APPENDIX A

OPINION OF THE ATTORNEY GENERAL OF CONNECTICUT AND RELATED INFORMATION

OPINION OF THE ATTORNEY GENERAL
OF CONNECTICUT

January 28, 1987

State of Connecticut

SEPH I. LIEBERMAN
ATTORNEY GENERAL

Office of The Attorney General
[illegible] TRINITY STREET
HARTFORD [illegible]

JAN. 23 1987

Colin C. Tait, Member
Connecticut Siting Council
1 Central Park Plaza
New Britain, CT 06051

RE: Jurisdiction of Connecticut Siting Council

Dear Mr. Tait:

This is in response to your letter of October 21, 1986, in which you inquire about the jurisdiction, if any, of the Connecticut Siting Council (hereinafter CSC or Council) over natural gas transmission pipelines such as the one proposed by the Iroquois Gas Transmission System (hereinafter Iroquois).

We conclude that the CSC has jurisdiction over the proposed Iroquois pipeline, but that the limits of the jurisdiction cannot be precisely determined until the completion of the certification process by the Federal Energy Regulatory Commission (FERC).

The Iroquois project envisions a high pressure natural gas pipe line which would carry natural gas from Canada through upper New York State, across Connecticut, under Long Island Sound and terminating in Long Island, New York. Conn. Gen. Stat. §§ 16-50i(a)(2) (1985) and 16-50k (1985) establish the jurisdiction of the Siting Council over gas transmission lines of the size and type proposed by Iroquois. In addition, Conn. Gen. Stat. § 16-50x (1985) vests whatever jurisdiction the State may have over the pipeline with the CSC--to the exclusion of local municipal authorities.[1] This has

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1 Conn. Gen. Stat. § 16-50x (1985) grants the Connecticut Siting Council exclusive jurisdiction

(footnote cont'd)

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been confirmed historically through the numerous transmission lines cases decided over the past fifteen years. The legislature expressly preempted local jurisdiction over the location and type of transmission facilities with the adoption of 1973 Conn. Pub. Acts No. 73-458, now Conn. Gen. Stat. § 16-50x. The Iroquois pipeline, however, is primarily regulated by federal agencies, most notably FERC, which issues certificates of public convenience and necessity vesting the certificate holder with the power of eminent domain. Natural Gas Act, 15 U.S.C. § 717f(h).

This primary federal role necessitates a review of Conn. Gen. Stat. § 16-50k (1985) which reads in relevant part:

> This chapter shall not apply to any matter over which any agency, department or instrumentality of the federal government has exclusive jurisdiction, or has jurisdiction concurrent with that of the state and has exercised such jurisdiction, to the exclusion of regulation of such matter by the state.

Interstate pipelines are subject to extensive regulation by Federal agencies. However, it is my opinion that the state retains jurisdiction to deal with matters of purely local interest, provided that such state regulation does not conflict with the goals of Congress or unduly burden interstate commerce. As stated in Transcontinental Gas Pipe Line Corp. v. Borough of Milltown, 93 F. Supp. 287, 293 (D.C.N.J. 1950), "While Congress has brought the natural gas field largely within the orbit of its control it has left the states some power of regulation with respect thereto."

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> over gas transmission facilities described in Conn. Gen. Stat. § 16-50i(a)(2). Conn. Gen. Stat. § 16-50x(a) in pertinent part reads: "Notwithstanding any other provision of the General Statutes to the contrary . . . the Council shall have exclusive jurisdiction over the location and type of facilities."

There is a line of pipeline cases decided by various federal courts which recognize that the state police powers have not been entirely subordinated.

> It does not appear to have been the intention of Congress in enacting the Natural Gas Act to exempt gas suppliers from complying with the local zoning ordinances. Nor does the Commerce Clause of the Constitution operate to exempt interstate commerce from reasonable local zoning regulation.

New York State Natural Gas Corporation v. Town of Elma, 182 F. Supp. 1, 6 (W.D.N.Y. 1960).

This view echoes the U.S. Supreme Court's earlier recognition that

> [t]he Natural Gas Act created an articulate legislative program based on a clear recognition of the respective responsibilities of the federal and state regulatory agencies.

Panhandle Eastern Pipe Line Co. v. Public Serv. Comm., 332 U.S. 507, 520 (1947).

While the state retains some authority, the larger question is the nature and extent of the CSC's jurisdiction. That question is answered by reviewing the few federal court decisions where the exercise of local regulation was considered. The two overriding federal principles controlling the Council's review are the doctrine of preemption and primacy of the Interstate Commerce Clause. What little guidance there is may have been best expressed in the Transcontinental case where the court stated:

> The police power of the state can be sustained only if it is reasonable and justifiable and does not create an undue burden on interstate commerce.

Transcontinental Gas Pipe Line Corp. v. Borough of Milltown, 93 F.Supp. at 294.

An interstate pipeline such as proposed by Iroquois is unquestionably engaged in interstate commerce. Thus, State regulation must not be unduly burdensome. As the courts are always quick to point out, however, there is no bright line to mark when a state crosses into the forbidden federal territory.

The test normally employed under the Commerce Clause where state regulation is not intentionally protectionist is that stated in Pike v. Bruce Church, Inc., 397 U.S. 137 (1970).

> Where the statute regulates evenhandedly to effectuate a legitimate local public interest, and its effects on interstate commerce are only incidental, it will be upheld unless the burden imposed on such commerce is clearly excessive in relation to the putative local benefits. . . . If a legitimate local purpose is found, then the question becomes one of degree. And the extent of the burden that will be tolerated will of course depend on the nature of the local interest involved, and on whether it could be promoted as well with a lesser impact on interstate activities.

Id. at 142.

Moreover, under the Supremacy Clause of the Constitution, state regulation is further subordinated by the extensive occupation of the regulatory field by the federal government. Northern Natural Gas Co. v. State Corp. Commission of Kansas, 372 U.S. 84 (1963); First Iowa Hydroelectric Cooperative v. F.P.C., 328 U.S. 152 (1946). The Supreme Court recently reviewed the standards for federal preemption of state law in Pacific Gas & Electric Co. v. State Energy Resources Conservation and Development Commission, 461 U.S. 190, 203-04 (1983). The Court held that Congress can preempt a field of regulation if it expressly states such a preemptive intention, or if the scheme of federal regulation is "so pervasive as to make reasonable the inference that Congress left no room for the States to implement it." Id. at 204, quoting Fidelity Federal Savings & Loan Ass'n v. de la Cuesta, 458 U.S. 141, 153 (1982). State law is also preempted

> [t]o the extent that it actually conflicts with federal law. Such a conflict arises when "compliance with both federal and state regulations is a physical impossibility," Florida Lime & Avocado Growers, Inc. v. Paul, 373 U.S. 142-43 (1963), or where state law "stands as an obstacle to the accomplishment and execution of the full purposes and objective of Congress." Hines v. Davidowitz, 312 U.S. 52, 67 (1941).

Id.

As a result, the Council's jurisdiction is restricted to matters of local concern which neither interfere with the federal regulatory scheme nor impose an undue burden on interstate commerce.

The CSC will exercise substantial control over such a line in that the placement of the line within the FERC approved route will be subject to the Council's order. Any order affecting the project will need to be founded on demonstrable local concerns in order to adequately substantiate that the Council's orders are not "unduly" burdensome to the project. It is entirely appropriate to expect the pipeline builders to file an application for a CSC certificate pursuant to the provisions of Conn. Gen. Stat. § 16-501 (1985) and relevant regulations promulgated under that statute. Some provisions of that section such as the requirement for proposed alternate routes may be inappropriate because the federal license may preclude this. The extensive list of decision criteria set out in Conn. Gen. Stat. § 16-50p (1985) provide a satisfactory articulation of qualifying local concerns. In particular, the CSC's duty to insure there will be no "undue hazard to persons along the area traversed" [subdivision (5) of subsection (a) of Conn. Gen. Stat. § 16-50p (1985)] is consistent with the court's ruling in New York Corp. v. Town of Elma, supra. [2]

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2 The Court recognized at page 6, that the local authority must show a substantial danger to local health, safety and welfare before it could issue an order. In a case involving an interstate pipeline, the term "undue hazard" equates to "substantial danger."

The reasonableness of the Council's conditions will ultimately control the question of jurisdiction. However, it is impossible in this advice to give a detailed analysis of the extensive regulations governing transmission line applications. Rather, the intricacies of the filing should be dealt with in consultation with the Assistant Attorney General(s) assigned to counsel the CSC pursuant to Conn. Gen. Stat. § 16-50n(c) (1985).

As an additional matter, you have pointed out that in previous opinions the Attorney General had advised that specific projects constructed under FERC certificates or those of its predecessor, the Federal Power Commission, were excepted from the Siting Council's jurisdiction. You state that the Attorney General had advised you in an opinion rendered in April of 1973 that the Federal Power Commission's exercise of jurisdiction exempted interstate pipeline company's projects from regulation under Connecticut's Public Utility Standards Act [Chapter 277a of the General Statutes]. In that letter, the Attorney General stated that he based his opinion on factual material attached to the letter of request for opinion. There may have been a factual difference in the situation reviewed in that advice. Moreover, the Council's exclusive jurisdiction over transmission facilities was not clarified until the passage of P.A. 73-458; in particular, section 4 which is now Conn. Gen. Stat. § 16-50x (1985). That act was signed by the Governor in June of 1973 and was not effective until October of 1973 which was subsequent to the issuance of the Attorney General's advice. Until § 16-50x was adopted, confusion apparently existed over the jurisdiction of municipalities, in particular, whether or not their authority over utility siting was fully preempted by the Public Utilities Standard Act. Subsequent amendments and further analysis resulted in a memorandum provided to your agency in 1980 which stated:

> It should be noted however, that other questions relating to interstate natural gas transmission pipelines may arise in the future in which the state would have an

> active regulatory role. The doctrine of preemption also provides, that in the absence of conflicting legislation by Congress, there is a residuum of power in the state to make laws governing matters of local concern which nevertheless in some measure affect interstate commerce of even, to some extent, regulate it.

In light of the evolution of the CSC's organic statutes and the law as applied to the facts specific to your inquiry, we advise that the conclusions in this opinion reflect the controlling legal principles which should guide your Agency in this matter. In sum, we have determined that the Siting Council has certain limited jurisdiction over the Iroquois pipeline project, but a precise determination of the Council's regulatory authority can not be made until the conclusion of the certification proceedings by the Federal Energy Regulatory Commission.

Very truly yours,

JOSEPH I. LIEBERMAN
ATTORNEY GENERAL

Robert S. Golden, Jr.
Assistant Attorney General

JIL/RSG/ftm

CONNECTICUT SITING COUNCIL

LETTER RULING

October 6, 1987

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

136 Main Street, Suite 401
New Britain, Connecticut 06051
Phone: 827-7682

October 6, 1987

Mr. Anthony M. Fitzgerald
Carmody & Torrance
P.O. Box 1990
New Haven, Connecticut 06509

Re: Petition No. 178 - Iroquois Natural Gas Transmission System petition for a declaratory ruling on Council jurisdiction over the proposed Iroquois pipeline.

Dear Mr. Fitzgerald:

At a meeting on August 4, 1987, the Connecticut Siting Council ruled that:

1. The Council considers its jurisdiction over the proposed pipeline to be as stated in the opinion of the Attorney General of the State of Connecticut dated January 26, 1987.

2. The appropriate time for Iroquois to file an application to the Council for a Certificate of Environmental Compatibility and Public Need would be after issuance of a Certificate of Public Convenience and Necessity by the Federal Energy Regulatory Commission (FERC). The Council concluded that FERC consideration of an application pursuant to the Natural Gas Act and the National Environmental Policy Act will include the balancing of need and environmental impacts, selection of a route, and the disposition of location-specific issues of pipeline alignment and environmental design. These are the essentials of the functions served by the Council in the exercise of its authority. Only after issuance of a Certificate of Public Convenience and Necessity by FERC would the Council know what issues remain unresolved, and thus subject to the Council's residual jurisdiction pursuant to section 16-50k(d) of the General Statutes of Connecticut.

3. For the same reasons that the appropriate time to file an application with the Council would be after issuance of a certificate by FERC, the Council is unable to define the scope of the Council's residual jurisdiction over the Iroquois pipeline in advance of issuance of a FERC certificate. After issuance of a FERC certificate, the Council would define the scope of its jurisdiction based on the FERC certificate, the application submitted to the Council, and the representations of other parties to application.

Very truly yours,

Colin C. Tait

Colin C. Tait
Council Member

JCK/ct

cc: Parties of Record
Council Members

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APPENDIX B

INFORMATION REGARDING ALTERNATIVE ALIGNMENTS IN CONNECTICUT UNDER CONSIDERATION BY FERC

APPENDIX B.1

ALTERNATIVE ALIGNMENTS EVALUATED IN THE FERC DEIS

NOVEMBER, 1990

TABLE 7.2.1 (cont'd)

Variation Name	Mileposts	County/Town	Status
Wimisink Variation	287.3 to 288.1	Fairfield/Sherman	Recommended
Still River Variation	297.5 to 298	Litchfield/New Milford	Recommended
Brookfield Wetland a/	301.8 to 302	Fairfield/Brookfield	Recommended
Route 133 Wetland a/	302.9 to 303.1	Fairfield/Brookfield	Recommended
Bound Swamp Wetland a/	305.1 to 305.6	Fairfield/Brookfield	Recommended
Lands End Wetland a/	305.6 to 306.4	Fairfield/Newtown	Recommended
Algonquin Variation	307 to 308.1	Fairfield/Newtown	Recommended
Old Farm Hill	308.3 to 310.1	Fairfield/Newtown	Rejected
Pootatuck River	311 to 311.4	Fairfield/Newtown	Recommended
Newtown Subdivisions	312.2 to 315.2	Fairfield/Newtown	Rejected
Forest Subdivision	315.8 to 316.3	Fairfield/Newtown	Rejected
Conrail (S.T.O.P.) Alternate	316.8 to 323.7	Fairfield/Monroe	Rejected
Monroe Subdivision	316.7 to 318.2	Fairfield/Monroe	Rejected
Blakeman Alternate	323.1 to 323.8	Fairfield/Shelton	Recommended
Carroll Variation	330.4 to 330.8	Fairfield/Stratford	Rejected
Milford Variation	331.1 to 332.8	New Haven/Milford	Recommended

3.6.26 Wimisink Variation

Independent of each other, we and Iroquois identified the need to consider a route variation between MP 287.3 to MP 288.1 in Fairfield, Connecticut to improve the alignment across the Naromi Land Trust/Wimisink Valley Sanctuary and the partially developed Smoke Ridge subdivision (see figure A-1, sheet 47 and 48 of 57). The 0.8 mile route variation would parallel the proposed route about 400 feet further south along hedge rows through the Wimisink Valley Sanctuary, and cross the expanding subdivision in such a way as to minimize disruption to planned residential lots. The variation is about the same length as the proposed route. It would traverse two areas of steep slope, 2,400 feet of forest and 250 feet of emergent wetland. Wimisink Brook, a cold-water fishery, would be crossed. About 1,650 feet of the Smoke Ridge subdivision would be crossed and one residence on County Route 39 would be within 50 feet of the pipeline right-of-way.

3.6.27 Still River Variation

The Still River Variation was identified by Iroquois to minimize the crossing of wetlands and avoid an oxbow crossing of the Still River. This was also an area of general concern during scoping. The 0.5 mile variation would replace that portion of the proposed route between MP 297.5 and MP 298 and would be aligned approximately 250 feet to 350 feet north of the proposed route (see figure A-1, sheet 49 of 57).

The only resources affected by the variation that differ from the proposed route would be wetlands, vegetation and land use. About 200 feet of wetlands and 1,000 feet of forest would be crossed. The variation as well as the proposed route would cross the Still River Meanders Natural Area. State-listed rare species known to occur in this area include agrimony, side-oats grama grass, cliff swallow and purple martin.

To avoid the oxbow, the variation deviates from the electric transmission right-of-way that is paralleled by the proposed route. The variation crosses the Still River to the north of the proposed crossing, and passes within 100 feet of a building used for a dog pound.

3.6.28 Algonquin Variation

Iroquois identified a route variation which would shift the proposed pipeline from the north side to the south side of an existing Algonquin pipeline between MP 307 and MP 308.3 in Newtown, Connecticut (see figure A-1, sheet 50). The reroute was identified to eliminate two extra crossings of Algonquin's pipeline and minimize disturbance to existing residences.

The route variation would traverse a predominantly forested area. An area of federally designated scrub-shrub and emergent wetlands would also be traversed for a distance of approximately 150 feet.

3.6.29 Fairfield County Subdivision Variations

Iroquois has identified four route variations in Fairfield County, Connecticut that it contends would provide better alignment through subdivisions that are planned or under construction. These include:

Variation Designation	Mileposts	Town	Major Subdivisions Affected	Figure-A-1 (Sheet)
Old Farm Hill	308.2 to 310.1	Newtown	Old Farm Hill, Teachers Ridge	50, 51
Newtown Subdivisions	312.2 to 315.2	Newtown	Feather Meadow 1&2, Deer Ridge, Cobbles Mill, Mountain Manor, Green Ridge	51, 52
Forest Subdivision	315.8 to 316.3	Newtown	Forest	52
Monroe Subdivision	316.7 to 318.2	Monroe	Whispering Pines, Buckhill Estates	52

The subdivision route variations are intended to limit the disturbance to subdivisions crossed or affect fewer lots within the developments. Iroquois is currently refining the alignment of these variations through discussions with affected developers.

3.6.30 Pootatuck River Variation

The Pootatuck River Variation was identified by Iroquois to reduce the number of crossings of the Pootatuck River. The variation would be 0.4 mile in length, between MP 311.0 and MP 311.4 of the proposed route (see figure A-1, sheet 51). Resources affected by the variation would be similar to the proposed route except for the number of crossings of the Pootatuck River, which would be reduced to one.

3.6.31 Conrail (STOP) Variation

We received a number of comment letters from residents in Monroe and Shelton opposing the location of Iroquois' proposed route. Several had joined together forming STOP (Southern Connecticut Townspeople Opposing the Pipeline). A primary concern was a segment of the proposed route between MP 316 and MP 323.7. It would cross remaining

open space, a large forested wetland, and an area of rural farms and forestland which is part of the regional Hill and Harbor Tourist Di: :t and would be located near limestone caves along Boys Halfway River.

STOP specifically requested that we consider an alternative route which would run parallel and adjacent to Conrail's tracks along the Housatonic River or follow electric transmission lines and highways. The State of Connecticut also requested consideration of maximum use of shared corridors in Newtown and Shelton. We identified two route variations, one of which was eliminated early on.

Powerline Variation - This variation would follow CL&P's Stevenson-Devon double circuit 115 kV transmission lines which generally parallel Iroquois proposed route approximately one mile to the east (see figure A-1, sheets 52 and 53 of 57). We evaluated this variation to determine if the proposed pipeline could be located adjacent to or on the existing transmission line. The powerline route variation would begin at MP 317.5 extend east on new right-of-way, cross Boys Halfway River and join the CL&P powerline about 1,500 feet east of Cottage Street. From this point, it would follow the CL&P powerline for 4.7 miles before rejoining Iroquois' proposed route at MP 323.7. The total length of this variation would be 5.6 miles compared with the corresponding 6.2-mile length of Iroquois' proposed route. Based on aerial and ground reconnaissance and review of detailed plans and profile drawings provided by CL&P we determined this route would not be feasible. The existing right-of-way is 100 feet wide and includes two transmission lines with 50 feet between the centerlines. The lattice-type towers are about twenty feet wide at their bases, further reducing the amount of available space in the right-of-way. The area surrounding the transmission line at MP 1.7 to MP 2.3 and MP 2.7 to MP 3.6 is substantially developed. Homes physically abut the right-of-way, with yards and accessory buildings encroaching into the right-of-way. In these areas, the powerline crosses steep slopes with outcrops of rock which would require removal through blasting or other means. Deviations to avoid homes are not feasible. Having concluded that the pipeline could not be placed along this route without relocations and significant disruptions to residences, we eliminated this variation from further consideration.

Conrail Variation - The second variation would follow the Conrail tracks. The Conrail Variation would begin at MP 316.8 and extend southeast, joining the Conrail right-of-way just west of Boys Halfway River. The Conrail right-of-way has one active track and an adjoining area from which a second track was removed. From this point, the route would generally be located on the portion of the vacated portion of the railbed for 5.5 miles. South of Indian Well State Park the route would depart from the Conrail tracks cross State Route 110 and rejoin the proposed route at MP 323.7. (see figures A-1, sheets 52, 52A and 53 of 57). The total length of the Conrail Variation would be 7.4 miles.

The Conrail Variation would cross seven streams, none of which are Class AA. It would parallel the Housatonic River for the majority of its length. This section of the river is classified "C/B", meaning that the goal is for the river to attain a "B" classification, but it currently supports a "C" classification. The Housatonic supports a significant fishery which includes several anadromous species, such as striped bass, blue fish, winter flounder and sea-run brown trout. About 2.7 miles of the variation is within the Housatonic River Floodplain. Twenty-three public wells are within 1.5 miles of the route variation, and about 0.5 mile of protected watershed is crossed.

The variation would cross 0.4 miles of wetland. The majority of this is linear riparian systems associated with traversed streams. Some were formed by construction of the railbed. No designated significant habitats, unique ecosystems, national areas, significant fisheries, or known locations of species of concern are crossed. Clearing would be required except in the segment of the variation south of Meadow Road. The amount of clearing would be substantially reduced by using the vacated portion of the railbed. Indian Well State Park, a state-owned year-round day use area, would be crossed, as would the Housatonic and Maples well fields owned and operated by Bridgeport Hydraulic Company (BHC).

3.6.32 Blakeman Variation

During the scoping process, a Fairfield, Connecticut resident proposed a modified alignment to avoid a condominium development under construction. Iroquois modified the proposed route between MP 323.1 and MP 323.8 (see figure A-1, sheet 53 of 57) to align the route adjacent to a proposed highway and further from existing residences and the condominium development now under construction. The variation avoids steep slopes, river and stream crossings, proximity to public water supplies, and wetlands, and is not within 50 feet of any residences. It is expected to be adjacent to a proposed highway. About 2,300 feet of forest and 625 feet of agricultural land would be crossed.

3.6.33 Carroll Variation

A route variation was suggested by a property owner in Stratford, Connecticut, to shift the proposed pipeline to the opposite side of a CL&P electric transmission right-of-way and provide greater clearance between his property and the proposed pipeline. Iroquois subsequently identified a route variation that incorporated the suggested reroute. The route variation would begin at MP 330.4 on the north side of the existing transmission line, would cross under the lines, continue east along the south side of the transmission line right-of-way, and cross back under the transmission line at Main Street, rejoining the proposed route at MP 330.8 (see figure A-3, sheet 54 of 57). Iroquois has also indicated that the route variation modifies the proposed alignment through the planned Pin Oak Subdivision; however, information we have reviewed appears to indicate that the proposed subdivision lies between MP 330.27 and MP 330.4, and would be unaffected by the route variation.

The route variation would be located adjacent to the existing right-of-way and would require 50 feet of additional permanent right-of-way; Iroquois has proposed to use 10 feet of the existing right-of-way for temporary work room and up to 40 feet of temporary workroom, as available, outside their new right-of-way.

Our analysis indicates that the route variation would require at least 50 feet of clearing through an adjacent forested area for a distance of approximately 1,100 feet. The variation would also be within 50 feet of two residences located adjacent to the existing right-of-way along Main Street.

3.6.34 Milford Variation

Iroquois identified a route variation in the City of Milford through discussions with city officials to minimize land use and wetland impacts. The State of Connecticut also raised concerns about the route through Milford and suggested an alternative that would run the

pipe down the Housatonic River and into Long Island Sound . Based on the route variation we evaluated in Milford, we saw no need to investigate running the pipe down the Housatonic River.

Our route variation would diverge from the proposed route at MP 331.1 on the east side of the Housatonic River and continue parallel to an existing CL&P electric transmission line right-of-way, traversing closer to industrial and commercial properties along Bic Drive. After crossing Bic Drive at approximately MP 332, the variation would proceed along the west side of the road, traversing wooded areas and parking lots to the rear of several commercial properties. The variation would then cross West Avenue and proceed to the east across Bic Drive, though the parking lot of Automatic Data Processing (ADP), across the Connecticut Turnpike (I-95) and to the rear of the Suisse Chalet Hotel, adjacent to the Beaver Brook wetland. The route variation would then cross the Amtrak rail lines and proceed easterly parallel to the rail lines, rejoining the proposed route at approximately MP 332.8. This 2.1-mile long route variation would replace a 1.7-mile long portion of the proposed route and would address several concerns raised during scoping, including impacts to the Beard Sand and Gravel property, JFK Elementary School, Mondo Ponds, and Beaver Brook (see figure A-1, sheet 54 of 57).

This route variation would parallel the existing electric transmission line for approximately 2,400 feet, and would parallel the Amtrak rail lines for approximately 1,000 feet. Although the route variation would take advantage of existing parking lots to limit the amount of clearing, the route would still traverse approximately 4,560 feet of wooded areas including a 200-foot crossing of a federally designated forested shrub wetland adjacent to West Avenue.

The route variation would cross Beaver Brook approximately 1,000 feet upstream from the Milford Reservoir. The Beaver Brook area, located between the Connecticut Turnpike and the Amtrak rail lines, is managed by the South Central Connecticut Regional Water Authority. The Milford Reservoir is not currently used for public water supplies. The route variation would cross the Beaver Brook area outside of the federally designated scrub shrub wetland.

The route variation would also border an intertidal, emergent wetland for a distance of approximately 1,400 feet along the electric transmission line, adjacent to the Housatonic River.

3.6.35 Route Variations Developed as Wetland Mitigation

The Section 404(b)(1) Guidelines (Guidelines) promulgated pursuant to the CWA (40 CFR 230) require that a permitting authority (i.e., the COE) which is contemplating the granting of a Section 404 permit analyze the use of practicable alternatives that would eliminate or minimize the discharge of dredged or fill material into wetlands or other waters of the United States (40 CFR 230.10). The permitting authority is required to adopt those practicable alternatives which reduce adverse impact on aquatic ecosystems, so long as the alternative does not have other significant adverse environmental consequences (40 CFR 230.10(a)).

For actions subject to NEPA, the Guidelines recognize that the analysis of alternatives required for NEPA documents will in most cases provide the information required for the analysis of practicable alternatives under the Guidelines (40 CFR 230.10(a) (4). Therefore, to facilitate the COE's analysis of practicable alternatives as required by the Guidelines, as well as fulfill the FERC's requirement to examine alternatives pursuant to NEPA, we have investigated the use of a number of variations that would minimize or eliminate disruption to wetland areas.

In general, greater consideration was given to avoiding forested wetlands or wetlands containing unique or significant habitat, and particular attention was given to those wetlands which could be avoided without creating other significant adverse environmental consequences.

A total of 34 route variations were evaluated with the sole intention of avoiding or minimizing wetland crossings. These wetland mitigation variations are in addition to wetland variations previously discussed, which involve other resources besides wetlands. Our analysis was based primarily on a review of FWS National Wetland Inventory (NWI) maps and NYDE regulated wetland maps, along with recent aerial photography. Table 3.6-1 lists the wetland mitigation variations and indicates their location and sponsor.

3.6.36 Route Variations Under Study

As a result of recent additional field reconnaissance and right-of-way consultations with landowners, a number of additional variations to the proposed pipeline route have been identified by Iroquois. The following briefly identifies these potential alignment modifications, and the rationale for them. Because of their late submittal we have not evaluated these variations or made any recommendations. These variations are offered herein for public comment and will be addressed in detail in the FEIS.

- Line Creek Variation: MP 13.9 to MP 15.5. This route refinement, located in the Town of Canton, St. Lawrence County is proposed in order to minimize impacts to wetlands and to avoid a septic sludge disposal area (see figure A-1, sheet 3 of 57). The route refinement is located a maximum of 800 feet from the original route, and was developed based on the results of field surveys.

- Route 11 Variation: MP 21.45 to MP 23.7. Located in the Town of Canton, St. Lawrence County, the purpose of this reroute is to minimize impacts to wooded wetlands (particularly those along Church Brook), to avoid several new homes located along O'Hord Road, and to provide a crossing of Route 11 that aligns the pipeline farther form existing structures (see figure A-1, sheets 4 and 5 of 57). This proposed revision was identified based on the results of field investigations.

- Route 28 Variation: MP 115.3 to MP 116.6. Located in the Town of Booneville in Oneida County, the purpose of this proposed revision is to avoid several new buildings adjacent to Route 28 (see figure A-1, sheet 19 of 57).

TABLE 3.6-1

Wetland Mitigation Variations

Name	County/Town	Location	Figure A-1 Sheet #
Lisbon Wetland	St. Lawrence/Lisbon	MP 8.1 to MP 9.5	2
Eddy Pyrites	St. Lawrence/Canton	MP 23.6 to MP 25.3	5
Justintown Road Wetland	St. Lawrence/Canton	MP 25.3 to MP 25.7	5
DeKalb Wetland	St. Lawrence/DeKalb	MP 27.4 to MP 29	5
Hermon Wetland	St. Lawrence/Hermon	MP 32.2 to MP 35.2	6
Pond Road Wetland	St. Lawrence/Hermon	MP 35.9 to MP 36.3	7
Firefall Wetland	St. Lawrence/Hermon	MP 38.3 to MP 39.2	7
Wolf Lake Wetland	St. Lawrence/Edwards	MP 39.5 to MP 39.9	7
Mott Creek	St. Lawrence/Edwards	MP 47.9 to MP 48.2	8
Route 812 Wetland	St. Lawrence/Pitcairn	MP 52.5 to MP 52.8	9
Route 3 Wetland	Lewis/Diana	MP 54.9 to MP 56.5	9, 10
Hogsback Creek	Lewis/Diana	MP 60.0 to MP 61.9	10
Blanchard Creek	Lewis/Diana	MP 63.3 to MP 63.5	11
Indian River	Lewis/Diana	MP 64 to MP 64.5	11
Punky Swamp	Lewis/Diana, Croghan	MP 66.5 to MP 69	11
Greig Wetland	Lewis/Greig	MP 93.2 to MP 93.7	15
Wingate Swamp	Oneida/Boonville	MP 110.6 to MP 111.7	18
Kent Creek	Oneida/Boonville	MP 113 to MP 113.7	19
Kayuta Lake	Oneida/Remsen	MP 117.2 to MP 118.4	19
South Kayuta Lake	Oneida/Remsen	MP 119.4 to MP 120	20
Remsen Wetland	Oneida/Remsen	MP 120.3 to MP 121.8	20
Cady Brook	Oneida/Remsen	MP 123.2 to MP 123.5	20
Trenton Wetland	Oneida/Trenton	MP 124.5 to MP 125.2	20
Big Bill Brook	Herkimer/Norway	MP 138.6 to MP 139.7	23
Mohawk River	Herkimer/Danube	MP 154 to MP 154.5	25
Canajoharie Wetland	Montgomery/Minden	MP 164.9 to MP 165.5	27
Route 162 Wetland	Montgomery/Charleston	MP 182 to MP 183.1	30
Wright Wetland	Schoharie/Wright	MP 195.6 to MP 196.3	32
Woodlawn Cemetery	Albany/Berne	MP 199.0 to MP 200.1	33
Athens Airport	Greene/Athens	MP 228.9 to MP 229.3	38
Brookfield Wetland	Fairfield/Brookfield	MP 301.8 to MP 302	50
Route 133 Wetland	Fairfield/Brookfield	MP 302.9 to MP 303.1	50
Bound Swamp Wetland	Fairfield/Brookfield	MP 305.1 to MP 305.6	50
Lands End Wetland	Fairfield/Newtown	MP 305.6 to MP 306.4	50

3.6.37 Route Variations Considered But Eliminated From Detailed Analysis

3.6.37.1 Independence River

A route variation was suggested by George Cataldo, a landowner in Lewis County, New York to align the proposed pipeline along the NYPA's 765 kV transmission line and avoid the additional crossing of the Independence River (MP 91.1). An alignment of the proposed pipeline along this transmission line was originally considered and rejected by the applicant as part of Alternative 1B. The routing in this area was also specifically discussed during the New York Article VII proceedings and addressed by the New York ALJs (NYPSC, 1989).

The difficulties with aligning the proposed pipeline along the 765 kV transmission line are discussed in detail in section 3.5.1.1. The proposed crossing would not be visible from public roads, and the proposed pipeline has been routed with optimum consideration of the topography. In the absence of any protective status for this portion of the river, we find the proposed crossing of the Independence River to be environmentally acceptable, considering the recommended stream crossing procedures (section 5.1.3.2).

3.6.37.2 New York Central/Conrail Railroad

A potential reroute starting at MP 110 was considered in order to utilize an existing railroad right-of-way which essentially parallels the proposed route about one mile to the west. The New York Central/Conrail railroad line in this area runs between Boonville and Remsen in Oneida County, New York. The proposed route could tie into the railroad corridor by following a primitive road at about MP 110.2 and rejoin the route prior to Remsen at about MP 121.2. The reroute would be about 11.8 miles in length, about 0.8 mile longer than the proposed route. No major rivers would be crossed and the same number of minor streams (15) would be crossed as the proposed route. The proposed route would affect approximately 17.8 acres of wetland while the reroute would potentially affect 23 acres. The proposed route does not affect any residences within 50 feet, while the railroad reroute would affect at least 2 residences within 50 feet based on the USGS 7 1/2 minute quadrangles. Because the reroute would be longer, affect some residences, and potentially cross more wetlands areas, the reroute is not considered desirable. Furthermore, an active railroad such as this presents construction and operational constraints. Generally, active railroads would require at least a 20-foot setback from the tracks and possible casing of the pipeline due to the stress caused by passing trains. These constraints limit the apparent opportunity of routing along rail lines.

3.6.37.3 Abandoned Railroad Grade

South of Remsen in Oneida County, New York, an abandoned railroad grade generally parallels the proposed route between MP 122 and MP 129. We evaluated a potential route variation using the abandoned grade for about 5.3 miles, which would require an additional 2.9 miles in spur segments to connect the proposed route with the railroad grade. In all, the route variation would be 1.2 miles longer than the 7-mile-long section of the proposed route it would eliminate. In May, 1989 we reviewed this potential route variation during a helicopter reconnaissance of the proposed project. The abandoned railroad grade was eliminated from further consideration because of steep terrain, particularly at the

West Canada Creek crossing, and potentially more wetland disruption and minor stream crossings. The old railroad grade follows steep side hills in places which would create engineering and slope stability problems. Furthermore, the crossing of West Canada Creek would probably require an aerial crossing because of the deep cut the river makes in this area (the Trenton Chasm). The applicant's earlier routing attempts in this area eliminated the idea of an aerial crossing of the chasm because of potential visual impacts. The route variation along the abandoned railroad grade would also involve the crossing of nine minor streams as compared to six along the proposed route. For these reasons, this route variation was eliminated from further consideration.

3.6.37.4 Cranberry Pond

In response to scoping comments and resource concerns, we examined potential route variations between MP 326 and MP 329 in Stratford, Connecticut to avoid Cranberry Pond. This wetland area is a federally designated scrub-shrub/emergent wetland. Routing in this area is constrained by several large subdivisions and dispersed residential development, industrial developments, State Route 8, and the Farmill River.

The proposed route parallels an existing electric transmission right-of-way between MP 323.7 and MP 326 and again between MP 328.3 and MP 329. We reviewed this existing right-of-way for routing opportunities between MP 326 and MP 328.3. North of Cranberry Pond, the electric transmission line traverses a residential subdivision with houses immediately adjacent to the right-of-way. In addition, the electric transmission lines span an open water area of Cranberry Pond; construction along the existing right-of-way in this location would require crossing the center of the wetland or disruption to residences.

Similarly, potential route variations to the west of the electric transmission line were constrained by residential development and wetlands associated with Black Brook and Cemetery Pond Brook. An existing pipeline right-of-way to the east of the proposed route was also reviewed and was found to have severe limitations to parallel construction of a new pipeline, particularly where the existing right-of-way traverses a large townhouse development. In contrast, the proposed route avoids dense residential developments and would skirt the edge of the Cranberry Pond wetland to the rear of the residences along Warner Hill Road. In view of our recommended mitigation for construction in wetland areas and the serious flaws in alternative routing in this area, we eliminated the route variations in this area from further consideration.

6.1.26 Wimisink Variation

Impacts associated with this variation that are different from the proposed route are primarily associated with wetlands and land use. The variation would cross 0.3 acre less wetland. It would cross about the same amount of the Smoke Ridge subdivision, although its alignment within the subdivision minimizes disruption of the layout of planned lots. It would come closer than the proposed route to one existing home on County Route 39. In general the alignment avoids tamerack, white oak and beaver locations within the sanctuary and minimizes the effects of forest clearing and wetland crossing. Iroquois is preparing a mitigation plan for the Wimisink Valley Sanctuary.

Overall we feel the route variation is environmentally superior to the proposed route and recommend its adoption. Further, we recommend Iroquois maintain existing vegetation or install screening between the pipeline and the home on County Route 39. Plans showing screening measures should be submitted for our review prior to construction along with a completed mitigation plan for the Wimisink Valley Sanctuary which includes input from the Naromi Land Trust.

6.1.27 Still River Variation

The 0.5 mile Still River Variation would be about the same length as the proposed route. The variation would affect 0.8 acre less wetland. The variation alignment at the Still River crossing would be more direct and avoid the condition on the proposed route where the river is paralleled for 700 feet. Rare species known to occur in the Still River Meanders Natural Area would not be affected by the route variation. The variation would reduce the length of existing right-of-way paralleled and would be immediately adjacent to the municipal dog pound, which would not result in any significant impact.

We recommend that this variation be adopted to avoid construction parallel to the oxbow, thereby reducing riverbank clearing and the amount of sediment potentially entering the river. We further recommend that Iroquois survey the river crossing to determine the need for river plantings. The results of this survey should be submitted for our review and approval prior to construction.

6.1.28 Algonquin Variation

This variation would not significantly change the impacts associated with the proposed route, since it simply shifts the proposed pipeline from the north side to the south side of the existing pipeline right-of-way. In either instance, the proposed Iroquois right-of-way would be adjacent to the existing right-of-way and would partially use the existing right-of-way for temporary work room. The variation would traverse more federally-designated wetlands, but would be in proximity to only one residence, as opposed to three along the proposed route. The variation would also avoid two extra crossings of the existing Algonquin pipeline. Based on a review of aerial photography and maps, we have determined that the south side of the existing right-of-way would provide a better location for the proposed pipeline.

Since the impacts associated with the route variation would be similar to the proposed route, and the variation would still be located along an existing right-of-way, we recommend that this variation be adopted.

6.1.29 Fairfield County Subdivision Variations

We have done a preliminary analysis of each of the subdivision variations proposed by Iroquois and have several concerns. We support the intent of modifying the proposed route to minimize impacts to planned or new subdivisions if the variations do not create other more significant effects. Based on map and aerial reconnaissance, we believe that insufficient information exists to ensure that greater impacts would not result from adopting the variations. Iroquois reports that the final alignments of these variations remain subject to further modification.

Based on our review and their preliminary data, it is apparent that most resource impacts would be similar for the proposed route segments and variations (tables 6.1-1). However, issues such as steep slopes, existing residences, public water supplies, Paugussett State Forest, and the need for public comment require further consideration. We cannot at this time recommend adoption of the Old Farm Hill, Newtown, Forest and Monroe subdivision variations.

Because these variations could be superior, we recommend that Iroquois submit for our review definitive alignment sheets showing the final locations of the route variations along with an environmental comparison using the resource factors identified in the Commission's July 27, 1988 order.

6.1.30 Pootatuck River Variation

Although the variation would be the same length as the proposed route, only one crossing of the Pootatuck River, a cold-water fishery, would be required, versus three crossings for the proposed route. The amount of wetland crossed would be reduced by 0.3 acre; and slightly less clearing (4 acres versus 4.7 acres) would be required. The proposed route and the variation would both pass within 50 feet of the same residence. Overall, the route variation is environmentally superior to the proposed, therefore, we recommend its adoption.

6.1.31 Conrail Variation

In evaluating the advantages of or disadvantages of the Conrail Variation and corresponding segment of Iroquois' proposed route, we focused on four areas: construction along the Conrail tracks, protected watersheds, Means Brook wetlands and the Boys Halfway River Caves. We also felt that costs of one route over another must be presented. Other issues along the proposed route such as crossing the Hill and Harbor tourist district or traversing open space are not significant given the existing mixed uses and developing nature of the area. The Shelton Land Trust crossed at MP 321 of the proposed route is discussed in section 5.1.9. Factors such as length, number of streams crossed, public wells and surface water supplies, significant habitats and species of concern are not significantly different between routes.

Construction on Conrail's Railbed - We reviewed the Conrail route and Iroquois' plan for constructing within the vacated railbed if this Conrail variation were adopted. It is our opinion that while technically feasible it has significant disadvantages which should be avoided

if possible. Some segments of the route are relatively flat where widening of the right-of-way and construction and operational access would be relatively easy (MP 1.1 to MP 1.2, MP 3.7 to MP 4.5, and MP 5.1 to MP 6.3). In most locations, however, the bedrock outcrops, steep slopes or sharp drop-offs would require extensive blasting or filling to create a permanent and stable pipe location. It's also apparent that to construct the pipeline, construction would have to occur from a work train utilizing the existing rail tracks. Although these tracks are currently used, there is both limited passenger and additional freight service being considered for the near future. Iroquois has raised other concerns, most notably the potential need to case the pipe to meet Conrail specifications, corrosion protection and handling of potentially hazardous material which may be found in the railbed during excavation. We feel these are primarily cost issues that don't affect the environmental feasibility of following this route.

Protected Watershed - Approximately 3.6 miles of Iroquois' proposed route crosses the watershed of Means Brook. Means Brook, a water-course channelized by the Bridgeport Hydraulic Company (BHC), feeds the Means Brook Reservoir which in turn feeds Trap Fall Reservoir. Means Brook Reservoir is not directly a public water source. Much of the land traversed along Means Brook is protected watershed by BHC who has responsibility for managing and protecting water resources within the larger watershed. The primary concerns of BHC would be limiting contamination of water supplies during construction due to sediment runoff or spills of hazardous materials.

During operation of the pipeline the greatest concern would be increased unauthorized access along the pipeline right-of-way which could either destroy vegetative cover or lead to dumping of wastes (Gliesing, 1989). BHC is not opposed to the location of Iroquois' proposed route in this area if strict construction and operational procedures are followed. BHC also does not have any concerns with the crossing of the Maples or Housatonic Well Fields by the Conrail variation.

Means Brook Wetland - Iroquois' proposed route crosses approximately 2,890 feet of forested wetland and borders it for an additional 1,300 feet in the vicinity of MP 320. This wetland is reported to be the largest forested wetland in the vicinity of Shelton, Connecticut (Cook, 1989).

Our field reconnaissance identified several features which would help minimize impacts to this wetland. Several one to two acre ponds (apparently for retention of runoff from an adjacent subdivision) have recently been constructed at MP 321. Construction of these ponds indicated a thin layer of organic soils 1 to 2 feet thick, underlayed by sand deposits. These characteristics appear to extend into the forested wetland indicating that surface and subsurface soils would be able to support construction equipment provided that during construction use of temporary synthetic pads laid over the natural ground surface and covered by granular soils were incorporated. The extent of wetland clearing could be reduced while preserving the integrity of the large wetland expanse by realigning the route to the easterly edge of the wetland and limiting the width of the clearing. In accordance with our wetland and stream crossing procedures (see Appendix D) stump removal would be limited to the area over the trench and the entire wetland would be allowed to revegetate to a woody condition. These conditions would reduce, but not eliminate wetland impacts.

Boys Halfway River Caves - The Boys Halfway River caves in the vicinity of MP 318 have been identified in scoping as an environmentally sensitive area. The area consists of one to several collapsed limestone caves and associated calcareous soils which provide the potential to support unique and possibly rare plant species. The area could also support a population of bats although this has not been determined. Currently no significant habitats or unique ecosystems have been specifically identified or designated in this area. Our experience indicates that with appropriate surveys, scheduling of construction and centerline realignment could mitigate impacts to these resources, if required.

Summary - The Conrail Variation is probably feasible, but undesirable, unless no other environmentally acceptable option exists. Our review of the area has identified no feasible routing option other than Iroquois' proposed route and the Conrail Variation. In addition, Iroquois reports that the Conrail Variation could cost $10,000,000 (± 25 percent level of accuracy) more than the corresponding route segment. With a detailed program of environmental surveys and studies, centerline realignment through Means Brook wetland and construction and operational procedures to be followed as a condition of certification, Iroquois' proposed route would be environmentally acceptable. We recommend the following measures be followed for Iroquois' proposed route between MP 316 to MP 323.7: For construction and operation of pipeline facilities within the watershed, Iroquois would develop a specific SPCC plan addressing: no construction during wet periods, spill prevention, cleanup, storage of materials, right-of-way maintenance and inspection, and measures to prevent unauthorized access and dumping. To minimize impacts to forested wetlands associated with Means Brook, alignment sheets showing a minimum length of route through the wetlands based on field delineation would be submitted for our review and approval. A specific construction plan would be developed showing clearing and construction procedures, access points and material laydown areas. The feasibility of construction during winter would be addressed. Plant and wildlife surveys would be undertaken in the vicinity of Boys Halfway River caves. If species of concern are identified, a mitigative plan including, but not limited to, centerline realignment, would be submitted for our review and approval.

6.1.32 Blakeman Variation

For the most part, the Blakeman Variation would have similar effects to those of the proposed route. Both routes are similar in length and neither affects water use or quality. The variation would result in clearing 1.5 acres less and affects no wetlands, whereas the proposed route affects 0.4 acres of wetlands. No unique plant species or natural areas are within 1.5 miles of either route. Plant species of concern and significant wildlife habitats are at least 0.5 mile from either route. The variation would disrupt 1.45 acres more of cultivated land.

On balance the variation appears slightly preferable to the proposed route. It would be farther from existing residences and potentially could be more compatible with developing and future uses. We recommend this alternative pending submittal of alignment sheets for our review, showing the location of the pipeline in relation to proposed subdivision and highway layout.

6.1.33 Carroll Variation

This route variation would be approximately 250 feet longer than the proposed route and would have similar impacts in most resource areas with the exception of vegetation and land use. The variation would require the clearing of approximately 1.3 acres of forest, whereas the proposed route along the north side of the transmission right-of-way would require slightly less clearing (approximately 0.9 acre). The route variation would be located within 50 feet of two residences, whereas the proposed route would be within 50 feet of four residences (one of these residences would be affected by both the route variation and the proposed route). The route variation would require two crossovers of the existing transmission right-of-way; the proposed route would be adjacent to the existing right-of-way but would not cross over it. Both alignments would traverse a small unnamed drainage.

The variation appears to reduce the temporary disturbance to adjacent residences but would result in clearing of more vegetation and may require additional safety considerations due to the two crossovers of the existing electric lines. Although the variation responds to the concerns of Mr. Carroll, the impacts would be transferred to another residence along the opposite side of the existing right-of-way. The route variation does not appear to have any affect on the proposed Pin Oak subdivision.

As discussed in section 5.1.9, we recommend that the applicant construct the proposed pipeline within existing rights-of-way unless constraints can be demonstrated. If followed along the proposed route, this recommendation would address the concerns raised by Mr. Carroll, reduce the impacts associated with the proposed route, and avoid the impacts associated with the route variation. Consequently, we reject the route variation in this area and recommend that the applicant construct the proposed pipeline within the existing right-of-way.

6.1.34 Milford Variation

This route variation would be approximately 0.4 mile longer than the proposed route. Impacts associated with this variation would be similar to those along the proposed route with the exception of land use, vegetation and wetlands. Generally, the route variation traverses more commercial and industrial land than the proposed route, and parallels existing rights-of-way (electric transmission line and railroad) for a total distance of .65 mile, whereas the proposed route does not parallel any existing rights-of-way. The route variation would require the clearing of approximately 10.5 acres of wooded land while the proposed route would require clearing of approximately 14.3 acres of wooded land.

Both routes would cross Beaver Brook, but the route variation would avoid most of the federally-designated wetlands in this area, while the proposed route would traverse approximately 800 feet of the associated scrub/shrub wetland. The proposed route, however would traverse 200 feet of a forested wetland and would border 1,400 feet of an intertidal, emergent wetland.

The route variation responds to the concerns raised by several scoping comments. By paralleling the existing electric transmission lines, the route variation would minimize disruption to the operations and development potential of the Beard Sand and Gravel

Company. The route variation would also locate the pipeline farther away from the Mondo Ponds area and the JFK Elementary School.

On balance, we find that the route variation is environmentally preferable to the proposed route, since the route variation makes greater use of existing rights-of-way and industrial and commercial properties. However, considering the properties that would be traversed, we believe the following additional restrictions would be necessary to minimize impacts along the route variation:

- Existing vegetative screens would be maintained at the rear of the industrial and commercial properties; particularly between the residential development and commercial properties to the west of Bic Drive.
- The construction right-of-way would be restricted to 75 feet to minimize the amount of clearing.
- Vegetative screens would be planted at all road crossings for the entire width of the right-of-way to restrict access and limit line-of-sight views of the permanent right-of-way.
- The alignment and construction through parking lots would be designed and carried out with the objective of minimizing the extent and duration of disruption; all parking areas would be restored to as found condition or better.

6.1.35 Variations Developed as Wetland Mitigation

A total of 34 route variations were evaluated solely to avoid or minimize wetland impacts. A comparison of each variation with the corresponding portion of the proposed route is provided in table 6.2-2. These comparisons are presented in tabular form since these variations primarily involve wetlands and do not affect other sensitive resources; the only other changes in the resources affected include the amount of forested or agricultural areas traversed and the number of streams crossed.

These 34 variations total approximately 30.5 miles and result in a total reduction of wetlands crossed from approximately 6 miles to 1 mile. Considering the generally minor changes associated with these route variations and the benefit of minimizing the amount of wetland disruption, we recommend that these 34 route variations be adopted.

