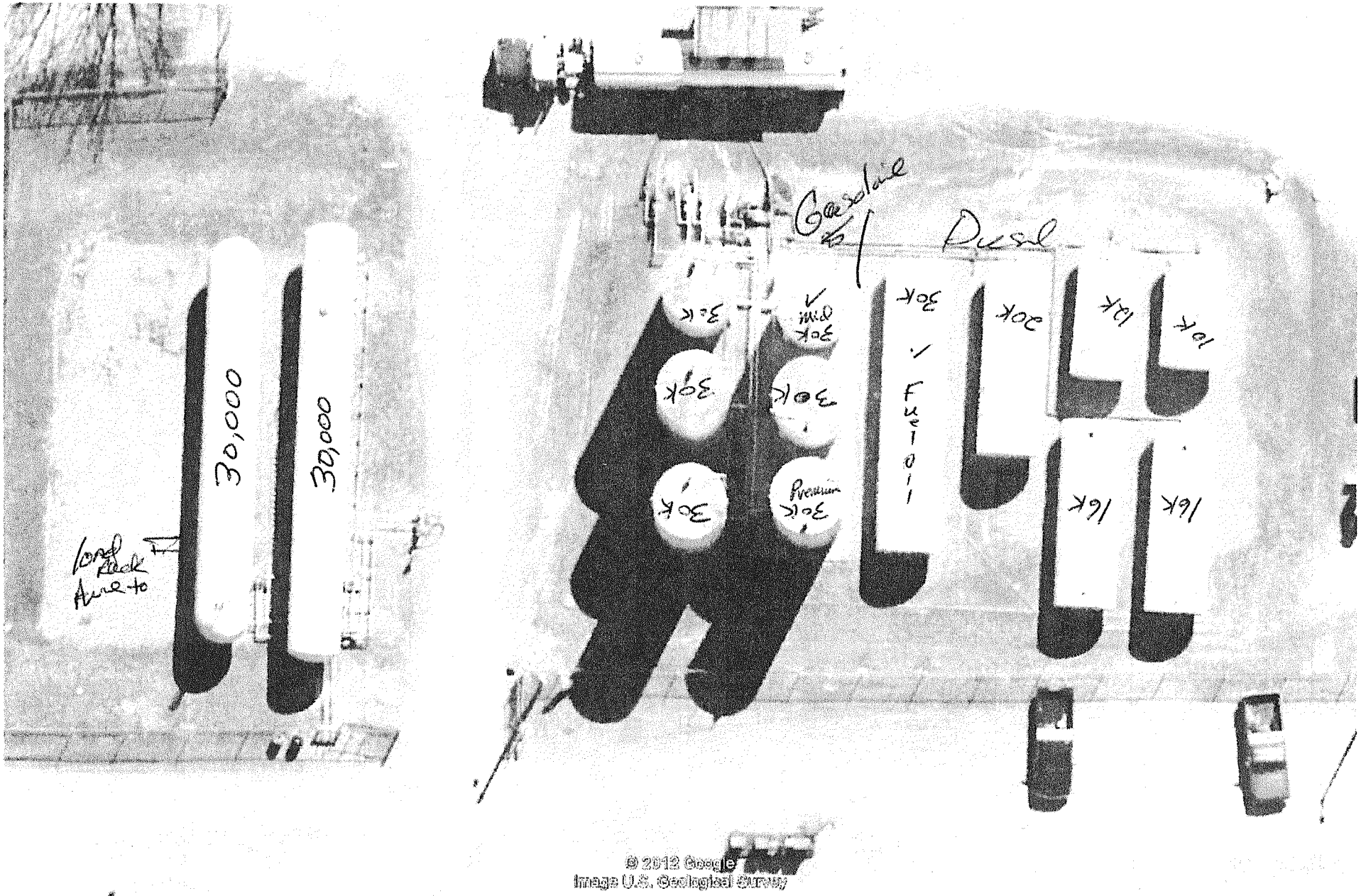
Mag 16.00
Wed Apr 28 13:27 2004
Scale 1:7,812 (at center)
500 Feet
200 Meters

