

**Health Aspects of
Environmental Impact Assessment
Volume III
Appendices**

Jennifer S. Simon

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Environmental Impact Assessment
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Volume III

Appendices

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APPENDIX A

TIMEFRAME FOR STUDY

PROJECT SCHEDULE

The project adhered to the following schedule:

| | |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| June 15, 1987 | Contract begins |
| June 25 | Conference call is held to launch work |
| June 26- July 10 | Initial review of draft survey is conducted |
| July 13-14 | Trip to Washington, DC is taken; Interviews are held to gather information of U.S. federal EIA process |
| July 15-24 | Survey is revised based on comments received during review; List of survey participants is developed |
| July 27- August 21 | Survey is translated to French; Trips are organized; Calls are made to U.S. EPA Regional Offices and State Offices to seek participation in project; Survey interviews are conducted |
| August 24-29 | Meetings are held with subcontractors to review provincial survey interviews and to begin organizing responses |
| August 31- September 4 | Interim report is prepared and submitted |
| September 8-11 | Trip to Ottawa is taken; Interviews are held to gather information regarding Canada's federal EIA process |
| September 12- October 26 | Draft of final report is prepared; Follow-up is conducted |
| September 17 | Interim Report is presented at CEARC meeting |
| November 25 | Comments on first draft of final report are received |
| January 19, 1988 | Draft Final Report is presented at CEARC meeting |
| January 31 | Draft Final Report is submitted |

APPENDIX B

SURVEY ON "HEALTH ASPECTS OF ENVIRONMENTAL IMPACT ASSESSMENT"

SURVEY
HEALTH ASPECTS OF ENVIRONMENTAL IMPACT ASSESSMENT

Name _____ Phone _____
Province/Organization _____
Office _____
Address _____

HEALTH ASPECTS OF ENVIRONMENTAL IMPACT ASSESSMENT

INTRODUCTION

Environmental Impact Assessment (EIA) is a valuable tool used in the planning and development of projects which may have a significant impact on the environment. Human health, which to a large extent is dependent upon the health of the environment, may receive varying degrees of attention in the Environmental Assessment (EA) depending on the project's potential impact on health. Health concerns may be addressed through the application of health-based standards during the planning and development of a proposed project, or they may be addressed through an actual analysis (e.g., risk assessment) of the potential health impacts. When an assessment of potential health impacts is necessary, the process is often completely integrated with the rest of the EA and it may contain any degree of complexity.

The assessment of human health impacts in EIA is receiving increasing attention world-wide. The World Health Organisation *recently* published a task group report (Working Group on the Health and Safety Component of Environmental Impact Assessment, February 1986) discussing the concept of Environmental Health Impact Assessment, a term used to describe the health component of EIA. In Ottawa, a national workshop on the subject, which was attended by EIA and health professionals from across the country, concluded that when potentially significant health impacts may be caused by a proposed project, the EIA should include an assessment of the risks to human health as part of the assessment of risks to the environment.

This research project has been initiated to find out the extent to which this is already done. The survey is not intended to be evaluative -- it is simply a survey of current practice. The purpose of this survey is to assess the current level of attention given to human health impact assessment in Canadian EIA processes and to guide future work in this area. These 32 questions explore: 1) whether potential human health impacts are considered in EIAs for proposals to develop projects that may have continuous discharges, intermittent discharges, fugitive discharges, or accidental discharges into the surrounding environment (i.e., air, soil, or water); 2) to what degree potential human health impacts are considered; 3) current and possible components of health impact assessment in EIA; and 4) suggestions for improving or formally establishing health impact assessment in Canadian EIA processes.

This survey **may** not be specifically tailored to your province's special circumstances regarding EIA. The survey has been designed to be as generic as possible given the wide range of programs across Canada, but the designers realize that some of the questions may not be phrased appropriately for your province. Please indicate the special circumstances under which your EIA process operates so that the questions and responses can be interpreted correctly. Thank you.

Also, please keep in mind that the following questions inquire about what occurs in actual practice rather than what is or may be required of the proponent in theory. Question 24 addresses this issue,

DEFINITIONS

Accidental discharges - The unforeseen release of significant quantities of waste, waste by-products, production products, or production by-products into the surrounding environment.

Acute, short-term impacts - The immediate effects to health that may be attributed to a release and exposure incident. These effects usually occur within 96 hours of a contaminant release and include such reactions as death, severe illness, and others. Some short-term impacts may be symptoms of chronic, long-term impacts.

Area of impingement - The area likely to be affected by a release and exposure incident.

Baseline characteristics study - A study of the existing human health conditions of a population within the area of impingement. The study results may be used to compare changes in human health that may occur due to the establishment of the proposed project.

Chronic, long-term impacts - Effects potentially caused by a release and exposure incident that do not occur immediately (e.g., carcinogenic, teratogenic, or mutagenic responses).

Clearinghouse - A central location for the collection, classification, and distribution of information (e.g., health data).

Continuous discharges - The routine, uninterrupted emission of effluent into the environment resulting from normal facility operations.

Cumulative effect - The total potential impact of the proposed development combined with potential impacts of pre-existing developments that may affect the area of impingement.

Epidemiology - The study of incidence, distribution, and control of disease in a population.

Exposure period - Depending on how it is defined by the parties involved, the exposure period may be the number of years a project is expected to be in operation (which may include a post-operation period of lingering effects or exposures from the storage or disposal of wastes and materials following active operation), the average length of a potential release and exposure incident, or another appropriate time frame.

Fugitive discharges - Effluent or chemical leaks that are usually confined within the facility and occur at such places as pipe joints.

Health impact assessment (or health impact assessment) - A component of Environmental Impact Assessment (and similar planning processes) in which potential impacts to human health due to the establishment and operation of a proposed development are identified, predicted, and evaluated to assess their significance and to mitigate them if necessary.

Health Professionals - Includes epidemiologists, toxicologists, medical physicians and any other professional that has formal expertise and training in a health-related field.

Health Status - The health of population during its lifetime, for example, morbidity statistics, etc.

Intermittent discharges - Sporadic emissions of effluent into the environment caused by emergency flares, start-up procedures, or shut-down procedures.

Parallel planning processes - Any process that is similar to an EIA planning procedure but which may not be legislated or otherwise formally declared as such.

Proponent - The organization, company, or department planning to undertake a proposal.

Teratology - The study of abnormalities in human growth or body structure.

BACKGROUND DATA ON INTERVIEWEE

University degree(s) _____

Previous professional experience(s) _____ I I _ . - _ + - . -

Current job title and responsibilities _____

Description of work with EIA (if any) _____

Description of work with health (if any) _____

Description of work with health in EIA (if any) _____

BACKGROUND FOR PROVINCE

| Check one or more | <u>Yes</u> | <u>No</u> | <u>Name</u> |
|------------------------------------------------------------|------------|-----------|-------------|
| EIA is: | _____ | _____ | _____ |
| legislated | _____ | _____ | _____ |
| promulgated in an Order in Council or the equivalent | _____ | _____ | _____ |
| set in regulations | _____ | _____ | _____ |
| set in guidelines | _____ | _____ | _____ |
| other | | | _____ |

Comments:

GENERAL

1) Do the Environmental Assessment (EA) legislation, Order in Council, regulations, and/or guidelines in your province contain any direct mandate for determining potential impacts to human health in proposed projects?

Yes _____ What is the mandate? _____

No _____ Does an indirect mechanism exist in legislation, Order in Council, regulations, and/or guidelines to support the examination of potential impacts to human health?

Yes _____ What is the mechanism used to assure assessment of potential health impacts?

No _____

2) Are environmental standards (e.g., for air quality, water quality, etc.) used in the EIA process?

Yes _____

Are the standards health-based?

Yes _____

How are the standards developed?

No _____

On what are they based? _____

How are the standards applied in an EIA? _____

No _____

3) Have any projects in your province gone through (or are any projects currently going through) a process to assess human health impacts?

Yes _____

What kinds of projects? _____

Please give a brief description of how health has been integrated into the rest of the EIA process in these examples (e.g., when is it first raised as a concern, how detailed is the assessment, etc.) _____

No _____

4) Are screening procedures used to decide which categories of industries or projects need a review of potential health impacts?

Yes _____ What are the screening procedures/criteria? _____

Who is involved in the screening procedures? _____

Who makes the final decision as to whether potential health impacts may exist and whether or not a health impact assessment should be included in the EIA (e.g., eng. health professional, government official, industry executive, or others or some combination thereof)? _____

No _____ How is the decision made regarding which projects need to review potential health impacts and who makes it? _____

Other _____

5) In a typical EIA, are specific terms of reference regarding health concerns negotiated with the proponent or are they set for the proponent either by your office or in pre-existing regulations or guidelines?

Yes _____ The terms of reference are: .
negotiated with the proponent _____
set by your office for the proponent (for each case) _____
set in regulations or
guidelines (these apply to all cases) _____
other _____

No _____ If health is a concern but no terms of reference exist for a health impact assessment, how are health issues usually assessed? _____

6) Are health professionals involved in the EA process?

Y es At what point(s) (e.g., throughout, only when needed, etc)?

What types of health professionals are involved? _____

Are ministry and local health officials (e.g., medical health officer) involved in the ELA? _____

Yes _____ who? _____

No _____

What role do these health professionals play in EIA?

No _____

Depends on the case _____ What does it depend on? _____

(If this is the response, please answer the questions asked for the 'Yes' response)

7) Does the proponent examine a particular exposure period?

Yes _____

Does government define the exposure period or is the proponent required to do so?

Province defines the exposure period _____

Proponent defines it _____

On what information is the definition of exposure period usually based (e.g., is it based on the number of years the project is expected to be in operation, an estimated length of a release and exposure incident, or something else)?

No _____

8) Is an area of impingement defined?

Yes _____

How is the area of impingement that is to be examined in the health impact -assessment determined? _____

No _____

ELEMENTS OF HEALTH IMPACT ASSESSMENT

9) Do terms of reference for Environmental Assessments require that baseline data be collected (i.e., data regarding the health status of the population during lifetime, for example, morbidity statistics, etc.)?

Yes What data are collected and what are the usual sources?

No Are these data available elsewhere? If yes, where?

10) Does the proponent identify critical subpopulations and examine potential health impacts (e.g., for children, nursing infants, infants, pregnant women, elderly)?

Yes What subpopulations are identified and examined?

Is the actual population in the area of impingement used to identify these subpopulations?

Yes How are the subpopulations identified?

No

No

11) Does the proponent examine potential health impacts that may occur in future generations?

Yes _____

What type of analysis is conducted (e.g., teratological studies, laboratory studies, studies of accumulated toxins, etc.)? _____

What potential health impacts are examined? _____

No _____

12) Does the proponent assess potential health impacts to residents in the area during the project's construction?

Yes What types of exposure are examined? _____

What types of health effects are examined? _____

What type of analysis is conducted? _____

No

To workers during the construction of the project?

Yes What types of exposure are examined? _____a--

What types of health effects are examined? _____

What type of analysis is conducted? _____

No

To residents in the area and employees once the project is operating?

Yes What types of exposure are examined? _____

What types of health effects are examined? _____

What type of analysis is conducted? _____

No

13) Does the proponent typically rely on animal test data or epidemiological studies (from other locations) or both for identifying potential health impacts?

Y e s Which data:

Animal test data Epidemiological studies Both

How does the proponent address/account for the limitations of these methodologies when attempting to relate them to potential health impacts for the target population? _____

No What information is used? _____

14) Does the proponent determine and assess potential acute, short-term impacts to human health?

Y e s What are they? _____

No

Potential chronic, long-term impacts?

Yes What are they? _____

No

Potential positive health impacts?

Yes What are they? _____

No

15) Does the proponent involve the public **in assessing** potential human health impacts?

Yes _____

Does the **province require. a certain** level of public involvement (e.g., is the proponent required to hold public meetings, conduct surveys, etc.)?

Y e s

How is the public required to be involved?

No _____

Other _____

Would funding supporting public input be useful?

Yes _____

No _____

No _____

Is the **degree** of **public** participation left up to the proponent to decide?

Yes _____

Other _____

16) Does the proponent examine existing exposure levels (e.g., from other sources) and assess the potential cumulative effect of additional exposure caused by the proposed project?

Yes _____ Are there procedures to follow?

Yes _____ What are they? _____

What **methodology(ies)** is(are) used (e.g., risk assessment, **etc.**)? _____

No _____ How does the proponent usually examine the cumulative effect? _____

No _____

17) Does the proponent consider methods of mitigating potential health impacts?

Yes _____ No _____

18) Does the proponent identify and assess potential impacts on health care facilities in the area due to an expected increase in population (from increased employment)?

Yes _____ No _____

Due to the potential health effects of normal discharges upon the surrounding population?

Yes _____ No _____

Due to the potential health effects of accidental discharges upon the surrounding population?

Yes _____ No _____

19) Does the proponent examine and develop accident scenarios and corresponding emergency response procedures in case of an accidental contaminant release for employees?

Yes _____ No _____

For the affected public in the vicinity of the project?

Yes _____ No _____

20) Does the proponent plan a procedure for disposal of its wastes and its waste by-products (e.g., slurry, ash, etc.) that would minimize potential environmental health effects and potential human health Impacts?

Yes _____

No _____ How are disposal needs addressed? _____

21) Does the proponent develop a means of on-going monitoring of human health effects during operation?

Yes _____ Please give one or two examples of monitoring programs that have been/are being developed and/or implemented.

No _____ Why not? _____

CONCLUSION

22) Do you think a health impact assessment should be a required component of EIA processes in your province?

Yes Why? _____

Do you consider the following components of a health impact assessment important to include in EXA?

| | <u>Yes</u> | <u>No</u> |
|----------------------------------------------------------------------------------------------------|------------|-----------|
| Involvement of health professionals from the beginning of the EIA | _____ | _____ |
| Study of baseline health data | _____ | _____ |
| Study of critical subpopulations | _____ | _____ |
| Study of potential impact on future generations | _____ | _____ |
| Study of potential impact on future employees, construction workers, residents during construction | _____ | _____ |
| Review of animal test and/or epidemiological data | _____ | _____ |
| Review of short and long term impacts | _____ | _____ |
| Public participation in EHIA | _____ | _____ |
| Study of cumulative health effects | _____ | _____ |
| Investigation of mitigation measures | _____ | _____ |
| Development of emergency response(s) | _____ | _____ |
| Development of monitoring program | _____ | _____ |
| Other _____ | | |

No Why not? _____

O t h e r

23) Do you have any suggestions on how to make health impact assessment an achievable and practical component of EIA?

Yes _____ What are your suggestions? _____

No _____

24) Many of the questions above have been phrased in the context, "Does the proponent examine . . ." They inquire about what the proponent does in actual practice. Is this different from what your province's legislation, Order in Council, regulation, and/or guidelines require of the proponent? In other words, is there a difference between theory and practice?

Yes _____ How is the practice different from what the written' policy requires (e.g., Does the proponent do more or less than what the policy requires, and in what way)? _____

No _____

25) In your opinion, do you think the. procedures and mechanisms followed by your province to have proponents assess potential health impacts in an EA are adequate?

Yes _____ Why? _____

No _____ Why not? _____

26) What are the strengths of the current set of procedures and mechanisms?

Why are these considered strengths? _____

27) What are the weaknesses of the current set of procedures and mechanisms?

Why are these considered weaknesses? _____

28) What improvements, if any, do you recommend for health impact assessment in EXA? _____

29) Do you know of any areas in health impact assessment where research is urgently needed?

Yes _____ What are they? _____

No _____

30) Do you need procedural guidelines or a "how-to" guide to assist EIA practitioners in human health impact assessment?

Yes _____ What type of guidelines do you need? _____

Do you think the guidelines or "how-to" guide should be standardised nationally?

Yes _____ Why? _____

No _____ Why not? _____

Would national ambient standards established for a wide variety of chemicals or pollutants assist the health assessment process?

Yes _____ Why? _____

No _____ Why not? _____

No _____

O t h e r

31) Do clearinghouses of health data (e.g., the Cancer Institute, etc.) exist in your province?

Yes _____ What data are stored and where? _____

Are these data available for use in EAs?

Yes _____ Are they used in EAs?
Y e _ s In what way? _____

No _____ Why not? _____

No _____ Why not? _____

No _____ Would a clearinghouse of health data be useful?

Yes _____ Why? _____

What types of data would be useful?

Would you prefer a provincial or national clearinghouse and why? _____

No _____ Why not? _____

32) Should the federal government play a stronger role in providing assistance to provinces regarding health impact assessment in EIA?

Yes _____ What types of assistance **would you want** the federal government to provide (e.g., advisory, procedural guidance, etc.)? _____

No _____

Request a copy of the statute/guidelines/regulations/"how-to" guide (if available), etc.

Request a copy of any **EIA** with an assessment of human health impacts (if available).

Request names, phone numbers of contacts in municipalities.

APPENDIX C

ABBREVIATIONS AND DEFINITIONS

ABBREVIATIONS

| | |
|------|---------------------------------------------|
| DOE | Department of Environment |
| EAA | Environmental Assessment Act |
| EAB | Environmental Assessment Branch |
| EARP | Environmental Assessment and Review Process |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| IPB | Interdepartmental Planning Board |
| IRP | interdepartmental Review Panel |
| MOE | Ministry of Environment |
| MOH | Ministry of Health |
| PSC | Pre-Submission Consultation |
| TAC | Technical Advisory Committee |

DEFINITIONS

Components of Health Impact Assessment

- Acute, short-term impacts - Immediate health effects which may be caused by construction or operation of a project (e.g., respiratory ailments, skin rashes, blindness, death, illness, etc.).
- Area of impingement - The area in which a project may have a potential impact; this area may or may not contain a human population and is usually based on environmental considerations such as wind patterns, topography, etc.
- Baseline** health study - A study which provides a picture of the current health status of a population. This may be used to identify sensitive populations or as a basis for comparison to detect changes in health status due to a project's operating practices.
- Chronic, long-term impacts - Potential health effects which may be caused by a project and do not appear immediately after exposure to a substance (e.g., cancer).
- Cumulative** exposures/effects - The total exposure of humans to a substance, accounting for all contaminant sources and pathways through the environment, and the associated health effects.
- Development of accident scenarios and emergency response procedures - The examination of various possible accidents and the development of emergency plans to use in case of an accident. Such plans may be developed for both employees and the public residing in the project's vicinity (area of impingement).
- Development of mitigation measures - Methods developed to mitigate potential human health effects. These methods may be the same as or different from methods to mitigate potential **environmental** impacts.
- Development of waste disposal procedures - Development of procedures to dispose of wastes properly so that impacts to the environment and to human health are minimized or avoided.
- Exposure **period** - The period during which a human population may be exposed to a contaminant. The basis for this **definition** may vary from project to project and may include **construction**, operation, and post-operation phases.
- Impacts to **critical subpopulations** - **Potential** health effects on members of a population which may be particularly susceptible to health impacts from exposure to certain contaminants in the environment. Examples of **critical** subpopulations may include the elderly, infants, pregnant women, nursing mothers, etc.
- Impacts to future generations** - Potential health effects on future generations caused by teratogenic or mutagenic effects from exposure to a substance emitted by a facility.

Impacts to health care facilities - The potential increase in demand for health care due to an expected increase in population (from increased employment) or due to a potential increase in illness from normal or accidental discharges.