TABLE 6.1-1 (cont'd)

Variation Name/ Environmental Factor	Variation	Proposed Route	Comment
24. Dover Variation MP 281.7 to MP 282.5			
• Total miles	.76	.74	
• Parallel to existing ROW (mi.)	.34	0	
• Areas crossed with slopes greater than 15 percent (mi.)	.02	.09	
• Forest cleared (ac.)	5.97	4.71	
• Active or rotated cropland (ac.)	1.15	1.15	
• Other: Mica Products	1300	2600	Distance from
Vincent Landfill	500	0	
25. State Route 55 MP 282.85 to MP 286.6			
• Total miles	3.6	3.75	
• Parallel to existing ROW (mi.)	0	.7	SR 55
• Minor river/stream crossings	2	4	
• Streams classified for trout	1	1	
• Wetlands (ac.)	.7	-	
• Significant habitats within 1.5 miles of pipeline centerline	1	1	
• Threatened and endangered species within 1.5 miles	1	1	
• Forest cleared (ac.)	26.3	16.1	
• Active or rotated cropland (ac.)	9.3	13.5	
• New pipeline within 50 feet of existing residences	1	7	
• Other: Nursery	-	1	
26. Wimisink Variation MP 287.3 to MP 288.1			
• Total miles	.8	.8	
• Areas of steep slopes encountered (mi.)	.28	.27	state wetland
• Minor river/stream crossings	1	1	Wimisink Brook
• Streams classified for trout	1	1	coldwater-trout stocked
• Wetlands (ac.)	.6	.9	
• Forest cleared (ac.)	5.51	6.66	
• New pipeline within 50 feet of existing residences	1	0	on Route 39
• New pipeline that would cross proposed approved subdivisions	1650	1700	Smoke Ridge
• Other: Naromi Land Trust (ft)	1500	2000	
27. Still River Variation MP 297.5 to MP 298			
• Total miles	.5	.5	
• Parallel to existing ROW (mi.)	.2	.5	electric line
• Minor river/stream crossings	1	1	Still River
• Wetlands (ac.)	.45	1.21	
• Significant habitats within 1.5 miles of pipeline centerline	1	1	
• Forest cleared (ac.)	2.3	2.0	pasture
• Other: Dog Pound	3	2	Conrail, electric road
Still Rivers Meanders Natural Area	1	1	

TABLE 6.1-1 (cont'd)

Variation Name/ Environmental Factor	Variation	Proposed Route	Comment
28. **Algonquin Variation** MP 307 to MP 308.1			
• Total miles	1.38	1.36	
• Parallel to existing ROW (mi.)	1.3	1.3	Algonquin
• Minor river/stream crossings	2	2	Unnamed
• Wetlands (ac.)	2.8	.95	
• Forest cleared (ac.)	14.70	15.15	
• New pipeline within 50 feet of existing residences	1	3	
29. **Old Farm Hill Subdivision** MP 308.3 to MP 310.1			
• Total miles	1.77	1.74	
• Areas of steep slopes encountered (mi.)	.27	.26	
• Minor river/stream crossings	3	1	
• Wetlands (ac.)	.6	.5	
• Forest cleared (ac.)	21.24	20.66	
• New pipeline that would cross proposed approved subdivisions (ft.)	3500	6100	
Newtown Subdivision MP 312.2 to MP 315.2			
• Total miles	3.32	2.98	
• Parallel to existing ROW (mi.)	.19	0	Highway ROW
• Areas of steep slopes encountered (mi.)	1	1	
• Minor river/stream crossings	7	7	
• Wetlands (ac.)	.68	1.60	
• Forest cleared (ac.)	36.9	32.7	
• New pipeline that would cross proposed approved subdivisions (ft.)	4500	5000	
Forest Subdivision MP 315.8 to MP 316.3			
• Total miles	.42	.50	
• Forest cleared (ac.)	5.05	6.06	
• New pipeline that would cross proposed approved subdivisions (ft.)	1500	2000	
• State Forest or State Parks crossed (ft.)	1000	0	
Monroe Subdivision MP 316.7 to MP 318.2			
• Total miles	1.44	1.51	
• Areas of steep slopes encountered (mi.)	.08	.15	State wetland
• Minor river/stream crossings	1	1	Halfway River
• Wetlands (ac.)	0.1	0.1	NW1 + State
• Significant habitats within 1.5 miles of pipeline centerline			Near Boys Halfway River
• Forest cleared (ac.)	10.9	11.5	
• Active or rotated cropland (ac.)	1.7	3.0	
• New pipeline within 50 feet of existing residences	2	3	
• New pipeline that would cross proposed approved subdivisions (ft.)	1900	2300	

TABLE 6.1-1 (cont'd)

Variation Name/ Environmental Factor	Variation	Proposed Route	Comment
30. **Pootatuck River Variation** MP 311.0 to MP 311.4			
• Total miles	.4	.4	
• Parallel to existing ROW (mi.)	.1	0	
• Streams classified for trout	1	1	coldwater-stocking
• Wetlands (ac.)	.1	.4	Fed. & State
• Forest cleared (ac.)	4	4.7	
• New pipeline within 50 feet of existing residences	1	1	same house
• New pipeline that would cross proposed approved subdivisions (ft.)	1900	2300	
31. **Conrail Variation** MP 316.8 to MP 323.7			
• Total miles	7.4	6.9	
• Parallel to existing ROW (mi.)	5.5	0	
• Minor river/stream crossings	8	9	
• Watershed crossed (miles)	.5	3.6	
• Community wells within 1.5 miles	23	23	
• Significant habitats within 1.5 miles of pipeline centerline	6	5	
• Wetlands (ac.)	2.0	8.6	
• State parks crossed	1	0	
32. **Blakeman Alternative** MP 323.1 to MP 323.8			
• Total miles	.7	.6	
• Wetlands (ac.)	0	.4	Fed. and State
• Significant habitats within 1.5 miles of pipeline centerline	2	2	
• Threatened and endangered species within 1.5 miles	1	1	Plant species
• Forest cleared (ac.)	5.2	6.7	
• Active or rotated cropland (ac.)	1.45	0	
• New pipeline that would cross proposed approved subdivisions	1	1	Summer Field Manor
• Other: Parallel to proposed ROW (ft)	1800	0	
33. **Carroll Variation** MP 330.4 to MP 330.8			
• Total miles	.42	.37	
• Parallel to existing ROW (mi.)	.20	.32	
• Minor river/stream crossings	1	1	
• Wetlands (ac.)	.06	.06	
• Forest cleared (ac.)	1.3	0.9	
• New pipeline within 50 feet of existing residences	2	4	
34. **Milford Variation** MP 331.1 to MP 332.8			
• Total miles	2.1	1.7	
• Parallel to existing ROW (mi.)	.65	0	
• Minor river/stream crossings	1	1	
• Public surface water supplies crossed	1	1	Beaver Brook (Inactive)
• Wetlands (ac.)	3.78	1.95	
• Forest cleared (ac.)	10.5	14.3	
• New pipeline within 50 feet of existing residences	0	1	

APPENDIX B.2

ALTERNATIVE ALIGNMENTS EVALUATED AS COMMENTS ON THE FERC DEIS

FEBRUARY 15, 1990

C3-6. Iroquois does not support FERC's "rejection" of the Fairfield County Subdivision Variations, given the additional information compiled from subdivision developers over the past several months. (DEIS Section 3.6.29, page 3-44, and DEIS Section 6.1.29, page 6-12).

Iroquois has continued to consult with both local government officials and subdivision developers in order to refine a pipeline alignment that will minimize impacts on the environment while taking into consideration plans for residential and commercial development. As part of these consultations, Iroquois has obtained and reviewed available plot plans; conducted (with some of the developers/property owners) field reconnaissance of route options; and reviewed available environmental data, including wetlands maps.* As a result of these efforts, Iroquois has refined or verified its proposed subdivision variations. It can be expected that minor modifications to these routes may continue as more specific right-of-way studies are conducted, and as developers refine their plans.

The routes that Iroquois proposes are shown on DEIS Figure A-1 (mapsheets 51 and 52 of 57). These maps (attached) have been revised to illustrate the route refinements in relation to the original route and original subdivision variations (if different than currently proposed). Environmental evaluations comparing each of the subdivision refinements to the original proposed route also are attached. The 64 resource factors, pursuant to FERC's request (see DEIS, page 6-12), were examined in evaluating these routes. However, because the route refinements are generally similar to the original routes, most of these factors are the same; as a result, the following evaluations focus on those features that differ.

Iroquois supports the subdivision refinements included herein. However, it is acknowledged that the original route or the original variations also could be built in an environmentally sound manner, albeit with comparatively greater impacts to existing and future residences.

*Wetlands maps based on hydric soils -- the criteria for identifying wetlands for Connecticut local government purposes.

ENVIRONMENTAL ANALYSIS OF ALTERNATIVE ROUTES THROUGH THE OLD FARM HILL SUBDIVISION

The Iroquois Gas Transmission System (Iroquois) proposes a route variation between mileposts 308.19 and 310.03 in the Town of Newtown, Connecticut. The purpose of a route variation in this area, which includes the Old Farm Hill Subdivision, is to minimize potential effects on the development of the residential area (e.g., by aligning the pipeline along property boundaries to the extent practical), while also minimizing impacts to wetlands and other environmental features.

In July 1989, Iroquois submitted a proposed route modification in the Old Farm Hill area to the Federal Energy Regulatory Commission (FERC). This route modification is included in FERC's Draft Environmental Impact Statement (DEIS) concerning the Iroquois project and is identified as the "Old Farm Hill Variation" (See DEIS pages 3-44 and 6-24 and DEIS map sheet 51 of 57). Since the submission of this variation to FERC, Iroquois has continued to consult with the subdivision developer and, with the developer's representative, has conducted an on-ground reconnaissance of the area. In addition, Iroquois has consulted with town representatives with jurisdiction over local inland wetlands. As a result of these additional investigations and consultations, Iroquois has made minor modifications to its proposed reroute through the subdivision. The route that incorporates these latest modifications is Iroquois' preferred alignment.

Table 3.6.29-1 (attached) compares the primary environmental features along the original proposed Iroquois route, the Old Farm Hill Subdivision Variation, and the preferred route. Figure A-1 (mapsheet 51 of 57) illustrates the location of each of these alignments on U.S. Geological Survey topographic quadrangle maps (scale 1 inch = 2000 feet). It should be noted that the maximum separation between the subdivision variation and the modified variation is approximately 400 feet.

As Table 3.6.29-1 shows, with the exception of wetlands, the three alignments are similar. All traverse perennial tributaries to Cavanaugh Pond (Class A). Although the two variations cross three such tributaries, whereas the original route crosses only one, the original route crosses closer to Cavanaugh Pond. All of the routes are within 1.5 miles of the same significant wildlife habitat (the Millikin Tract Natural Area where wintering bald eagles have been reported); however, the variations are about 0.3 to 0.4 miles farther from this area than the original route.

Federally designated and town designated wetlands are traversed along all three routes (See Table 3.6.29-1). Table 3.6.29-2 summarizes the federal wetlands traversed, by milepost and wetland type. The original proposed route traverses 350 feet of scrub-shrub and emergent wetlands; the Old Farm Hill Subdivision Variation traverses 200 feet of forested wetlands; and the preferred route traverses 150 feet of forested wetlands.

The preferred route also minimizes the distance of town designated wetlands traversed. In Connecticut, town wetlands are designated based on the presence of hydric soils. The original route traverses two hydric soil types, including approximately 500 feet of Adrian muck and 2000 feet of Ridgebury/Leicester/Whitman soils. The Old Farm Hill Subdivision Variation traverses 700 feet of Scarboro mucky sandy loam and 700 feet of

Ridgebury/Leicester/Whitman soils; while the preferred route traverses 700 feet of Scarboro mucky sandy loam.

TABLE 3.6.29-1
COMPARISON OF ENVIRONMENTAL FEATURES ALONG
THE PREFERRED IGTS, THE OLD FARM HILL SUBDIVISION VARIATION,
AND THE ORIGINAL PROPOSED ROUTE

Environmental Feature	Preferred Route *	Old Farm Hill Subdivision Variation	Original Route
Total Miles	1.81	1.77	1.74
o Parallel to existing rights-of-way	0	0	0.24
o Not parallel to existing rights-of-way	1.81	1.77	1.50
Geology and Soils			
o Erodible soils (miles)	1.50	1.15	1.25
o Hydric soils (miles)	0.13	0.27	0.47
o Steep slopes (miles)	0.98	0.87	0.53
Water Use and Quality			
o Total streams crossed (number)	3	3	1
o Streams crossed within 1.5 miles upstream from municipal water supplies (number)	0	0	0
Vegetation			
o Forests (miles)	1.81	1.75	1.70
o Crops/pasture (miles)	0	0	0
o Other open land (miles)	0	0.02	0.04
o Regulated wetlands (miles)**			
- Federal	0.03	0.04	0.07
- State/Town	0.11	0.27	0.47

Table 3.6.29-1 (Continued)

Environmental Feature	Preferred Route	Old Farm Hill Subdivision Variation	Original Route
o Unique plant communities within 1.5 miles of the right-of-way (number)	0	0	0
o Plant species of special concern within 1.5 miles of the right-of-way (number)	0	0	0
Wildlife and Fisheries			
o Significant wildlife habitats within 1.5 miles of the right-of-way (number)	1	1	1
o Streams with important fisheries (number)	0	0	0
o Wildlife species of special concern within 1.5 miles of the right-of-way (number)	0	0	0
Land Use			
o Specialized agriculture (e.g., orchards, vineyards, sugar-bushes)	0	0	0
o Residences within 50 feet	0	1	0
Transportation			
o Major highway and utility corridors traversed (number)	2	2	2
Cultural Resources			
o Prehistoric resources within 1.5 miles of the right-of-way (number)	2	2	6
o Historic resources within 1.5 miles of the right-of-way (number)	3	3	3

Table 3.6.29-1 (continued)

Environmental Feature	Preferred Route	Old Farm Hill Subdivision Variation	Original Route
o National Register of Historic Places sites within 1.5 miles (number)	1	1	2

* Preferred route is the Revised Old Farm Hill Subdivision Variation.
** Wetlands delineated by the federal government (i.e., on National Wetland Inventory [NWI] maps) or by Connecticut towns (i.e., based on soil type).

Source: Phenix Environmental, Inc. 1989.

TABLE 3.6.29-2
FEDERAL DESIGNATED WETLANDS TRAVERSED ALONG THE PREFERRED ROUTE, THE OLD FARM HILL SUBDIVISION VARIATION AND THE ORIGINAL ROUTE

ROUTE	MILEPOST	WETLAND TYPE *	DISTANCE TRAVERSED (FEET)
Preferred Route	308.40	PFO1E	50
	308.48	PFO1E	50
	308.82	PFO1E	50
TOTAL			150
Old Farm Hill Subdivision Variation	308.40	PFO1E	50
	308.48	PFO1E	50
	308.85	PFO1E	50
	308.90	PFO1E	50
TOTAL			200
Original Proposed Route	308.2	PEME	100
	308.48	PSS1/EME	100
	308.68	PSS1/EME	150
TOTAL			350

* PFO1E = Palustrine deciduous forested
PSS1/EME = Palustrine deciduous scrub-shrub/emergent

Source: Phenix Environmental, Inc. 1989.

ENVIRONMENTAL ANALYSIS OF ALTERNATIVE ROUTES THROUGH NEWTOWN SUBDIVISIONS

The Iroquois Gas Transmission System (Iroquois) proposes a route variation between mileposts 312.19 and 315.17 of the original route in the Town of Newtown, Connecticut. The objective of this variation is to minimize potential environmental effects while limiting potential conflicts with proposed developments in the Trout Run, Green Ridge, Mountain Manor (I and II), Cobbler's Mill, Deer Ridge, and Feather Meadow subdivisions.

In July 1989, Iroquois submitted a proposed subdivision route modification to the Federal Energy Regulatory Commission (FERC). This modification, identified as the "Newtown Subdivision Variation", is included in the Draft Environmental Impact Statement (DEIS) concerning the Iroquois project (See DEIS pages 3-44 and 6-24, and DEIS map sheets 51 and 52 of 57).

Since the submission of this variation in July, Iroquois has continued to consult with local developers, review subdivision plans, and perform preliminary field reconnaissance of the proposed and alternative routes. As a result, Iroquois has incorporated several minor revisions to its route variation. This route is referred to as the "Revised Newtown Subdivision Variation" and represents Iroquois' preferred route through this portion of Newtown.

Table 3.6.29-3 (attached) compares the primary environmental features along the original Iroquois route, the subdivision variation, and the revised subdivision variation. Figure A-1 (map sheets 51 and 52 of 57) illustrates the location of these routes on U.S. Geological Survey topographic maps (scale 1 inch = 2000 feet). The maximum separation between the subdivision variation included in the DEIS and the revised variation is approximately 800 feet.

The environmental features along the three route options are similar, as Table 3.6.29-3 indicates. All of the routes cross seven streams that are tributaries of either Pole Bridge Brook or the Housatonic River. However, the original alignment crosses one intermittent tributary to Pole Bridge Brook that the route variations do not. Similarly, the route variations both traverse an additional perennial tributary to the Housatonic River that the original route avoids. All of these watercourses are small, and all are designated as Class A.

Forest is the predominant land use along all of the routes. However, most of the area is under development pressure for residential uses, as evidenced by the number of new homes under construction or planned for construction in the near future.

Federal and Connecticut town designated wetlands are traversed by all three alignments (see Table 3.6.29-3). Table 3.6.29-4 summarizes the federal wetlands traversed by milepost and wetland type. The original proposed route traverses 760 feet of forested, scrub-shrub and emergent wetlands; both the original and revised subdivision variations traverse 450 feet of forested and scrub-shrub wetland.

Town designated wetlands, which are identified based solely on the presence of hydric soils, are traversed by all three alignments. These town wetlands are underlain by soils of the Scarboro and Ridgebury/Leicester/Whitman types. The original route traverses approximately 2850 feet of these soils; the original Newtown Subdivision Variation traverses approximately 1700 feet; and the Revised Newtown Subdivision Variation traverses 1400 feet.

TABLE 3.6.29-3
COMPARISON OF ENVIRONMENTAL FEATURES ALONG THE PREFERRED IGTS, THE NEWTOWN SUBDIVISION VARIATION, AND THE ORIGINAL PROPOSED ROUTE

Environmental Feature	Preferred Route *	Newtown Subdivision Variation	Original Route
Total Miles	3.34	3.32	2.98
o Parallel to existing rights-of-way	0.17	0.17	0
o Not parallel to existing rights-of-way	3.17	3.15	2.98
Geology and Soils			
o Erodible soils (miles)	1.53	1.53	1.28
o Hydric soils (miles)	0.27	0.32	0.54
o Steep slopes (miles)	0.63	0.48	0.38
Water Use and Quality			
o Total streams crossed (number)	7	7	7
Vegetation			
o Forests (miles)	3.10	3.13	2.64
o Crops/pasture (miles)	0	0	0
o Other open land (miles)	0.18	0.13	0.28
o Regulated wetlands **			
- Federal (miles)	0.09	0.09	0.14
- State /Town (miles)	0.27	0.32	0.54

Table 3.6.29-3 (continued)

Environmental Feature	Preferred Route *	Newtown Subdivision Variation	Original Route
o Unique plant communities within 1.5 miles of the right-of-way (number)	2	2	2
o Plant species of special concern within 1.5 miles of the right-of-way (number)	1	1	1
Wildlife and Fisheries			
o Significant wildlife habitats within 1.5 miles of the right-of-way (number)	0	0	0
o Streams with important fisheries (number)	0	0	0
o Wildlife species of special concern within 1.5 miles of the right-of-way (number)	2	2	2
Land Use			
o Residences within 50 feet	0	0	0
o Public lands (miles) **	0.11	0.11	0.11
Transportation			
o Major highway and utility corridors traversed (number)	1	1	1

Table 3.6.29-3 (continued)

Environmental Feature	Preferred Route *	Newtown Subdivision Variation	Original Route
Cultural Resources			
o Prehistoric resources within 1.5 miles of the right-of-way (number)	3	3	5
o Historic resources with 1.5 miles of the right-of-way (number)	3	3	4
o National Register of Historic Places sites within 1.5 miles (number)	0	0	0

* Preferred Route is the Revised Newtown Subdivision Variation.
** Wetlands delineated by the federal government (i.e., on National Wetland Inventory [NWI] maps) or Connecticut towns (i.e., based on soil type).
*** Public lands are those owned by USDOT along Interstate 84.

Source: Phenix Environmental, Inc. 1989.

TABLE 3.6.29-4
FEDERAL DESIGNATED WETLANDS ALONG THE PREFERRED ROUTE
(THE REVISED NEWTOWN SUBDIVISION VARIATION);
THE ORIGINAL NEWTOWN SUBDIVISION VARIATION;
AND THE ORIGINAL PROPOSED ROUTE

ROUTE	MILEPOST	WETLAND TYPE	DISTANCE TRAVERSED (FEET)
Preferred Route	312.60	PFO1E	50
	312.25	PSS1E	100
	313.63	PFO1E	50
	314.24	PFO1E	50
	314.30	PFO1E	50
	315.20	PFO1E	50
	315.55	PFO1E	50
	315.72	PFO1E	50
TOTAL			450
Original Newtown Subdivision Variation	312.60	PFO1E	50
	313.25	PSS1E	100
	313.64	PFO1E	50
	314.26	PFO1E	50
	314.36	PFO1E	50
	315.12	PFO1E	50
	315.45	PFO1E	50
	315.64	PFO1E	50
TOTAL			450
Original Proposed Route	312.54	PFO1E	50
	312.72	PSS1/EME	50
	312.76	PEME	100
	313.08	PSS1E	260
	313.40	PFO1E	50
	313.98	PFO1E	50
	314.17	PSS1E	50
	314.96	PFO1E	50
	315.05	PFO1E	50
	315.16	PFO1E	50
TOTAL			760

* PFO1E = Palustrine deciduous forested
PSS1/EME = Palustrine deciduous scrub-shrub/emergent
PEME = Palustrine emergent
PSS1E = Palustrine scrub-shrub

Source: Phenix Environmental, Inc. 1989.

ENVIRONMENTAL ANALYSIS OF THE FOREST VIEW SUBDIVISION VARIATION AND THE ORIGINAL PROPOSED ROUTE

The Iroquois Gas Transmission System (Iroquois) has proposed a route variation between mileposts 315.8 and 316.3 of the original route in the Town of Newtown, Connecticut. The objective of this variation is to limit potential conflicts with a proposed subdivision development.

Iroquois submitted the proposed route modification to the Federal Energy Regulatory Commission (FERC) in July 1989. This modification, identified as the "Forest Subdivision Variation", is included in the Draft Environmental Impact Statement (DEIS) concerning the Iroquois project (see DEIS pages 3-44 and 6-24, and DEIS map sheet 52 of 57).

Since the submission of this variation in July, Iroquois has continued to consult with local developers, review subdivision plans, and perform preliminary field reconnaissance of the pipeline route. In addition, Iroquois has consulted with representatives of the DEP Division of Forestry regarding plans for Paugussett State Forest. As a result of these efforts, Iroquois has verified the alignment of the Forest View Subdivision Variation as its preferred route in this area.

This environmental evaluation responds to the FERC's request (see DEIS page 6-12) for additional information concerning the subdivision variation and for a comparative evaluation of the variation and the original proposed route.

Table 3.6.29-5 (attached) compares the primary environmental features along the original Iroquois route and the subdivision variation. In performing this comparative analysis, Iroquois evaluated both routes using the 64 resource factors identified in FERC's July 27, 1988 Order. However, since the maximum separation between the subdivision variation included in the DEIS and the revised variation is approximately 550 feet, many of these factors are the same. As a result, Table 3.6.29-5 focuses on those factors that differ between the two routes.

Neither of the two routes traverse any streams, federally designated wetlands, known cultural resource sites, significant habitats or steep slopes. The principal difference between the two alignments is that the variation traverses 1000 feet along the boundary of Paugussett State Forest in order to avoid an alignment through the middle of residential lots in the Forest View Subdivision. By traversing along the boundary of the State Forest, the variation is also within 250 feet of a federally designated wetland.

Both routes traverse entirely through wooded areas. However, the variation is about 0.1 mile shorter than the original proposed route; as a result it will affect less forest land overall.

Neither alignment traverses any federally designated wetland (as identified from National Wetland Inventory maps). However, both alignments traverse an area of Ridgebury/Leicester/Whitman soils, a hydric soil type identified by the U.S. Department of Agriculture, Soil Conservation Service. Connecticut towns identify wetlands based solely on the presence of hydric soils. The original route traverses this soil type for 300 feet, whereas the Forest View Subdivision Variation crosses it for 200 feet.

Neither route would traverse any known cultural resources. However, both are within 1.5 miles of three state-designated historic areas, and one archeological site.

TABLE 3.6.29-5
COMPARISON OF ENVIRONMENTAL FEATURES ALONG THE
FOREST VIEW SUBDIVISION VARIATION
AND THE ORIGINAL PROPOSED ROUTE

Environmental Feature	Subdivision Variation	Original Route
Total Miles	0.40	0.50
o Parallel to existing rights-of-way	0	0
o Not parallel to existing rights-of-way	0.40	0.50
Geology and Soils		
o Erodible soils (miles)	0.19	0.13
o Hydric soils (miles)	0.04	0.06
o Steep slopes (miles)	0	0
Vegetation		
o Forests (miles)	0.40	0.50
o Regulated wetlands (miles)*		
- Federal	0	0
- State/Town	0.04	0.06
o Unique plant communities within 1.5 miles of the right-of-way (number)	0	0
o Plant species of special concern within 1.5 miles of the right-of-way (number)	1	1

Table 3.6.29-5 (Continued)

Environmental Feature	Subdivision Variation	Original Route
Wildlife and Fisheries		
o Significant wildlife habitats within 1.5 miles of the right-of-way (number)	0	0
o Wildlife species of special concern within 1.5 miles of the right-of-way (number)	1	1
Land Use		
o Public lands traversed (feet)**	1000	0
Transportation		
o Major highway and utilities	2	2
Cultural Resources		
o Prehistoric resources with 1.5 miles of the right-of-way (number)	1	1
o Historic resources with 1.5 miles of the right-of-way (number)	3	4
o National Register of Historic places sites within 1.5 miles (number)	0	0

* Wetlands delineated by federal or town governments.
** Paugussett State Forest; original route borders but does not traverse.

Source: Phenix Environmental, Inc. 1989.

ENVIRONMENTAL ANALYSIS OF THE MONROE SUBDIVISION VARIATION AND THE ORIGINAL PROPOSED ROUTE

In July 1989, the Iroquois Gas Transmission System (Iroquois) proposed a route variation in the towns of Newtown and Monroe, Connecticut. The route variation, which would replace the area between mileposts 316.70 and 318.21 of the original Iroquois route, was proposed to minimize potential environmental impacts (particularly to wetlands) and to limit potential conflicts with existing and proposed residential development in the Whispering Pines and Buckhill Estate subdivisions.

The proposed route variation was submitted to the Federal Energy Regulatory Commission (FERC) and was included in the Draft Environmental Impact Statement (DEIS), where it is identified as the "Monroe Subdivision Variation" (see DEIS pages 3-44 and 6-24, and DEIS map sheet 52 of 57). This environmental analysis responds to the FERC's request for additional information regarding the subdivision variation (see DEIS page 6-12).

The Monroe Subdivision Variation is approximately 1.44 miles in length; 0.25 mile of the variation is in Newtown and 1.19 miles are in Monroe. Since submitting this subdivision variation to the FERC, Iroquois has continued to review subdivision plans; to consult with local developers; and to conduct preliminary field reconnaissance of the original proposed route and the variation. These efforts have served to confirm the location of the Monroe Subdivision Variation as depicted on DEIS map sheet 52 of 57. Iroquois prefers the subdivision variation over the original route in this area.

Table 3.6.29-6 (attached) compares the primary environmental features along the original proposed route and the subdivision variation. In performing this comparative analysis, Iroquois evaluated both routes the 64 resource factors identified in FERC's July 27, 1988 Order. However, since the maximum separation between the subdivision variation and the original proposed route is only 1100 feet, many of these factors are the same. As a result, Table 3.6.29-6 focuses principally on those features that differ between the two routes.

As Table 3.6.29-6 indicates, both routes traverse similar environmental features. Forested areas are the dominant vegetation type along both alignments, although virtually all such areas are within existing or proposed subdivision developments. Both routes also traverse the Whispering Pines and Buckhill Estate subdivisions. However, the variation traverses generally along property boundary lines, whereas the original route does not.

Both routes cross one stream -- the Halfway River (Class B/A). Along each alignment, the pipeline would traverse this stream in areas where the adjacent land use is wooded.

In addition, both the original route and the subdivision variation will cross three major rights-of-way. These include an electric transmission corridor, the Conrail tracks, and State Route 111.

The original route and the Monroe Subdivision Variation each traverse both federally and town-designated wetlands (See Table 3.6.29-6). Both alignments traverse the same federal wetland, a riverine open water area along the Halfway River. Town designated wetlands are traversed for 800 feet by the original route (Ridgebury/Leicester/Whitman soils) and for 950 feet by the proposed variation (Ridgebury/Leicester/Whitman and Ridgebury fine sandy loam soils).

Neither the variation nor the original route crosses any known cultural resources. However, the general area traversed by both routes is sensitive in terms of cultural resources, since there are various recorded historic and archeological sites in the immediate vicinity.

TABLE 3.6.29-6
COMPARISON OF ENVIRONMENTAL FEATURES ALONG THE
MONROE SUBDIVISION VARIATION
AND THE ORIGINAL PROPOSED ROUTE

Environmental Feature	Subdivision Variation	Original Route
Total Miles	1.44	1.51
o Parallel to existing rights-of-way	0	0
o Not parallel to existing rights-of-way	1.44	1.51
Geology and Soils		
o Erodible soils (miles)	0.60	0.44
o Hydric soils (miles)	0.18	0.15
o Steep slopes (miles)	0.37	0.39
Water Use and Quality		
o Total streams crossed (number)	1	1
o Streams crossed within 1.5 miles upstream from municipal water supplies (number)	0	0
Vegetation		
o Forests (miles)	0.58	1.24
o Crops/pasture (miles)	0.45	0
o Other open land (miles)	0.14	0

Table 3.6.29-6 (Continued)

Environmental Feature	Subdivision Variation	Original Route
o Regulated wetlands (miles)*		
- Federal	0.01	0.01
- State	0.18	0.15
o Unique plant communities** within 1.5 miles of the right-of-way (number)	5	5
o Plant species of special concern within 1.5 miles of the right-of way (number)	3	3
Wildlife and Fisheries		
o Significant wildlife habitats within 1.5 miles of the right-of-way (number)	0	0
o Streams with important fisheries (number)	0	0
o Wildlife species of special concern within 1.5 miles of the right-of-way (number)	0	0
Land Use		
o Residential (number of homes within 50 feet)	0	0
o Commercial/industrial (miles)	0	0.32
o Public lands (miles)	0	0
Transportation		
o Major highway and utility corridors traversed (number)	3	3

Table 3.6.29-6 (Continued)

Environmental Feature	Subdivision Variation	Original Route
Cultural Resources		
o Recorded prehistoric resources within 1.5 miles of the right-of-way (number)	3	3
o Historic resources within 1.5 miles of the right-of-way (number)	5	5
o National Register of Historic Places sites within 1.5 miles (number)	0	0

* Wetlands delineated as such by federal or state governments.
** Includes natural areas.

Source: Phenix Environmental, Inc. 1989.

only one residence. Because the routes are so close together, land uses and vegetation types traversed by the two routes are approximately the same.

3.10.8 Leeds Road Variation

The Leeds Road Variation is proposed by Iroquois in response to new residential construction located along Leeds Road near milepost 231.3 in the Town of Athens, Greene County. To avoid conflicts with this development, the variation diverges west from the proposed route at milepost 230.9 and crosses Leeds Road approximately 520 feet west of the original crossing. The variation then traverses parallel to and within 600 feet of the proposed route for about 1500 feet, then crosses it at milepost 231.5 and rejoins the proposed route at milepost 231.6.

The variation is designed to avoid new houses adjacent to Leeds Road and existing and planned houses east of Leeds Road. Neither route traverses any wetland, but the variation does cross 3000 feet of forest compared to the 700 feet of forest crossed by the proposed route. However, the proposed route would be in close proximity to residences.

3.10.9 Stillson Hill Variation

Iroquois proposes a route modification in the vicinity of Stillson Hill Road, in the Town of New Milford, Connecticut. The purpose of the variation is to align the pipeline farther from existing homes, to reduce impacts to wetlands, and to minimize potential effects on forested areas by taking advantage of cleared agricultural areas and an existing access road. This variation was developed in response to concerns expressed by residents of Stillson Hill Road regarding the proximity of the pipeline to homes, wells (in an area where groundwater supply is of particular concern), and wetlands. The Stillson Hill Road residents were also instrumental in the selection of the variation by pointing out the existence of a wide access road (along which the pipeline could be aligned) and by participating in field reconnaissance of the proposed variation.

The proposed variation would deviate west from the proposed route at about milepost 289.0, and traverse south predominantly through cleared pasture lands and around an area of hydric soils. In this area, the route would traverse about 125 feet from an older home with historic attributes; this residence is located along Church Road. Morrissey Brook (a Class A trout stream) would be traversed by the variation south of Church Road. Land use adjacent to both banks of this stream at the point of crossing is predominantly pasture land interspersed with some reverting field and scattered large sycamore trees.

The variation continues south, generally parallel to and and 500 to 1200 feet west of the original proposed route, traversing areas of mixed pasture land, cropland, and forest land. In this area, the variation is a minimum of 500 feet from residences located along Stillson Hill Road. In comparison, the original proposed route was aligned within 50 to 100 feet of some of these homes. It should be noted that the original route was aligned to parallel a telephone right-of-way in this area. This telephone right-of-way is no longer active and the easement is not maintained.

At about milepost 290.0, the variation leaves a cultivated agricultural field, traverses a wooded area, and then is aligned along an existing access road. This access road is approximately 50 to 60 feet wide. The variation follows this road

for about 1500 feet before traversing due southeast across forested areas and linear forested wetland to rejoin the original proposed route at about milepost 290.5.

Table 3.10.9-1 presents a comparison of the environmental features along the two routes which differ. The proposed variation traverses more agricultural pasture than the original (3700 vs. 1300 feet), and less forestland than the original (4200 vs. 5200 feet). The variation traverses significantly fewer wetlands than the proposed route. Specifically, most of the variation is aligned away from a linear forested wetland that the former telephone right-of-way paralleled or spanned. The variation traverses an estimated 500 feet of wetlands, based on the presence of hydric soils. In comparison, the original route crosses about 1100 feet of wetlands.

Neither route traverses reported locations of rare, threatened, or endangered species. However, both are within an area that is considered generally sensitive for the location of cultural resources.

The variation is located in the town of New Milford, except for approximately 1100 feet just south of Church Road. In this area, the variation is located in the Town of Sherman (Fairfield County). The portion of the route that the variation would replace is located entirely in New Milford. Overall, Iroquois prefers the variation in this area because it minimizes impacts to wetlands, forested areas, and residences.

3.10.10 Kimberly-Clark Variation

This variation is proposed in order to align the pipeline route farther upgradient from the Kimberly-Clark Landfill in the Town of New Milford and to provide a better crossing of Pine Knob and the Candlewood Trail. The proposed variation would diverge from the proposed route at about milepost 291.8 and traverse south (skirting the Pine Knob ridge to the west) and then due east across Pine Knob. The variation would reconnect to the original proposed route at about milepost 292.45.

The variation is approximately 0.75 miles long, compared to the 0.65 miles of the proposed route that it would replace. Both routes are aligned exclusively through forested areas. However, the variation traverses more areas of deciduous forest, whereas the proposed route crosses more mature coniferous forested areas. Both routes also traverse the Candlewood (Blue Dot) Trail, a hiking path that is part of the Connecticut Forests and Parks Association network. The variation crosses this trail in an area of deciduous forest. The proposed route traverses the same trail in the vicinity of a hemlock forest.

The variation has been specifically aligned to avoid upgradient monitoring wells that have been installed by Kimberly-Clark on the west (upgradient) side of the landfill. The proposed route traverses directly through several of these monitoring wells. It should be noted that Kimberly-Clark is in the process of obtaining a RCRA permit, which requires upgradient monitoring wells.

Iroquois prefers the variation in this area. The variation is aligned across a "saddle" in the ridge that is formed by the Candlewood Mountain/Pine Knob, and thus will provide for a better crossing of the steep terrain in this area. The variation would also avoid potential conflicts with the Kimberly-Clark monitoring wells.

3.10.11 Brookfield Variations

In the Town of Brookfield, Iroquois proposes several minor route modifications. These route refinements have been identified based on consultations with landowners, on field reconnaissance of the right-of-way (performed in conjunction with town inland wetlands commission representatives and others), and on responses to comments raised at various public forums, including the FERC DEIS hearings and various public meetings and hearings held in the Town of Brookfield. The minor route modifications that Iroquois proposes or is investigating are listed below:

1. Milepost 299.4 to 299.9. Clarification of alignment adjacent to the electric transmission lines, away from the Still River gorge area.

2. Milepost 301.75 to 302.8. Potential route refinement to align the pipeline adjacent to the existing railroad right-of-way, and to avoid wetlands located adjacent to Oak Grove Road, as well as a tree farm (in the middle of which is a red maple wetland) in the same area. Part of this alignment would also be on the west side of the existing railroad tracks, within an abandoned (and overgrown) railroad grade. Such an alignment would minimize the distance traversed through wetlands, since the proposed route on the east side of the existing railroad right-of-way will traverse linearly through an area of hydric soils (which are the basis on which local Connecticut governments identify wetlands and which could also qualify as federal wetlands based on the use of the Uniform Federal Delineation Procedures). Iroquois is continuing to evaluate this variation, and believes that the variation may have merit.

3. Milepost 303.55 to 303.8. This variation is proposed to align the pipeline route along property boundaries within an undeveloped section of a light industrial park. There is no material difference in the land uses (disturbed) that would be traversed by the variation and the proposed route in this area.

3.10.12 New York Department of Agriculture and Markets (NYSDAM): Deflection No. 10

Representatives of NYSDAM have recently indicated to Iroquois that the pipeline route in the vicinity of mileposts 167.5 to 171.4 does not accurately reflect the incorporation of a NYSDAM reroute (referred to as "Deflection No. 10") to which Iroquois stipulated in the PSC Article VII process. It is Iroquois' understanding that this NYSDAM deflection will be submitted by NYSDAM (through the New York State Task Force) in comments concerning the DEIS. Iroquois has conducted field reconnaissance of NYSDAM Deflection No. 10 and supports its adoption.

Table 3.10.9-1
Environmental Comparison of Proposed Stillson Hill Variation and the Original Proposed Route

Environmental Feature	Length Crossed (feet) Original Route (b)	Stillson Hill Variation (c)
Total Length	7600	8400
Vegetation Type		
Agricultural Pasture	1300	3700
Forest	5200	4200
Forested Wetland	0	400
Emergent Wetland (a)	1100	100
Wetlands Crossed		
Total Number	1	3
Total Length	1100	500
Streams Crossed		
Perennial	1	1

a) Based on the presence of hydric soils.

Source: Phenix Environmental, Inc. 1990.

6.1.18 ROW Alignment Variation

The right-of-way (ROW) Alignment Variation was proposed by FERC to align the pipeline parallel and adjacent to an existing powerline right-of-way between mileposts 255.3 and 255.8.

As FERC notes in the DEIS, both routes cross the same amount of wetland, but the variation would affect more forestland. However, Iroquois has concerns regarding construction constraints along the variation. Iroquois construction personnel evaluated this alignment option in detail, including the performance of field reconnaissance where access permission could be obtained. As a result of this evaluation, the following concerns were identified. The variation encounters rugged rocky terrain that would pose severe constraints for construction, including potential safety to construction workers, as would increase environmental impacts (stemming from the need for a wider than normal right-of-way in order to install the pipeline through rugged, side slope areas). For example, adjacent ot the transmission line right-of-way, the Iroquois route would encounter a side slope adjacent to a transmission tower at milepost 255.4. In the vicinity of milepost 255.7, the pipeline route encounters large rock outcrops that would require extensive blasting. A house located near the proposed Iroquois' route (at about milepost 255.8) would not be significantly affected. As a result, Iroquois prefers the original proposed route in this area.

6.1.19 Silver Lake Wetland Variation

This variation is actually a continuation of the alignment described in Section 6.1.18. Iroquois also has conducted a field reconnaissance of this variation and the proposed route. The results of this field review indicate that the pipeline can be aligned along the west side of the existing transmission line easement. Such an alignment would avoid both a side slope (located next to a transmission tower at milepost 256.07 on the east side of the transmission line easement) and the majority of a wetland (which is located beneath and east of the powerline at approximately milepost 256.16). Figure 6.1.19-1 (attached) shows Iroquois' preferred alignment in this area.

6.1.29 Fairfield County Subdivision Variations

Iroquois' comments regarding these subdivision variations are presented under C3-3.

6.1.31 Conrail Variation

Since the fall of 1989, Iroquois has conducted further evaluations of the Conrail Variation. As part of these analyses, Iroquois representatives conducted, on several occasions, field reconnaissance (walkovers) of potential alignments along the rail corridor, consulted with the Town of Monroe and the City of Shelton, and met with representatives os the Consolidated Rail Corporation (Conrail). While the use of this variation has merit for environmental reasons, to date Iroquois has been unable to overcome the significant engineering, legal, and safety constraints associated with such an alignment. These constraints stem from the required adherence of all construction activities to Conrail's detailed specifications which -- when

applied in the context of the limited work room adjacent ot the railroad tracks in this area -- make the installation of the pipeline impossible.

Unless these specifications can be waived and an agreement can be reached with Conrail, and engineering concerns can be addressed regarding the stability of the Conrail track bed and the safety of pipeline alignment within or adjacent to such a track bed, Iroquois must support the FERC's recommendation to reject the Conrail Variation.

In addition to the reasons given by the FERC in the DEIS for the rejection of this alignment, Iroquois offers the following additional data. These data were obtained as a result of a meeting held on December 12, 1989 with Conrail representatives. The meeting included a field reconnaissance of the railroad right-of-way that would have to be utilized if the Conrail Variation were adopted.

a.) **Train traffic disruption.** Conrail has committed significant financial resources to repair the rail bridge over the Housatonic River and, as a result, has recently increased the tonnage over the rail line. The portion of the rail line that would be affected by the Conrail Variation is part of the rail link between New Haven and Danbury. The railroad currently has two through trains daily, as well as "locals". Traffic is expected to increase in the future, and Conrail has no plans to abandon the line.

b.) **Easement acquisition and maintenance.** All other construction and engineering considerations aside, Iroquois' easement in the Conrail property would always be subordinate to any other easement for railroad use. For example, the Connecticut rail transportation authorities could ask for an easement for a second set of tracks from Conrail at any time. If Connecticut made this request, the Iroquois pipeline would have to be moved. The same would be true if Conrail elected to install a second set of tracks in response to increased freight traffic.

The movement of the pipeline onto a new right-of-way adjacent to the tracks is simply not feasible not only in terms of cost, but also in terms of environmental impacts and construction constraints. This is because in many places along the existing Conrail tracks, there is simply no room due to the presence of rock bluffs on one side and steep slopes down to the Housatonic River on the other. As a result, the creation of such a right-of-way would involve significant impacts that could not be mitigated, such as the removal of the rock bluffs that about the tracks [resulting in potential impairment of the stability of the homes that are located upslope from the rail line (i.e., along Route 110)]. Basically, if a second track were installed, there would be no room in which to locate the pipeline along an estimated 30% of the Conrail alignment.

c.) **Construction constraints.** There would be problems associated with installing the pipeline next to the active rail line because Conrail would not allow a work train. The placement of a gravel pad over the tracks, or any other option that would

involve a disruption of service, also were not acceptable to Conrail. This is important in this particular section of track because there are no sidings that could be used to "clear up" the line (i.e., allow trains to pass while Iroquois construction was ongoing).

Conrail was also particularly concerned about the potential effects of pipeline construction activities on the track bed, which has been stabilized and ballasted. This was a specific concern in areas where the track bed is elevated and the construction of the pipeline in close proximity could threaten the integrity of the track bed. Disturbances to the track bed could not be repaired by pipeline crews since any work on rail track areas must be performed by the rail unions. This would be extremely costly for Conrail (and thus for Iroquois).

d.) **Other.** Conrail also raised various other concerns, to which there are no immediate solutions. These include restrictions on blasting, the installation of sheet piling, ditch spoil removal and disposal, and importation of backfill.

In addition to the constraints posed by adherence to the Conrail specifications, the alignment of the pipeline across various watercourses (e.g., Boys Halfway River) -- which the railroad spans on an elevated, ballasted track bed -- would cause significant impact. To install the pipeline across such watercourses, the route would have to deviate from the railroad. Since there is little room to select an appropriate stream crossing location, the pipeline would have to cross these watercourses in areas that are characterized by relatively steep slopes, box culverts, and rock. As a result, substantial impacts could occur in terms of land disturbance (required for staging) and overall construction time.

Correspondence between Iroquois and Conrail is attached.

6.1.32 Blakeman Variation

Iroquois concurs with FERC's recommendation regarding the adoption of this variation. Pursuant to FERC's request (page 6-14), Figure 6.1.32-1 depicts the alignment of the pipeline in relation to the proposed Summerfield Farm/Manor subdivision and the proposed Superblock highway.

6.1.33 Carroll Variation

Iroquois takes exception to the FERC's rejection of the Carroll Variation. The objective of this minor route modification (milepost 330.4 to 330.8) was to increase the separation between existing residences and the proposed pipeline route, and to minimize conflicts with planned residences (i.e., Pin Oak Subdivision). Iroquois' analyses indicate that these objectives can be achieved while minimizing environmental effects.

Specifically, both the variation and the original preferred route would cross the same amount of wetlands (50 feet of federally designated forested wetlands and 250 feet of wetlands as delineated by the town based on soil type); these wetlands are linear in nature and could not be avoided without a substantial alignment modification and significant impacts to existing residential neighborhoods. Moreover, a review of aerial photography of the area indicates that approximately the same amount of forested area would be disturbed along either route, if it is assumed that the pipeline construction would require work space outside of the existing electric transmission corridor. However, more residential properties would be closer to the pipeline route along the original alignment than along the variation.

Iroquois has evaluated FERC's recommendation to utilize the existing electric transmission corridor in this area, and has consulted with CL&P, the owner of these facilities, regarding this issue. The CL&P right-of-way in this area is 250 feet wide and includes three transmission lines, none of which has a voltage higher than 345 kV. Iroquois' analyses indicate that there may be sufficient space within this easement to install the pipeline along the southern boundary; Iroquois has inititated discussions with CL&P regarding this matter.

Since the submission of this proposed route modification to the FERC in July 1989, Iroquois has continued to consult with local landowners and the developers of the Pin Oak Subdivision. Iroquois has reached a verbal agreement with these property owners regarding an alignment across the subdivision and along the southern boundary of the electric transmission right-of-way. Iroquois proposes to install its pipe 10 feet within this right-of-way, pending agreement with CL&P.

In sum, because the environmental effects that would occur if the pipeline were installed along either route are similar, and Iroquois agrees to utilize the existing transmission corridor to the extent practical (i.e., except as otherwise constrained by the presence of rock outcrops and conflicts with the three electric transmission lines that already occupy the easement), then the concerns of local landowners should take precedence and the Carroll Variation should be adopted.

6.1.34 Milford Variation

In the discussion of the Milford Variation, the wetland acreage affected along the variation and the proposed route appear to have been transposed. Iroquois analyses indicate that the original route would cross almost twice as much federally designated wetland as the variation. Moreover, the purpose of the variation is specifically to avoid an alignment through the Beaver Brook wetland.

6.1.35 Variations developed as Wetland Mitigation

Subsequent to the submittal to FERC of route variations proposed to minimize crossing wetland areas, which were evaluated in the DEIS and recommended by FERC. Iroquois has made minor refinements to two wetland variations to further minimize wetland impacts. These wetland variations include the Lisbon Wetland Variation (MP 8.1-9.5), and the Justintown Road Wetland Variation (MP 25.3-25.7). A comparison of the revised wetland variations with

APPENDIX B.3

ALTERNATIVE ALIGNMENTS EVALUATED AS DIRECTED BY THE FERC OR THE CORPS OF ENGINEERS

MARCH - APRIL 1990

3.3.2 In Stream Housatonic River Variation

Comments:

Several DEIS comments noted that an alignment down the Housatonic River (which is taken to include Lakes Lillinonah and Zoar) should be seriously considered. (TBCT, CT, CMCT)

Response:

The installation of the pipeline down the Housatonic River (the northern portion of which is listed on the National Rivers Inventory List of potential wild, scenic, and recreational rivers, and all of which is a major recreational resource and important habitat for a variety of terrestrial and fisheries resources) would pose insurmountable environmental and engineering constraints. First, in order to install the pipeline linearly within the river, significant construction issues would have to be overcome. Most of the river is not navigable to large vessels, and the laybarge -- while laying pipe -- is physically not capable of manuevering

around the bends in the river. As a result, the pipeline could not be installed using the conventional flotation equipment that would be used to cross a river perpendicularly or to install the marine pipeline. Instead, various locations along the river banks would have to be cleared for staging areas for the pipe, and man-made "islands" from which the construction equipment would have to work would have to be created in the river. This would create significant impacts to both the aquatic and terrestrial environments. The various dams (e.g., Stevenson Dam, Shelton Dam) pose additional construction constraints. Because the pipeline could not be installed beneath these facilities, an overland route would have to be designed around such areas. In order to install the pipeline around Stevenson Dam, for instance, the pipeline would have to exit from Lake Zoar and traverse steep, wooded slopes. A considerable amount of blasting would be required, and the pipeline right-of-way would have to be significantly wider than 100 feet. It is likely that the overland route would have to traverse the Town of Monroe's Webb Mountain Park (an undeveloped, wooded area adjacent to the west side of the river below Stevenson Dam). There are similar problems with an overland route around the Shelton Dam. However, in this densely developed area, various homes and businesses would have to be removed.

Second, even if the engineering constraints could be overcome (which is not possible from a feasibility viewpoint), from an environmental viewpoint, the installation of the pipeline linearly along the riverbed would cause significant impacts, both to the freshwater and tidally-influenced portions of the river. Such impacts would stem from problems with respect to the significant disturbance of sediments (in some areas likely containing PCBs or other contaminants), effects of dredging on aquatic resources (including the important seedbed oyster areas

south of Interstate 95 near the mouth of the river), direct disturbance to wintering bald eagle roosting habitat adjacent to Stevenson Dam, impacts to tidal wetlands (many of which support species listed by the federal or state governments as rare, threatened, or endangered), direct and indirect impacts associated with the loss of river-oriented recreational opportunities during construction, and long-term aesthetic impacts associated with the removal of woodland to create staging areas adjacent to the river

Lastly, it is extremely unlikely that the installation of the pipeline down the Housatonic River would ever receive agency certification (e.g., Corps of Engineers permit, coastal consistency certification approval). The fact that the NMFS and the Connecticut Department of Agriculture, Division of Aquaculture both commented to the FERC regarding the inadvisability of this option gives direct support to this opinion.