Local Road
US Highway
Railroad Abandoned
Population Center
Water
River/Canal

Google earth

feet 300
meters 90

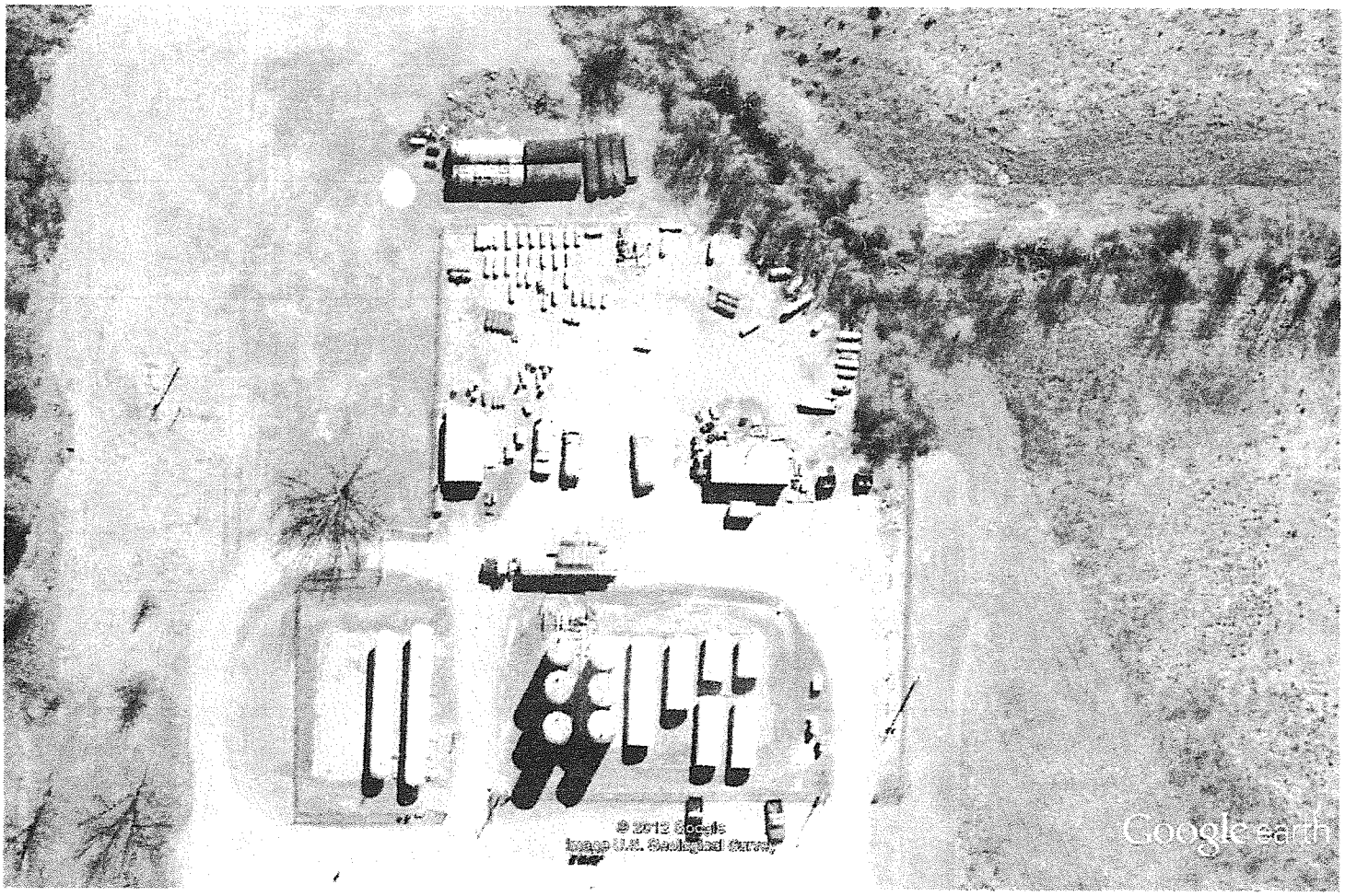
F Ray Moore Oil Co.
187 & 189 Cherry Ln., Washington



