



February 21, 2005

Mr. Gil Paquette
TRC Environmental Corporation
400 Southborough Drive
South Portland, ME 04106

SUBJECT: AUDIBLE NOISE REVIEW

Dear Mr. Paquette:

Commonwealth Associates, Inc. (CAI) has reviewed the audible noise measurements and calculations prepared for the Northeast Reliability Interconnect 345 kV transmission line. These original measurements and calculations were made in October 1989. The calculations at that time were based on wood H-frame construction and 2-1192.5 ACSR conductors per phase. We understand that the design of the line is essentially the same, and, therefore, the calculated values for audible noise would be applicable today. We have also reviewed the Maine Department of Environmental Protection Site Location Law, Chapter 375, Section 10, Control of Noise.

In summary, the expected edge of right-of-way audible noise for wet conductor conditions is calculated as 42 dBA. The audible noise regulations require nighttime levels to be below 50 dBA in areas that are not commercial, industrial or transportation. In some areas the regulations may require levels below 45 dBA. The calculated 42 dBA wet conductor audible noise level is within both the 50 and 45 dBA requirements.

We have provided a brief report that summarizes our review and includes the appropriate sections of our 1989 report for reference. Please call me if you have any questions or need any additional information on the predicted audible noise levels for the project.

Yours very truly,

David A. Shafer, P.E.
Manager, Electrical Systems

cc RN Collins
SS Miller

**AUDIBLE NOISE IMPACT
OF PROPOSED 345 KV TRANSMISSION LINE**

Prepared for

BANGOR HYDRO-ELECTRIC COMPANY

Prepared by:

D.A. Shafer, P.E.

At the offices of
Commonwealth Associates, Inc.
P.O. Box 1124
Jackson, Michigan 49204
Revised February 21, 2005
316001

Approved for submittal:



David A. Shafer, P.E.
Manager, Electrical Systems

AUDIBLE NOISE IMPACT OF PROPOSED 345 KV TRANSMISSION LINE

Commonwealth Associates, Inc. (CAI) made audible noise measurements and calculations for the proposed Northeast Reliability Interconnect 345 kV tie line to New Brunswick in October 1989. We have reviewed the measurements and calculations made at that time and have included them herein for reference purposes.

The audible noise measurements were pre-construction. In other words, the noise measurements are made to assess ambient conditions prior to construction of the transmission line. The measurements were made at eight sites that were chosen to represent conditions from Orrington to the Maine-New Brunswick border along the proposed corridor of the new line. These sites were reviewed with regard to the present day alignment of the line and are substantially representative of the present day alignment.

At the time the measurements were made, the ambient conditions would be characterized as very quiet. The dominant noise level was recorded as 34 to 45 dBA at all sights except one. Most of the measurement sights were along roadways, so the noise source for the high measurements was traffic, with an occasional overhead aircraft. The high noise levels were 60 to 77 dBA.

The proposed transmission line will be nearly inaudible under fair weather conditions. Wet conductor conditions are generally considered the worst condition for 345 kV transmission line audible noise. Wet conductor conditions occur just after a rain or when the conductor is wetted by fog, dew, or melting snow. The predicted noise level for wet conductor conditions for the wood H-frame line with 2-1192.5 ACSR conductors per phase is 45 dBA directly underneath the line. Higher noise levels (55 dBA) are predicted for heavy rain conditions, however, the noise of the rain itself tends to mask the transmission line noise during heavy rain.

In conclusion, the proposed 345 kV line will create audible noise during wet conductor conditions of approximately 45 dBA directly underneath the line. The noise drops off rapidly and will be 36 dBA (barely audible) at 250 feet from the line centerline.

The Maine Department of Environmental Protection, Chapter 375, Section 10 of the Site Location Law (38 M.R.S.A. Section 484(3)) addresses noise regulation. For routine operation of developments, the noise level is not to exceed 75 dBA at any time of day at the property line. A more restrictive requirement is provided for areas not commercial, transportation, or industrial; the noise level is not to exceed 60 dBA in daytime and 50 dBA nighttime. An even more restrictive requirement is prescribed for areas where existing pre-development noise levels are less than 45 dBA daytime and 34 dBA nighttime. In this case noise level is not to exceed 55 dBA daytime and 45 dBA nighttime.

The typical right-of-way width of the proposed line is 170 feet. If the line is centered in the right-of-way, then the edge of right-of-way is 85 feet from the transmission line centerline. The calculated wet conductor audible noise at the edge of right-of-way is estimated at 42 dBA. Thus, the transmission line is below even the most stringent noise requirements.

**PRECONSTRUCTION MEASUREMENTS
AND IMPACT ASSESSMENT**

**FOR
RADIO AND TV RECEPTION
AND
AUDIBLE NOISE**

**FOR
BANGOR HYDRO-ELECTRIC COMPANY
SECOND 345 KV TIE LINE TO NEW BRUNSWICK**

Prepared By:

**D. A. Shafer, P.E.
R. S. Smith
R. L. Newman
J. Towler**

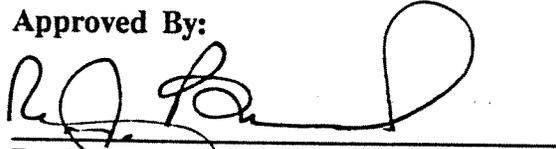
**At the Offices of:
Commonwealth Associates Inc.
301 Francis Street
P.O. Box 1124
Jackson, Michigan 49204-1124
January 31, 1990**

Measurements By:

**D. A. Shafer, P.E.
R. S. Smith
R. L. Newman**

October 24-27, 1989

Approved By:


**R. J. Broad, P.E.
Vice President**

9.0 AUDIBLE NOISE MEASUREMENTS AND ASSESSMENT

Ambient audible noise measurements were made at all eight sites and are summarized on Exhibit 8. These measurements were made using the "A" weighting network. The "A" weighting network is normally used because it approximates the response of the human ear and is typically referenced in community noise standards.

At the four sites in the Bangor area the predominant sources of audible noise were traffic, aircraft and wind in trees. These caused high noise levels of 60 to 70 dB(A). During quiet periods noise levels were 38 to 42 dB(A). At the more remote sites, occasional traffic or aircraft would cause high readings of 40 to 50 dB(A), and during quiet periods noise levels were below 34 dB(A).

At Site 20, audible noise measurements were made underneath the existing 345 kV line. At the time, the line's noise was barely audible as a very faint crackling. The theoretical audible noise expected from the existing line is presented on Exhibit 9 along with the measured ambient noise levels. The high ambient noise sources were predominantly traffic and aircraft.

Predicted audible noise characteristics of the proposed line are presented on Exhibit 10. During heavy rain, the noise of the rain masks the noise of the transmission line; therefore, the wet conductor condition is more appropriately considered in the analysis. No complaints are expected for noise levels below 53 dB(A). As shown on the Exhibit, the predicted noise level for wet conductor conditions is below this level. During fair weather, the line's noise will be nearly inaudible off of the right-of-way.