3.3.3 Sherman Variations

Comments:

Several comments were received that identify options (e.g., the use of existing powerlines, or alternatives to avoid the Naromi Land Trust's Wimisink Sanctuary) to the alignment of the pipeline in Sherman, Connecticut. (HVA, CT)

Response:

Iroquois provides the following information regarding its review of these proposed variations in Sherman.

Sherman 1 (HVA)

The Sherman 1 alternate would deviate from the proposed route at approximately milepost 287.6, just after the proposed route enters the Naromi Land Trust's Wimisink Sanctuary, traverse south around the southern end of the wetland complex along Wimisink Brook, and return north along Route 39 to the preferred route at approximately milepost 287.9. The alternate route would be approximately 1.1 miles long, or over three times longer than the portion of the proposed route it would replace (0.35 miles).

Iroquois rejects the Sherman 1 alternate for a number of reasons, as further described below. However, the primary reason for rejecting the alternate is that there are no critical environmental features along the proposed route that would necessitate a reroute, and for the most part, the environmental impacts of the alternate are substantially greater simply due to the fact that the alternate route is three times as long as the preferred route.

Specifically, the Sherman 1 alternate would traverse more areas identified as wetlands than the proposed route. Based on NWI maps, the alternate would traverse a minimum of 1500 feet of forested and emergent wetlands; for comparison, the proposed route would traverse approximately 400 feet across an emergent wet meadow. It is likely that additional wetland impacts would occur along the alternate since the alternate is aligned linearly along a forested drainage channel, and although this wetland was not included in the above total, if sufficient room was not available to avoid the wetland, significantly more wetland area would be temporarily affected.

In addition to wetlands identified on the NWI maps, the alternate would traverse significantly more hydric soils than the proposed route (2200 feet along the alternate versus 1400 feet along the proposed route). These areas of hydric soil would be regulated as inland wetlands under Connecticut state law.

The Sherman 1 alternate also would have greater impacts to residences, since the route would be located along Route 39 for a portion of its length, and there are a number of residences along Route 39 in this area. Although these homes could likely be avoided during construction, there would be greater inconvenience to these homeowners than would be necessary if the proposed route were selected.

In addition, the alternate route appears to traverse areas being developed for residential purposes (Smoke Ridge subdivision). Although it is likely this area could be avoided as well, it may require relocating the alternate route into wetlands to a greater extent.

Finally, although the alternate would traverse the Naromi Land Trust's Wimisink Sanctuary for a shorter distance, it would nonetheless traverse it for a portion of its length, thus selecting the alternate would not avoid the sanctuary entirely. In addition, Iroquois has met with representatives from the Naromi Land Trust (who, although opposed to the project agreed to a walkover reconnaissance of the route through the Sanctuary),and has developed an alignment through the Sanctuary that will minimize impacts to existing wetland resources. Mitigation plans to be developed in conjunction with FERC and the land trust should result in enhancement of portions of the wetland.

In summary, Iroquois rejects the Sherman 1 alternate because there is no overriding reason to adopt a reroute through this area. The proposed route is inherently less damaging to the environment, since environmental impacts of the alternate on wetlands and residential properties would be greater than those associated with the proposed route.

Sherman 2 (HVA)

The HVA has proposed an alternate route in the Town of Sherman, Connecticut, identified as Sherman 2, which would replace the proposed Iroquois route between approximately mileposts 286.6 and 287.9. The proposed alternate would be approximately 2.0 miles long, or 50% longer than the proposed route, which is 1.3 miles long. The alternate would leave the preferred route at milepost 286.6, just west of the New York/Connecticut state line, and follow Route 55 to the intersection with Route 39. At that point the alternate would follow Route 39 south to the intersection with the preferred route.

The Sherman 2 alternate is unacceptable for a number of reasons. The alternate would require a change in the location at which the pipeline would traverse the Appalachian Trail. The present location of the trail crossing was developed in consultation with the National Park Service over a three-year period, and the crossing was developed to minimize visual impacts to trail users. The present route will cross the trail through an opening in a hedgerow which borders an agricultural field, and Iroquois has committed to use specialized construction to confine the area of disturbance to the present

opening. As a result, there will be no long term visual impacts to trail users resulting from the present crossing.

If the Sherman 2 alternate were chosen, the route would cross the trail along Route 55 in a wooded section. Although the trail would already be crossing the highway, the pipeline route would necessitate widening the cleared area along highway corridor. The National Park Service reviewed this area with Iroquois in 1987 and indicated that such a crossing would not be preferable.

A major reason for rejecting the Sherman 2 alternate is that, as can be seen clearly on topographic maps of Route 55 in this area, the highway passes between areas of severe slopes and wetland areas, and there are numerous (approximately 20) houses or other structures immediately adjacent to the highway. Construction along this portion of Route 55 would be severely constrained by these factors. The steep slopes are too severe to allow construction on the side slopes, and in most cases, crossing to the opposite side of the highway from areas of steep slopes will encounter either houses or wetlands, and oftentimes both.

An analysis of potential wetland impacts along the alternate versus the preferred indicates that the alternate would have to traverse significantly more wetland areas than the proposed route. Based on National Wetland Inventory (NWI) maps, the proposed route would cross two wetlands for a total distance of approximately 400 feet; the alternate would traverse approximately six wetland areas for a total distance of 2150 feet. Based on the presence of hydric and floodplain soils, the alternate would cross approximately 4,400 feet of wetland soils (as regulated in Connecticut), whereas the proposed route would traverse

only approximately 1800 feet. The greater incidence of wetlands traversed along the alternate is due to the fact that severe side slopes and houses must be avoided, leaving only wetland areas to be traversed along much of the route. Construction along the Serman 2 alternate also would necessitate an alignment along Route 55 within several hundred feet of a Cooper's Hawk sighting in 1989.

Finally, the Sherman 2 alternate would not avoid the Naromi Land Trust's Wimisink Brook property, and would in fact traverse the property for a greater distance; approximately 2700 feet along the Sherman 2 alternate as compared to approximately 1900 feet along the preferred route.

In summary, Iroquois rejects the Sherman 2 alternate primarily because the proposed route is environmentally acceptable, and the potential impacts associated with the Sherman 2 alternate would be greater. These would include greater impacts to wetlands and residences, traffic disruption, and the greater length of the Naromi Land Trust's Wimisink Brook Sanctuary traversed along the alternate. Although Iroquois recognizes that these impacts could be mitigated, there is no justification for not constructing along the proposed route, which would minimize both potential environmental impacts and the length of the pipeline route.

3.3.4 New Milford Variations

Iroquois has thoroughly investigated routing options in New Milord and has proposed variations in response to landowner and town concerns. The variations proposed by Iroquois were submitted as part of its comments on the

DEIS (see Iroquois Comment C-10, the Stilson Hill Road Variation, Kimberly-Clark Variation, and map correction in the vicinity of the Waste Management landfill). In addition, Iroquois has continued to contact each landowner along the proposed pipeline route in New Milford (as well as in all other affected municipalities) to request permission to conduct environmental and engineering surveys. The results of these surveys will serve to identify site-specific environmental factors; in addition, Iroquois' right-of-way agents will discuss property-specific concerns with individual landowners (e.g., the location of septic and reserve septic beds, wells, springs). Iroquois will use the results of the surveys to refine the pipeline alignment as necessary. Any such alignment refinements will be submitted to the FERC.

While Iroquois believes that its route (incorporating the variations that it has submitted as part of its DEIS comments) is sound, investigations have been conducted of the alignment variations described above. Iroquois will submit summaries of the results of these investigations within the next two weeks.

3.3.5 Candlewood Lake Variation (Brookfield)

Comments:

The pipeline should be aligned down the center of Candlewood Lake. (TBCT)

Response:

Iroquois has the same basic concerns with respect to an alignment down the center of Candlewood Lake as described for the proposal to place the pipeline

within the bed of the Housatonic River (see Section 3.5.2, above) -- that is, the alternative is not viable from either an engineering or an environmental perspective. In addition to significant engineering constraints, an alignment within the lake bed would create significant recreational and aesthetic impacts. In order to exit and enter the lake, the pipeline right-of-way would necessarily have to be aligned on steep wooded slopes leading into the lake. This would result in long-term visual impacts, particularly since the lake is among the most heavily-utilized recreational lakes in the state. Since the shores of Candlewood Lake are ringed by residential development, it also is likely that homes would have to be removed in order to install the pipeline. Extensive blasting could be required to prepare a smooth bottom on the lake bed to ensure that no spans would endanger the pipe. Finally, even if all other obstacles to installation in the lake bed could be overcome, this alternative would require that the pipeline exit the lake at its southern end. This portion of the Town of Brookfield and the City of Danbury is densely developed, and a pipeline could not be installed here without the removal of a number of structures.

3.3.6 Route 7 to Conrail Variation

Comments:

Align the pipeline down the Route 7 corridor, to the Conrail right-of-way. (TBCT)

Response:

The same primary concerns as described for the New Milford Route 7 Variation (see Section 3.5.4, above) also apply to this proposed variation. In particular,

the alignment of the pipeline within the Route 7 right-of-way would not be feasible because of the disruption to traffic flow on the highway, the direct and indirect impacts to the numerous existing businesses located adjacent to Route 7, and concerns about the long-term safety of the pipeline within a highly developed area. The pipeline could not be installed within the highway right-of-way due to safety considerations and work space limitations. As a result, the pipeline would have to be placed adjacent to the highway; this would have significant adverse effects on the commercial, industrial, and residential uses the border the road. In addition, since it is likely that a portion of the highway would have to be closed during construction activities, significant problems associated with traffic congestion and access would occur.

The use of the Conrail right-of-way from Route 7 to the east also poses construction constraints. These center primarily on the fact that the pipeline could not be laid within the railroad trackbed due to concerns relating to the stability of the pipeline within the false fill (which comprises the trackbed) and the maintenance of the integrity of the rail line. The pipeline could not be installed outside of the railroad easement due to wetlands, physical bottlenecks consisting of steep rock slopes, new residential subdivision developments, and existing industrial and commercial complexes.

Iroquois notes that its original (1986) route did parallel a portion of the Route 7 corridor, south of Silvermine Road in the Town of Brookfield, as well as a portion of the Conrail right-of-way. This alignment, which would have placed the pipeline adjacent to the eastern border of highway property, was opposed by the Town because of the presence of a linear town park along the Still River, the aesthetic effects associated with the removal of pine tree screens along the

highway, and the proximity to municipal and commercial/industrial buildings adjacent to Route 7. The alignment of the pipeline adjacent to the railroad easement has been precluded by new subdivision developments.

Iroquois' current route parallels Route 7 for a distance of about 2650 feet near Commerce Road. This alignment , which during construction will entail the use of the asphalt parking lots of several commercial/industrial buildings, will place the pipe between the edge of the asphalt parking lots and the highway right-of-way. None of the screening vegetation along Route 7 will be removed.

3.3.7 Newtown Subdivision Variations

Comment:

The pipeline should be aligned so as to avoid impacts to existing homes, rather than to avoid future impacts to as yet undeveloped residential lots located in the Old Farm Hill, Feather Meadow, and Forest Hill Subdivisions. In addition, the pipeline route should be placed farther into the Paugussett State Forest, away from the existing residential development in the Osborne Hill area. (TNCT, various Newtown residents).

Response:

The subdivision variations in the Town of Newtown (i.e., the alignment options identified in the DEIS as the Old Farm Hill Variation, Newtown Variation, and

Forest View Variation) were identified by Iroquois in response to a FERC request regarding consultations with subdivision developers in order to minimize potential impacts to future residential areas. The general intent of this request also is reflected in the DEIS, Section 7.3, Recommended Measure No. 37.

Before discussing each of these variations, Iroquois notes that in the DEIS, the FERC rejected all of the subdivision variations, pending the receipt of more detailed information. Iroquois provided such information in its comments on the DEIS (see Iroquois DEIS Comment C3-6); in these comments, Iroquois reiterated its preference for an alignment along the subdivision variations, noting at the same time that, if required, either the variations or the original proposed route could be built in an environmentally compatible manner. Iroquois is confident that an alignment through the areas in which subdivisions are proposed can be found that minimizes impacts to existing residentes and to future building lots. Since none of the routes involve significant environmental resources (e.g., there are no major river crossings or streams involved in any of the alignments), it is Iroquois' position that the route in these areas can generally be refined as required by minor alignment modifications.

The following describes Iroquois' position with respect to each of the subdivision variations.

Old Farm Hill. The variation proposed by Iroquois would have a potentially significant effect on two existing residences on Hanover Road. As currently planned, the Iroquois route would affect one of these through an alignment close to a garage and potential impacts to a dug spring. The pipeline would

also create a visual impact to this same residence, as well as to a second home located within a wooded area across the street. Iroquois will continue to investigate minor alignment modifications to minimize the impact to these properties, while at the same time continuing to avoid or minimize impacts to wetlands. Except for the impacts to these existing structures, Iroquois contends that the variation is superior to the original route, which also would be close to several existing residences. The variation avoids wetlands to the extent practical, and minimizes impacts to those wetlands that must be crossed.

Newtown Subdivision. Within this area, the Iroquois route is aligned close to several existing homes in subdivisions along Fox Hollow and Cobblers Mill roads. Recent field reconnaissance has indicated that this alignment would place the pipeline within wetlands, the boundaries of which were incorrectly depicted on available published maps. As a result, Iroquois has refined the route in this area in order to minimize wetlands crossings; this will result in an alignment farther away from the existing homes (within whose backyards the wetlands are located). A larger portion of the proposed subdivisions in this area will be traversed.

Forest View/Paugussett State Forest. The prefered Iroquois route in this area is aligned within and along the border of the Paugussett State Forest. However, both existing and proposed (i.e., Forest View) residential subdivisions are located just outside of the State Forest. Town representatives and local residents have requested that the pipeline route be moved farther into the forest in order to avert potential concerns associated with the use of the pipeline right-of-way by hunters and other users of the state lands. The Town of Newtown is pursuing such an alignment with the State of Connecticut, Department of

Environmental Protection. At the town's request, Iroquois has identified an alignment within the state forest along which the pipeline could be built (avoiding most wetlands, steep slopes, etc). This potential alignment variation was identified based on the review of topographic maps, aerial photography, the management plans for the State Forest, and field reconnaissance (walk-overs) of the portions of the alignment to which access permission could be obtained (including the public lands within the State Forest).

Iroquois has presented the resultant alignment alternative to the Town (at the Town's request), and has agreed to attend, if requested by the Town, any meeting(s) between the town and the state regarding the route in this area. Copies of this route also have been submitted to the FERC.

Iroquois can install the pipeline in an environmentally-sound manner along any of the route alternatives in this area. The principal vegetation type along all of the alignment options is mixed (second or third growth) hardwood forest. In addition, all of the alignments would involve some crossings of areas that will qualify as wetlands pursuant to the Uniform Federal Procedures. These wetlands are generally located along small drainages. However, along any of the alignments, such wetlands crossings have been minimized to the extent practical.

3.3.8 Conrail Variation

Comments:

Various comments were submitted in support of the Conrail Variation. This variation would follow an existing railroad line in the Town of Monroe and the City of Shelton, Connecticut, and would thereby avoid a crossing of wetlands associated with Means Brook in the same two municipalities. (TNCT, CSCT, Shelton (Maguire), HVA, CT).

Response:

The Conrail Variation was first proposed in early 1989 by a Shelton citizen's group that opposes the alignment of the Iroquois route in the Means Brook area. The objective of the variation is to avoid the Means Brook area by aligning the pipeline along an existing Conrail easement that traverses along the west side of the Housatonic River. In this area, the railroad bed is elevated above the riverbank and, in some places, has been carved out of rock areas that slope steeply down to the river.

The rail line in this area consists of a single track; a second track has been removed. Conrail has recently invested considerable financial resources in repairing a rail bridge over the Housatonic River between Shelton and Derby, and currently operates four freight trains per day over the track, which connects New Haven and Danbury.

In an effort to fully investigate all potential alternatives to avoid the Means Brook area (which includes wooded wetlands and an aqueduct used by the Bridgeport Hydraulic Company (BHC)), Iroquois has consulted with municipal officials and citizens groups regarding the Conrail Variation, and has made every effort to determine under what conditions, if any, the pipeline could be

safely installed and operated along the Conrail Variation. Such consultations have occurred over a period of almost 12 months, and have entailed reconnaissance of the Conrail alignment with municipal representatives and with Conrail officials.

After an initial meeting with Conrail representatives in December 1989, Iroquois submitted comments regarding the Conrail Variation as part of its analyses of the FERC DEIS (see Iroquois Comment C6-1 (6.1.31)). In those comments, Iroquois expressed serious reservations about various unresolved safety and engineering constraints associated with the construction and operation of a high-pressure pipeline within or adjacent to the active railroad track bed in the extremely constrained environment along the Housatonic River. Chief among Iroquois' concerns were:

- The stability (during both construction and operation) of the trackbed and the false fill upon which portions of the track are located;

- The short-and long-term stability of the slopes adjacent to the trackbed and the Housatonic River and the potential impacts to such slopes from the extensive blasting that will be required in order to install the pipeline (destablilization of such slopes could, in turn, destabilize the pipeline, railroad tracks, and nearby roads);

- The compliance with Conrail specifications regarding pipeline construction and operation (the pipeline cannot be constructed unless Conrail could relax such specifications);

- Construction constraints posed by the Conrail specifications and by several "bottlenecks" along the railroad line that would pose virtually insurmountable obstacles for safe pipeline installation;

- Direct disruptions to the ballasted track bed and to the track as a result of construction;

- Potential impacts to BHC groundwater wells and recharge ponds located adjacent to the railroad tracks;

- Potential impacts to Indian Well State Park;

- Environmental impacts associated with the construction of the pipeline, especially in areas where the pipeline could not be installed adjacent to the rail easement and would have to deviate away from the track (e.g., where the track is elevated in box culverts above streams and rivers);

- Aesthetic impacts associated with views of large rock cuts, which will be visible to users of the river and from Highway 34/areas east of the river (e.g., Oxford, Seymour, Derby); and

- Socioeconomic impacts associated with the suspension of freight train operation over the track not only for the duration of the pipeline construction period, but also for the period during which Conrail will have to repair the damage to the track and track bed

caused by the pipeline installation activities.

In an effort to resolve these concerns and as a follow-up to its December 1989 meeting with Conrail, Iroquois consulted with Conrail representatives in March 1990. These consultations served only to intensify Iroquois' grave reservations about the use of the Conrail Variation, particularly with respect to engineering constraints, pipeline and train stability, and overall public safety. Appendix 3b includes an engineering and environmental report that specifically describes the Conrail Variation and the most significant constraints associated with it.

In sum, while appearing on the surface to have environmental merit because it would avoid a routing in the Means Brook area, the Conrail Variation cannot be built safely. Even if the significant safety issues could somehow be overcome, the installation of the pipeline along the Conrail Variation would result in significant and unacceptable engineering, environmental, and socioeconomic impacts.

3.3.9 Stratford Variations

Comments: The pipeline route in the Town of Stratford, Connecticut should be modified either to avoid the town entirely or to minimize impacts to the town by installing the pipeline within existing rights-of-way. To this end, the Town of Stratford and others submitted two basic types of route variations:

- Alternate 1, which would involve a crossing of the Housatonic River between the cities of Shelton and Milford, thereby avoiding Stratford entirely; and

- Alternate 2, which would involve several modifications to different portions of the approximately 3 miles of the pipeline route within the town. Specific route variations are suggested in order to minimize impacts to Cranberry Pond and to other wetlands areas.

Response:

The following specifically addresses the alternative routes suggested by the Town of Stratford and others. Before discussing these alternatives, however, Iroquois points to the following:

- The pipeline route as currently aligned traverses approximately 3.2 miles through Stratford; of this, about 60% are aligned parallel and adjacent to (and utilizing a portion of) an existing electric transmission right-of-way.

- The entire construction right-of-way through Stratford (except for the areas adjacent to the Merritt Parkway and Housatonic River crossings) will be 75 feet wide or less.

- The centerline of the pipeline as currently proposed will not be any closer than 50 feet to any residence.

- The sales meter station proposed for location adjacent to Chapel Street is expected to be on property owned by

Connecticut Light & Power (CL & P), adjacent to existing electric transmission lines.

- Iroquois has reached agreement with the owner of property south of Main Street (Putney), adjacent to the Housatonic River and Route 110, regarding the installation of the pipeline.

In addition, Iroquois notes that extensive efforts have been made to meet with Stratford officials and with the public, not only within the past several months (subsequent to the publication of the DEIS), but also over the past four years. In the past two-and-a-half months alone, Iroquois has voluntarily attended two public hearings held by the town concerning the project; met with representatives of the town Conservation Commission; and made a presentation at the town's public works committee session.

At the meeting with Conservation Commission members (which was held on the evening of February 1, 1990), the basic alternative routes that have now been submitted to FERC and to the Corps of Engineers were identified and Iroquois representatives committed to review them. A field review was conducted of the alternative generally identified as the First Alternate Route, and preliminary results were orally summarized for the town at a public hearing held on February 6, 1990.

Iroquois remains committed to continue to work with the town. However, based on current analyses of the alternatives presented by the town, Iroquois prefers the route as currently aligned through Stratford.

3.3.9.1 First Alternate Route

As part of the initial project planning process, in 1986, Iroquois investigated an alignment similar to the one proposed here by the Town of Stratford. This alignment, referred to as the Housatonic River Crossing Alternative, was included in Iroquois' 1986 Environmental Report (ER), see pages 2-125 and 2-127 (attached). Because the route that the Town proposes is a variation of this alternative, the following first discusses the Housatonic River Crossing Alternative and then describes Iroquois' position regarding the specific alignment suggested by Stratford.

Housatonic River Crossing Alternative

In 1986, the Housatonic River Crossing Alternative was investigated specifically as an option for avoiding an alignment through developed residential areas of Stratford. In identifying and analyzing this route, Iroquois, too, initially believed that an alignment along the east side of the Housatonic River in the City of Milford (i.e., generally adjacent to a railroad track) might have merit. However, closer examinations revealed construction constraints associated with the route. Chief among these were the potential impact on homes in the Long Hill area of Shelton, and potential impacts associated with the crossing of the Merritt Parkway and the alignment of the pipeline on a sideslope leading down to the Housatonic River. In addition, there is a significant habitat on the eastern side of the river which encompasses linear tidal wetlands and flats areas.

In conjunction with the Town of Stratford's request, Iroquois revisited the Housatonic River Crossing Alternative, conducting additional route inspections of the potential alignment in February and March 1990. The results of Iroquois' initial 1990 investigations of this alignment have identified some of the same concerns raised in 1986. These include:

- Areas of rock and steep slopes from Route 8 to Route 110. In the areas in which there are no residences, there exist extensive areas of rock and rock bluffs leading directly down to Route 110. In the areas of less severe terrain, residences have been built. Thus, while there may be some acceptable areas in which to cross Route 110, reaching these areas without significantly affecting developed areas or areas planned for development could be difficult.

- Along the east bank of the Housatonic River, the pipeline would have to be aligned generally adjacent to the railroad tracks. In certain areas, this alignment does not pose problems whereas in others it does. The alignment of the route beneath the Merritt Parkway could pose a problem. This is because there are steep slopes leading directly down to the river in this area. It is likely that a deviation would be required that would take the route close to a large commercial building within an office park.

- South of the Merritt Parkway, an alignment along the rail line would run into problems associated with side slopes (steep slopes leading down to the river from the railroad and then upslope from the tracks). In order to align the pipeline in this area, deviations from the rail line would likely be required, leading to potential conflicts with other uses (e.g., residential, commercial).

- As the route proceeds closer to the proposed pipeline crossing of the river (e.g., near Southern Connecticut Gas' LNG tank), additional constraints are encountered. These include active sand and gravel operations; inactive operations that have left large pits/areas of open water; the inactive Milford (McNeil) Landfill, which directly abuts the eastern boundary of the railroad tracks for some distance; and the inactive D'Addario landfill (which is located directly west of the railroad tracks). (The landfill could be a significant constraint; if the pipeline were to be placed between the landfill and the river, it is possible that contamination, if it exists, would be encountered in the trench).

On the other hand, most of the terrain along the eastern side of the river is favorable to pipeline construction. There appears to be little grade rock and except for the slopes directly along the Housatonic River and the railroad in the vicinity of the Merritt Parkway, the topography is generally characterized by little relief. The area as a whole is largely undeveloped consisting

predominantly of agricultural and forested areas with scattered residences and sand/gravel mining. The industrial uses are all concentrated along Oronoque Road in the southern part of the route. Except at the river crossing, few wetlands would appear (from initial review) to be encountered.

More detailed comparative analyses of this route variation and Iroquois' proposed route will be submitted separately.

Tennessee Gas Variation: First Alternate Route

The Town of Stratford initially asked Iroquois to evaluate an alignment directly adjacent to the existing Tennessee Gas pipeline that traverses through the northern portion of the town. The town's position was that an alignment adjacent to an existing gas pipeline -- where the property owners were already impacted -- would result in less impact than a new pipeline right-of-way.

However, the Tennessee pipeline was installed prior to the residential development that currently characterizes the northern portion of Stratford as well as the southern portion of the City of Shelton. Iroquois' review of this route confirmed that the existing Tennessee pipeline is located within the front, side, or back yards of an estimated 13 homes on Mustang Drive in Shelton. As a result, alignment of a second pipeline in the same area would have significant impacts on these residences. This is particularly true since the area between Routes 8 and 110 as a whole is characterized by extensive rock outcroppings; blasting would thus be required to install the pipeline. Iroquois' position is that any alignment that would place the center of the

pipeline within such close proximity to numerous homes (in this case, about 10 feet from the foundation of existing residences) is not viable.

The Town subsequently identified another route option, currently identified as the First Alternate Route. This option would involve a deviation from the Tennessee pipeline right-of-way in order to avoid an alignment along Mustang Drive. Instead, the pipeline would be aligned in back of the homes along Mustang Drive, crossing the residential streets of Blaho Drive and Falcon Lane. The entire alignment, including the crossing of the Housatonic River, would be north of the existing Tennessee pipeline, crossing the river about 700 feet north of this existing pipeline.

This alignment, too, however, would pass very close to a number of residences. Specifically, the pipeline would have to be aligned between houses located along Soundridge Road, Mustang Drive, Blaho Drive, and Falcon Lane. In addition, the route as depicted on the Town's map would involve crossing through or very near various buildings located along Route 110 (River Road).

The alternative would provide for a wider crossing of the Housatonic River than Iroquois' proposed route and, in the City of Milford, would have the same constraints that were noted for Iroquois' initially considered Housatonic River Crossing Alternative. (It is perhaps significant that the Town of Stratford makes no comment about the potential alignment of the pipeline once it crosses the Housatonic River.)

In addition, the alternative would traverse the river between Murphy's Boat Yard in the City of Shelton and a tidal wetland in the City of Milford. Construction across the tidal wetland would have to be included as part of the river crossing as a whole. Thus, the entire length of the river crossing in this area would be about 1270 feet (vs. 740 at Iroquois' proposed crossing). The staging area for the river crossing would have to be located on the Milford side of the river, in an upland area characterized by open fields and mature softwood/hardwoods.

The alignment of the pipeline across Murphy's Boat Yard and the tidal wetland could raise concerns regarding consistency with state coastal policies and plans. However, it should be noted that construction impacts to both the boat yard and the wetland would be short-term and construction could be timed to avoid recreational use conflicts with the boat yard.

3.3.9.2 Second Alternate Route

The Second Alternate Route proposed by the Town of Stratford involves a number of variations to portions of the Iroquois route. Iroquois offers the following comments on these variations, noting that these comments are based on Iroquois' review of aerial stereo photography, topographic maps, wetlands maps (including hydric soils, the basis on which Connecticut towns identify wetlands), and on-ground reconnaissance (largely from road crossings). Iroquois has not obtained permission to conduct right-of-way specific surveys of any of the town's proposed alternative routes, nor has it yet initiated detailed site-specific surveys of its own routes.

Section A-B.

In this area, Iroquois has aligned its proposed pipeline route in an upland area, specifically to avoid the Cranberry Pond. Iroquois has noted the town's concerns with respect to the pond/bog area, and will continue to work with the town with respect to those concerns. However, it should be noted that Iroquois' original route through Stratford did follow an alignment similar to that proposed by the town (see the 1986 ER). Such an alignment has since been largely precluded by new development. For example, at the intersection of Warner Hill Road and James Farm Road, the alignment depicted by the town would be extremely close to homes and could require the displacement of such structures.

Sections B-C and C-D.

Iroquois proposes to use a portion of the CL & P right-of-way in this area for temporary work room. However, in order to avoid an alignment of the pipeline in greater proximity to residences located along James Farm Road, Iroquois proposes to locate the pipeline on the west side of the powerlines. Such an alignment will cross more areas of hydric soils; however, the alternative in this specific case would be to align the pipeline on sideslope areas, closer to a number of homes. It should also be noted that the CL & P right-of-way in this area is only 110-feet wide. The right-of-way already includes two transmission lines, thus leaving little space within which the pipeline could be constructed without potentially affecting the integrity of the tower footings or damaging conductors.

Section D-E.

Iroquois has conducted a field reconnaissance of this section of the right-of-way (i.e., observation from existing roads). Iroquois notes that the reason for deviating from the CL & P right-of-way in this area in the first place was because there are four homes that have been built extremely close to the CL & P towers at the intersection of Peters Lane. The transmission lines span portions of the yards of the homes. As a result, an alignment adjacent to the transmission towers (there is not enough room between them) would require that the pipeline be placed within less than 50 feet from the foundations of these homes.

Section E-F.

Iroquois does propose to align the pipeline to the west of the CL & P facilities in this area. Iroquois has informed the town of this.

Section F-G.

Iroquois agrees with the town.

This 5.8-mile alternative was initially evaluated to provide an alternate crossing of the lower Housatonic River and an alternative route through some of the congested residential areas in the towns of Stratford and Milford. Specifically, the alternative would diverge from the proposed alignment near State Route 8 in the Town of Shelton and runs east-southeast for 1.5 miles before crossing the Housatonic River south of Wooster Island. After crossing the Housatonic River, the alternative would turn south and run parallel and adjacent to an existing railroad right-of-way. The alternative route would follow the railroad south for approximately 3.4 miles, crossing under the Wilbur Cross Parkway and rejoining the proposed alignment in the Town of Milford (see Figure 2-18).

This alternative is not feasible for several reasons. Development in the Long Hill Avenue area of Shelton is continuing and the pipeline could affect several of the homes in this area. In addition, because the approach to the Housatonic River is down a very steep rock hill, considerable blasting would be required and State Route 110 might have to be temporarily closed. The slope down the hill is so severe that a rock boring machine, which must ride on steel rails in a position no greater than 20° off level, could not be employed. There is no room to construct a by-pass lane; and due to heavy traffic along this highway, it is likely that it would have to be closed for several days while the pipe was installed.

In addition, the crossing beneath the Wilbur Cross Parkway is located at the highway bridge over the Housatonic River. The pipeline would have to be located along a steep side hill, and considerable rock blasting would be required.

1986 ER

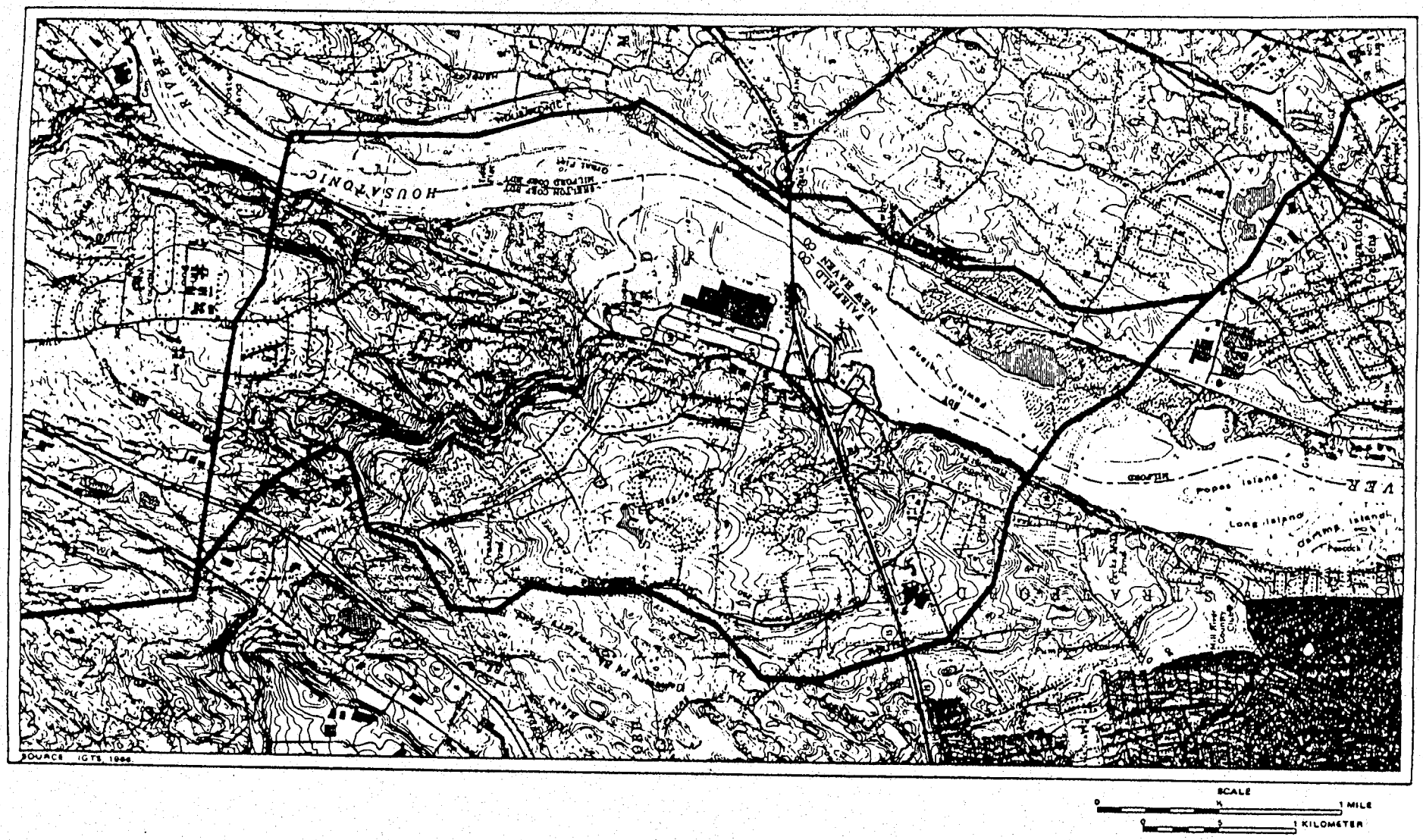


Figure 2–18 HOUSATONIC RIVER ALTERNATIVE

CONRAIL VARIATION - ENGINEERING STUDY

1.0 INTRODUCTION

The purpose of this study is to analyze in detail the engineering and environmental implications of the proposed Conrail Variation which, as discussed in the Federal Energy Regulatory Commission's (FERC's) Draft Environmental Impact Statement (DEIS), would replace the portion of the proposed route of the Iroquois Gas Transmission System (Iroquois) from M.P. 316.6 to M.P. 323.6 by aligning the pipeline largely adjacent to or within an easement of the Consolidated Rail Corporation (Conrail). This detailed study supplements the DEIS comments that Iroquois provided regarding the variation in February, 1990. The study responds to various public and agency comments submitted as part of the DEIS review process.

The DEIS identified various engineering and environmental constraints the construction and operation of the Iroquois pipeline along this variation would pose. These include:

a. Train traffic disruption, including the impact of suspending train operations on Conrail's track for a period of time to perform construction, and the problem of rebuilding/restoring the track after installation of the pipeline;

b. Easement aquisition and maintenance, including the implications of colocating a high-pressure pipeline and a railroad within the same easement;

c. Construction constraints, including the significant physical problems of situating a pipeline within or adjacent to the railroad track bed; and

d. Other concerns, including additional environmental and terrain impacts as a result of land disturbance associated with the installation of the pipeline.

In order to address the above issues in greater detail, this report identifies and evaluates, on a site-specific basis, the particular constraints posed by the Conrail Variation and the impacts that would be created by attempting to construct the Iroquois pipeline adjacent to or within the rail bed.

The report includes various exhibits in order to facilitate the discussion of issues. These are attached as follows:

- Exhibit 1 - Route map of Conrail Variation;
- Exhibit 2 - Detailed terrain description and engineering concerns along Conrail Variation;
- Exhibit 3 - Photographic log of the Conrail Variation; and
- Exhibit 4 - Cross section profiles at several locations along the Conrail Variation.

The results of these analyses support Iroquois' previous position with respect to this variation -- that is, while the variation appears surficially to have environmental merit (because it would avoid an alignment in the Means Brook area), the pipeline cannot safely be installed and operated along the Conrail easement, and installation of the pipeline along Conrail would not be without environmental impacts.

2.0 SUMMARY OF ENGINEERING/CONSTRUCTION/ENVIRONMENTAL ISSUES

The following lists the primary concerns posed by the Conrail Variation with respect to pipeline construction and operation. These concerns have been identified based on field reconnaissance of the variation.

Engineering/Construction Constraints

- Construction workspace restrictions.
- Stability of slopes/trackbed during blasting and pipe laying.
- Areas of impassable terrain (bottlenecks).
- Alignment across major railway bridges/box culverts over streams.
- Need to close rail line and work over or remove tracks; in some areas, closure or removal and subsequent reconstruction of nearby roads.
- Impacts to adjacent homes and buildings (stability).
- Inability to guarantee long-term pipeline stability (during operation).

Environmental Concerns

- Slope stability/erosion/lanslide potential.
- Impacts to off-railroad areas in which pipe would have to divert from track (e.g., Boys Halfway River).
- Hydrologic impacts in areas where pipeline would have to be laid linearly along streams or in wetlands next to the railroad.

- Potential impacts to wintering bald eagle roosting sites along the Housatonic River near Stevenson Dam.

- Potential water quality impacts to the Housatonic River and to Bridgeport Hydraulic Company wells and recharge ponds.

- Potential visual impacts to Indian Well State Park and to views of the Housatonic River area from the river itself and from Route 34.

- Potential socioeconomic impacts associated with closure of rail line and Indian Well State Park access road (Indian Well Road) and Birchbank Road (which extends north to homes located along the river).

2.1 Construction Workspace Restrictions

In order to evaluate the viability of this variation and the potential impacts of construction and operation of the pipeline along this route (if feasible), Iroquois first defined workspace requirements.

Usually a minimum workspace of about 75 feet wide would be needed to construct a high-pressure 24-inch-diameter pipeline. Figure 2-1 illustrates the typical workroom arrangment for the Iroquois project.

Assuming that any construction along Conrail would have to involve the costly removal and off-site storage of all materials blasted or graded from the adjacent steep hillside and excavated from the trench, it would be unnecessary to have space for material storage (zone 1) and for top soil storage (zone 6) along Conrail (refer to Figure 2-1). It also could be possible to reduce the work area (zone 2) by 5 feet, to 20 feet. This would require that a 50-foot-wide area be utilized to perform all the pipeline construction activities (see Figure 2-2). Alternatively, all blasted rock, grade rock, and spoil (sub-soil/ditch rock) material would be spread over the rail bed; after the completion of construction, the rail line would have to be reconstructed.

3.0 IMPACTS ON CONRAIL

3.1 Conrail's Specifications

Of prime importance when performing pipeline construction within a railway right-of-way (e.g., a perpendicular crossing of the railine) is adherence to the specifications of the railway system in order to ensure that the safety and integrity of the operation of the railway is not compromised. This is also the case here.

Conrail's specifications explicitly describe that pipelines laid parallel on railroad rights-of-way shall be located as far away from tracks and other important structures (i.e., bridges, culverts, signals) as possible. The specifications also require the pipeline to be fully cased if it is located within 25 feet of the centerline of the track or within 45 feet of the nearest point of any bridge, building, or important structure.

In December, 1989 and again in March, 1990, Iroquois discussed with Conrail personnel the possibility of altering the specifications for casing of the entire length of pipeline within the specified limits of the railway tracks. Iroquois suggested an alternative to casing by proposing to imbed the pipeline in concrete for the full length along the railbed. Conrail advised Iroquois that although imbedding the pipeline in concrete may reduce concerns of impact loading from the rail traffic (or train car, if one were to derail) on the pipeline, it would not act as a second enclosure which they feel ensures that gas from a pipeline leak would be dispersed from the rail line and not ignited by sparks from a passing train.

3.2 Casing the Pipeline

An asessment of the work room available along the Conrail Variation was confirmed with measurements in the field. Exhibit 4 provides cross-section profiles across the Conrail tracks at various locations along the route variation. A review of the work space required to install the pipeline in a trench revealed that virtually all of the 6.0 miles adjacent to the Conrail tracks would need to be cased to avoid major grading and terracing of all areas adjacent to the Conrail easement. Casing

the pipeline poses an impossible task alongside the Conrail tracks due to lack of workspace and the fact that only straight pipe can be pulled through a casing. The alignment of the pipeline alongside Conrail would have sidebends, sags, and overbends which therefore could not be installed within a casing pipe.

There are other major engineering/operational concerns of having a casing of such length, even if it could theoretically be installed. In particular, the probability of an electrical short (through contact) of the casing pipe to the carrier pipe would be very high and probably enevitable. This would negate the cathodic protection system which could result in a leak in the pipe through corrosion over time. This leak would be impossible to locate specifically within the 6.0-mile segment; as a result, this would require that the pipe be excavated, removed, and repaired. This would necesarily result in a major impact (shut down)to the rail traffic and rail bed integrity. Thus, the only conceivable means of installing a pipeline adjacent to Conrail is without a casing, which would be unacceptable to Conrail from a safety perspective. Attempting to install the pipe in a casing would be unacceptable to Iroquois from an engineering and reliability perspective due to the inability to pull the pipe through the casing and prevent leaks in a "shorted" casing.

3.3 Work Space - Blasting

Many of the areas along the Conrail Variation would require that the adjacent hillside be regraded by blasting to provide a level work area for pipeline construction activities. Since the blasting activities (i.e., drilling, loading with explosives, matting and the detonation of the blast) are incompatible with the safe operation of the railway, the railway would have to be closed for the duration of pipeline construction.

The stability of the railway bed and adjacent slopes also is of major concern to Conrail, and the risk of a resultant derailment is a major concern to Iroquois. Since blasting would be required to excavate the trench for the pipeline in many areas and to grade adjacent slopes to provide a level workspace, the stability of the railbed following the pipeline construction cannot be guaranteed (see Figure 3-1).

Exhibit 4 identifies the slopes that are encountered along the Conrail Variation. The cross section profiles included in this exhibit were developed based on on-site

studies conducted in March 1990. As these profiles show, many of the slopes directly adjacent to the railroad are well in excess of 30^{o} and, as a result of blasting activities and terracing, could become unstable. (It is noted by way of perspective that one cannot drive a car up a graveled roadway in excess of 12^{o}.)

In addition to these steep slopes, there are some very severe slopes adjacent to the Conrail Variation. The physical ability to safely perform blasting activities within these areas is not available with today's technology or equipment.

3.4 Tunnelling

Tunnelling of any portion of a pipeline route parallel to the Conrail tracks is not feasible because of concerns regarding the stability of the hillside. A tunnel could not safely be constructed along the slope of the hillside because it would undermine the base of the slope. In the event of any seismic activity in the area, , or because of the normal vibrations from train traffic, any tunnel alternative would have to be designed to withstand the seismic forces, thereby requiring the pipe to be positioned well into the hillside so as not to compromise the stability of the area.

3.5 Overall Pipeline Stability

Both Conrail and Iroquois are particularly concerned about areas in which the railroad tracks have been laid on false fill. This is because along certain portions of the Conrail Variation, the pipeline would have to be laid within the ballasted area of the track bed. Excavation of the embankments, which have been stabilized over a great many years of rail line operation, would be required. This would threaten the stability of the slopes and pose a severe safety hazard, which could result in landslides capable of causing a train derailment into the Housatonic River. Such a landslide could also cause the pipeline to rupture.

3.6 Conflicts with Maintenance and Pipeline Safety

Maintenance of the pipeline in the vicinity of the Conrail tracks would pose an obstruction to rail traffic. This is because any major maintenance work on thepipeline would necessarily involve the closure of the rail line for the duration of the maintenance activities.

Similarly, maintenance activities normally performed by Conrail (e.g., re-ballasting of the track bed, slope stabilization) could affect the integrity of the pipeline. Any interference with the cathodic protection system could pose additional risk to the integrity of the pipeline.

4.0 AREAS OF IMPASSABLE TERRAIN

There are four specific areas along the Conrail Variation within which it would be impossible to perform pipeline construction activities without major impacts to the environment or significant and unacceptable levels of risk to the safety of the workers performing the construction. A detailed description of each of these follows.

4.1 M.P. 1.73 (see Cross Section - Exhibit 4)

The area is located on a steep hillside adjacent to the Housatonic River. The Conrail bed is positioned high on the hillside, above the access roadway that leads into the Stevenson Dam and power plant.

The rail bed is approximately 36.5 feet wide between the uphill and downhill slopes. The uphill gradient is approximately 56^{o} and the downhill gradient is about 37^{o}. Thus, the rail line is literally perched on the side of a steep slope and the pipeline would necessarily have to be placed above the railroad in order to prevent undermining the track bed.

Blasting activites would have to be perched on the uphill slope to cut a terrace into the hillside to permit pipe installation. In order to locate the pipeline over 25 feet away from the tracks, approximately an additional 30 feet would have to be graded, resulting in a cut face about 45 feet high and which could be unstable. Performing and controlling blasting on this degree of slope would be difficult to accomplish safely.

4.2 M.P. 4.64 (see Cross Section - Exhibit 4)

This area is immediately adjacent to the Housatonic River and Indian Well State Park. The Conrail bed is actually on filled material at the river's edge. The existing width of the railroad bed is only 28 feet wide to the base of a 46^{o} uphill slope. The uphill slope also supports the Indian Well State Park roadway, which is about 25 feet from the base of slope.

In order to place the pipeline 25 feet from the tracks, an additional 22-foot-wide area would have to be graded. This would leave a cut face 22 feet high at the edge of the roadway. It would be necessary to rebuild the roadway and support it with a massive retaining wall. Because the hillside in this area is unstable, such a structure would not necessarily be safe.

4.3 M.P. 5.0 (See photographs 21 & 22 - Exhibit 3 and Cross Section MP 4.9 - Exhibit 4)

The area is immediately adjacent to the Housatonic River. A concrete railway bridge supports the tracks over a hillside stream. The Indian Well State Park road is about 25 feet from the edge of the rail track.

Installation of the pipeline over 45 feet away from the rail bridge would require removing the road and cutting a deep trench to pass under the hillside stream. Additional uphill grading would have to be performed to ensure adequate clearance from the rail bridge and the stability of the hill after construction.

This obstacle would require that the pipeline be bent away from the bridge structure and traverse the rugged terrain under the roadway. A massive amount of regrading of the uphill slope would be required. Even then, the extent of pipe bending would require the use of throughput restricting factory bends.

4.4 M.P. 5.69 (See Cross Section Exhibit 4)

This area also is immediately adjacent to the Housatonic River. The railbed is adjacent to a steep (85^{o}) slope that supports the park roadway.

In order to install the pipeline 25 feet away from the tracks, an additional 15 feet would have to be graded out of the slope. This would result in a theoretical cut face about 100 feet high between the railroad and the road above. This could not be achieved without undermining the roadway entirely, and it is doubtful whether it could be achieved at all.

5.0 ENVIRONMENTAL ISSUES

This section briefly describes the major environmental issues associated with construction of the Conrail Variation and the portion of the proposed route it would replace.

The primary environmental consequences associated with construction of the Conrail Variation would result from the need to cut and fill the extremely steep side slopes along the Conrail route (as described in previous sections) to provide a suitable location for pipeline construction. Creation of a level work area would necessitate extensive blasting to create cuts into the side slopes up to 100 feet high, and the resultant cleared right-of-way would be considerably greater than the typical 75- to 100-foot area required in areas of more gentle topography.

The severe cuts into the rock face would present difficulties in restoring and stabilizing the right-of-way, and although revegetation could be accomplished, there would be relatively long-term visual impacts of the large cleared cut and fill areas along the south bank of the Housatonic River; an area which is readily visible from Highway 34.

The proposed route traverses the Means Brook watershed, and avoidance of impacts to wetlands in the Means Brook area is one of the major benefits offered by supporters of the Conrail Variation. It has also been stated that because the Conrail Variation would be constructed along the railroad, there would be no impacts to wetland resources. However, it should be noted that the Conrail Variation would traverse nearly as many feet of wetlands identified by the National Wetlands Inventory (NWI) as the proposed route (3200 feet for the Conrail Variation and 3740 feet for the proposed route). In addition, the Conrail Variation would traverse approximately 5750 feet of hydric or floodplain soils, which are designated as wetlands in Connecticut. For comparison, the proposed route would traverse approximately 9150 feet of hydric soils. It should also be noted that the route of the Conrail Variation is severely restricted, and the ability to avoid impacts to wetlands is limited. Along the proposed route, however, the wetland areas identified above from either NWI maps or soil maps may be avoided to some extent by minor route

variations. These minor variations will be identified during the ecological surveys designed to delineate wetlands in the field.

Both routes would be within approximately 1.5 miles of a number of significant habitats or unique natural features, and both routes would traverse one feature. The proposed route would pass within 1.5 miles of five features, and would be located very close to the Boys Halfway River Cave (also known as Devil's Den). Although the proposed route as shown on the FERC DEIS maps indicates that Iroquois would traverse the caves, the caves occupy a relatively small area, and the proposed route can and will be modified slightly to avoid impacting the caves once access to the property can be obtained and the specific location of the caves in relation to the pipeline route can be determined.

The Conrail Variation traverses within 1.5 miles of six features, and would traverse a significant area for wintering bald eagles near the Stevenson Dam. Because the possibility for routing variations is limited along the Conrail Variation, the alternate route could not avoid traversing the wintering area. Although the route could be constructed during a time of year that would not directly conflict with wintering eagles, a substantial number of large trees along the railroad, and thus along the Housatonic River, would have to be removed, potentially impacting the roosting areas for the wintering eagles.