Google earth

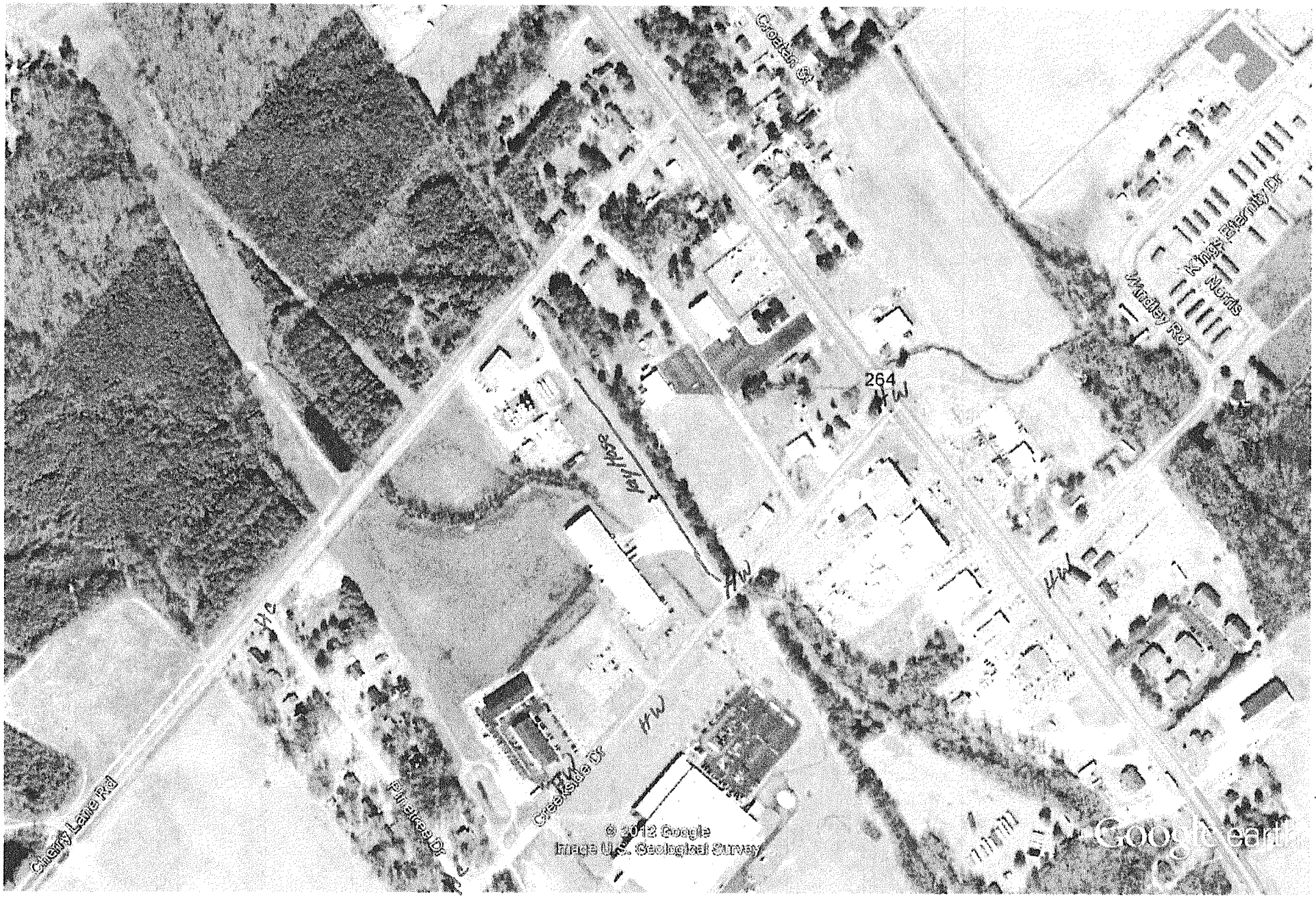
feet 100

meters 40



Google earth

feet 300
meters 90



Google earth

feet 2000

meters 800

Structure Name F. Ray Moore - Warehouse

Structure Address 189 Cherry Lane

Length	Width	Sq Ft	Sq Root	X 18	X construction type	GPM sum 1	X Occupancy	GPM sum 2
100	50	5000	70.71	1272.79	0.8	1018.23	0.85	865.50

Exposure % add	Exposure add GPM	Exposure per side (75% max) Total Side A	Exposure per side 75% max Side B	Exposure per side 75% max Side C	Exposure per side 75% max Side D	Total GPM with exposures
25%	216.37		0	0	0	865.50
19%	164.44					
14%	121.17					
9%	77.89					
75%	649.12	Total A,B,C,D				
	MAX	0				

Round off to nearest 250 GPM for flows less than 2500 GPM, the nearest 500 GPM over 2500 GPM

Column J, K, L and M
If up to 10 feet add 25% per side
If 11 to 30 feet add 19% per side
If 31 to 60 feet add 14% per side
If 61 to 100 feet add 9% per side

Column F
Fire Resistive 0.6
Non-combustible 0.8
Ordinary 1
Wood Frame 1.5

Column H
.75 if Mostly non-combustible contents
.85 if Limited combustibles (apartments, churches, schools, hospitals)
1.0 if Mostly combustible (restraunts, sheds, garages)
1.15 if Free burning contents (post offices, horse stables, feed mills, repair garages,ag storage)
1.25 if Rapid burning (aircraft hangers, tires, flammable liquids, wood working)

Total GPM with exposures	Add 50% for each floor above ground floor		# of floors	Total to add for floors above	Sub-total with floors added	If wood shingles on roof add 500 GPM	