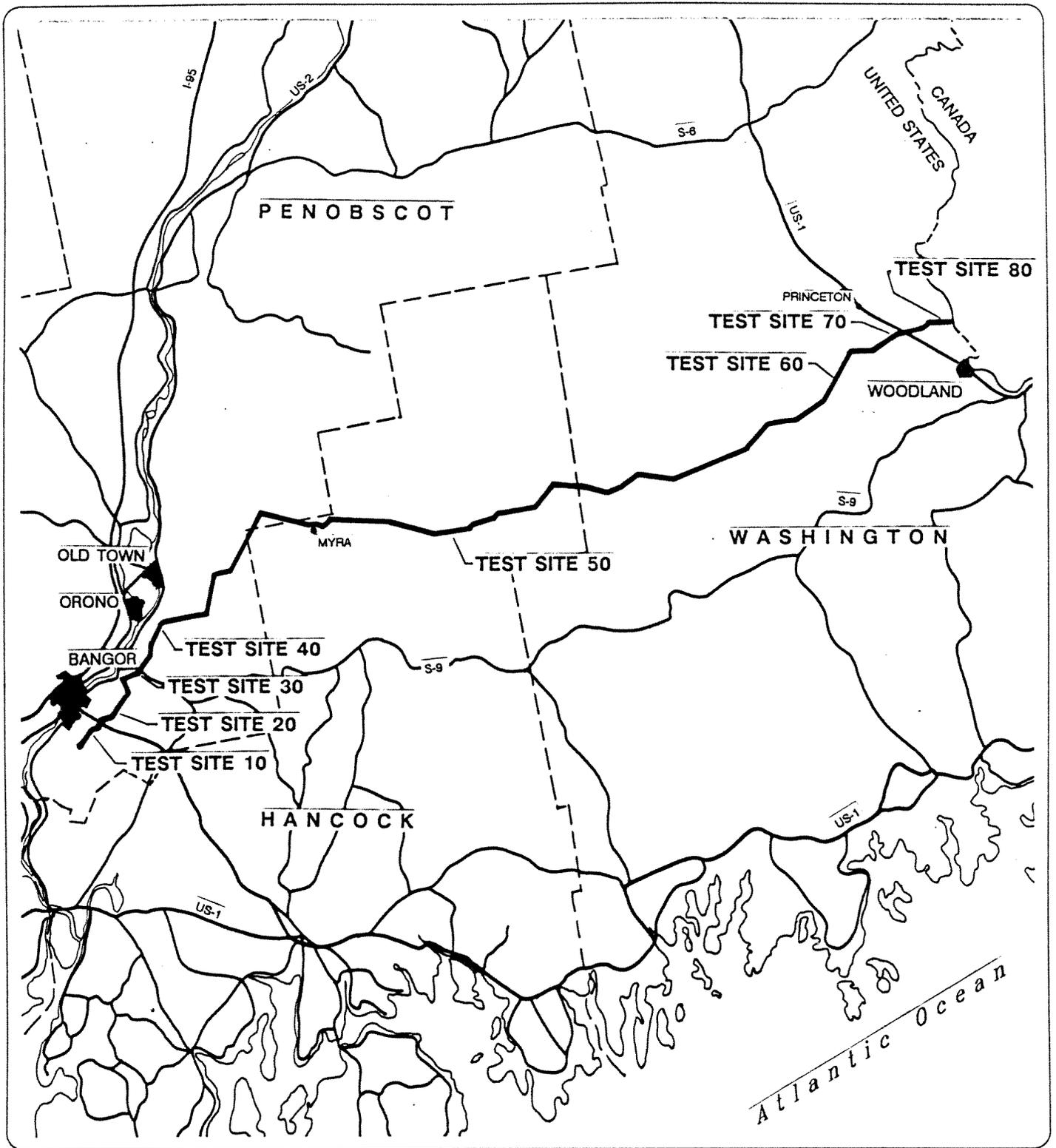
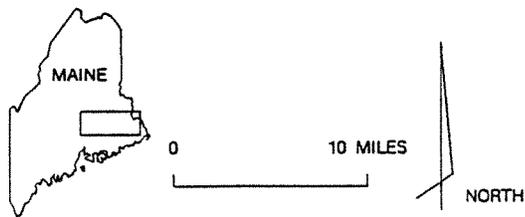


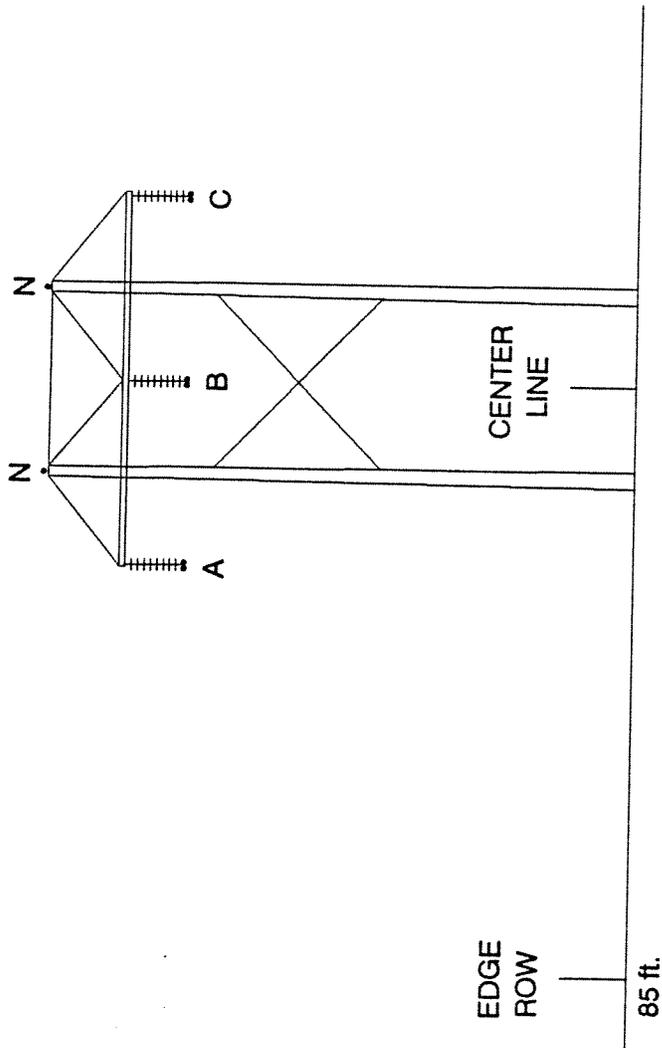
EXHIBIT 1

MEASUREMENT SITE LOCATIONS

BANGOR HYDRO-ELECTRIC COMPANY
SECOND 345KV TIE LINE TO NEW BRUNSWICK



TRANSMISSION LINE PARAMETERS
SECOND 345KV TIE LINE TO NEW BRUNSWICK - SC

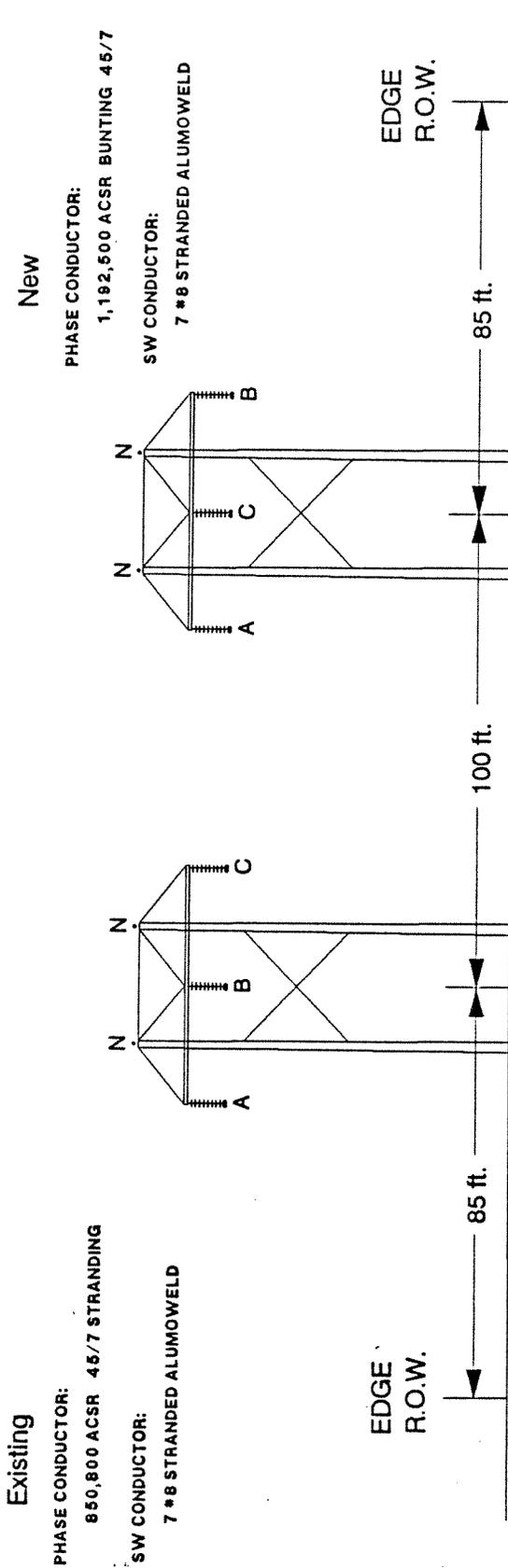


PHASE CONDUCTOR: 1,192,500 ACSR BUNTING
SW CONDUCTOR: 7 #8 STRANDED ALUMOWELD

BUNDLE	CONDUCTOR SEPARATION (inches)	# OF SUBCOND.	CONDUCTOR DIAMETER (cm)	SUSPENSION HEIGHT (feet)	CONDUCTOR SAG (feet)	HORIZONTAL DISTANCE (feet)
1	18.00	2	1.302	58.50	30.50	-26.00
2	18.00	2	1.302	58.50	30.50	0.00
3	18.00	2	1.302	58.50	30.50	26.00
4	.00	1	.385	78.25	21.50	-15.25
5	.00	1	.385	78.25	21.50	15.25

