

VIII. SITING OF OIL AND GAS WELLS

A. INTRODUCTION

An operator must have a permit before site construction and drilling can commence. To obtain a permit, he must submit an application giving detailed information on the proposed well. The drilling permit application review process is one of the Department's primary tools in preventing environmental damage from oil and gas operations.

Many of the potential negative impacts of oil and gas development hinge on the location chosen for the well and the techniques used in constructing the access road and well site. The negative impacts are comparable to those of any moderately sized construction site. Clearing of vegetation and temporary dust, noise and exhaust fumes from heavy equipment are the primary negative impacts. A substantial portion of staff time is devoted to reviewing this stage of oil and gas development.

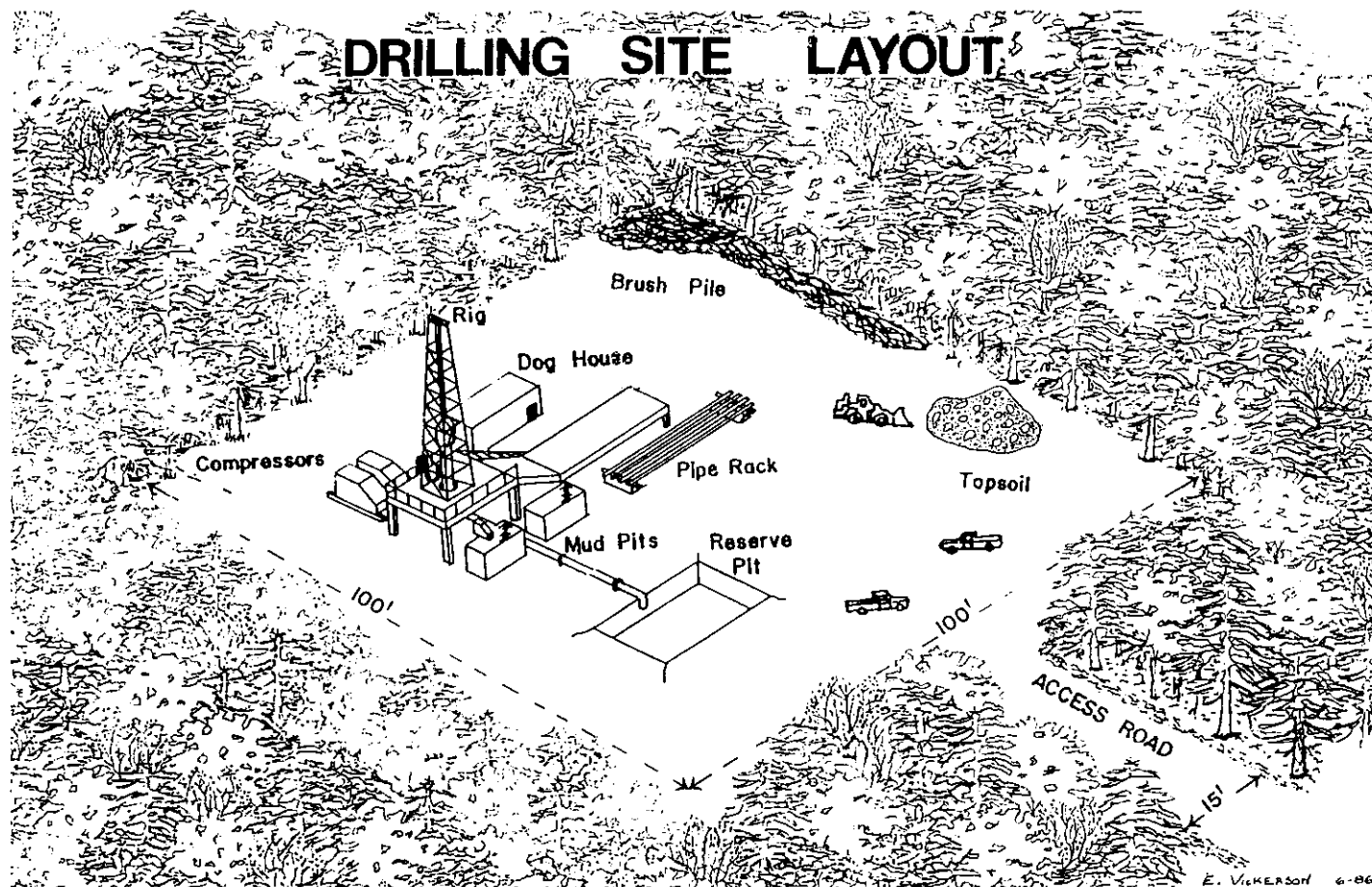
Before a drilling permit can be issued, DEC staff must ensure that the proposed location of the well and access road complies with the Department's spacing regulations and siting restrictions. Many siting set-back restrictions are already in regulatory form. Other siting restrictions are issued as permit conditions aimed at minimizing potential environmental impacts of oil and gas development operations. See Figure 8.1 for the layout of a typical drilling site.

B. WELL SPACING

Most of the siting restrictions on the location of wells are based on environmental and/or safety considerations. However, well spacing regulations are based on geologic and engineering data and considerations.

Well spacing specifically refers to the area of the subsurface hydrocarbon reservoir that will be drained by the well. (Well spacing regulations do not apply to solution mining wells). The area drained by a

FIGURE 8.1



single well depends upon the characteristics of the oil or gas producing formation. Most oil and gas formations in New York State are being drained by wells spaced from 1 to 160 acres.

Proper spacing is necessary for the maximum efficient and economical recovery of oil and gas and to protect the correlative rights of landowners, well operators and others with a financial interest in the wells. Maximizing the recovery of oil and gas resources is essential if the Nation is to decrease its energy imports.

1. Statewide Spacing

Most wells must be spaced according to the statewide 40 acre spacing rule unless they are in a field subject to a spacing order or other spacing regulations. The exception to spacing regulations occurs only in the old oil fields which were discovered prior to 1981 because these fields had been developed to such an extent that spacing was impractical or unreasonable. Spacing of any future waterfloods proposed for any new oil field areas would be covered in the site specific environmental assessment required for new waterfloods. Under the 40 acre rule a well can be no closer than 1,320' from any other well completed in the same producing formation. Also wells can be no closer than 660' from any boundary line of the lease, consolidated or pooled leases, or unit to which the well belongs.

The 40 acre spacing rule was temporarily adopted statewide based on the physical characteristics of common gas producing formations nationwide.

The Medina, the state's most common gas producing formation, is a low permeability, low porosity "tight sand" with limited, but stable gas production rates. Naturally, not all of New York State's oil and gas producing formations actually have the same physical characteristics nor is the Medina uniform statewide. Promoting efficient well spacing for optimum

recovery of oil and gas is of concern to the Department. In the future more staff time will be dedicated to evaluating the State's oil and gas producing formations and reviewing historic production trends. Specific regulations and orders will be issued based on the results of these studies.

C. SITING REGULATIONS AND POLICIES

Once it has been determined that the proposed well location complies with the applicable spacing regulations and orders, DEC staff are required to check and ensure that the well location is at least:

- 100 feet from a private dwelling.
- 75 feet from the traveled part of a public road.
- 150 feet from a public building or area.

Staff also check to determine if the proposed well and access road locations are:

- within 50' of a surface water body.
- within a drinking water watershed.
- within 2,640' of a municipal water supply.
- over a primary or principle aquifer.
- in an Agricultural District or on other agricultural lands.
- within 50' of a stream protected by the Stream Disturbance Program.
- in an area subject to erosion.
- in/or near an historic or archeologic site.
- in/or near a significant habitat.
- within 100' of a floodplain.
- within 100' of a freshwater wetland.
- on State lands, State Parklands or other government properties.
- within a coastal zone area.

Variances from any of the above setback restrictions can be given upon request after appropriate public notice and review. A hearing must be held if

any objections to the variance are recorded.

The potential environmental impacts that these siting constraints address are discussed on the following pages.

D. PUBLIC SAFETY AND WELL SITING

The restrictions on the placement of wells near private dwellings and public buildings, roads or areas were adopted to protect the public from the safety hazards of oil and gas operations. Siting of wells too close to areas used for public assembly would unnecessarily expose them to possible accidental injury. In addition, the surface restrictions help protect the public from far less common, but potentially far more serious accidents, such as blowouts, well fires and major spills.

1. Public Safety/Other Well Site Facilities

The 75, 100 and 150 foot well surface setback restrictions also indirectly influence the siting of pipe racks, compressors, the dog house (which serves as a temporary office and crewshed) and other well site facilities that are usually located next to the well for practical reasons. However, pits, separators, tank batteries and other objects can be located some distance from the well. As a supplement to the existing regulations, Department staff can use their general powers under SEQR to limit the placement of pits, tanks and other well site facilities too close to private dwellings, and public buildings, roads or areas. The option is rarely exercised because few wells are actually drilled at the minimum distances allowed in the surface restrictions. Geology largely dictates the actual siting of a well. Also, landowners may restrict well locations during the leasing process to protect their home, barn or other important areas. Most conflicts in this respect occur on leases sold by previous owners, where current owners do not have these options or when the landowner failed to get

his desired land use restrictions in writing.

Landowners should be aware that the Department can order restoration of environmental damage that occurs, regardless of whether it is addressed in the lease provisions.

Recent changes in the Public Service Commission's (PSC) gas pipeline safety code (16 NYCRR Part 255) also discourage the placement of wells less than 150 feet from a residence. Gathering lines installed closer than that to an existing residence or place of public assembly must comply with more expensive increased transmission line standards. The discrepancy between DEC's requirement of 100 feet between wells and homes and PSC's 150 foot restriction for gas gathering lines connected to such wells provides further reason for increasing the magnitude of DEC's surface restriction. **It is recommended the DEC's siting restriction be increased to 150 feet for private dwellings and provide them protection equal to that for public buildings.**

When pits, tanks and other well site facilities are sited too close to private dwellings and public buildings, roads or areas, several different types of problems can result:

- accidental overshoot of waste fluids being discharged to a pit could injure people or damage buildings, roads or public areas.
- accidental explosion of an oil tank (as occurred in the spring of '84) could injure people and damage buildings, roads or public areas in the vicinity (Olean Times Herald, 1984).
- a pit fire associated with a well blowout could pose an even greater risk to the public than the well fire itself if the pit is less than 100 feet from a private dwelling, public road, building or area.
- lack of fencing around pits can be a safety hazard in populated areas for people in general, but particularly for children, pets and farm animals.
- dust from air drilling operations can coat vegetation and cause air

quality problems for people in the vicinity. However, dust washes off quickly and its relatively high pH can mitigate some of the effects of acid rain on vegetation (Yarosz, 1986).

Although Department staff are aware of the importance of protecting public safety, there is a chance that the above mentioned siting concerns have been overlooked on occasion because existing procedural requirements do not take them into account. **The existing regulations do not require that the plats accompanying each permit application show the proposed location of pits, access roads, tanks, etc., a survey of these items is not required, but it is recommended the proposed location of the above drill site details be sketched on the plat accompanying each permit application.**

2. Noise, Visual and Air Quality Impacts

Although the surface siting restrictions are basically safety oriented, they also serve to lessen noise, visual and air quality impacts associated with drilling rig operations. Their effectiveness in reducing these impacts depends in part on the presence of natural and man-made barriers in the buffer zone that can block sights and sounds.

a. Temporary Noise, Visual and Air Quality Impacts - The equipment and facilities involved in well drilling operations can be large enough to be seen from a considerable distance. Drilling rigs vary in height from 30 feet for a small cable tool rig to 100 feet or greater for a large rotary, though the larger 100 foot rotary drilling rigs are not commonly used in New York State. Typically rigs used in New York are, with reference to the number of connected joints of drill pipe the rig can hold, either "singles", roughly 40 to 45 feet tall or "doubles", roughly 70 to 80 feet tall.

The study of visual impacts is a relatively new field, therefore no literature exists on the visibility of rigs. Reference to a study of the

visual impacts of high voltage transmission towers indicates that the maximum visibility threshold of an 80 foot tall double rig would be less than two miles (Jones and Jones, 1976). In reality, the rigs visibility threshold would be much less due to: 1) undulations in topography, 2) vegetation and other obstructions that would screen sight of the rig and 3) the fact that the transmission towers (on which the two mile figure is based) are much wider at the top than drilling rigs. Transmission towers are also permanent features of the landscape, while drilling rigs are temporary.

Once drilling starts, the length of time a rig and its associated equipment will be on site depends on the type of rig used and the depth of the well. A cable tool rig generally takes 3 to 8 weeks to drill a well. It is not uncommon, however, for a cable drilling operation to stretch on to half a year or more because some operators run their rigs only on evenings and/or weekends. Although drilling can take much longer with cable tool rigs, their visual impacts are more minor due to their relatively short height, 25 feet to 35 feet, and lack of auxiliary equipment. Most wells in New York State, however, are drilled by rotary rigs in less than a week, though drilling can extend two weeks or longer.