Impacts to residents during construction - Potential health effects to residents in the area of impingement caused by activities associated with the construction of a project (e.g., potential effects from noise, dust, blasting, etc).

Impacts to workers during construction - Potential health effects to construction workers caused by activities associated with the construction of a project (e.g., potential effects from noise, dust, blasting, etc).

Impacts to residents during operation - Potential health effects to residents in the area of impingement caused by activities associated with the project's operation (e.g., potential effects caused by air emissions, water emissions, food contamination, accidental discharges, etc).

Impacts to workers during operation - Potential health effects to workers caused by activities associated with the project's operation (e.g., potential effects caused by accidents, exposures to substances in the workplace, etc).

Plan for on-going monitoring of health status - A program designed to monitor the health of a human population in an area of impingement to detect any abnormal changes in the health of the population which may be attributable to a project.

Review of existing literature - A literature search to help identify and assess potential health effects which may be caused by a proposed project.

APPENDIX D

BRITISH COLUMBIA

D.1 Royal Commission of Inquiry into Uranium Mining: Health and
Environmental Protection, Table of Contents



Province of **British Columbia**

Royal Commission of Inquiry Health and Environmental Protection Uranium Mining

COMMISSIONERS' REPORT

October 30, 1980

VOLUME 1

NM1280

DAVID V. BATES, M.D.
JAMES W. MURRAY, P h . D .
VALTER RAUDSEPP, P.Eng

Chairman and Commissioner

Commissioner

Commissioner

Commission Executive Secretary

Commission Counsel (to June 30, 1980)

Commission Counsel

DR. D. V. BATES

DR. J. W. MURRAY

MR. V. RAUDSEPP

BRIG. GEN. E. D. DANBY

MR. R. J. ANTHONY

MR. G. A. LETCHER

ROYAL COMMISSION OF INQUIRY INTO URANIUM MINING

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APPENDIX E

SASKATCHEWAN

- E.1** Excerpt, University of Saskatchewan Proposed Waste Incinerator Environmental Assessment Guidelines
- E.2** Saskatchewan Health study, "Respiratory Illness in **Estevan**"

APPENDIX E.1

PROJECT-SPECIFIC GUIDELINES

FOR

THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT

UNIVERSITY OF SASKATCHEWAN

PROPOSED

WASTE **INCINERATOR**

landfilling is to be considered, an analysis of hydrogeological conditions in the planned disposal area should be provided.

2.7 Assessment of Impacts

The EIS should include a complete and, wherever practicable, quantitative analysis of all potentially significant effects of the proposed development. Analyses should address all phases of the project (construction through to decommissioning) and all environmental components likely to be affected by, or affect, the project. Projected impacts under normal and defined worst-case situations should be assessed.

Predicted changes in air quality in areas surrounding the project should be described and the effects of those changes assessed. As noted previously, considerations are likely to relate mainly to socio-economic issues, but there may be a need to include biophysical concerns. In addition to direct impacts associated with the potential release of contaminants the University should assess possible indirect effects of the proposal. For example, is the presence of an Incinerator

of this type compatible with air intakes at nearby research facilities?

The U of S should also address the question of risks to human health associated with operation of the facility.

2.8 Mitigation/Enhancement

Where analyses **show that environmentally** undesirable situations may arise as a result of the project proceeding, the U of S should indicate specifically what preventative or mitigative measures **would** be employed to retain, or achieve an acceptable, or more desirable, state. Contingency plans to remedy or control undesirable events should also be described.

Any adverse environmental impacts which cannot be mitigated or which can be only partially mitigated should be identified and evaluated.

2.9 Monitoring, Follow-up Studies and

Environmental Audits

Although final required monitoring programs would be determined by regulatory agencies,

the EIS should provide a detailed description of the planned studies (e.g., what is to be

APPENDIX E.2

RESPIRATORY ILLNESS IN ESTEVANAbstract

In order to compare patterns of respiratory illness in the province of Saskatchewan to patterns in the Estevan Region, information was collected from several sources. Trends of mortality and morbidity were observed **over** the period 1975 to 1980 for mortality and 1975 to 1982 for morbidity for all Respiratory Diseases (**ICD-9** Codes 460 to **519**), Acute Respiratory Infections (460 to **466**), Pneumonia and **Influenza** (480 to 487) and Chronic Obstructive Pulmonary Disease (490 to **496**). **In** general there appears to be no significant difference between provincial and local trends.

Introduction

The province of Saskatchewan has a significantly low incidence of mortality due to respiratory illness in relation to the rest of Canada.' **However**, certain small areas may be foci **of** acute or chronic but not-fatal illnesses. Reasons postulated can be many; it is difficult to be **sure** if an area has a significant risk of illness without a thorough case/control study.

This review of available statistics was performed in order to assess the situation in the Estevan area of southern Saskatchewan.

Methods

General information about mortality due to Respiratory Disease in general, Chronic Obstructive Pulmonary Disease and Pneumonia and Influenza can be found in the Mortality Atlas of Canada, Vol. 2 and 3. ^{1,2}

Saskatchewan Health Policy Research and Management Services was approached for Statistics Canada mortality information. The number of deaths **occurring in the** year 1975 to 1980 due to the following causes as tabulated for Saskatchewan and for Rural Municipality 5 (**RM5**), which

includes the city of Estevan:

| | ICD-9 Code |
|----------------------------------------------|------------|
| Total Respiratory Diseases | 460 to 519 |
| Acute Respiratory Infection | 460 to 466 |
| Pneumonia and Influenza | 480 to 487 |
| Chronic Obstructive Pulmonary Disease (COPD) | 490 to 496 |

Age specific rates were calculated using the Statistics Canada **populations** for the area. Age standardized rates were than calculated **for** each year using the population of Canada, 1981 as the etandard population.

Hospital separation information was used as an indicator of morbidity due to respiratory disease. The Saskatchewan Hospital Services Plan (SHSP) was able to provide the number of hospital separations in the province and **RMS** in the above categories for the years 1975 to 1982. These were separations where the respiratory illness was indicated as being the primary diagnosis. Again age specific rates and age standardised rates were calculated, as above.

Statistical differences between the province and **RMS** were calculated using the mean number of cases for the mean population over the time periods indicated.

Graphs of mortality and hospital separation (morbidity) rates were prepared in order to compare these more readily.

Results

See the accompanying tables for the accumulated information on deaths and **hospitalizations**. (Tables I to VI)

Figures I to IV show the above information in graph format.

Tables VII and VIII show the average number of deaths for the period

1975-1980 and the average number of hospital separations for 1975-1982. Using the average populations for the respective periods, the statistical differences between provincial figures and **RMS** figures were calculated using $\frac{(O-E)^2}{E}$, where the expected results are derived from the average provincial incidence figures. For males, females and the total population, there is **no** statistical difference between the province and **RMS** in any of the disease categories examined.

The tables and graphs for each category were examined individually for trends and disease patterns, accepting the fact that there is no difference between provincial and **RMS** information.

Total Respiratory Disease shows a decline in the rate of deaths over **the period** shown. **Hospitalizations** over a slightly longer period show little decline, however.

Acute Respiratory-Infections have an almost negligible mortality, but hospitalisation rates are high and fairly constant over the period examined.

Pneumonia and Influenza deaths are decreasing accompanied by a fairly pronounced reduction in hospitalisations.

Both deaths and hospitalizations due to COPD have remained fairly constant.

Discussion

As mentioned above, there is no statistical difference in the patterns of death and **hospitalization** (Mortality and Morbidity) between the province and **RMS**. In general, fewer people are being admitted and dying with pneumonia and influenza while there is a constant (perhaps slightly increasing) number of hospitalizations with less serious illness.

Speculation as to the reasons for the improvement in overall

patterns might include suggestions that medical treatment is increasingly improved, that fewer people are subjecting themselves to lifestyle related hazards (eg. smoking) or environmental conditions including the strains of viruses circulating and respiratory irritants may have altered over the years. It is not possible to identify any specific area which could be improved, but emphasis on lifestyle hazards and environmental controls will certainly have a positive effect on future results.

- References
1. Statistics Canada, Mortality Atlas of Canada, Volume 2, General Mortality. 1980.
 2. Statistics Canada, Mortality Atlas of Canada, Volume 3, Urban Mortality. 1984.

Table I
Deaths due to Respiratory Illness
Province vs. RMS
1975 - 1980

| DISEASE CATEGORY | | 14 5 | | 1976 | | 1977 | | 1978 | | 79 | | 1980 | |
|-----------------------------|---|------|-----|------|-----|------|-----|------|-----|-----|-----|------|-----|
| | | Prov | RMS | Pcov | RMS | rov | RMS | rov | RMS | rov | RMS | Prov | RMS |
| Total Respiratory Disease | T | 749 | 6 | 753 | 13 | 611 | 7 | 706 | 10 | 612 | 9 | 622 | 7 |
| | M | 454 | 1 | 483 | 12 | 414 | 5 | 458 | 5 | 381 | 5 | 388 | 4 |
| | F | 295 | 5 | 270 | 1 | 257 | 2 | 248 | 5 | 231 | b | 234 | 3 |
| Acute Respiratory Infection | T | 6 | | 8 | | 8 | - | 6 | - | 6 | | 3 | - |
| | M | 3 | | 5 | | 5 | - | 3 | - | 4 | | 2 | - |
| | F | 3 | | 3 | | 3 | - | 3 | - | 2 | | 1 | - |
| Pneumonia/Influenza | T | 489 | b | 502 | 9 | 431 | 6 | 430 | 6 | 396 | 7 | 356 | 5 |
| | M | 260 | 0 | 277 | 9 | 240 | 4 | 250 | 2 | 221 | 4 | 188 | 2 |
| | F | 229 | b | 225 | 0 | 197 | 2 | 180 | 4 | 175 | 3 | 168 | 3 |
| COPD | T | 191 | 2 | 189 | 1 | 178 | - | 208 | 1 | 159 | 1 | 196 | |
| | M | 156 | 1 | 165 | 1 | 139 | - | 167 | 1 | 126 | 1 | 159 | |
| | F | 35 | 1 | 24 | 0 | 39 | - | 41 | 0 | 33 | 0 | 35 | |

Table II
Age Standardized Mortality Rates*: Comparison between Province and RMS 1975-1980

Males and Females Combined

| DISEASE CATEGORY | 1975 | | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | |
|-----------------------------|------|------|------|-------|------|------|------|------|------|------|------|------|
| | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS |
| Total Respiratory Disease | 66.8 | 57.6 | 64.7 | 119.7 | 57.6 | 51.7 | 59.4 | 76.6 | 49.3 | 72.5 | 50.1 | 44.7 |
| Acute Respiratory Infection | 0.6 | - | 0.7 | - | 0.8 | - | 0.5 | - | 0.5 | - | 0.3 | - |
| Pneumonia /Influenza | 42.8 | 36.6 | 42.1 | 79.6 | 36.6 | 50.4 | 34.8 | 52.4 | 30.1 | 59.3 | 27.3 | 32.3 |
| COPD | 17.6 | 20.9 | 17.0 | 10.7 | 15.8 | - | 11.3 | 9.0 | 13.7 | 0.4 | 16.6 | - |

*per 100,000. Standardized to population of Canada 1981

Table III
Age Standardized Mortality Rates*: Comparison of Province to RMS 1975-1980
For Males and Females

| DISEASE CATEGORY | | 1975 | | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | |
|-----------------------------|---|------|------|------|-------|------|------|------|------|------|------|------|------|
| | | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS |
| Total Respiratory Disease | M | 70.6 | 20.2 | 72.8 | 206.9 | 62.0 | 71.4 | 68.6 | 66.0 | 54.0 | 80.1 | 55.6 | 52.8 |
| | F | 58.5 | 94.2 | 51.5 | 19.8 | 48.6 | 35.4 | 45.1 | 86.0 | 40.5 | 61.4 | 40.5 | 37.0 |
| Acute Respiratory Infection | M | 0.6 | - | 0.7 | - | 0.9 | - | 0.5 | - | 0.7 | - | 0.4 | - |
| | F | 0.6 | - | 0.5 | - | 0.6 | - | 0.6 | - | 0.4 | - | 0.2 | - |
| Pneumonia/Influenza | M | 38.9 | - | 40.0 | 145.4 | 34.3 | 56.9 | 35.6 | 29.2 | 29.3 | 65.6 | 24.8 | 25.3 |
| | F | 45.1 | 72.6 | 42.6 | - | 36.9 | 35.4 | 31.9 | 75.6 | 30.1 | 52.2 | 20.3 | 37.8 |
| COPD | M | 25.9 | 20.2 | 25.8 | 21.4 | 21.7 | - | 26.3 | 11.1 | 19.3 | 14.5 | 14.0 | - |
| | F | 7.1 | 21.7 | 4.8 | - | 7.7 | - | 7.9 | - | 6.3 | - | 6.8 | - |

*per 100,000. Standardized to Population of Canada 1981

Table IV
Hospitalisations due to Respiratory Illness. Province vs. RMS 1975-1982

| DISEASE CATEGORY | 1975 | | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | |
|-----------------------------|-------|------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|-------|-------|-----|
| | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | |
| Total Respiratory Disease | T | 4815 | 419 | 33907 | 371 | 12354 | 355 | 32621 | 3161 | 9937 | 370 | 9003 | 373 | 17998 | 346 | 10564 | 128 |
| | M | 0790 | 216 | 18327 | 201 | 7558 | 192 | 17802 | 195 | 6312 | 213 | 5659 | 193 | 5356 | 204 | 6701 | 172 |
| | F | 6017 | 203 | 15580 | 170 | 4796 | 163 | 14819 | 166 | 3625 | 157 | 3344 | 100 | 12642 | 142 | 3863 | 156 |
| Acute Respiratory Infection | T | 0640 | 88 | 8293 | 84 | 7771 | 77 | 0196 | 03 | 0460 | 93 | 7950 | 95 | 7300 | 104 | 7045 | 108 |
| | M | 4620 | 86 | 4374 | 55 | 4150 | 66 | 4354 | 47 | 4477 | 48 | 6211 | 48 | 3895 | 59 | 4270 | 56 |
| | F | 4028 | 32 | 3919 | 29 | 3621 | 31 | 3042 | 36 | 3983 | 45 | 3747 | 41 | 3405 | 45 | 3575 | 52 |
| Pneumonia/Influenza | T | 0192 | 127 | 10349 | 110 | 9374 | 120 | 9527 | 07 | 7947 | 74 | 7077 | 69 | 6699 | 79 | 8076 | 77 |
| | M | 3383 | 61 | 5494 | 54 | 4955 | 58 | 5023 | 41 | 4314 | 47 | 3721 | 32 | 3523 | 39 | 4162 | 43 |
| | F | 4809 | 66 | 4855 | 56 | 4419 | 62 | 4504 | 46 | 3633 | 27 | 3356 | 37 | 3176 | 40 | 3914 | 34 |
| COPD | T | 7984 | 133 | 7307 | 89 | 7304 | 77 | 7600 | 104 | 7347 | 116 | 7850 | 119 | 7417 | 81 | 8208 | 79 |
| | M | 4650 | 65 | 4208 | 42 | 4240 | 45 | 4464 | 62 | 4274 | 73 | 4579 | 63 | 4392 | 49 | 4944 | 43 |
| | F | 3334 | 68 | 3099 | 47 | 3044 | 32 | 3226 | 42 | 3073 | 43 | 3271 | 56 | 3025 | 32 | 3264 | 36 |

Table V

Age Standardized Morbidity Rates*: Comparison between Province and RMS 1975-1982
Males and Females Combined

| Disease Category | 1975 | | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | |
|-----------------------------|---------------|---------------|--------|---------------|---------------|--------|--------|--------|--------|--------------|--------|---------------|---------------|--------------|--------|--------|
| | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS | Prov. | RMS |
| Total Respiratory Disease | 3394.6 | 3976.0 | 3245.2 | 3332.1 | 3076.2 | 3117.4 | 3073.4 | 3196.9 | 2800.2 | 3243.9 | 2690.5 | 3316.7 | 2582.8 | 038.4 | 2777.1 | 2868.9 |
| Acute Respiratory Infection | 832.9 | 823.2 | 781.5 | 749.7 | 725.0 | 640.0 | 760.4 | 720.9 | 779.7 | 769.2 | 731.3 | 823.3 | 666.1 | 807.0 | 705.6 | 915.1 |
| Pneumonia/Influenza | 995.3 | 1200.4 | 994.7 | 992.3 | 894.3 | 1066.4 | 893.4 | 786.3 | 738.3 | 664.3 | 647.0 | 608.5 | 611.2 | 704.6 | 720.2 | 676.3 |
| COPD | 780.0 | 1287.7 | 696.6 | 813.6 | 692.4 | 683.5 | 723.4 | 911.1 | 682.6 | 1020.3 | 721.6 | 1049.4 | 672.1 | 109.0 | 731.6 | 694.3 |

*per 100,000 Standardized to population of Canada 1981

Table VI

Age Standardized Morbidity Rates: Comparison between Province and RMS 1975-1982
For Males and Females

| DISUSE CATEGORY | 1975 | | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | | |
|-----------------------------|------|--------|---------------|--------|---------------|-------|--------|--------------|--------|--------|---------------|--------|--------|-------|---------------|---------------|--------------|
| | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | Prov | RMS | |
| Total Respiratory Disease | M | 3574.3 | 3987.0 | 3415.4 | 3572.2 | 267.7 | 3327.4 | 3280.9 | 3617.6 | 2987.6 | 3658.5 | 2835.8 | 3436.9 | 767.4 | 3594.0 | 1961.3 | 3012.0 |
| | F | 3183.0 | 3936.3 | 3042.1 | 1061.1 | 057.6 | 2906.8 | 2838.7 | 2987.8 | 2587.3 | 2818.3 | 2520.5 | 3217.8 | 374.5 | 2499.6 | 1571.2 | 2730.2 |
| Acute Respiratory Infection | M | 880.5 | 1027.0 | 819.6 | 958.8 | 769.1 | 164.6 | 803.1 | 780.9 | 823.5 | 786.9 | 169.5 | 841.2 | 703.1 | 1000.8 | 760.9 | 952.3 |
| | F | 785.2 | 614.6 | 743.2 | 531.2 | 679.2 | 516.9 | 717.6 | 655.6 | 736.9 | 752.3 | 692.3 | 806.5 | 627.1 | 783.6 | 649.7 | 882.6 |
| Pneumonia & Influenza | M | 1008.9 | 1137.3 | 1008.6 | 968.5 | 912.5 | 1015.0 | 901.6 | 760.3 | 774.3 | 830.5 | 657.7 | 572.0 | 621.8 | 6136.6 | 721.8 | 766.9 |
| | F | 971.8 | 1266.1 | 968.9 | 007.7 | 867.8 | 1118.0 | 870.8 | 829.2 | 693.2 | 495.8 | 629.6 | 640.5 | 594.3 | 708.4 | 726.1 | 586.6 |
| COPD | M | 866.8 | 1196.7 | 768.6 | 765.2 | 775.4 | 774.3 | 814.0 | 1066.9 | 762.2 | 1233.0 | 804.7 | 1092.7 | 763.1 | 887.9 | 843.4 | 737.0 |
| | F | 675.9 | 1364.4 | 610.8 | 862.2 | 598.8 | 591.7 | 622.7 | 758.0 | 588.9 | 804.5 | 623.6 | 1028.2 | 568.3 | 563.7 | 604.3 | 658.0 |

