09/20/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PHILADELPHIA ELECTRIC COMPANY	)	Docket Nos. 50-352
	)	50-353
(Limerick Generating Station, Units 1 and 2)	)	

NRC STAFF TESTIMONY OF ANTHONY POLICASTRO IN RESPONSE TO CONTENTION V-16a

This testimony is offered in response to Contention V-16a, which states:

> Noise effects and constant dredging maintenance connected with operations of the intake and its associated pump station will adversely affect the peace and tranquility of the Point Pleasant proposed historic district.

Q1. Please state your name and occupation.

A1. My name is Anthony J. Policastro. I am Principal Investigator, Power Plant Noise Impacts, Argonne National Laboratory (ANL). I am serving as a consultant to the NRC Staff on the evaluation of impacts of noise associated with operation of the Limerick Nuclear Generating Station. My evaluation will be provided to the Staff for use in the Draft and Final Environmental Statements (DES/FES) on Limerick.

Q2. What is the purpose of your testimony?

A2. The Staff has requested me to evaluate the potential impacts on residents of Point Pleasant, Pennsylvania of noise resulting from

operation of the proposed Point Pleasant intake and pumping station. I have conducted a preliminary evaluation of potential noise impacts from such sources and the results of that evaluation are presented in this testimony. The results of my final evaluation will be presented in the DES/FES.

Q3. Based upon your review of information provided to you by the Applicant, what will be the principal source of noise from operation of the Point Pleasant intake and pumping station.

A3. The principal source of noise which will be audible to residents of Point Pleasant from the intake and pumping station will be the electrical transformers to be located adjacent to the pumphouse. I have been advised that constant dredging maintenance of the intake is not anticipated and have not, therefore, performed any analysis of noise associated with dredging activities.

Q4. Please describe the evaluation you conducted.

Q4. Calculations have been prepared with the University of Illinois/ANL community noise model [1] as applied to the noise sources at the Point Plesant pumping station. The noise levels at the four nearest residences to the pumphouse have been chosen as representing the potentially most severely affected inhabited locations. The location of the pumphouse and nearest residences are sketched in Exhibit 1. Assumptions made in preparing the calculations were as follows:

(1) The equipment within the pumphouse does not transmit any significant noise through the pumphouse walls and the pumphouse will not, therefore, be a noise source to Point Pleasant residents. The building structure appears to have sufficient attenuation to reduce pump and fan noises to insigificant levels. The heating, vetilating and air conditioning outlets to the outside should be insignificant noise sources and may be neglected.

(2) The major noise sources at the pumping station are the two transformers outside the pumphouse. Noise levels from these transformers were based on data presented in the Edison Electric Institute Environmental Noise Guide [2]. The transformers are expected to operate continuously. At present it is not clear which of four manufacturers of tranformers will be chosen. However, present plans are for unquieted transformers (with standard FEMA rating 67dB), rather than transformers which have been quieted beyond the FEMA rating. Outdoor noise calculations for both types of transformers have been made.

(3) Effects of the pumphouse structure as a barrier to the propagation of noise from the transformers were not included in the present calculations. Residences 1 and 4 are in the line of sight of the transformers, and as a result, barrier effects of the pumphouse are not expected to be important for those locations. The pumphouse, however, stands between the transformers and residences 2 and 3. Noise levels due to the transformers may be greatly reduced at these locations as a result of the presence of the pumphouse.

(4) Standard day conditions (°15C, 70% RM) are assumed for ambient meteorology.

(5) Ambient noise level measurements provided to me by the Applicant (report by Cerami & Associates [3]) were used and assumed valid for the site of each home. The ambient noise levels reveal the presence of the running water through the sluice gates of the nearby Pennsylvania Canal and a small creek flowing into the canal near the pumphouse site. This octave band sound pressure level spectrum (for daytime hours-45dBA) is given in Exhibit 2. The plateau in the 500-4000 Hz frequency range reveals the presence of the noise from the flowing water. Measurements by Cerami and Associates were made at the proposed site of the pumping station at a location 30 ft north of the south property line and 100 ft east of Route 32 (River Rd). It is not certain that these measurements are typical of ambient noise measured at the property lines of the four nearest residences, since the homes are at differenet distances from the running water sources. The ambient noise levels at residences 1, 2, and 3, may be lower than at the location where ambient measurements were made by Cerami and Associates. The lack of data on the spatial variation of the ambient noise measurements, necessarily leads to some uncertainties in the noise prediction at the site of each home. For purposes of my calculations, I have, however, used for the ambient noise level at all four residences the nighttime noise level of 44dBA measured at the site chosen by Cerami and Associates.