Aside from rigs there are also several smaller features of the well site whose visibility will depend more upon local topography, vegetation, etc. Like the rig, they are present for relatively short periods of time and their visual impacts are minor.

Cable-tool and Rotary Rigs

Pits - one pit to hold rock cuttings, drilling mud and brine, must be constructed at each well site unless a tank is installed. A backup reserve pit is also sometimes required. The pits are generally no larger than 25 feet by 50 feet, and must be lined to prevent the

escape of fluids.

Construction equipment - bulldozers, backhoes, and other types of construction equipment needed to prepare the well site and access road will be present for short periods.

Trucks - drilling crew with support staff vehicles as well as larger service trucks for logging, cementing, hydro-fracturing, perforating, delivery, etc., will be on the drilling site from time to time.

Rotary Rigs Only

Compressors - there are usually 2 to 5 compressors at a rotary rig well site. Each compressor is roughly 15 feet to 20 feet long and is sometimes mounted on trailers. As a general rule, the deeper the well, the larger the number of compressors.

Pipe racks - there are usually 2 to 4 pipe racks per well, each roughly 10 feet wide by 30 feet long. Number of pipe racks will depend partly on depth of well.

Dog house - which serves as a temporary office and crewshed, may be as much as 30 feet or longer, usually about 8 feet high and no more than 8 feet wide so it can be carried on a trailer.

Mud logging unit - a truck mounted unit approximately 8 feet wide, 10 feet high and 25 feet to 35 feet long may be present.

Drilling rigs and the auxiliary equipment listed above are not aesthetically compatible with private dwellings and public buildings or areas. The degree of incompatibility is a subjective matter influenced greatly by individual perception. Overall, however, it is agreed that drilling operations, like road building, sewer line excavation, and other necessary construction activities, are not visually appealing. Fortunately, most visual and noise impacts are temporary as are the associated diesel fumes and dust from construction equipment.

This list below, from the United States Environmental Protection Agency (USEPA) data, gives some estimates on noise levels that might be generated on an average drillsite in New York:

<u>Subject</u>	<u>Noise Level Ranges (dBA)* at 50 feet</u>
Rotary rig with capacity of 150,000 pounds and 400 horsepower	95 - 105
Trucks	82 - 94
Backhoes	72 - 94
Tractors	75 - 95
Concrete Mixing	75 - 88

For comparison, the following list of familiar activities and places is given:

<u>Subject</u>	<u>Noise Level Ranges (dBA)</u>
Quiet residential	40
Average residence daytime activities	50
Typical office	60
Ordinary conversation	65

*dBA is a measurement of noise levels (decibels) with special equipment that selectively filters sound similar to the human ear.

The following "rules of thumb" are helpful for understanding noise levels.

1. An increase of 3 (dBA) is the smallest increase that can be perceived by the human ear.
2. dBA levels are logarithmic in nature, so a 10 dBA increase is double the perceived loudness.
3. The nighttime sound level in quiet rural New York where most oil and gas drilling occurs is about 30 dBA (Vessels, 1986, personal communication #58).
4. An $L_{dn} = 55$ dBA is identified by the USEPA as an outdoor noise level which will protect the public health and welfare with an adequate margin of safety. The day/night equivalent sound level (L_{dn}) is a weighted equivalent for a 24-hour period with 10 dBA added to equivalent sound levels at night.

Noise levels from a point source can be estimated from a formula that expresses noise attenuation as a logarithmic function of receptor distance. For noise propagation calculations, it is assumed that the noise level is reduced by 6 dB for each doubling of distance from 50 feet away from the noise source. The calculation does not include attenuation due to barriers, vegetation or the influence of other factors such as relative humidity, wind, and noise levels at different frequencies.

$$N_D = N_{SO} - \frac{6\text{dB} \times \log (D/50 \text{ feet})}{\log 2} \text{ or } 20 \times \log \left| \frac{D}{50} \right|'$$

where:

N_D = noise level decibels (dB) at distance D from source

N_{SO} = noise level decibels (dB) at 50 feet from source

D = distance from noise source

To determine the additional attenuation for typical New York vegetation (tall grass and shrubs) subtract 3 to 4 dB per 100 feet. Hills and trees also act as sound barriers and an additional 5 to 20 dB could be subtracted. Pneumatic mufflers and sound barriers which might be added as special permit conditions for drilling in high population density areas could reduce noise another 15 to 50 dBA.

The USEPA in 1977 gave the following criteria for determining the relative impacts of noise level increases:

- o less than 5 dBA - considered to be a "slight" increase which is noticeable, but less than twice as loud as background.
- o 5 to 15 dBA - considered to be a "moderate increase which would be experienced as being approximately twice as loud as the background.
- o Greater than 15 dBA - considered to be a "significant" increase in noise level.

Most of the information on noise levels was adapted from the FEIS for the Niachlor Project (1985).

People living in close proximity to a drilling site (from 150 to 1,000 feet) may experience moderate to significant noise impacts during the 5 to 10 days it takes to drill a well.

b. Longer-Term Noise and Visual Impacts - After the well is drilled, the extent of the subsequent activities at the site that could cause visual or noise related disturbances to surrounding areas will depend largely on whether the well is a producer or a dry hole. If it is a dry hole, the site will be reclaimed. This will involve some final use of, and noise from, construction equipment, resulting in a temporary increase in noise impacts. Although no timetable exists for site reclamation, pits must be reclaimed within 45 days after the cessation of drilling operations. **A site reclamation timetable of 45 days is suggested for future regulations.** Extensions can be granted by the Regional Minerals Manager for reasonable cause, such as seasonal weather conditions.

After site reclamation, the only lasting visual impacts from drilling a dry hole may be moderately long term changes in landscape contours and vegetation caused by well site and access road clearing and construction. This may be particularly noticeable in otherwise heavily forested areas, but there is no permanent visual impact at about 40 percent of the well reclamation sites. Figure 11.2 shows one of the largest drilling rigs used in New York State and the drill site after reclamation.

If the well is capable of commercial production, the drilling rig may remain on site for a few more days to complete the well or a smaller production rig can be moved in. There may be some delay between the drilling of a well and its' completion. After the well is completed, most of the site is reclaimed. All that will remain at a producing gas well site will be an assembly of wellhead valves (known as a Christmas tree) approximately 4 feet

high, a slightly shorter gas meter, a dehydrator, a separator and a brine storage tank if necessary. Some operators bury their brine storage tanks so they are not visible. Most of the equipment operates at very quiet noise levels. Figure 8.2 depicts a typical producing gas well site.

Some producing oil well sites need more equipment to function properly. A well pump, separator and/or heater treater and tank battery may be needed to separate water from the oil. In the old oilfields, however, this equipment is usually consolidated in a centralized area since the wells are closely spaced. Neither separators, heater treaters or tank batteries present noise problems but, if pumps are required, there may be some noise associated with their operation depending on the type used. After the water is separated, the oil and water are stored on site in tanks to await transport.

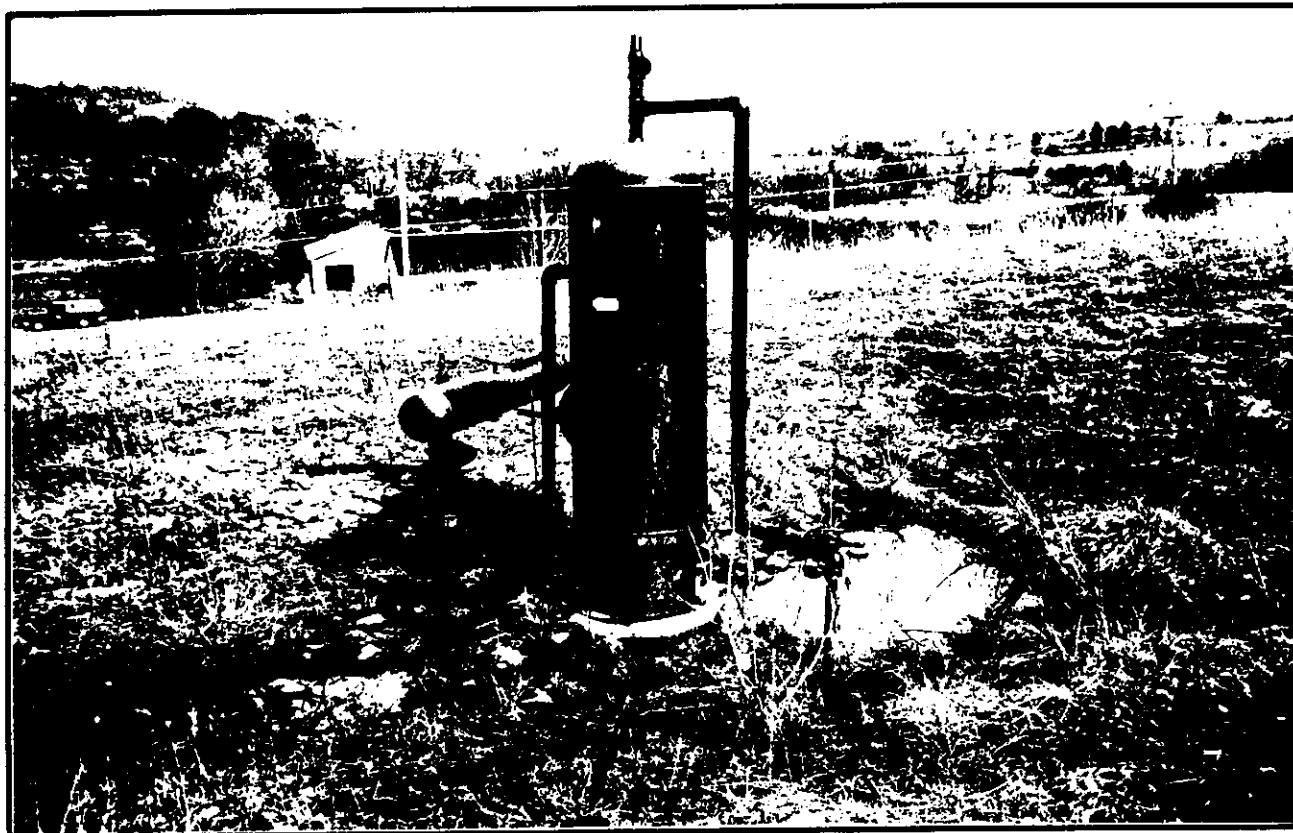
In rare cases, oil or brine production tanks may be large enough to have significant visual impacts. Some operators do camouflage the tanks by painting them green to blend in with the surroundings. Installation of screening or moving the tank location are other alternatives which might be used as mitigation measures if a well was in the area of an important visual resource.

After the gas or oil well stops producing, it must be plugged and abandoned and the well site reclaimed. The long term visual impacts of the reclaimed site will be the same as those discussed above for a dry hole.

c. Visual Resources of Statewide Significance - The most important visual resources in New York State are: 1) National Parks, 2) State Forest Preserves, 3) National or State Wild, Scenic and Recreational Rivers, 4) State Game Refuges, 5) National Wildlife Refuges, 6) National Natural Landmarks, 7) National or State Historic Sites and 8) State Parks.

The first four categories do not occur in New York State's oil and gas producing region (Husek, Payne, Sanford, 1986, personal communications #36,

FIGURE 8.2 - TYPICAL GAS PRODUCTION WELL SITE



The Moonbrook County Club No. 1, located at the edge of the golf course fairway, is a good example of the typical size of a gas production well site. The well was drilled in October 1979. In summer, the 3' tall separator is barely visible from the golf course because of the surrounding vegetation.

54, 63). There are only two National Wildlife Refuges and nine National Natural Landmarks in the State's oil and gas producing region and most of these are included under DEC's Significant Habitats Inventory (National Registry of Natural Landmarks, 1983-86) and (Wright, 1986, personal communication, #73). Of the 400 plus National or State Historic Sites within the region, the vast majority are in populated areas that are unlikely to experience oil and gas activity (National Register of Historic Places, New York State Listings, 1979-86). Where a proposed activity might have a negative visual impact on an historic site, DEC will add mitigating conditions to the permit as appropriate.