Table VII

Deaths due to Respiratory Illness

Average over 1975 - 1980

Province vs **RMS**

| | | <u>Province</u> | <u>RMS</u> |
|-----------------------------|----------|-----------------|------------|
| Total Respiratory Disease | T | 685.5 | 8.7 |
| | M | 429.7 | 5.3 |
| | F | 255.8 | 3.4 |
| Acute Respiratory Infection | T | 6.2 | |
| | M | 3.7 | |
| | F | 2.5 | |
| Pneumonia/Influenza | T | 435 | 6.2 |
| | M | 239.3 | 3.5 |
| | F | 195.7 | 2.7 |
| COPD | T | 186.8 | .8 |
| | M | 152.0 | .7 |
| | F | 34.8 | .1 |

Average SHS? Population 1975-1980

| | Total | Male | Female |
|------------|-----------------|----------------|---------|
| Province | 962,069 | 484,954 | 478,317 |
| RMS | 10,311.1 | 5,191.5 | 5,119 |

Table viII
 Hospitalization Due to Respiratory Illness
 Average over 1975 - 1980
 Province versus RM5

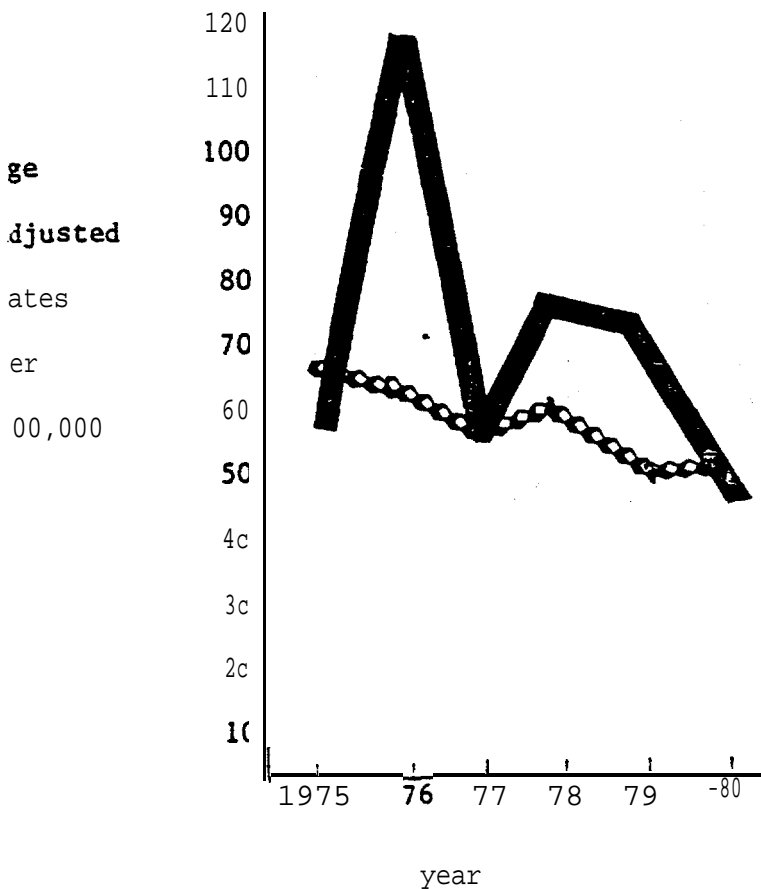
| | | <u>Province</u> | <u>RM5</u> |
|-----------------------------|----------|-----------------|------------|
| Total Respiratory Disease | T | 31399.9 | 365.4 |
| | M | 17064.1 | 198.3 |
| | F | 14335.8 | 167.1 |
| Acute Respiratory Infection | T | 8058.9 | 91.5 |
| | M | 4293.9 | 51.9 |
| | F | 3765.0 | 39.6 |
| Pneumonia/Influenza | T | 8655.1 | 92.9 |
| | M | 4571.9 | 46.9 |
| | F | 4083.2 | 46.0 |
| COPD | T | 7638.1 | 99.8 |
| | M | 4468.9 | 55.3 |
| | F | 3169.2 | 44.5 |

Average SHSP Population 1975-1980

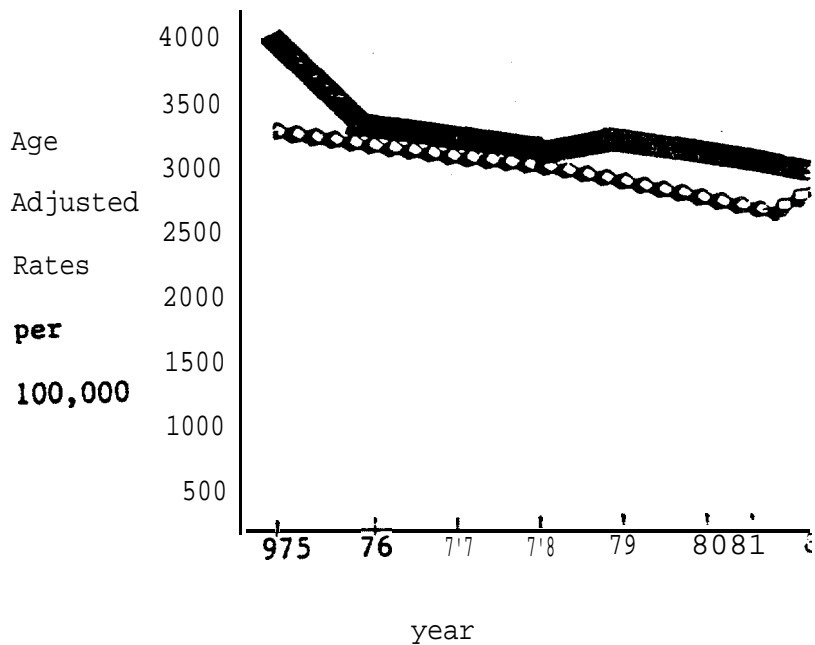
| | <u>Total</u> | <u>Male</u> | <u>Females</u> |
|------------|--------------|-------------|----------------|
| Province | 970,478 | 488,932.5 | 482,447.4 |
| RM5 | 10,375 | 5,218.8 | 5,158.8 |

Figure I. Total Respiratory Disease
Age Adjusted Rates per 100,000

a) Mortality



b) Morbidity





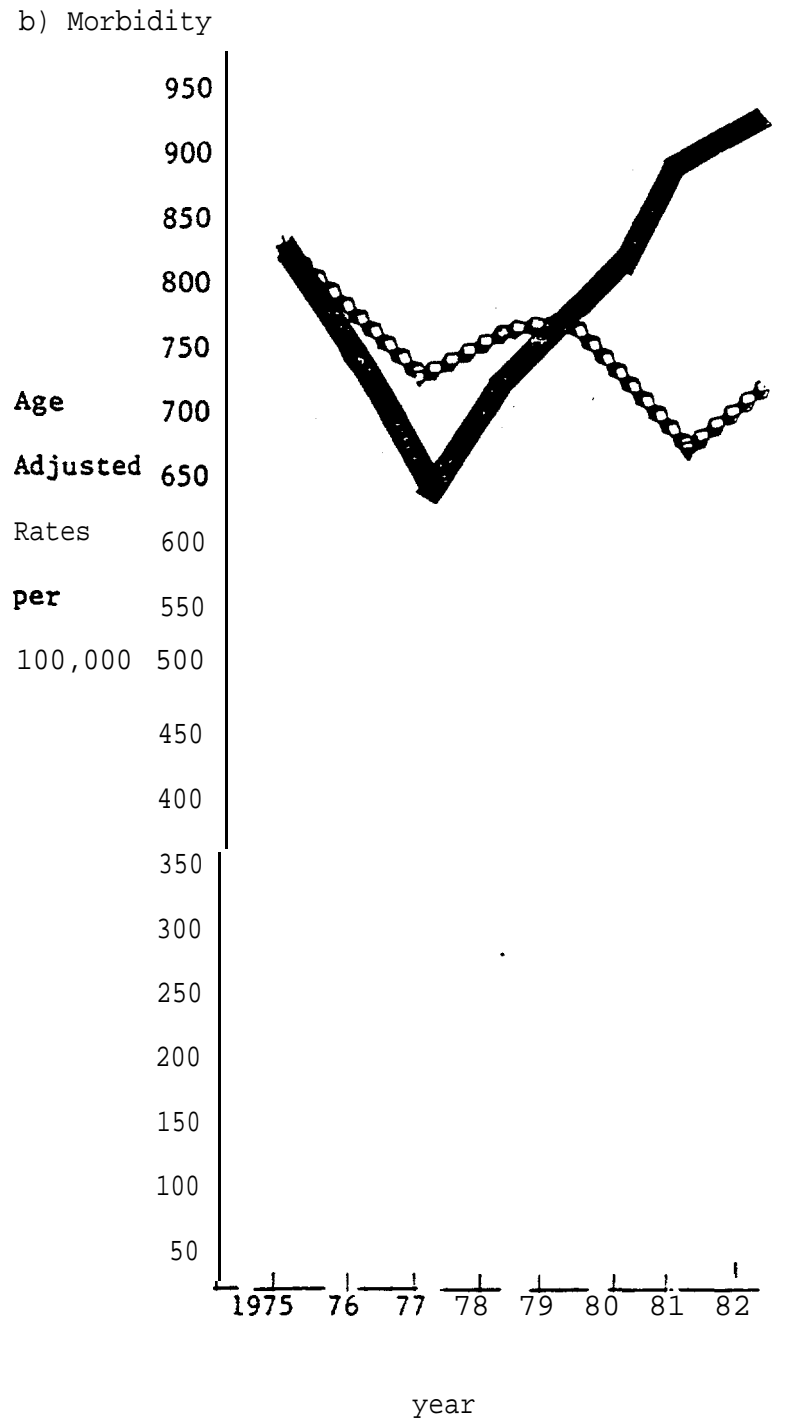
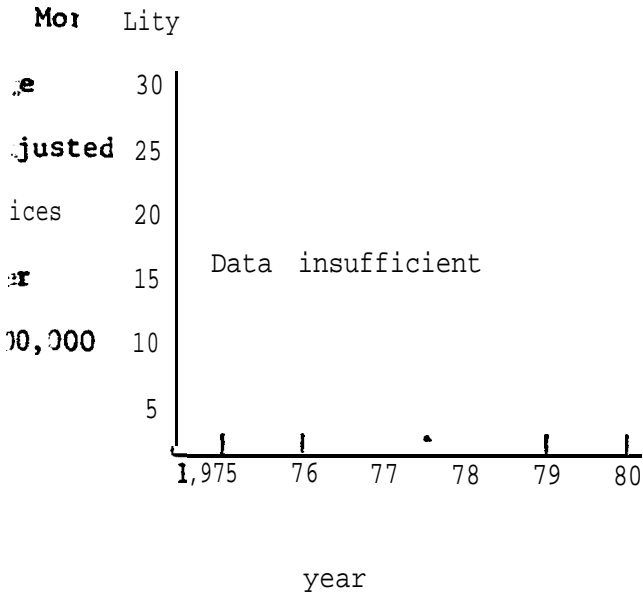
Province: 
RMS: 

Figure II. Acute Respiratory Infection

Age Adjusted Rates per 100,000





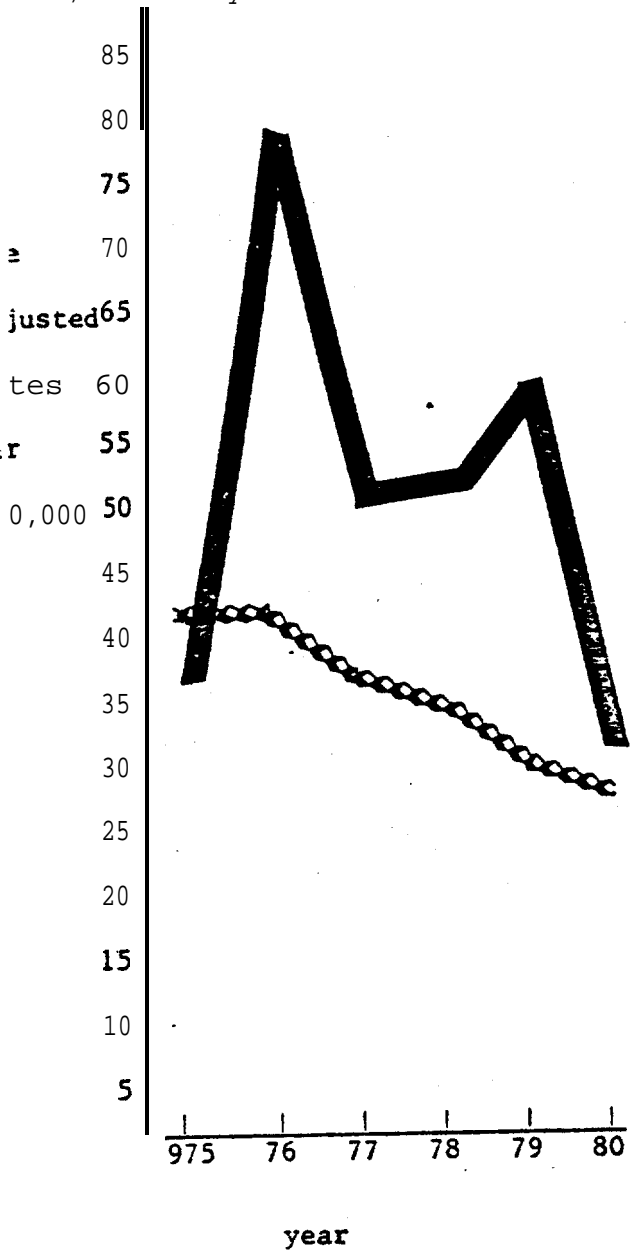
Province: 
RM5: 

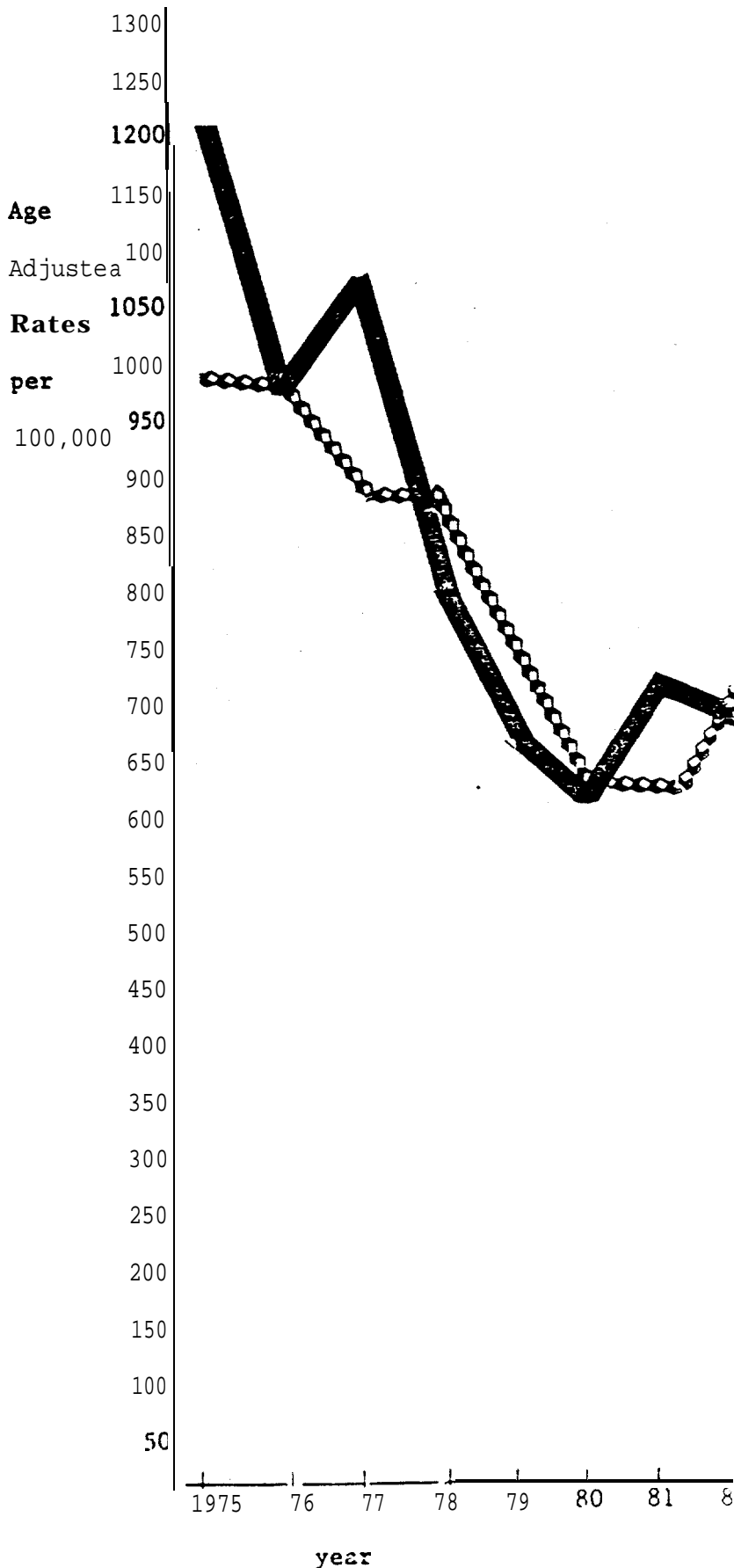
Figure III. Pneumonia and Influenza

Age Adjusted Rates per 100,000

a) Mortality



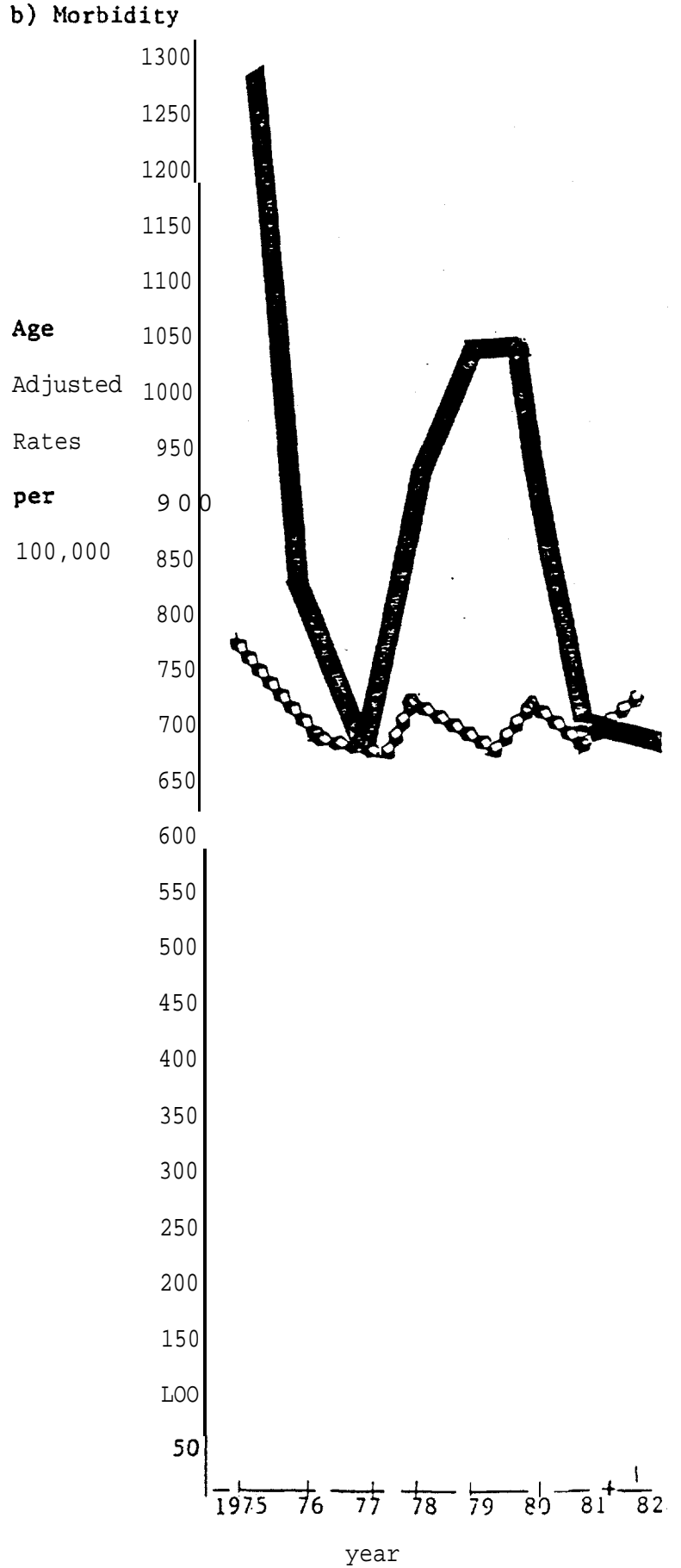
b) Morbidity



Province: ○○○○
 RMS: ██████

Figure IV. **Chronic** Obstructive Pulmonary Disease

Age Adjusted Rates per 100,000



Province : ○○○○○○
RM5 : ██████████

APPENDIX F

MANITOBA

- F.1 ● Proponent's Screening Process.**
- F.2 EIS: Limestone Generating Station, Appendix B, 'Issues Not Expected to Require Impact Management.'**
- F.3 'EIA Guidelines'**

APPENDIX F.1

ENVIRONMENTALMANAGEMENT DIVISIONTHE PROPONENT'SFEBRUARY, 1986SCREENING PROCESS

The following are some questions the proponents should utilize in selecting those projects to be submitted to the Manitoba Environmental Assessment and Review Agency. In answering these questions the proponents are expected to use their best professional judgement (e.g. architect, biologist, engineer, geologist) as if administering the Environmental Assessment and Review Process to fulfill the intent and purpose of this policy.