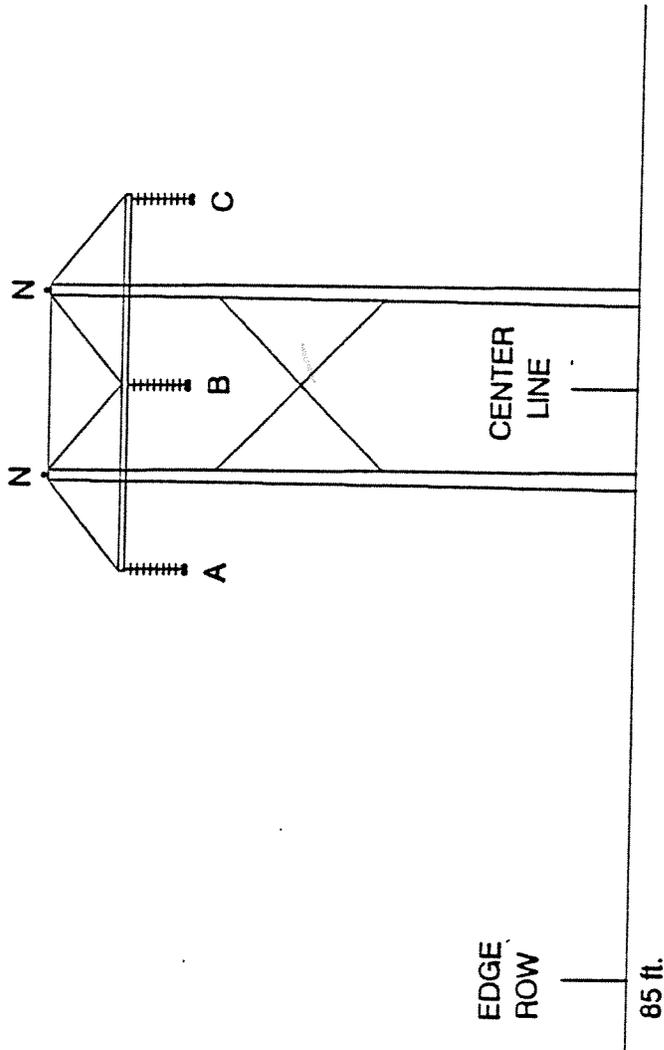
TRANSMISSION LINE PARAMETERS

SECOND 345KV TIE LINE TO NEW BRUNSWICK



	BUNDLE	CONDUCTOR	# OF	CONDUCTOR	SUSPENSION	CONDUCTOR	CONDUCTOR	HORIZONTAL
	SEPARATION	DIAMETER	SUBCOND.	DIAMETER	HEIGHT	SAG	DISTANCE	DISTANCE
	(inches)	(cm)		(cm)	(feet)	(feet)	(feet)	(feet)
Existing	1	18.00	2	1.100	58.50	30.50	-76.00	
	2	18.00	2	1.100	58.50	30.50	-50.00	
	3	18.00	2	1.100	58.50	30.50	-24.00	
	4	.00	1	.385	78.25	21.50	-65.25	
	5	.00	1	.385	78.25	21.50	-34.75	
New	1	18.00	2	1.302	58.50	30.50	24.00	
	2	18.00	2	1.302	58.50	30.50	50.00	
	3	18.00	2	1.302	58.50	30.50	76.00	
	4	.00	1	.385	78.25	21.50	34.75	
	5	.00	1	.385	78.25	21.50	65.25	

TRANSMISSION LINE PARAMETERS
MEPCO 345KV LINE 396 AT EASTERN AVE



PHASE CONDUCTOR: 850,800 ACSR 45/7 STRANDING
 SW CONDUCTOR: 7 #8 STRANDED ALUMOWELD

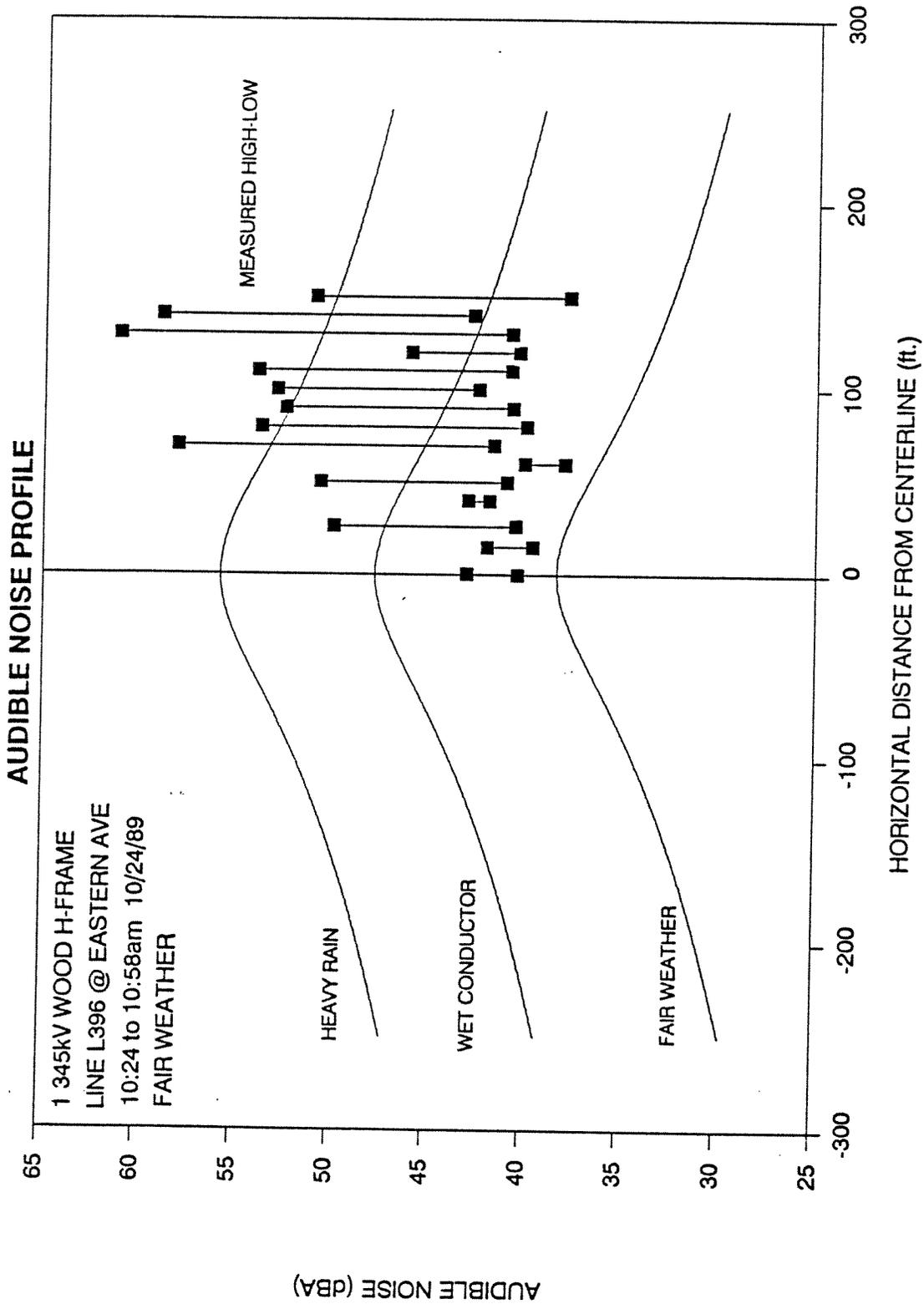
BUNDLE	CONDUCTOR SEPARATION (inches)	# OF SUBCOND.	CONDUCTOR DIAMETER (cm)	SUSPENSION HEIGHT (feet)	CONDUCTOR SAG (feet)	HORIZONTAL DISTANCE (feet)
1	18.00	2	1.100	58.50	22.25	-26.00
2	18.00	2	1.100	58.50	22.25	0.00
3	18.00	2	1.100	58.50	22.25	26.00
4	.00	1	.385	78.25	21.50	-15.25
5	.00	1	.385	78.25	21.50	15.25

**BANGOR HYDRO ELECTRIC CO.
SECOND 345kV TIE LINE TO NEW BRUNSWICK**

MEASURED AMBIENT AUDIBLE NOISE

SITE	TIME	AUDIBLE NOISE			PRINCIPAL SOURCES OF NOISE
		LOW dBA	HIGH dBA	DOMINANT dBA	
10	8:45	39	60	44	TRAFFIC, AIRCRAFT, DOG
20	10:30	38	61	42	WIND, AIRCRAFT, TRAFFIC
30	13:35	42	77	63	TRAFFIC, WIND IN TREES
40	9:55	42	46	45	TRAFFIC, BIRDS
50	15:11	< 34	38	35	STREAM, WIND
60	14:40	< 34	44	34	WIND, AIRPLANE
70	11:52	< 34	40	36	TRAFFIC
80	8:45	< 34	46	37	TRUCKS, BIRDS