The computer model [1] predicted noise levels from the two transformers at the four community locations. The model run included the effects of sound attenuation due to atmospheric conditions including temperature and humidity, and sound attenuation due to the ground.

Q6. Please describe the results of your calculations.

A6. The results of the calculations were:

(a) The noise caused by the unquieted transformers consists of low frequency tones which will be audible above background at the four residents' homes. These tones may be found to be objectionable (e.g., they may interfere with sleep during summer nights, when windows may be open). The tones which are expected to be audible at each home are listed in Table 1. Inclusion of barrier effects of the pumphouse may change these results, particularly for residences 2 and 3. Use of a full or partial enclosure for the transformers to deflect the noise away from the homes, perhaps towards the river, should correct this problem. Use of quieted transformers, alone or in combination with a partial/full enclosure, should also correct the problem.

(b) The predicted broadband noise resulting from the two transformers is quite low at each of the four residences. Two noise indicators (explained in Table 1) are presented in Table 1. The indicators reveal that the transformer noise is low in absolute terms. The noise, however, will be noticeable in terms of tonal components, but not significantly in terms of overall or A-weighted sound pressure levels. This residential area is relatively quiet

and, as a result, the transformer noise (though not a loud source itself) is expected to be audible.

Q7. Have you reached any preliminary conclusions regarding the potential impacts of transformer noise on the residents of Point Pleasant?

A7. Yes. The noise of the transformers could be objectionable to persons living at the four residences nearest to the pumphouse. The noise levels could, however, be significantly reduced by construction of an enclosure around the transformers, by purchase of quieted transformers, or by a combination of the above steps. The transformer tones are not exected to be audible beyond approximately 175 meters from the transformer location.

Q8. Do you expect to be able to factor further details of the final plans and specifications for the Point Pleasant pumping station into your evaluation for the DES/FES?

A8. Yes, provided that I receive from the Applicant the final plans and specifications for the pumping station (including details on the sound levels associated with operation of the transformers purchased and information on any enclosures that may be planned), I will be able to factor this information into my evaluation for use in the DES/FES.

References

1. W.E. Dunn, A.J. Policastro, and M. Wastag. User's Guide for Mathematical Model to Predict Noise Impacts in the Community. Division of Environmental Impacts Studies. Argonne National Laboratory. Draft Report. September 1982.

2. Bolt Beranek and Newman, Inc. Edison Electric Institute Environmental Noise Guide. Volumes 1 and 2. Published by Edison Electric Institute. New York City, 1978.

3. Neil Moiseev. Site Noise Survey, Point Plesant Pumping Station. Cerami and Associates, Inc. Report 5127. October 20, 1981. Provided in September 3, 1982, Applicant's response to Staff Request for Additional Information #E290.24-1.

Exhibits

Exhibit 1: Neshaminy Creek Water Resources Development Plan. Point Pleasant Pumping Facilities, Point Pleasant Pumping Station. Vicinity Plan - Property and Rights of Way Limits, with identification of four nearest residences added by Dr. Policastro.

Exhibit 2: Point Plesant Pumping Station. Figure 1: Ambient Octave Band Sound Pressure Levels, 45 dB(A). Cerami and Associates, Inc.

Table 1. Noise Predictions At The Four Nearest Residential Community Locations Due To Point Pleasant Pumping Station

Location	Noise Levels (dB) due to Transformers alone				Ambient Noise Level (dB)		Noise Level (dB) (Transformers Plus Ambient)				Audible Tones (Hz)	
	Unquieted[1]		Quieted[4]				Unquieted		Quieted		Unquieted[5]	Quieted
	dBO[2]	dBA[3]	dBO	dBA	dBO	dBA	dBO	dBA	dBO	dBA		
1	47	38	37	28	49	44	51	45	49	44	120,240,360,480	None
2	50	41	40	31	49	44	52	46	49	44	120,240,360,480	None
3	48	39	38	29	49	44	51	45	49	44	120,240,360 480	None
4	49	40	39	30	49	44	52	45	49	44	120,240,360,480	None

1/ Transformers with a NEMA rating of 67dB.