The proposed route traverses the Pomperaug Blue Dot trail, which traverses along the Boys Halfway River to and past the caves. The Conrail Variation also would traverse this trail. In order to avoid the large concrete culvert that conveys the Boys Halfway River beneath Conrail, the pipeline route in this area would likely have to deviate to the west of Cottage Street and thus would cross the trail in an area characterized by large hemlocks and mature hardwood vegetation. The Conrail variation also traverses two other recreational areas; Indian Well State Park and Webb Mountain Park (owned by the Town of Monroe).

In addition, the alignment of the pipeline along the Conrail Variation will result in long-term aesthetic impacts in the Housatonic River Valley. Iroquois' proposed route will also result in aesthetic impacts associated with the installation of the pipeline in wooded areas.

EXHIBIT 1

TOPOGRAPHIC ROUTE MAP

CONRAIL VARIATION

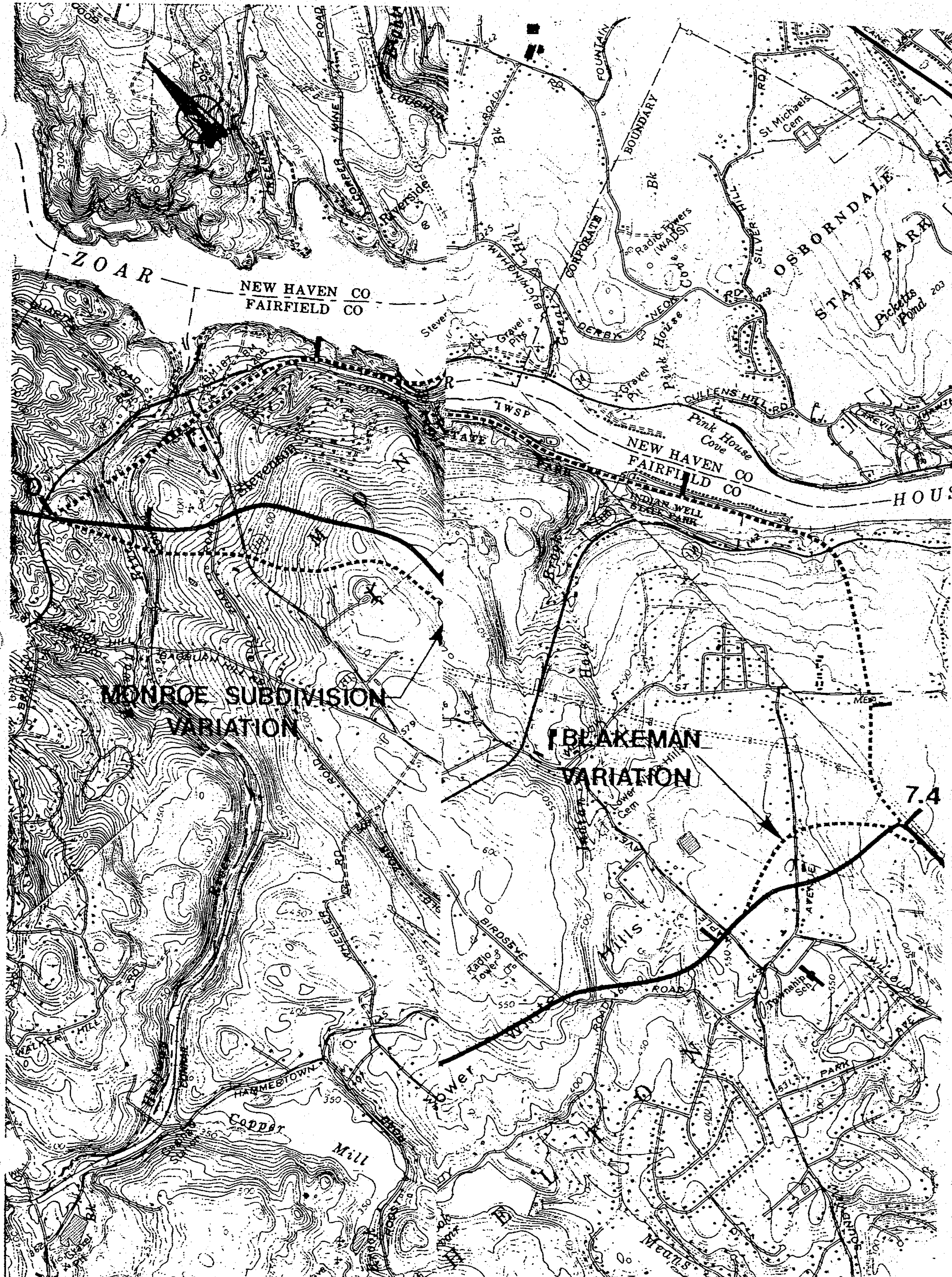

ZOAR
NEW HAVEN CO
FAIRFIELD CO
MONROE SUBDIVISION
VARIATION
BLAKEMAN
VARIATION
7.4
OSBORNDALE
STATE PARK
Picketts Pond
St Michaels Cem
Radio Towers (WADS)
Pink House Cove
CULLENS HILL RD
NEW HAVEN CO
FAIRFIELD CO
HOUS
Indian Well State Park
Township Sch
Radio Tower
Copper
Mill
Means

EXHIBIT 2
DETAILED TERRAIN DESCRIPTION AND CONCERNS ALONG THE CONRAIL VARIATION

M.P.	Description - Concerns
0.0	Variation from proposed route.
0.2	Halfway River crossing
0.5	Stevenson lumber yard and railway overpass of Highway 34.
	Very limited room for alignment next to rail overpass. Insufficient workroom next to buildings. (See photgraphs 1,2 & 3).
0.6 to 1.2	Conrail aligned between Cottage Street and Highway 34. The railbed is at approximately the same grade as Cottage Street at M.P. 0.6 (see photograph 4) but is elevated in a fill embankment farther south (see photographs 5 & 6).
1.2 to 1.4	Conrail line situated on top of large embankment at point of crossing over Boys Halfway River (see photgraphs 7, 8 & 9). Large concrete bridge and box culvert supporting railbed over river would pose major obstruction to pipeline route within railbed. Extensive regrading of terrain (i.e., a wooded slope) adjacent to railbed would be required to align pipe to cross over to Highway 34 and then back to rail bed at M.P. 1.5. Highway 34 also would be impacted.
1.4 to 2.4	Steep sloping sidehill with height approximately 500 feet above Housatonic

	River. Railbed positioned at an elevation of about 200 feet above the river bank. Proposed alignment adjacent to railbed in slope of 56^{0} would require massive regrading and terracing of the hillside.
	. Blasting of minimum 50 foot work area would leave sharp cut faces on uphill side in excess of 30 feet in height (see photographs 10 & 11 and cross-section at M.P. 1.73 in Exhibit 4).
	. Fly rock resulting from blasting activities would be very difficult to control.
	. Close proximity to Stevenson Dam and power plant could pose difficulties for blasting.
2.4 to 4.0	. Very narrow work area available west of rail line would require terracing of hillside. Blasting on hillside would make control of fly rock very difficult and could affect nearby homes on river front and hillside (see photographs 12 & 13) and cross-sections at M.P. 3.52 and M.P. 3.80, Exhibit 4.
4.0 to 4.5.	. Area adjacent to railbed traverses the Bridgeport Hydraulic Company recharge ponds and the White Hills Brook. The recharge wells and ponds and the brook would be directly impacted by trenching alongside the railbed. (see photgraphs 14,15,16,17 and 18). The crossing of Indian Well (Birchbank) Road at M.P. 4.5

	would also impact the railway signals, the roadway, and the brook during construction.
4.5 to 5.1.	Sloping hillside between railbed and Indian Well Road. Blasting would result in sharp cut and vertical face on hill supporting roadway. The stability of the roadway would be jeopardized by construction; the road may have to be removed and replaced along with retaining walls constructed along this segment for roadway stability (see photographs 19 and 20 and cross-section at M.P. 4 60 and M.P. 4.90, Exhibit 4). Railroad bridge over hillside stream at M.P 5.0 poses major obstacle. Pipeline would be forced to deviate under road bed, closing roadway completely during construction.
5.1 to 5.7	Very narrow work area alongside railbed with steep uphill slope supporting the Indian Well State Park roadway. (see cross-section at M.P. 5.69, Exhibit No. 4)
5.7 to 5.8	Very narrow workspace adjacent to railbed alongside steep hillside. Concrete railbridge over hillside stream poses obstacle that would be impossible to overcome (see photgraphs 23 & 24).
5.8 to 6.5	Very narrow workspace passing over road to State Park adjacent to The Maples (Bridgeport Hydraulic Company facility and wells), and traversing wetland at M.P. 6.3.

	Steep uphill slope where route would deviate from Conrail at M.P. 6.4 would be regraded for construction and may be subject to erosion up to Route 110. At top of slope (see photographs 25 & 26 and cross-section at M.P. 6.36 in Exhibit 4
6.5 to 7.4	Good workspace available.

EXHIBIT 3

PHOTOGRAPHIC LOG

CONRAIL VARIATION

MARCH 1990

Photo 1: View of Stevenson Lumber looking northwest on Conrail track at M.P. 0.5 crossing over Route 111. Note lack of space for construction.

Photo 2: View of building northeast of Conrail track at M.P. 0.5 crossing over Route 111. Note lack of space for construction.

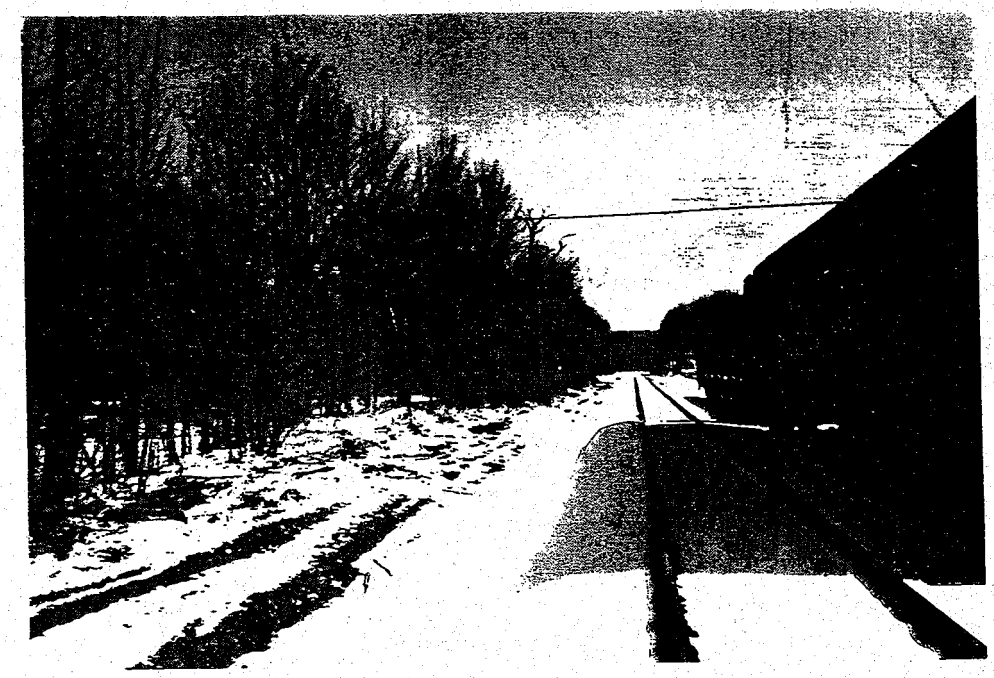


Photo 3: View south along Conrail at M.P. 0.5. This is the only siding along this segment of Conrail tracks.

Photo 4: View east from Conrail, showing wooded slope, to Highway 34 at M.P. 0.6. Note truck on Highway 34 in photo.

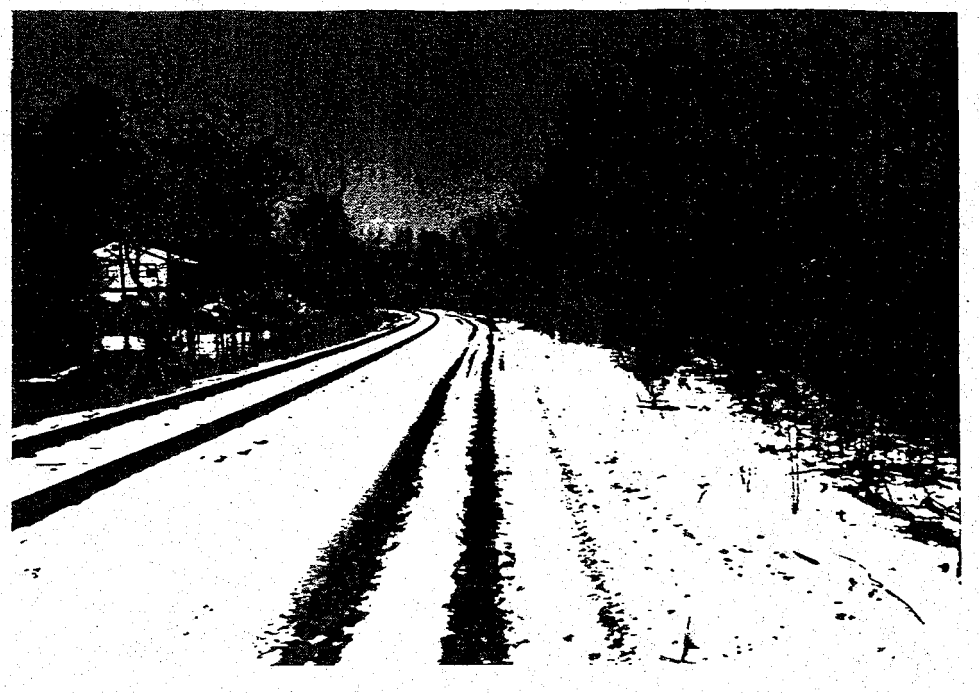


Photo 5: View north along Conrail and Cottage Street at M.P. 0.9. Highway 34 is to the east (i.e., to the right in the photograph).

Photo 6: View looking west to Conrail from Highway 34 at M.P. 1.2. Note height of railway embankment and concrete culvert underneath it. This is the smaller of two major culverts that carry water flows from the Boys Halfway River underneath the railroad.

Photo 7: View north along Conrail and Cottage Street at M.P. 1.3. Railway bed is situated in large embankment. Note lack of space between Cottage Street and railway.

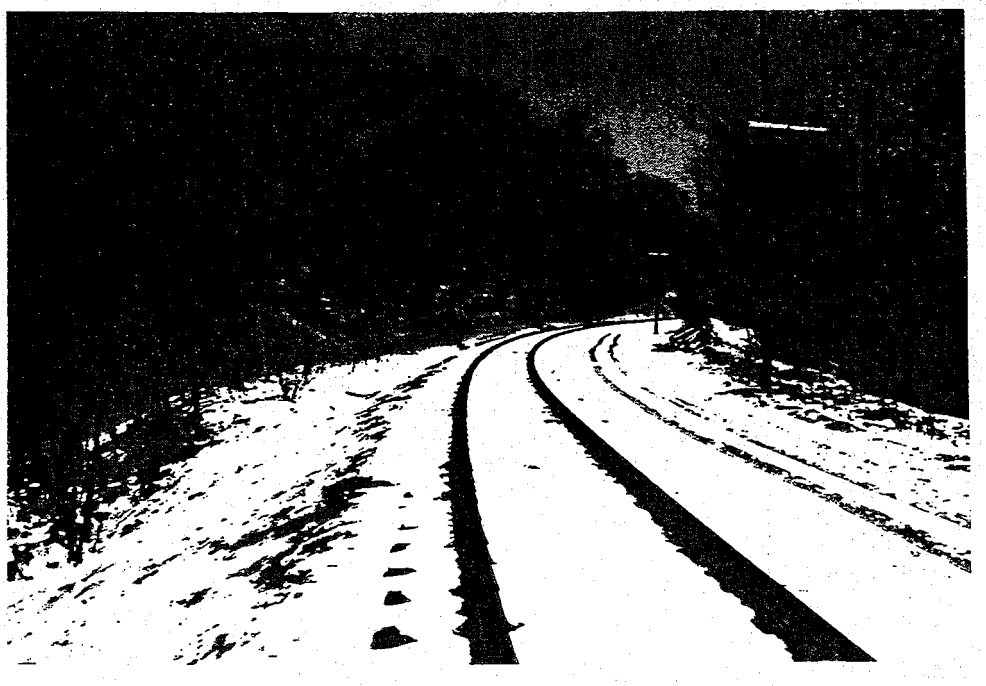


Photo 8: View north along Conrail to Cottage Street at M.P. 1.4. Note height on railway embankment.

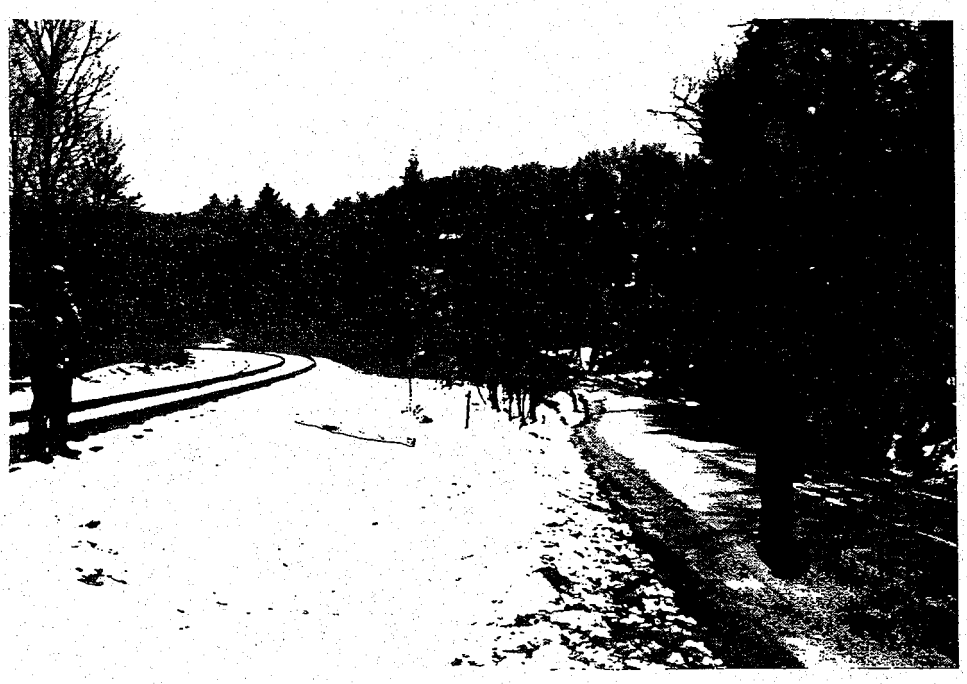


Photo 9: View south along Conrail and Cottage Street at M.P. 1.3. Boys Halfway River crosses under rail and roadway. Note lack of space between road and railway and rocky slope west of Cottage Street.

Photo 10: View looking west to Conrail from Highway 34 (on east side of Housatonic River). M.P. 1.6 to 2.0. Note railway bed terraced into hillside.

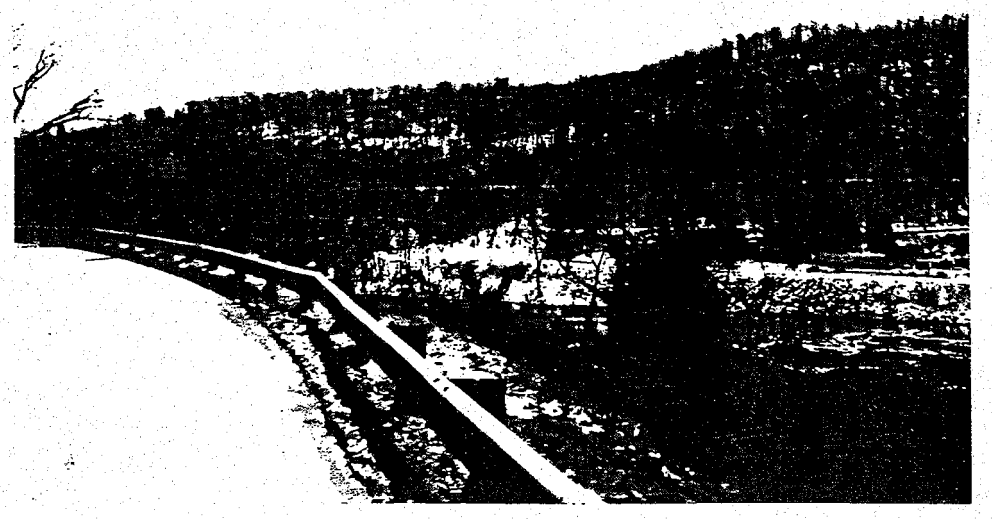


Photo 11: View west to Conrail from Highway 34 on east side of Housatonic River. M.P. 1.7 to 2.1.

Photo 12: View north along Conrail at M.P. 3.3. Houses border tracks directly to the east and upslope to the west.

Photo 13: View south along Conrail at M.P. 3.3.

Photo 14: View south along Conrail at M.P. 4.0. White Hills Brook traverses linearly alongside railroad, and Bridgeport Hydraulic Company recharge areas are to the west.

Photo 15: View south along Conrail at M.P. 4.1. White Hills Brook is alongside railroad.

Photo 16: View north along Conrail at M.P. 4.5 Indian Well (Birchbank) Road. White Hills Brook crosses roadway here.

Photo 17: View north along Conrail at M.P. 4.5. Bridgeport Hydraulic Company Housatonic wellfield is located to the east of the tracks; its recharge areas are to the west.

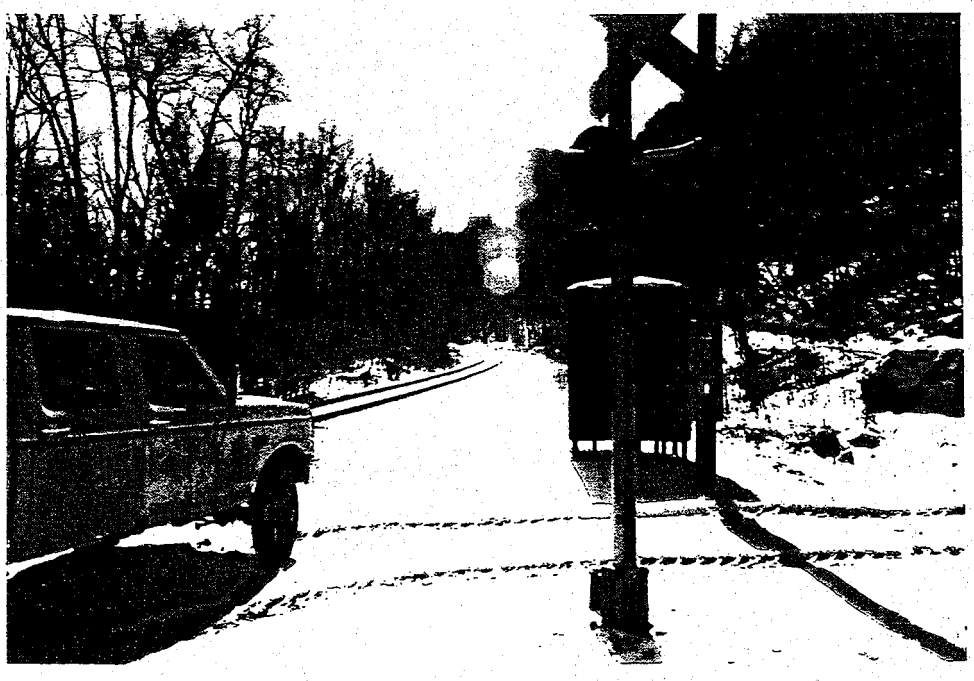


Photo 18: View south along ConRail at M.P. 4.5. Indian Well (Birchbank) Road is to the west (upslope) of the railroad.

Photo 19: View south along Conrail at M.P. 4.6.

Photo 20: View north along Conrail at M.P. 4.7. Guardrail on Indian Well Road visible in top left of photo.

Photo 21: View north along Conrail and Indian Well Road at M.P. 5.0. Note railroad bridge over hillside stream.

Photo 22: View of railroad abutment and road culvert at M.P. 5.0.

Photo 23: View north along Conrail at M.P. 5.8.

Photo 24: View south along Conrail at M.P. 5.8. Note steep rocky slopes west of Conrail.

Photo 25: View north along Conrail at M.P. 6.3.

Photo 26: View west from Conrail to hillside where Conrail variation would deviate from the railroad tracks - M.P. 6.4. Note steep rocky slope.

EXHIBIT 4

CROSS SECTION PROFILES

CONRAIL VARIATION

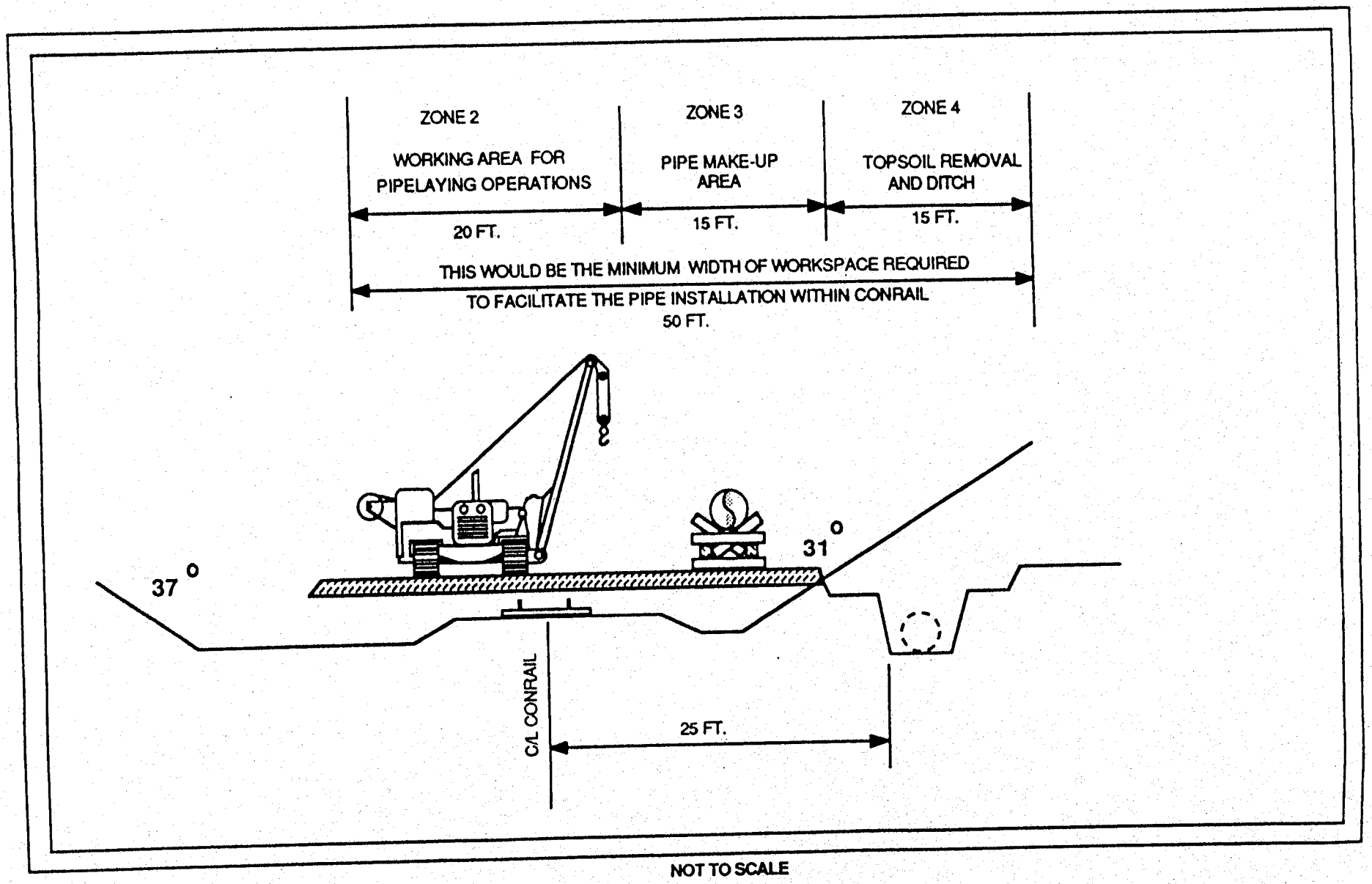
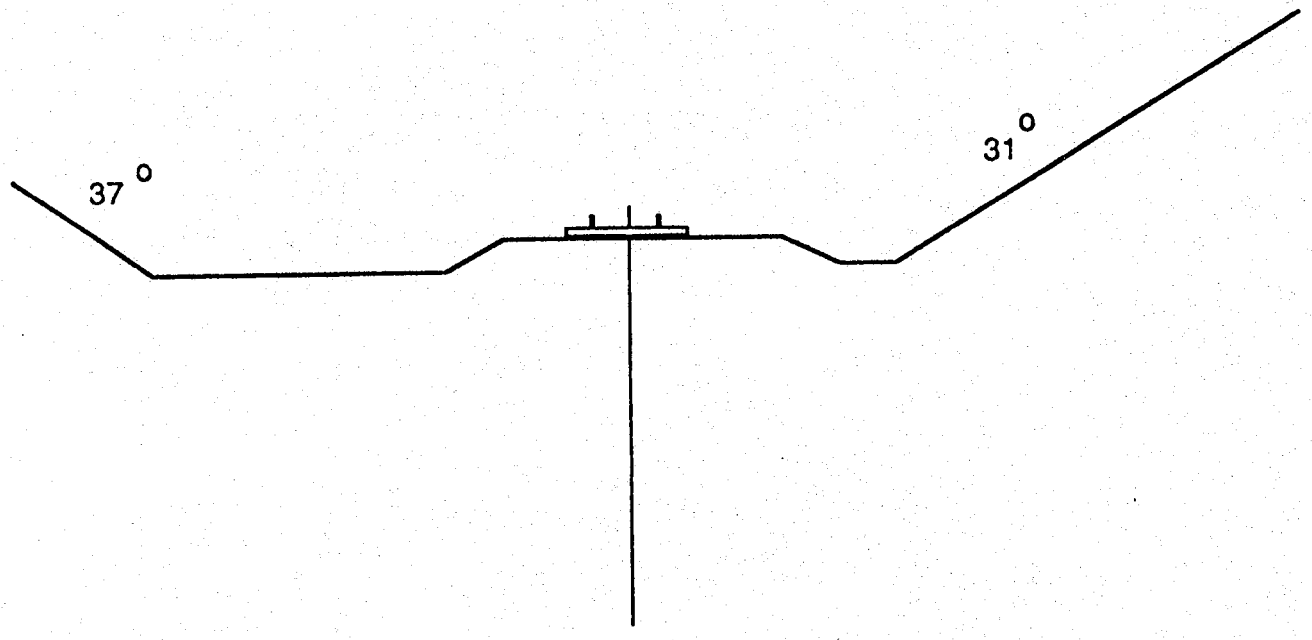


FIGURE 4-1

RIGHT-OF-WAY AND CROSS-SECTION - M.P. 0.73



M.P. 0.73

FIGURE 4-1A

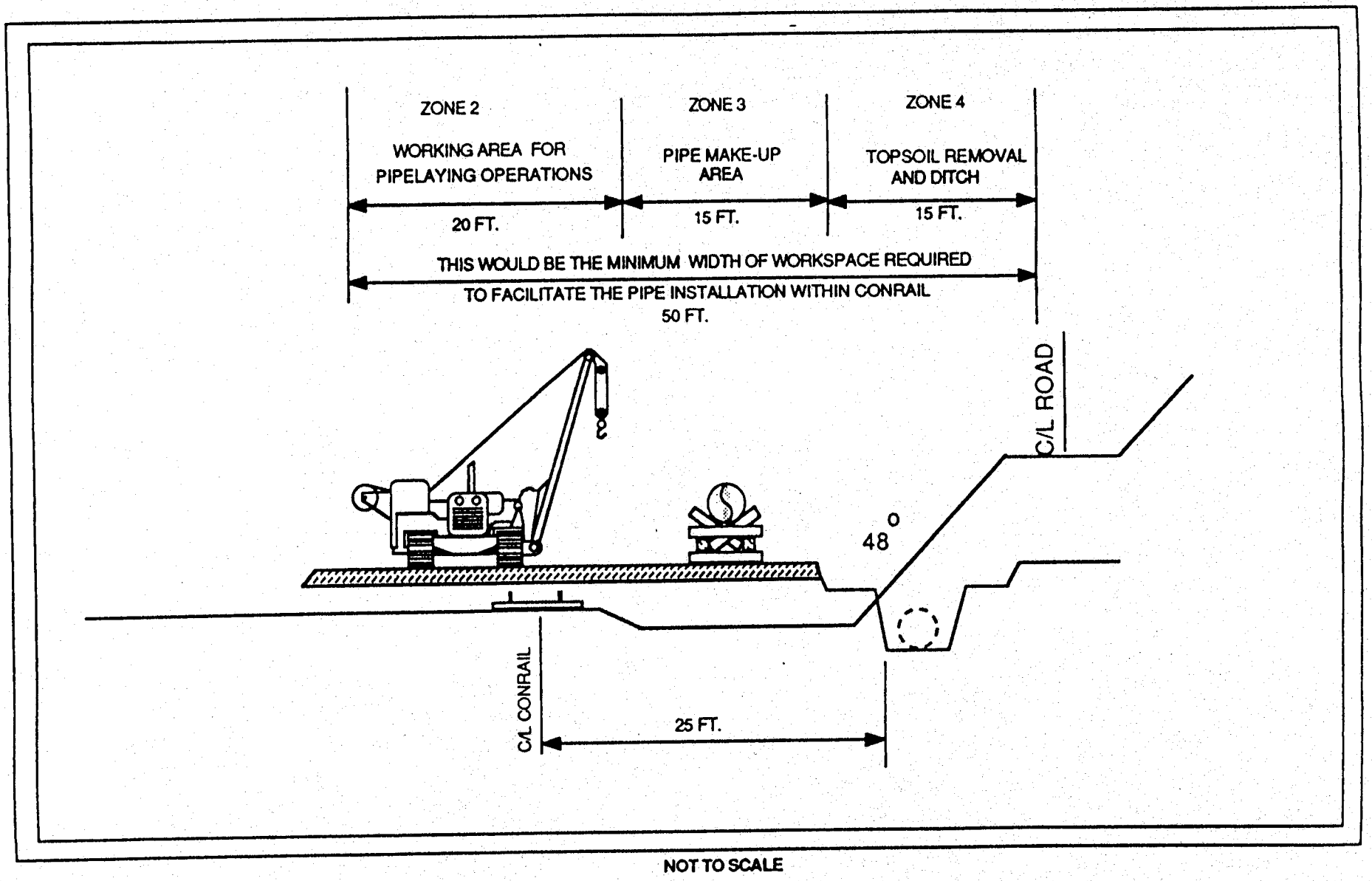


FIGURE 4-2
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 1.26

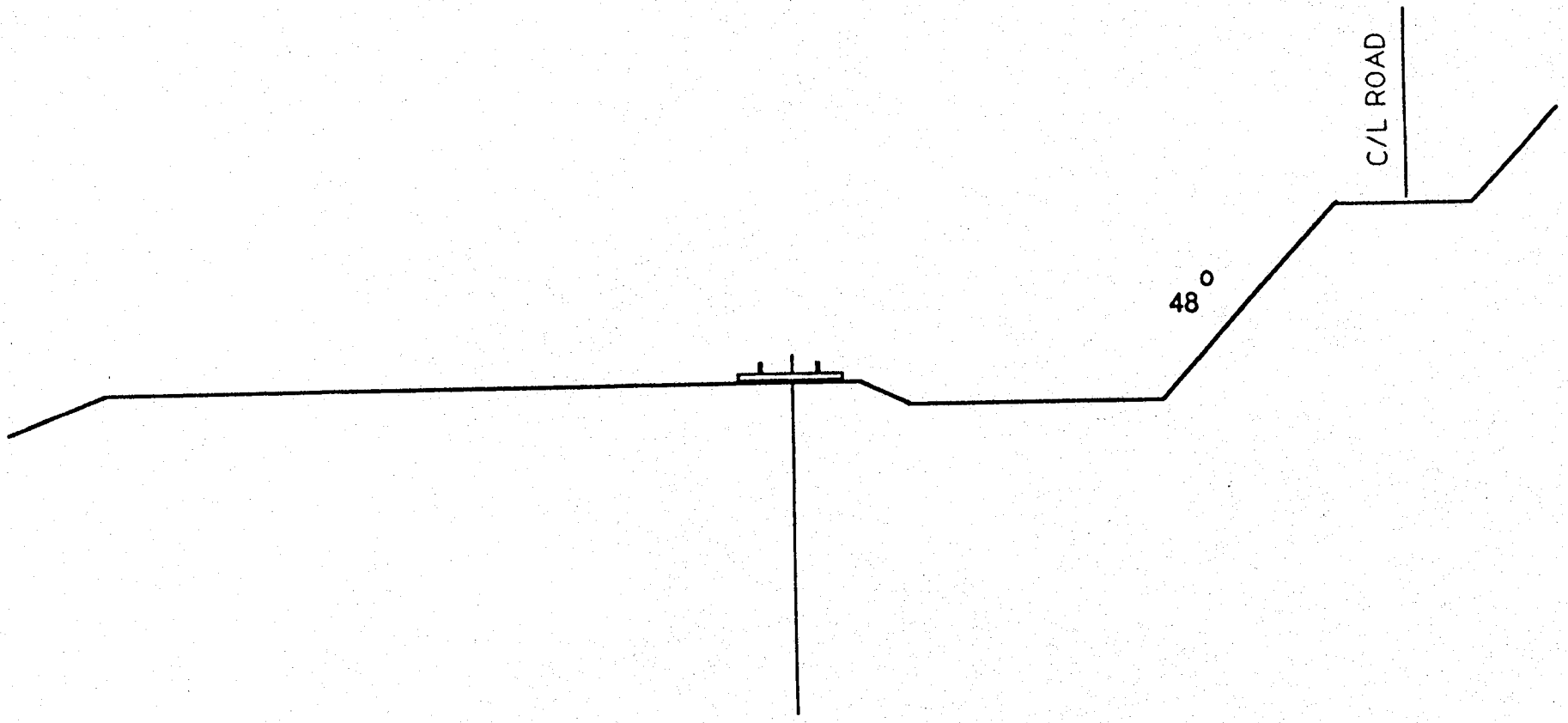
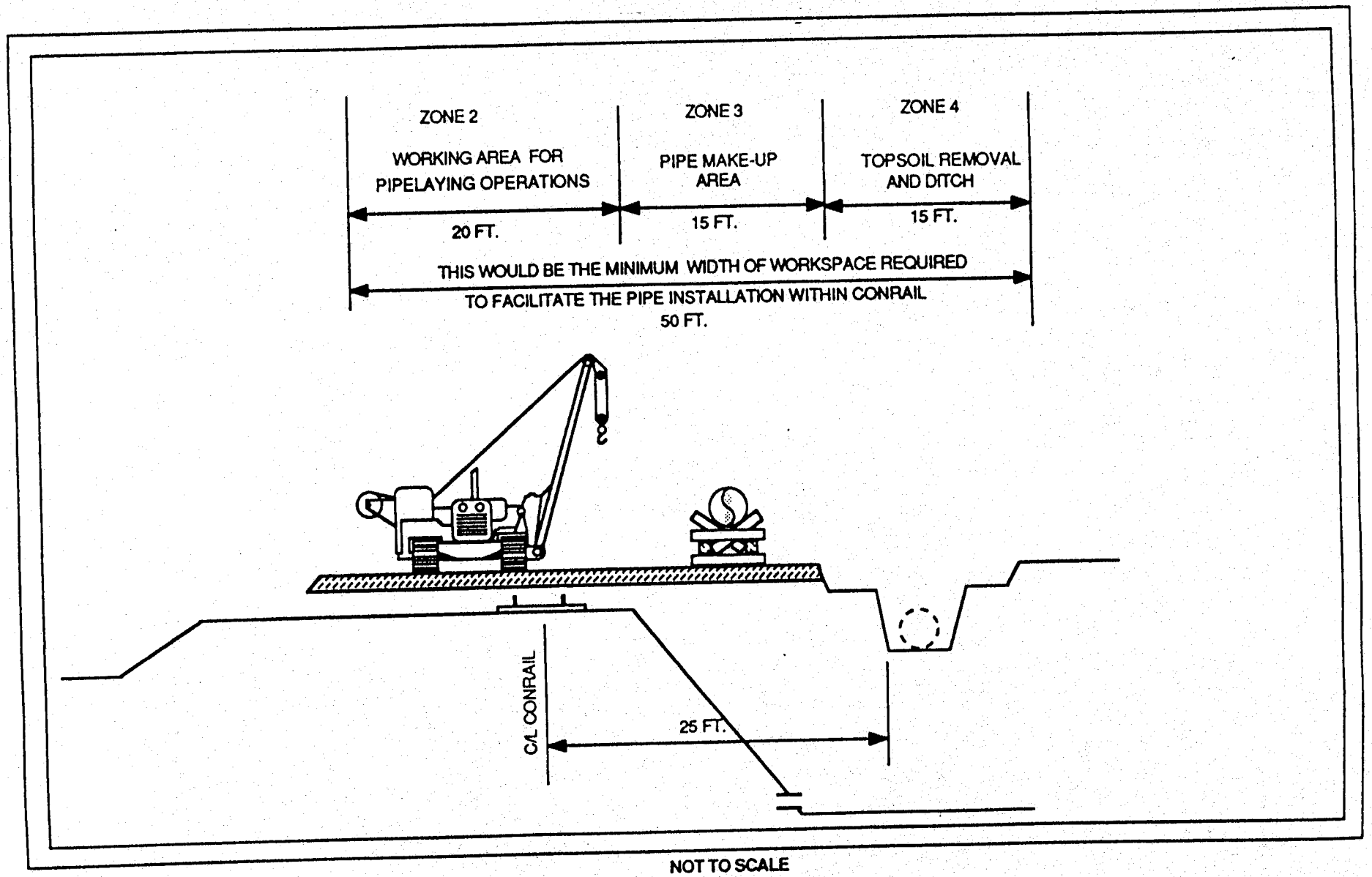