Right the proposed undertaking:

- 1) result in a significant detrimental effect on air, water or soil quality, or on ambient noise levels for adjoining areas?
- 2) have significant effects on adjacent persons or property or persons or property not associated with the undertaking?
- 3) generate secondary effects (e.g. land development, population growth) likely to significantly affect **the** environment.
- 4) necessitate the irreversible commitment of **any** significant amount of non-renewable resources?
- 5) preempt the use or potential use of a significant natural **resource** for any other purpose?

F-2

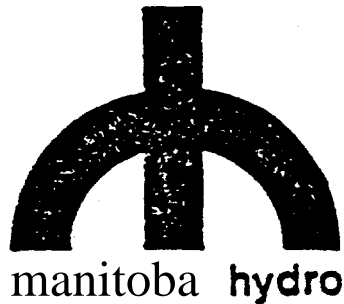
- 6) cause significant interference with the movement of any resident or migratory fish or wildlife species?
- 7) have **effects** on an area of ten acres or greater?
- 8) block views or adversely affect the aesthetic image **of** the surrounding area?
- 9) have an effect on any-unique, rare or endangered species, historical or archeological resources, habitat or physical feature of the environment?
- 10) establish a precedent or involve a new technology either **of** which is **likely** to have significant environmental effects now or in the future.
- 11) be highly controversial?

..

APPENDIX F.2

LIMESTONE GENERATING STATION
ENVIRONMENTAL IMPACT STUDY

Impact Management Needs
Discussion Paper #2



Prepared by:
MacLaren/InterGroup
Winnipeg, Manitoba
and
Manitoba Hydro

February 1985

APPENDIX B

ISSUES NOT EXPECTED TO REQUIRE IMPACT MANAGEMENT

HEALTH CARE

- **No issue is anticipated with regard to the Gillam hospital during the construction (or operations) phase because:**
 1. **much of the project-related health requirements during construction will be provided at Sundance and the construction camp;**
 2. **the health facility and staff are currently underutilized;**
 3. **renovation plans for the hospital will add fifty per cent more space by March of 1986;**
 4. **out-patient services, which did experience a capacity strain during Long Spruce, will likely not experience the same problems this time due to the Sundance clinic;**
 5. **demands of the construction project may in fact help the facility to attract and retain professional and technical staff.**
- **Capacities. Of the facilities and staff will be well above what is required to service the- new operations workforce; total population will approximate the post-Long Spruce 1981 population level.**
- **Bird residents, who will use Sundance and Gillam facilities in the immediate future, plan to have their own health care. facility eventually; this facility may be in place by the time the Sundance facility is closed.**

HISTORIC RESOURCES

- **Elders of the Fox Lake Band, who have historically used the area between Split Lake and Hudson Bay, indicated that they knew of no sites of historical significance along the Nelson River, with the exception of gravesites at the Limestone camp (currently protected) and gravesites at Mosenose Lake (well away from the Nelson River). No significant meeting areas or other sites were noted.**

LIFESTYLE AND COMMUNITY COHESION

- **The presence of a construction project with the magnitude of Limestone in terms of activity and people is likely to have a marked**

APPENDIX F. 3

ENVIRONMENTAL IMPACT
ASSESSMENT GUIDELINES

ENVIRONMENTAL
MANAGEMENT DIVISION
FEBRUARY, 1986

All provincial departments, agencies and crown corporations required to undertake or procure an environmental assessment of a proposed project shall comply with the following impact assessment guidelines, and such other guidelines as may be developed by the Environmental Assessment Review Agency.

A. Guidelines Respecting all Environmental Impacts of a Proposed Project

1. All primary and secondary effects, *beneficial* or otherwise should be described. Short **and long-term** impacts should be projected.
2. The environmental assessment should address:
 - a. All ecological changes **expected** through alteration of the physical and biological habitat.
 - b. The implication of these ecological changes as related to air, water, or soil.
3. The time frame in which impacts are anticipated should be detailed.
4. Remedial, protective and corrective measures to be implemented if required should be thoroughly described.

B. Guidelines Respecting Probable Adverse Effects Which Cannot be Avoided

1. The **type** and magnitude of any adverse impact on air, water, or soil which cannot be reduced in severity, or which cannot be reduced to an acceptable level should be described.
2. For those impacts which cannot be eliminated **or** reduced, their implications and the reasons why the proposed action should be accepted, notwithstanding the limitations of these effects or impacts should be described in detail.
3. Where abatement or mitigative measures can be **implemented** to reduce adverse effects to acceptable levels, the basis for considering these levels adequate, and the effectiveness **and** costs of the abatement measures should be specified.

C. Guidelines Respecting Alternatives

1. Alternative facility configurations of the proposal should be considered.
2. Alternative locations for the proposed project should be discussed.
3. Alternatives to the proposed project which may involve tradeoffs among uses of available environmental resources should be developed, described and objectively weighed.

4. The analysis **of** alternatives should be structured in **a** manner which will permit comparison of environmental benefit or damage.
5. Where practical, impacts of alternative action(s) should be qualified or described qualitatively to facilitate an objective judgement of their significance.

D. Guidelines Respecting the **Relationship** Between Local **Short-Term** Uses of the Environment and the Maintenance and Enhancement of **Long-Term** Productivity.

1. Cumulative and long-term effects of the proposed action which either significantly reduce or enhance the state **of** the environment should be described.
2. The desirability of the proposed action should **be** weighted to guard against shortsighted foreclosure **of** future options or needs.
3. Special attention should be devoted **to** those effects which narrow the range of beneficial uses of the environment or **pose** long-term risks to health or property.
4. **A** description and evaluation **of** the **immediate** long-term environmental effects.
5. Irreversible environmental damage which may result from accidents associated with the proposed action should be considered.

APPENDIX G

ONTARIO

G.1 Excerpt, General Guidelines for the Preparation of Environmental Assessments

6.2 **EIS:** Investigations for Landfill Sites in the City of Brampton, Table of Contents and **"Summary** of Major Categories and Evaluation Criteria"

APPENDIX G.1

GENERAL GUIDELINES
FOR THE PREPARATION OF
ENVIRONMENTAL ASSESSMENTS

Environmental Approvals Branch
Ministry of the Environment
Ontario

Second Edition January 1981

A P P E N D I X A
EXAMPLES OF SOME OF THE FACTORS TO BE CONSIDERED IN
ENVIRONMENTAL ASSESSMENT STUDIES

Introduction

The natural and man-made environments are made up of inter-related and interacting components. The environmental assessment study includes the identification, inventory and analysis of these components and their interrelationships, and the prediction of the potential effects on them of the various alternatives considered. Below is an outline list of some of the environmental factor-s to be considered; it is not to be taken as being exhaustive, and is present&d purely by way of example. The factors may be expanded or rearranged in accordance with the magnitude, location and stage of the study reached. Of course, every factor will not necessarily be relevant to each undertaking.

A. NATURE (Natural Environment)

Physical Features:

- topography;
- geology (surface and subsurface) and soils: types and capability (e.g., agricultural; erodibility, stability);
- hydrology (surface and subsurface), drainage;
- water and air quality; ,
- climate: micro and macro.

Biological

- terrestrial and aquatic fauna and flora;
- identification of ecological systems and description of successional stage (components, interrelationships and sensitivity);
- rare/endangered, sensitive/unique **faunal or floral**
species communities, habitats

B. MAN (**Social**, Cultural and Economic),

at local, regional and provincial levels as applicable.

- Population (density and distribution), community structure;
- Local governments, institutions;
- Community infrastructure, services (e.g., housing, social services, utilities);
- Health and safety, noise;
- Land Use: existing, future, potential; controls (official plans, zoning by-laws, etc.):
- **Visual** and aesthetic, environmental quality;
- Cultural, historical and archaeological;
- Financial implications for proponent;
- Economics, including municipal tax structures;
- Engineering: construction, operation and maintenance.



**Investigations for Landfill Sites
in Areas I, II, and VI
in the City' of Brampton**

**Health and Safety
Report**

THE REGIONAL MUNICIPALITY OF PEEL

**Medical Officer of Health
Regional Municipality of Peel**

March 1987

HEALTH'AND SAFETY
SUPPORT DOCUMENT #7

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| 3.2 Area I | 12 |
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| 3.5 Wells | 13 |
| 3.6 Conclusion | 14 |

TABLE E.1
SUMMARY OF MAJOR CATEGORIES AND **EVALUATION** CRITERIA
USED IN LANDFILL SITE **COMPARISON**

| | |
|------------------|----------------------------------------------------------------------|
| CATEGORY A- | PUBLIC HEALTH AND SAFETY (43) ¹ |
| Criterion A.1 - | Groydwater and surface water contamination on-site or off-site (.57) |
| Criterion A.2 - | Air emissions and noise (.15) |
| Criterion A.3 - | Birds, rodents, insects, mud and litter (.14) |
| Criterion A.4 - | Traffic impacts (.14) |
| CATEGORY B - | NATURAL ENVIRONMENT (19) |
| Criterion B.1 - | Mineral resources (.05) |
| Criterion 8.2 - | Agricultural soils (.38) |
| Criterion 8.3 - | Forest resources (.11) |
| Criterion 8.4 - | Terrestrial ecology (.22) |
| Criterion 8.5 - | Aquatic ecology (.19) |
| Criterion B.6 - | Floodplain areas (.05) |
| CATEGORY C- | SOCIAL ENVIRONMENT (19) |
| Criterion C.1 - | Land use (.35) |
| Criterion, C.2 - | Agricultural land use (.31) |
| Criterion C.3 - | People (.34) |
| CATEGORY D- | CULTURAL ENVIRONMENT (6) |
| Criterion D.1 - | Heritage, historical/archi tecturaf resources (.37) |
| Criterion D.2 - | Archaeological resources (.07) |
| Criterion. D.3 - | Visual aesthetics (.30) |
| Criterion D.4 - | Special cultural features (.26) |
| CATEGORY E - | SYSTEM COMPONENT COSTS (3) |
| Criterion E.1 - | Site development costs (N/A) ³ |
| Criterion E.2 - | Operating costs (N/A) ³ |
| Criterion E.3 - | Haul costs (N/A) ³ |
| CATEGORY F - | COMMUNITY COSTS (8) |
| Criterion F.1 - | Community cost of impacts on existing populations (.31) |
| Criterion F.2 - | Economic impacts (.14) |
| Criterion F.3 - | Community costs of planning changes (.51) |
| Criterion F.4 - | Conservation of natural resources (.04) |
| CATEGORY G- | TECHNICAL CONSIDERATIONS (3) |
| Criterion G.1 - | Reliability and technical factors (.50) |
| Criterion G.2 - | Capacity and f lexibility ₄ factors (.50) |
| Criterion G.3 - | Size and location (N/A) ₄ |
| Criterion G.4 - | Level of service (N/A) ₄ |

¹ Category weighting factor: sum of category weighting factors equals 101 due to rounding.

² Criteria weighting factor.

³ Weighting factors **not used**, since total score for Category E was **based on a** summation of costs.

⁴ Criteria C.3 and G.4 were not specifically evaluated since they were considered in other criteria (see Appendix B, Section 4.20)

APPENDIX H

. QUEBEC

H.1 Screening Elements in General Guide for the Environmental Assessment of Industrial Projects

H.2 Agreement between Ministries of Health and Environment

H.3 EIS: Proposed Incinerator Project, Table of Contents

APPENDIX H.1

MINISTÈRE DE L'ENVIRONNEMENT DU QUÉBEC

GUIDE GÉNÉRAL POUR
L'ÉVALUATION ENVIRONNEMENTALE
DE PROJETS INDUSTRIELS

PRELIMINAIRE

DIRECTION DES ÉVALUATIONS ENVIRONNEMENTALES

M1 1987

| |
|--------------------------------------|
| ANNEXE : ÉLÉMENTS DE L'ENVIRONNEMENT |
|--------------------------------------|

1. ÉLÉMENTS DU MILIEU NATUREL

1.1 Secteur physique/chimique

- Eau:
 - eaux souterraines
 - eaux de surface
 - qualité de l'eau
 - quantité de l'eau
 - réseau de drainage
 - hydrodynamique
 - sédiments de fond

- Air:
 - qualité de l'air
 - composition chimique
 - micro-climat
 - vent
 - humidité

- Sol:
 - caractéristiques morphométriques
 - sensibilité à l'érosion
 - caractéristiques de drainage
 - proportion de matière organique
 - composition chimique
 - pergélisol

- Bruit:
 - intensité (niveau sonore)
 - durée
 - répétition

1.2 Secteur biologique

- **Faune:** espèces et populations terrestres
espèces et populations aquatiques
habitats et communautés terrestres
habitats et communautés aquatiques
espèces rares ou menacées

- **Flore:** espèces végétales terrestres
espèces végétales aquatiques
habitats et groupements terrestres
habitats et groupements aquatiques
espèces rares ou menacées

2. ÉLÉMENTS AU MILIEU HUMAIN

2.1 Secteur spatial

- **Utilisation**
du sol: types d'utilisations
caractéristiques particulières
compatibilité des utilisations
Équipements, biens et services
plans de développement

2.2 Secteur social

- **Démographie:** effectifs et structure de la population

- **Mode de vie:** organisation sociale
us et coutumes
liens sociaux et familiaux
valeurs communes

- Qualité de vie: logement
santé
sécurité
travail
loisir, récréation
education
bien-être **physiologique**
bien-être **psychologique**
participation démocratique

2.3 Secteur économique

- Activités économiques: secteur primaire
secteur secondaire
secteur tertiaire
- Emploi: marché de l'emploi
revenus et salaires

2.4 Secteur culturel

- Patrimoine: patrimoine archéologique
patrimoine architectural
patrimoine territoriale

2.5 Secteur visuel

- Paysage: caractéristiques du paysage
sites exceptionnels



Bureau du sous-ministre

APPENDIX H.2

Sainte-Foy, le 28 juillet 1987

NOTE AUX: Sous-ministres adjoints
Directeurs généraux
Directeurs régionaux
Directeurs et directrices

Direction des Évaluations
Environnementales

REÇU LE

DE: Jean-Claude Deschênes

JUIL 30 1987

OBJET: Entente entre le MSSS et le MENVIQ

Environnement Québec

Madame,
Monsieur,

Je porte à votre attention l'entente conclue le 21 avril 1987 entre le ministère de la Santé et des Services sociaux et le ministère de l'Environnement relativement aux interactions entre la santé et l'environnement.

J'inclus également pour votre information et gouverner le programme annuel d'activités développé lors d'une rencontre entre des représentants des deux ministères, le mois dernier.

Je compte sur votre collaboration habituelle pour que dans les matières qui vous concernent, vous preniez les mesures appropriées afin de donner suite aux obligations que nous avons contractées.

Je suis certain que vous comprenez toute l'importance de cette collaboration accrue avec le MSSS et son réseau puisque comme vous le savez, fréquemment nos interventions en environnement visent à protéger la santé publique.

Confiant que la coordination et la complémentarité des efforts des parties mènera à une appréciation mieux intégrée des problèmes rencontrés ainsi qu'à une utilisation optimale des ressources des deux ministères, je vous remercie d'avance de l'implication que vous et le personnel sous votre direction accorderont à cet effort collectif pour une meilleure collaboration MSSS-MENVIQ.

Au début de septembre, Gérard Divay et Clément Veilleux vous rencontreront pour discuter des implications de ce protocole et de ce programme d'activité.

Le sous-ministre

J&N- CLAUDE DESCHÊNES

PROGRAMME ANNUEL D'ACTIVITES

Le ministère de la Santé et des Services sociaux et le ministère de l'Environnement ont déterminé le programme annuel 1987-88 des activités en vertu de l'entente qui les lie. Ce programme touche les dossiers suivants:

1- EAU

- | | | |
|-----|--------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1.1 | Micropolluants: | choix des contaminants à contrôler et détermination des norms. Consultation par le MENVIQ |
| 1.2 | Etat de la qualité de l'eau potable: | rapport annuel: Consultation par le MENVIQ |
| 1.3 | Sous-comité du CCHMT sur l'eau potable: | préparation conjointe dts réunions |
| 1.4 | Eaux de baignades (surveillance des plages publiques): | bilan des opérations: Consultation par le MENVIQ |

2- DECHETS

- | | | |
|-----|-----------------------|-----------------------------------------------------------------------------------------|
| 2.1 | Rejets industriels: | liste des quelques 200 substances prioritaires à surveiller. Consultation par le MENVIQ |
| 2.2 | Déchets bio-médicaux: | politique conjointe |

3- QUALITE DE L'AIR INTERIEUR ET EXTERIEUR

- | | | |
|-----|-------------------------|----------------------------------------------------------------------------------------------|
| 3.1 | Radon dans les maisons: | pertinence de poursuivre les mesures (MENVIQ) et de faire dts études épidémiologiques (MSSS) |
|-----|-------------------------|----------------------------------------------------------------------------------------------|

3.2 Révision du règlement
de la qualité de l'atmosphère:

nouvelles normes sur l'émission
de substances organiques
volatiles. Consultation par
le MENVIQ

4- ETUDES ENVIRONNEMENTALES

4.1 Projets industriels
exemple: Norskhydro:

impacts de 5 ou 6 projets
sur la santé. Consultation
par le MENVIQ

4.2 Modèle d'analyse de
risque mis au point
par le MENVIQ:

évaluation par le M.S.S.S.