	375		0	0.00			
750.00					750.00	0	750.00

FIRE FLOW NEEDED GPM

750.00

Structure Name F. Ray Moore - OFFICE

Structure Address 187 Cherry Lane

Length	Width	Sq Ft	Sq Root	X 18	X construction type	GPM sum 1	X Occupancy	GPM sum 2
72	40	2880	53.67	965.98	1	965.98	0.85	821.08

Exposure % add	Exposure add GPM	Exposure per side (75% max) Total Side A	Exposure per side 75% max Side B	Exposure per side 75% max Side C	Exposure per side 75% max Side D	Total GPM with exposures
25%	205.27		0	0	0	821.08
19%	156.01					
14%	114.95					
9%	73.90					
75%	615.81	Total A,B,C,D				
	MAX	0				

Round off to nearest 250 GPM for flows less than 2500 GPM, the nearest 500 GPM over 2500 GPM

Column J, K, L and M
If up to 10 feet add 25% per side
If 11 to 30 feet add 19% per side
If 31 to 60 feet add 14% per side
If 61 to 100 feet add 9% per side

Column F
Fire Resistive 0.6
Non-combustible 0.8
Ordinary 1
Wood Frame 1.5

Column H
.75 if Mostly non-combustible contents
.85 if Limited combustibles (apartments, churches, schools, hospitals)
1.0 if Mostly combustible (restraunts, sheds, garages)
1.15 if Free burning contents (post offices, horse stables, feed mills, repair garages,ag storage)
1.25 if Rapid burning (aircraft hangers, tires, flammable liquids, wood working)

Total GPM with exposures	Add 50% for each floor above ground floor		# of floors	Total to add for floors above	Sub-total with floors added	If wood shingles on roof add 500 GPM	
	375		0	0.00			
750.00					750.00	0	750.00

FIRE FLOW NEEDED GPM

750.00