FIGURE 4-2A



NOT TO SCALE

FIGURE 4-3

RIGHT-OF-WAY AND CROSS-SECTION - M.P. 1.33

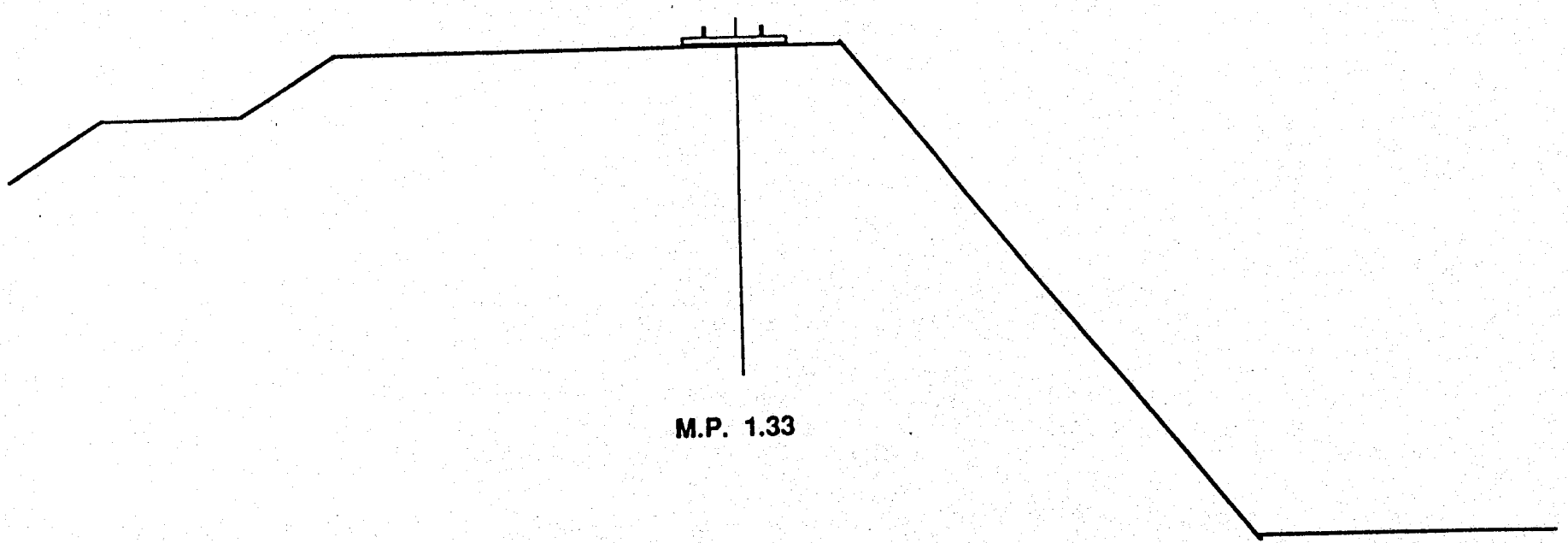


FIGURE 4-3A

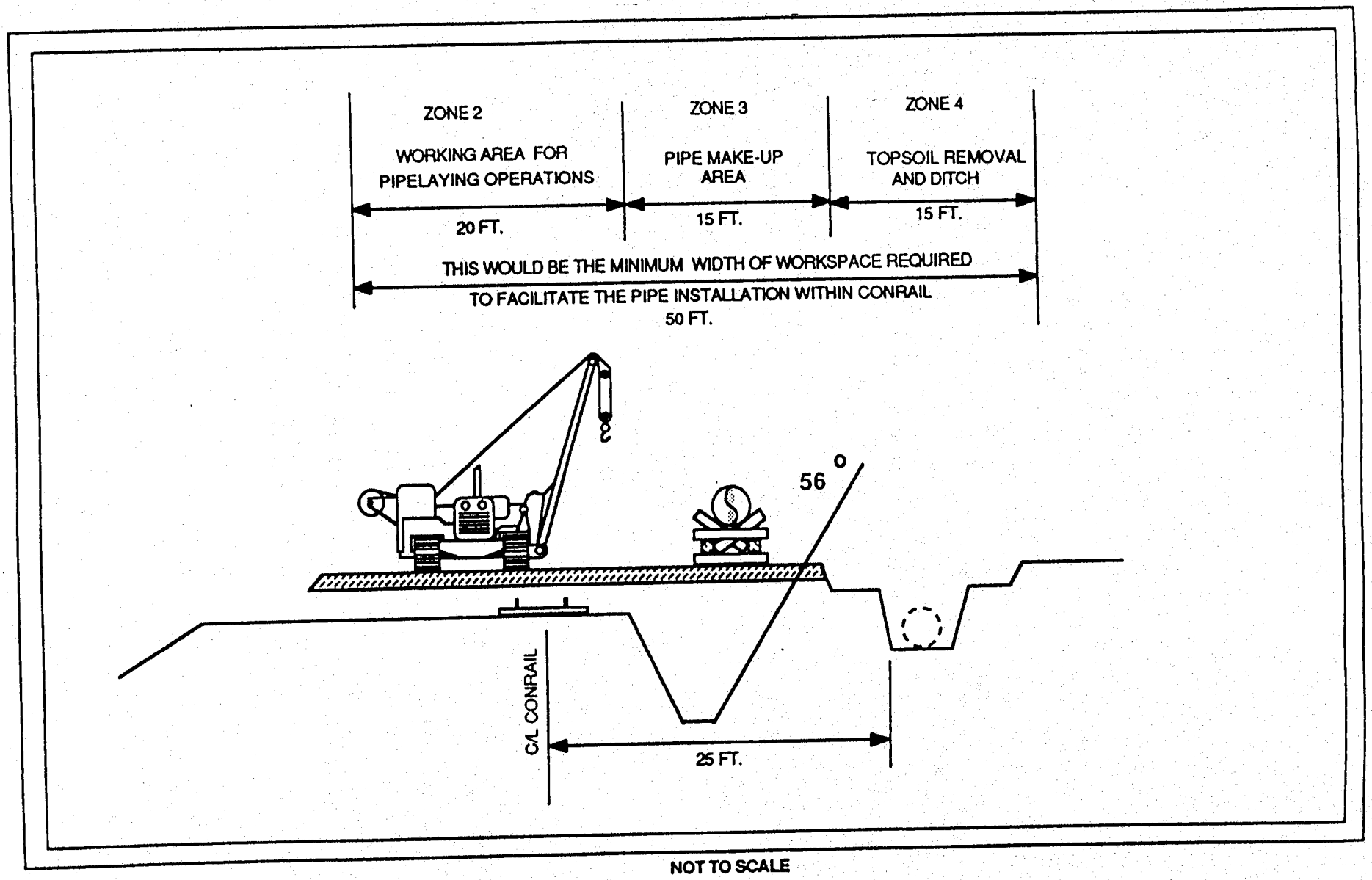


FIGURE 4-4
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 1.73

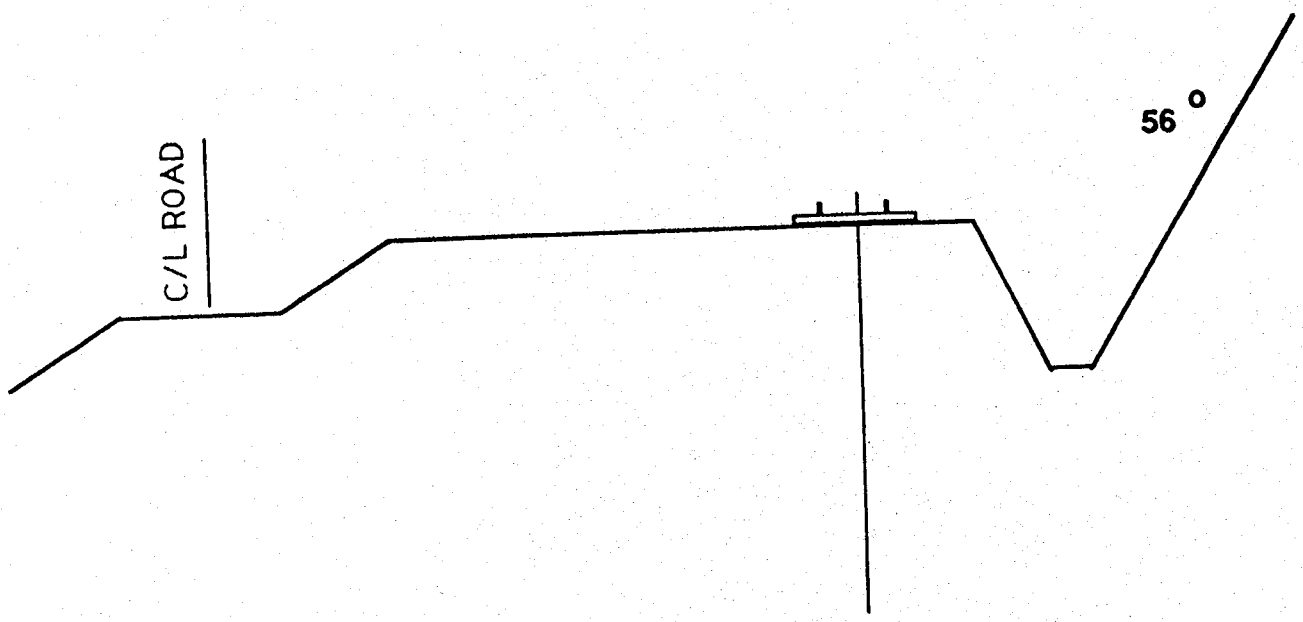


FIGURE 4-4A

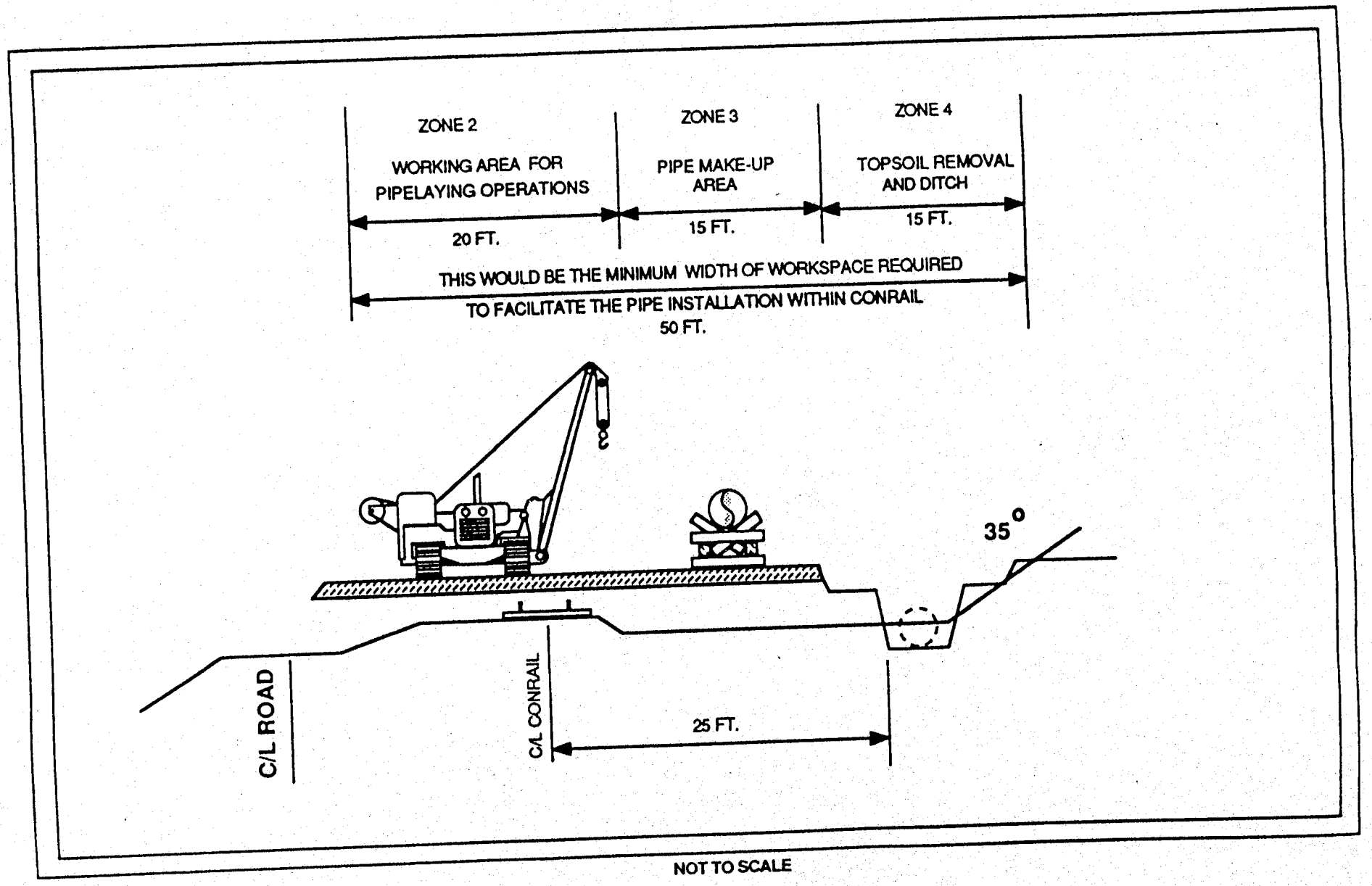


FIGURE 4-5
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 3.52

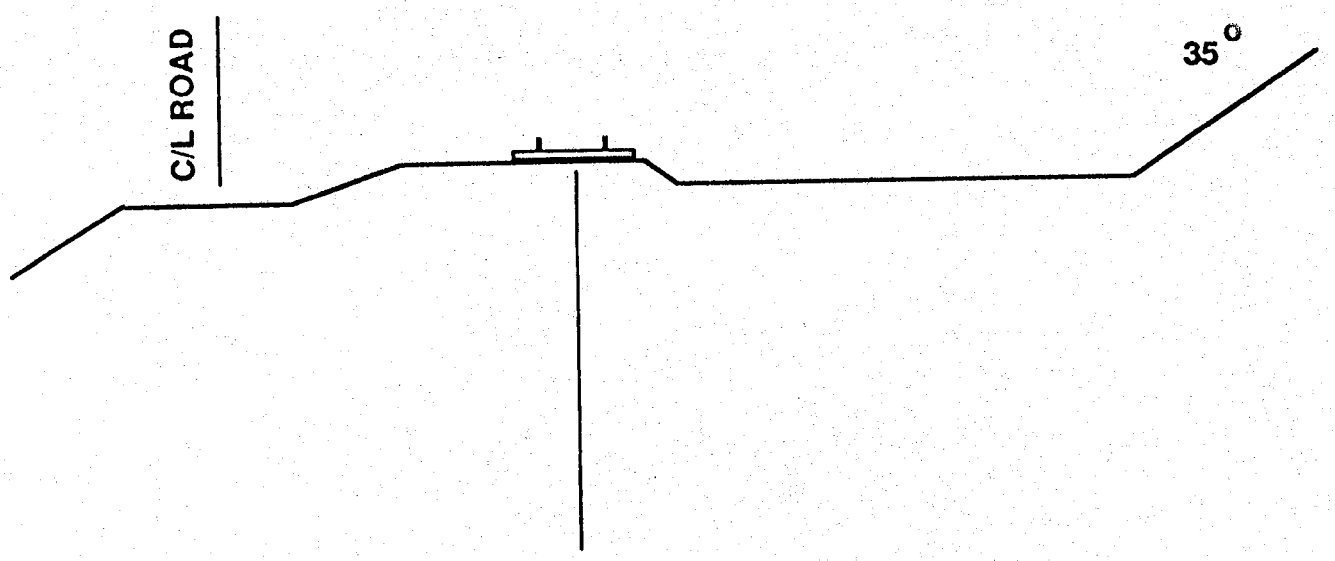


FIGURE 4-5A

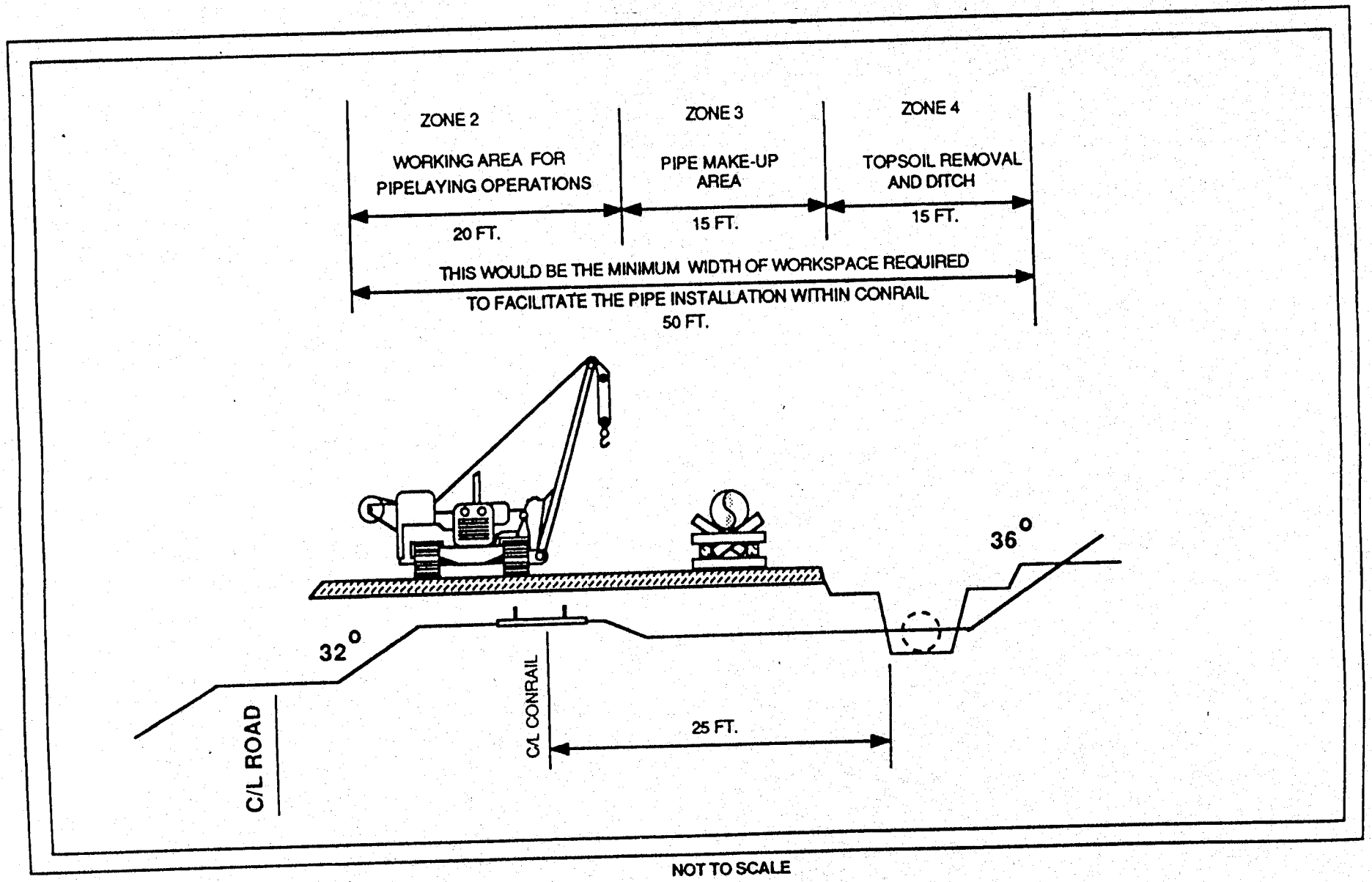


FIGURE 4-6
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 3.86

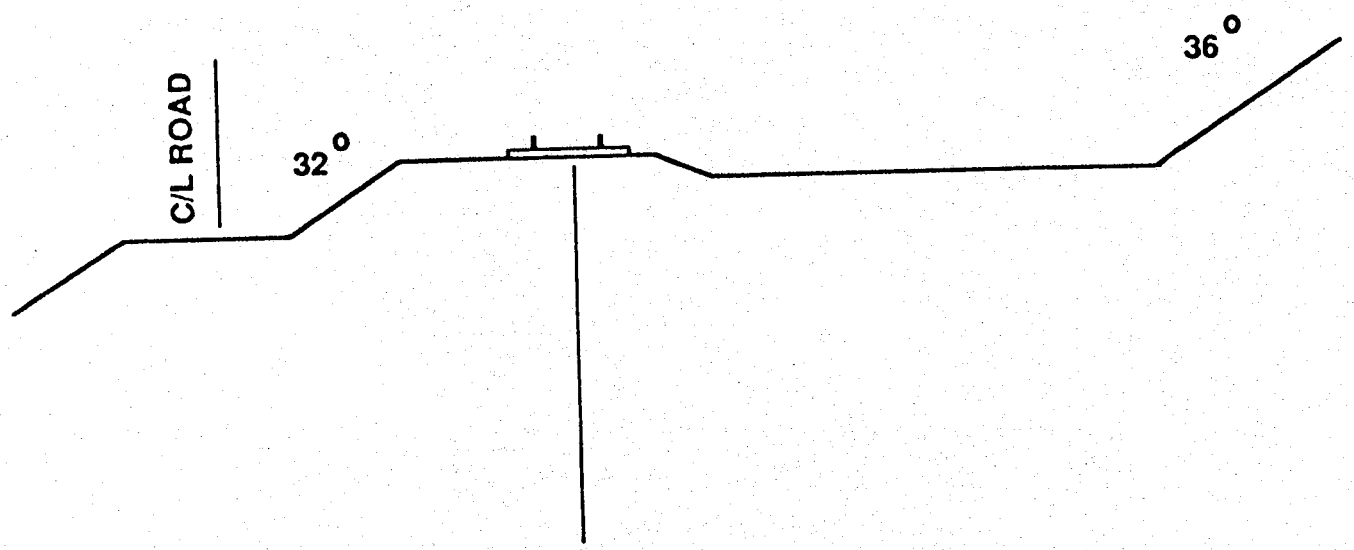


FIGURE 4-6A

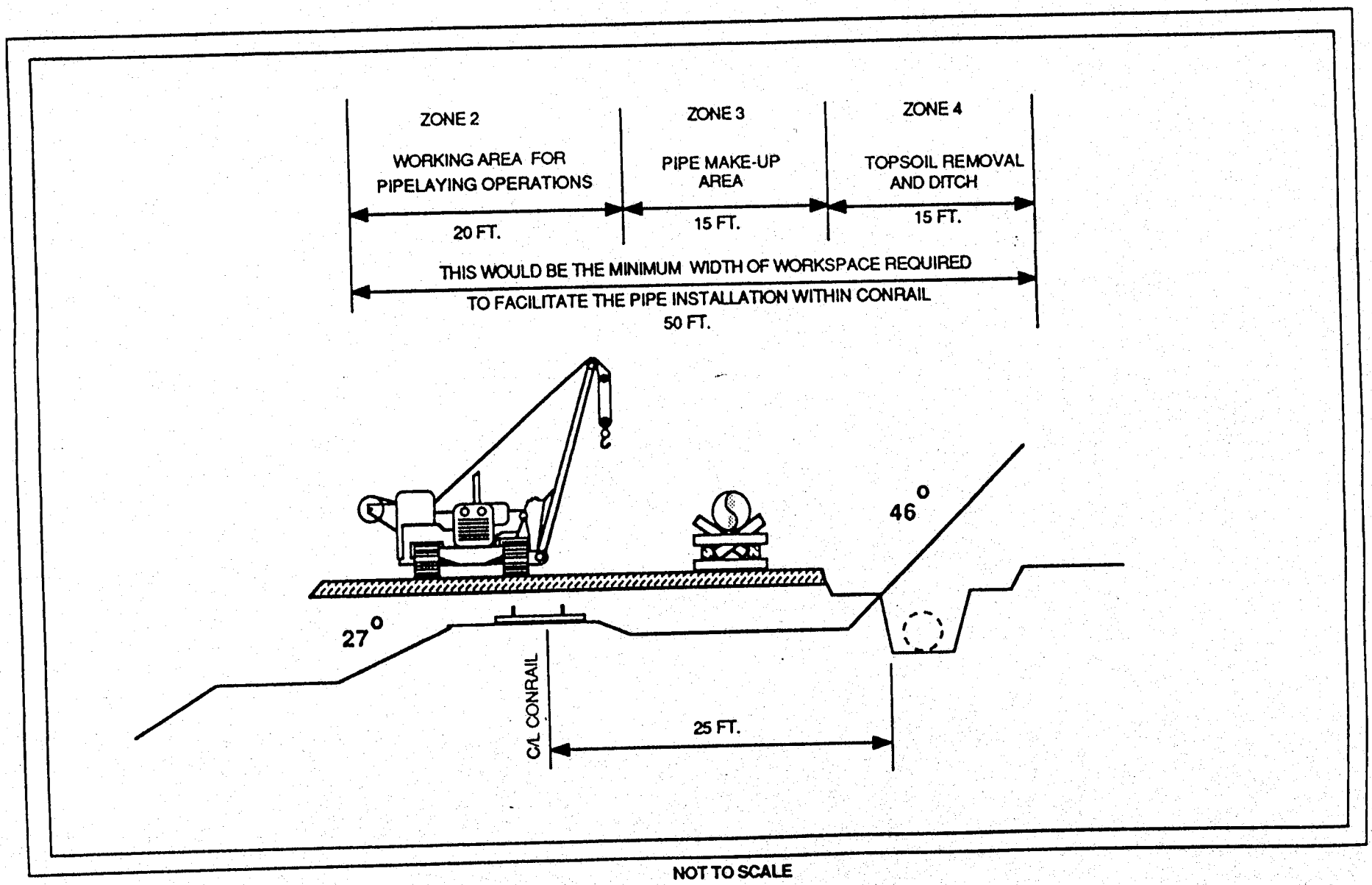


FIGURE 4-7
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 4.64

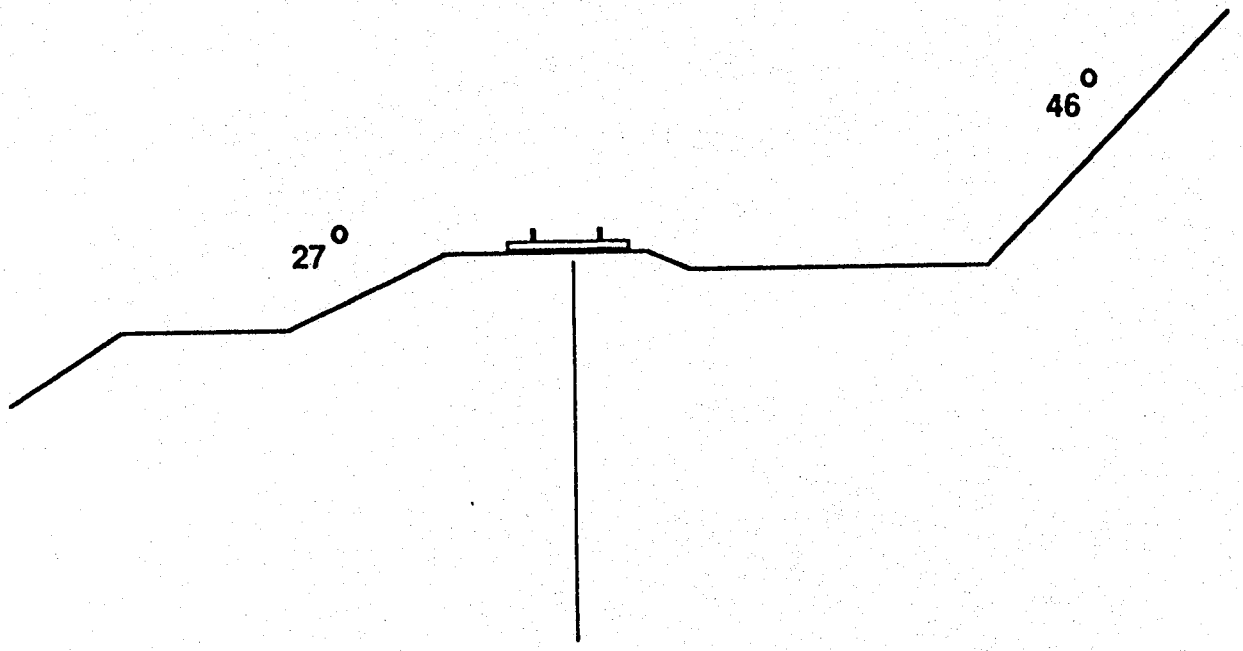


FIGURE 4-7A

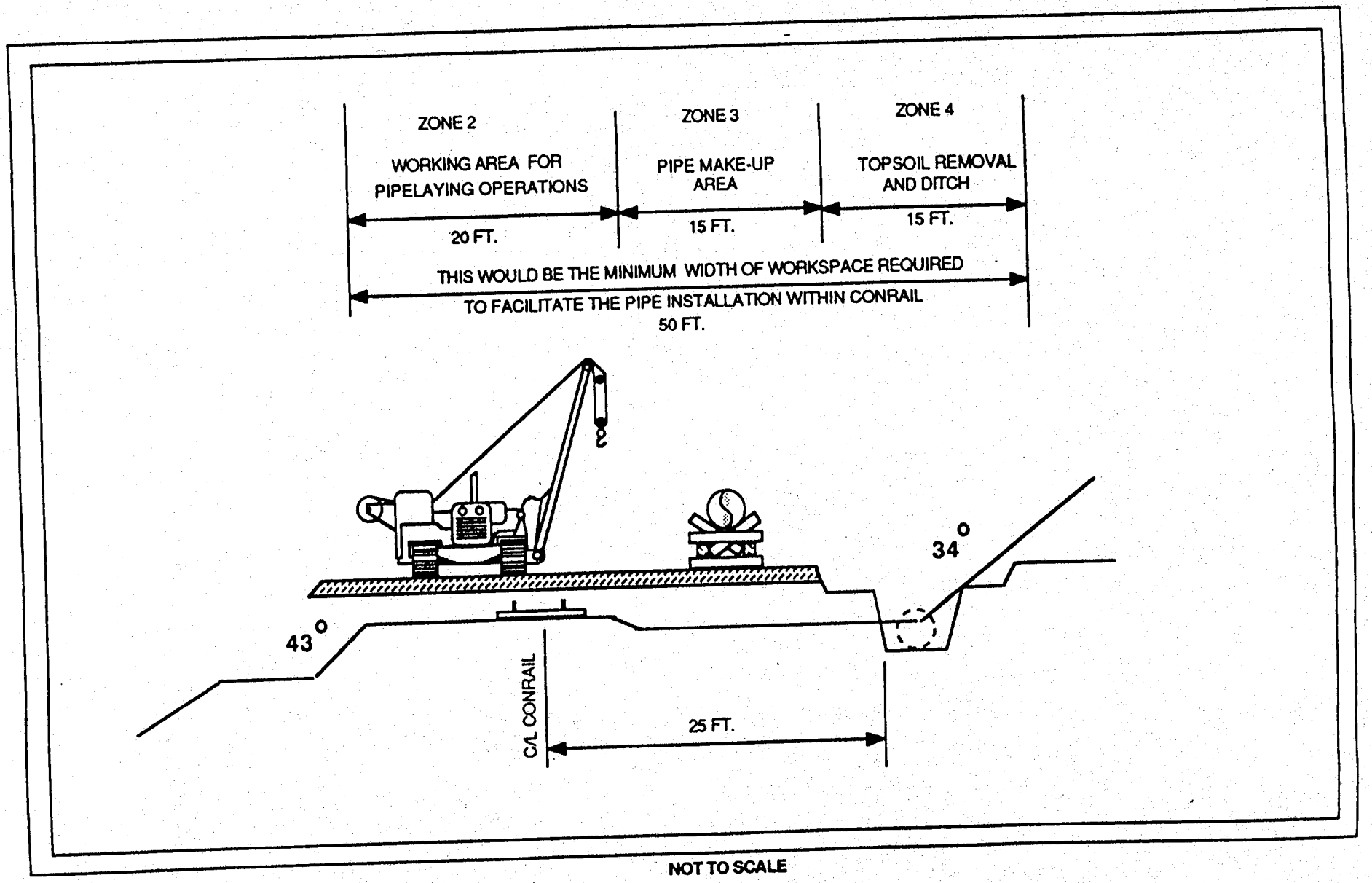


FIGURE 4-8
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 4.90

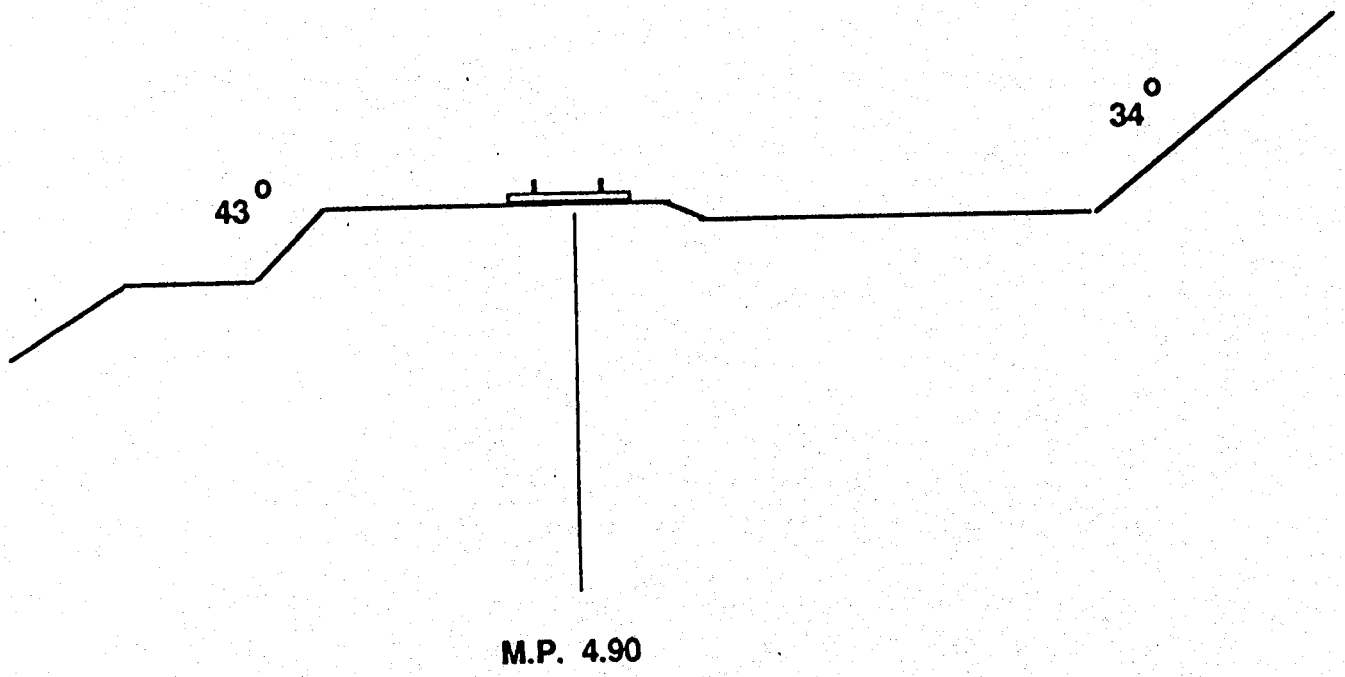


FIGURE 4-8A

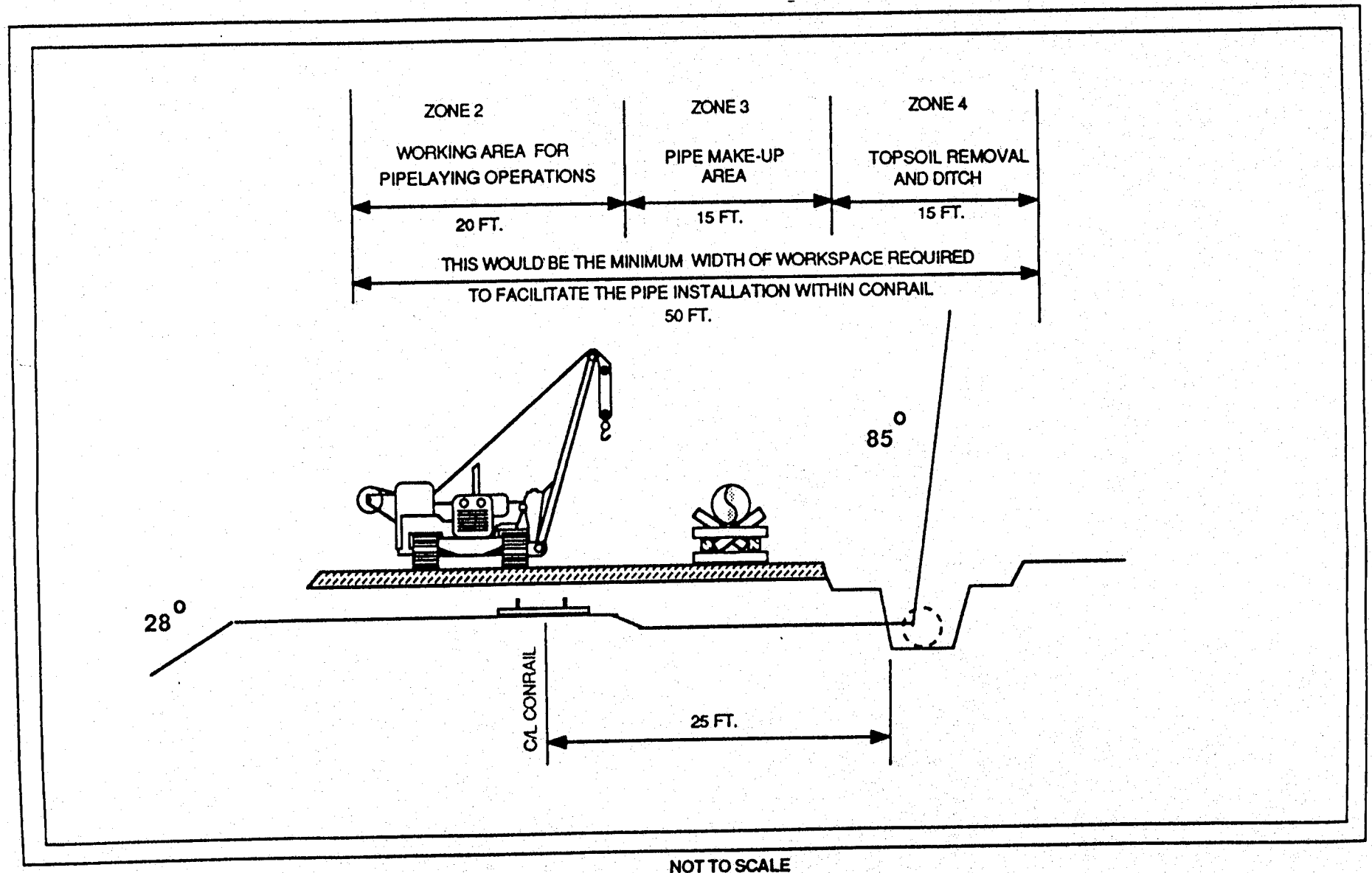


FIGURE 4-9
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 5.69

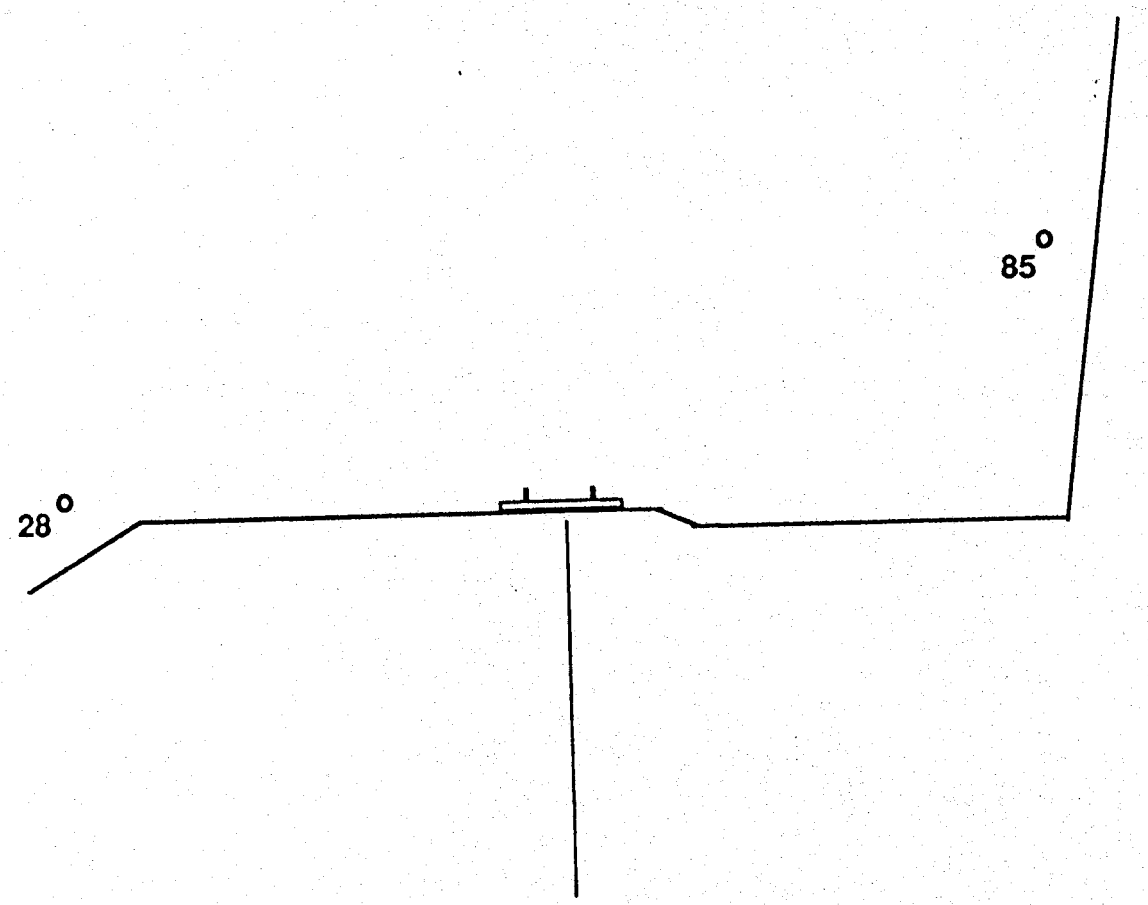
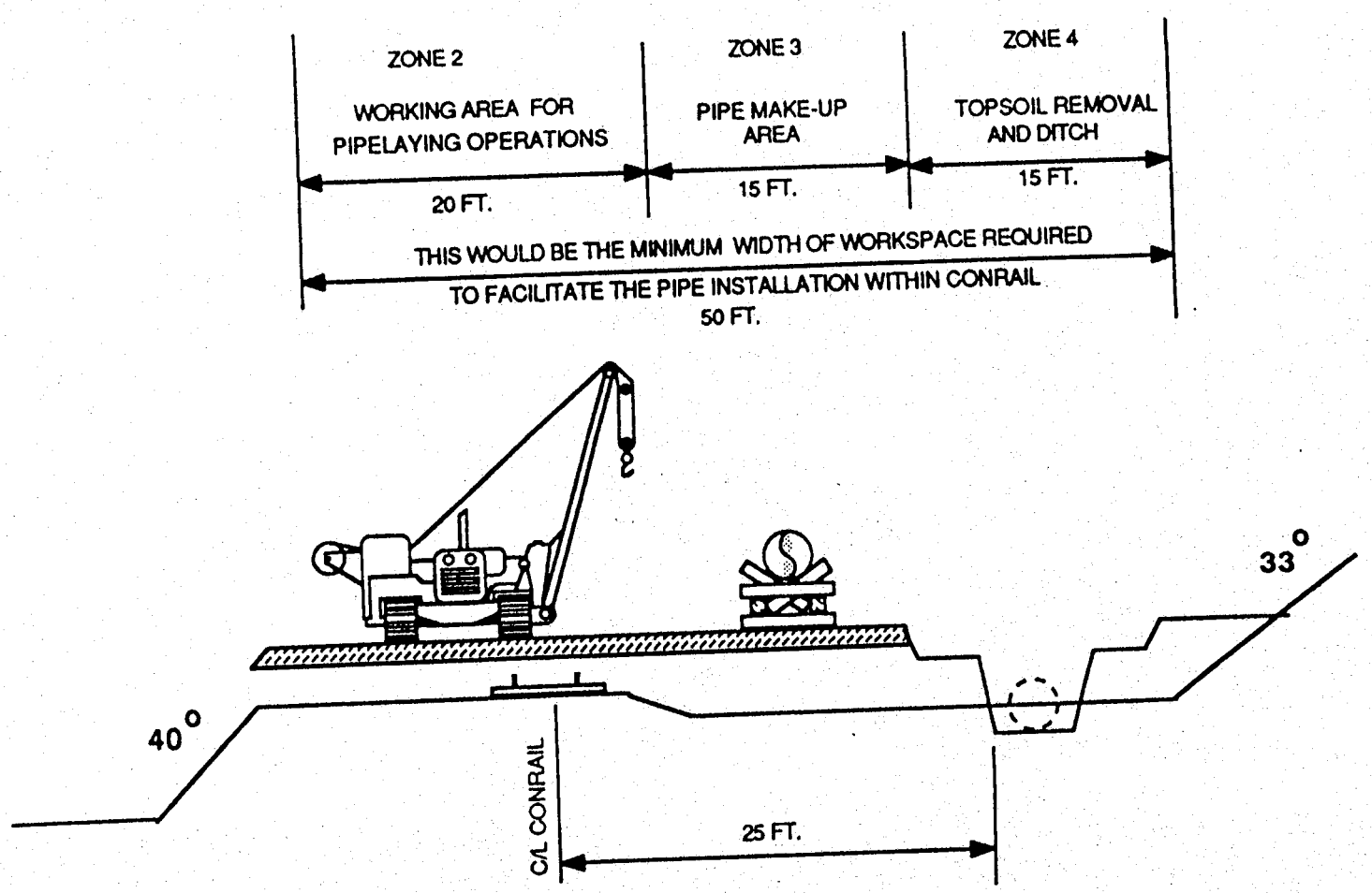
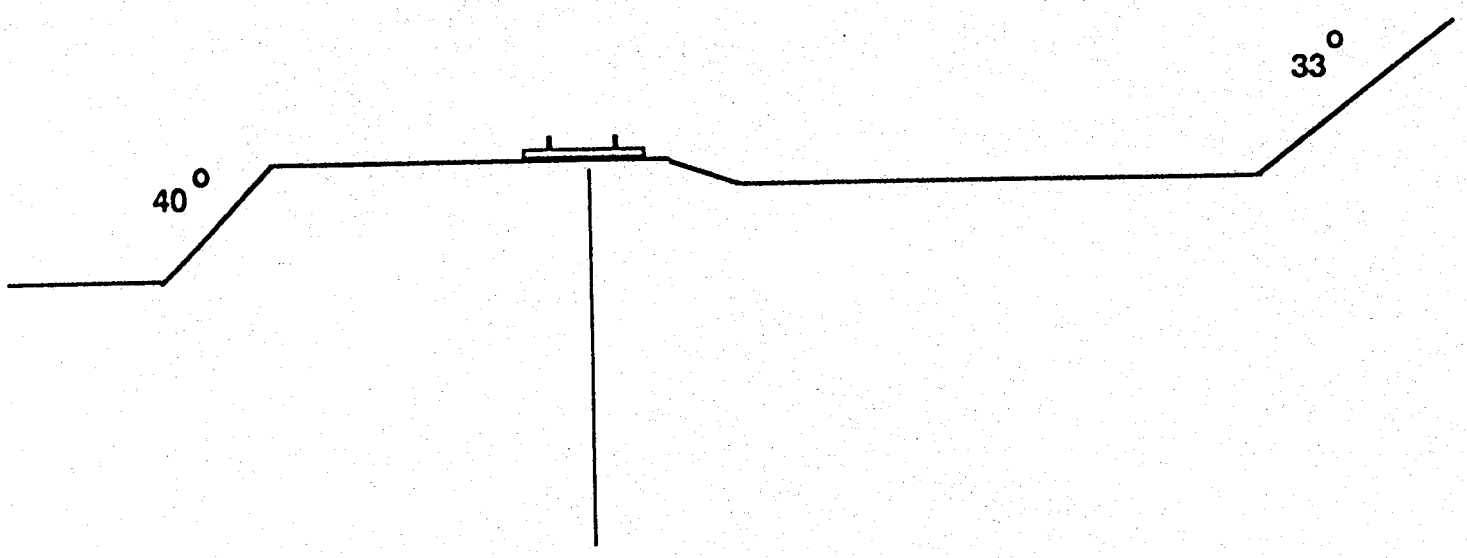


FIGURE 4-9A



NOT TO SCALE

FIGURE 4-10
RIGHT-OF-WAY AND CROSS-SECTION - M.P. 6.36



M.P. 6.36

FIGURE 4-10A

OTHER COMMENTS SUBMITTED TO THE FERC OR TO THE CORPS OF ENGINEERS

APRIL 1990

Analysis of New Milford Variations and Shelton/Stratford (HVA) Alternate No. 1

1.0 New Milford Variations

The HVA and the Town of new Milford suggested a number of alternate routes in the Town of New Milford, including those designated as Nos. 1, 2, 3, 3a, 3b, and 3c. The following paragraphs compare the environmental impacts and engineering feasibility of constructing all or portions of these alternates.

New Milford No. 1

Part of New Milford No. 1 is proposed to traverse for approximately 8 miles down Route 7 in the towns of New Milford and Brookfield. This portion of the alternate is rejected because it could not be built without extensive disturbance to existing commercial, residential, and industrial facilities along Route 7, and because of the extremely severe consequences to traffic movements along the highway.

Iroquois has stated numerous times that, for safety reasons, it will not align the high-pressure pipeline linearly beneath roadways for extensive distances. Moreover, the installation of the pipeline completely within Route 7 could not be accomplished without closing down the road entirely for the duration of the construction period, which could amount to several months. Since there are limited north-south routes available to this very congested highway, the impacts to traffic congestion would be significant, as would impacts to the various commercial, residential, and industrial properties along the route to which effective access would be difficult to maintain.

Thus, to construct along Route 7, the pipeline would have to be aligned adjacent to the highway. Route 7 in this area is characterized by dense strip development along almost its entire length. A significant number of the structures would have to be disturbed, and some would have to be removed in order to permit safe installation and operation of the pipeline adjacent to the highway. This is unacceptable to Iroquois, which has committed to avoid the taking of structures.

In addition, construction along Route 7 would involve significant impacts to traffic flow patterns. Anyone who has driven along this portion of Route 7 is aware that there is very heavy traffic at most times of the day. Construction of the pipeline along Route 7 would necessitate interrupting traffic for extended periods as construction equipment and vehicles accessed the construction areas. This interruption is likely to last for an extended period since construction along the congested roadway could proceed only at approximately 200 to 300 feet per day. The entire 8-mile stretch thus could take a single crew 150 to 200 days. Although additional crews could be added, this would simply increase the number of congested areas along the highway, further disrupting traffic.

Other impacts associated with the use of an alignment adjacent to Route 7 include the disturbance to various buried utilities that are aligned both within the road and extend laterally from the road to service the adjacent residential, commercial, and industrial areas. The Iroquois pipeline would have to be installed so as to avoid these existing utilities; due to the numerous facilities that exist in the area, this would be difficult. In addition, the construction of the pipeline would result in secondary adverse economic effects to the numerous businesses that are located along the Route 7 strip. If access is cut off or impaired to these facilities, it can be expected that sales revenues would decline, as customers seek goods and services in more readily accessible locations. This would have particularly severe consequences for businesses such as the Candlewood Valley Country Club, grocery stores, and sole proprietorships.

New Milford Nos.1 and 2

The following discussion compares the environmental and engineering feasibility of two alternates proposed in the northern part of New Milford. Both alternates 1 and 2 share the same alignment for much of their length, excluding that portion of New Milford 1 that is located along Route 7 for the reasons described above.

New Milford alternates 1 and 2, hereinafter referred to as NM 1 and NM 2, would replace that portion of the proposed route generally between mileposts 288.85 and 293.0; the remaining portion of NM 1 is along Route 7, and will not be considered further.

NM 1 is approximately 4.1 miles long, and NM 2 is approximately 3.9 miles long; for comparison, the proposed route that would be replaced by these alternates is approximately 4.15 miles long.

NM 1 would diverge from the proposed route at milepost 288.85 and traverse east across Morrissey Brook and directly up an extremely steep slope east of milepost 289. Although the alignment has been located, such that the route would traverse directly up the slope and could thus be constructed as shown, from a construction and restoration standpoint, unless there is an overriding reason to construct in such an area (as there is for the crossing of Candlewood Mountain farther south at milepost 292), these areas are avoided during routing to the extent possible.

Alternate NM 2, on the other hand, traverses the same steep slope, but rather than traversing directly up the slope, NM 2 is aligned along severe side slopes. This alignment would result in substantial impacts during construction due to the extensive amount of cutting and filling that would be required to create a level working area for construction equipment. In addition, the long-term stability of the pipeline could be in jeopardy if the slopes were to become destabilized. Iroquois rejects this alignment as being in conflict with sound pipeline engineering practices.

NM1 and NM2 join at a location opposite milepost 290 on the proposed route. At a location approximately opposite milepost 290.5, both NBM1 and NM2 (which at this point share the same alignment) would again traverse steep side slopes which would not allow safe, environmentally sound pipeline construction. This side slope could be avoided to the east, but would involve traversing a large wetland area. Avoidance to the west is not possible due to at least two structures immediately at the toe of the slope.

Continuing south, the common alternate would be aligned between a trailer park and a subdivision at the intersection of routes 37 and 7. There is approximately 200 feet between structures in this area in which to locate the pipeline. Thus for a 100-foot right-of-way, construction would be within 50 feet of both structures. While this is certainly possible from a construction standpoint, it is not desirable to disturb residential properties to this extent if they can be avoided (which they can along the proposed route). In addition, in the area between the trailer park and the housing area, the route would be

aligned along the Candlewood Trail for approximately 250-300 feet. The common alternate route as shown would then traverse along Route 7 for approximately 1000 feet before the two alternates diverge. NM1 would continue along Route 7, where as NM2 would be aligned generally parallel to and west of Route 7.

NM1 and that portion of NM2 along Route 7 are not acceptable to Iroquois for the reasons cited above for the rejection of Route 7 in general. In addition, in the area along Route 7 near the intersection of Route 37, there are a number of structures immediately adjacent to the road that would be disturbed during construction.

The portion of NM2 which is located west of Route 7 would encounter a number of structures in the area opposite milepost 292.6 of the proposed route. In this area there are a number of structures located between the toe of a slope and Route 7; although it may be possible to route the pipeline between these structures, the pipeline would be extremely close to these structures, and without significant justification for this level of disturbance to existing structures, Iroquois is opposed to this alignment.

All three alignments would traverse Morrissey Brook, Bullymuck Brook, and Rocky River, as well as several smaller unnamed tributaries. The proposed route would traverse more areas of hydric soils (1950 feet) than either NM1 (350 feet) or NM2 (850 feet). However, both alternate routes would traverse more wetlands identified by the NWI (four forested or scrub shrub drainages along the alternates versus three along the proposed route).

In summary, Iroquois rejects the alternates NM1 and NM2 because of potentially serious construction constraints associated with steep side slopes, potentially severe and unnecessary impacts to residential and other structures, and the fact that the pipeline could not be installed in Route 7 without incurring significant impacts.

In addition, it should be noted that Iroquois has consulted with residents of the Stillson Hill area, and although it is understood that they are generally opposed to the pipeline route in New Milford as a whole, there has been general agreement with a routing variation to the west of the proposed route that would alleviate many of the concerns of the residents in this area. This route variation has been filed with FERC in the comments to the DEIS submitted by Iroquois on February 15, 1990. On the other hand, a number of residents

were vehemently opposed to an alignment to the east of Stillson Hill Road.

New Milford 3 and 3a

The combination of Alternatives 3, 3a, 3b and 3c would replace the proposed route between mileposts 294.6 and 297.6. Since Alternatives 3 and 3c are common to any of these alternative alignments (see the maps submitted as part of Iroquois' March 30, 1990 comments), the following discussion refers to Alternates 3a and 3b (each of which includes alternates 3 and 3c) in relation to the proposed route.

All three routes are approximately the same length, although both 3 (at 3.05 miles) and 3a (at 3.23 miles) are slightly longer than the proposed route (3.0 miles). The two alternates share the same alignment for most of their length, differing from each other primarily in the vicinity of the Route 7 highway crossing.

West of Route 7, both routes traverse the Sunny Valley Foundation farm. alternate 3 crosses Route 7 between a restaurant/nightclub ("Krazy Vins") and Sobel Real Estate, and passes south of Kimberly-Clark's industrial plant. In this area, the alternate crosses through an area that is being developed (roads, sewers, etc. are in-place). Alternate 3a, on the other hand, traverses Route 7 in an area of very congested commercial development (i.e., a shopping plaza and various retail establishments); it is unlikely that the pipeline could be aligned through this area without having to remove structures. East of Route 7, the alternate passes diagonally through a tree farm area.

Both routes converge west of the Housatonic River, in the vicinity of a residential area. The alternate route would cross the Still River (which drains into the Housatonic River) very close to several residences on the north bank and within a wetland/floodplain area on the south bank. The staging area for this crossing which would have to be on the north bank due to the presence of the railroad track on the south side, would have a significant impact on the two adjacent homes. For these reasons, this area is not an acceptable location for a river crossing.

After crossing the Still River, the route would have to be aligned east of the railroad since wetlands and meanders in the river border the railroad to the west. On the east side of the railroad, steep slopes lead directly to the railroad tracks. In this area, Iroquois estimates that three or four homes would have to be removed in order to install the pipeline. This is because these homes are very close to the tracks and there is not enough room to install the pipe without impacting these structures. An alignment on the opposite side of the tracks would affect mature trees and ornamental vegetation in Harrybrooke Park, a scenic privately-owned park that is aligned generally between the railroad tracks and along the Still River. This park is open for use by town residents.

Neither of these alignments would result in less environmental impact than the proposed Iroquois route. Although both would avoid the Hill and Plain School and Candlewood Valley Country Club, impacts would occur to other residential and developed areas.

2.0 Shelton/Stratford (HVA) Alternate No. 1

This alternate was suggested by the Town of Stratford and was endorsed by the HVA, the State of Connecticut, and the City of Shelton. As discussed in comments submitted to the Corps of Engineers on March 30, 1990, Iroquois could not install the pipeline along the specific route identified by the Town of Stratford without causing significant environmental impact and without incurring unacceptable risks to the integrity of the pipeline and the railroad tracks on the east side of the river. This is because such an alignment would involve significant and unacceptable impacts to homes in residential areas of Shelton (the pipeline would have to be within an estimated 10 feet of the foundations of several homes). Similarly, on the east side of the Housatonic River, the pipeline could not be installed within the Conrail tracks -- as suggested by the town and others -- for the same general reasons (e.g., steep slopes leading down to the river, false fill in the track bed, raised trackbed, lack of workspace) as described for the Conrail Variation (see Iroquois' March 30, 1990 comment responses).