There are roughly 25 State Parks within the State's oil and gas producing region. DEC is prohibited from leasing State Park Lands [ECL 23-1101(1)(b)] but some oil and gas drilling activity does occur in Darien Lake, Selkirk Shores and Allegany State Parks where the Office of General Services acting for the New York State Office of Parks and Recreation had undertaken leasing programs in the past. Visual impacts of proposed oil and gas activities within viewing distance of other State Parks will have to be considered on a case-by-case basis during the permit review process. For example, visual screening of production facilities might be necessary for a well directly across from a State Park entrance (Benas, 1986, personal communication #2) (See Section 8.M.2 on page 8-49 for additional information on State Park drilling permits).

d. Summary of Noise and Visual Impacts- The only significant noise impacts from oil and gas development activity are confined to the brief well drilling and completion stages. Short term visual impacts from well drilling and completion activities vary greatly depending upon rig height, topography, vegetation, extent of support facilities and distance to viewer. Over the 30

year producing life of a typical gas well, the visual impacts will be minimal because of the small scale of the equipment involved. Typical oil well production is approximately 30 years also, but the visual impact may be greater because more production equipment is needed. Only in the relatively rare instances where large oil and/or brine holding tanks are needed (example - Bass Island trend) is there a possibility of significant long term visual impacts.

The wording of the existing surface restriction regulations does not address the siting of well site production facilities with respect to private dwellings and public buildings, roads or areas. However, landowners and Department staff can restrict the siting of well site facilities through lease conditions or permit conditions under special circumstances.

E. WATER QUALITY

Pollution of surface and groundwaters is strictly prohibited by the State Oil, Gas and Solution Mining Law. Protection of water quality is the most important concern in regulating oil and gas development. Proper drilling, casing, production and plugging procedures are the primary water quality safeguards. However, careful siting of oil and gas wells provides essential back-up protection in case of an accident.

During the pre-drilling site inspections conducted for every well permit application, DEC staff check the proximity of the proposed oil and gas operations to surface water bodies and municipal water supplies to ensure water quality protection.

Anyone wishing more information on detailed water quality standards, tests and regulations are referred to Article 17 of the Environmental Conservation Law and 6NYCRR Parts 700 to 705.

1. Surface Waters

It is difficult to formulate rules regarding the width of a buffer zone

needed between oil and gas wells and surface water bodies. Topography, vegetation and other surficial features will strongly affect the adequacy of a buffer zone. In general, however, the existing 50 foot surface restriction does not provide adequate protection in case of an accident. The land within a 50 foot radius surrounding surface water bodies often slopes downhill toward the water. Even on a very gentle slope, pollutants such as spilled oil or brine can travel 50 feet to a stream or lake in a matter of minutes giving well site personnel little time to respond. The lack of response time will be even more acute on steeper slopes, particularly if the vegetation between the well and the surface water body was cleared during well site preparation.

Another weakness in this surface restriction stems from its exclusive focus on well siting. Under the present regulations, mud pits and reserve pits can be dug directly next to surface waters, although this is very unlikely because they must be adjacent to the well. Pits must have an impermeable lining and be large enough to contain all fluids. In spite of these precautions, accidental leaking and overflow has occurred. Storage tanks, oil-water separation ponds and other potential sources of pollution can also be sited directly next to surface waters under existing regulations. Although Department staff often place conditions on permits or give instructions to operators limiting the siting of these facilities, the topic should be addressed on a more consistent basis. **It is recommended the minimum siting restriction on the proximity of wells and associated production facilities to permanent surface bodies of water be increased to 150 feet.** A waiver of this and most other siting and spacing restrictions can be given following the exception request, public notice and hearing procedures detailed in 6NYCRR Part 553.

2. Springs

Springs are not included in the well siting restrictions for surface water bodies but they do warrant protection. Springs supply the sole source of drinking water to many private homes. They also supply water to wetlands, streams and ponds. Springs and other near surface water supplies are more easily disturbed by construction activities than deeper groundwater supplies. Turbidity is the most common impact of site construction operations on springs. However, such impacts are usually temporary in nature providing the operator adheres to sound reclamation practices.

Department staff are aware of the importance of springs and often protect them through conditions on permits. **It is recommended the surface water setback restriction be applied to springs which are used for a domestic water supply.**

3. Municipal Water Supplies

In some instances siting of an oil or gas well in the vicinity of a water supply is effectively precluded by municipal ownership of lands surrounding the water well or reservoir. Oil and gas development will not occur in such areas unless the municipality elects to lease the land. Where the municipality does not maintain a buffer of public land around the water supply, both the siting of an oil or gas well and the potential environmental impacts will depend partially on the type of water supply involved. Should a successful legal challenge be made against siting restrictions, municipalities not maintaining a buffer zone might be required to compensate affected mineral rights owners.

a. Surface Municipal Water Supplies - Approximately one-fourth of the municipal systems in the State are supplied by surface waters. These municipal reservoirs are protected by the same minimum setback requirements that apply to all surface water bodies. However, the existing 50 foot well

setback requirement may not provide adequate back-up protection for surface waters in case of an accident. In addition, no regulatory restrictions exist on the placement of pits, tanks or other potential sources of pollution directly next to surface waters. Department staff are aware of the importance of municipal water supplies and place conditions on the permit to restrict the siting of oil and gas facilities. **It is recommended the minimum siting restriction on the proximity of wells and associated production facilities to surface municipal water supplies be increased to 150 feet.**

Erosion and sedimentation concerns are more consistently handled. An erosion and sedimentation control plan must be prepared for every proposed oil and gas well in the watershed of a drinking water reservoir. The Department then requires specific erosion and sedimentation control measures through conditions in the drilling permit. The siltation of any stream or water body due to ground disturbance may constitute a violation of water quality standards.

b. Municipal Water Wells - In the past, oil and gas wells have been drilled within 1,000 feet of municipal water wells. However, Department staff were aware of the importance of municipal water supplies and could place conditions on a drilling permit to restrict the siting of oil and gas wells, pits, tanks and other potential sources of pollution near municipal water wells. In addition, affected local governments are notified whenever a drilling permit application is received for an oil or gas well within 2,640 feet of a municipal water well. This procedure was added in 1982 at the behest of local governments concerned about the impact of oil and gas development activities on their water supplies. As of February 1985, the Commissioner made a decision to require that a Draft EIS be submitted with the permit application for any well within 1,000' of a municipal water

well and proposed well locations less than 2,000' from a municipal water well must be treated as a SEQR Type 1 action likely to require an EIS.

Site construction operations rarely impact groundwater supplies except when a surface water has a direct hydrological connection to groundwater supply. Even then, intrusion of pollutants from surface waters is rare for a number of reasons: 1. surface contamination is easily recognized and can be corrected before groundwater is affected, 2. surface waters will dilute contaminants, and 3. the communication channels from surface waters to groundwaters provide a natural filtering network.

In general, groundwater is especially vulnerable to pollution because water flows much more slowly through the small rock pores underground and substances introduced into an aquifer may remain a long time before they are flushed out. Breakdown of pollutants is also inhibited by the absence of oxygen and normal surface weathering processes. In addition, groundwater pollution is generally not as quickly detected as surface pollution. Therefore, a corroded well casing could leak gas, oil and/or brine into groundwater for several years before these substances would be detected in a water well. However, the very low fluid levels in most producing wells in New York make it unlikely that fluids from the producing zone will be able to rise high enough to pollute groundwater horizons. The sensitivity of groundwater to pollution and the necessity of potable water supplies to survival, highlight the importance of careful drilling, casing, cementing, and plugging and abandonment procedures.

c. Primary and Principal Aquifers - During the permit application review process, Departmental staff check whether the well will penetrate one of the State's primary or principal aquifers. Primary aquifers are highly productive aquifers already heavily used for public water supplies. Principal aquifers are underground formations known to be highly productive or whose

geology suggests abundant potential supply, but which are not heavily used for public water supply at the present time. Wells drilled in primary and principal aquifers are subject to special supplementary permit conditions that have been in effect since November 1982. The Commissioner revised these permit conditions based on comments received at the December 19, 1984 public hearing on aquifer drilling in Jamestown, New York. Although the principal aquifers in New York have not been completely delineated and mapped, where they are identified, aquifer conditions are imposed.

The quality of the casing and cementing job on a well is of prime importance in protecting groundwater from gas, oil, brine or other substances in the wellbore. Therefore, the special aquifer conditions require a State Inspector to be present for the cementing of the conductor, surface and production casing. In addition, the freshwater string must be set a minimum of 100 feet into bedrock. A calculated 50 percent excess cement must be used and the cement must be grouted down from the surface if circulation is not achieved. The aquifer permit conditions are described in greater detail under the appropriate drilling steps.

Contamination of especially shallow aquifers can result from any penetrating structure such as improperly constructed water supply wells, mine shafts, and pilings for bridges and buildings.

4. Public (Community and Non-Community) Supplies

"Community water system" means a public water system which serves at least five service connections used by year-round residents, or regularly serves at least 25 year-round residents. "Public water system" means either a community or non-community system which provides piped water to the public for human consumption, if such system has at least five service connections or regularly serves an average of at least 25 individuals daily at least 60 days

out of the year. Such term includes: (1) collection, treatment, storage, and distribution facilities under control of the supplier of water of such system and used in connection with such system, and (2) collection or pre-treatment storage facilities not under such control which are used in connection with such system.

The Department of Health (DOH) does enforce guidelines and standards for Community and Non-Community water supply systems. There are approximately 8,800 Non-Community systems. There are three times as many Non-Community as there are Community water supply systems. The construction guidelines for Non-Community systems are not as stringent as for Community systems. Non-Community systems are distinguished from Community systems in part by a non-continuous water supply use. Restaurants, gas stations, grange halls, camps and schools usually come under the Non-Community designation. Community and Non-Community water supply systems and other private wells for any properties subject to permit under the State Sanitary Code are reviewed for compliance with the location, construction and protection criteria in Rural Water Supply. Additional similar criteria are used in the review of larger, community water system wells approved pursuant to Part 5 of the State Sanitary Code. In those cases, design standards are contained in the DOH's Bulletin 42, Recommended Standards for Water Works.

Once a well is constructed, if the property is under code supervision by DOH, the operation is expected to comply with the applicable code section. Again, Rural Water Supply is used as guidance if construction flaws are detected, or if a well must be abandoned and a new one drilled. Other cases in which Rural Water Supply standards are applied include when a county passes a Housing Code pursuant to Part 21 of the State Sanitary Code, or adopts Subpart 5-2 of the Code, or investigates a public health nuisance complaint involving a well under Part 8 of the Code.

In addition, service requests from a family involving their own well or drinking water, or for review of housing conditions for institutionalized residents (group homes) or welfare recipients for another agency are often conducted by local health units.

Some local governments choose not to enforce the uniform code for new construction. In these cases, the responsibility falls to the county, or to the Department of State if the county also fails to enforce the code. In addition, many localities enforcing the code still do not recognize their responsibility to enforce Rural Water Supply

The differences in the water quality standards for Non-Community water and Community systems, listed in Part 5 of the State Sanitary Code, are minor. Operators of Community systems must sample for water quality at least quarterly. Operators of Non-Community systems are not required to monitor as frequently, and the agents for which there are maximum contaminant levels are fewer. Operators of Non-Community systems are still expected to provide safe water and to make notification when they do not so monitor.

No specific regulations exist under Article 23 of the Environmental Conservation Law to protect Non-Municipal Community water supplies over that given to other privately owned water wells, but the Non-Municipal Community systems listed in the DOH atlas are given a closer review, and depending on the size may be treated as a municipal water supply. All water wells are protected by the drilling, casing and cementing guidelines and the aquifer drilling permit conditions. Privately owned Non-Municipal Community and Non-Community water systems have many protections, but not the same protection given to municipal water supplies under the current requirements.

5. Private Wells

No surface restrictions exist in the siting of an oil or gas well near a

private water well and operators are not required to show water well locations on the plats accompanying their permit applications. However, the restriction on siting of an oil or gas well within 100 feet of a private residence may also affect the distance to the water well. Water wells may be located almost anywhere, but they are usually in close proximity to the residence they serve.

Although private water wells considered individually are of less significance than municipal wells, they are equally sensitive to groundwater pollution. In fact, they may be more vulnerable to pollution problems because there are no standard statewide water well construction requirements. Water well casings are not always grouted and extended above ground. Thus they can serve as a vertical collection conduit for surface pollution. In addition, the ground surface surrounding water wells is not always built up to drain surface waters away from the well. **For these reasons, a 150 foot setback from private water wells is recommended unless the water well owner approves a smaller setback.** Additionally, the plat accompanying the drilling application should show the location of all private water wells of public record within 1,000 feet of the wellsite. In New York State, private water wells usually become a matter of public record when a property sale or transfer has occurred. Concerned citizens should check with the local officials about the possibility of including their water wells in the property descriptions maintained for tax purposes. It is recommended that written landowner approval be required for a waiver of the restrictions proposed for private water wells and springs used as a domestic water supply. It should be noted that water well pollution problems have sometimes been wrongly attributed to oil and gas drilling activities. The actual source may be such things as naturally occurring shallow gas, road salting or other causes.