5- PESTICIDES

5.1 Projet de règlement
sur les pesticides:

classification des pesticides.
Consultation par le MENVIQ

6- RECHERCHE

6.1 Identification des
axes de recherche
communs en santé
environnementale:

concertation sur un program
annuel et co-financement

7- FORMATION

7.1 Colloque en santé
environnementale -
automne 1986:

organisation conjointe

QUEBEC, JUILLET 1987

ENTENTE ENTRE
LE MINISTERE DE LA SANTE ET DES SERVICES SOCIAUX
ET
LE MINISTERE DE L'ENVIRONNEMENT
RELATIVE AUX INTERACTIONS ENTRE
LA SANTE ET L'ENVIRONNEMENT

AVRIL 1987

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- 3- Description des responsabilités
- 4- Objets, mécanismes de collaboration et niveau d'intervention
- 5- Sujets de collaboration
- 6- Consultation sur les politiques, la législation, la réglementation
- 7- Échange d'information: principes généraux
- 8- Programme annuel des activités
- 9- Comité consultatif
- 10- Révision de l'entente
- 11- Autres collaborations

ANNEXE: Sujets de collaboration'

INTRODUCTION

Reconnaissant que l'exposition humaine aux divers contaminants rejetés dans l'environnement risque d'affecter la santé et le bien-être de la population, le ministère de la Santé et des Services sociaux et le ministère de l'Environnement conviennent de l'importance d'améliorer la collaboration susceptible de mener à bonne fin l'atteinte de l'objectif commun, notamment: la protection de la santé publique et le bien-être des individus.

La présente entente vise à préciser les sujets prioritaires de collaboration ainsi que les objets, les niveaux de collaboration et les mécanismes qui assureront cette collaboration.

1- CHAMPS DE COLLABORATION

La présente entente concerne tous les éléments de l'environnement-santé (eau, air, sol, les personnes et autres organismes vivants) et leurs interactions.

2- SIGNATAIRES DE L'ENTENTE

La présente entente est faite entre le ministère de l'Environnement (MENVIQ) et le ministère de la Santé et des Services sociaux (MSSS).

3- DESCRIPTION DES RESPONSABILITES

Définies par leurs responsabilités, il est précisé par la présente entente qu'en matière de santé environnementale:

- le ministère de la Santé et des Services sociaux vise à l'amélioration de l'état de santé des individus et du niveau de santé de la population et prend les mesures requises pour assurer la protection de la santé publique. Ce rôle implique qu'il participe à l'élaboration des programmes d'assainissement du milieu physique dans lequel vit la population à laquelle ces programmes sont destinés. La Direction de la Prévention et de la protection de la santé publique du ministère de la Santé et des Services sociaux (M.S.S.S.), en collaboration avec les centres hospitaliers - départements de santé communautaire (C.H.-D.S.C.) et les centres locaux de services communautaires (C.L.S.C.), le Centre de toxicologie du Québec (C.T.Q.), le Laboratoire de santé publique du Québec (L.S.P.Q.) est désignée à ces fins;
- le ministère de l'Environnement est mandaté pour s'occuper de la qualité du milieu de vie de façon à assurer la santé, le bien-être et l'épanouissement des êtres humains et des autres organismes vivants essentiels à l'équilibre écologique. Outre la connaissance de l'état de l'environnement, ce rôle comprend des actions d'évaluation, de prévention et de des problèmes pollution dégradation susceptibles de la santé humaine.

Ainsi la réalisation de ces mandats requiert des activités qui appartiennent, selon le niveau d'intervention, une contribution différente des organismes impliqués.

L'hygiène du milieu (premier niveau d'intervention) regroupant l'assainissement du milieu, l'inventaire des sources de pollution, le monitoring environnemental et d'autres activités de même nature relève du Ministère de l'Environnement. Le ministère de la Santé et des Services sociaux avec les organismes désignés collaborent au niveau de l'identification des éléments environnementaux susceptibles d'entraîner des risques pour la santé et l'établissement de normes pour qu'elles soient, entre autres objectifs, sécuritaires pour la santé humaine.

La surveillance de l'état de santé de la population (second niveau d'intervention), notamment par la réalisation d'études épidémiologiques et la surveillance médico-environnementale, relève du ministère de la Santé et des Services sociaux et des organismes désignés. Le Ministère de l'Environnement collabore au niveau des données relatives à la présence de contaminants dans le milieu (eau, air, sol, poissons).

Le contrôle des épidémies et des intoxications humaines (intervention de niveau tertiaire) relève du Ministère de la Santé et de son réseau avec la collaboration du Ministère de l'Environnement quant au contrôle des causes d'origine environnementale pouvant être responsables de ces épidémies et intoxications.

4- OBJETS, MECANISMES ET NIVEAUX DE COLLABORATION

Les objets de la collaboration peuvent concerner:

- la définition ou la détermination des éléments, des substances, des problèmes
- les normes et objectifs
- l'évaluation de cas et l'intervention sur le terrain
- la connaissance (données, études)
- la recherche

Les mécanismes qui peuvent être utilisés selon les cas sont:

- l'information (transfert de données, de rapports, d'études)
- la consultation (demande d'avis)
- la concertation (obligation de trouver un terrain d'entente)

Les niveaux de collaboration peuvent être:

- Au niveau central (MSSS et MENVIQ)
- Au niveau sous-régional (D.S.C., C.L.S.C.) et au niveau régional (Direction régionale du MENVIQ)

5- SUJETS DE COLLABORATION

Dans un premier temps, les organismes concernés conviennent d'une collaboration sur les questions suivantes dont le détail se trouve en annexe:

- l'eau de consommation
- Les taux de baignade
- les déchets dangereux (industriels et bio-médicaux)
- la qualité de l'air extérieur et intérieur
- l'utilisation des pesticides
- + les études de répercussions environnementales
- + les urgences environnementales

6- CONSULTATION SUR LES POLITIQUES, LA LEGISLATION, LA REGLEMENTATION

Les parties conviennent de se consulter lorsqu'un document d'orientation de l'un des ministères affectera ou résultera de l'affectation des responsabilités de l'autre ministère. Sont visés les projets de politique, de législation, de réglementation, de directive, de guide, de programme d'actions.

7- ECHANGE D'INFORMATION: PRINCIPES GENERAUX

Les informations qui conviennent de s'échanger les parties seront traitées conformément aux principes généraux suivants:

- une reconnaissance de la source des données, études, rapports lors de l'utilisation
- une consultation sur l'interprétation des données avant leur diffusion
- une concertation sur leur diffusion

8- PROGRAMME ANNUEL DES ACTIVITES

En janvier de chaque année, le ministère de l'Environnement et le ministère de la Santé et des Services sociaux détermineront

un programme annuel des activités reliées à la santé environnementale à entreprendre ou poursuivre dans l'année budgétaire subséquente. Ce programme sera transmis aux niveaux régional et sous-régional.

Au niveau régional, les organismes de santé et la Direction régionale du MENVIQ se concerteront pour établir un programme annuel de travail portant sur les problèmes spécifiques à leur région. Ce programme sera transmis au MSSS et MENVIQ qui, après analyse, intégreront ce qui sera retenu, dans le programme annuel des activités à entreprendre ou à poursuivre dans l'année.

En cours d'année, toute proposition d'action urgente non prévue au programme annuel et qui implique des ressources non disponibles sera évaluée par un comité ad hoc formé de représentants des deux ministères. Si la proposition est retenue, les modalités d'exécution en seront établies.

9- COMITÉ CONSULTATIF

Les signataires de l'entente s'engagent à constituer un comité consultatif composé de représentants du M.S.S.S., de son réseau et du MENVIQ pour aviser les sous-ministres sur toutes questions relatives à l'entente et à son exécution.

10- REVISION DE L'ENTENTE

L'entente peut être révisée en tout temps par accord des parties.

11- AUTRES COLLABORATIONS

Il n'y a pas de collaboration prévue dans la présente entente ni constitue une entrave à toute collaboration souhaitable sur des sujets autres que ceux retenus à l'article 5.

SIGNÉ LE 8/10/71



Réjean Langin
Sous-ministre
Ministère de la Santé et des
Services sociaux



Jean-Claude Deschenes
Sous-ministre
Ministère de l'Environnement
du Québec

ANNEXEDétail de la collaboration prévue sur les
sujets retenus à l'article 5 de l'entente1- EAU DE CONSOMMATION

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------|
| Choix des contaminants à contrôler et détermination des normes | Consultation par MENVIQ | Central |
| Programme provincial de surveillance de l'eau potable | Concertation sur les nouveaux paramètres Pour le reste: information par MENVIQ | Central |
| Données sur la qualité de l'eau de consommation | | |
| - concernant une région | Information par MENVIQ | Régional et sous-régional |
| - concernant la province | Information par MENVIQ | Central |
| Données médicales, toxicologiques, épidémiologiques reliées à l'eau de consommation | | |
| - concernant une région | Information par MSSS | Régional et sous-régional |
| - concernant la province | Information par MSSS | Central |
| Appréciation des cas problèmes impliquant un danger à la santé humaine | Concertation et si danger reconnu, le MSSS et le MENVIQ en seront informés | Régional et sous-régional |
| Intervention sur les cas problèmes | Information par MENVIQ et consultation, si nécessaire | Régional et sous-régional |
| Recherches | Concertation sur programme annuel | Central |

2- DÉCHETS DANGEREUX (industriels et bio-médicaux)

a) Déchets dangereux d'origine industrielle

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|---------------------------------------------------------------------|--------------------------|--------------------------------|
| Liste des substances potentiellement dangereuses à la santé humaine | Consultation par MENVIQ | Central |
| Normes acceptables des substances dangereuses en relation avec la | Consultation par MENVIQ | Central |

| | | |
|-----------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------|
| Identification des sites d'enfouissement dangereux | Information par MENVIQ | Central |
| Appréciation des cas problématiques impliquant un danger à la santé humaine | Concertation | Central, régional et sous-régional |
| Intervention sur les cas problématiques | Information Ddr MENVIQ et consultation, si nécessaire | Régional, sous-régional et central |
| Données épidémiologiques et médicales reliées aux déchets dangereux | Information par MSSS | Régional et sous-régional |
| Recherches | Concertation sur le programme annuel | Central |

b) Déchets bio-médicaux

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|-----------------------------------------------------------------------------------|--------------------------|--------------------------------|
| d) A l'intérieur des établissements | | |
| Guide d'identification des problèmes possibles et des solutions | Concertation | Central |
| Évaluation des problèmes à chaque établissement et programme de correction | Information par MSSS | Régional et sous-régional |
| b) A l'extérieur des établissements | | |
| Exigences relatives à l'entreposage (contenants), au transport et à l'élimination | Information par MENVIQ | Central |

3- EAUX DE BAINADE (plages publiques)

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|-------------------------------------------------------------------------|--------------------------|--------------------------------|
| Choix des paramètres de contrôle qualitatif et détermination des normes | Consultation par MENVIQ | Central |
| Programme provincial de surveillance des plages publiques | Consultation par MENVIQ | Central |
| Données sur la qualité des eaux des plages publiques | Information par MENVIQ | Régional et sous-régional |
| Données épidémiologiques et médicales reliées aux eaux de baignade | Information par MSSS | Régional et sous-régional |

4- QUALITÉ DE L'AIR EXTÉRIEUR ET INTÉRIEUR

a) Air extérieur (atmosphérique)

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------|
| Choix des paramètres de contrôle qualitatif et détermination des normes | Consultation pdr MENVIQ | Central |
| Connaissance (données, études) sur les contaminants | | |
| - concernant une région | Information par MENVIQ | Régional et sous-régional |
| - concernant la province | Information par MENVIQ | Central |
| Connaissance (données médicales, toxicologiques et épidémiologiques) reliée à la pollution de l'air | | |
| - concernant une région | Information par MSSS | Régional et sous-régional |
| - concernant la province | Information pdr MSSS | Central |
| Appréciation des cas problèmes impliquant un danger à la santé humaine | Concertation | Régional, sous-régional et central |
| Intervention sur les problèmes | Information pdr MENVIQ et consultation, si nécessaire | Régional, sous-régional et central |
| Recherches | Concertation sur le programme annuel | Central |

b) Air à l'intérieur des habitations sauf les milieux de travail

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|----------------------------------------------------------------------|--------------------------|--------------------------------|
| Connaissance (données médicales, toxicologiques et épidémiologiques) | Information par MSSS | Régional et sous-régional |
| Détermination des objectifs de qualité | Concertation | Central |
| Guide de bonnes pratiques à suivre par les citoyens et citoyennes | Concertation | Central |

5- UTILISATION DES PESTICIDES

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|------------------------------------------------------------------------------------------|--------------------------|--------------------------------|
| Choix des pesticides à contrôler et classification en terme de danger à la santé humaine | Consultation par MENVIQ | Central |

| | | |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------|
| Détermination de normes pour protéger la santé publique | Consultation par MENVIQ | Central |
| Données relatives à la pollution de l'environnement | Information par MENVIQ | Central |
| Données médicales, toxicologiques, épidémiologiques, reliées aux pesticides | Information par MSSS | Régional sous-régional et central |
| Données sur la vente et l'utilisation des pesticides | Information par MENVIQ | Central |
| Appréciation des car problèmes impliquant un danger à la santé humaine | Concertation et si danger reconnu le MSSS et le MENVIQ en seront informés | Régional et sous-régional |
| Intervention sur les car problèmes | Information par MENVIQ et consultation, si nécessaire | Régional et sous-régional |
| Développement et mise à jour de cours de formation | Consultation par MENVIQ (et participation du MSSS) | Central |
| Recherches | Concertation sur programme annuel | Central |

6- ETUDES DE RÉPERCUSSIONS ENVIRONNEMENTALES

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------|
| Certains projets assujettis au Règlement sur l'évaluation et l'examen des impacts sur l'environnement: paragraphes m, q, r, s et de l'article 2 | Consultation par MENVIQ sur la directive et sur l'acceptabilité environnementale du projet | Central |
| Projets industriels nécessitant une étude des répercussions environnementales | Consultation par MENVIQ sur le guide de référence et sur l'acceptabilité environnementale du projet | Central |

7- URGENCES ENVIRONNEMENTALES (impliquant un danger à la santé humaine)

| <u>OBJETS</u> | <u>TYPE DE MÉCANISME</u> | <u>NIVEAU DE COLLABORATION</u> |
|-------------------|--------------------------|-----------------------------------------------------|
| Evaluation de cas | Consultation réciproque | Régional et sous-régional ou central, selon les cas |

Interventions

- | | | |
|------------------------------|------------------------|---------------------------|
| - questions d'environnement | Information par MENVIQ | Régional et sous-régional |
| - questions de santé humaine | Information par MSSS | Régional et sous-régional |

APPENDIX H.3

Directive du ministre indiquant la nature,
la portée et l'étendue de l'étude d'impact sur
l'environnement

Projet d'incinérateur modulaire de BPC
par la compagnie Sanexen International Inc.

Dossier # 3211-20-04

NOVEMBRE 1986

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APPENDIX I

NEWFOUNDLAND

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I.2 EIS: Excerpt, Freshwaterbry Offshore Base

SOCIO-ECONOMIC ASSESSMENT

PROPOSED HOPE **BROOK MINE**

Prepared for:

SBLCO DIVISION
BP **RESOURCES** CANADA LTD.

Submitted by:

D. W. KNIGHT ASSOCIATES LTD.
8 AUGUST 1986

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3.1.6 Social Ills/Health

The Study Area appears to be plagued with a high rate of youth unemployment. The 1981 Census reports an average rate of unemployment of 23.9 percent for males between 15 and 24 years of age inclusive. For females of the same age group this rate rises to 30.9 percent. In Ramea, the youth unemployment rate for both males and females was 5.9 percent, whereas the Rose Blanche female youth unemployment rate was a drastic 75.0 percent. Channel-Port aux Basques reported a male youth unemployment rate of 38.5 percent.

It is conditions such as represented by the above figures that many believe help cause the present social problems in the Study Area.

Depression is a very real problem for many people dealing with long-term unemployment. The need for an outlet of pent-up feelings surfaces in the form of violence, (physical and sexual abuse) and **in** 'drug and alcohol **abuse**. This is evident in the Corrections Caseload statistics for both the Channel-Port aux Basques and Burgeo Districts administered by the Department of Social Services. The number of young offenders in the Burgeo District increased from none in the April to August period of 1983 to peak at 48 in September 1985 and then decline to 22 in March 1986. The statistics for the Channel-Port aux Basques District show ten young offenders in April 1983 and 84 in March 1986. Adult offences have shown the same percentage increase.

There are many family problems in the Study Area according to the District Social Services Officers for Burgeo and Channel-Port aux Basques. The child welfare caseload for the

Burgeo District increased from an average of 21 cases in 1983 to 42 cases in 1985. This doubling effect was experienced in the Channel-Port **aux** Basques District with a 1983 average of 134 cases and a 1985 average of 261 cases. In the past year in excess of 100 cases of child abuse **were** reported for the Channel-Port aux Basques **region**⁴.

In order to counter these occurrences, a number of **organizations** and service clubs have been set up in the southwest coast area. The Gateway Women's Centre in Channel-Port aux Basques has put together a booklet of the available services and offers a drop-in service to women who need help **or** someone to talk to. There is a Child Protection Committee established, which includes doctors, lawyers and **teachers**. Their aim is to handle situations which may arise where children are involved. The Family Violence Committee is trying to get a transition house similar to the one operating in Corner Brook set up on the southwest coast to make the service more available.

Social services groups, including the Ministerial Committee, are trying to provide more support and assistance for the abusers. There is also concern for **the** family structure as high rates **of** unemployment are forcing people to move **away** in search of work.

There are other social support groups also available. Alcoholics Anonymous holds meetings in Channel-Port aux Basques, Isle aux Morts and **Codroy** Valley to cover the southwest coast region. The Mariners **Association**, Stroke Group, the **Gateway**

⁴**Interview** with Gateway Women's Centre Co-ordinator, Channel-Port aux Basques: May 1986.

Association for the Deaf, Senior Citizens Club, weight control groups and a life skills group for developmentally delayed adults are active in Channel-Port aux Basques. Community service groups like the Lions and the Kinsmen meet in Channel-Port aux Basques. The surrounding communities do not have a variety of **groups**, instead the Churches play a larger role in Community Service.