With the above caveats, the following compares the proposed Iroquois route to a modification of the Stratford alternate that would appear to reflect the intent of the comments submitted by Stratford and others. (In its comments, the HVA advocates a "creative"

approach to pipeline routing in this area in order to avoid an alignment near areas in Stratford such as Cranberry Pond). The alignment of this alternative is depicted on the attached map. Table 1 compares the general environmental features of each route.

The alternative, hereinafter referred to as the Stratford/HVA Variation, would diverge from the proposed Iroquois route at about milepost 326.6 and traverse generally due east. Land in this area consists of a mix of light industrial, residential, and agricultural uses. Between Long Hill Avenue and Route 110, the alternate would cross an area that has been cleared for residential/townhouse development.

The alternate would cross the Housatonic River through Murphy's Boat Yard (on the Shelton side of the river) and a tidal wetland (on the Milford side of the river). The pipeline would have to be located a minimum of 200 feet away from Tennessee Gas' existing 16-inch pipeline which crosses the river in the same location (this pipeline was installed in the 1950s).

On the Milford side of the river, the alternate would be aligned generally parallel to (but outside the easement of) the Conrail tracks. This area as a whole is generally undeveloped, and the principal land uses are cropland, forestland, sand/gravel mining, and scattered residential uses. The properties in the area are owned by various sand/gravel operations, by CL&P and by the State. Many of the lands are used by the Housatonic Rod and Gun Club. Some commercial uses are located adjacent to Route 15 (Merritt Parkway). As discussed in previous comments, the southern portion of this alternate would pass between two inactive hazardous/solid waste sites -- the D'Addario Landfill and the McNeil Landfill. In comparison, no such sites would be crossed by the proposed route.

The alternate route will pass through two areas in which there have been reports (one historic and one recent) of plant species of concern, whereas the corresponding portion of the proposed route would not potentially affect any such species. The historic (@ 1900) site location of the species (Phaseolus polystachyus) is reported in the Shelton area, whereas the recent record (1981) of plants of concern (including Isoetes spp., a federal candidate "2") is within the tidal wetland that the alternate would traverse on the east side of the Housatonic River.

The proposed route will cross approximately 2,210 feet of wetlands based on National Wetland Inventory (NWI) maps. In comparison, the variation will cross 1,700 feet of NWI wetlands. (For both routes, this wetland total includes the crossing of the Housatonic River.

A portion of the proposed route will be aligned parallel and adjacent to an existing CL&P right-of-way. Iroquois proposes to use 10 feet of this right-of-way for temporary construction workroom and to narrow its construction right-of-way to 75 feet in both Stratford and Milford. On the alternate route, Iroquois cannot align the pipeline directly adjacent to the Conrail tracks along most of its length due to steep slopes, sideslopes, etc.

In summary, the alternate route would result in fewer potential temporary impacts to wetlands and residences. It also would avoid an alignment near Cranberry Pond and a crossing of the Farmill River in Shelton. However, it would result in temporary impacts to Murphy's Boat Yard. The tidal wetlands along the east side of the Housatonic River would also be affected. Moreover, the alternate would be aligned linearly within the coastal zone.

In addition, Iroquois' initial review indicates that two large residential developments would be affected along the variation -- one is being proposed for location north of Route 110 in Shelton while the other is planned south of the Merritt Parkway.

Table 1
Summary Comparison
of the
Shelton/Stratford HVA Variation and the Proposed Route

	Variation	Proposed Route
Length (miles)	5.70	5.39
. Parallel to Existing ROWs	1.79	2.87
. Not Parallel to Existing ROWs	3.91	2.52
Land Uses Traversed (miles)		
. Forestland	2.70	3.75
. Open (Agricultural)	2.02	0.56
. Residential	0.27	1.00
. Commercial	0.72	0.08
. Industrial	0.01	--
Length of Housatonic River (Feet) Crossing	1270	740
Wetlands (feet)*	1,700	2,210
Significant Habitats Crossed (no.)	2	0
Hazardous/Solid Waste Sites within 200 feet (no.)	2	0

Source: Iroquois Gas Transmission System 1990.

* Based on NWI maps

3.0 CONNECTICUT

Nine route variations were submitted as part of comments provided to the FERC. (These variations are exclusive of those submitted by groups such as the Housatonic Valley Association or the State of Connecticut. Iroquois' responses to such variations are included as part of its responses to comments received concerning the project by the U.S. Army Corps of Engineers.) Iroquois' analyses of the nine route variations are presented below.

3.1 SHERMAN VARIATIONS

Location: Town of Sherman

Comments: Various options to the current route in Sherman should be evaluated. These include:

(1) Variation 1.

(2) Variation 2A.

(3) Variation 2B.

(4) Variation 3. Use of ConEd and CL & P right-of-way in northern Sherman.

These variations were proposed in order to minimize impacts to existing homes in the vicinity of the proposed route. (Dutton: NW Sherman Civic Association)

Response:
Iroquois does not prefer Variations 1, 2A, or 2B because all are either longer or would involve greater impacts to environmental resources such as wetlands and woodlands. Since none of these variations would result in significant benefits in terms of environmental or engineering factors, Iroquois sees no merit in them.

Variation 3. Iroquois has evaluated the use of the ConEd and CL & P right-of-way (ownership of the powerline changes at the New York - Connecticut border). This alternative was evaluated as part of the initial project review, but was never considered seriously. It was again considered during the Article VII process. Both evaluations involved both on-ground and aerial reconnaissance of the transmission corridor.

Iroquois would not endorse an alignment along this corridor for several reasons. First, in New York, the powerlines span several areas of wetlands or former quarries. Avoidance of the quarry in particular would require an alignment very close to homes. In Connecticut, the electric transmission line traverses the Bulls Bridge area, which is considered by some to be extremely scenic. In this area, the pipeline route would have to cross forested lands owned by the NPS along the Appalachian Trail, which traverses adjacent to the Housatonic River in this area. Consultations with the NPS dating to 1987 have indicated that an alignment across the Trail in this location would not be approved. Moreover, along this variation, the pipeline would have to cross the

Housatonic River twice in the space of 0.75 mile. The pipeline also would traverse through a new large lot subdivision that is currently being developed.

3.2 STILSON HILL ROAD VARIATION

Location: Town of New Milford

Comments: These comments address the proposed Iroquois route in the northern part of the town, specifically in the vicinity of Stilson Hill Road and point out major concerns with respect to the alignment of the pipeline along the former AT & T easement (which is no longer discernible) and through areas of wetlands and wildlife habitat. Concern also is expressed regarding private wells. (Stilson Hill Association)

Response:
As noted in these comments, Iroquois representatives have conducted walking tours of the proposed and an alternative route in this area with local residents. Iroquois has acknowledged that the route was originally aligned in this area in order to follow the AT & T easement, which was depicted on USGS topographic maps. Based on the field reconnaissance conducted of the area with the permission of the residents, Iroquois presented, in its comments to FERC concerning the DEIS, an alternative that would place the pipeline farther to the west from Stilson Hill Road, and would follow an alignment in part through fields and an existing access road. The use of the Stilson Hill Road Variation identified in Iroquois' DEIS comments would serve to avoid the wetlands located along the route of the former AT & T right-of-way, would place the pipeline farther from residences along Stilson Hill Road, and would avoid the "rock knob" and an alignment near the Hauser residence. As noted in its February, 1990 comments on the DEIS, Iroquois supports this variation.

Other alternatives to the location of the route in this area include several variations submitted by the Town of New Milford and the HVA. These alternatives are evaluated in Iroquois' responses to comments submitted to the Corps of Engineers.

3.3 BROOKFIELD VARIATION

Location: Town of Brookfield

Comments: Several comments presented alternatives to the Brookfield Wetland Variation identified in the DEIS. These involve the use of an alignment to the west of and adjacent to the Conrail tracks (and in part within the Conrail easement). (Waidelich, Williams)

Response:
Iroquois has conducted several field reconnaissances of this area with local residents and with representatives of the Town Inland Wetlands Commission. The route variation described in the comments is essentially the same as the variation identified by Iroquois in consultation with such local residents in January 1990. Iroquois presented this variation (identified as "Brookfield Variation No. 2") in its comments on the DEIS. As proposed, the variation would result in greater impacts to two residences located on the west side of the Conrail tracks. However, such an alignment would appear to avoid most wetlands; field studies will, of course, be conducted of wetlands in this area.

3.4 BUCHTA VARIATION

Location: Town of Brookfield

Comments: Alternatives involving the use of railroad rights-of-way should be used in order to avoid impacts to an existing residence. (Buchta)

Response:
Iroquois will align its pipeline along the abandoned railroad right-of-way across Mr. Buchta's property. The pipeline will be installed so that access to Mr. Buchta's property is maintained at all times.

3.5 PAUGUSSETT STATE FOREST VARIATION

Location: Town of Newtown

Comments: The pipeline route should be aligned deeper into the State Forest in order to avoid impacts to existing residential areas (potential effects identified are to aesthetics, private wells, septic systems, etc.) located in the Sandy Hook area of Newtown. (Hovious, Goodman, Hamann, Mazzariello, Dauz, Cantalupo)

Response:
Iroquois has responded to these concerns in comments submitted to the Corps of Engineers. In addition, Iroquois has held discussions with the Town of Newtown and with local residents regarding an alignment of the pipeline route farther into the State Forest. Such an alignment would place the pipeline farther from the existing residences, and would appear to alleviate concerns regarding aesthetic impacts, as well as impacts to private wells, septic systems, and to tresspassing on private lands by hunters and other recreational users of the forest (who residents fear would use the right-of-way as an access point).

Iroquois has conducted reconnaissance-level investigations of a pipeline alignment farther into the forest, and has found no engineering or environmental constraints that would preclude the installation of the pipeline

along such a route. A map depicting Iroquois' interpretation of a proposed alignment through the forest is attached.

Any of the route variations in this area would impact forested areas, which is the predominant type of vegetation. An alignment through the interior of the state forest could, however, raise greater concerns relating to forest fragmentation type of impacts. However, there exist single-track accessways into the forest already.

The State of Connecticut and others (e.g., the HVA) have expressed concern about the preservation of publicly owned lands. State representatives have indicated that an alignment deeper into the forest, while not precluded by state law, is not preferable.

3.6 CONSTITUTION BOULEVARD VARIATION

Location: City of Shelton

Comments: The pipeline route should be realigned to the north, along the Constitution Boulevard right-of-way, and should cross the Housatonic River at the intersection of Route 110 and Coram Road in Shelton. The route could then be aligned along the Conrail tracks on the east side of the river. This alignment would bypass the Town of Stratford entirely, and would avoid industrially-zoned lands along the Bridgeport Avenue (Route 110) corridor in Shelton. (Welch/Wells)

Response:
Iroquois has investigated in general an alignment of the pipeline along a variation similar to this. Such a variation was initially presented in the 1986 ER and identified as the "Housatonic River Variation". At that time, Iroquois dismissed this variation due to construction concerns.

The Constitution Boulevard Variation presents a worthwhile concept because it would result in the avoidance of various wetlands areas in Stratford. However, the specific alignment suggested in the comments is not feasible. This is because the Constitution Boulevard (Superblock Highway) in Shelton traverses steep areas in which extensive grade and ditch rock blasting would be required. Parts of this highway have been developed. Iroquois' reconnaissance indicates that there is not enough room within the right-of-way to install the pipeline. As a result, an alignment adjacent to the road would be required. Such an alignment would result in significant impacts, particularly since the road either drops off steeply or is bordered by extensive rock cuts (which would have to be blasted).

Constitution Boulevard is not yet connected between Routes 108 and 110. In this area, the pipeline would have to traverse steep rocky slopes near numerous single-family and townhouse developments. Extensive grade and ditch rock blasting would be required.

Iroquois notes that it has met with Mr. Wells regarding his industrial property along the CL & P corridor adjacent to Bridgeport Avenue. Iroquois has aligned the pipeline away from the CL & P right-of-way in this area specifically to accommodate Mr. Wells' proposed plans for industrial development (as they were presented to Iroquois in 1989). As a result, Iroquois prefers its proposed alignment in this area of Shelton and opposes the use of this variation, which would result in significant impacts to residential areas and to other areas of existing or proposed industrial use.

3.7 JAMES FARM ROAD VARIATION

Location: Town of Stratford

Comments: The pipeline should be moved to the opposite side of the CL & P right-of-way that traverses this area in order to minimize potential impacts to an existing residence, including the loss of a tree screen and potential adverse effects on a septic system and swimming pool. (Ballaro)

Response:
Iroquois is acutely aware of the various issues raised by the alignment of the pipeline along the western side of the CL & P corridor that parallels James Farm Road. Iroquois has investigated the alignment of the pipeline on the east side of this powerline, as well as within the CL & P easement. Neither option is viable. First, the CL & P easement is only about 110 feet wide, and accommodates two tower lines. There is not enough room in this area to install the pipeline. (Iroquois has, however, plans to use 10 feet of the right-of-way for construction work space.) Second, the CL & P easement abuts a slope on the east. This slope, which leads down from James Farm Road (located to the east), drops about 50 to 60 feet in the space of less than 100 to 200 feet. The pipeline could not be constructed on this sideslope without jeopardizing the stability of the slope and the integrity of the pipeline. Even if the pipeline could be installed in this location, an extensive cut into the slope would be required in order to create a level work space. This would have potentially significant impacts on the various houses that are built or are under construction along the top of the slope adjacent to James Farm Road.

Iroquois appreciates the concerns expressed by the Ballaros, and has specifically discussed with them measures that will be implemented to mitigate the effects of the construction of the pipeline adjacent to their home. Iroquois has committed to landscape the right-of-way in this area (taking care not to adversely affect wetlands) and to ensure that screening vegetation is replanted to minimize the Ballaro's views of the transmission towers.

3.8 PUTNEY DEVIATION AND NORTHEAST UTILITIES VARIATION

Location: Town of Stratford and City of Shelton

Comments: This comment reiterates comments submitted by the Town of Stratford (and echoed by the State of Connecticut and the HVA) regarding the use of alternative alignments that would either (1) avoid Stratford altogether, or (2) align the pipeline along the existing CL & P (i.e., Northeast Utilities') right-of-way. (Codespoti)

Response:
The variations suggested by this comment are the same as those described by the Town of Stratford in its comments on the DEIS. Iroquois has responded to Stratford's comments in a letter to FERC dated (February,1990), as well as in comments submitted to the Corps of Engineers on March 30, 1990.

(Mr. Codespoti, the originator of the comments, is a principal in the Pin Oak Subdivision that is located along the proposed pipeline route in the vicinity of the Carroll Variation in Stratford.)

3.9 MILFORD LANDFALL VARIATION

Location: City of Milford

Comments: These comments relate to the concerns of the Milford Harbor Management Commission that the alignment of the pipeline through its designated transient small boat anchorage area will affect the use of this area, and that the alignment of the pipeline across the Milford harbor channel will permanently limit the Harbor Commission's ability to deepen the channel. In light of these concerns, the Harbor Commission recommends an alignment on the west side of the Charles Island tombolo. (Gunther)

Response:
Iroquois is well aware of the Harbor Commission's concerns, having appeared before a meeting of the Harbor Commission in January 1990. Iroquois addressed these concerns as part of its responses to the comments received by the Corps of Engineers on the DEIS (see Iroquois' March 30, 1990 submission to the Corps). The key points of Iroquois' response are as follows:

- In the designated small boat anchorage area, the pipeline will be buried to provide sufficient depth of cover. Iroquois' analyses indicate that small boat anchors will not penetrate the substrate to this depth. (Iroquois has attached to its responses to the Corps a copy of relevant portions of its Preliminary Pipeline Design report; this report summarizes the results of studies of anchor interactions.)

- In terms of future plans for a marina in the Charles Island area,

Iroquois' pipeline would preclude in-water development in the immediate vicinity of the pipeline. However, to Iroquois' knowledge, no concrete plans exist for this area. If such a marina were to be developed, due consideration would have to be given for the shellfish resources that exist in the area. In consultations with NMFS, no indication has ever been given that marina developments on Charles Island were being considered, either in the near or long-term future.

- Iroquois investigated numerous alignments for the marine pipeline at the Milford landfall. These alignment variations are identified in Iroquois' 1986 ER, as well as in its 1988 Resource Report No. 10, Alternatives. Several of these alignment variations -- including Iroquois' initial proposal for a route in the area -- involved alignments to the west of Charles Island. NMFS and the Connecticut Department of Agriculture, Division of Aquaculture expressed significant concerns with any alignment to the west of the tombolo due to impacts to shellfish resources. In addition, Iroquois own studies revealed that this is an erosional area, which could pose some concerns for long-term pipeline stability. Moreover, in order to reach the west side of the tombolo, an alignment through the center of Silver Sands State Park (i.e., through wetlands areas) or close to residences located to the west of the park would be required.

As a result, Iroquois has no intention of supporting any alignment other than the route as presently proposed, based on the information provided by the Harbor Commission to date. Iroquois believes that its marine pipeline as proposed can be installed and operated to result in minimal impacts to not only the recreational use of the Charles Island area, but also to the marine resources. Iroquois notes that the concerns of the Harbor Commission must be balanced with the sensitive environmental resources that exist in the area. Iroquois has done this in its present alignment.

APPENDIX C

FERC DEIS RECOMMENDED MEASURES AND RESPONSE OF IROQUOIS GAS TRANSMISSION SYSTEM AS PART OF COMMENTS ON THE DEIS

7.3 FERC STAFF RECOMMENDED MEASURES

To further mitigate the environmental impacts associated with the construction and/or operation of the proposed facilities, we recommend that the following mitigation measures be included as specific conditions to any certificate issued by the FERC. Recommendations 1 through 30 pertain to both Iroquois and Tennessee; 31 through 43 pertain solely to Iroquois; and 44 through 59 pertain solely to Tennessee.

1. Both applicants shall adhere to the construction procedures and mitigation measures described in their respective application and in their responses to the staff's data requests, except as otherwise modified by these certificate conditions.

2. The applicants shall submit detailed alignment maps and aerial photography at a scale not smaller than 1:6,000. All staging areas, access roads, and other areas that would be used or disturbed shall be identified. Any alterations to the mapped route or aboveground facility locations shown on the 1:6,000 scale aerial photography filed with the Commission on January 17, 1989 for Iroquois and on July 18, 1989 for Tennessee, other than the staff's recommended variations and minor field realignments per landowner needs and requirements, shall be clearly identified and must be filed with the Secretary of the Commission and approved by the Director of OPPR prior to implementation.

   Such alterations shall include, but not be limited to, all route changes resulting from implementation of the cultural resource mitigation measures; endangered, threatened, or special concern species mitigation measures; further route modifications that may

be recommended by state regulatory authorities; and those agreed to for individual landowners which also affect adjacent parcels of property.

3. The authorized pipeline routes and aboveground facility locations shall include all of the staff's recommended route variations, alternate sites, and construction procedures identified on tables 5.1.9-2, 5.1.9-4, and 7.2-1 of this EIS. Where type "C" construction is specified on table 5.1.9-4, the applicants shall file with the Secretary of the Commission, detailed construction and right-of-way restoration plans for these areas for review and approval by the Director of OPPR prior to construction.

4. For the areas identified in table 5.1.9-2 where the applicants proposed pipeline facilities would parallel existing powerline rights-of-way, the entire 50-foot-wide permanent right-of-way shall be placed within those electric transmission rights-of-way. Additionally, the proposed pipeline construction right-of-way shall extend no more than 25 feet outboard from the existing electric utility right-of-way except where specified by recommended route variations in table 7.2-1.

5. Both applicants shall implement the "Stream and Wetland Construction and Mitigation Procedures" contained in Appendix D when constructing across flowing streams, rivers and wetlands; and shall implement the "Erosion Control, Revegetation, and Maintenance Plan" contained in Appendix C, for all other disturbed areas. Any deviation from these procedures must be reported to and approved by the Commission environmental staff at least two weeks prior to implementation. Any deviation that the staff determines to be significant cannot be implemented without the prior written approval of the Director of OPPR.

6. Both applicants shall employ at least one Environmental Inspector per construction spread to monitor compliance with all mitigation measures. The Environmental Inspector's duties and responsibilities shall include those described in section 5.1.2.1.2 of this EIS and the E&SC Plan (see Appendix C).

7. Tree stump removal shall be restricted to the area immediately over the trench and in areas where grading is required. In all other areas where tree cutting is required, trees shall be cut at ground level and the stumps left in place, unless otherwise requested by the landowner.

8. For each owner or manager of woodland, the applicants shall offer to install and maintain at all access points one or more of the ORV and pedestrian control measures described in section 5.1.9.2.1 at the completion of cleanup and reseeding.

9. During negotiations with landowners, Iroquois and Tennessee shall avoid routing the pipeline close to wells or septic systems and will take into consideration any potential plans for the expansion or relocation of these systems.

10. Prior to construction, Iroquois/Tennessee shall identify, and file with the Secretary of the Commission for review and approval by the Director of OPPR, the preferred method of disposal of any excess rock from trench excavation. Excavated rock shall not be used as backfill in rotated or permanent cropland, as well as residential areas.

and in no areas shall excavated rock be mixed with top soil during backfilling of the trench.

11. Iroquois and Tennessee shall conduct a comprehensive pre-construction survey to locate soil drainage systems. This survey should include input from landowners, state agencies, and the U.S. Soil Conservation Service. Further, both shall repair traversed soil drainage systems and demonstrate the effectiveness of such repairs. Qualified specialists shall be used to insure proper repairs and adequate probing/testing of the repaired drainage systems.

12. Prior to commencing pipeline construction, both applicants shall prepare, and file with the Secretary of the Commission for review and approval by the Director of OPPR, a proposed groundwater monitoring plan designed to provide a program for site-specific identification of community and private water supply wells and springs located near the proposed routes. The plan shall also provide for documentation of pre- and post-construction well and spring water quality and yields and should be of adequate detail to determine with relative certainty whether the pipeline construction was responsible for any adverse impact to the groundwater user. In the event that private wells or springs identified as a result of the groundwater monitoring program are damaged by pipeline construction activities, the applicants shall provide an emergency source of potable water and shall restore the system to its original capacity.

13. Iroquois and Tennessee shall prepare and file with the Secretary of the Commission a Spill Containment and Control Plan which describes the preventive and mitigative measures to be employed to minimize the impacts associated with such occurrences. These measures should include but not be limited to: requiring all fueling and lubrication to be done in areas designated for such purposes, with such areas to be located away from all water bodies; requiring each construction crew to have on hand sufficient supplies of absorbent and barrier materials to allow the rapid recovery of any spills; and development of standing procedures regarding excavation and off-site disposal of any soil materials contaminated by spillage.

14. Iroquois and Tennessee shall not conduct refueling activities or store hazardous material within 200 feet of any municipal or community water supply well.

15. Iroquois and Tennessee shall conduct streambed blasting using delayed detonations for each pair of holes to reduce the total acoustic shock wave intensity. Additionally, prior to each detonation in rivers (greater than 100 feet wide), a disturbance such as a scare charge or other methods shall be used in the water to scare fish out of the area prior to trench blasting.

16. To protect wildlife nesting along the right-of-way, Iroquois and Tennessee shall perform vegetation maintenance on the right-of-way no more frequently than once every five years and shall not undertake maintenance clearing on the right-of-way prior to August 1 of any year.

17. The applicants shall apply the total score method used by Freeman (1982) to identify all trees within or adjacent to the proposed construction right-of-way that have a score of 80 percent or greater than that recorded for that particular species in the "National

Register of Big Trees" (Prado, 1978). To avoid damage to all trees falling within this category (i.e., specimen trees), the applicants shall adjust the final route alignment so that specimen trees are avoided by allowing no trenching within 15 feet of the outer edge of the tree's drip line. Further, Iroquois and Tennessee shall identify, clearly mark and protect any trees immediately adjacent to the cleared right-of-way that are of significant value to the landowner.

18. Iroquois and Tennessee shall complete all Phase 1 and Phase 2 cultural resource reports required under the Commission's July 27, 1988 order, and forward copies to the Director of OPPR and the appropriate SHPOs. This requirement shall apply to the proposed action and the related nonjurisdictional projects identified in this EIS.

    a. In all cases where cultural resources eligible for the National Register of Historic Places (NHRP) are found within the project area, applicants shall attempt to avoid these resources. Any modifications, including route realignments, shall be filed with the Secretary of the Commission for review and approval by the Director of OPPR in accordance with condition no. 1.

    b. Where cultural resources such as archeological sites, historic districts, and significant standing structures that meet the criteria for NHRP eligibility are located in the proposed project area and cannot be avoided or would be visually affected by the project, applicants shall prepare Phase 3 mitigation or data recovery plans and submit the plans to the SHPO for comment and to the Secretary of the Commission for review and approval by the Director of OPPR.

    c. No construction shall begin in those portions of the proposed project area or any other areas that would be disturbed (e.g., staging areas, storage and maintenance areas, access roads, etc.) that contain significant cultural resources until the Director of OPPR has reviewed and approved all cultural resource surveys and mitigation plans, and has considered any comments by the appropriate SHPOs and the Advisory Council on Historic Preservation and has provided written approval.

19. The applicants shall ensure that Indian tribes and identified interested Indian groups and individuals will be consulted and provided the necessary information in order for those parties to respond to areas of historic value, including sacred areas, archeological sites and their excavation, burials, and other ethnographic use areas, with particular reference to traditional plants, animals, and ritual areas. The applicants shall provide copies of all correspondence with the above parties and all documentation on traditional Native American concerns resulting from the consultation in the cultural resources technical report. Due to the sensitive nature of this information, it shall be provided to the appropriate SHPOs marked "Sensitive" and filed with the Secretary of the Commission marked "Privileged - Do Not Release."

20. Iroquois and Tennessee, in coordination with the appropriate state agencies, shall conduct surveys of specific sites along the route which are suspected of containing vernal pool habitat or suitable habitat for state-listed species. Iroquois and Tennessee, in consultation with these state agencies, shall develop and file site-

specific construction and mitigation plans with the Secretary of the Commission for review and approval by the Director of OPPR, prior to construction.

21. Iroquois and Tennessee shall construct dry-ditch crossings of all streams that are utilized as public water sources, regardless of their size.

22. Iroquois and Tennessee, in consultation with the appropriate state agencies, shall conduct preconstruction winter surveys of the Deer Wintering Areas (DWAs) crossed to determine intensity of use and location of concern. Mitigation plans for all DWAs crossed shall be developed and filed with the Secretary of the Commission for review and approval by the Director of OPPR, prior to construction.

23. To reduce uncontrolled use of new right-of-way through forested areas, Iroquois and Tennessee shall plant dense vegetation at least 7 feet high at each road crossing of the right-of-way in all unbroken forested areas which exceed one mile in length. A vegetated berm at least two feet high shall be placed parallel to the intersected roads in these forested areas to further reduce uncontrolled access.

24. Iroquois and Tennessee shall not construct within one mile of any bald eagle roost site between the period of November 1 and March 31.

25. If hazardous wastes are encountered during construction, Iroquois and Tennessee shall stop construction and notify state and local agencies to determine the appropriate course of action.

26. Iroquois and Tennessee shall coordinate closely with the owner or manager of golf courses to be crossed to develop a construction schedule to minimize disruption and to limit the amount of time construction occurs on the property.

27. Iroquois and Tennessee shall file with the Secretary of the Commission, for review and approval by the Director of OPPR, specific construction mitigation plans for each trail crossings including the Seaway Trail, North Country Trail, Housatonic Range Trail, AT Iris Trail, Quinnipiac State Trail, Willow Brook Trail and Hanton City Hiking Trail. Mitigation measures shall include plantings and limitations of clearing to 50 feet.

28. Iroquois and Tennessee shall comply with all required mitigation recommended in the visual mitigation table (see table 5.1.9-6).

29. Prior to initiating service to the nonjurisdictional customers identified in this EIS, Iroquois or Tennessee (whichever makes the delivery) shall certify that all necessary permits to construct and operate the nonjurisdictional facilities have been obtained. Copies of all applicable permits, including any conditions and stipulations, shall be filed with the Secretary of the Commission. No gas service shall be rendered until the Director of OPPR has reviewed this material and approved the commencement of the service.

30. Within 30 days of the issuance of a certificate for this project, Iroquois and Tennessee shall each file with the Secretary of the Commission, for review and approval by the

Director of OPPR, a plan describing how the mitigating measures identified in section 7.3 of this EIS will be implemented. The plan must identify dates for (1) the completion of cultural resource requirements and other required surveys (2) the start of construction, and (3) the start and completion of restoration.

31. Iroquois shall construct the pipeline route across New York State Forests by following the route variations described in sections 3.6.9 (Harrisville), 3.6.11 (Jadwin Memorial State Forest), and 3.6.12 (Indian Pipe State Forest).

32. In the event that construction of the Long Island Sound crossing and associated landfalls occurs after March 15, Iroquois shall survey the landfall areas for piping plover nesting activity, and shall not construct at the landfall areas between March 15 and October 1 if nesting piping plovers are present.

33. Before commencing construction in Albany County, New York, Iroquois shall consult with the U.S. Fish and Wildlife Service and the New York State Department of Environmental Conservation to determine if the proposed route is in the vicinity of a bald eagle nest site. In the event that a nest site has been established, Iroquois shall develop, in consultation with the FWS and the NYDEC, a final route alignment and construction schedule which would avoid any impact on this species. The final route alignment and construction schedule shall be filed with the Secretary of the Commission for review and approval by the Director of OPPR, prior to construction in Albany County, New York.

34. At landfill sites near the towns of Russia and Dover, NY, and New Milford and Milford, CT, Iroquois shall determine if they were exclusively used as Class III fill (rock, concrete, and soil) sites. If they were used as other than Class III fill sites, or if the records are incomplete or inconclusive, Iroquois shall route the pipeline around the site to avoid the possibility of encountering toxic materials. If the landfill route cannot be avoided and toxic materials are suspected, Iroquois shall perform sufficient testing to ensure that contaminated materials will not be excavated or otherwise disturbed.

35. Iroquois shall not conduct any construction activities within 0.5 mile of the great blue heron rookery (Albany County, NY) between April 1 and July 31. In addition, Iroquois shall survey its right-of-way within 0.5 mile of the rookery to determine the location of suitable nest trees, and shall make final centerline adjustments to avoid clearing suitable nest trees.

36. Following completion of Iroquois' survey of the proposed pipeline route, route realignments to avoid known maple sugarbushes shall be filed with the Secretary of the Commission for the Director of OPPR's review and approval. Where avoidance is not possible Iroquois shall identify their economic value to establish the level of compensation for tree removal and lost production.

37. Where the pipeline would cross residential developments identified on table 5.1.9-5, Iroquois shall coordinate with the developer and realign the centerline as necessary to minimize disruption to site plans. This should be done in a manner that would encumber as a few residential properties as possible with the pipeline easement and

Creek (Lake Latonka) with the Secretary of the Commission for review and approval by the Director of OPPR, prior to construction. In addition, Tennessee shall consult with the Stockbridge Bowl Association to ensure that the proposed crossing of Larrywaug Brook does not adversely impact the drawdown capability of Stockbridge Bowl.

46. Where blasting is necessary, Tennessee shall employ the following measures to minimize possible impacts:

    a. Seismographic surveys shall be conducted to monitor ground vibrations adjacent to homes and other structures and care would be taken to ensure that vibrations due to blasting are limited.

    b. A full time blasting consultant shall be employed; types of explosives, loading quantities and procedures, drill patterns, and timing of delays would be approved, as would the method, use, and type of matting to minimize vibrations and fly-rock.

    c. Blasting would not be permitted within 10 feet of existing structures. Precautions would be taken where the proposed route parallels or crosses existing electrical transmission corridors. In such areas, the use of electrical detonation caps would be restricted.

    d. All blasting shall occur during daylight hours.

    e. At homeowner's requests, pre-blast and post-blast foundation inspections shall be conducted to ensure structures are not damaged within 100 feet of the blasting zone.

47. Tennessee shall not maintain any new additional permanent right-of-way through the Allegheny National Forest and shall consult with the forest's wildlife biologist for recommended plantings to revegetate the unmaintained portions of the right-of-way.

48. Tennessee shall limit any additional clearing for construction through the Onondaga (Onondaga County, NY) deer winter area to 25 feet.

49. Tennessee shall not construct across or temporarily drain the beaver ponds in the vicinity of MP 300 + 2.34 and MP 301 + 1.01 (Mercer County, PA) before August 1, when the waterfowl nesting season has been completed.

50. Tennessee shall have a qualified biologist available during construction in order to relocate to nearby suitable habitat any Eastern Massauga snakes encountered in pipeline right-of-way in Mercer County, PA.

51. Tennessee shall realign the Columbia/Berkshire Loop to the north side of the existing right-of-way to avoid the Kampoosa Bog located between MP 256+6.0 and MP 256+8.0.

would make use of the development's access roads wherever possible without adversely affecting other resources.

38. Iroquois shall limit the construction right-of-way to 75 feet and the permanent, cleared right-of-way to 50 feet.

39. Iroquois shall develop final alignment and mitigation plans for land trust crossings and file them with the Secretary of the Commission for the Director of OPPR's review and approval, prior to construction.

40. Iroquois shall implement its proposed Land Preservation and Enhancement Program (LPEP) to offset impacts to public interest areas located on or near the right-of-way. In addition, Iroquois shall conduct its proposed ecological impact studies to assess the long-term affect of construction and operation of the Iroquois pipeline on streams, wetlands, deer wintering areas, and upland forest habitats. However, in order to ensure that Iroquois-proposed ecological studies are properly designed and implemented to answer long-standing questions pertaining to the ecological impact of constructing natural gas pipeline facilities in the northeastern U.S., Iroquois shall file a detailed design and implementation plan for each phase of its proposed ecological impact study with the Secretary of the Commission for review and final approval by the Director of OPPR, prior to implementation.

41. Iroquois shall utilize the following schedule when constructing across the specified water bodies: the Hudson River shall be crossed between August 1 and November 30; the Housatonic River shall be crossed between October 1 and December 31; the Long Island Sound shall be crossed between October 1 and May 31; and the St. Lawrence River shall be crossed between July 1 and August 31. In addition, Iroquois shall adopt the timing constraints contained in table 5.1.4-1 when constructing across cold-and warm-water streams in New York.

42. Iroquois shall undertake a survey of wetlands at the St. Lawrence River crossing area. If the boundaries are found to be as previously mapped, Iroquois shall reroute and move the staging area to the west in order to reduce the wetland area traversed.

43. Iroquois shall prepare site specific wetland restoration plans for wetlands disturbed at both the St. Lawrence and Hudson River staging areas. These plans shall be filed with the Secretary of the Commission for review and approval by the Director of OPPR, prior to construction.

60. Iroquois shall not construct within Connecticut's or New York's coastal management zone until it has filed proof with the Commission that the responsible state agencies concur that the proposed facilities are consistent with each states' coastal zone management program. Determination from each state shall be filed with the Secretary of the Commission for review prior to construction.

C7-1. Iroquois submits the following comments regarding the FERC Staff's recommended measures (see Section 7.3, pages 7-7 to 7-18).

The following comments refer to the Staff's recommended measures applicable to the Iroquois project. These include Nos. 1 through 43 and No. 60.

As a general comment that pertains to many of the Staff's recommendations, Iroquois is concerned about the requirement for the submission of various data for review and approval to both the Secretary of the Commission and to the Director of the Office of Pipeline and Produce Regulation (OPPR). Specifically, Iroquois urges that if such approval is necessary, then a definitive schedule be set within which the OPPR would be required either to review and approve the submission or to provide reasons as to why the submission cannot be approved. If OPPR does not comment within the specified period, then it should be assumed that approval is given.

Iroquois' specific comments on each of the 44 recommendations pertinent to the project are discussed below.

1. Iroquois agrees to adhere to the construction procedures and mitigation measures described in its application and in its responses to Staff's data requests. These procedures will be specifically defined in Iroquois' EM & CPs (prepared for New York) and the D & M plan (prepared for Connecticut). However, it should be noted that Iroquois takes exception to some of the conditions recommended in the DEIS, as explained in previous comments or in response to the following recommendations.

2. Iroquois agrees to submit to the FERC detailed alignment maps, which will be based on aerial photography, that identify the right-of-way, staging areas, access roads, and aboveground facility locations. These alignment maps will be at a scale of 1 inch = 500 feet, and will be the same maps submitted as part of the EM & CPs and the D & M Plan. In congested areas, or areas of specific sensitivity (e.g., road crossings, wetlands crossings), Iroquois will provide detailed drawings at a scale of 1 inch = 200 feet or greater.

Iroquois further proposes that the definition of "minor field realignments" that do not have to be filed with the Secretary of the Commission and approved by the Director of the OPPR include route adjustments that do not affect other landowners, do not impact any significant environmental resources, and are no more than 660 feet from the certified centerline. Iroquois proposes such a clearcut definition in order to limit the burden placed on the Director of the OPPR for the review of minor changes that will not result in significant environmental impact, or decisions regarding tradeoffs among different environmental features. Iroquois also is concerned about the time required for the Director of the OPPR to review the various minor alignment modifications that could easily occur as a result of minor deviations to avoid resources such as wetlands delineated during field reconnaissance or archaeological sites identified during field investigations. Such minor modifications will undoubtedly occur, given Iroquois' policies to avoid

wetlands and to mitigate impacts to potentially significant cultural resources through avoidance wherever practical.

As an alternative to Staff's recommendation in this area, Iroquois is willing to submit proposed route modifications to FERC Staff for review and to consult regularly with Staff regarding this issue. Iroquois proposes that Staff have the authority to approve such minor changes, with the Director of the OPPR involved only in instances that require trade-offs between environmental resources that are clearly significant.

Finally, if FERC requires information regarding route modifications, a schedule for the submission and review of such materials should be clearly defined.

3. Iroquois agrees with this recommendation, with the following exceptions:

- Where Iroquois has taken exception to FERC Staff's recommendations regarding routing or where Iroquois has provided updated information regarding aboveground facility locations (refer to Iroquois' comments regarding Table 5.1.9-2, Table 5.1.9-4, and Table 7.2-1).

- Detailed plans for "Type C" residential mitigation will be submitted to FERC as part of the alignment maps and plans described in (2) above.

- If approval from the Director of the OPPR is required, then a time limit of one month from the date of submission should be set for the completion of this review.

4. Iroquois has thoroughly investigated the use of powerline rights-of-way as recommended by the FERC. Iroquois' detailed response to this recommendation is discussed in Comment 5-9, in specific reference to Table 5.1.9-2. As Comment 5-9 notes, except in specific cases, Iroquois disagrees in general with the placement of the entire permanent easement within an existing powerline right-of-way. Iroquois' position is based on the consideration of safety, construction, environmental, and legal issues relative to the use of most utility rights-of-way.

5. Iroquois agrees with this recommendation, except as noted in its comments concerning Appendix C and Appendix D (refer to Comments CC-1 and CD-1).

6. Iroquois agrees with this condition.

7. Iroquois has agreed not to remove tree stumps in wooded wetlands where the soils are saturated, except those along the trench line. However, along the entire right-of-way where trees must be cut (including upland areas), Iroquois cannot agree to remove tree stumps only in the area immediately over the trench and in areas where grading is required.

As a result of the rural nature of most of the roads in the project area and weight restrictions on such roads and bridges, Iroquois intends to utilize the right-of-way as the primary accessway for construction vehicles and

equipment. Iroquois estimates that in excess of 150 vehicles will be involved in the construction of each spread. If stumps were left in place, the movement of construction traffic along the right-of-way -- and thus the speed at which construction could proceed -- would be impeded significantly. As a result, vehicular speeds would have to be significantly reduced, and extra precautions would have to be taken with rubber-tired vehicles. Leaving the stumps in place also could create a safety hazard (associated with difficulties in the handling of construction equipment and pipe during pipe laying operations).

To increase worker safety and to facilitate vehicular use of a right-of-way in which tree stumps are left in place, fill materials would have to be hauled in from off-site and placed over the stumps. This is not practical, from either economic or environmental perspectives (because the fill material would necessarily mix with the soil and would be difficult to remove later).

8. Iroquois agrees with this recommendation, but notes that individual landowner preferences must be considered in the type of mitigation measure used.

9. Iroquois agrees with this recommendation.

10. Iroquois agrees not to use excavated (shot) rock as backfill in rotated or permanent cropland, and not to mix excavated rock with topsoil during the backfilling operation. However, Iroquois is unclear as to the intent of Staff's recommendation regarding the use of rock as backfill in residential areas. If the pipeline is installed through bedrock in the vicinity of a residential area, after a suitable padding is placed around the pipe, the rock excavated from the trench will be used as backfill. Topsoil will be placed over this, and any excess rock will be disposed of pursuant to landowner requests and rock disposal plans approved by the involved agencies.

Prior to construction, Iroquois agrees to submit to the Commission its preferred methods of excess rock disposal. However, it should be understood that the preferred methods of disposal will vary along the pipeline route, and that the exact quantities of excess rock that will require disposal can only be estimated. This is because the actual amount of ditch (as opposed to grade) rock encountered during construction cannot be accurately predicted.

It is Iroquois' intent to regrade the right-of-way to original contours, where practical. Some of the excess rock will be used for this purpose.

11. Iroquois agrees with this recommendation, and has already begun the process of contacting landowners, as part of the survey process, regarding soil drainage systems. The locations of such drainage systems will be determined based on existing data and landowner consultations.

12. Iroquois agrees with this recommendation, except that the groundwater monitoring plan should be limited to those areas in which wells are located within 300 feet of the centerline of the pipeline where blasting is expected to be required.

13. Iroquois agrees with this recommendation.

14. Iroquois agrees with this recommendation.

15. Iroquois agrees to employ methods for instream blasting that will limit impacts to fish resources in sensitive streams. Delayed detonations, air bubble curtains, and scare charges are among the methods that could be used. However, the specific blasting techniques to be employed at a particular stream (e.g., whether delayed detonations for each pair of holes should be used) should be determined by the blasting consultant that Iroquois will hire. This should not be a blanket recommendation.

16. Iroquois agrees with this recommendation.

17. Iroquois is in the process of conducting vegetation surveys, including surveys to identify specimen trees. However, the methods used to identify the specimen trees differ slightly from those proposed by the FERC staff. Specifically, IGTS proposed to identify those trees which have a score of 90% or greater than that recorded for that particular species on each state's Big Tree List, rather than a score of 80% on the National Register of Big Trees. To accommodate the FERC staff recommendation, Iroquois will review both criteria, and identify those trees meeting the strictest standard.

The Staff's recommendation to "identify, clearly mark, and protect any trees immediately adjacent to the cleared right-of-way that are of significant value to the landowner" is nebulous. Iroquois' proposal for a 100-foot-wide right-of-way is to ensure that no damage occurs to properties adjacent to this area. As part of consultations with landowners during the easement negotiation process, Iroquois will note any special concerns of the landowners, including trees that are to be avoided, if possible.

18. Iroquois agrees with this recommendation, except for those items relating to the timeliness of review by the Director of the OPPR. Item 18(c) should be rewritten to make clear that construction activities can proceed in areas of the project that do not contain significant cultural resources, and that the reference to the "review and approval of surveys and mitigation plans" relates to those portions of the project area that contain significant cultural resources.

19. Iroquois generally agrees to this provision, and has already consulted with groups with traditional links to the project area. The results of these consultations revealed no concerns on the part of the tribes. With respect to the implementation of this provision, Iroquois urges that the role of the applicant and the FERC Staff with respect to consultations with Indian tribes and interested Indian groups be coordinated. In Section 4.1.11, the FERC indicates that contacts with such groups will be made by Staff. Unless Iroquois is fully apprised of those contacts, the applicant can not "ensure" that all such groups are consulted, as recommended in this provision.

20. Iroquois has agreed to conduct surveys for state-listed species of concern. The surveys will be conducted within the proposed right-of-way in those areas where suitable habitat exists and where such species are reported to occur or where there is reason to believe that they may occur. If state-listed species are found to be present, Iroquois will develop, in consultation with appropriate state agencies, specific construction and mitigation plans, and submit these to the Secretary of the Commission for review and approval by the Director of OPPR prior to construction.

With respect to vernal pool habitat, Iroquois is currently conducting, and will continue to conduct, on-ground reconnaissance of the entire pipeline route to field-identify and delineate wetlands. The surveys utilize the uniform federal wetlands delineation procedures (i.e., vegetation, hydrology and hydric soils). In Connecticut, a soil scientist will be part of the survey team and will identify hydric soils (the basis for wetlands delineation for Connecticut local governments). Vernal pool habitats will qualify as wetlands, and would be identified during these surveys. Any recorded important vernal pool or habitat for state-listed species would have been noted during consultations with New York and Connecticut significant habitat unit personnel.

21. Iroquois does not agree with this provision. Dry ditch crossings of all streams that serve as potable water supplies, regardless of size, are not feasible for a number of reasons. First, as a practical matter, size does play a major role in the selection of a construction method for a stream crossing. The dry ditch method is not applicable to large rivers and streams. For example, the Hudson River is a public water supply, the crossing of which could obviously not be accomplished using the "dry" method. Second, streams with rock bottoms, in which blasting is required, cannot be crossed using the dry method unless trade-offs are made in terms of increased impacts on other environmental features.

Moreover, depending on the distance of the proposed pipeline crossing location from the municipal water intake on a particular water body, there may be no need for the use of a dry crossing. This is because studies have demonstrated that sedimentation from in-stream construction activities is typically limited to the immediate vicinity of the trench (i.e., generally within 0.5 miles downstream of the crossing). This is noted in the DEIS on page 5-29.

As a result of these concerns, Iroquois proposes that this recommendation be modified to state that dry ditch crossings should be performed of streams that serve as public water supplies whenever the dry construction technique is feasible, and that particular care should be taken to limit downstream sedimentation in all areas in which the pipeline crossing is located 2 miles or less upstream from the public water supply intake point.

22. Iroquois agrees with this recommendation.

23. Iroquois generally agrees with the principle of this recommendation, understanding it to mean that vegetation will be planted that will attain a height of at least seven feet when mature. A two-foot-high berm, in addition to the use of a vegetative screen (or other methods of preventing uncontrolled access to the right-of-way), would only be contemplated in certain circumstances and if it would not interfere with the reestablishment of pre-construction drainage patterns. This entire condition also should be subject to landowner approval, because virtually all of the property traversed by the Iroquois route is private.

24. Although Iroquois generally agrees with this recommendation, the statement should be clarified. Iroquois assumes the intent of the recommendation is to prevent disturbance to wintering bald eagles during construction. Based on existing information, there are no known bald eagle wintering areas in the immediate vicinity of the proposed route, and the

constraints on construction would present no scheduling conflicts. However, bald eagles are known to winter along the St. Lawrence, Hudson, and Housatonic rivers and portions of the pipeline construction across the Hudson and Housatonic rivers may overlap the wintering period, which extends from November 1 through March 31.

It should be noted that in-stream construction across the Hudson River has a timing window of August 1 to November 30, while FERC has recommended construction of the Housatonic River crossing during the October to December period. As noted in response to Recommended Measure No. 41 below, Iroquois proposes that the construction window for the Housatonic River crossing be extended to encompass the period October through February.

Because there exists the possibility that wintering eagles may be present at some time in the vicinity of these pipeline crossings, and may utilize roosting trees near the crossings, Iroquois recommends that consultations with appropriate state and federal wildlife agencies be relied upon to determine whether a potential exists for the construction to significantly affect wintering eagles.

25. Iroquois agrees with this recommendation.

26. Iroquois agrees with this recommendation, and has already had contact with the manager of the Candlewood Valley Golf Course in New Milford, Connecticut, the only course along the proposed route. Iroquois anticipates that construction across the golf course can be accomplished quickly (i.e., in about a week) and that a schedule can be developed so that the impacts on the use of the course are minimized.

27. Iroquois agrees to file with the Commission specific construction mitigation plans for the Appalchian Trail and the Housatonic Range (Candlewood) Trail. In addition, based on consultations with the Town of Monroe, Iroquois has agreed to provided a mitigation plan for the Pomperaug Blue Dot Trail.

Since the Seaway Trail is New York State Highway 37, (and the proposed pipeline crossing of this highway is in an area of no particular scenic value), Iroquois proposes to construct this highway crossing in the same manner as it will install the pipe across all similar state highways; therefore, a specific mitigation plan for this area is not required. The North County Trail is a proposed national hiking trail, the location of which is still uncertain in the general vicinity of the Iroquois route. All of the lands on which the trail would be located in the Iroquois project area are private and, to the best of Iroquois' knowledge, a specific alignment of the trail across such lands has not been established. Consequently, it would be difficult for Iroquois to submit a specific construction and mitigation plan for this area.

Iroquois agrees to limit its right-of-way across the Appalachian Trail to 50 feet. For the reasons described above, there exists no similar basis for limiting the width of the right-of-way across Route 37 or in the vicinity of the North Country Trail. If, after the construction of the pipeline, the North Country Trail is established across the right-of-way, Iroquois would be willing to consult with the National Park Service to develop a vegetative screening plan, if such a plan is appropriate. The exact width of the construction right-of-

way, across the other trails would be determined subsequent to field investigations.

28. Iroquois agrees in principle with this recommendation. However, until site-specific surveys have been completed, Iroquois cannot agree to limit its construction right-of-way. This is because the presence of rock may dictate that the "normal" right-of-way width be utilized.

29. This FERC recommendation specifies that Iroquois cannot initiate service to a non-jurisdictional customer until Iroquois has certified to the Commission that all necessary permits to construct and operate that customer's non-jurisdictional facilities have been obtained and the Director of OPPR has approved the commencement of service. Iroquois has no objection to this recommendation insofar as it relates to the physical deliveries of gas to the non-jurisdictional customers. However, Iroquois proposes that the recommendation be modified to make clear that it relates solely to the physical flow of gas and does not supersede any right Iroquois may have under its gas transportation contracts to commence collecting reservation charges when Iroquois is ready to commence service, notwithstanding the inability of the non-jurisdictional customer to accept that service.