2/ dBO is an unweighted, overall measure of sound pressure levels.

3/ dBA is an A-weighted measure of sound pressure levels, which is defined to approximate sound pressure levels perceived by the human ear.

4/ Quieted by 10dB below NEMA rating.

5/ These values represent the frequency of the tonal components of the transformer sound at the locations indicated.

PROFESSIONAL QUALIFICATIONS

Anthony J. Policastro

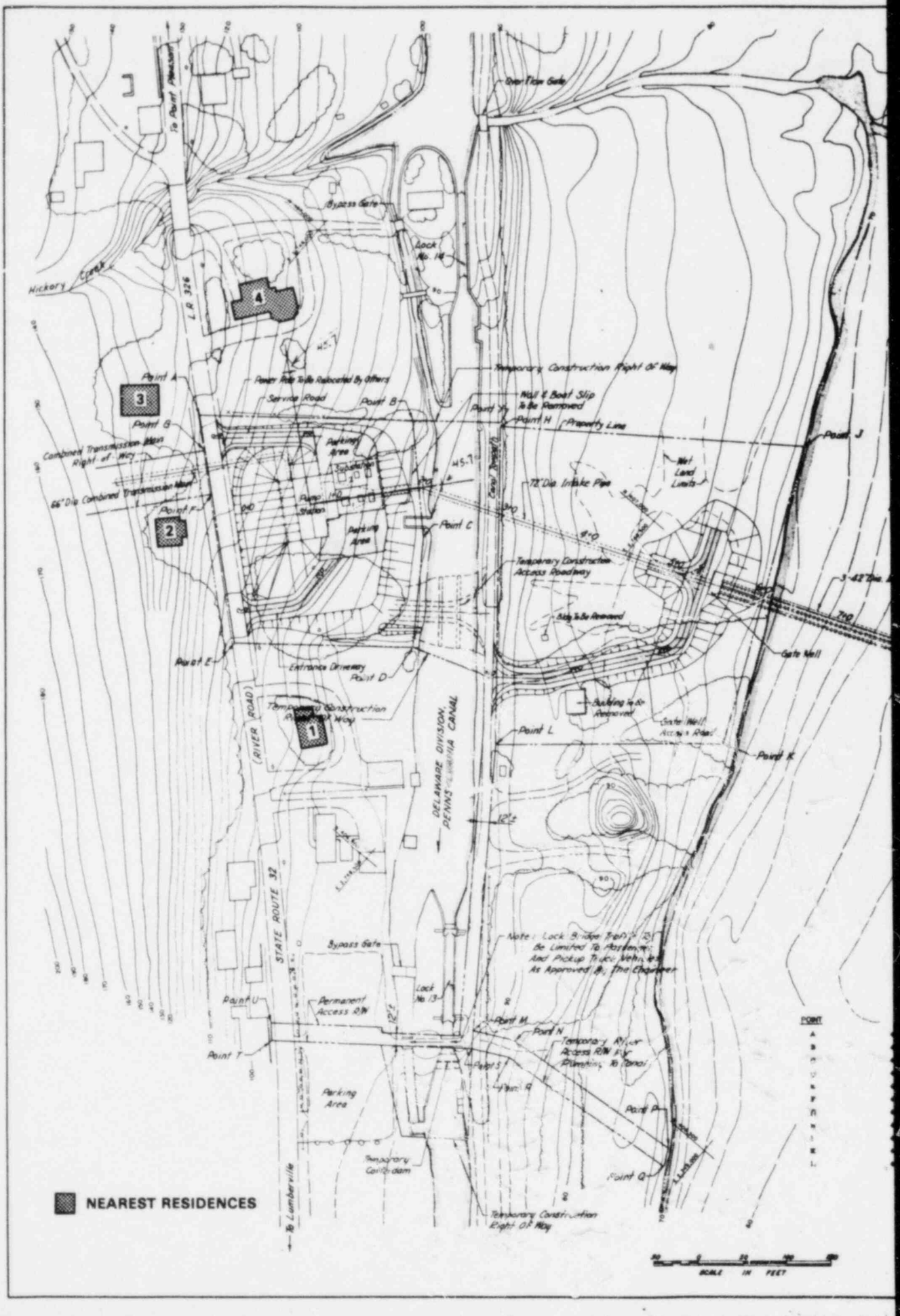
Argonne National Laboratory

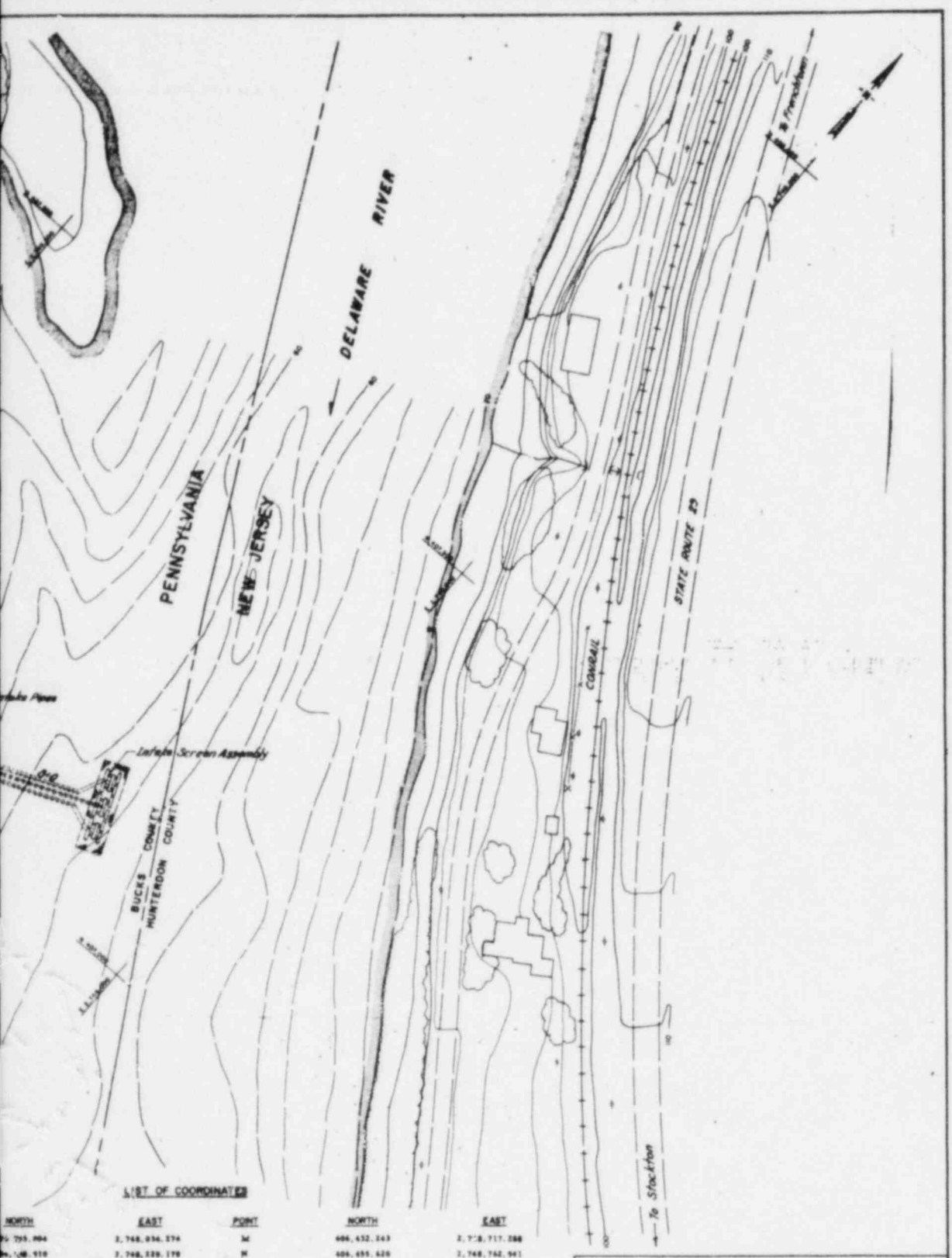
I am a Mechanical Engineer in the Division of Environmental Impact Studies. I am also a project leader for research projects in the area of environmental transport relating to fluid mechanics. Over the past year, my duties have involved direction of the following projects (a) development of a computer model for noise impacts in the community from coal-fired and nuclear power plants (for DOE/ERA) (the model is presently being used (for NRC) in the environmental impact evaluation in support of the licensing of new nuclear plants), (b) development of validated models for cooling tower plume rise, drift deposition, fogging, icing, and snowing (for EPRI), (c) validation of models for ultimate heat sink cooling pond thermal performance (for NRC) and (d) validation of short-term long-range models for SO_2, sulfates, and particulates (for EPA). Each of these projects provides research results needed for the preparation of environmental impact evaluations. Since 1972, I have participated in the preparation of approximately 10 environmental impact statements and appeared as a witness at two Atomic Safety and Licensing Board hearings.