F. AGRICULTURE

During the pre-drilling site inspections conducted for every well permit

application, Department staff check whether recommendations or permit conditions are needed to mitigate the impacts of oil and gas activities on agricultural operations. Agriculture is a major industry in New York State, both in land use and monetary terms. Sixteen and one-half percent of the State's total land area is devoted to growing crops and another 6.76 percent to pasture. In 1984, the agricultural activities on these lands contributed \$2.8 billion to the economy (NYS Dept. of Agriculture and Markets, 1982b). Because of the importance of agriculture to this State and the predominately rural setting of oil and gas operations, potential conflicts between these two industries deserve extra consideration.

Special attention is focused on proposed oil and gas development activities that fall within Agricultural Districts. Under the Agricultural District Law (Agriculture and Markets Law, Article 25), all State Agencies must modify their administrative regulations and procedures to encourage the maintenance of commercial agriculture. Therefore, 6NYCRR Part 617 defines any activities disturbing more than 2.5 acres of land in Agricultural Districts to be Type I Actions under the State Environmental Quality Review Act. (The land disturbance threshold for Type I actions is generally set at ten acres). Type I Actions are more likely to require the preparation of an EIS than other actions and are also more likely to involve review by more than one governmental agency. Operators drilling wells or laying pipelines in Agricultural Districts are very careful to limit the disturbed area, and even wells outside Agricultural Districts rarely disturb more than 2.5 acres.

Although there are special environmental reviews required for agricultural areas in Agricultural Districts, under the proposed regulatory program careful consideration will be given to environmental impacts in all agricultural areas.

1. Drainage Systems

The construction of access roads and well sites and/or the travel of heavy equipment over them can damage tile drainage systems. This is a serious problem because artificial drainage systems have been installed on over a half million acres of farmland in the State at considerable public and private expense (NYS Dept. of Agriculture and Markets, 1982b).

When a drainage system is damaged, excess soil moisture conditions return and the farmer is faced not only with the cost and labor of repairing the system, but also an annual income loss from smaller harvests. A farmer can also be faced with similar difficulties if the placement of a well or access road interferes with the naturally existing drainage (NYS Dept. of Agriculture and Markets, 1982a).

2. Bisection of Fields

Another major conflict concerns the unnecessary bisection of fields when alternate well and access road locations exist. The placement of either a well or access road in the middle of a field removes viable farm land from production and interferes with basic farming operations such as plowing, planting, fertilizing and harvesting. Bisection of fields may also interfere with future plans to install drainage or wheeled irrigation systems (NYS Dept. of Agriculture and Markets, 1982a).

Adequate reclamation of well sites and access roads that have been sited in the middle of a field can also be a problem. Placement of a heavy rig and the repeated passage of large trucks can compact the soil in the field to the point where plant roots cannot penetrate it. Paraplowing can mitigate much of the damage caused by soil compaction (Blot, 1986, personal communication #4). In some cases bisection of a field is necessary because of spacing requirements. However, in many instances access roads can be planned according to existing and future land use needs.

3. Site Restoration

Prompt and adequate restoration of well sites, access roads and other areas disturbed by oil and gas operations can also be a problem. At the simplest level, failure to smooth out deep ruts at abandoned well sites interferes with movement of farm equipment. Formation of sinkholes in poorly reclaimed drilling or reserve pits is a more serious concern because of the danger such holes pose to humans, livestock and farm equipment. Livestock have been injured by ingesting or entangling themselves in the trash, and expensive farming equipment has been damaged by debris caught in moving parts (NYS Dept. of Agriculture and Markets, 1982a).

Although no formal policy exists, Department staff generally discourage on site trash burial and recommend that it be taken to a landfill. When trash has been buried on site, the burial depth has sometimes been too shallow to prevent damage to plow blades and/or re-emergence of the trash at the surface through frost action (NYS Dept. of Agriculture and Markets, 1982a).

Because of complaints concerning burial of trash and pit liners which have a tendency to work their way back to the surface and interfere with farm operations, it is recommended the permit holder be required to have landowner approval to bury either trash or the drilling pit liner.

Damage to plow blades has also occurred when they collided with casing left in the ground. **The Department recommends that the well casing must be cut down below plow depth during plugging and abandonment in agricultural areas. The safe buffer depth is now specified as 4 feet below the surface of the ground.**

Another major concern in the agricultural community is restoration of the natural soil profile. During access road and well site construction, the land is usually stripped to bedrock or the hardpan clay zone to avoid erosion and

sedimentation problems and provide adequate support for heavy equipment. The topsoil that is removed should be stockpiled for later use. Mixing of topsoil with the subsoil below it during either site clearing or restoration will seriously hinder crop production (NYS Dept. of Agriculture and Markets, 1982a). The Seneca County Soil and Water Conservation District has estimated that reduced crop yields may be expected for 20 years or more when the topsoil location is reversed with the subsoil and buried below the plant root zone (Cool, 1982, personal communication #14). **Therefore, it is recommended that topsoil stockpiling and redistribution during site reclamation be required in all agricultural areas. Additional measures such as paraplowing where compaction has occurred are also recommended.**

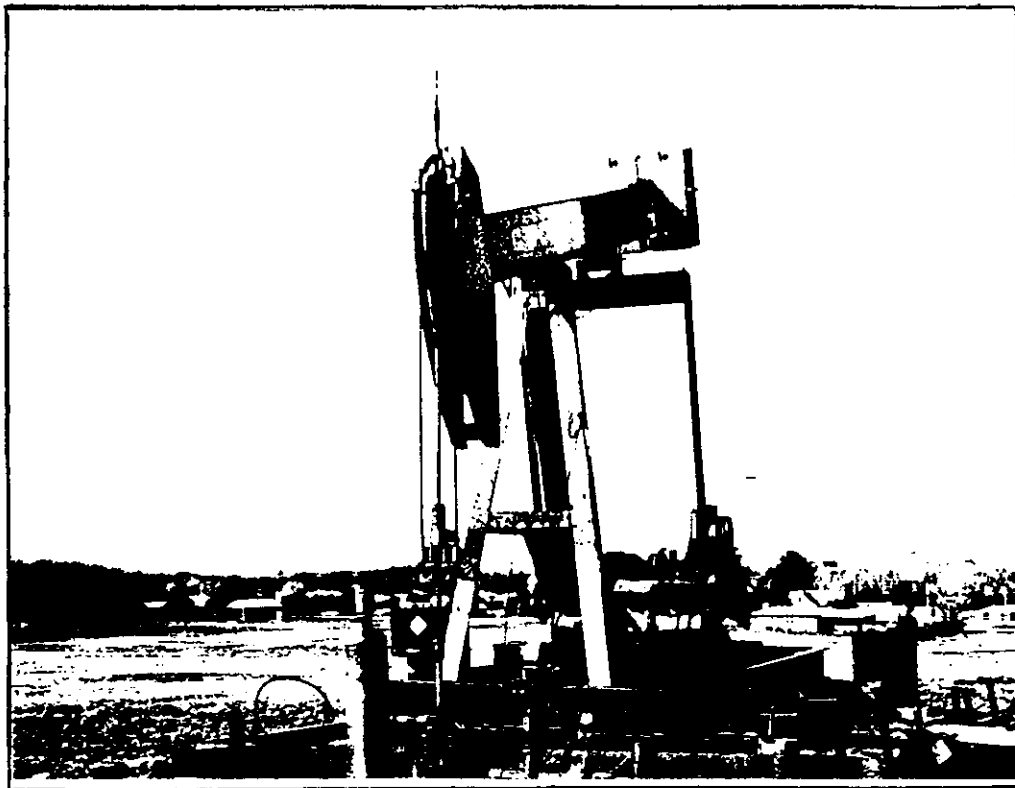
Crop yields may also be affected when a site is restored with soils that have been contaminated with oil, gas, brine or other waste fluids. Brine and oil contamination of soil is a serious problem that can inhibit crop production for years unless prompt restoration is made (NYS Dept. of Agriculture and Markets, 1982a). (See Figure 8.3).

4. Water Supply

Contamination of water supplies used for livestock, irrigation and other agricultural purposes is also a concern to farmers. Over the years, oil and gas operations have been suspected in several water pollution incidents. However, the source of these water pollution problems is often difficult to determine, especially without accurate information on the original quality of the water supply. In addition, it is difficult to prove the exact cause of livestock illness or mortality without extensive testing (Lacey, 1983, personal communication, #43).

Farmers are also concerned about the location of drilling pits in or near pastures (NYS Dept. of Agriculture and Markets, 1982a). Drilling pits containing brine can be an nuisance because stock may be attracted to the

FIGURE 8.3 RESTORED SITE OF BLOWOUT AND
PRODUCTION RECORD HOLDER



The Lipari No. 1 located on the hillside above the Josephson wells (Fig. 8.6 and 8.7) was permitted in 1981 with no special conditions. Although drilled within the Bass Island Corridor, the Department had not yet developed drilling conditions for the formation.

Large volumes of oil and gas entered the wellbore during drilling. Two attempts to control the well failed and the well "blew-out". A third attempt succeeded, but not before an extensive fire and oil spill occurred. Approximately three acres of land were affected by the oil spill and fire. However, as evidenced by Fig. 8.7, the affected land is again under cultivation. Prudent clean-up operations protected the surrounding land and water resources. The site presently shows no evidence of a non-routine incident of this magnitude.

As seen in this figure, the Lipari No. 1, presently recovers oil and gas through an artificial means of energy (i.e. pumping). However, for two months this well was the most productive well ever in New York, producing at rates approaching 2,000 barrels of oil per day. Natural energy depletion and paraffin problems have substantially reduced this well's capacity to produce. This well was included in the Bass Island Summary Abatement Order.

FIGURE 8.3

salt. Fencing around pits is rare because of their temporary nature.

5. Lease Terms

Some of the above mentioned problems regarding drainage, bisection of fields, and livestock safety are best addressed by contractual arrangements between the landowner and the lessee because the landowner is most familiar with the details of his farming operations, such as the exact location of his drainage systems and his future plans for the farm. For guidance, the New York State Soil and Water Conservation Committee has recently developed a suggested addendum to oil and gas leases to help farmers deal with these and other problems (State Soil and Water Conservation Committee, 1983). Additionally, the Farm Bureau and the District Attorney's office have also published a Bulletin to aid the landowner (Cornell University, 1982). Soil and Water Conservation District staff are also reporting increased cooperation by the oil and gas industry in recognizing agricultural concerns. (Lacey, 1983, personal communication #43).

Often farmers designate where they want wells and access roads to be located. Although oil and gas companies usually honor landowners verbal requests, inclusion of siting restrictions in the lease document is the best means of protecting farming operations and other landowner concerns. Landowners also may request that a road be built in a specific location for their future use as a farm road, logging road, etc. In these cases the road will not be reclaimed. Landowners are cautioned to carefully review the proposed contractual lease terms because the Department can intervene only when environmental damage or regulatory violations have occurred. Leases also sometimes include the following provisions related to well and access road siting and preparation (State Soil and Water Conservation Committee, 1983):

- require fencing of well site and disturbed areas during and after

construction to prevent injury to livestock.

- compensation for damages to land, crops, fences, trees, buildings, springs, water wells, ponds, livestock or other property.
- timing of construction so as to provide for minimal impacts on the soil profile (e.g., construction during summer months) and minimum interference with plowing, planting or harvesting of crops.
- repair of damaged conservation practices (drainage systems, ditches, etc.)
- restrictions on use of landowner's water supplies.
- require removal or burial of drill site trash and debris
- require a gate on access road to prevent escape of livestock or unauthorized entry.

6. DEC Permit Conditions

Although most of the potential conflicts between agriculture and oil and gas operations should be handled during the leasing process, DEC's regulations are also important in preventing problems. As a result of both the permit application review and pre-drilling site inspection processes, DEC staff may attach conditions to permits requiring:

- adoption of erosion and siltation control measures
- stockpiling of topsoil for use during site reclamation
- timetable for site reclamation
- the movement of wells and/or access roads to the edge of fields where they will interfere less with farming operations.

Erosion, sedimentation and general agricultural issues have been added to the Pre-Drilling Environmental Assessment Form so that these issues will be addressed on a consistent basis.

G. STREAM DISTURBANCE

During the pre-drilling site inspections conducted for every permit

application, Department staff check whether the proposed well or access road location is within 50 feet of a protected stream. If so, a Stream Disturbance Permit may be required. Physical alteration of the bed or banks of a stream can cause [6NYCRR Part 608.2(c)(2)]:

- danger of flood
- loss of fish and aquatic wildlife habitat
- irregular variations in water velocity
- water level and/or temperature change
- unreasonable and unnecessary erosion of soil
- increase in water turbidity

To prevent problems like those listed above, the change, modification or disturbance of the bed or banks of any protected stream [Class AA thru C(T)] is prohibited without a Stream Disturbance Permit from the DEC Division of Regulatory Affairs. Construction of dams and other impoundments, removal of sand or gravel, placement of fill and building of docks are all covered under the permit program. The most common activity related to oil and gas development that might require a Stream Disturbance Permit is the construction of an access road across a stream.