Specifically, Iroquois proposes that Recommended Measure No. 29 be amended by striking the final sentence and replacing it with the following sentence:

> "No gas deliveries shall commence to a non-jurisdictional customer until the Director of OPPR has reviewed the materials provided for that customer and approved the commencement of deliveries to that customer, provided, however, that nothing in this Recommended Measure shall be construed as superseding or otherwise affecting any right Iroquois or Tennessee may have under its Gas Transportation Contracts to commence the collection of demand or reservation charges when Iroquois or Tennessee is ready, willing and able to commence service to a customer.

30. Iroquois agrees with this recommendation. However, a timetable should be given for the Commission's review and approval of this plan.

31. While Iroquois understands the circumstances which motivate FERC in its position on the crossing of New York State Reforestation Lands (SRLs), Iroquois urges FERC to reconsider that policy. The New York State Constitutional provision limiting easements across SRLs is itself a measure with environmentally protective purposes. In the interests of comity with the state, respect for its environmental enactments, and the avoidance of potential litigation, Iroquois urges FERC to reconsider its position.

32. Iroquois generally agrees with this provision. However, the recommendation should be clarified to insure that the assumed intent (i.e., to protect nesting piping plovers) is met without posing unnecessary restrictions on pipeline construction scheduling.

First, it should be noted that since marine construction is scheduled for the period between January and May 31, some marine pipeline construction activities are likely to be underway when the nesting season for plovers begins. However, such activities may be centered in the offshore -- rather

than the nearshore waters or at the landfalls. If plovers select a nesting site in the vicinity of the pipeline landfall while construction activities at that landfall are underway, it can be assumed that such activity is not a significant disturbance to the nesting activity, and construction should be allowed to continue.

If nesting plovers are found in the vicinity of the landfall when no construction activities are underway, Iroquois recommends that consultations with appropriate state and federal wildlife agencies be held to determine whether the nest is near enough to the landfall to result in significant disturbance. Iroquois would commit to such consultations.

33. Iroquois agrees with this provision.

34. Iroquois agrees with this recommendation, and has already incorporated proposed route changes that have been recommended by Staff to avoid two of these sites (i.e., the Rose Valley Landfill in Russia, New York and the Mica Products/Walter Vincent landfills in Dover, New York).

35. Iroquois disagrees with a blanket restriction on any construction activities within 0.5 mile of a heron rookery from April 1 to July 31, but would agree to comply with timing restrictions determined on a case-by-case basis. The potential disturbance to a heron nesting colony would be based on a number of factors, including the extent to which the colony is screened from the construction area by intervening vegetation or topography; the degree of other non-pipeline related disturbance in the area, such as road traffic and farm machinery, to which the birds had become accustomed; the stage of the nesting cycle when construction is planned (i.e., the likelihood for nest abandonment would decline as the nesting cycle proceeds); and the type of construction activity that is planned.

Iroquois agrees to survey for existing colonies within 0.5 of the right-of-way, and to search the right-of-way area within 0.5 miles of any nesting colonies that are located to determine whether suitable nesting trees are present. Based on the survey, final centerline adjustments will be made where possible to avoid clearing suitable nesting trees.

36. Iroquois agrees with this recommendation.

37. Iroquois agrees with this recommendation, and has already consulted with residential developers regarding this matter. Such consultations can be expected to continue.

38. Iroquois disagrees with this uniform restriction on the width of the construction and permanent rights-of-way. Iroquois proposes the use of a 100-foot wide right-of-way for construction and a 60-foot wide permanent easement.

Iroquois fully understands the FERC Staff's rationale for proposing to limit the width of the right-of-way -- that is, to reduce disturbance to forested areas. If the FERC's recommended 75-foot-wide right-of-way were used along the entire Iroquois route, then a maximum of 416 acres of woodlands could potentially be preserved. However, as a practical matter, this total amount of woodlands could not be preserved since it will be impossible to limit the width of the right-of-

way along the entire pipeline route. For example, in areas of steep slopes, grade rock, or side slopes, additional work room will be required to store the excess material that will be temporarily relocated to the edge of the right-of-way in order to create a level construction area, as well as to provide passage for construction vehicles. Similarly, at certain stream crossings, staging areas and spoil storage areas will be required. Moreover, by limiting the construction right-of-way to 75 feet, adequate space could not be provided for the effective segregation of topsoil and subsoil, resulting in mixing during the backfilling of the trench. This would cause significant, long-term impacts in cultivated agricultural lands and in woodlands, and could limit the effectiveness of right-of-way restoration.

The Iroquois partners' extensive experience in constructing major pipelines in environments similar to those encountered by the proposed project also has shown that where construction rights-of-way less than 100 feet wide are used, extensive off right-of-way damages typically occur. This was the situation on the North Bay Shortcut, a large diameter pipeline constructed by TCPL in 1983. Some of Iroquois' particular concerns with respect to a 75-foot-wide construction right-of-way include:

- In agricultural areas, at least 100 feet is required to ensure proper topsoil stripping and adequate topsoil and subsoil segregation during store (full right-of-way width topsoil stripping could require a wider area).

- Iroquois expects to encounter a substantial amount of grade and ditch rock. This rock will have to be stored at least temporarily on the right-of-way; such rock must be segregated from the topsoil and subsoil storage piles. Moreover, if such rock "spills" into adjacent wooded areas, damage to trees could occur (during attempts to remove the rock).

- Tree stumps similarly may have to be temporarily stored on the right-of-way (i.e., during construction) prior to off-site disposal.

- Due to the terrain along portions of the Iroquois route, considerable grading is expected to be required. Sufficient space on the right-of-way is needed to store this material.

As a result, even if FERC limits the right-of-way to 75 feet, additional work room will still be required.

Iroquois' approach is to contain all construction activity within the 100-foot-wide right-of-way. In this manner, landowners will be fully compensated for the use of the easement area and any off right-of-way damages will be minimized or eliminated.

While Iroquois cannot agree with the blanket use of a 75-foot-wide right-of-way for construction along the entire pipeline route, Iroquois will agree to reduce the construction easement to 75 feet wherever physical constraints allow, for short distances in environmentally sensitive areas, or in residential areas. In fact, Iroquois' approach will achieve the same end result as the FERC Staff's recommendation; however, instead of assuming an initial 75-foot-wide

construction easement (and then having to identify all of the areas where pushouts, staging areas, steep slopes, side slopes, stream crossings, or rock will require a wider right-of-way), Iroquois proposes to start with a 100-foot-wide construction area and identify all areas in which the use of a narrower construction easement is practical. Given the terrain traversed by the proposed project (including various areas of grade and ditch rock, slopes, streams), Iroquois contends that this is the most logical approach.

Table 7.38-1 (attached) identifies the areas in which Iroquois proposes to use a 75-foot-wide construction easement. This table was developed based on the detailed review of the entire pipeline route by Iroquois' construction spread supervisors, who are the most familiar with the terrain along the proposed right-of-way. As this table shows, Iroquois proposes to limit the construction right-of-way to 75 feet or less for approximately 135 miles (or about 39% of the land portion of the route). This includes 34.3 miles of the route in Connecticut and 100.9 miles of the route in New York.

With respect to the permanent easement, Iroquois has committed to limit the width of the right-of-way maintained in non-woody vegetation to 50 feet in forested areas. However, for safety purposes, Iroquois proposes to maintain the rights to a permanent easement on a 60-foot-wide area. Since woody vegetation will be permitted to reestablish within all but a 50-foot-wide area, this proposal conforms to the FERC's Staff's recommendation from an environmental viewpoint. As a result, a 60-foot-wide permanent easement should be approved in accordance with Iroquois' approach as described above.

39. Iroquois agrees with this condition.

40. Iroquois agrees to this condition regarding the LPEP. As noted at pages 22-23 of Iroquois' December 29, 1989 Amendment and in the response of Iroquois Gas Transmission System to Comments, Protests and Requests for Hearings and Clarification (February 13, 1990) at 15, Iroquois' willingness to implement the LPEP program is specifically conditioned upon a Commission judgement that LPEP expenditures meet the "used and useful" test and are therefore includable in the rate base. Iroquois agrees to implement ecological studies as specified in this recommendation, and as stipulated in the New York State Article VII process. Iroquois agrees to submit to the Commission for review and approval a detailed design and implementation plan for each phase of these studies. However, since some of the studies are season-specific, the prompt receipt of comments from FERC on this plan will be essential. Iroquois thus recommends that a definitive schedule for such review and comment be established with the FERC.

41. Iroquois agrees with this recommendation, with the understanding that the dates listed apply to instream construction activities, except that Iroquois strongly urges the FERC to extend the time period for instream construction of the Housatonic River crossing to encompass the period October through February. This extension would assure that construction of the crossing will occur in the 1990-1991 winter, thus facilitating Iroquois' critical November 1, 1991 in-service date. Construction activities on upland areas in preparation for the crossings of major rivers could occur outside of the windows listed.

42. Iroquois agrees to this recommendation, and has already conducted these wetlands surveys. Iroquois has modified its proposed staging area, and the

associated location of the right-of-way through the backshore, to minimize impacts to wetlands.

43. Iroquois agrees with this condition for the Hudson River. Because the realignment of the staging area at the St. Lawrence River eliminates impacts to all but a narrow riparian wetland that could not be avoided, Iroquois does not believe that a specific mitigation plan for this area is warranted.

60. Iroquois has filed coastal zone consistency certifications with the appropriate agencies in both New York and Connecticut, and has provided copies of these submittals to the FERC. Iroquois agrees with this recommendation.

TABLE 7.38-1

IROQUOIS GAS TRANSMISSION SYSTEM:
Areas in which a restricted construction area could be used*

Construction Spread	Mileposts	Total Miles
Spread 1		
	0.75-1.75	1.00
	6.05-7.00	0.95
	12.50-13.25	0.75
	13.70-13.75	0.05
	14.00-15.45	1.45
	15.75-16.45	0.70
	18.05-19.10	1.05
	21.05-22.10	1.05
	24.00-25.00	1.00
	25.95-27.95	2.00
	31.10-32.00	0.90
	43.50-49.40	5.90
	50.95-51.75	0.80
	53.45-58.75	5.30
	77.50-78.00	0.50
	82.00-87.00	5.00
	89.50-91.00	1.50
	94.50-95.25	0.75
Spread 1 Total		**30.65**
Spread 2		
	95.50-98.40	2.9
	98.60-99.00	0.4
	100.20-100.60	0.4
	101.70-102.00	0.3
	102.20-102.40	0.2
	102.60-102.70	0.1
	103.00-103.80	0.8
	107.80-108.00	0.2
	108.30-108.70	0.4
	109.50-111.40	1.9
	112.00-113.00	1.0
	114.40-115.60	1.2
	115.80-117.80	2.0
	118.70-120.40	1.7
	120.70-122.10	1.4
	122.30-122.50	0.2

TABLE 7.38-1 (Continued)

Construction Spread	Mileposts	Total Miles
	128.80-123.30	0.5
	124.50-125.20	0.7
	126.60-128.80	2.2
	129.00-129.40	0.4
	129.80-129.90	0.1
	130.70-130.90	0.2
	134.90-136.20	1.3
	136.60-136.70	0.1
	136.80-137.20	0.4
	137.60-137.70	0.1
	153.30-154.00	0.7
	155.80-156.00	0.2
	166.80-167.00	0.2
	168.90-169.10	0.2
	171.30-171.40	0.1
	172.70-173.00	0.3
	173.20-174.40	1.2
	176.40-176.90	0.5
	183.40-183.90	0.5
	188.50-188.60	0.1
Spread 2 Total		**25.1**
Spread 3		
	192.60-193.11	0.51
	193.60-194.14	0.54
	194.21-195.66	1.45
	195.72-196.22	0.50
	196.43-197.08	0.65
	197.14-197.39	0.25
	198.00-198.84	0.84
	198.90-199.34	0.44
	199.52-199.86	0.34
	199.92-200.96	1.04
	201.04-201.44	0.40
	201.66-203.50	1.84
	203.56-203.75	0.19
	204.70-205.18	0.48
	205.24-206.32	1.08
	206.42-206.72	0.30
	208.22-209.35	1.13
	209.41-209.51	0.10
	209.81-211.17	1.36
	211.25-211.35	0.10

TABLE 7.38-1 (Continued)

Construction Spread	Mileposts	Total Miles
	212.00-212.40	0.40
	213.18-213.38	0.20
	213.60-214.09	0.49
	214.15-214.30	0.15
	215.51-215.93	0.42
	215.99-216.07	0.08
	216.13-216.75	0.62
	218.12-218.79	0.67
	222.00-222.39	0.39
	222.45-224.00	1.55
	225.30-225.92	0.62
	228.72-229.60	0.88
	229.66-229.80	0.14
	232.96-235.52	2.56
	235.56-236.40	0.84
	236.48-236.58	0.10
	236.64-239.57	2.93
	240.59-240.75	0.16
	241.80-242.80	1.00
	242.87-243.88	1.01
	243.95-244.80	0.85
	245.47-245.88	0.41
	245.99-246.73	0.74
	248.71-248.80	0.09
	248.91-249.12	0.21
	249.19-249.30	0.11
	264.00-264.27	0.27
	264.34-264.59	0.25
	264.66-264.80	0.14
	265.92-266.17	0.25
Spread 3 Total		**32.07**
Spread 4		
Areas of 75-foot-wide Right of Way		
	270.50-270.75	0.25
	281.00-281.85	0.85
	282.35-284.15	1.80
	285.10-285.40	0.30
	285.60-286.00	0.40
	286.50-286.80	0.30
	286.90-287.15	0.25

TABLE 7.38-1 (Continued)

Contruction Spread	Mileposts	Total Miles
	287.30-287.60	.30
	288.95-289.50	.55
	290.35-291.60	1.25
	292.15-293.10	.95
	294.60-297.05	2.45
	297.60-302.90	5.30
	303.05-304.10	1.05
	304.20-305.60	1.40
	306.15-306.35	.20
	309.00-309.45	.45
	310.10-313.75	3.65
	314.45-315.15	.70
	316.25-316.50	.25
	317.10-318.10	1.00
	319.30-323.85	4.55
	326.10-330.80	4.70
	331.15-331.95	.80
	332.95-334.15	1.20
Spread 4 Subtotal (75-foot right-of way)		**34.90**
Areas of 90-foot-wide Construction Right-of-Way		
	315.15-316.25	**1.10**
Areas of less than 75-foot-wide Construction Right of Way		
	285.40-285.60	0.20
	286.00-286.50	0.50
	297.05-297.60	0.55
	302.90-303.05	0.15
	304.10-304.20	0.10
	306.35-306.45	0.10
	331.95-332.95	1.00
Spread 4 Subtotal (less than 75-foot-wide ROW)		**2.60**
Spread 4 Total		**38.60**
Long Island Spread		**8.80**
TOTAL REDUCED ROW (all spreads)		**135.22**

TABLE 7.38-1 (Continued)

* All final decisions on right-of-way width will be made during field surveys. It is likely that the total area will increase rather than decrease. Additional work room also will be required for:

- Full width topsoil stripping;
- Major roads and highway crossings;
- Railroad crossings; and
- Intermediate and large river crossings.

All areas of restricted right-of-way would require 75 feet for construction, unless otherwise noted.

Source: Iroquois Gas Transmission System 1990.

APPENDIX D

WETLANDS TABLE

AREAS OF HYDRIC AND ALLUVIAL SOILS TRAVERSED BY THE IROQUOIS GAS TRANSMISSION SYSTEM

LOCATION		FERC DEIS			RESULTS OF FIELD/OFFSITE DELINEATIONS						
County	Town	Milepost (a)	Class (a)	Length (ft) (a)	Actual Field Milepost (c)	Wetland ID #	Field Class.	Crossing Width A (ft)	Final Crossing Width B (ft)	Potential Reduction (ft)	Soil Series
Fairfield	Sherman				286.85		PFO1E	350	150	200	Ridg/Leics/Whit
Fairfield	Sherman	287.90	PEME	400	287.55		PEME	1300	1300	0	Raypol/Saco
Litchfield	New Milford				288.50		PFO1	1200	1200	0	Leicester/Whitma
Litchfield	New Milford				288.75		PFO1	300	300	0	Leicester
Litchfield	New Milford				289.05		PFO/SS/EM	300	300	0	Limerick/Ondawa
Litchfield	New Milford	289.15	PSS1/EME	50							
Litchfield	New Milford				289.40		PSS1/EME	250	250	0	Ondawa
Litchfield	New Milford				289.48		PFO/SS1E	50	50	0	non hydric
Litchfield	New Milford	289.87	PFO1E	50							
Litchfield	New Milford				290.05		PFO1	100	50	50	Ridgebury
Litchfield	New Milford				290.45		PFO1	150	100	50	Leic/Ridg/Whit
Litchfield	New Milford				290.55		PFO1	300	100	200	Leic/Ridg/Whit
Litchfield	New Milford	291.66	PFO/SS1E	50	291.50		PFO1	300	300	0	Limerick
Litchfield	New Milford	292.95	PFO1E	50	292.97		PFO1E	50	50	0	non hydric
Litchfield	New Milford				294.87		PEME	250	0	250	Raynham
Litchfield	New Milford				295.00		PFO1	300	300	0	Raynham
Litchfield	New Milford	297.01	PEME	50	297.00		PFO1	250	250	0	Alluvial Land
Litchfield	New Milford				297.16		Golf Course	700	700	0	Raynham(drained)
Litchfield	New Milford	297.27	POWH	50	297.27		POWH	0	0	0	Water hazard
Litchfield	New Milford				297.30		Golf Course	350	350	0	Raynham(drained)
Litchfield	New Milford	297.51	R2OWH	420	297.44		R2OWH	1000	1000	0	Genesee/Saco
Litchfield	New Milford				297.50		PFO/SS	100	100	0	Saco
Litchfield	New Milford	297.69	POWH	100							
Litchfield	New Milford				297.80		PEME	50	0	50	Wareham
Litchfield	New Milford				297.95		PEME	100	0	100	Wareham
Litchfield	New Milford				298.05		PEME	250	250	0	Wareham
Litchfield	New Milford				298.45		PEME/PFO	2700	2100	600	Wareham
Litchfield	New Milford	298.47	POWH	210							
Litchfield	New Milford	298.68	POWH	210							
Fairfield	Brookfield				299.05		PFO/SS	200	200	0	Walpole
Fairfield	Brookfield				299.20		PEM/SS	400	100	300	Walpole
Fairfield	Brookfield				300.00		PSS/EM	2300	2300	0	Walpole
Fairfield	Brookfield				300.50		PSS/EM	700	700	0	Raypol
Fairfield	Brookfield				300.67		PSS/EM	300	300	0	Raypol
Fairfield	Brookfield				301.10		PFO1	1700	1700	0	Walpole
Fairfield	Brookfield	301.56	PFO1E	50	301.54		PFO1	450	450	0	Raypol
Fairfield	Brookfield				301.66		PFO1	1300	1300	0	Raypol
Fairfield	Brookfield	302.11	PFO1E	50							
Fairfield	Brookfield	302.41	PFO1E	520							
Fairfield	Brookfield				302.33		PFO1	1550	1550	0	Raypol
Fairfield	Brookfield	302.51	PSS1F	260							
Fairfield	Brookfield				302.80		PSS/EM	250	250	0	Walpole
Fairfield	Brookfield				304.62		PFO1	400	400	0	Ridg/Leic/Whit
Fairfield	Brookfield	304.86	PFO1E	50	304.72		PFO1	75	75	0	Ridg/Leic/Whit

AREAS OF HYDRIC AND ALLUVIAL SOILS TRAVERSED
BY THE IROQUOIS GAS TRANSMISSION SYSTEM

Fairfield	Brookfield	305.09	PFO1E	50	305.10		PFO1	1000	200	800	Ridgebury
Fairfield	Brookfield	305.26	PFO1E	520							
Fairfield	Brookfield	305.40	POWH	260			-				
Fairfield	Brookfield				305.45		PEME	50	50	0	non hydric
Fairfield	Brookfield	305.60	POWH	50							
Fairfield	Newtown	306.16	PEME	50	306.07		PEME	1100	1100	0	Ridgebury
Fairfield	Newtown	306.18	PEME	630	306.32		PEME	150	150	0	Ridgebury
Fairfield	Newtown	306.30	PFO1E	420	306.42		PFO/EM	600	400	200	Scarboro
Fairfield	Newtown	306.48	R2OWH	50							
Fairfield	Newtown	306.68	PSS1/EM	150							
Fairfield	Newtown				306.82		PFO/SS	150	150	0	Ridg/Leic/Whit
Fairfield	Newtown				307.00		PFO1	300	300	0	Scarboro
Fairfield	Newtown	307.19	POWH	100							
Fairfield	Newtown				307.22		PFO1	800	800	0	Scarboro/Adrian
Fairfield	Newtown	308.11	PSS1/EME	50	308.11		PFO1	50	50	0	non hydric
Fairfield	Newtown	308.20	PEME	100							
Fairfield	Newtown				308.47		PFO1E	50	50	0	non hydric
Fairfield	Newtown	308.48	PSS1/EME	100							
Fairfield	Newtown	308.68	PSS1/EME	150							
Fairfield	Newtown				308.69		PFO1	650	650	0	Scarboro
Fairfield	Newtown				310.22		PFO1	150	150	0	Leicester
Fairfield	Newtown				310.50		PFO1	250	250	0	Leicester
Fairfield	Newtown	311.19	R2OWH	50	311.16		R2OWH	250	200	50	Saco/Scarboro
Fairfield	Newtown	311.33	POWH	100							
Fairfield	Newtown	311.44	PEME	50							
Fairfield	Newtown	312.54	PFO1E	50	312.54		PFO1E	150	150	0	Scarboro
Fairfield	Newtown	312.72	PSS1/EME	50							
Fairfield	Newtown	312.76	PEME	100							
Fairfield	Newtown				312.95		PFO1	200	200	0	Ridg/Leic/Whit
Fairfield	Newtown	313.08	PSS1E	260	313.08		PFO1	150	150	0	Ridg/Leic/Whit
Fairfield	Newtown	313.40	PFO1E	50	313.40		PFO1	700	0	700	Ridg/Leic/Whit
Fairfield	Newtown	313.98	PFO1E	50	314.00		PFO1	500	500	0	Ridg/Leic/Whit
Fairfield	Newtown	314.17	PSS1E	50							
Fairfield	Newtown	314.96	PFO1E	50	314.95		PFO1	150	150	0	Ridg/Leic/Whit
Fairfield	Newtown	315.05	PFO1E	50							
Fairfield	Newtown	315.16	PFO1E	50	315.15		PFO1	250	150	100	Ridg/Leic/Whit
Fairfield	Newtown	315.50	PFO1E	210							
Fairfield	Newtown				316.10		PFO1E	200	200	0	Ridg/Leic/Whit
Fairfield	Newtown				316.32		PFO1E	100	100	0	Ridg/Leic/Whit
Fairfield	Newtown	316.93	R3OWH	50	316.95		R3OWH	50	50	0	
Fairfield	Monroe				317.65		PFO1E	250	250	0	Ridg/Leic/Whit
Fairfield	Monroe	318.22	PFO1E	100	318.40		PFO1E	100	50	50	non hydric
Fairfield	Monroe	318.30	PFO4E	50	318.50		PFO1	50	50	0	non hydric
Fairfield	Monroe	318.85	PFO1E	50	318.85		PFO1E	50	50	0	non hydric
Fairfield	Monroe	318.97	PFO1E	50	318.97		PFO1E	50	50	0	non hydric
Fairfield	Monroe	319.29	PFO1E	630	319.28		PFO1E	3050	3050	0	Rayp/Ridg/Adrian
Fairfield	Shelton	319.60	PFO1E	580	319.80		PFO1E	400	400	0	Rayp/Ridg/Adrian
Fairfield	Shelton	320.03	PFO1E	2210	319.96		PFO1E	3900	3900	0	Rd/Lc/Wh/Sc/Ad
Fairfield	Shelton	320.26	PFO1/EME	50							

AREAS OF HYDRIC AND ALLUVIAL SOILS TRAVERSED BY THE IROQUOIS GAS TRANSMISSION SYSTEM

Fairfield	Shelton	320.76	PSS1/EME	50	320.73		PFO1E	50	50	0	non hydric
Fairfield	Shelton				321.15		PFO/SS/EM	250	250	0	Scarboro/Walpole
Fairfield	Shelton				321.42		PFO1	100	100	0	Ridg/Leic/Whit
Fairfield	Shelton	321.66	PFO1E	50	321.65		PFO1	50	50	0	non hydric
Fairfield	Shelton	321.81	PFO1E	50	321.85		PFO1/SS	150	150	0	Ridg/Leic/Whit
Fairfield	Shelton	322.07	PFO1E	50	322.07		PFO/SS	200	200	0	Ridg/Leic/Whit
Fairfield	Shelton	322.14	PFO1E	50	322.13		PFO1E	50	50	0	non hydric
Fairfield	Shelton	322.56	PSS1	50	322.55		PSS/EM	600	250	350	Ridg/Leic/Whit
Fairfield	Shelton	323.14	PFO1E	150	323.15		PFO1	100	100	0	Ridg/Leic/Whit
Fairfield	Shelton				323.65		PFO1	150	150	0	Ridg/Leic/Whit
Fairfield	Shelton	323.76	PFO1E	50	323.70		PFO1/SS	250	250	0	Ridg/Leic/Whit
Fairfield	Shelton				324.00		PFO/SS1E	100	100	0	non hydric
Fairfield	Shelton	324.10	PSS1F	150	324.10		PFO1	100	100	0	Ridg/Leic/Whit
Fairfield	Shelton	324.25	PSS1/EME	50	324.25		PFO1	150	0	150	Ridg/Leic/Whit
Fairfield	Shelton	324.42	PFO1E	50							
Fairfield	Shelton	324.53	PFO1E	210	324.47		PFO1	1100	1100	0	Adrian/Carlisle
Fairfield	Shelton				324.65		PFO1	400	400	0	Ridg/Leic/Whit
Fairfield	Shelton	324.83	PFO1E	100							
Fairfield	Shelton				324.95		PSS/EM	50	0	50	Adrian
Fairfield	Shelton	324.87	PFO1E	520							
Fairfield	Shelton	325.20	PFO1E	100	325.15		PFO1	200	200	0	Ridg/Leic/Whit
Fairfield	Shelton	325.35	PFO1E	50	325.30		PFO1	50	50	0	non hydric
Fairfield	Shelton	325.40	PFO1E	1050	325.36		PFO1	150	150	0	Ridg/Leic/Whit
Fairfield	Shelton				325.62		PFO1	100	50	50	Ridg/Leic/Whit
Fairfield	Shelton	325.77	PFO1E	50							
Fairfield	Shelton	326.27	PEME	50	326.24		PFO1	100	100	0	Ridg/Leic/Whit
Fairfield	Shelton				326.52		PFO/EM	100	100	0	Ridg/Leic/Whit
Fairfield	Shelton	326.84	PFO1E	50	326.86		PFO1	50	50	0	non hydric
Fairfield	Shelton	327.29	R3OWH	50	327.25		R3OWH	50	50	0	non hydric
Fairfield	Stratford				328.00		PFO1	300	300	0	Carlisle
Fairfield	Stratford				328.27		PFO/SS	300	0	300	Carlisle
Fairfield	Stratford	328.39	PFO1E	150	328.38		PFO1E	75	75	0	non hydric
Fairfield	Stratford	328.49	PFO1E	470	328.50		PFO/SS/EM	600	600	0	Carlisle
Fairfield	Stratford				329.00		PFO	50	0	50	Adrian
Fairfield	Stratford	329.15	PFO/SS1E	300	329.15		PFO	100	100	0	Adrian
Fairfield	Stratford	329.48	PFO/SS1E	50							
Fairfield	Stratford	329.60	PFO1E	50	329.40		PFO1E	50	50	0	non hydric
Fairfield	Stratford	329.70	PFO1E	50	329.70		PFO1E	300	250	50	Ridg/Leic/Whit
Fairfield	Stratford	329.85	PSS1E	260							
Fairfield	Stratford				329.92		PFO	200	200	0	Leicester
Fairfield	Stratford				330.30		PSS/EM/FO	250	100	150	Ridg/Leic/Whit/A
Fairfield	Stratford				330.50		PFO	100	100	0	Ridg/Leic/Whit
Fairfield	Stratford	330.52	PFO1E	50	330.60		PFO/SS	200	200	0	Ridg/Leic/Whit
Fairfield	Stratford	330.91	E1OWL3	730	330.92		E1OWL3	700	700	0	Housatonic River
New Haven	Milford				331.90		PFO	1900	1900	0	Raypol
New Haven	Milford	332.10	PFO1E	50							
New Haven	Milford				332.50		PSS/EM	200	0	200	Raypol (filled)
New Haven	Milford	332.62	PFO4ex	50	332.60		PFO/SS	200	0	200	Adrian/Palms
New Haven	Milford	332.64	PSS1/5F	1050							

AREAS OF HYDRIC AND ALLUVIAL SOILS TRAVERSED BY THE IROQUOIS GAS TRANSMISSION SYSTEM

New Haven	Milford	333.55	PSS5/OWH	100	333.52		PSS/OW	150	150	0	Walpole
New Haven	Milford	333.99	PEMEx	470							
New Haven	Milford	334.19	E2BBP	100							
New Haven	Milford	334.21	E2FLN	520							
Total				17620				46500	41250	5250	

IX

Total
17

APPENDIX E

RELIABILITY AND SAFETY INFORMATION FROM THE DEIS AND IROQUOIS' 1988 RESOURCE REPORT

5.1.12 Reliability and Safety

5.1.12.1 Safety Standards

The proposed pipelines in the Iroquois/Tennessee Project would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR Part 192. The regulations are intended to ensure adequate protection for the public from natural gas pipeline failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, which determine more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined as follows:

Class 1	Location with 10 or fewer buildings intended for human occupancy.
Class 2	Location with more than 10 but less than 46 buildings intended for human occupancy
Class 3	Location with 46 or more buildings intended for human occupancy; or where the pipeline lies within 100 yards of any building or small, well-defined outside area occupied by 20 or more people during normal use.

Class 4 Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil, and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require 36 inches in normal soil and 24 inches in consolidated rock. Class locations also specify the maximum distance to a sectionalizing block valve--10 miles in Class 1, 7.5 miles in Class 2, 4 miles in Class 3, and 2.5 miles in Class 4. Pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. The proposed pipeline segments in the Iroquois/Tennessee Project contain Class 1, 2, and 3 locations. The portion of the proposed Iroquois system that crosses Long Island Sound would be constructed to Class 3 specifications.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under section 192.615, each pipeline operator must also establish an Emergency Plan that provides written procedures to minimize the hazards from a gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events - gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- making personnel, equipment, tools, and materials available at the scene of an emergency;
- protecting people first and then property, and making safe from actual or potential hazards; and
- emergency shutdown of system and safely restoring service.

Each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a gas pipeline emergency, and coordinate mutual assistance in responding to emergencies. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

5.1.12.2 Potential Hazards

The transportation of natural gas by pipeline involves some degree of risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiant, possessing only a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000 degrees Fahrenheit and is flammable at concentrations between 5.00 percent and 15.0 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. The specific gravity of methane is 0.55 and, therefore, it is buoyant at atmospheric temperatures.

5.1.12.3 Pipeline Accident Data

Since February 9, 1970, 49 CFR Part 191 has required all operators of transmission and gathering systems to notify DOT of any reportable incident, and to submit a written report on form F7100.2 within 20 days. Reportable incidents are defined as any leak that:

- caused a death or personal injury requiring hospitalization;
- required taking any segment of transmission line out of service;
- resulted in gas ignition;
- caused estimated damage to the property of the operator, or others, or both a total of $5,000 or more:
- required immediate repair on a transmission line;
- occurred while testing with gas or another test medium; or
- in the judgement of the operator was significant, even though it did not meet the above criteria.

DOT changed reporting requirements after June 1984 to reduce the amount of data collected. After that date, operators must only report incidents that involve property damage of more than $50,000, injury, death, release of gas, or otherwise that are considered significant by the operator. To avoid combining dissimilar data sets, only incidents reported during the 14.5-year period from January 1970 through June 1984 are used in this analysis (American Gas Association, 1986).

During the 14.5-year period, 5,862 service incidents were reported over the nationwide total of approximately 300,000 miles of natural gas transmission and gathering systems. Service incidents, defined as failures that occur during pipeline operations, have remained fairly constant over this period with no clear upward or downward trend in annual totals. In addition, 2,013 test failures were reported. Correction of test failures removed defects from the pipeline prior to placing it in service.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 5.1.12-1 provides a percentage distribution of

TABLE 5.1.12-1

Service Incidents by Cause

Cause	Percentage	Incidents/1,000 mi-yr.
Outside forces	53.5	0.70
Corrosion	16.6	0.22
Material defect	16.9	0.21
Construction defect	4.8	0.06
Other	8.2	0.11
Total	100.0	1.30

the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

The dominant incident cause is outside forces, constituting 53.5 percent of all service incidents. Outside-forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; from earth movements due to soil settlement, washouts, or geological hazards; from weather effects such as winds, storms and thermal strains; and from willful damage. The breakdown of outside-forces incidents in table 5.1.12-2 shows that human error in equipment usage was responsible for approximately 75 percent of outside-forces incidents. Since April 1982, operators have been required to participate in "one call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "one call" program is a service utilized by public utilities and some private sector companies (i.e., oil pipelines, cable television, etc.) to provide construction contractors or other maintenance workers an accurate identification of the underground location of pipes, cables and culverts prior to excavation.

TABLE 5.1.12-2

Outside Forces Incidents by Cause

Cause	Percent
Equipment operated by outside party	67.1
Equipment operated by or for operator	7.3
Earth movement	13.3
Weather	10.8
Other	1.5

Table 5.1.12-1 identifies an average annual service incident frequency of 1.30 failures per 1,000 miles per year for all natural gas transmission and gathering lines. The population of pipelines included in the data set varies widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant level of service incident frequency, pipelines installed prior to that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, since corrosion is a time-dependent process. Further, new pipes generally use more advanced coatings and cathodic protection to reduce corrosion potential.

Older pipelines have a higher frequency of outside-forces incidents partly because may be less well-known and less well-marked than newer lines. In addition, the population of older pipelines contains a disproportionate number of smaller diameter pipelines, which have a greater rate of outside-forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Table 5.1.12-3 clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure over unprotected or partially protected pipe. The data shows that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly apparently reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 5.12-3

External Corrosion By Level of Control

Corrosion Control	Incidents/1,000 mi-yr.
None - bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

5.1.12.4 Impact on Public Safety

The service incident data summarized in table 5.1.12-1 include pipeline failures of all magnitudes with widely varying consequences. Approximately two-thirds of the incidents were classified as a leak, and the remaining one-third classified as a rupture, implying a more serious failure. Fatalities or injuries occurred in 4 percent of the service incidents reported in the 14.5-year period.

Table 5.1.12-4 presents the annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 1987. Fatalities between 1970 and June 1983 have been separated into employees and nonemployees, to better identify a fatality rate experienced by the general public. Fatalities among the public averaged 2.5 per year nationwide over this period. The simplified reporting requirements in effect after June 1984 do not differentiate between employees and nonemployees.

TABLE 5.1.12-4

Gas Transmission and Gathering System Fatalities a/,b/

Year	Employees	Nonemployees	Total
1970	1	0	1
1971	2	1	3
1972	3	3	6
1973	1	1	2
1974	1	3	4
1975	5	2	7
1976	1	6	7
1977	5	3	8
1978	1	0	1
1979	4	8	12
1980	0	1	1
1981	5	1	6
1982	4	6	10
1983	1	2	2
1984 c/	-	-	9
1985 c/	-	-	6
1986 c/	-	-	4
1987 c/	-	-	-
Annual Average	2.5	2.5	5

a/ 1970 through June 1984 - American Gas Association, 1986.

b/ U.S. DOT Hazardous Materials Information System.

c/ Employee/nonemployee breakdown not available.

The nationwide totals of accidental fatalities due to various manmade and natural hazards are listed in table 5.1.12-5 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously since individual exposures to hazards are not uniform among all categories. Nevertheless, the average 2.5 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

TABLE 5.1.12-5

Nationwide Accidental Deaths a/

Type of Accident	Fatalities
All accidents	92,000
Motor vehicles	46,000
Falls	11,600
Drowning	5,700
Poisoning	5,200
Fires and burns	4,800
Suffocation by ingested object	3,100
Tornado, flood, earthquake, etc. (1980-82 avg.)	132
Lightning (1980-82 avg.)	94
All liquid and gas pipelines (1978-87 avg.) b/	27
Gas transmission and gathering lines Nonemployees (1970-84 average) c/	2.5

a/ All data, unless otherwise noted, reflects 1984 statistics from the National Safety Council, "Accident Facts - 1985 Edition," Chicago, IL.

b/ U.S. Department of Transportation, "Annual Report on Pipeline Safety - Calendar Year 1987."

c/ American Gas Association, 1986.

Based on approximately 311,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines in service is 0.008 per 1,000 miles per year. Applying the industry wide average to the proposed 369-mile Iroquois pipeline yields a recurrence interval of one fatality every 340 years. The proposed loops consisting of a new pipeline adjacent to an existing pipeline would cause only a slight increase in risk to the nearby public.

5.1.12.5 Site-Specific Impacts

In accordance with 49 CFR Part 192, the trench would be deeper in agricultural areas to accommodate the use of heavy farm machinery or the existence of drainage systems.

Where blasting is required, it would be performed during the day only. Blasting mats would be used in areas near homes or other structures to minimize the risk of harm to people or structures.

In the event of a fire due to a gas leak or rupture, the pipeline company would be responsible for shutting off the supply of gas to the leaking section of pipeline. For large leaks or ruptures, automatic shutoff valves would close immediately; for smaller leaks, shutoff valves would be closed manually. Once the leaking pipeline section is isolated, the fire would be allowed to burn itself out.

Local fire and public health agencies would provide fire protection for people, structures and property around the fire.

As discussed in section 2.4 of this EIS, a contingency plan would be prepared by the pipeline company, working with local agencies, to identify personnel to be contacted, equipment to be mobilized and procedures to be performed to respond to an interruption of normal pipeline operation.

IROQUOIS GAS TRANSMISSION SYSTEM
RESOURCES REPORT NO. 11
RELIABILITY AND SAFETY

September 26, 1988

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11.1 INTRODUCTION

The purpose of this report is to address the safety and reliability aspects of the proposed Iroquois Gas Transmission System (IGTS), a 369.4-mile natural gas transmission system. The analysis is based on a comprehensive review of available project design documents, including applicable regulations, historical trends in the risk of gas transmission line incidents, descriptions of facility specifications, and evaluation of IGTS construction, operation, and maintenance procedures.

Further, the analysis focuses specifically on the risk to the public from the transportation of natural gas (methane) by the IGTS. The risk is associated with the potential for incidents (either caused by natural factors such as earthquakes or human factors such as excavations), which could cause pipeline ruptures or leaks resulting in the release of natural gas.

There is some degree of risk to the public from the transportation of natural gas by pipeline. It is possible for accidents to occur resulting in the release of natural gas. If subjected to an ignition source, this released gas can burn and/or explode.

The IGTS will transport only natural gas (methane); the gas will not have any additives. Methane is not toxic, but is an asphyxiant; that is, if breathed in high concentrations, it can cause oxygen deficiency. Methane has an ignition temperature of 1,004°F, with flammable limits in air of between 5.0 and 15.0%. It weighs about half as much as air at atmospheric temperatures, and as a result, if released it rises rapidly after warming.

Natural gas transmission pipelines have been in service within the United States since the early part of this century. Today, over 300,000 miles of gas transmission pipeline are in operation in the United States, and thousands of additional miles are in operation in other countries. Both in the United States and around the world, these pipelines have had an excellent transportation safety and reliability record. Many factors, including pipeline design, construction, operation, and maintenance, have contributed to the excellent safety record of natural gas transmission pipelines. The safety of new pipelines, such as that proposed by IGTS, is based on both the large volume of

historic pipeline, engineering and operating data available, and technological advances made in gas transmission pipeline equipment systems.

This report contains an overview of the operating safety record for gas transmission pipelines in the United States. Available incident data are reviewed and parameters that influence the potential for an incident are presented. Where possible, parameters that provide specific insight into the safety and reliability history of pipelines similar to IGTS are identified.

IGTS will meet or exceed all of the requirements of the U.S. Department of Transportation (DOT) Pipeline Safety Regulation (49 CFR 192), "Transportation of Natural and Other Gases by Pipeline: Minimum Federal Safety Standards." Areas where IGTS will exceed federal requirements are identified and their influence on safety discussed. Pipeline emergency plans are required under 49 CFR 192; an overview of the required emergency plan is provided.

The routing of the IGTS pipeline also has a bearing on public safety considerations. For the most part, the IGTS has been aligned to avoid densely populated areas. Where the pipeline does traverse near more concentrated residential or commercial/industrial developments, all relevant DOT codes regarding pipeline design in such areas will be met. The following additional information regarding pipeline design criteria is provided:

- Most of the pipeline route in New York will pass through Class 1 areas, designated by 49 CFR 192, Paragraph 192.5. Class 1 areas are those where along any one mile length of pipeline and within 200 yards either side of the pipeline there are 10 or fever buildings intended for human occupancy.

- Some of the pipeline route in southwestern Connecticut will pass through Class 3 areas. Class 3 areas are designated by 49 CFR 192 to be those with 46 or more buildings intended for human occupancy along any one mile length of the pipeline and within 200 yards either side of the pipeline.

- Those portions of the pipeline under Long Island Sound will be of Class 3 construction, as will the entire 8.7-mile portion of the IGTS on Long Island.

- Some of the pipeline route may be in Class 2 areas. as designated by 49 CFR 192, Paragraph 192.5. Class 2 areas are those areas where the number of buildings intended for human occupancy in the above-noted bands along the pipeline is between 10 and 46.

Where pipelines traverse populated areas, the federal code requires that more conservative design factors be used, as will be discussed later in this report. Pipeline area classifications at specific locations along the IGTS route have been determined in accordance with 49 CFR 192.

11.2 POTENTIAL HAZARDS

11.2.1 Overview of Hazards

The natural gas transmission pipeline network in the United States was begun over 50 years ago and today, about 300,000 miles of gas transmission line crisscross the country. Pipeline systems ranging in diameter from 1 inch to 42 inches are in service.

The extensive use and public acceptance of pipelines, in the United States and many other countries, reflect the excellent safety record of this mode of energy transportation. Figure 11-1 illustrates the safety of pipelines in general (natural gas, oil, gasoline, chemical, etc.) relative to other forms of transportation. The figure shows that there were only 16 pipeline-related fatalities (this includes both pipeline employees and non-employees) in 1983, as compared to a total of 46,115 transportation-related fatalities. Of the pipeline-related fatalities, only two were attributable to gas transmission pipelines (one pipeline employee and one non-employee). Over the past 14.5 years, for all natural gas transmission pipelines in service, there has been an average of one public fatality per year per 120,000 miles of pipeline in service. This average includes pipelines of all diameters, locations, and ages (some pipelines have been in service for over 50 years).

Many factors contribute to the excellent safety record for gas transmission pipelines, including the following:

- There are in-place national pipeline codes of practice developed by industry and government regulations which address design, construction, inspection, operation, and maintenance of pipelines. The federal code is entitled

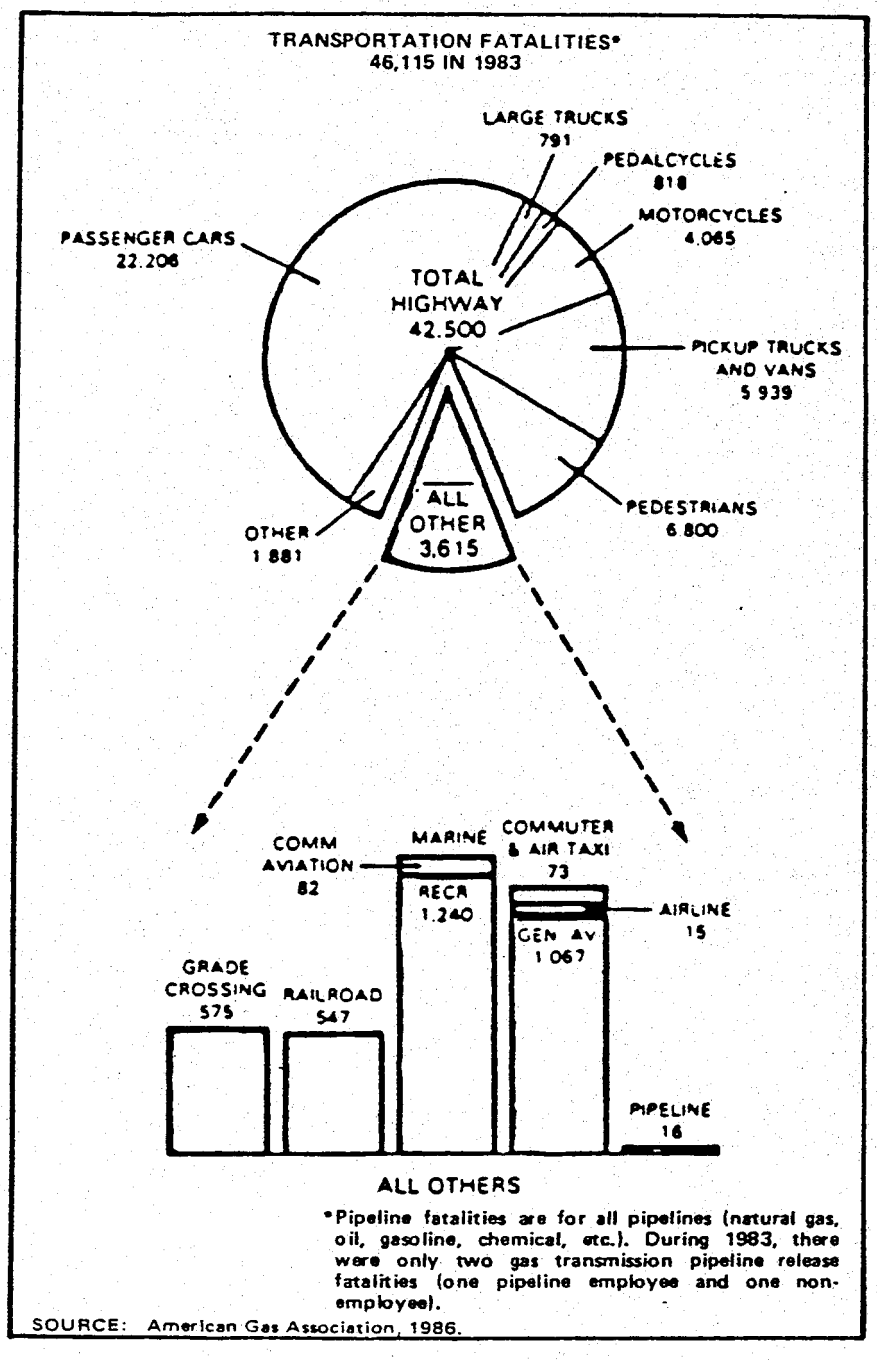

Figure 11–1 COMPARISON OF 1983 TRANSPORTATION FATALITIES

"Transportation of Natural and Other Gases by Pipeline, Minimum Safety Standards" (49 CFR 192) and issued by the DOT.

- o State and federal authorities have joint programs and agencies to enforce federal pipeline regulations. Training programs for government personnel responsible for pipeline safety have been in place for over 10 years.

- o Mandatory pipeline incident reporting procedures are in place to insure that field experience with existing pipelines is made available to pipeline operators.

- o Most pipelines are buried and the earthen cover acts as a natural barrier to protect the pipelines from potential external damage sources.

- o The pipeline industry is an established, mature industry which utilizes proven and documented technology.

- o Regular aerial surveys are conducted along the pipeline right-of-way, during pipeline operation, to check for possible low level leaks and for possible construction activity nearby. On the ground leak detection surveys are also carried out on a regular basis.

- o As required, pipeline operating parameters are altered and/or pipe is replaced to reflect changes in land use along the right-of-way throughout the life of the pipeline.

The safety of new pipelines, such as that proposed by IGTS, is further enhanced by taking into account in the design the large volume of historic pipeline operating data available and technological advances made in gas transmission equipment systems.

IGTS will consist of about 332 miles of 24-inch-diameter buried pipeline to be constructed through upstate and eastern New York and western Connecticut; 3 miles, near the southern Connecticut seacoast, will consist of 20-inch-diameter buried pipeline. A subsea crossing of Long Island Sound will consist of a 20-inch-diameter submarine pipeline 26 miles in length to a landfall on Long Island. From this point, an 8.7-mile, 20-inch-diameter buried land pipeline will traverse south across Long Island to a connection with existing gas distribution systems at South Commack.

The entire IGTS pipeline will be designed to meet, and in terms of several criteria exceed, the requirements of 49 CFR 192. The following lists specific criteria where IGTS will exceed federal standards:

- The entire pipeline will be designed and tested to operate safely at a pressure of 1,440 psig.

- The pipe material will be specified to have minimum toughness qualities which will provide protection from fracture initiation and will ensure fracture arrest.

- Under requirements laid down in 49 CFR 192, only a small percentage of pipeline welds need to be radiographed (X-rayed) during construction where the pipe traverses low population density Class 1 and 2 areas. All IGTS welds will be 100 percent radiographed during construction.

- The pipe will be inspected during manufacture at the pipe mill and after delivery to the construction site to identify and eliminate defects before the pipe is installed.

- After installation and before operation, the pipe will be internally inspected using an instrumented inspection tool to detect possible construction defects before the pipeline is placed in service. Defects that affect the safety of the pipeline will be repaired before the pipeline is placed in service.

- At regular intervals during operations, the pipeline will be internally inspected with a specialized tool to detect, at an early stage, deterioration of the pipeline which could lead to a failure.

The pipeline right-of-way will be marked, and both regular flyovers and on ground inspections and leak checks will be made along the pipeline right-of-way after the pipeline has been placed in service. A public awareness pipeline information program will be instituted, and IGTS will have a "call before you dig" program to protect the pipeline from damage by excavators.

The IGTS operating partner, TransCanada PipeLines, Ltd. (TCPL), has constructed and operates over 6,000 miles of large diameter gas transmission line in Canada and has direct interests in major pipelines in the northern United States. Some of the pipelines have been in operation for 30 years, and TCPL's operating safety and reliability record (service incidents per mile of pipeline) has been slightly better than the United States record for similar pipelines. TCPL has established proven procedures and programs for the design, construction, maintenance, and safe operation of gas transmission lines.