I received my B.S. (1966), M.S. (1967), and Ph.D. (1970) in the areas of applied mathematics and fluid mechanics at Columbia University. From 1970-1975, I worked on the Great Lakes Research Project at Argonne (Energy and Environmental Systems Division). On that project I carried out a validation study of mathematical models for the prediction of surface and submerged thermal discharges in water. In that area I am presently preparing a monograph entitled "Thermal Pollution Models" for publication by the American Geophysical Union. In addition, I am the U.S. representative to a technical working group for the International Atomic Energy Agency for the purpose of developing a nuclear power plant safety guide on radioactivity dispersion in the surface waters.

I have also been a consultant and research collaborator at several European research institutes: Swedish Meteorological and Hydrological Institute (thermal discharges in water), Rudjer Boskovic Institute (thermal discharges in water), Boric Kidric Institute (thermal discharges in water), and Karlsruhe University (cooling tower plume modeling). Other areas of my work over the past several years included the modeling of ground-water flow, LNG dispersion, and air pollution over complex terrain.

My publications consist of about 50 papers (journal articles, conference papers, invited papers, and reports). I have also directed five M.S. theses and am presently on the dissertation committee for two Ph.D. theses at the University of Illinois.


Hickory Creek
L.R. 326
To Point Pleasant
Bypass Gate
Lock No. 14
Over Flow Gate
Temporary Construction Right Of Way
Power Pole To Be Relocated By Others
Service Road
Point A
Point B
Point G
Point H
Point J
Point F
Point C
Point D
Point E
Point K
Point L
Point M
Point N
Point P
Point Q
Point R
Point S
Point T
Point U
Half E Boat Slip To Be Removed
Property Line
Wet Land Limits
72" Dia. Intake Pipe
Pump Station
Parking Area
Temporary Construction Access Roadway
Entrance Driveway
Gate Well
Gate Well Access Road
Parking Area Removed
Combined Transmission Main Right of Way
66" Dia. Combined Transmission Main
DELAWARE DIVISION
PENNSYLVANIA CANAL
(RIVER ROAD)
STATE ROUTE 32
Bypass Gate
Lock No. 13
Permanent Access R/W
Temporary Access R/W
Parking Area
Temporary Coffer dam
To Lumberville
Temporary Construction Right Of Way
Note: Lock Bridge Traffic Is To Be Limited To Residents And Pickup Trucks Within 1/2 As Approved By The Chartiers
NEAREST RESIDENCES
SCALE IN FEET



LIST OF COORDINATES

NORTH	EAST	POINT	NORTH	EAST
[illegible]	2,768,036.274	M	606,652.243	2,768,717.288
[illegible]	2,768,329.178	N	606,655.620	2,768,762.941
[illegible]	2,768,314.995	P	606,475.917	2,768,936.803
[illegible]	2,768,185.717	Q	606,454.850	2,768,977.227
[illegible]	2,768,229.582	R	606,436.031	2,769,168.111
[illegible]	2,768,183.168	S	606,413.995	2,769,128.991
[illegible]	2,768,066.211	T	606,273.754	2,768,551.831
[illegible]	2,768,300.073	U	606,290.199	2,768,537.798
[illegible]	2,768,867.118			
[illegible]	2,768,752.862			
[illegible]	2,768,529.065			
[illegible]			606,972.024	2,768,297.110