At present, the Channel-Port aux Basques District Social Service office, which covers from Grand Bruit to South Branch, employs six **social workers, one** homemaker, one respite worker, one behavioural management specialist, one clerk-stenographer and two support staff, all of which, according to the District Officer, **are** working at full **capacity**. The 1985 average caseload for Social Assistance **was** 409 persons, down from the 1984 average of 455 people.

There are two hospitals in the region - **the** recently opened Dr. Charles L. **LeGrow** Health Centre in Channel-Port aux Basques and **the** Burgeo **Cottage Hospital**. The **LeGrow** Health Centre is a 13 million dollar complex which opened **in** 1984. It presently **employs six doctors and a team of nurses and nursing assistants**. A **helicopter pad is on the hospital site to assist in transporting patients to and from the outlying areas**. The smaller Burgeo hospital has **two doctors on staff and nursing support**. Emergencies too large to handle are sent to **Channel-Port aux Basques by helicopter**. There is no **helicopter stationed in Burgeo, one must fly in from either Paaedena or St. Albans**. Where Paaedena is the nearer, it is from **here the helicopter will fly if there is an urgent situation**.

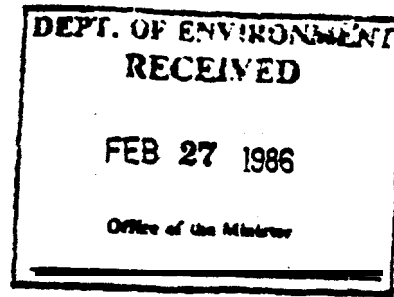
Ramea is equipped with a nursing station where one doctor and a Public Health Nurse are on call. Public Health Nurses are available to the smaller communities upon request and regularly

visit each place during the year: for example, the Public Health Nurse **from** Channel-Port aux Basques visits Rose Blanche every Thursday. Helicopter landing pads are located in some of the communities, Ramea, for instance, for quick emergency response.

3.1.7 The Fishery

The economy of the southwest coast has developed around and owes its existence to the fishery. Today,, both inshore and offshore fisheries are active in this area employing a large proportion of the labour force, and generating employment at the various fish plants for about 1,242 **people during the peak** season, and about 200 people in the off-season. Cod is the **focus** of the offshore **fishery** and is processed **at fish plants in Channel-Port aux Basques, Isle aux Morts, Rose Blanche, Burgeo and Ramea. The inshore fishery produces lobster, herring, capelin, scallops and lumpfish. The offshore fishery is a year round operation while the inshore fishery is confined to the late spring, summer and early fall.**

Formerly, the area west of Burgeo was important as a commercial salmon fishery but the permanent closure of this **fishery by the Department of Fisheries and Oceans** because of a depleted salmon **stock, has** eliminated this source of employment. The **effects of this** closure are most apparent in Grand Bruit. There have been no commercial salmon landings in Grand **Bruit and La Poile since** 1983. This may **be seen from** Table 3.6 which also shows a dramatic **drop in groundfish landings in Grand Bruit** for the **1985** fishery. This **drop can be attributed** to the **fact that some of the Grand Bruit fishermen were** working at the Hope Brook Mine and not fishing full-time. Another reason for the drop .



APPENDIX I.2

**FRESHWATERBAY OFFSHORE BASE
ENVIRONMENTAL IMPACT STATEMENT
FEBRUARY 1986**

4.1.7 Public Information Meetings

On the evenings of February 3 and 4, 1986, Public Information Meetings were held at Canon Stirling Auditorium, SC. John's, and St. George's Hall, Petty Harbour, respectively. Each meeting consisted of presentations by the proponent, FOB Ltd., on the project description, and by NORDCO Limited and Frederick Hann Associates Ltd. on findings of the E.I.S. to date.

Following the formal presentation, questions and comments were received from the audience. These were generally concerned with loss of employment (J. McGrath, LSPU, and B. Neice, MUN), loss of fishing access (C. Roberts, St. John's Fishermen's Committee, and T. Best, Petty Harbour Fishermen's Co-op), and effects on aesthetics and tourism (E. Hall, Parks Canada and V. Silk, Petty Harbour/Maddox Cove Community Council). Concern was also expressed regarding increased traffic and the development of Freshwater Bay as setting a trend of expansion toward Cape Spear. A presentation by T. Keivans of SOHILCO was made at both meetings.

The following are texts of formal presentations from the public..

4.1.7.1 Presentation by Vicki Silk - Petty Harbour, February 4, 1986

Good Evening! This presentation is being given on behalf of the Petty Harbour/Maddox Cove Town Council and will hopefully bring to light many of the questions and concerns about issues surrounding the Freshwater Bay Industrial development that are likely to affect the people of this area for years to come. I say "industrial development" rather than "offshore oil supply base" in order to give those not overly familiar with the proposal a more realistic impression of what exactly a supply base is.

A supply base in this instance means the development of up to two hundred and eighty acres of natural forest running from the barachois Freshwater Bay to the Cape Spear highway, bounded on the west by

Leamy's Brook and ponds and on the east by town land. This development will be visible for miles around, from many different viewpoints. The existing forest will be replaced by a lot of concrete; roads, industrial warehouses, manufacturing facilities, lots of Lsydown space meaning storage for everything from pipes to fuel and all other rig-related gear. There will be heavy traffic coming and going, day and night, not necessarily on the Cape Spear Road alone, but possibly through the Petty Harbour/Maddox Cove communities also. It means that the wildlife of the surrounding area will be displaced and in some instances possibly destroyed, i.e. on river dams. A base means docking facilities where supply boats, barges and possibly small fuel tankers come and go twenty-four hours a day. This base will be lit up like Disneyland day and night and will affect landowners of the area should they ever decide to build out that way. People who will be affected are those who hike, cycle, hunt, cut wood and in general enjoy the natural beauty and serenity of the area. The base is a place where all waste materials from the rig will be unloaded and then disposed of. Some of the waste materials will include sewage, pollutant run off, drilling mud, sulphuric acid, arsenic and fuel oil. As is becoming quite apparent, an offshore oil supply base is no small matter and this meeting here tonight is pretty much everyone's last opportunity to have some input into the final recommendations of the NORDCO E.I.S. and also to let representatives of Freshwater Bay Offshore-Base Limited know how the local people feel about the whole project and their most major concerns.

One of the ongoing problems in our community is high unemployment and I would like to know if there is going to be any firm commitment in place to hire some people from our community who could make use of our two or three heavy duty equipment and truck operators. It seems to me that this could be one way of off-setting some of the negatives.

When we are told that traffic will not be affected, I get quite confused reading the schedule of development. The updated report states that warehouse and laydown space will be occupied in the first twelve months, however, the dock will not be in place for twenty-four

...which leads me to believe that there will be a serious increase in traffic flow for at least a two-year period. Is Shea Heights going to bear the brunt of this increase in traffic or will it have to be re-routed through the harbour and the cove? What effect will this have on the safety of our roads, the conditions and the safety of our children?

...regards to all the waste that will be brought in from the rigs, how and where will it all be disposed of? And what about the... Will there have to be an official hazardous waste disposal site and where (if so)? I think all Newfoundlanders should be informed about hazardous wastes and their disposal sites as this kind of issue has caused many problems in the past throughout Canada, particularly in the area of personal health.

The council of this community is hoping to develop tourism to its fullest potential over the next few years and we worry about the long-range effect that local industrial development the size of the ECR project will have on tourism. As everyone knows Cape Spear is quite a novelty to our tourists, not only because it is a national park but also because it is the most easterly point in North America. Likewise, Petty Harbour being very representative of a typical Newfoundland fishing community attracts many tourists. Between the two there are thousands of tourists yearly, coming and going along the Cape Spear Highway and we don't want this development to be a huge eyesore. We feel that our community has the most to lose should this occur and we want to know exactly what is planned in the way of landscaping and ongoing upkeep of the area?

Although this next issue will be addressed later in more detail by B. Martin, I would like to touch on it anyway. Freshwater Bay has been a traditional and I might add, highly productive squid-jigging ground for many of our fishermen in the past and I would like to know when and with whom will our fishermen's committee get to sit down and work out a concrete compensation plan?

I have touched on most of the key areas of concern that council has, although there are still many unanswered questions. Where is the water supply going to come from? We want the Roundabout and Market Three Ponds Left untouched as these are the only good troutng ponds left to the area. We want full assurances that the old hiking trail to Freshwater Bay will remain untouched by the development. The Landowners of the Maddox Cove and Petty Harbour community want to know when the land freeze out Maddox Cove Road will be lifted? They want to know why Petroceanic people and 8 crowd from town can get permits to develop a huge industrial site are yet they themselves, owners of land that has been handed down through many generations can't get a permit to turn around on their land, not to mention maybe build a home. This is a huge problem especially because there is no room whatsoever for expansion in the Harbour itself.

I believe that all of these questions should be answered before the development starts; ● patience has shown that the "after-the-fact" ● approach is not always a rewarding one.

In closing I will ask that we be considered and consulted on all changes that may occur in F.O.B.'s plan. I believe this approach will make it easier to learn how to live with the new development.

Vicky Silk

APPENDIX J

NEW BRUNSWICK

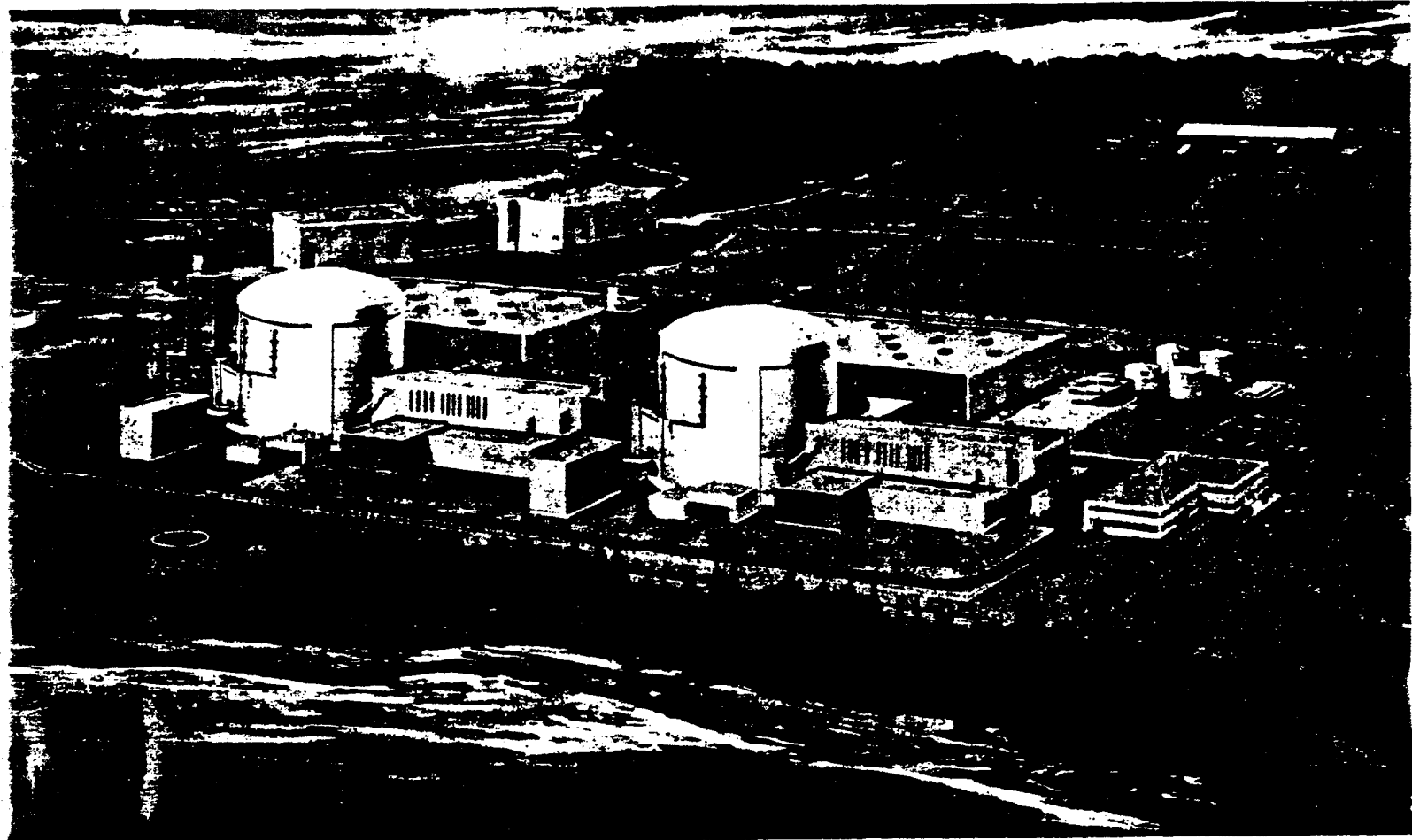
J.1 **EIS:** Lepreau **II Nuclear** Power Plant, Table of Contents

J.2 Excerpt, Guidelines for the Preparation of an **EIS**, Lepreau II
Environmental Assessment Panel

LEPREAU 2

APPENDIX J.1

Environmental Impact Statement



Prepared for
Maritime Nuclear
by
WASHBURN & GILLIS ASSOCIATES LTD.

in association with
SENES CONSULTANTS LIMITED
and

DPA CONSULTING LTD.
May, 1984

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APPENDIX J.2

LEPREAU II
ENVIRONMENTAL ASSESSMENT PANEL

GUIDELINES
FOR THE PREPARATION OF
AN ENVIRONMENTAL IMPACT STATEMENT

January, 19 84

- b) the frequency and the effect of plant shutdowns on the quantity and temperature of thermal effluent (e.g. ranges of temperature to which fish and invertebrates would be exposed);
- c) upper and **lower** lethal limits of fish and invertebrates likely to be affected.

2. Describe plans for monitoring the effects of thermal effluent on fish, birds, and macroinvertebrates.

6.1.8 Combined Biological Effects

Discuss the overall environmental effects in light of the impacts identified in the above sections.

6.2 IMPACTS OF RADIATION ON HUMANS

It is **recognized** that the proposed plant would operate under Atomic **Energy** Control Board statutory limits for radiation exposures, and that the generally acceptable **principle** that radiation exposures should be kept as low as reasonably achievable would be applied. Nevertheless, a description of how the Proponent would apply these limits and **principles to** reducing the exposure of humans to radiation from the combined operation of Lepreau I and II should be provided.

- 1. a) Estimate the total annual **radiation** dose to humans caused by radioactive effluents and emissions from Lepreau II during normal operating conditions, as received by:
 - persons living 1 kilometre from the plant;

- persons living between 1 kilometre and 5 kilometres from the plant:
 - persons living between 5 kilometres and 10 kilometres from the plant;
- b) provide comparable dose estimates from the Lepreau I plant and from the natural background;
- c) discuss the potential health risk associated with each of the above estimates, and their total, with particular reference to the incidence of cancer and genetic defects.
2. With reference to each of the above estimates (1(a) (b)) provide a breakdown of probable radiation exposures via:
- air
 - water
 - locally harvested foods (vegetables, fish, other marine organisms, etc.)
 - direct gamma **exposure**.
3. Discuss any existing and proposed monitoring programs to study health effects on humans, indicating the number **and** locations of people to be **examined**.
4. a) Describe the range and estimated frequency of potential upset conditions (including risk of earthquake) at the Point Lepreau Development which would result in increased release of radionuclides to the environment and subsequent exposure to humans;
- b) describe exposure levels related to such events, as measured in various environmental media, at which action would be taken to protect human health, and the nature **of** such actions:

- c) discuss the additional radiation dose to humans involved in the above scenarios, specifying the geographical areas concerned and the risks to human health with particular reference to the incidence of cancer and genetic defects.
5. Discuss the risks associated with off-site transport of high-level radioactive wastes and the potential health impacts involved.
6. Describe measures for health protection of workers from radiation exposure at the Point **Lepreau** development.

6.3 IMPACTS ON THE SOCIO-ECONOMIC ENVIRONMENT

It should be demonstrated that sufficient data has been collected to make an assessment of short-term and long-term impacts of the proposed project on various components of the socio-economic environment. The design of studies, collection of data, analytical procedures and interpretation of results should allow for a structural view of the social environment where the components are interrelated.

6.3.1 Employment

Information should be provided describing:

1. the number, types of jobs to be created and skills **required** during each of the major phases of the Lepreau II- development (i.e. planning, construction **and** operation) as a direct result of expenditures by the Proponent;
2. the numbers and types of jobs to be created during each of the major phases as a result of indirect effects of the Lepreau T-F project (e.g. housing

APPENDIX K

NOVA SCOTIA

K.1 Tidewater Quarry Public Hearing Report, Table of Contents

APPENDIX K-1

**NOVA SCOTIA ENVIRONMENTAL
CONTROL COUNCIL
P. O. BOX 2107
HALIFAX, NOVA SCOTIA
B3J 387**

**Report and Recommendations
to the Minister of the Environment
following a Public Hearing on the proposed
Tidewater Quarry in Halifax County**

**Nova Scotia Environmental
Control Council**

**Halifax, Nova Scotia
August, 1984**

C O N T E N T S

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| | Appendix VII Written Summation - Paul Miller on behalf of Waverley Ratepayers Association | |

APPENDIX L

FEDERAL ENVIRONMENTAL ASSESSMENT AND **REVIEW** PROCESS

- L.1 Excerpt, Environmental **Screening** Procedures Manual, Department of **Energy, Mines, and Resources (EMR)**
- L.2 Example **EMR** Screening Reports
- L.3** Excerpt, 'Terms **of** Reference **for** the Review **of** Military Flying Operations Based at Goose Bay, Labrador'

APPENDIX L.1

DRAFT COPY

DEPARTMENT OF ENERGY, MINES AND RESOURCES

ENVIRONMENTAL SCREENING
PROCEDURES MANUAL

OFFICE OF ENVIRONMENTAL AFFAIRS, FEBRUARY, . 1987

PARTB: INITIAL SCREENING RESULTS

1. Automatic Exclusion **Yes** [] **No** [] 2. Class Assessment **Yes** [] **No** []
 Completed
3. Expected Impact Levels (Rate both those by the environment on the project, and the project on the environment)

Rate the Potential Impact Significance as:

- 0 = No Effect 3 = High
 1 = Low 4 = Unkown Effect
 2 = Moderate

Complete the impact significance only for those factors relevant to this project.

| Environmental Factor | Potential Impact Significance | | Impact Description |
|-------------------------------------------|----------------------------------|-------------------------|--------------------|
| | Project on Factor | Factor on Project | |
| Groundwater Quantity | | | |
| Groundwater Quality | | | |
| Surface Water Quant. | | | |
| Soil Quality | | | |
| Permafrost | | | |
| Geology/Geophysics | | | |
| Air Quality | | | |
| Local Weather/ Climate | | | |
| Local Vegetation | | | |
| Wildlife | | | |
| Wildlife Habitat | | | |
| Noise Levels | | | |
| Archeology/Heritage | | | |
| Recreation | | | |
| Public Interest/ Conflict | | | |
| Surrounding Land Use | | | |
| Land Capability | | | |
| Social Services | | | |
| Municipal Services (sewers, roads, et) | | | |
| Local/Regional Planning | | | |
| Health & Safety | | | |
| Hazards (natural and man-made) | | | |
| Native Lands/Land Claims) | | | |
| Navigation | | | |
| Economics | | | |
| Other | | | |

APPENDIX L.2

SCREENING REPORT

ENERGY MINES AND RESOURCES

EASTMAIN FIREWOOD CUTTING AND UTILIZATION

DOCUMENTATION: Firewood Demand and Supply Study for
Eastmain, Wemindji and Waskoganish,
Quebec - Cogesult Inc.