Since 1970 when 49 CFR 192 went into effect, all gas transmission pipeline operators have been required to file reports on "reportable service incidents" with the DOT as defined in Section 11.2.2. The time intervals between reportable service incidents for IGTS have been estimated using DOT historic data and are presented in Table 11-1. The data have not been corrected for the additional safety features which will be incorporated into the IGTS design; thus, the results shown in Table 11-1 are conservative. As the table indicates, the risk of one reportable service incident somewhere along the length of IGTS is once in 24.6 years. A service incident in the 20-inch-diameter pipeline beneath Long Island Sound would not be expected more than once every 364 years, while the risk of a reportable service incident along any one mile of IGTS pipe is one per 9,100 years.

The probability of a member of the public being fatally injured by IGTS has also been estimated using historic pipeline fatality data for all gas transmission pipelines and potential hazard zones computed from IGTS gas releases. For a full line rupture, the historic estimated risk of fatality is 0.7 per million years, and for a 3-inch-diameter hole, the rate is 0.34 per million years. The latter is more probable in a Class 3 area than is a full line rupture. Table 11-2 compares these fatality rates to those commonly encountered by the public. The risks of fatality for automobile travel and air transportation are frequently referred to as voluntary risks, that is, the public elects to participate in these activities. Risks of fatality attributable to storms and other naturally occurring events are called involuntary risks. Commonly, accidents which have an annual risk of fatality of less than one in a million (1×10^{-6}), about that shown for storms in Table 11.2, are of little concern to the public and are considered to be acceptable. Based on these criteria, pipelines, as a whole, are an acceptable safety risk to the public, and this is confirmed by the widespread use of gas transmission pipelines in the United States.

The annual risk of fatality associated with IGTS will be considerably less than the historic pipeline values shown in Table 11-2 and noted above. The results given in Table 11-2 are conservative since they do not reflect all the safety features incorporated into the IGTS design.

Table 11-1

POTENTIAL FOR REPORTABLE SERVICE INTERVALS
BASED ON HISTORIC DATA

Reportable Service Incident Location	Recurrence Interval*
Anywhere along IGTS length	Once in 24.6 years
Any one mile of IGTS length	Once in 9,100 years
Beneath Long Island Sound	Once in 364 years

*Recurrence intervals are based on historic pipeline data and do not include all the safety features incorporated into IGTS design.

Table 11-2

RISK OF FATALITY ASSOCIATED WITH COMMONLY UNDERSTOOD HAZARDS

Cause of Fatility	Annual Risk of Fatality
Events Eliciting Public Concern	
Motor vehicle accident	260×10^{-6}
Falls in the house	42×10^{-6}
Fires and hot substances	40×10^{-6}
Drowning	33×10^{-6}
Accidental Poisoning	25×10^{-6}
Firearms	10×10^{-6}
Aircraft accident	8×10^{-6}
Electrocution in the home*	1×10^{-6}
Events Not Normally Eliciting Public Concern	
Full line rupture**	0.7×10^{-6}
Lightning	0.5×10^{-6}
Tornado	0.4×10^{-6}
3-inch-diameter hole**	0.34×10^{-6}

*While using home appliances and wiring.
**Historic pipeline fatality rates.

11.2.2 Gas Transmission Pipeline Safety Record

Interstate natural gas transmission pipelines in the United States are required to comply with the design, construction, operation, inspection, and maintenance criteria in 49 CFR 192 (DOT 1985). This regulation went into effect in 1970 and, at about the same time, federal regulations were also adopted requiring gas transmission pipeline operators to file reports with the government on "reportable service incidents" involving all gas transmission pipelines, regardless of when the pipelines were built. Over the years, the data have been analyzed and published by several organizations. Additionally, other natural gas pipeline operating experience data bases are available. The following provides a description of gas transmission pipeline incident data reviewed for this project:

- Annual Report on Pipeline Safety (1974-1984); U.S. Department of Transportation, Materials Transportation Bureau.
- An Analysis of Reportable Incidents for Natural Gas Transmission and Gathering Lines, 1970 through June 1984, Report to the American Gas Association, Battelle Columbus Division, March 3, 1986.
- Accidents Connected with Federal Oil and Gas Operations on the Outer Continental Shelf, Gulf of Mexico, Volume I, 1956-1979, and Volume II, January 1980-June 1984, U.S. Department of the Interior, Minerals Management Service.
- HAZMAT Computerized Data Base for Gas Transmission Pipeline Leak Reports, 1970-February 1986, U.S. Department of Transportation.
- Incident Statistics for Canadian Gas Transmission Lines, Canadian Gas Association.

The above gas transmission pipeline data resources include a diversity of pipeline diameters, years of installed service, adjacent land usage, and equipment technology. "An Analysis of Reportable Service Incidents for Natural Gas Transmission and Gathering Lines, 1970 through June 1984" contains a general analysis of DOT's gas transmission pipeline safety data, and summary results from that work are provided in the first portion of this report. Historic data were then further

analyzed to obtain information applicable to gas transmission pipelines built to federal standards (49 CFR 192) and of a diameter similar to IGTS. IGTS will actually be designed and built to standards which exceed the requirements of 49 CFR 192. The stringent design and construction standards for IGTS will result in an IGTS safety record that is above that reflected in the historic data. Special design and construction standards which will be used by IGTS are discussed under IGTS Approach to Pipeline Safety, Section 11.3.

The following provides the definition of a "reportable service incident" as used by the DOT. A reportable service incident is defined as that which resulted in a death or injury requiring hospitalization; required the removal from service of any segment of transmission pipeline; resulted in gas ignition; caused estimated property damage totaling $5,000 or more; involved a leak requiring immediate repair; involved a test failure that occurred while testing with either gas or another test medium; or, in the judgment of the operator, was significant even though the above criteria did not apply. (DOT has recently revised its definition of a reportable service incident, but the change does not affect the existing data base.)

Figure 11-2 presents a comparison of pipeline service incidents from 1970 to 1984, by cause. Over the years, outside forces have been the dominant cause of pipeline service incidents (55% of all incidents). The most common outside force is unauthorized digging along a pipeline resulting in impacting the line with heavy equipment. Service incidents specifically attributable to pipelines include corrosion, material defects, and construction defects.

The data contained in Figure 11-2 are for all gas transmission lines, regardless of the age of the pipeline. Figure 11-3 presents the gas transmission pipeline service incident data by the decade in which the pipeline was installed, by year of service incident, and by cause. The data show that older pipelines (those constructed in the 1930s and 1940s) have a much higher rate of incidents than newer lines. The leading causes of incidents in pipelines built in the 1930s are outside forces (about two-thirds of all incidents) and corrosion (about one-fourth of all incidents). Many older pipelines are small in diameter and not well marked; thus, they are more vulnerable to damage by outside

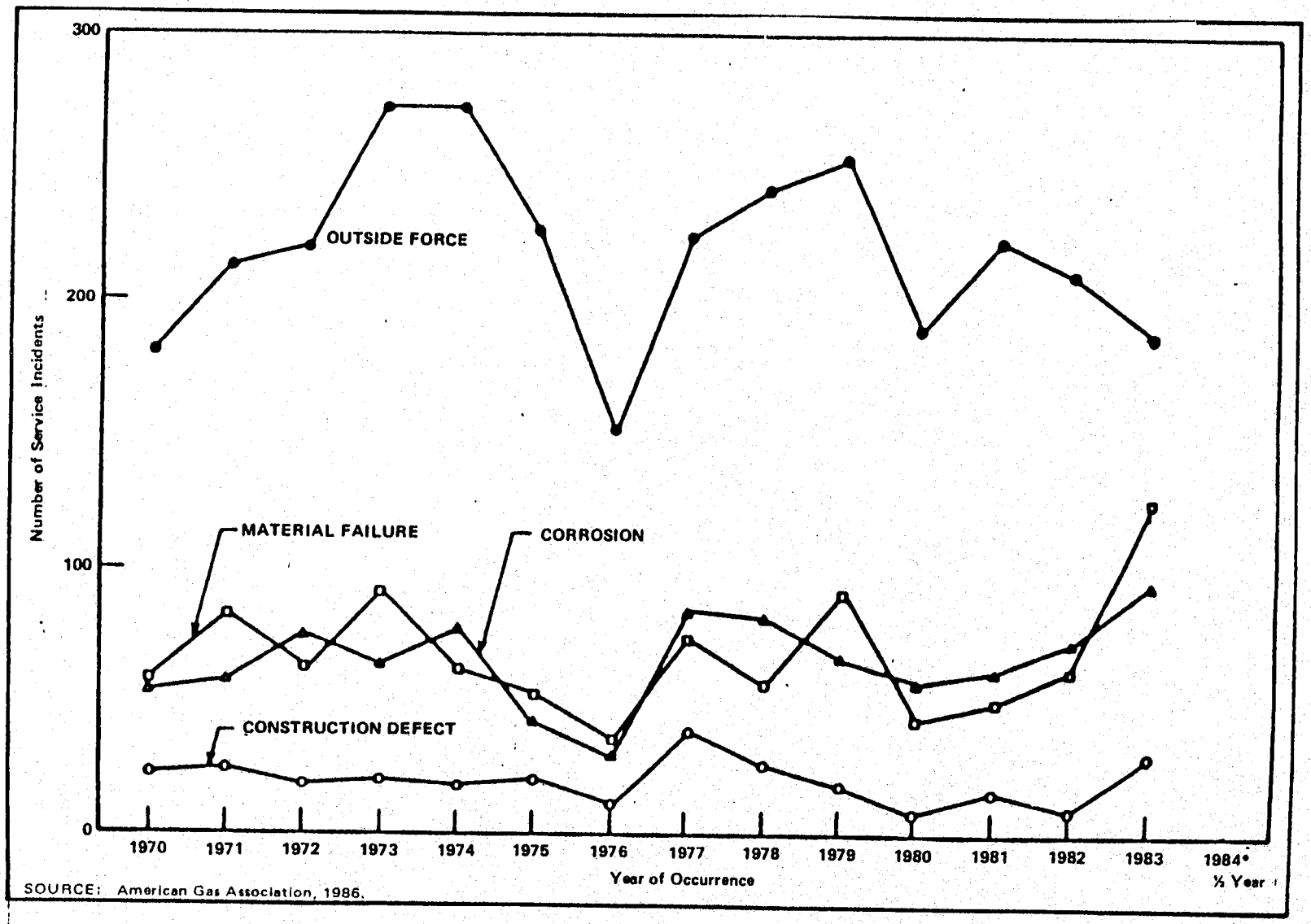

Figure 11–2 HISTORIC CAUSES OF GAS TRANSMISSION LINE SERVICE INCIDENTS FOR EXISTING PIPELINES

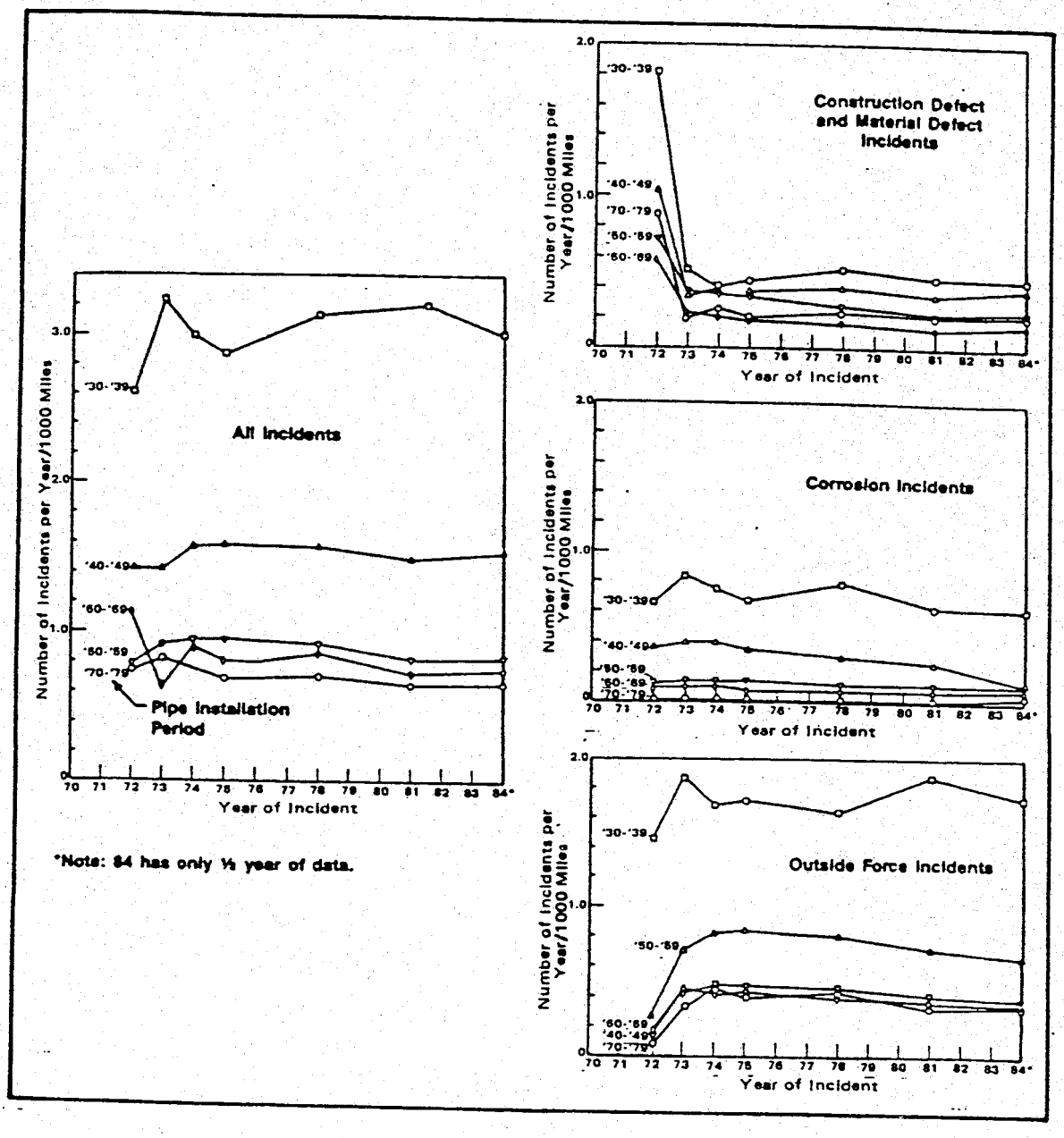

Figure 11–3 SERVICE INCIDENTS BY YEAR INSTALLED

forces. Pipelines built since the 1950s have a significantly lower corrosion related incident rate due, in part, to advances in corrosion protection technology.

Figure 11-4 presents service incident rates by the diameter of the pipeline. The data clearly demonstrate that smaller diameter pipelines (less than 6-inch-diameter) are much more vulnerable to outside forces than large diameter pipelines. The overland portions of IGTS will be 24- and 20-inch-diameter pipe. Figure 11-4 shows that the outside force incident rate for small pipe is about 1.2 per year per 1,000 miles of small pipe (6-inch pipe), 0.72 per year per 1,000 miles for 12-inch pipe, and 0.45 per year per 1,000 miles for 24-inch pipe. It should be noted that these data include all pipe, not just that installed since 49 CFR 192 went into force.

Figure 11-5 presents pipeline data based on land use adjacent to the pipeline. The data show that about 80% of incidents occur either in rural or undeveloped areas, Class 1 locations. There are a number of possible reasons for the high percentage of reportable incidents in rural and undeveloped areas, including unauthorized digging along the pipeline, poorly marked lines in rural areas (especially small diameter older lines), and the larger percentage of lines that are located in rural and undeveloped areas. Equally important is the low percentage of incidents in populated areas (commercial, industrial, and residential areas represent about 10% of all reported incidents).

IGTS will traverse several major rivers, as well as Long Island Sound. Figure 11-5 shows that only 2.4% of reportable incidents occur in marine environments. U.S. Department of the Interior (DOI) statistics for pipelines in the Gulf of Mexico indicate that, on the average, there is one reported incident per year in the Gulf. Within the gas producing areas of the Gulf of Mexico, there is extensive marine traffic, including offshore petroleum facility work boats, construction vessels, fishing vessels, and tank ships.

Figure 11-1 presented a comparison of transportation-related fatalities for common modes of transportation during the year 1983. The data for pipelines are for all types of pipelines, including petroleum products, gas distribution, gas transmission, etc. Table 11-3 presents a historic tabulation of fatalities and injuries associated with the

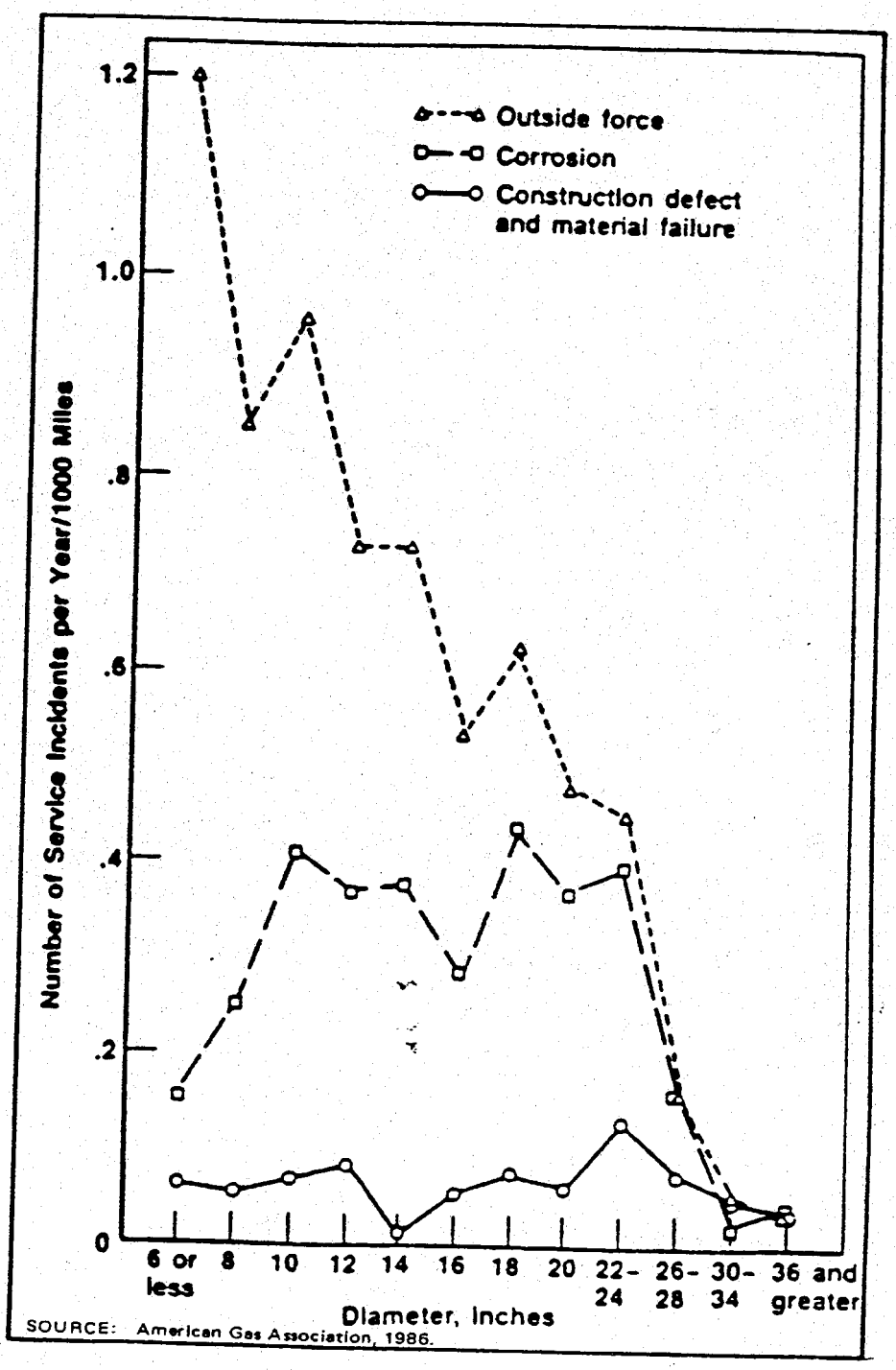

Figure 11–4 RELATIONSHIP OF SERVICE INCIDENTS TO PIPE DIAMETER BASED ON HISTORIC DATA

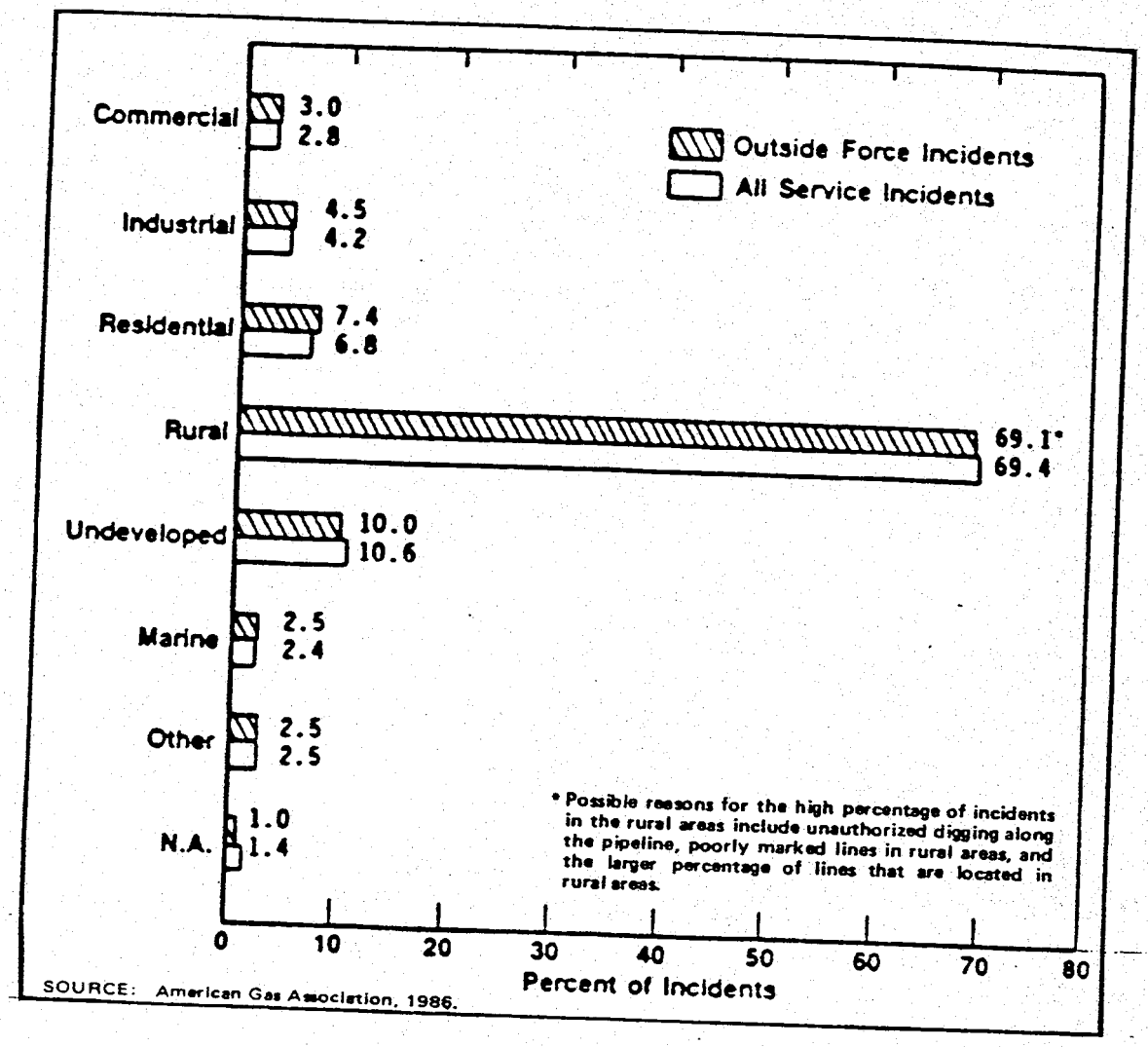

Figure 11–5 DISTRIBUTION OF SERVICE INCIDENTS BY AREA BASED ON HISTORIC DATA

Table 11-3

FATALITIES AND INJURIES FROM GAS TRANSMISSION PIPELINE FAILURE INCIDENTS

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*	Total
Number of Fatalities																
Employees	1	2	3	1	1	5	1	5	1	4	0	5	4	1	2	36
Non-employees	0	1	3	1	3	2	6	3	0	8	1	1	6	1	0	36
Number of Injuries																
Employees	11	14	23	3	7	10	22	10	15	14	8	3	9	5	7	161
Non-employees	13	10	14	16	14	11	20	12	15	82	8	2	32	20	4	274

*Only 6 months of data.

operation of gas transmission lines for the period 1970-1984. Although it is difficult to find a common basis for comparison (in terms of human lives) of the safety of the various modes of transportation, it is clear that pipelines as a whole are responsible for an extremely small fraction of all transportation-related facilities. Further, incidents in the gas transmission industry account for only a small fraction of all pipeline fatalities.

The HAZMAT computer data base, along with the American Gas Association analysis of the data base, were further analyzed in an effort to develop incident statistics more specific to IGTS. The additional insights obtained include the following:

- The HAZMAT data base contains 5,686 reported service incidents, and about 40% of those occurred in the three prolific gas-producing states (Louisiana, Oklahoma, and Texas). Only 1.1% occurred in New York and 0.35% in Connecticut.

- IGTS will meet or exceed the requirements of 49 CFR 192. As Figure 11-3 shows, the service incident rate for all pipelines built since the code went into effect is about 0.7 per year per 1,000 miles of pipe (pipe of all diameters). The IGTS, as described in this document, will be a combination of 24-inch and 20-inch-diameter pipe. The DOT data review showed a total of 36 incidents involving pipelines of 20-inch-diameter and larger and built since the code went into effect. Analysis of available data (American Gas Association 1986) showed that there were approximately 22,000 miles of transmission line of 20-inch-diameter and greater and built since 1970 that were in operation during this period. This results in an estimated service incident rate for modern, large diameter pipelines of 0.11 per year per 1,000 miles of pipe, or about one-seventh the rate for pipelines of all diameters built over the same period. Based on Figure 11-3, it would be expected that this very low incident rate for large diameter pipelines would continue.

- A review of the operating record of TCPL, the operating partner for IGTS, indicates that its rate of significant incidents is slightly less than that determined for modern, large diameter pipelines in the United States.

Using the available historic data, the following can be said relative to potential accidents involving pipelines similar to IGTS:

- The recurrence interval for a reportable service incident for a 369-mile pipeline (IGTS is about 369 miles in length) anywhere along its length can be calculated to about 24.6 years using historic data.

$$\text{Recurrence Interval (yr)} = \frac{1{,}000 \text{ mile}}{0.11/\text{yr} \times 369 \text{ mi}} = 24.6 \text{ yr}$$

- Within any one mile segment of a large diameter pipeline, the predicted recurrence interval for a reportable service incident is about 9,100 years.

$$\text{Recurrence Interval (yr)} = \frac{1{,}000 \text{ miles}}{0.11/\text{yr} \times 1 \text{ mile}} = 9{,}100 \text{ yr}$$

- Based on Gulf Coast data, the probability of a reportable service incident involving the portion of IGTS below Long Island Sound is much less than that for equivalent pipelines on the shore. To be conservative, the onshore failure rate for pipelines has been used to compute the reportable incident recurrence interval for the Long Island Sound portion of IGTS. The interval is estimated to be 350 years.

$$\text{Recurrence Interval (yr)} = \frac{1{,}000 \text{ miles}}{0.11/\text{yr} \times 26 \text{ miles}} = 350 \text{ yr}$$

- Using the fatality data presented in Table 11-3, a conservative estimate of the chances of 8.3×10^{-6} fatalities per year-mile for a modern pipeline similar to IGTS can be made. The probability of fatality, per mile, is numerically equal to the average fatality rate.

  Average Facility Rate =

$$\frac{36 \text{ Fatalities}}{14.5 \text{ yr} \times 300{,}000 \text{ mi}} = 8.3 \times 10^{-6} \text{ fatalities/yr-mile}$$

  Therefore, the probability of fatality per mile per year = 8.3×10^{-6}. This chance of fatality equates to 1 in 120,000 per year per mile.

The historic gas transmission pipeline accident data that have been described in this section demonstrate that pipelines are an exceptionally safe and reliable method for transporting energy, especially when compared with other methods of transportation. Further, estimated recurrence intervals on both a total project and a per mile

basis indicate that significant accidents associated with modern pipelines built to federal standards and similar in diameter to IGTS are extremely unlikely to occur.

11.3 IGTS APPROACH TO PIPELINE SAFETY

The IGTS approach to pipeline safety is to make it an intrinsic feature of pipeline design, construction, and operation. A similar approach was the basis for the development of national codes of practice and standards which formed the basis for the development of DOT requirements (49 CFR 192) which define minimum safety standards. TCPL has standard engineering/construction specifications for pipelines which are filed with and have been revieved by Canadian pipeline regulatory authorities and were also developed on the basis of intrinsic safety considerations. These practices meet and/or exceed the requirements of 49 CFR 192 and typical United States pipeline practices. It is IGTS' intention to use the accepted U.S. practices as the basis for developing specifications for the proposed IGTS project.

11.3.1 Regulatory Environment

The design and operation of the IGTS, as well as all natural gas transmission lines in the United States, is governed by 49 CFR Parts 190, 191, and 192. Part 190 prescribes procedures utilized by the DOT Office of Pipeline Safety, the agency that implements the regulations regarding pipeline safety promulgated under the Natural Gas Pipeline Safety Act (NGPSA).

Part 191 identifies the requirements for the reporting of incidents and annual pipeline summary data by operators of gas pipeline facilities. The operator must report within 30 days any incident that involves a release of gas from a pipeline which results in a death or injury necessitating in-patient hospitalization or estimated property damage, including cost of lost gas, of $5,000 or more.

Part 192 defines minimum safety requirements for pipeline facilities and the transportation of gas. For example, Part 192 defines pipeline class locations, which determine pipeline design and safety measures such as pipeline wall thickness, design pressure, valve spacing, and cover (burial depth). The class location unit is an area

extending 200 yards on either side of the center line of any continuous 1.0-mile length of pipeline. In general, the class location is determined by the buildings in the class location unit.

Part 192 also defines minimum requirements for pipeline materials and design, as well as the spacing between mainline valves. Mainline valve spacing is determined by pipe class location, with minimum requirements as follows:

Class Location	Maximum Distance to Valve
4	2.5 miles
3	4 miles
2	7.5 miles
1	10 miles

In addition, Part 192 specifies welding practices including procedures, qualifications of welders, inspection, and testing. Nondestructive testing of welds is required for all project proposed pipelines as a function of glass location:

- In Class 1 locations, at least 10%.
- In Class 2 locations, at least 15%.
- In Class 3 and Class 4 locations, at crossings of major or navigable rivers, and within railroad or public highway rights-of-way, 100% unless impracticable, in which case at least 90%.

Finally, Part 192 defines minimum requirements for:

- The protection of pipelines from external, internal, and atmospheric corrosion.
- Pipelines are required to have an approved external protective coating and to be equipped with a cathodic protection system, which must be tested at least once each year.
- Depth of cover over the pipe in different class locations and under different subsurface conditions. Cover in normal soil in Class 2, 3, and 4 locations is 36 inches; in Class 1 locations it is 30 inches. In rock, minimum cover

requirements are 18 and 24 inches in Class 1, and in all other class locations, respectively.

- o Leak-testing and strength-testing for pipelines.
- o Operation procedures, including a written operation and maintenance plan.

11.3.2 Design and Construction

The IGTS pipeline will be designed, constructed, inspected, operated, and maintained in accordance with the requirements of 49 CFR 192. From a regulation perspective, the requirements set forth in 49 CFR 192 are, by definition, the "minimum requirements" for IGTS. From a safety point of view, 49 CFR 192 delineates stringent requirements for pipelines, resulting in a high level of built-in pipeline safety. This built-in safety is reflected in the excellent transportation safety record for pipelines described in Section 11.2. IGTS will exceed the requirements of 49 CFR 192 in several technical areas which will further enhance IGTS safety. These areas are described below.

Material Specification and Fracture Control Design. The design pressure of the IGTS pipeline will be 1,440 psig. Table 11-4 presents the proposed pipe wall thickness, pipe grades, design factors, and notch toughness requirements for the various pipe diameters and class locations (i.e., specification of pipe material which is inherently resistant to initiation and propagation of pipeline ruptures).

Fracture control design is not required by 49 CFR 192, but will be included in the IGTS pipeline design to optimize the resistance to fracture.

The pipe material specification will include notch toughness requirements that:

- o Confine fracture initiation and propagation to the ductile mode.
- o Optimize the leak before break characteristics of pipe and components.
- o Increase the resistance to deformation and penetration.
- o In the unlikely event of a rupture, limit the extent of the break by providing self arrest of the rupture.

Table 11-4

IGTS PIPE DESIGN PARAMETERS

Location Class	Pipe Outer Diameter (inches)	Pipe Wall Thickness (inches)	Pipe Grade (API 5LX)	Design Factor*	Charpy V-Notch Energy Absorbed -Full Size- (min. ft-lb)
1	24	0.370	X65	0.72	32
2	24	0.412	X70	0.60	32
3	24	0.494	X70	0.50	32
3	20	0.443	X65	0.48	32
Marine**	20	0.500	X60	0.50	32

*Based on a design pressure of 1,440 psig.
**Beneath Long Island Sound.

There are data that further indicate that for a pipe with a wall thickness of 0.375 inches, common equipment used by excavators cannot penetrate the pipe. Based on the pipe wall thicknesses, as shown in Table 11-4, it would be difficult for common types of excavation equipment to puncture IGTS.

British Gas has conducted studies to evaluate the operating pressure needed to rupture a pipe designed to IGTS standards if a surface defect grows through the pipe wall (Fearnehough 1985). The results presented in Figure 11-6 show that the pipe will not rupture if the ratio of pipe stress to pipe SMYS (specified minimum yield strength) is less than 0.3. Even at higher ratios of pipe stress to pipe SMYS, in the unlikely event that a flaw exists sufficient to cause fracture propagation, the fracture would self arrest.

Welding and Radiography Standards. TCPL's procedures for welding quality assurance and radiography exceed the requirements of 49 CFR 192 in a number of areas, two of which are described below.

Welding procedures are prequalified by performing test welds and then physically testing these welds. To insure fracture toughness, Charpy V-notch and COTD (crack opening tip displacement) tests are conducted on test coupons.

Under the requirements of 49 CFR 192, welds in Class 3 and submerged marine pipeline locations must be 100% radiographed. Within Class 1 and Class 2 areas, 10% and 15% of welds, respectively, are required to be radiographed. IGTS will radiograph 100% of all welds.

Sectionalizing Valves. Pipeline sectionalizing block valves will be installed at spacing intervals specified by 49 CFR 192. Each valve will be equipped with both manual and power actuators at the valve. Pressure detectors will be located both upstream and downstream at each valve and low pressure signals from the detectors, which are indicative of a line break, will initiate closure of the sectionalizing valves. Provision of power actuators on sectionalizing valves will reduce the time needed to close them in the event a service incident occurs.

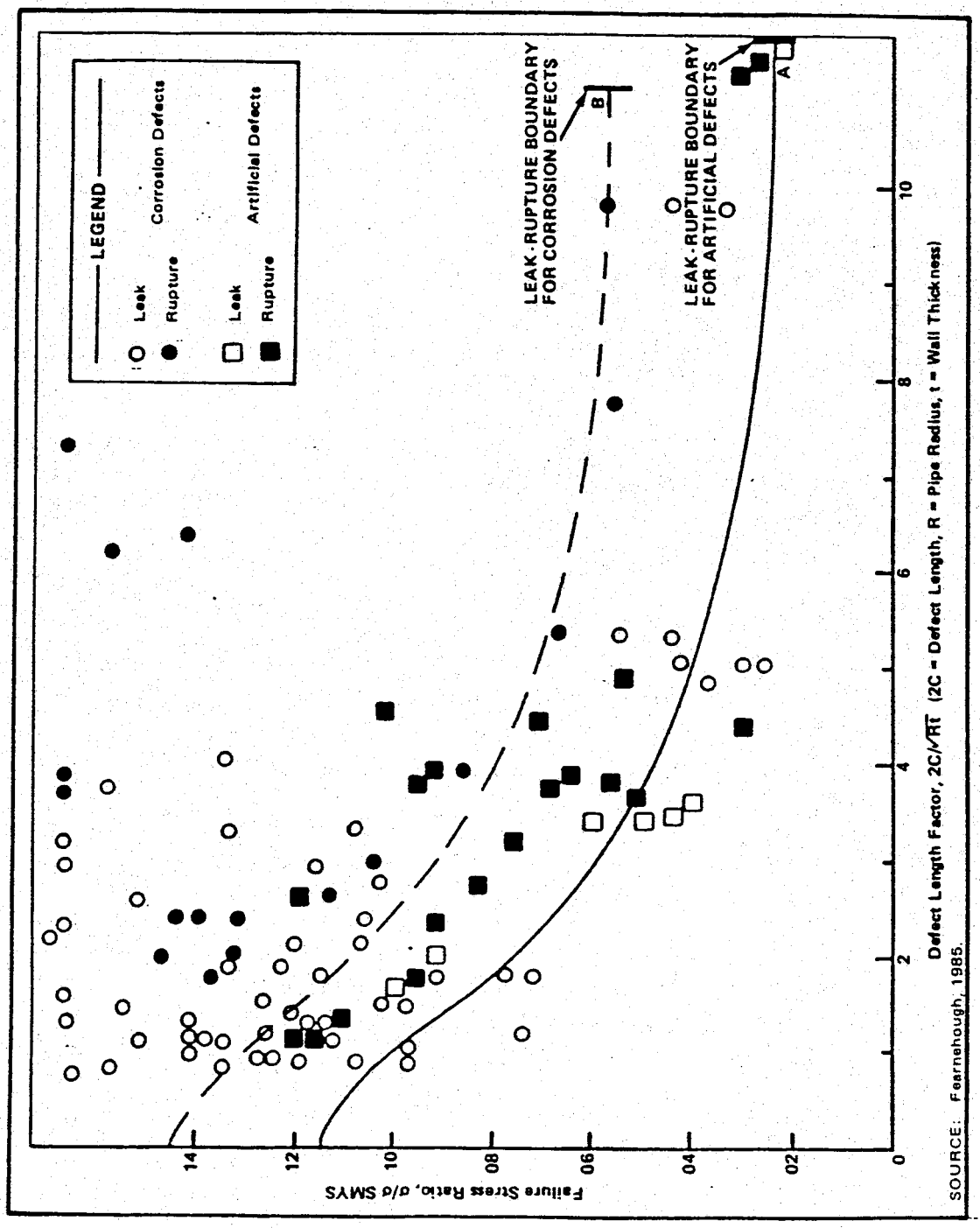

Figure 11–6 LEAK-RUPTURE BEHAVIOR OF PIPELINE DEFECTS

Hydrostatic Test Pressure. The completed IGTS pipeline will be hydrostatically pressure tested before being placed in service. The following table lists "Test Factors" required by 49 CFR 192.

Class Location	Test Factor (49 CFR 192)
Class 1	1.10
Class 2	1.25
Class 3	1.50
Class 4*	1.50

*Class 4 locations are those within 200 yards of a pipeline, where buildings with four or more stories are prevalent.

The maximum allowable working pressure for a pipeline can be obtained by dividing the hydrostatic test pressure by the test factor in the table.

Security

All aboveground pipeline facilities (i.e., mainline valves, meter stations, pig launchers, and receivers) will be fenced. Fences will be of chain-link design and will stand 8'10" high above ground when erected, including one foot of three strands of barbed wire overhang. Gates to these facilities will be kept locked at all times unless IGTS personnel are working at a site. All valves will be locked to prevent unauthorized manual operation.

11.3.3 Additional Construction Inspections

The pipe that is used in the construction of the IGTS pipeline will be inspected at the pipe mill and after delivery to the construction site. After IGTS is completed and before it is placed in service, the pipeline will be internally inspected using an instrumented inspection tool. This insures that significant defects caused by pipe construc-

tion, pipe laying, and backfilling operations remaining in the pipe when it is put into service are minimized.

Pig Launchers and Receivers. Pig launchers and receivers will be installed at regular intervals along the IGTS to accommodate inspection of the pipeline with an internal inspection tool at regular intervals throughout the life of the IGTS project. An inspection tool developed by TCPL for this service will be made available to IGTS. This tool is capable of detecting external and internal pipe corrosion and other anomalies. This type of inspection provides for early detection and correction of conditions that might result in a pipeline failure.

Protection of Marine Pipeline. The potential effects of vessel anchors and fishing gear on the Long Island Sound section of the pipeline have been studied (J.P. Kenny 1986). The results show that pleasure vessel anchors and fishing gear cannot damage the pipeline. This is due, in part, to the diameter of the line, the pipe wall thickness, and the concrete outer coating on the pipe. To protect the pipeline from oil tankers anchoring at Northport Terminal, the pipe will run at least 2,000 feet from the terminal. This distance is about twice the anchor chain length of vessels calling at Northport. In addition, in the near shore areas, the pipe will be buried.

Corrosion Protection. Use of modern corrosion protection technology reduces the potential for a corrosion caused pipeline failure and thus increases the safety of pipelines.

TCPL has had extensive experience with corrosion protection systems for pipelines. Based on this experience, the IGTS pipeline will be both coated and provided with cathodic protection. The pipe coating will be a state-of-the-art system. The cathodic protection will meet the requirements of 49 CFR 192.

Appropriate precautions will be taken to mitigate the potential affects of induced currents in the pipeline caused by High Voltage Alternating Current (HVAC) in accordance with NACE recommended practice RP-01-77, "Mitigation of Alternating Current and Lightning Effects on

Metallic Structures and Corrosion Control Systems," and DC interference in accordance with 49 CFR 192.4.

11.3.4 Operation and Maintenance Procedures

IGTS's operating partner, TCPL, built and has in service over 6,000 miles of gas transmission lines across Canada and has equity interests in major pipelines in the northern United States. TCPL has been operating these systems since 1957 and has developed and instituted programs to provide for the safe, reliable operation of the pipelines. Some of these include:

- o TCPL has developed a written Code of Operating Practice for its existing pipelines which contains procedures for normal day-to-day operations, maintenance, and repair, as well as abnormal and emergency situations, and accident investigation. These procedures are formally reviewed on an annual basis and also updated more frequently if needed.

- o Training programs are in place for pipeline operating and maintenance personnel. The training programs include on-the-job training, classroom work, and refresher courses. When warranted, special training classes are held to address new equipment systems and new technology.

- o An active program to minimize pipeline damage is in place. The program includes direct contact with landowners along the pipeline right-of-way, direct contact with excavating contractors who commonly work in areas near the right-of-way, and the installation of "call before you dig" signs along the pipeline right-of-way. In addition, IGTS will provide all landowners along the pipeline route with a brochure that includes information about the operation of gas transmission pipelines.

- o TCPL has established a program for monitoring and maintaining pipeline integrity. The program includes regular aircraft flights along the existing pipeline right-of-way, on-ground pipeline leak surveys, and inspections of pipelines using internal tools. Aircraft overflights also monitor construction on new pipelines and unusual activities along existing pipelines.

- o Audit systems are in place to insure that pipeline operations and safety procedures are adhered to.

TCPL will utilize these resources to assist in establishing operating and maintenance procedures for IGTS and to insure that these procedures meet the requirements of all government regulations.

The pipeline will be instrumented and its operation will be monitored from a centrally located control center. Inspection and maintenance of the pipeline will be performed in accordance with a detailed operating and maintenance plan. Regular inspections will comply with DOT requirements as specified in 49 CFR 192 and will include:

- Weekly helicopter patrols to observe conditions on and adjacent to the pipeline right-of-way will be conducted, weather permitting. These patrols are to detect leaks, and to identify any nearby construction or marine activities and any other factors that may affect public safety and pipeline operation.
- The entire pipeline right-of-way will be walked once each calendar year to check for minor gas leaks not evident from air patrols.
- Periodic internal pipeline inspections using TCPL's internal inspection tools to check for corrosion or mechanical damage. These inspection tools are also discussed under Pig Launchers and Receivers, in Section 11.3.3.
- Side-scan surveys of the marine pipeline will be conducted using either remotely controlled vehicles, divers, or remote sensing equipment.

IGTS personnel will be trained to insure that the inspections described above are performed in accordance with the IGTS operations and maintenance plan.

IGTS field staff will be located at three district offices along the pipeline system. The field staff will be available to:

- Perform the pipeline inspections.
- Perform general maintenance of the pipeline and right-of-way.
- Locate and mark the pipeline when requested by contractors and others doing excavation along the pipeline.
- Supervise all crossings of the pipeline by other agencies (i.e., other pipelines, cables, ditches, roads, etc.) to

insure that the crossings are performed safely and to the specifications of IGTS.

- Shut down the pipeline in the event of an emergency.

11.3.5 Emergency Plans

IGTS will be designed, constructed, and maintained to insure safe operation. As already described, systems will also be built into IGTS for detecting leaks, isolating the pipeline, and responding to emergencies. Emergency plans will be developed in conjunction with local officials and will include notification of local officials in the event that an IGTS-related accident occurs. IGTS district field staff will be available to respond to a pipeline emergency 24 hours a day. Written emergency response, accident investigation, and repair procedures will be prepared, in accordance with 49 CFR 192, Paragraph 192.615, and field personnel will be trained in their proper use. The IGTS pipeline emergency plan will comply with all applicable federal requirements and will provide the following:

- The plan must be in writing.
- Procedures for receiving, identifying, and classifying notices of events which require immediate response.
- Establishing and maintaining communications with appropriate fire, police, and other public officials.
- Prompt and effective response to each type of emergency, including leaks, fires, explosions, and natural disasters.
- The availability of IGTS personnel to respond to the scene of an emergency.
- Procedures for first protecting people, and then property.
- Procedures for emergency shutdown and depressurization of the pipeline.
- Making safe any actual or potential hazard to life or property.
- Procedures for notifying appropriate fire, police, and other public officials of emergencies, and coordinate with them both planned and actual responses during an emergency.

11.3.6 Liaison with Local Authorities

Over the past several years, IGTS has consulted informally with various local emergency management authorities (e.g., fire departments, police departments, emergency management councils) regarding the protection of the public in the unlikely event of pipeline failure. In the future, IGTS will continue to consult with all local authorities along the pipeline route. Each authority will be provided with specific information regarding pipeline facility location and concerning the measures to take in the event of a natural or manmade incident regarding the pipeline. This information will be provided in the form of briefings, training sessions, and printed material, and will include:

- For each town, map plans showing the location and depth of pipeline facilities, as well as other pertinent information such as gas pressure and location of nearest valves. The plans will show access routes to the facilities, as well as the general locations of structures near the pipeline.
- Description of the chemical and physical properties of natural gas, provided in a Material Safety Data Sheet (MSDS) or equivalent MSDS format.
- Emergency telephone numbers of IGTS district operations personnel, who will be reachable on a 24-hour basis.
- Copies of the IGTS Emergency Plan (see Section 11.3.5).
- Briefings regarding the procedures to be followed in the event of a pipeline rupture and/or fire. These briefings will be conducted shortly before the initiation of pipeline operation, and then on a periodic basis thereafter.

It should be noted that IGTS does not believe that any special equipment will be needed to respond to emergencies related to the IGTS pipeline. This is because IGTS recommends that gas fires be controlled primarily by controlling gas flow (i.e., shutting off the valves and thus the gas supply), and that local emergency management authorities function primarily to control the spread of ancillary fires, to limit access to the area, and to perform other activities normally associated with a fire emergency.

11.3.7 Procedures to Limit Hazards

Studies have been performed to evaluate the potential for hazard in the highly unlikely event that the IGTS pipeline is seriously damaged. The results of these studies in comparison with other hazards are reflected on Table 11-2. At the top of the table are risks voluntarily accepted by the public, i.e., automobile travel. Risks of fatality associated with lightning and tornadoes are less than 10^{-6} (one in a million) and are generally perceived by the public to be of little concern. These types of risks are called involuntary risks. The estimated pipeline probability of fatality to the public is less than 10^{-6}/year; thus, by common measures, is perceived by the public to be of little concern. Based on this criteria, the potential safety risk presented by pipelines, such as IGTS, is acceptable, and this is confirmed by the extensive use of natural gas transmission pipelines in the United States.

However, the potential hazard statistics identified in Table 11-2 are for all gas transmission pipelines in operation and have been computed in a very conservative manner. The public probability of fatality for IGTS will be considerably less than that computed because IGTS will take extra precautions during both pipeline construction and operation. These include:

- IGTS will be designed and tested to meet and exceed the requirements of 49 CFR 192.
- The IGTS right-of-way will be clearly marked and regularly patrolled and inspected to insure that the potential for third party damage is avoided.
- The diameter and wall thickness of the IGTS pipeline will make failure due to outside forces (digging) very difficult.
- The metallurgy of the pipe proposed by IGTS reduces the possibility of pipeline rupture, even if a flaw should be present.
- The internal inspection of the pipe with an internal inspection tool after construction is completed and regularly during operation allows detection of flaws (which could result in leaks) before any serious damage is incurred.

- The corrosion protection system provided IGTS will be based on modern technology and will reduce the possibility of corrosion induced flaws occurring.

11.4 CONCLUSIONS

The historic operating record of the natural gas transmission pipeline industry, combined with the proposed procedures for the design, construction, and operation of the IGTS, lead to the following conclusions:

- Over the years, pipelines have had an excellent public safety record when compared to other modes of transportation.
- Government regulations and enforcement procedures for the design, construction, operation, and inspection of pipelines have been established to insure safe pipeline design and operation. IGTS will meet and exceed the requirements of these regulations.
- TCPL, IGTS's operating partner, responsible for construction and operation of IGTS, is an established and highly experienced operator of natural gas transmission pipelines.
- IGTS will be equipped to rapidly isolate the pipeline should an incident occur.
- IGTS will participate in pipeline "call before you dig" and local emergency response programs.
- Based on historic pipeline and operating data, the estimated recurrence interval for a reportable incident anywhere along the 369-mile length of IGTS is once every 24.6 years. Over the operating life of IGTS, one reportable service incident would be expected based on historic data. IGTS expects to better this.
- The probability of a pipeline incident for the portion of IGTS beneath Long Island Sound is much less than the below-ground land portion. A reportable service incident would not be expected in this location of IGTS during the operating life of IGTS.
- IGTS will present a much lower transportation risk than that commonly encountered by the public due to the modern technology that will be used in the design, construction, and operation of IGTS.
- The public risk presented by IGTS is extremely small and is acceptable based on commonly used criteria.

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