1. Streambanks

Some minor stream erosion and temporary stream siltation is inevitable during the access road construction; however, Stream Disturbance Permits contain conditions that effectively minimize these problems. During the stream ford construction, rock and soil cannot be pushed into the stream when breaking through stream banks. Excavated soil also cannot be stored at locations on top of stream banks where it could erode into the stream or cause banks to collapse. In addition, all existing stream bank vegetation must be left undisturbed except at the actual crossing site. Immediately after

completion of the project, all disturbed stream banks must be graded to meet existing adjacent topographic conditions, seeded with a perennial grass mixture and mulched with hay or straw. Seed and mulch must be re-applied as necessary until a vigorous vegetative cover is established. Sometimes the operator is also required to install water bars, cross ditching and staked hay bale filter barriers on the access road where silt and suspended soils could otherwise reach a stream or pond. The described erosion control measures must be adequately maintained until well production is complete.

2. Gathering Lines

Some of the major negative impacts which can occur as a result of pipeline installation are loss of vegetation, disruption of scenic vistas, disruption of the natural soil profile, increases in erosion in sensitive areas, and increases in sedimentation at stream crossings and in wetlands. Pipeline installation can temporarily disrupt traffic at railroad and highway crossings. Pipelines and the associated compressor stations can also have negative noise impacts on people living in proximity when no noise mitigation measures are taken.

Often gathering lines cross streams or other environmentally sensitive areas. Before the gathering lines were regulated, such lines could simply be suspended across the stream where exposure to the elements, flood debris, and possibly vandals, could damage them. For example, several years ago a break in a gathering line crossing a trout stream to a storage tank spilled oil that remained in the stream for several years (Cooper, 1983, personal communication #15). The Department now has siting jurisdiction of gas gathering lines in environmentally sensitive areas such as wetlands and stream crossings and both safety and siting jurisdiction over oil gathering lines. To protect streams from such accidents, the Department now requires that collector lines be buried adjacent to the access road crossing. Open trenches down the stream

bank must be backfilled immediately after pipeline installation to prevent the entry of silt and suspended solids into surface waters from rain induced flows. The Department may also require that any steel casing/oil line entrenchment across the stream be carried out during low water conditions and expeditiously completed within a maximum 24 hour period.

The Public Service Commission (PSC) has safety jurisdiction over gas gathering lines and the PSC specifies minimum burial depths. The specifications required by PSC for gathering lines have been included in Appendix 6.

3. Culverts and Sills

A culvert is sometimes installed to channel the stream beneath the access road. As an alternative, a sill may be constructed flush with the stream bottom to allow the vehicles to drive through shallow water. Depending upon the type of stream crossing the Department requires, the culvert base be emplaced on or slightly below stream bed elevation. Only clean gravel (with minimum soil) may be used as fill around the culvert to minimize entry of silt and suspended solids into the water. Both the up and downstream sides of the culvert structure usually must be riprapped to prevent damage from erosion. When used, riprap generally must be entrenched at least 18 to 20 inches below the stream bed.

4. Fill and Filter Fabric

Filter fabric is often required in access road construction to decrease the amount of fill needed and minimize impacts on the stream. Whether filter fabric is used or not, placement of fill to construct the access road must always be kept to the absolute minimum necessary to enable passage of heavy equipment and to prevent impounding of flood waters. All fill must meet permit specifications and be obtained from State approved sites. When filter

cloth underlayment (geotextile) for the sill is used it must be of appropriate bearing strength to support the weights of the heaviest equipment expected to be used in the well drilling operation.

5. General

The following types of general conditions may also be included in the Stream Disturbance Permit:

- the use of equipment in the stream, except at the authorized crossing site is strictly prohibited. No gravel shall be removed from any stream for access road and/or well site construction or maintenance without prior approval from the Department.
- the stream shall not be crossed during or immediately after a storm which may cause high water conditions or flooding.

6. Aquatic Habitat

Protection of fish and aquatic habitat is one of the primary goals of the Stream Disturbance Permit program. The Permit conditions outlined above are generally effective in preventing stream siltation. However, during fish spawning periods when stream water quality is of special importance, work on the bed or banks of a stream may be restricted.

H. EROSION AND SEDIMENTATION

During the pre-drilling site inspection conducted for every well permit application, Department staff check whether recommendations or permit conditions are needed to prevent erosion and sedimentation problems from oil and gas drilling activities. Clearing vegetation from well sites and constructing access roads disturbs the soil and leads to accelerated soil erosion. Soil erosion and sedimentation are more likely to occur when: 1) a site is prepared during the wet season, or 2) an inordinate amount of precipitation washes out the site.

Soil is an essential natural resource. Yet when soil from access roads

and well sites is deposited in nearby water bodies, it becomes a pollutant. Stream siltation can temporarily elevate the level of suspended particulates in the water, reduce light penetration and lower the rate of photosynthesis and primary productivity of the aquatic community. In addition, pesticides, herbicides, viruses, pathogens, toxic metals, fertilizers, and other plant nutrients absorbed or adsorbed onto fine grained soil particulates may become biologically available to organisms in the water column or on the substrate. The biological and chemical oxygen demand of the suspended material may also remove dissolved oxygen from the water and deplete the supply available to fish and other aquatic life (Ertugrul, 1982). Sediment loading of water bodies can also (NYS DEC, Division of Water, 1985):

- smother fish eggs laid in bottom gravels.
- destroy fish habitat by covering up rock rubble. If the sediment contains a high proportion of silt/clay particles the damage to the habitat will be irreversible without mechanical removal of the sediment.
- destroy or cover invertebrates, vegetation, and detritus on which fish life depends.
- clog stream channels, fill lakes and ponds, and reduce reservoir capacity.
- damage water distribution systems.
- degrade water for human consumption, interfere with disinfection, mask pathogenic organisms and increase water filtering and treatment costs.
- detract from recreational use of water.
- increase flood levels of water bodies.

The above problems can be alleviated by good erosion control planning and increasing the setback restrictions as recommended.

1. Wells and Drinking Water Reservoirs

Pre-drilling site inspections have been conducted for every well permit

application since 1982 when money from the higher permit fees authorized by the amended Oil, Gas and Solution Mining Law made it possible to support additional inspection staff. At about the same time, a policy was also implemented requiring operators to submit complete erosion and sedimentation control plans for wells to be drilled in the watershed of a drinking water reservoir.

As a result of the inspections and/or plans, DEC requires adoption of specific erosion and sedimentation control measures based upon the topography, soils and vegetation of the well site and access road area. Such measures are generally very effective provided they are carefully planned, installed and maintained. Common erosion and sedimentation control measures that might be required by conditions attached to a well drilling permit include diversion ditches (to control surface runoff) filtration strips, sediment barriers, road culverts, cross drains, sediment ponds, seed and mulch and grading.

2. Other Wells

Review of erosion and sedimentation control plans for wells in drinking water reservoir watersheds has generally increased staff awareness of these types of concerns. Accordingly, conditions regarding potential erosion and sedimentation problems are often added to drilling permits for oil and gas wells in other locations. These issues and many more are covered in the Environmental Assessment Form (see Appendix 5) which must be submitted by the operator with the drilling permit application.

Some of the natural resources that may be affected by erosion and sedimentation are listed on the Inspection Form. For example, DEC staff must check whether the proposed well or access road location is within 50 feet of a surface waterbody or 100 feet of a freshwater wetland. However, a 50 foot buffer between a well and a lake or stream is not an adequate indication of the potential for sedimentation problems. Depending upon the local

topography, eroded sediments can travel much farther than 50 feet. In addition, the average area cleared around the well is approximately 100 feet x 100 feet outside of Agricultural Districts and the site could extend up to the water's edge, leaving disturbed, erosion-prone soils directly next to the waterbody. This is further justification for extending the buffer zone between a proposed well and a surface water body.

I. HISTORIC/ARCHEOLOGIC SITES

During the review of every well permit application, Departmental staff check whether the proposed oil and gas activities will disturb any areas of historic or archeologic significance. The New York State Historic Preservation Act of 1980 requires that all State agencies prevent adverse impacts on the State's historic and archeologic resources.

1. Historic Sites

There are several hundred historic sites in New York State listed on either the State or Federal Registers. Areas listed or eligible for listing cannot be disturbed or impaired. The sites currently listed range from individual buildings, to farms of more than 50 acres, to entire villages (Ross, 1983, personal communication #60).

To date, no conflicts have been recorded between oil and gas drilling related activities and a site on either Register. In the event a well is proposed in the vicinity of an historic site, the Department will base its determination regarding issuance of the permit on individual circumstances. Possible conditions which might be required for a permit include:

- visual screening of operations.
- setback requirements greater than existing minimums (private home - 100', public building or area - 150').
- restriction on times of operation, for example not during the tourist

season, museum hours, etc.

- landscaping reclamation requirements.

2. Archeological Sites

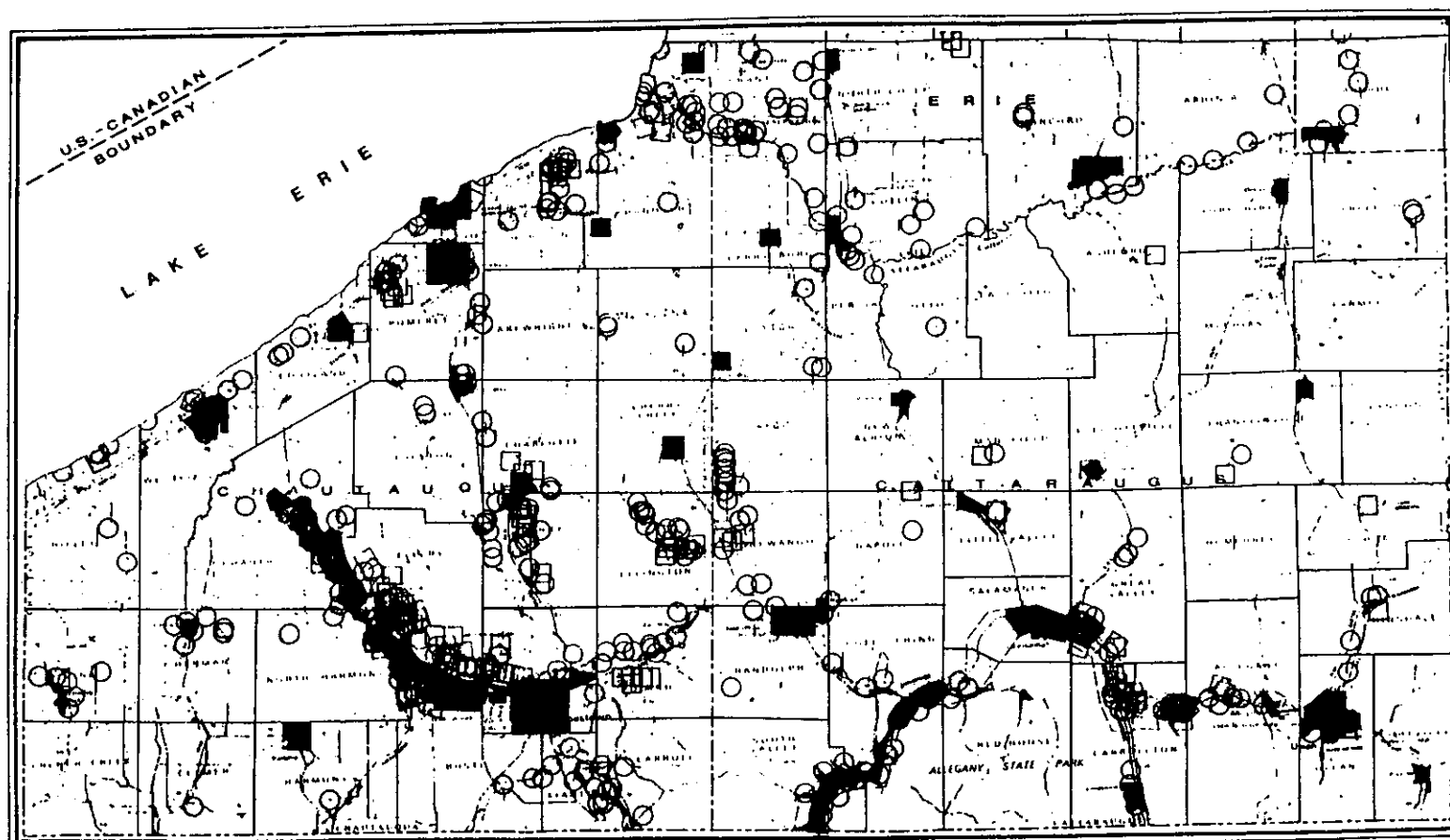
The State Office of Parks, Recreation and Historic Preservation (OPRHP) has identified over 1,000 archeological sites in the western and central parts of the State which may be eligible for listing on the State Register. In order to protect sites from "arrowhead poachers" OPRHP's archeological maps are very general in nature. Site locations are indicated only by one mile wide circles or squares (Kuvic, 1983, personal communication #39) (See Fig. 8.4).