NESHAMINY CREEK
WATER RESOURCES DEVELOPMENT PLAN

POINT PLEASANT PUMPING FACILITIES
POINT PLEASANT PUMPING STATION

VICINITY PLAN - PROPERTY AND RIGHT OF WAY LIMITS

CIVIL

E. H. BOURQUARD ASSOCIATES, INC.
CONSULTING ENGINEERS
HARRISBURG, PENNA.

REVISION NO.	DESCRIPTION	BY	DATE

DATE: August 1982
SCALE: As Shown

COUNTY OF BUCKS
NESHAMINY WATER
RESOURCES AUTHORITY

DRAWING NO. PPPS-C
SHEET NO. 1 OF 26

Cerami

AND ASSOCIATES, INC.
ACOUSTICAL CONSULTANTS

PROJECT Point Pleasant Pumping Station

SHEET 1 OF 1
DATE 10/20/81

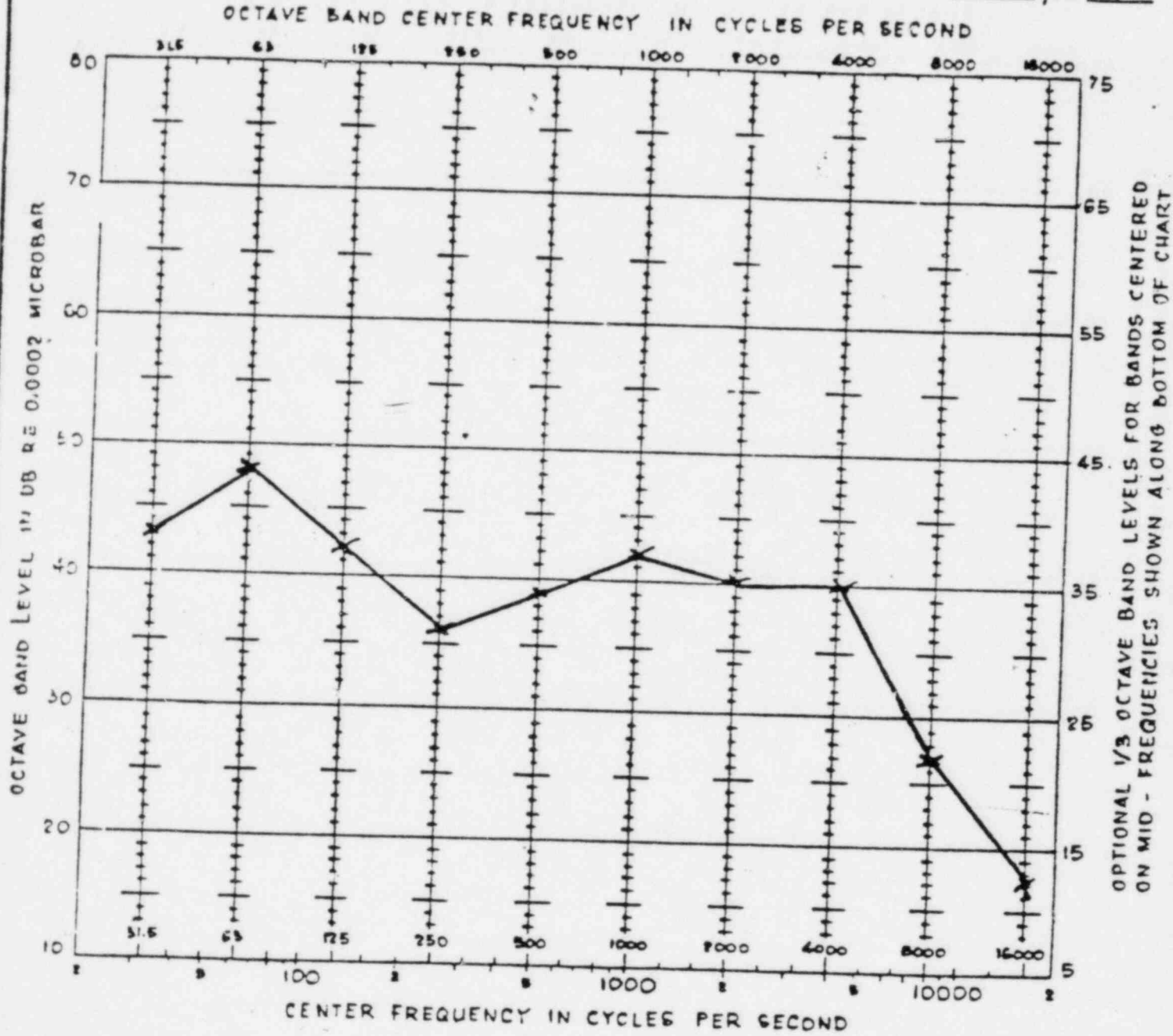


FIGURE 1: Ambient Octave Band Sound Pressure Levels, 45 dB(A)