PROJECT DESCRIPTION:

The Cree Regional Authority With the assistance of several government agencies has developed a program for the cutting and utilization of firewood in the area surrounding Eastmain, Quebec. **Eastmain** is a small Cree community located on the shores of James Bay. The program is designed to encourage the use **of** firewood in the place of heating oil as a fuel source for residential heating in the community. A cutting regime has been developed to ensure that firewood is harvested on a sustainable yield basis. Instruction programs relating to efficient and safe use of woodstoves have also been developed.

ENVIRONMENTAL CONCERNS:

Environmental concerns related to forestry operations typically centre upon the negative impacts logging operations have on terrestrial and aquatic environments. Logging can deplete tree stocks and can destroy habitats. Removal **of** trees from stream banks can negatively affect water quality and aquatic ecosystems. Roads built for logging disrupt natural drainage patterns and create greater public access to forested areas.

Large scale conversion from heating oil to firewood as a fuel source **can** pose problems for local air quality as well as for the health and safety of individual residents.

IMPACT ASSESSMENT:

The availability of trees in the **Eastmain** area has been extensively studied by Cogesult Inc. **Cogesult's** study concludes that total wood availability for the period of 1985 to 2013 in the **Eastmain** area is 491,398 cords. Total demand **for the same** period in the same area is expected to be 35,400 cords assuming that most houses convert from oil to firewood as a fuel source. Total demand is therefore only 7% of total supply. Cogesult concludes that wood can be harvested on a sustainable basis virtually indefinitely.

The area surrounding **Eastmain** is not very biologically productive. Disruption of fauna habitat is therefore expected to be minimal. Harvesting plans for the area call for the maintenance of a 30m protection strip on either side of all streams in the harvest area.

Riparian environments should therefore not be harmed. All cutting will take place in the winter with snowmobiles being used to haul **felled** trees. No roads will be built so drainage patterns and forest accessibility should not be altered by cutting activities.

Present wood burning activities in **Eastmain** are typically inefficient and unsafe. Greater instruction in the use of woodstoves and proper wood drying practices should increase the efficiency and safety **of wood** burning in Eastmain. The number of woodstoves in the area will be too small to significantly alter local air quality.

The environmental impacts of the project are judged to be minimal. **More** closely regulated wood use practices as outlined in the project proposal will result in more environmentally benign use of local forest **resources** than is currently the case. The project may proceed as planned.

SCREENING REPORTDEPARTMENT OF ENERGY, MINES AND RESOURCESENERGY EFFICIENT HOUSING, PELLY CROSSINGProject Description

The Selkirk Indian Band has proposed construction of high energy efficient housing at the village of Pelly Crossing, Yukon Territory. The project provides for the construction of eight houses including at least four R-2000 homes. The total project cost is estimated at \$985,000 including a contribution of \$125,003 from the Remote Community Demonstration Program.

A number of space heating options were considered including wood heating, which was the ultimate choice. Domestic hot water is to be supplied by a woodfired system having oil firing capability.

Based on comparison with wood fuelled space heating, a simple payback period of 6.5 years is required for a \$10,000 incremental cost over a standard design of house. Based on comparison with oil fired space heating, a \$10,000 incremental cost would be recovered in 3-2 years. The \$7,500 incremental cost of the energy efficient houses would be recovered in about the same time.

Environmental Concerns

Wood heating is associated with products of combustion that may impair local air quality.

Construction of very tight houses brings the risk of internal air quality problems due to insufficient ventilation.

Environmental Assessment

The project is essentially one of energy conservation, and as such will tend, to improve environmental conditions through reduced energy consumption.

Degradation of air quality is not foreseen to be a problem in the village of Pelly Crossing.

Heat recovery ventilators are to be installed in the demonstration houses, which will ensure proper air turnover and interior air quality.

It is considered that the project can proceed without further environmental assessment.

APPENDIX L.3

TERMS OF REFERENCE
FOR THE REVIEW OF
MILITARY FLYING OPERATIONS
BASED AT GOOSE BAY, LABRADOR

Mandate of the Environmental Assessment Panel

The Environmental Assessment Panel established by the Minister of Environment is to undertake a review of the environmental and socio-economic issues associated with low level flight training in Labrador and in the Northern and lower north shore parts of Quebec.

Scope of the Review

The review will examine:

- 1) the existing and anticipated low level flight training being carried out in accordance with bilateral agreements with NATO allies; and
- 2) a proposal to establish an integrated Tactical Fighter Weapons Training Centre (TFWTC) for training NATO Air Forces. The proposed TFWTC would require airport and infrastructure expansion, as well as training facilities at Goose Bay and the development of tactical weapons ranges in Labrador.

The Panel will consider the 'impacts of current, planned and proposed military flight training activities on the quality of the environment and on its natural resources, particularly on wildlife, such as the caribou, which are important to native livelihood. A joint study has been commissioned by the Federal and Newfoundland governments on the effects of current flying

activities on caribou. The Panel will also review the public health effects of low flying aircraft on the affected populations in the region. A study on the subject has been initiated by the Canadian Public Health Association under the sponsorship of the Newfoundland Government. Data examined will include both of these studies, although they should not be considered as the total information base for the review of these questions.

The Panel will review the socio-economic effects of the proposal on communities and people in the Goose Bay area and on the Labrador coast as well as on permanent and temporary settlements, including traditional hunting, fishing and trapping camps as well as outfitting campsites within flight corridors and target practice areas. The effects to be reviewed include impacts on employment and economic development, on community facilities and infrastructures, and on native social organization, lifestyles, land use and wildlife harvesting.

Issues related to land use by the native people are within the scope of the review. However issues related to land claims policy are not within the scope of the review and neither is Canada's defence policy.

There are other activities planned in the region (i.e. the new North Warning Radar System in Labrador and the concurrent development of Gull Island and/or Muskrat Falls hydroelectric projects with a potential sawmill operation) which will not be reviewed by this Panel. However information on planned activities would be provided to the Panel so it may understand the cumulative impacts, if any, resulting from the activities it will review and other activities planned in the region.

In addition to being reviewed under the Environmental Assessment and Review Process, the project is also subject to the federal impact assessment process of the James Bay and Northern Québec Agreement (JBNQA). The panel will therefore give due consideration to the guiding principles stated in section 23.2.2

APPENDIX M

UNITED STATES

- M.1 Excerpt, Council on Environmental Quality 'Indicators of Environmental Significance'
- M.2 EIS: Excerpts **from** selected appendices, O'Hare Water Reclamation Plant and Solids Pipeline (US EPA)
- M.3 **EIS:** Excerpts, Waste Water Treatment Facility, City of **Fort Worth**, Texas (US EPA)
- M.4 EIS: **Noxious** Weed Control, Table of Contents (US Forest Service)
- M.5 EIS Supplement: Noxious Weed Control, Table of Contents (Bureau of Land Management)
- M.6 EIS: Ground-Based *Free* Electron **Laser** Technology Integration Experiment, Table of Contents (US **Army**)
- w.7 **EIS:** Chemical Stockpile Disposal Program, Table of Contents (**US** Army)
- M.8 Public Health and Environmental **Exposure** Assessment, Table of Contents (US EPA)
- M.9 Guidance on Feasibility Studies Under CERCLA (US EPA)
- M.10 "**Hazard** Ranking System,' Table of Contents and Introduction (US EPA)

**CRITERIA FOR PREPARATION OF AN
ENVIRONMENTAL IMPACT STATEMENT**

COUNCIL ON ENVIRONMENTAL QUALITY

General criterion for purposes of the National Environmental Policy Act (NEPA), and applicable to all federal agencies, is the CEQ definition of significance,

"Significantly" as used in NEPA requires consideration of both context and intensity.

Context means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interest, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

- **Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect will be beneficial.**
- **The degree to which the proposed action affects public health or safety.**
- **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.**
- **The degree to which the effects on the quality of the human environment are likely to be highly controversial.**
- **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**
- **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.**
- **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.**

APPENDIX M.2

DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE

METROPOLITAN SANITARY **DISTRICT** OF GREATER CHICAGO

DES PLAINES - O'HARE WATER RECLAMATION PLANT

AND SOLIDS PIPELINE

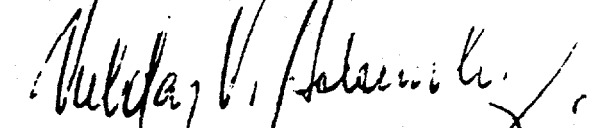
PREPARED BY THE

UNITED STATES **ENVIRONMETNAL** PROTECTION AGENCY

REGION V

CHICAGO, TLLINOIS

APPROVED BY:



VALDAS V. ADAMKUS
DEPUTY REGIONAL ADMINISTRATOR

MARCH 1975



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

January 16, 1975

Dear Sir:

Region V of the **USEPA** is initiating the preparation of a draft Environmental Impact Statement for the proposed O'Hare Water Reclamation Plant in Des Plaines, Illinois.

Much of the public opposition to the proposed treatment facility has focused on the potential health hazard of locating a sewage treatment plant in close proximity to a residential neighborhood. We want to determine the present state of knowledge of the health significance of airborne bacteria, viruses, and gaseous chemical compounds which **may** be emitted from uncovered sewage treatment plants of this **size** and process.

Attached is a brief description of the proposed project with accompanying maps illustrating the wastewater facility design layout, the site location and other relevant background information.

To aid **in** our environmental impact evaluation, we would like you to address the following questionnaire. We are interested in your own research experiences with these topics and in any relevant references to the scientific literature that you can identify. To incorporate the results of this questionnaire into the draft Environmental Impact Statement, - we need to have your response by February 3, 1975.

If you have any questions concerning this project, please contact Dale Luecht or Cathy **Grissom** of **my** staff at **312-353-7730**. Thank you for your help.

Sincerely yours,

A handwritten signature in cursive script that reads "Harlan D. Hirt".

Harlan D. Hirt
Chief, Planning Branch

Enclosures
a/s

Questionnaire

1. Are any synergistic effects known between **airplane** related emissions and aerosols or gases generated by activated sludge **treatment processes**? If so, what are these effects?
2. What epidemiological studies have been conducted on the **health of sewage** treatment plant workers or residents in the area **of a** treatment facility? What do the results indicate?
3. In **your** opinion, is there any significant health hazard associated with siting a wastewater treatment plant of this size and process type in **this location? Why or why not?**
4. In your opinion, will there be any significant odor problems associated with the operation of a facility such as this? Why or why not?
5. **Is** there a minimum distance and/or special protective measures which should be incorporated into the design **of a** treatment plant such as this to protect the workers and the adjacent residential **communities** from any potential health hazard?
6. **In your** opinion, would a wastewater reclamation plant **of** this size and **process** type produce **significant quantities of chemical emissions of a corrosive or abrasive nature?** **Discuss the reasons why you feel this will or will not be a problem.**
7. **Are you** aware **of any** other comparable situations where similar issues **occurred?** What were these issues and how were they resolved?

Sent January 20, 1975 .

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 Region V

HEALTH ASPECTS OF SEWAGE TREATMENT FACILITIES

Research & Development Department
S. J. Sedita

January, 1975

III. HEALTH ASPECTS

Let us now examine the larger issue of the health implications associated with the generation of microbial aerosols. The major question to be answered is, "Are the assumptions concerning the implications valid?" Based purely on the experience associated with the construction and operation of activated sludge plants in the United States and the rest of the world since 1915, the answer must be no!

An obvious place to further explore this question would be to look at the health prospects of the population with the greatest exposure, namely, the wastewater industry worker. Several extensive surveys of this group have been carried out (Ander's, 1954; Browning and Gannon, 1963; California Water Pollution Control Board, 1965; Dixon and McCabe, 1964). The results of these studies lead one to conclude that workers in **the** wastewater industry are not exposed to any special danger because of the chemical and biological composition of sewage. With specific reference to infectious hepatitis, the Safety Committee of the California Water Pollution Control Board (1965) concluded that transmission of this disease by the usual means (personal contact or transfusion) was more likely even among this group (**waste-water** industry workers).

Considerable attention has been given to the studies of **Randall and Ledbetter (1966)**, and Adams and Spendlove (1970), in arriving at the conclusion that a **recognizable** health hazard exists in the form of bacterial aerosols. The Randall and Ledbetter work was carried out at a maximum distance of 100 feet from the aeration basin of the plants studied, which is

surely not a fair test of the **exposure** liability of individuals living at **greater** distances from the **aerosol source**. The Adams and Spendlove paper, on the other hand, purports to show significant **coliform** survival at distances **of up to** 0.8 miles (4224 ft.) from **the** aerosol source. In both samplings cited at 0.8 mi, the upwind control coliform count was 25% and 33% respectively of the downwind test sample. Further, with respect **to the** total bacterial count the upwind control at 0.8 mi was 71% of the upwind test sample, indicating that a significant proportion of the viable particles per cubic meter came from sources other than the waste treatment facility under **consideration**.

A consideration of the health aspects of aerosolized viruses and bacteria must necessarily include several factors, i.e.:

a) The concentration of ingested or respired viruses necessary **to elicit** symptoms in an individual.

b) The concentration of airborne viruses in the immediate environment **of an** individual.

c) Definable parameters that affect the survival of airborne viruses (presumably the same factors which affect bacterial survival in aerosols).

d) The degree **of** aerosolization associated with the activated sludge process.

e) The concentration of individual types of viruses in the wastewater being treated and aerosolized.

Although definitive information pertaining to all of the above factors does not exist, let us make an attempt to **analyze** some relevant aspects of each (Metcalf, et. al, 1974).

It is **recognized** that as little as one tissue culture infective dose (TCID) of certain viruses may initiate infection in man. (Berg, 1971, states that, "a single plaque forming unit (PFU) of virus is capable of producing infection in man.") One **must** keep in mind, however, that the virus **particle** must come into contact with a susceptible cell (Plotkin and Katz, 1967). One must also **realize** that the ingestion of a single virus may not necessarily produce infection and probably does not in the majority of cases (see also letter to Mr. R. Ward from G. F. **Mallison**, Assistant Director Bacterial Diseases Division Bureau of Epidemiology, Center for Disease Control, Atlanta, Georgia). An examination of the variability of results in minimal infective dose studies indicates that there may be as much as a hundred-fold variation in data from study to study and with different enteroviruses (**Plotkin** and Katz, **1967**).

Most of the studies on minimal infective dose such as those described above, were carried out using only one type of virus as total inoculum. Viruses **encountered** in the environment, whatever the source, generally include a somewhat heterogenous population (Metcalf, et al, 1974; Lamb, et al, 1964). It is, therefore, altogether possible that an individual ingesting or breathing more than one virus will ingest or breathe in more than one virus type. There is no evidence to suggest that this situation results in a greater risk of infection than ingesting or breathing more than one virus of the same type. On the contrary, experience with the Sabin strain of poliovirus

types suggests that **infection** with more than one virus type may induce viral interference. (Davis et al, 1967)

One must also be **aware**, regarding the enteroviruses, that infection with a minimal dose does not normally result in perceivable symptoms. Polioviruses **have** been most extensively studied in this regard, and of the cases studied only **one to two** percent of persons exposed and infected exhibited frank symptoms of the disease. (Davis et al, 1967).

In a study of enteric viruses in activated sludge effluents, 52.6% of the isolates were identified as polioviruses. The population of the country is, on the whole, **immunized** against these viruses if they were non-vaccine strains. In addition, the remaining vaccine strains of poliovirus are non-virulent.

The majority of viruses that have been isolated from **waste-water** fall into three classification groups: picornaviruses, adenoviruses and reoviruses. Of the three groups picornaviruses (poliovirus , **coxsackievirus** , and echovirus) are most often isolated. Ingestion of picornaviruses very seldom results in anything more serious than transient infection **of the** alimentary tract, and reoviruses are, "questionable causes of respiratory tract disease " (Report of the Committee on Infectious Diseases, American Academy of **Pediatrics**, Evanston, Ill., 1974). The points made here apply equally to bacterial infections.

It **is** pertinent to this discussion to **recognize** that populations do not live in sterile environments and that microbes are everywhere. "One must be chary of the type of microbiological

thinking that equates the mere presence of microbes with illness or the potential for illness. The fact is that illness is an unusually complex phenomenon that does not have a **1:1 relationship** to microbes " (**Benarde** , 1973).

Returning, for a moment, to the question of "minimal infective **dose**," **as posed** in our previous discussion on viruses (and **indirectly** on bacteria) let us face a few facts. Reports appear in the literature from time to time indicating that one or another laboratory animal was given a specific disease. The range of numbers of organisms required to produce the illness may extend from a single cell (or virus particle) to several million. Additionally, the investigator very often has had to manipulate **or stress** the animal in order to produce "a take." The fact is that the combination of factors necessary to produce an illness is not known. "Among epidemiologists, it is widely accepted that it is even more difficult to start an epidemic than to try and stop **one** " (Benarde , 1973).

Addressing the problem of aerosol generation further, it is not difficult to appreciate the concern which public officials have for their constituency. They should not, however, create a problem where none is known to exist. **It** might be well to bear in mind the admonition of Dr. James W. Mosely, Chief, Hepatitis Unit, Epidemiology Branch, CDC to workers in the field of public health. His comments concerned the transmission of viral diseases by drinking water, but **we** feel that they are germane to this discussion (Mosely, J. W., P. 5 in Berg, 1967).

"There are valid reasons for looking for new evidence. They are not, however, adequate substitutes for evidence. Our eagerness as public health workers to "do something" must not compromise the-quality of data which we demand as scientists. We must also not confuse the possibilities which we entertain as scientists with the probabilities on which we base our recommendations as public health workers"

Also relevant to our discussion is the concern expressed that the existence of the O'Hare Treatment Plant will be a nuisance and lower property values. Let us examine this question in the light of our experience at the **Hanover** plant.

The Hanover plant, admittedly much smaller than the proposed **O'Hare** facility, was constructed in an **area** relatively far removed from the population of the area. Now, however, residences abut the property line, **children pass** through the plant grounds on their way to **school**, and there is a park and playground on the other side of the fence surrounding the plant property.

The nuisances associated with sewage treatment facilities generally arise from odors associated with primary sludge treatment. The O'Hare facility is designed to be only a biological aeration facility. There is no generation of primary sludge for anaerobic digestion, nor will wasted secondary sludge be treated on site. On the contrary, it will be **pumped** via closed pipe to the new Salt Creek plant (John E. Egan Plant) for final treatment. Raw *sewage* will be pumped from a covered wet-well 100 ft. up to the aeration basin which should eliminate *any* odor problems. Also all grit, screenings and scum removed from the wastewater will be collected and temporarily stored in covered containers. Such operations will be performed in a temperature

controlled room and the filled containers will be removed from the plant site on a routine basis (Letter to Mr. R. Ward from Bart T. Lynam, 1973).

Research

In as much as available data show that sewage treatment plant workers are healthier than workers in other industries, and that no documented evidence to the contrary exists, the District supports the position that more research is desirable to better define and evaluate the health implications of sewage treatment plant related aerosols).