Most of the archeologic sites are of Indian origin, with a significant proportion of them concentrated along water bodies. The sites range in size and importance from a single fire pit to entire villages. As the inventory is expanded, more sites from the colonial period may be added (Kuvic, 1983, personal communication #39).

Since archeologic sites are generally difficult to detect by their surface appearance, they are more likely to be damaged by oil and gas activities than other historic structures. Even if artifacts are salvaged during construction, removal from their original location and disturbance of the site will destroy much of their value. Archeologists need to study the relative position of artifacts to surrounding bones, rocks, soil, etc., to determine their age and more about the lives of the people who used them (Kuvic, 1983, personal communication #39).

Before a permit can be issued for any oil and gas activity within one of the mapped one mile wide circles or squares, the proposed project must be reviewed for its archeological impacts. Normally this would involve forwarding the permit application to OPRHP for review. However, in recognition of the time constraints involved in drilling activities, operators

FIGURE 8.4 ARCHEOLOGICAL SITES IN SOUTHWESTERN NEW YORK



SOURCE: New York State Archaeological Site Locations, 1981
New York State Office of Park Recreation & Historic Preservation

may have an independent archeological survey conducted instead and submit the results with their permit application. Survey costs generally range from \$500 to \$1,500, though the cost may increase if something of archeological worth is found. Figure 8.5 summarizes the archeologic review process.

The presence of archeological artifacts at a site does not necessarily preclude a permit from being issued. Recovery of archeological data from the affected area may be sufficient to satisfy the requirements of the State Historic Preservation Act (Kuvic, 1983, personal communication #39).

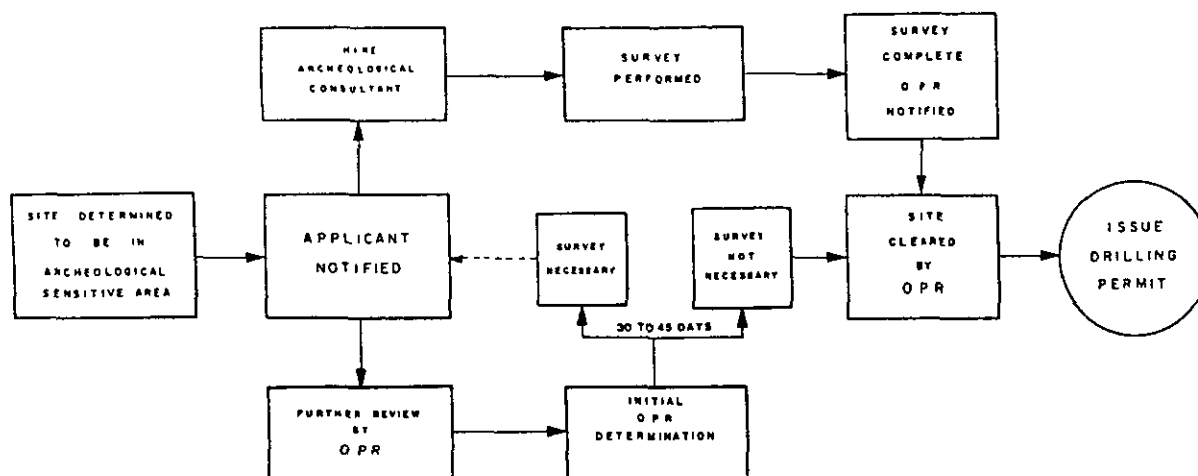
J. SIGNIFICANT HABITATS

During the review of every drilling permit application they receive, DEC's Division of Regulatory Affairs (DRA) staff check whether the proposed oil and gas activities will disturb flora or fauna of special concern. Since its inception in 1975, the State Significant Habitat Inventory has been a useful tool for protecting important fish and wildlife resources including rare, endangered and threatened species. Approximately 1,000 significant habitats have been identified so far statewide and work continues on expanding the inventory (Brown, 1984, personal communication #6).

Significant habitats are defined as areas which "provide some of the key factor(s) required for survival, variety, or abundance of wildlife, and/or for human recreation associated with such wildlife." Examples of significant habitats include (NYS DEC, Division of Lands and Forests, 1980):

- areas containing endangered or rare species.
- high concentrations of wildlife.
- concentrated migration routes.
- urban open space of value as wildlife habitat.
- uncommon land forms.
- unusual vegetative associations that support unusual wildlife.

FIGURE 8.5 ARCHEOLOGIC REVIEW PROCESS



The following steps must be taken after the Division of Regulatory Affairs determines a proposed oil or gas well location is within an archeologically sensitive area.

STEP 1: DEC notifies applicant that location is within an archeologically sensitive area. Applicant is given option of:
a) having the proposed location reviewed by the Office of Parks, Recreation and Historic Preservation (OPR) or b) hiring a qualified consultant to do an archeologic survey.

STEP 2a: If applicant elects OPR review, a map of the proposed well location must be sent to OPR.

Note: Advantages - after OPR review, the cost of an archeological survey may not be necessary.
Disadvantages - review process could take 30 to 45 days and OPR may determine a site survey is still necessary.

STEP 2b: If the applicant elects to hire a consultant, the applicant must have the consultant notify OPR with the results of the survey.

STEP 3: OPR will issue approval or disapproval within 30 to 45 days.

STEP 4a: If final approval is given by OPR, the drilling permit can be issued.

STEP 4b: If final approval is not given by OPR, the drilling permit cannot be issued. Applicant may be required to move proposed location or have survey performed.

Note: Approval by OPR can be in either written or verbal form.

FIGURE 8.5

- areas containing features critical to a particular species such as deeryards, nesting areas and spawning grounds.

The majority of the Significant Habitats in or near existing oil and gas fields fall into one of the following categories:

1. Heronries

The Great Blue Heron nests in colonies ranging in size from 2 to 400 nests. Individual sites are important to the birds' survival. There are only 90 to 100 known heronries in the entire State (Brown, 1984, personal communication #6). The noise and activity associated with oil and gas operations could pose a threat to heronries only during the nesting season which extends roughly from early April until the end of July. The exact distance needed between a well and a heronry to ensure the nesting birds are not disturbed is uncertain. Heronries are known to exist near railroad tracks and other noisy locations, and it may actually be more important that the oil and gas operations remain out of the birds' visual contact. Therefore, the Department sets the minimum distance between wells and heronries on an individual basis allowing for local topographic features, density of vegetation and a margin of safety (Cooper, Taft, personal communications, #15 and 65).

2. Deer Wintering Areas

Deer wintering areas are by far the most prolific type of significant habitat existing in the State's oil and gas producing region (Cooper, Jurczak, Taft, personal communications, #15, 37, 65, and 66). There are several hundred wintering areas ranging in size from one to 600 or 700 acres. The hemlock and pine softwood trees provide protection from the elements as well as food in the form of woody browse. These areas are vital to the deer's survival, especially during harsh winters (Cooper, Jurczak, 1984, personal communications #15 and 37).

As needed, DEC staff may require the relocation of a proposed access road or well site to prevent either destruction of softwood cover or disturbance of the herd by drilling during winter months. Relocation may also be required because of the indirect, but potentially more serious, impacts resulting from creation of new access routes into the wintering areas for snowmobiles, dogs and hunters (Cooper, 1984, personal communication #15).

Replanting of conifers in disturbed areas is occasionally also used as a mitigation technique (Jurczak, 1984, personal communication #37).

3. Uncommon, Rare and Engangered Plants

There are no records to date of a conflict between oil and gas drilling operations and a rare plant community. There are, however, a wide variety of rare, endangered and uncommon plant habitats in the general vicinity of the State's existing oil and gas fields. Although it is difficult to generalize, most of these plant communities have survived either because they are not easily accessible or restrictions have been placed on their use. Once damaged, re-establishment of these delicate plant communities would generally be slow, if not impossible. Therefore, the best technique for mitigating oil and gas drilling related impacts is complete avoidance of the plant habitat.

Aside from the listing of the plant habitats in the Significant Habitats Inventory, many of the plants involved are also on the New York State List of Protected Plants (ECL 9-1503). Designation on the list, however, only protects plants on public property.

Some of the significant plant communities occurring in wetlands may receive some additional protection under the State's Freshwater Wetlands Law depending on whether the wetland is over 12.4 acres or has been designated a unique wetland regardless of its size. (See 8.L for additional information).

K. FLOODPLAIN

During the pre-drilling site inspections conducted for every permit application, Department staff check whether a State or Local Floodplain Permit is needed [ECL Article 36]. Floodplains are the lowland areas along streams, rivers, ponds and lakes which carry extra water when heavy rain, melting snow or some other phenomena causes a waterbody to overflow its normal banks. Property damage and other problems can arise when development of any type takes place in these areas.

To help alleviate problems in floodplains, Congress passed the National Flood Insurance Act in 1968. To benefit from the insurance breaks offered by the national program, local governments must develop long term flood management plans and issue permits for activities in floodplains. If the local government does not exercise its option, the State must handle the permitting for that area.

Under the national program the Federal Emergency Management Administration has been working on mapping 100 year floodplain boundaries. Due to funding problems, however, fewer than half the eligible communities have received or expect to receive the data from the federal government. Therefore, floodplain maps are being developed on a municipal basis for these communities.

During the pre-drilling site inspections, DEC staff must check whether the well or access road will be within 100 feet of a floodplain boundary. If the proposed well location is in a community that has its own floodplain program, the community will be notified of the permit application. Whether State or local authorities issue the floodplain permit, the following concerns should be addressed when siting a well in or near a floodplain:

1. Mud or Reserve Pits

Wherever possible, mud pits should be located on the side of the well most distant from the water course and the well site should be graded to

direct surface run off and accidental spills into the mud pit. Floods can destroy or weaken pit effectiveness in a number of ways. Floodwaters may seep through or completely wash away the retaining walls and float the liner away from the sides. If the flood is high enough, it may crest the pit and flush out the contents. Even a minor flood, which does not breach the river bank, could cause a rise in the water table on a floodplain which might float the liner out of a mud pit. Although contamination of the floodwaters by pit fluids is a concern, the high volume of floodwaters usually involved should dilute the pit wastes sufficiently to prevent harm. Contamination of groundwater and accidental leakage of waste fluids from a flood damaged pit are of greater concern.

2. Brine and Oil Tanks

The operator may elect to install one or more tanks at a well site to collect brine and/or oil. Since such tanks are usually associated with the production phase, they are one of the more permanent features of a well site. Brine from drilling operations usually goes to the mud or reserve pit. However, the Department has the authority to require installation of tanks for handling drilling brines also.

Tanks on well site locations generally range in size from 12 to 200 barrels (one oil field barrel = 42 gallons). The only significant difference between oil and brine tanks is that the latter are usually lined to prevent salt water corrosion. The Department does require that oil holding tanks in primary aquifer areas be surrounded by a dike capable of retaining $1\frac{1}{2}$ times the capacity of the tank. The dikes are usually formed of compacted earth and may also be lined with an impermeable material. **It is suggested the regulations be amended to require dikes around all oil storage tanks in the future, regardless of their location.**

Flood damage to tanks can result from collisions with uprooted trees or other flood debris. Floodwaters may also float a tank off its foundation possibly causing the tank to collide with other objects along the way. Damage to collection and distribution lines connected to a tank is also a concern if the well is flowing. Brine from a damaged tank probably will not cause serious environmental problems provided the leak occurs while the floodwaters are present to dilute it. Brine leaks after the floodwaters have receded could be more serious.

Unlike brine, oil will not be "diluted" by the floodwaters. It may spread out on the water surface and travel a substantial distance or it may be deposited in a suffocating layer. Although fresh oil floats on water, weathered oil may sink to the bottom after the turbulent water conditions associated with flooding have passed. The most likely natural resources to be damaged by oil from a tank are:

- the surface water body the floodplain is associated with and any flora or fauna living in or near the waterbody,
- wetlands in the floodplain (for more information on the potential environmental impacts of oil on these natural resources, see section on wetlands).

To prevent the types of problems described above, the Department requires that all brine and oil tanks in floodplains be securely anchored in place in accordance with the plan entitled "Deadman Tie Down - Liquid Storage Tank". A deadman is a buried anchor, steel piling, concrete plug or timber, to which a guy wire is attached. The deadman used for anchoring must be buried a minimum of three feet below ground level.