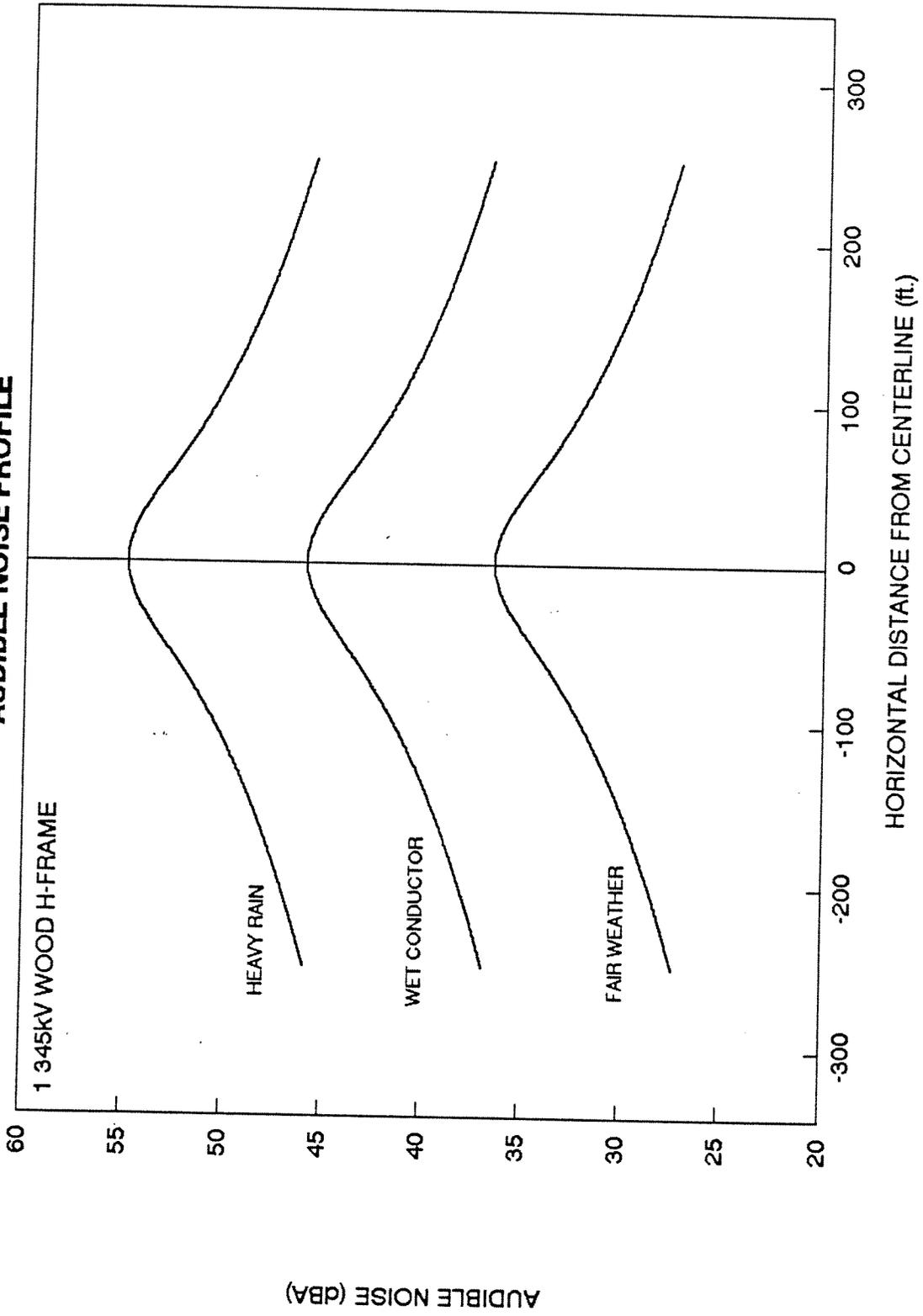
BANGOR HYDRO ELECTRIC CO.



AUDIBLE NOISE (DBA)

HORIZONTAL DISTANCE FROM CENTERLINE (ft.)

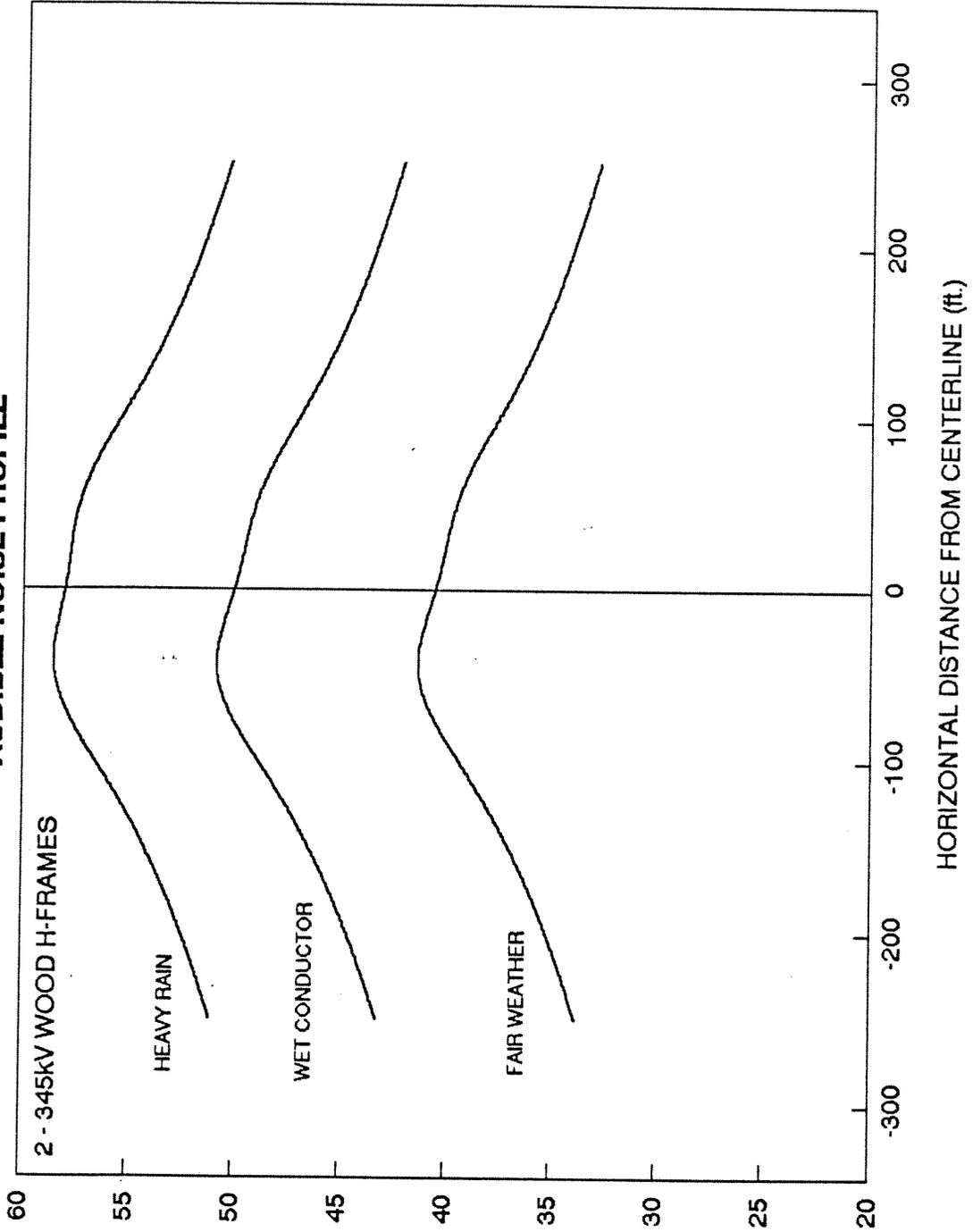
BANGOR HYDRO ELECTRIC CO.
SECOND 345KV TIE LINE TO NEW BRUNSWICK
AUDIBLE NOISE PROFILE



BANGOR HYDRO ELECTRIC CO.

SECOND 345KV TIE LINE TO NEW BRUNSWICK

AUDIBLE NOISE PROFILE



AUDIBLE NOISE (dBA)

HORIZONTAL DISTANCE FROM CENTERLINE (ft.)

APPENDIX A
SITE LOCATIONS AND WEATHER DATA

Descriptions of the eight measurement sites and weather at the time of measurements are contained in this Appendix.

<u>Site No.</u>	<u>Page No.</u>
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30	A6 - A7
40	A8 - A9
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70	A14 - A15
80	A16 - A17

SITE LOCATION - WEATHER DATA
SITE 10

Date: 10/27/89
Time: 8:25 a.m. - 11:07 a.m.
Temperature: Wet 47°F
Dry 49°F
Relative Humidity: 93%
Barometric Pressure: 30.2
Wind Speed: -
Wind Direction: -
Weather Description: Overcast

Site Description: First house east of existing lines on north side of Wiswell Road.

Closest Residence: Small wood frame house at site.

Land Usage: Residential - Rural

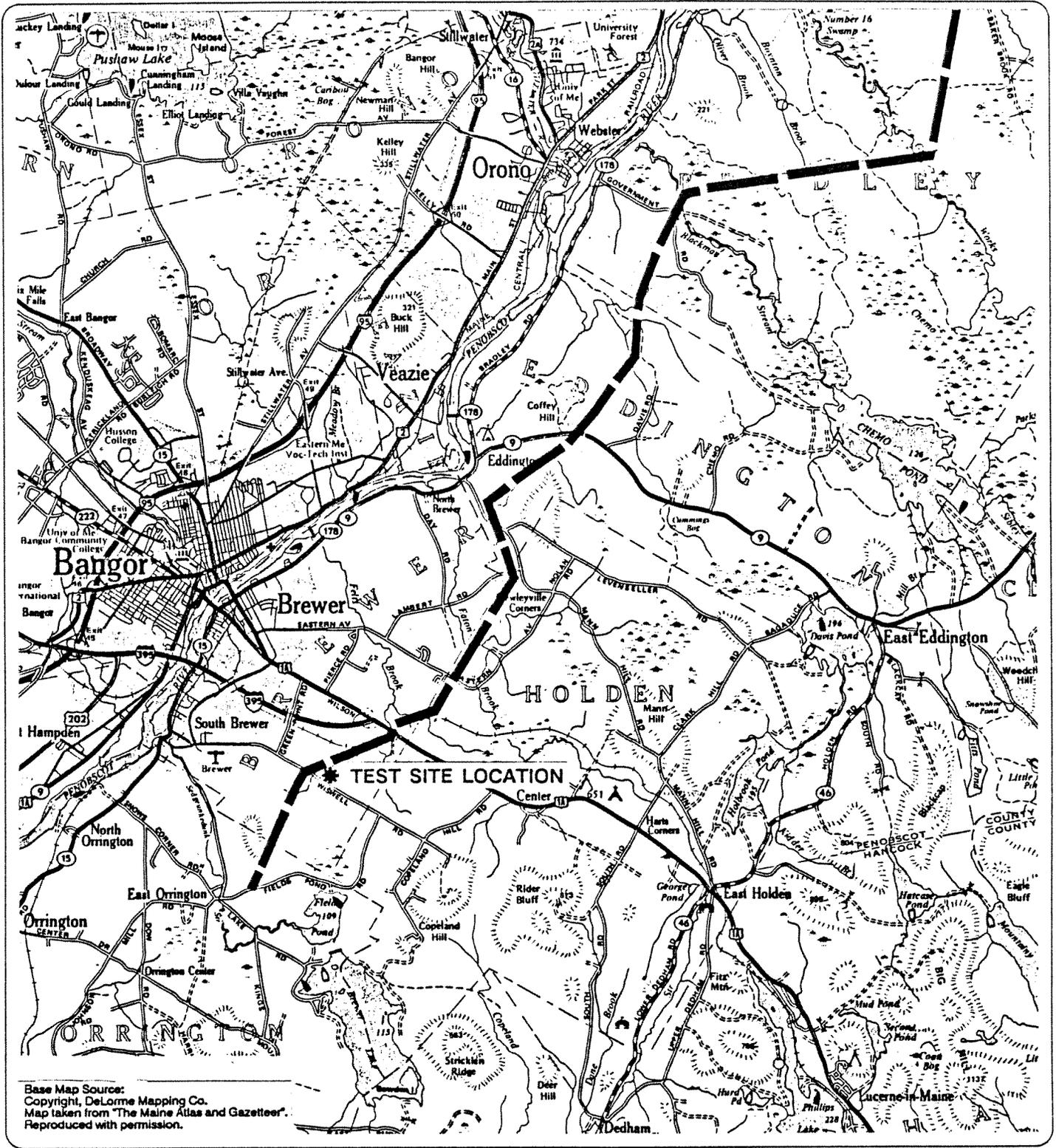
Topography: Flat - low and swampy at transmission lines.

Shielding or Reflecting
Terrain or Structures: House and barn.

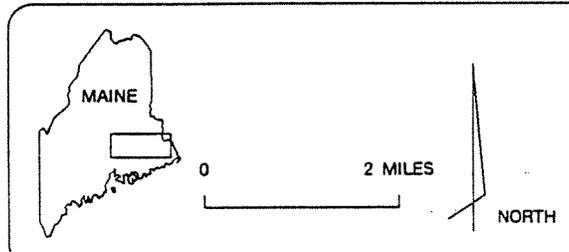
Sources of Radio Noise: Transmission and distribution lines.



View Looking Northeast
A2



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TEST SITE 10

BANGOR HYDRO-ELECTRIC COMPANY
 SECOND 345KV TIE LINE TO NEW BRUNSWICK

SITE LOCATION - WEATHER DATA
SITE 20

Date: 10/24/89
Time: 8:45 a.m. - 3:30 p.m.
Temperature: Wet 56°F
Dry 58°F
Relative Humidity: 88%
Wind Speed: -
Wind Direction: -
Weather Description: Sunny

Site Description: North side of Eastern Ave. under existing 345 kV line L396.

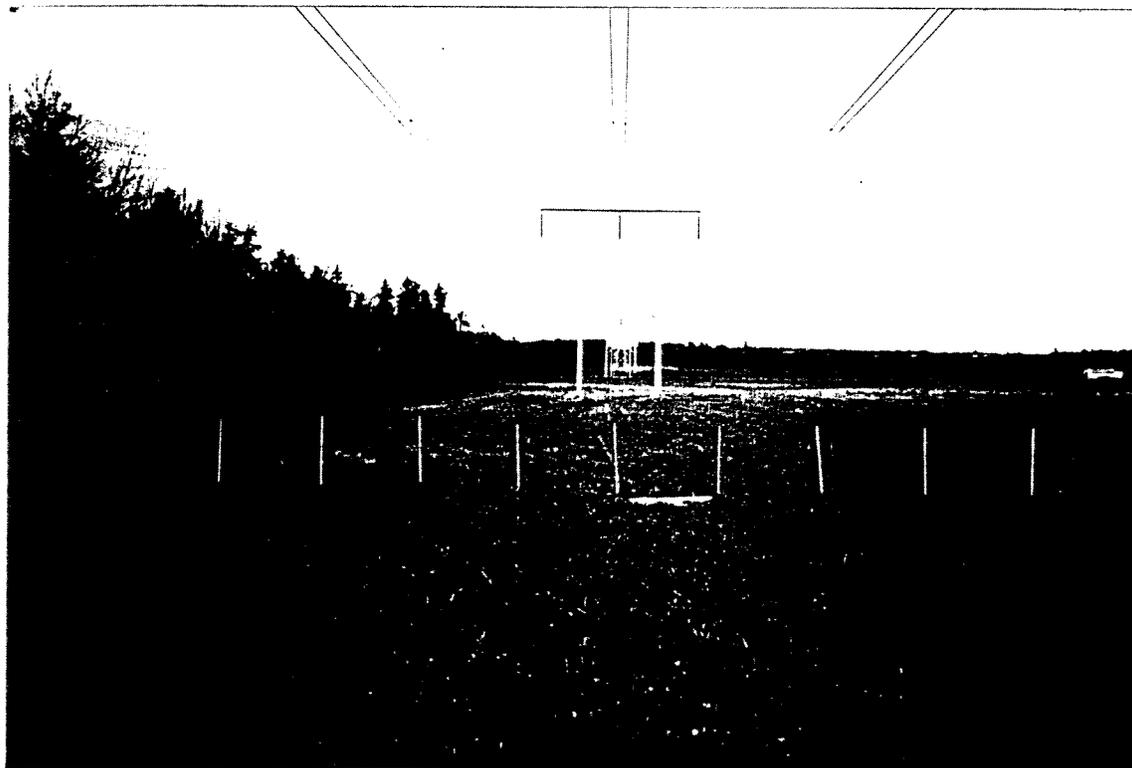
Closest Residence: South side of road approx. 200' west, white wood frame.