3. Other Tanks

Portable tanks, called Baker tanks, may also be installed at a well site to temporarily store such things as fresh water, completion fluids, workover

fluids and spent frac fluids. These square tanks generally rest horizontally on a skid which allows them to be moved more easily. In fact, a single tank may be employed for a number of uses in different locations around the well site over a relatively short period of time. Tanks may also be rented from a supply company as needed. Under such conditions, they are rarely anchored in place like the permanent brine and oil storage tanks.

Fresh water is not a pollutant and its accidental release into the environment is not a significant concern. Completion fluids, workover fluids and spent frac fluids are potential pollutants so adequate containment is required.

Although floods can occur year round, they are most common during the snow melt/spring rain season. Local weather stations regularly issue flood watches or warnings as needed. In the event of a flood warning, an operator should have time to secure or remove temporary storage tanks.

4. Brush Debris

The brush pile remaining from clearing of the access road and well site would be one of the first things to be swept away by a flood. Depending upon local topography, the brushy debris could block the access road, hinder well site operations or do damage farther downstream. To prevent this, the Department attaches the following conditions to permits for wells in floodplain areas:

- 1) merchantable tree parts shall be salvaged for lumber, if possible.
- 2) non-merchantable tree parts and brush debris be salvaged for use as firewood, or
- 3) winnowed and securely anchored to form a brush pile (anchors are necessary to prevent downstream flood debris damage), or
- 4) buried on site under 2 feet of soil.

5. Erosion/Topsoil

As previously mentioned, erosion is a topic that must be addressed in construction of access roads and well sites. It is a particular concern in floodplains because of the strong erosive power of moving flood waters. For example, if the stock pile of topsoil that has been saved for later site reclamation is within the floodplain, it may be lost downstream. Although the issue of topsoil protection is not addressed in Floodplain Permit conditions, the Department prohibits drilling during flood season and requires that adequately sized culverts be installed under the access road to provide proper drainage and water flow within the flood hazard area. This permit condition also sometimes specifies the number of culverts.

6. Bulk Supplies

Bags of drilling mud materials, cement, additives and other supplies may be stored on site until they are needed. The most common storage places are wooden pallets or a small shed known as a mud house. Because the supplies are normally stored on platforms and protected from rain, etc., severe flooding is one of the few ways they might accidentally enter the environment in large quantities.

7. Accidents

The chances of just about any type of accident occurring are greater when movements of personnel and equipment are hampered by flood conditions. Therefore, the Department prohibits drilling or construction activities on floodplains during flood or high water season.

L. FRESHWATER WETLANDS

"Freshwater wetland" is a general category that includes such diverse habitats as mossy bogs, cattail marshes and swamps of mature trees. They are all characterized, however, by the presence of shallow waters or waterlogged

soils that support distinctive communities of aquatic or water-tolerant plants. During the pre-drilling site inspections conducted for every well permit application, Department staff check whether the well, access road or any other associated oil and gas facilities will be within 100 feet of a freshwater wetland.

Under the Freshwater Wetlands Act, it is State policy to preserve, protect and conserve freshwater wetlands and the benefits derived therefrom [ECL 24-0103]. Therefore, a Freshwater Wetlands Permit is required for any oil and gas activities within 100 feet of any wetland 12.4 acres or larger. Such permits may also be required for smaller wetlands of unusual local or statewide significance. Mineral Resources staff may also add conditions to well drilling permits to protect wetlands under 12.4 acres based on the responsibility of State agencies to promote efforts which prevent or eliminate damage to the environment. The Department allows oil and gas drilling activities in wetlands only when alternate locations are not available. The basic policy of impact mitigation for wetlands is avoid, restore or compensate (Riexinger, 1986, personal communication #59).

Although all wetlands cannot be credited with equal environmental importance, viewed as a group they perform many essential functions [ECL 24-0105.7]:

- flood and storm control by the hydrologic absorption and storage capacity of wetlands vegetation and soils;
- wildlife habitat by providing breeding, nesting and feeding grounds and cover for many forms of wildlife, including migratory waterfowl and rare species such as the bald eagle and osprey;
- protection of subsurface water resources, provision for valuable watersheds and recharge of ground water supplies;
- recreation by providing areas for hunting, fishing, boating, hiking, bird

- watching, photography, camping and other uses;
- pollution treatment by serving as biological and chemical oxidation basins;
 - erosion control by serving as sedimentation areas and filtering basins, absorbing silt and organic matter and protecting channels and harbors;
 - education and scientific research by providing readily accessible outdoor biophysical laboratories, living classrooms and vast training and education resources;
 - open space and aesthetic appreciation by providing often the only remaining open areas along crowded river fronts and coastal Great Lakes regions; and
 - habitat for some of the rare plants on the New York State List of Protected Plants.

At the most elemental level, construction of access roads and well pads in wetlands can be expected to destroy vegetation and displace wildlife. The actual extent of the environmental impacts from oil and gas activities will vary with type of activity, type of wetland and conditions placed on the permit. Wetland classifications are given in Table 8.1. These classifications help identify the relative value of wetlands. The topics that should be considered in reviewing a permit application for a well in or near a wetland are outlined below.

1. Interruption of Natural Drainage

Construction of access roads and well pads in or near wetlands changes the existing contours of the land. The changes often interrupt surface runoff patterns and may also interfere with the natural flow of waters in the wetland. Depending upon local conditions, these changes could result in such things as:

Table 8.1 Freshwater Wetland Classifications

<p>Class I Wetlands ^{1,2,3}</p> <p>Class I wetlands provide the most critical of the State's wetland benefits, reduction of which is acceptable only in the most unusual circumstances. A permit shall be issued only if it is determined that the proposed activity satisfies a compelling economic or social need that clearly and substantially outweighs the loss of detriment to the benefit(s) of the Class I wetland.</p>	<p>Class II Wetlands ^{1,2,3}</p> <p>Class II wetlands provide important wetland benefits, the loss of which is acceptable only in very limited circumstances. A permit shall be issued only if it is determined that the proposed activity satisfies a pressing economic or social need that clearly outweighs the loss of or detriment to the benefit(s) of the Class II wetland.</p>
<p>Class III Wetlands ^{1,2,3}</p> <p>Class III wetlands supply wetland benefits, the loss of which is acceptable only after the exercise of caution and discernment. A permit shall be issued only if it is determined that the proposed activity satisfies an economic or social need that outweighs the loss of or detriment to the benefit(s) of the Class III wetland.</p>	<p>Class IV Wetlands ^{1,2,4}</p> <p>Class IV wetlands provide some wildlife and open space benefits cited in the act. Therefore, wanton or uncontrolled degradation or loss of Class IV wetlands is unacceptable. A permit shall be issued for a proposed activity in a Class IV wetland only if it is determined that the activity would be the only practicable alternative which could accomplish the applicant's objectives.</p>

¹The proposed activity must be compatible with the public health and welfare.

²The proposed activity must be the only practicable alternative which could accomplish the applicant's objectives and must have no practicable alternative on a site that is not a freshwater wetland or adjacent area.

³The proposed activity must minimize degradation to, or loss of, any part of the wetland or its adjacent area and must minimize any adverse impacts on the functions and benefits which that wetland provides.

⁴The proposed activity must make a reasonable effort to minimize degradation to, or loss of, any part of the wetland or its adjacent area.

TABLE 8.1

- an increase or decrease in the water level in all or part of a wetland with possible permanent change in flora, fauna and benefits that the wetland provides.
- diversion of water to areas adjacent to wetlands possibly creating temporary soggy soil conditions, new wetland areas, water in basements, etc.
- erosion of topsoil, washout of access roads, etc.

Problems like those above have been mitigated by attachment of permit conditions requiring that adequately sized culverts be installed under the access road to provide proper drainage and flows within the wetland. The routing of flowing water and runoff around the well pad can also be handled by a similar permit condition.

2. Flooding

Water levels in wetlands can vary with the season, and flooding of the access road and/or well site may occur. When movements of personnel and equipment are hampered by high water, there is an increased chance for accidents. Therefore, drilling permits for wells in wetland areas sometimes contain a condition prohibiting drilling or construction activities at a well site during periods of the year when either it, or its access road, is inundated by flood waters. A permit condition may also require an operator to carry out all work during dry periods of the year as expeditiously as possible.

The placement of fill for construction of the access road and well site must generally be kept to the absolute minimum necessary and in some cases bank run gravel is specified. However, to protect the well site from high water, the Department may instruct the operator to build it up.

3. Erosion and Sedimentation

Clearing vegetation from well sites and constructing access roads in any setting disturbs the soil and leads to accelerated erosion. In addition to possible deterioration of the access road and well site, problems may also result from deposition of the eroded sediments in or near the wetland. Small quantities of eroded materials generally will not cause any significant problems. However, the potential does exist for burial of wetland vegetation with possible permanent change in a portion of the wetland. Sedimentation of water bodies associated with the wetland may also be a concern.

These problems can be effectively mitigated by the runoff, erosion and siltation conditions attached to permits similar to those for wells in drinking water reservoir watersheds. Such permit conditions are also used for protecting wetlands but not on such a consistent basis. Operators have sometimes been required to install water bars, cross ditching and staked hay bale filter barriers on the access road where silt and suspended solids might otherwise reach a stream, pond, or wetland.

4. Brush Disposal

Depending upon individual circumstances, large piles of brush and other woody debris may be created during well site and access road clearing. Brush piles left behind in a wetland may alter wetland characteristics or be visually incompatible with the surrounding vegetation. In addition, loose brush may cause damage downstream if the wetland is flooded. However, some DEC wildlife staff support brush piles as temporary feed areas for deer and a habitat for squirrels, chipmunks, birds and other small animals.

To prevent problems, operators are required to salvage merchantable tree parts for lumber if possible. If salvage is not possible, they must be disposed of. Non-merchantable tree parts and brush debris must be (1) salvaged for firewood, (2) disposed of at an approved landfill site, (3) buried on-site under 2 feet of soil, (4) chipped to provide a ready mulch for

erosion control, (5) winnowed and securely anchored to form a brush pile (anchors are necessary to prevent downstream flood debris damage). Open burning of brush and debris is prohibited.

None of these disposal options should cause any environmental damage to the wetland, with the possible exception of option #3. However, the permit condition is usually worded to require brush debris burial in previously disturbed areas only.

5. General Permit Conditions

There are also several general conditions that may be attached to permits for oil and gas related activities that are aimed at minimizing the area disturbed:

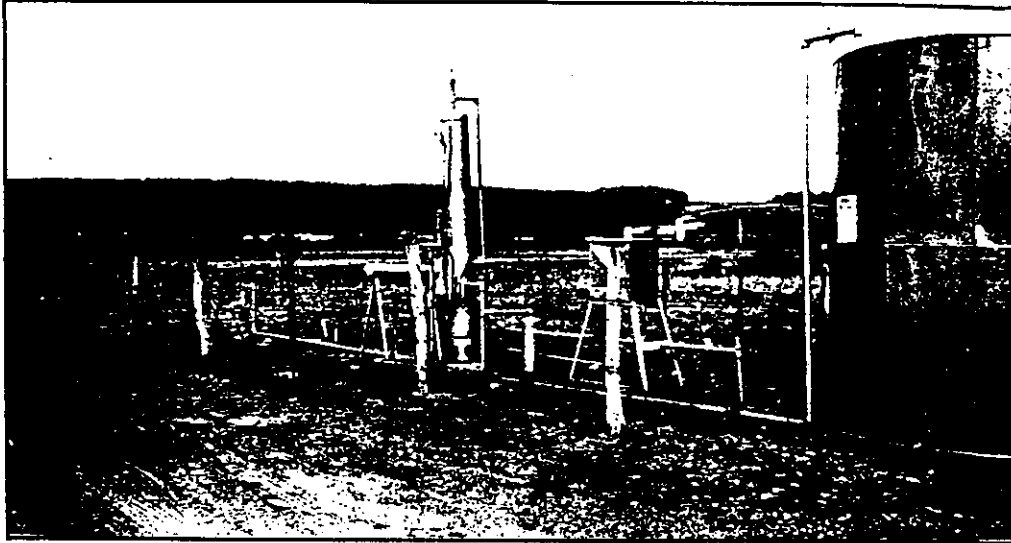
- disturbance to the wetland and its adjacent area shall be strictly limited to the work area identified in the site plan.
- the permittee and/or any project contractor(s) are prohibited from operating equipment in any other portion of the wetland or its 100 feet wide adjacent area without obtaining prior written approval.
- the storage of construction equipment and materials shall be confined to the project work site and/or to upland (non-wetland) areas more than 100 feet distant from the wetland boundary.
- the placement of fill, trees, brush and construction debris within any portion of the wetland (outside the project area identified in the site plan) is strictly prohibited.
- placement of fill to construct or upgrade the access road/well site shall be kept to the absolute minimum.
- filter cloth underlayment (geotextile) shall be used for the access road and drilling pad and it shall be of appropriate bearing strength to support the weight of the heaviest equipment expected to be used.