Land Usage: Farming

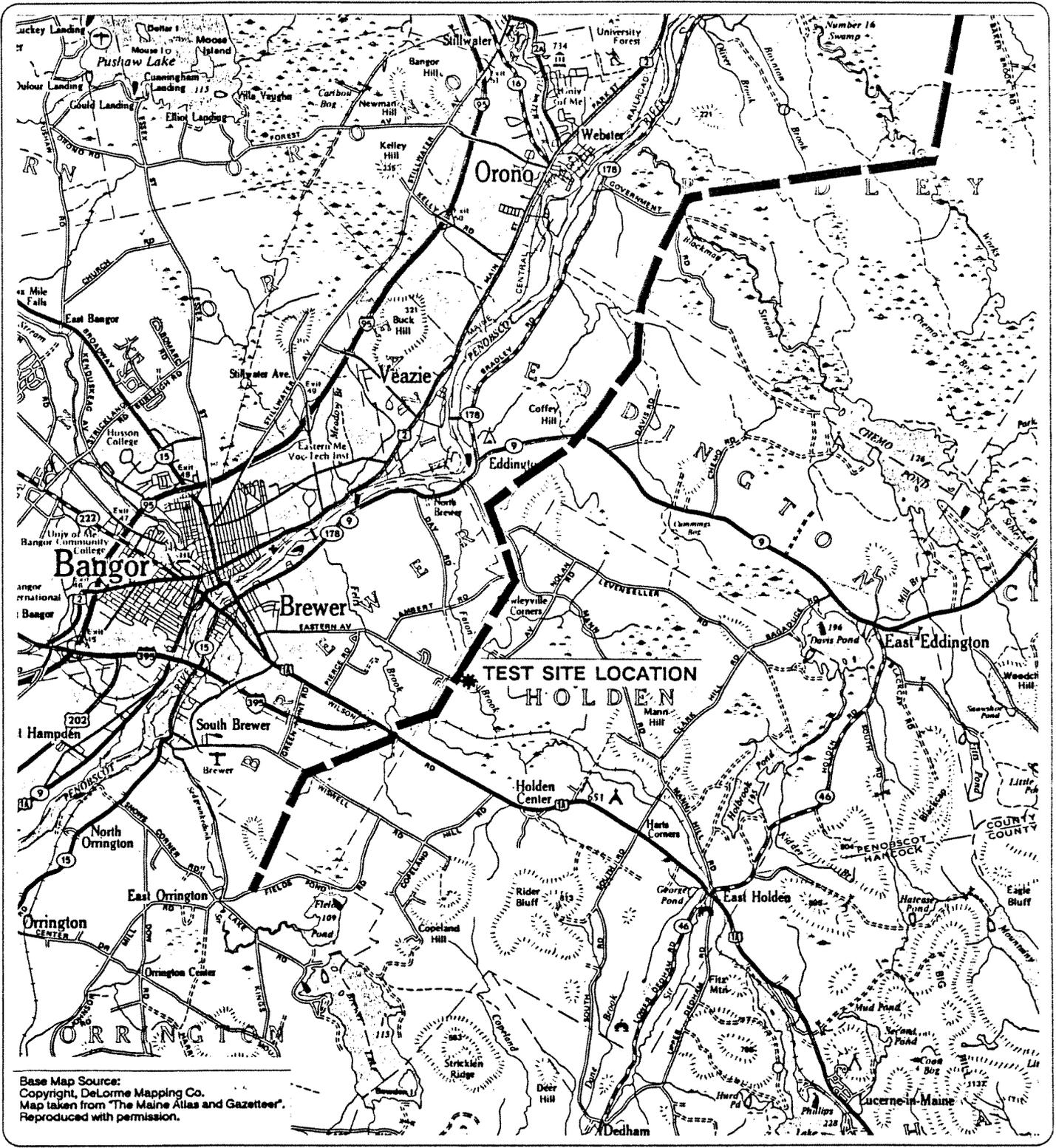
Topography: Flat - grass and clover field/trees 60' west of centerline.

Shielding or Reflecting Terrain or Structures: 345 kV line and structures.

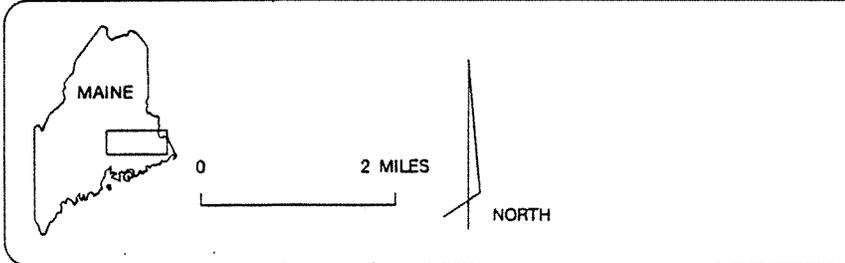
Sources of Radio Noise: 345 kV line



View Looking Northeast
A4



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TEST SITE 20

BANGOR HYDRO-ELECTRIC COMPANY
 SECOND 345KV TIE LINE TO NEW BRUNSWICK

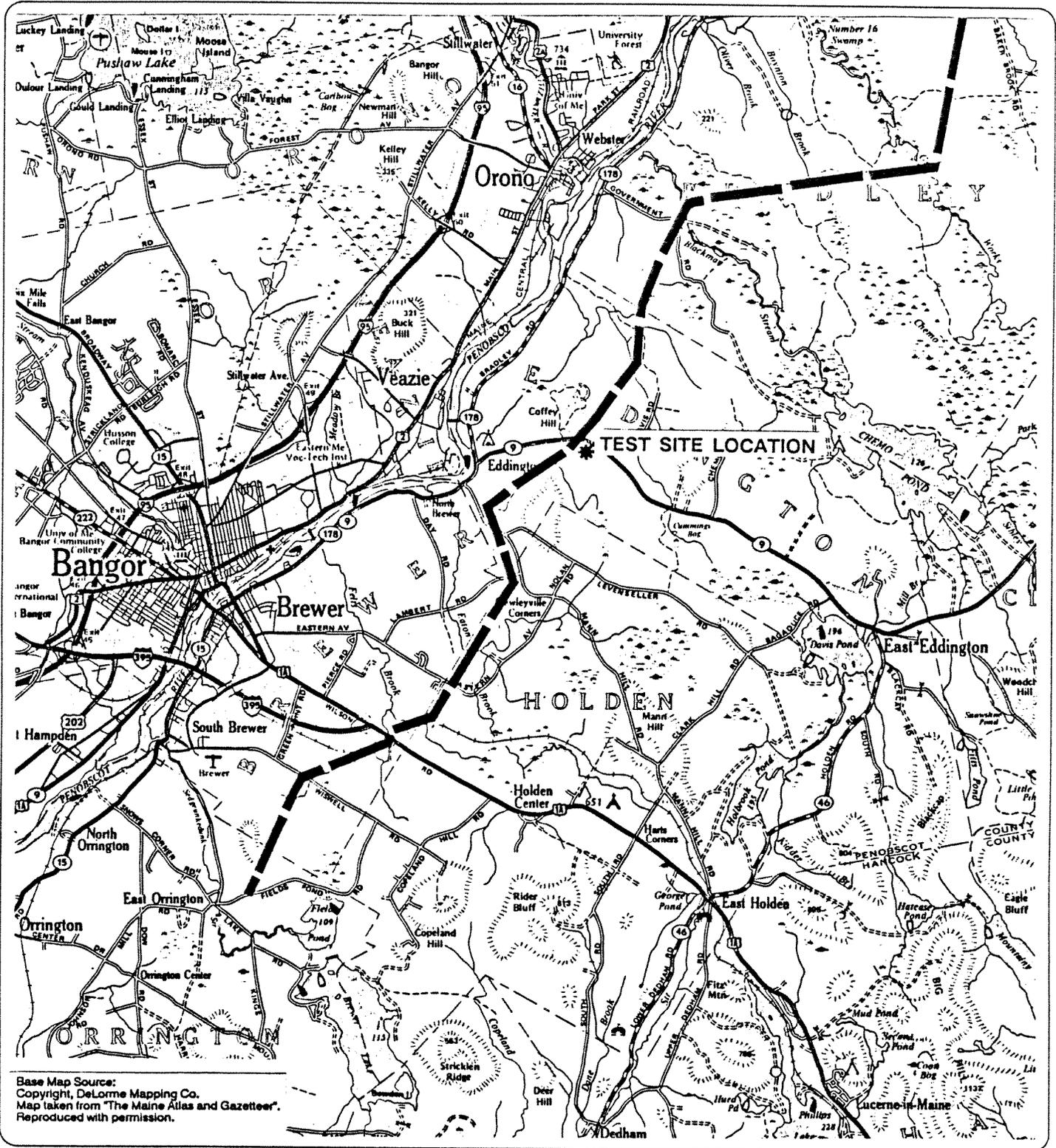
SITE LOCATION - WEATHER DATA
SITE 30

Date: 10/27/89
Time: 1:20 p.m. - 3:00 p.m.
Temperature: Wet 61°F
Dry 67°F
Relative Humidity: 71%
Barometric Pressure: 30.0
Wind Speed: Light Breeze
Wind Direction: From Northwest
Weather Description: Sunny - light clouds, 50-60% clouds.

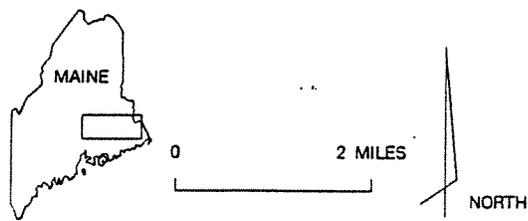
Site Description: At transmission line crossing and Highway 9.
Closest Residence: House and garge at site.
Land Usage: Rural residential/farm, pasture across road.
Topography: Wooded to south and west.
Shielding or Reflecting
Terrain or Structures: House and Garage
Sources of Radio Noise: Distribution line - heavy truck and car traffic on
Route 9.



View Looking West
A6



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TEST SITE 30

BANGOR HYDRO-ELECTRIC COMPANY
 SECOND 345KV TIE LINE TO NEW BRUNSWICK

SITE LOCATION - WEATHER DATA
SITE 40

Date: 10/25/89
Time: 9:00 a.m. - 12:15 p.m.
Temperature: Wet 54°F
Dry 56°F
Relative Humidity: 88%
Wind Speed: -
Wind Direction: -
Weather Description: Clear and Sunny
Site Description: East of existing line on government road at trail marked C2A.

Closest Residence: None

Land Usage: Experimental forest project.

Topography: Flat to small hills - dense pine forest.

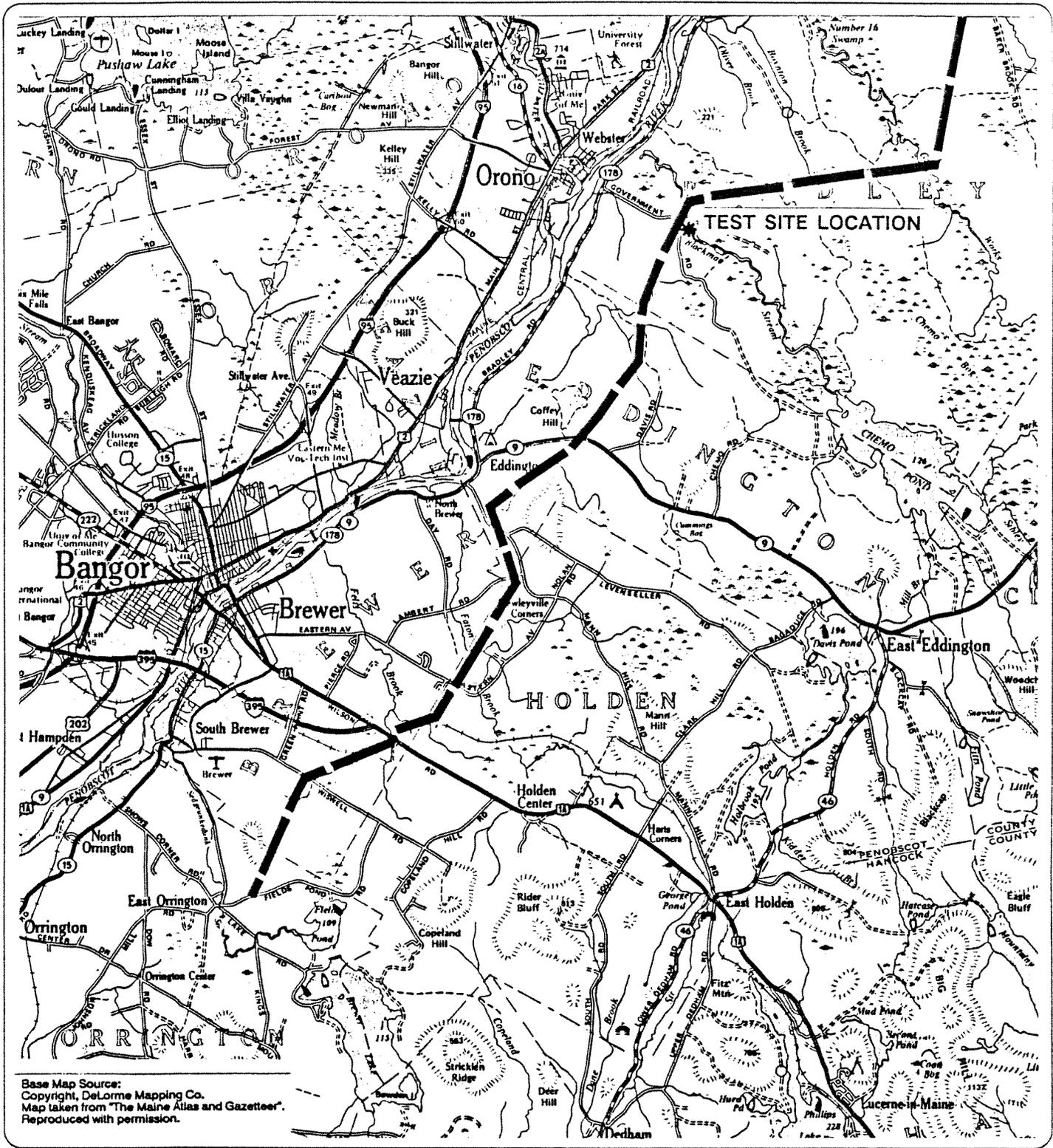
Shielding or Reflecting Terrain or Structures: Pine trees

Sources of Radio Noise: 1 - 345 kV line; 1 - 115 kV line; 1 - 46 kV line

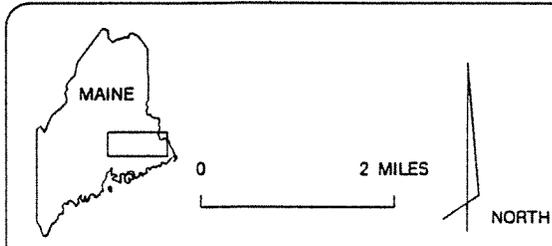
Comments: Audible noise under mid-span-centerline of 345 kV line. 42.5-45 dB audible buzzing at tower insulator string but not measurable above ambient noise.



View Looking West
A8



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TEST SITE 40

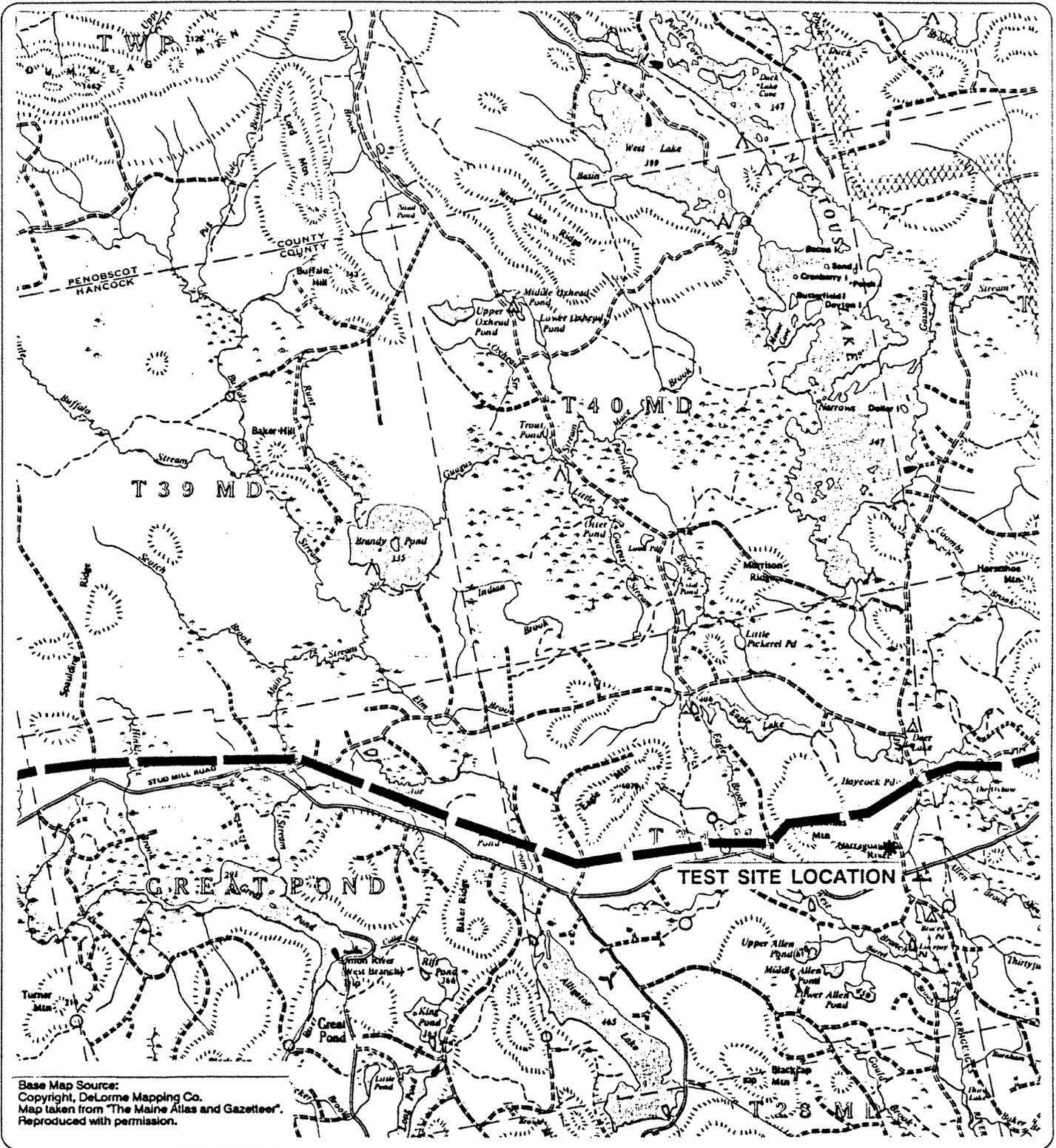
BANGOR HYDRO-ELECTRIC COMPANY
 SECOND 345KV TIE LINE TO NEW BRUNSWICK

SITE LOCATION - WEATHER DATA
SITE 50

Date: 10/25/89
Time: 2:45 p.m. - 4:45 p.m.
Temperature: Wet 56°F
Dry 65°F
Relative Humidity: 56%
Wind Speed: -
Wind Direction: -
Weather Description: Sunny - Clear Skies
Site Description: 0.2 mile north of Stud Mill Road on Road 32-000 south of proposed primary and near edge of ROW.
Closest Residence: None
Land Usage: Timber cutting.
Topography: Hilly with dense beech and pine.
Shielding or Reflecting Terrain or Structures: Pine trees
Sources of Radio Noise: None