- access roads shall incorporate low spots and/or adequately sized culverts as necessary in construction to provide proper drainage and flow within the wetland.
- installation of brine and water lines and electrical conduit shall take place at the same time and be accomplished in one operation without delay between construction phases. The operation shall be completed during low water conditions within a maximum 48 hour period.
- within 30 days after completion of the well, top soil shall be graded over the well site to recreate as nearly as possible the previously existing topography. A mulch of hay or straw shall be applied to the graded area.
- all disturbed areas shall be seeded immediately upon project completion.

6. Creation of Replacement Wetland

Creation of new wetland habitat is required by the Division of Regulatory Affairs for any substantial wetland loss that will result from access road or well site construction. The operator is required to excavate pot-holes or a level-ditch pond (approximately 150 feet long) to create new shallow water emergent marsh areas. Replacement is generally on an acre for acre basis, though adjustments may be made according to the "value" of the wetland destroyed. The policy aims for replacement of lost value more than lost acreage (Riexinger, 1986, personal communication #59). All such habitat improvements must be constructed at locations adjacent to or near the well sites and access roads. They also must be within and/or adjacent to the disturbed wetlands, and constructed in accordance with DEC specifications and/or US Department of Agriculture Soil Conservation Service specifications with DEC concurrence. (See Fig. 8.6 and 8.7) All mitigation measures must be completed within a set time period; usually 30 days from the commencement of well drilling is the time period specified. Informal extensions are routinely

FIGURE 8.6 - WETLAND PERMIT CONDITIONS AND MITIGATION POND



The Josephson No. 2 well was subject to the requirements of Aquifer and Bass Island permit conditions. Furthermore, this well conformed to the requirements set forth in the Freshwater Wetland Permit No. 90-81-0045B.

In addition to the 15 general requirements, 14 supplemental conditions were included on this permit. The highlights of the conditions for this well are as follows:



1. Construction of mitigation ponds at locations approved by the landowner and DEC staff.
2. Drilling prohibited during flood or high water seasons.
3. Culverts must be installed where appropriate.
4. Well site shall be seeded with a mixture of redbud, roughstalk bluegrass and ryegrass, at a rate of 10 pounds per acre.
5. Filter cloth, shall be installed under the well site and access road and be of appropriate strength to support the weight of the heaviest equipment expected to be used during well drilling operations.

This well was drilled in November, 1982. The access road and well site, supported by filter cloth and gravel, cost approximately \$109,000.00. This access road, however, services three other well sites. A mitigation pond shown above was constructed approximately 100 feet from the well site. Natural vegetation grows within 20 feet of the well site.

FIGURE 8.7 - GAS WELL IN CLASS 1 WETLAND



The Josephson No. 3 is located in a Class I Wetland. Like the Josephson No. 2 it was subject to Aquifer, Bass Island and Freshwater Wetland Permit conditions. One stipulation unique to the Josephson No. 3 was that the site remain unseeded to encourage the growth of indigenous vegetation. As seen in the background, the wetland supports native vegetation as little as 30' from the wellsite. About 30 deer were sighted driving to the well on the day this photo was taken. The access road for this site is merely an extension of the road used for the Josephson No. 2 well. This photo was taken in March 1986 before the trees budded.

given for just cause such as adverse weather conditions.

The operator is sometimes specifically required to use soil from the mitigation ponds and ditches as (1) access road fill, (2) top soil cover on access roadway shoulders, (3) top soil cover over the well pad during site restoration, (4) dikes for temporary settling basins and mud pits, and/or (5) to create small mounds or hummocks where prior approval has been granted.

The mitigation program emphasizes habitat for waterfowl and fur bearing mammals. As a general rule, the more shallow water areas in a wetland, the better it is for these types of wildlife. Therefore, both the potholes and level ditch ponds can be no more than 3 feet deep (Taft and Jurczak, 1984, personal communication #66).

Differences between the newly created wetland areas and the wetlands cleared for drilling activities should be considered. A shallow water emergent marsh is only one of many types of wetlands and is not strictly an equivalent substitute for a swamp with mature trees or a peat bog. It will not necessarily provide replacement habitat for all the plants and animals destroyed or displaced by the drilling activities. Nor will it always provide the same benefits. For example, a marsh on a lake that serves as a fish breeding ground cannot be adequately replaced by a "land locked" marsh. Although creation of new habitat for waterfowl and fur bearing mammals is a desirable goal, consideration of other wetland types and benefits is incorporated into the mitigation program.

7. Increased Access

Construction of an access road in or near a wetland can, in some cases, enhance the wetland's value. Increased public access could be beneficial in wetlands that provide areas for hunting, fishing, boating, hiking, bird watching, photography, camping or other recreational uses. It could also be

helpful in areas used for education and scientific research.

Negative impacts may also result from increased recreational and other uses of wetland areas that have been made more accessible. This possibility should be carefully considered before issuing a drilling permit for wetlands that either provide habitat for particularly sensitive species or perform an extremely vital ecological function.

8. Pit Location

Mud and reserve pits are sometimes sited within 100 feet of a freshwater wetland depending upon local topography, availability of alternate sites and Regional Policy. (Saturated soils generally prevent placement of pits directly in wetlands). Although there are strict regulations regarding their construction, pits do occasionally leak or overflow (Deitz, 1983, personal communication #16) and (Jurczak, 1984, personal communication #37). The salt and other chemicals in pit fluids can contaminate soil or water and kill wetland vegetation. If soil contamination is severe enough, it may even prevent future plant regrowth.

For example, in 1982, brine from a gas well destroyed 13 acres when an operator deliberately discharged brine down a ditch directly into a wetland. The operator had to pay a significant penalty, but recovery of the wetland has been slow. The landowner recently received a Freshwater Wetlands Permit to clear dead trees from three acres of the affected area. Fortunately, no discharges like this have occurred since the Department acquired more staff and has increased the frequency of drilling inspections.

Damage to wetlands has also occurred when discharged brine or frac fluids have overshot the pit and run into a wetland. Reoccurrence of such problems has been effectively prevented by recent use of a permit condition requiring that pits be located on the side of the well site most distant from wetlands, whenever possible.

M. STATE LANDS

During the review of every well permit application, Department staff check whether proposed oil and gas activities are on state lands and require a State Lands Permit or are on lands under the jurisdiction of the Office of Parks and Recreation. Oil and gas drilling on DEC controlled State lands occurs primarily on State Reforestation and Game Management areas where land use conflicts and disruption or recreational activities will be minimal.

1. State Lands Permits

State Lands Permits are temporary revocable permits issued for activities on State Lands under DEC control to protect the lands and ensure that their designated use will continue unhindered. The permits are usually not required for oil and gas drilling activities on State leases because lease stipulations generally satisfy permit concerns (Beil, 1983, personal communication #1).

A recently issued policy formalized DEC's land use guidelines for these and other State lands (Grant and Doig, 1984). State Forests, Wildlife Management Areas, Reforestation Areas, Tidal Wetlands, Multiple Use Areas and Unique Areas will be managed to maximize public benefits, including:

- perpetuation of unusual and fragile ecosystems, and habitats.
- enhancement of natural resources.
- provision of opportunity for outdoor recreation and education.
- production of wood, fuel, minerals and other materials.
- contribution to faunal food webs and other ecosystems.
- watershed protection.
- generation of income to the State.

Pre-eminent land uses, identified as such either in law or by the Department, will be given first priority and all other uses that are compatible with it will be encouraged. Unique areas, wetland wildlife management areas and

highly productive reforestation areas near significant markets are likely to have pre-eminent uses. Upland wildlife management areas, multiple-use areas and some reforestation areas probably lack a single pre-eminent use and the combination of uses will be adopted which best serves the broad public interest in natural resources.

To help achieve these goals, each Regional Supervisor for Natural Resources will prepare a management plan for the State lands in his Region. Although no schedule for these plans has been set, once they are in place they may affect future oil and gas development activities on State lands.

2. State Park Lands

Although DEC is generally responsible for oil and gas leasing of State lands, the Oil, Gas and Solution Mining Law specifically prohibits the agency from leasing State Park lands [ECL 23-1101.1(b)]. The Office of Parks, Recreation, and Historic Preservation (OPRHP) in the past, however, did conduct its own parkland leasing program with the help of the Office of General Services.

In a Draft Memorandum of Understanding (MOU) with DEC, OPRHP has tentatively agreed to take lead agency responsibility under SEQR for all oil and gas drilling activities on State Park lands. Under the (MOU) if implemented, DEC will immediately notify OPRHP whenever a permit application is received for oil and gas drilling on State Park lands.

N. COASTAL ZONE

Proposed oil and gas activities in the State's coastal areas must be consistent with the New York State Waterfront Revitalization and Coastal Resources Act (WRCRA) which requires a balance between economic development and preservation of the State's unique coastal resources (Executive Law Article 42 Sections 910-920) The related State Coastal Zone Management Plan provides guidance in achieving this goal through 44 general policies that

address a wide range of coastal related concerns, such as (U.S. Dept. of Commerce, 1982):

- protection of significant coastal fish and wildlife habitats.
- protection of scenic resources of statewide significance to the quality of coastal areas.
- preferential siting of water dependent uses and facilities on or adjacent to coastal waters.
- expanded recreational use of fish and wildlife resources in coastal areas through increased access.
- encouragement of construction of new, or improvement of existing, onshore commercial fishing facilities.
- protection of coastal freshwater wetlands and the benefits they provide.
- expanded public access to water related recreation resources and facilities.
- restoration, revitalization and re-development of deteriorated waterfront areas.

As is evident from the sample above, it would be difficult to achieve 100 percent implementation of all 44 policies because of the many competing demands for the State's limited coastal areas. The landward boundary of the coastal area covered by the Plan is generally 1,000 feet from the Lake Erie shore, although it is cut to 500 feet or less in many places where development is heavy or a major road or railway closely parallels the coast. In other areas it has been extended several thousand feet inland to include such things as State lands or significant tributary valleys (U.S. Dept. of Commerce, 1982).

There are no specific restrictions on siting of oil and gas wells in

coastal areas in the State CZM Plan. However, all proposed wells that fall under SEQR Unlisted and Type I categories must be consistent with the CZM Plan to the maximum extent practicable before a DEC well drilling permit can be issued (6 NYCRR 617.5(d)). Since there are currently no oil and gas activities on the SEQR Type II list, all proposed wells in "coastal areas" are subject to consistency review.

1. Local Plans

Local governments within the "coastal zone" have the option of adopting their own Local Waterfront Revitalization Program (LWRP). Depending upon local interests, the plans may be limited in scope or address the entire range of topics covered in the State CZM Plan. The local plans may also be more restrictive than the State Plan and may prohibit development activities at specific sites. Several Lake Erie communities have local CZM programs in the preliminary stages.

2. Significant Coastal Fish and Wildlife Habitats

Under WRCRA, the Department of State has the authority to designate significant fish and wildlife habitats in coastal areas which have been identified by DEC. Under WRCRA's regulations (19 NYCRR Part 602) a habitat is significant if it: (a) is essential to the survival of a large portion of a particular fish or wildlife population; (b) supports populations of species which are endangered, threatened or of special concern; (c) supports populations having significant commercial, recreational, or educational value; and (d) exemplifies a habitat type which is not commonly found in the State or in a coastal region. Also, the significance of certain habitats increases to the extent that they could not be replaced.

Using these criteria, DEC is currently completing an evaluation of habitats along the State's 3,200 miles of shoreline and has recommended that DOS designate a number of qualifying habitats (NYS Dept. of State, 1986).

O. "CRITICAL ENVIRONMENTAL AREA"

The regulations under SEQR provide for establishment of "critical environmental area" designations to certain sensitive environmental areas. This designation would put the area on a "Type I" list, meaning that any state or local agency unlisted action would be more likely to be significant and require an environmental impact statement.

"Critical Environmental Area" (CEA) means a specific geographic area designated by a state or local agency, having exceptional or unique characteristics that make the area important (6 NYCRR 617.2(j)).

To be designated, the CEA should have an exceptional or unique character covered by one or more of the following: a benefit or threat to public health or safety; a natural setting of habitat or aesthetic significance; social, cultural, historic, archeologic, recreational or educational purposes; or an inherent ecological, geological, or hydrological sensitivity to change (6 NYCRR 617.4(i)). Designation of a CEA must be preceded by a written public notice and hearing (6 NYCRR 617.4(h)).