View Looking Northeast
A10



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0 2 MILES

NORTH

TEST SITE 50

BANGOR HYDRO-ELECTRIC COMPANY
 SECOND 345KV TIE LINE TO NEW BRUNSWICK

SITE LOCATION - WEATHER DATA
SITE 60

Date: 10/26/89
Time: 2:25 p.m. - 4:00 p.m.
Temperature: Wet 49°F
Dry 58°F
Relative Humidity: 51%
Wind Speed: -
Wind Direction: -
Weather Description: Clear and Sunny

Site Description: Approximately 6 miles west at South Princeton Road on Stud Mill Road to site at "y" in road.

Closest Residence: None

Land Usage: -

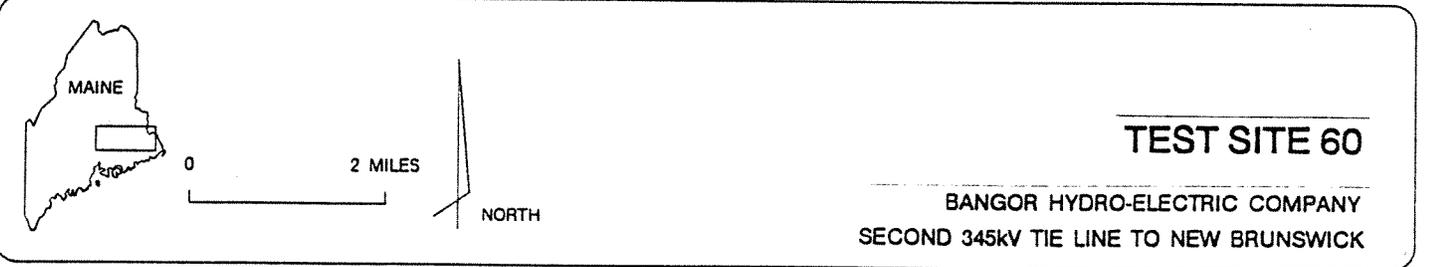
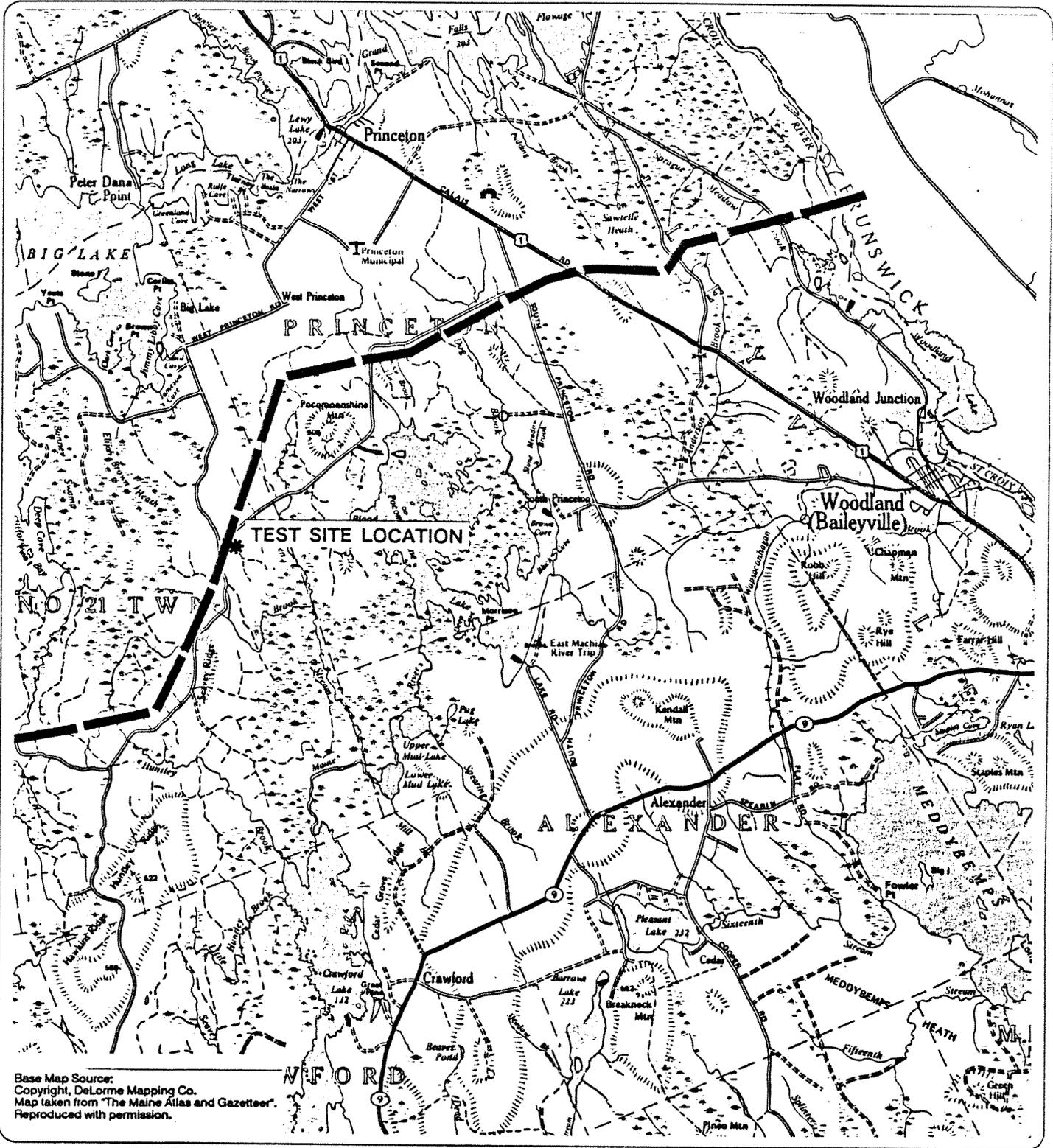
Topography: Rolling, wooded, pine, birch - medium size.

Shielding or Reflecting Terrain or Structures: Trees and Brush

Sources of Radio Noise: None



View Looking East
A12



SITE LOCATION - WEATHER DATA
SITE 70

Date: 10/26/89
Time: 11:35 a.m. - 1:50 p.m.
Temperature: Wet 49/50°F
Dry 58/59°F
Relative Humidity: 49/50%
Wind Speed: -
Wind Direction: -
Weather Description: Clear and Sunny
Site Description: 230' west of South Princeton Road to transmission line edge at right-of-way.
Closest Residence: None
Land Usage: Paper mill forest.
Topography: Slightly rolling, small and medium pines - scattered brush.
Shielding or Reflecting Terrain or Structures: None
Sources of Radio Noise: None



View Looking East
A14

SITE LOCATION - WEATHER DATA
SITE 80

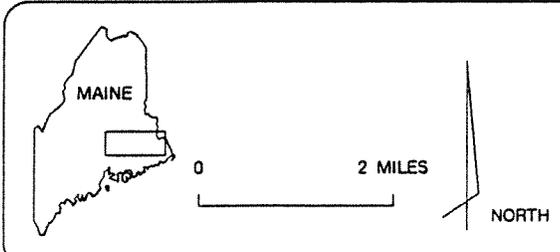
Date: 10/26/89
Time: 8:30 a.m. - 11:00 a.m.
Temperature: Wet 46°F
Dry 50°F
Relative Humidity: 80%
Wind Speed: -
Wind Direction: West
Weather Description: Clear and Sunny; Hazy in Distance
Site Description: Near Maine-New Brunswick border north of Woodland, Maine.
Closest Residence: None
Land Usage: Forestry - young pines 3'-5' tall.
Topography: Large forested hills.
Shielding or Reflecting Terrain or Structures: None
Sources of Radio Noise: DC 46 kV guyed steel lattice line at bottom of hill.



View Looking West
A16



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TEST SITE 80
 BANGOR HYDRO-ELECTRIC COMPANY
 SECOND 345KV TIE LINE TO NEW BRUNSWICK