Under **USEPA** Contract #68-02-1746 the Metropolitan Sanitary District of Greater Chicago **is** cooperating fully with the Southwest Research Institute of San Antonio, Texas in a study entitled "Health Implications of Sewage Treatment Facilities". The **District** has made the complete facilities of the John E. Egan Plant, Schaumburg, Illinois, available to the Southwest Research Institute for the conduct of this study. The objectives of this study are summarized as follows:

"To determine whether or not there are any health hazards associated with the operation of activated sludge treatment plants. There are many new sewage plants under construction within the United States, and by necessity most are being sited in close proximity to populated areas. This project will collect information on the transport of bacterial and viral pathogens, parasites and trace metals from an activated sludge treatment plant (John E. Egan Plant, Schaumburg, Illinois) to persons living within a 5-km radius. There will also be a survey of the population near this plant before the plant is operational and during its operation to determine possible incidence of disease that may be associated with a sewage treatment plant. The information generated from this study will be used by the Environmental Protection Agency in its assessment of potential health effects associated with the operation of a sewage treatment facility."

In addition the District in cooperation with the Illinois Institute of Technology Research Institute, Life Sciences Research Division has submitted to the **USEPA** for funding a proposal entitled "**Viral and Bacterial Levels Resulting** from Land Application **of** Digested Sludge".

The objectives of this study include a comprehensive evaluation of the environmental effects of aerosols associated with **the** us8 **of** digested sewage sludges in agricultural production.

It is clear that the efforts demonstrated by the District **to** gather new information on the Health Implications of Sewage **Treatment** Activities completely contradicts the claims of others that the District is insensitive in **this** regard.



Environmental Impact Statement

Draft

Wastewater Treatment
Facilities/City. of
Fort Worth,
Tarrant County, Texas

This EIS is intended to provide information to decision makers and the general public regarding alternatives available for collection, treatment, and discharge or reuse of wastewater. The purpose of the information is to permit citizens and government officials to make an informed choice among available alternatives, so that the decisions made will be of environmental benefit.

In evaluating alternatives, the technique of cost-effectiveness analysis is used. The analysis involves comparing all alternatives in a logical, objective, and systematic manner in order to identify relative merits and deficiencies. Where possible, the comparisons are quantitative and involve the use of monetary values. The goal of the analysis is to identify the most cost-effective alternative, which is the alternative that:

- achieves all requirements mandated by Federal, state and local laws and regulations, including environmental requirements.; and**
- does so with minimum long-term cost to society; that is, with the most benefits and 'lowest attainable combination of dollar expenditures, environmental sacrifices, and social burdens.**

While quantitative and monetary terms are used, the cost-effectiveness analysis also is partly dependent upon qualitative considerations and subjective judgments. Consequently, the results of the analysis are neither absolute nor fixed.

The results of the cost-effectiveness analysis are presented to the City, the CAC, the TDWR, EPA, other Federal, state, and local agencies and the general public for review and comment. Based upon the cost-effectiveness analysis and evaluation of environmental consequences presented in the Draft EIS, EPA through the TDWR will decide whether to grant funds for the City's preferred project or an alternative project pursuant to provisions of the Municipal Wastewater Treatment Construction Grant Amendments of 1981 to the Clean Water Act, and determination of the TDWR through the state priority system

3.6 KEY ISSUES

This Draft EIS concentrates on many key issues of concern identified by EPA and the affected public during conduct of the EIS public participation program including:

United States
Department of
Agriculture

Forest
Service

Intermountain
Region

Ogden, Utah

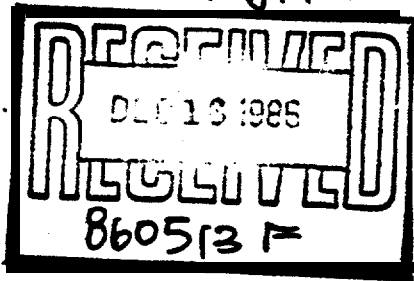


APPENDIX M.4

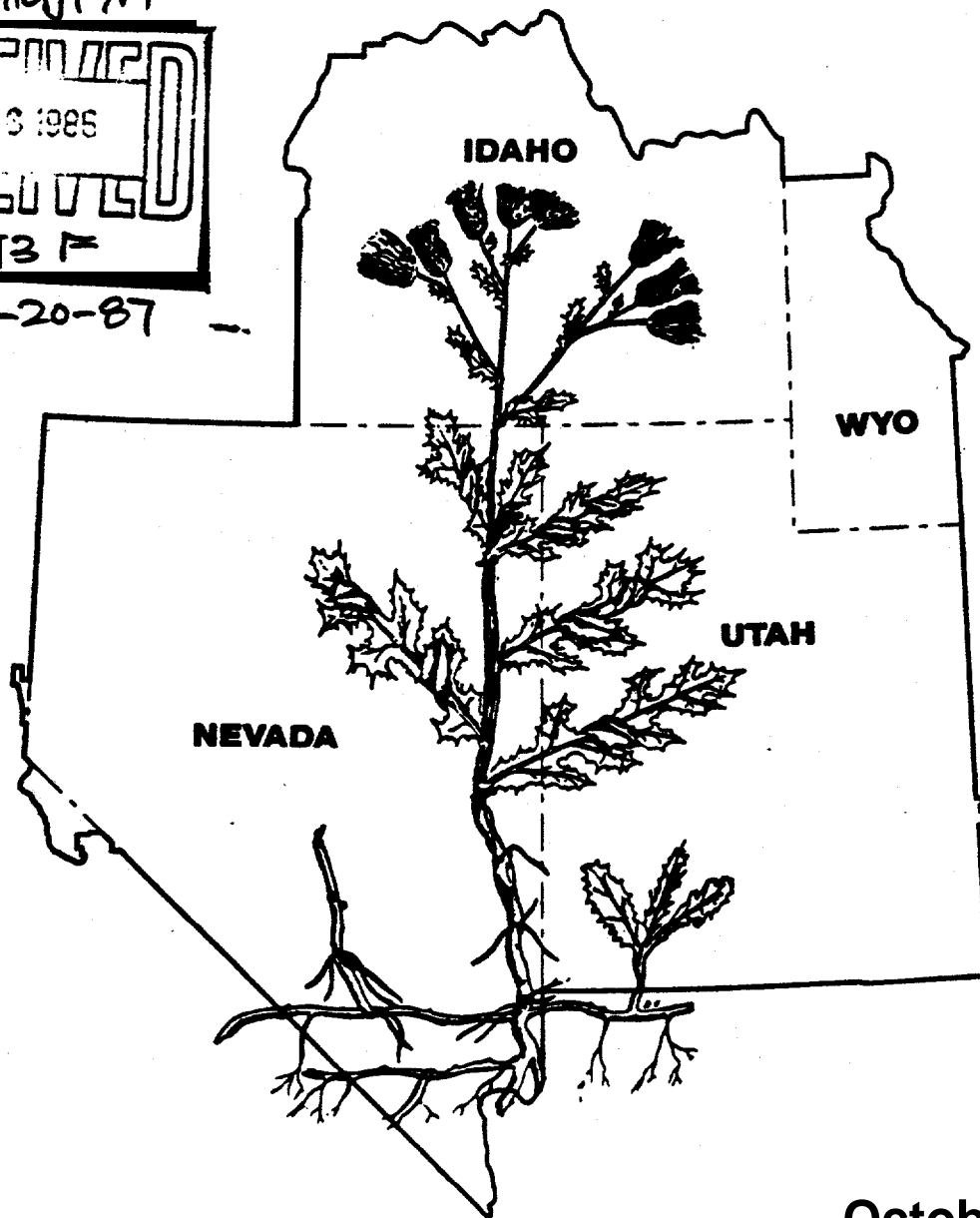
Intermountain Region Noxious Weed and Poisonous Plant Control Program

Final Environmental Impact Statement

FAL Kaldjian



DUE: 1-20-87



October 1986

- Sources of odors and effectiveness (or lack thereof) of methods to control odors at the existing Village Creek WWTP;
- Correction of existing odor problems before any possible expansion at the existing site and assurance that new facilities would not aggravate the odor problem
- Impacts of existing and potential future odors and insect problems on property values and tax base;
- Problems with local zoning and development encroaching on the existing plant site;
- Importance of considering alternative methods of sludge handling and disposal with an emphasis on a system that reduces odor;
- Importance of considering all feasible wastewater management alternatives and alternatives to further expansion of the existing Village Creek WWTF (i.e., abandoning existing WWTF and developing an alternative system);
- Importance of evaluating each alternative in regard to potential impacts on:
 - water quality
 - air quality (including odors)
 - biological resources
 - socioeconomic infrastructure (including property values, land use, zoning, public services, tax base, community growth, etc.)
 - public health
 - ambient noise levels
 - recreation
- Need for project to comply with appropriate environmental laws and regulations;
- Need for all alternatives considered to be cost effective;
- Need for proposed program to be consistent with areawide water quality management planning;
- Need to enforce current regulations for operation and wastewater discharge from the existing Village Creek WWTP before any expansion plans are implemented;
- Importance of assuring an adequate level of trained operation and maintenance staff at the Village Creek WWTP; and
- Need for expanded wastewater treatment to accommodate planned growth and development.

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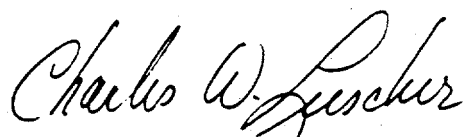
Draft

Supplement to the Northwest Area Noxious Weed Control Program

Final Environmental Impact Statement

Prepared by

U.S. Department of the Interior
Bureau of Land Management
October 1986



State Director, Oregon State Office

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U.S. ARMY

Strategic Defense Command



D R A F T

**ENVIRONMENTAL IMPACT STATEMENT
OF THE PROPOSED
GROUND BASED FREE ELECTRON LASER
-TECHNOLOGY INTEGRATION EXPERIMENT
WHITE SANDS MISSILE RANGE
NEW MEXICO**

September 1986

Prepared by:
**U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE DIVISION
HUNTSVILLE, ALABAMA**
and
**FT. WORTH DISTRICT
FT. WORTH, TEXAS**

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ACRONYMS

GLOSSARY

APPENDIX A - Correspondence

APPENDIX B - Archeological Survey and Report

APPENDIX C - PTMAX Air Emission Model

APPENDIX D - Socioeconomic Analysis Gravity Model

APPENDIX E - Eye Safety Calculations

APPENDIX F - Public Involvement

APPENDIX G - Memorandum of Agreement Between VSMR and New Mexico SHPO

**Chemical Stockpile Disposal Program
Draft Programmatic Environmental Impact Statement**

July 1, 1988

**Program Manager for Chemical Demilitarization
Aberdeen Proving Ground, Md. 21010-5401**

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APPENDIX M.8

United States
Environmental Protection
Agency

Region 4
345 Courtland Street, NE
Atlanta, GA 30365

EPA 904/9-86 141
August 1986

EPA Public Health and Draft
Environmental Exposure
Assessment

Unison PCB Separation Facility
Henderson County, Kentucky

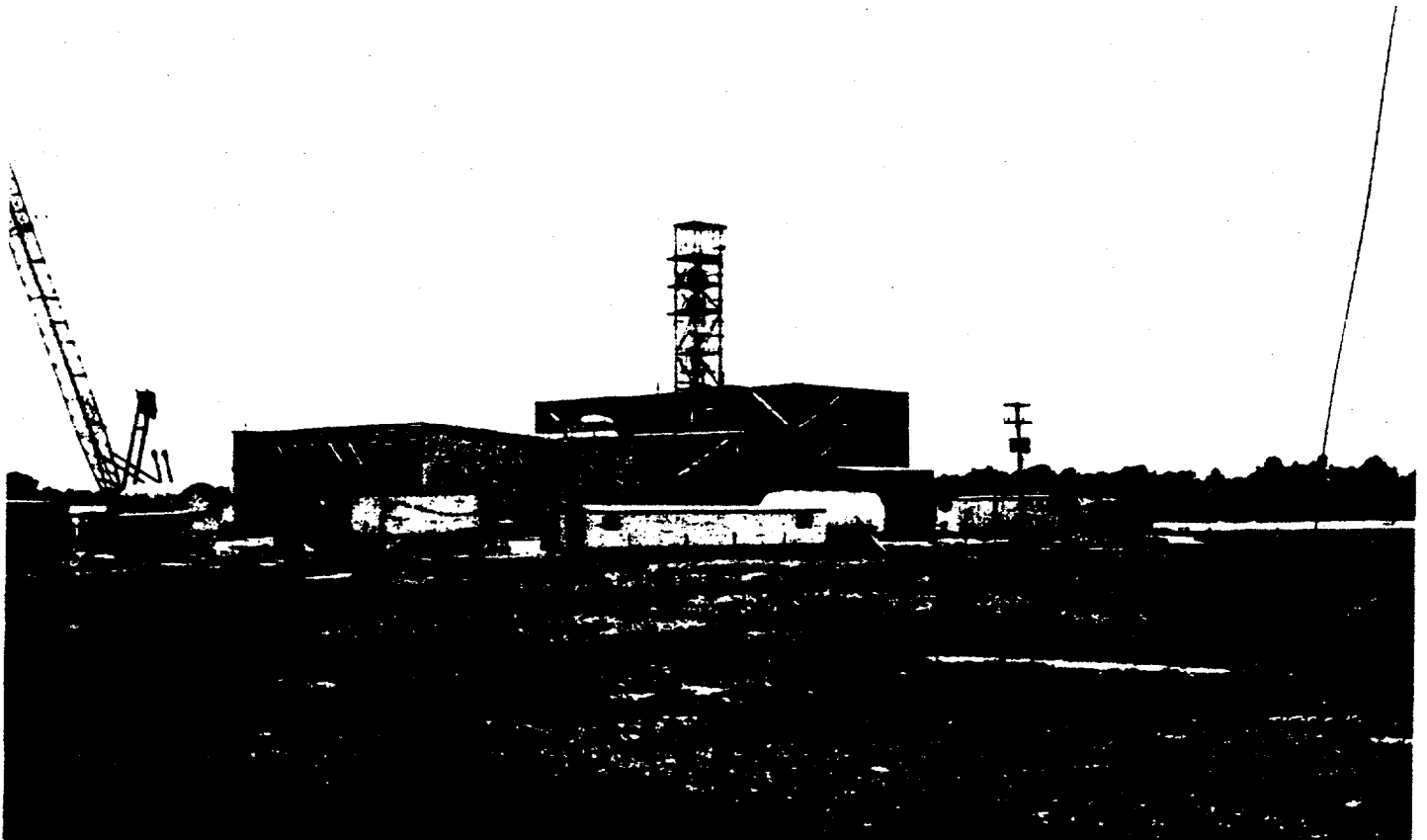


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Guidance on Feasibility Studies Under CERCLA

Prepared for:

**Hazardous Waste Engineering Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268**

and

**Office of Emergency and Remedial Response
and
Office of Waste Programs Enforcement
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
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Uncontrolled Hazardous Waste Site Ranking System

**A Users Manual
(HW-10)**

Originally Published in
the July 16, 1982, *Federal Register*

United States
Environmental Protection
Agency

1984

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1.0 INTRODUCTION

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (**CERCLA**) (PL 96-510) requires the President to identify the 400 facilities in the nation warranting the highest **priority** for remedial action. In order to **set** the priorities, **CERCLA** requires that criteria be established based **on** relative risk or danger, taking into account the population at risk; the hazardous potential of the substances at a facility; the potential for contamination of drinking water supplies, for direct human contact, and for destruction of sensitive ecosystems; and other appropriate factors.

This document describes the Hazard Ranking **System** (HRS) to be used in evaluating the relative potential of uncontrolled hazardous substance facilities to cause **human** health or safety problems, or ecological or environmental damage. Detailed **instructions** for using the HRS are given in the following sections. Uniform application of the **ranking** system **in** each State will permit EPA to identify those releases of hazardous substances that pose the greatest hazard to humans or the environment. **However**, the **HRS** by itself cannot establish priorities for the **allocation** of funds for remedial action. The HRS is a means for applying uniform technical **judgement** regarding the potential hazards presented by a facility relative to other facilities. It does not address the feasibility, desirability, or degree of cleanup required. Neither does **it** deal

with the readiness or ability of a State to carry out such remedial action as may be indicated, 3; to meet other conditions prescribed in CERCLA.

The HRS assigns three scores to a hazardous facility:

- S_M reflects the potential for harm to humans or the environment from migration of a hazardous substance away from the facility by routes involving ground water, surface water, or air. It is 3 composite of separate scores for each of the three routes.
- S_{FE} reflects the potential for harm from substances that can explode or cause fires.
- S_{DC} reflects the potential for harm from direct contact with hazardous substances at the facility (i.e., no migration need be involved).

The score for each hazard mode (migration, fire and explosion and direct contact) or route is obtained by considering a set of factors that characterize the potential of the facility to cause harm (Table 1). Each factor is assigned a numerical value (on a scale of 0 to 3, 5 or 8) according to prescribed guidelines. This value is then multiplied by a weighting factor yielding the factor score. The factor scores are then combined: scores within a factor category are added; then the total scores for each factor category are multiplied together to develop a score for ground water, surface water, air, fire and explosion, and direct contact.

In computing S_{FE} or S_{DC} , or an individual migration route score, the product of its factor category scores is divided by the maximum possible score, and the resulting ratio is multiplied by 100. The last step puts all scores on a scale of 0 to 103.

TABLE I

COMPREHENSIVE LIST TO RATING FACTORS

| HAZARD MODE | FACTOR CATEGORY | FACTORS | | |
|--------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | GROUND WATER ROUTE | SURFACE WATER ROUTE | AIR ROUTE |
| Migration | Route Characteristics | <ul style="list-style-type: none"> ● Depth to Aquifer of Concern ● Net Precipitation ● Permeability of Unsaturation Zone ● Physical State | <ul style="list-style-type: none"> ● Facility Slope and Intervening Terrain ● One-Year 24-Hour Rainfall ● Distance to Nearest Surface Water ● Physical State | |
| | Containment | <ul style="list-style-type: none"> ● Containment | <ul style="list-style-type: none"> ● Containment | |
| | Waste Characteristics | <ul style="list-style-type: none"> ● Toxicity/Persistence ● Hazardous Waste Quantity | <ul style="list-style-type: none"> ● Toxicity/Persistence ● Hazardous Waste Quantity | <ul style="list-style-type: none"> ● Reactivity/Incompatibility ● Toxicity ● Hazardous Waste Quantity |
| | Targets | <ul style="list-style-type: none"> ● Ground Water Use ● Distance to Nearest Well/Population Served | <ul style="list-style-type: none"> ● Surface Water Use ● Distance to Sensitive Environment ● Population Served/Distance to Water Intake Downstream | <ul style="list-style-type: none"> ● Land Use ● Population Within 4-Mile Radius ● Distance to Sensitive Environment |
| Fire and Explosion | Containment | <ul style="list-style-type: none"> ● Containment | | |
| | Waste Characteristics | <ul style="list-style-type: none"> ● Direct Evidence ● Ignitability ● Reactivity ● Incompatibility ● Hazardous Waste Quantity | | |
| | Targets | <ul style="list-style-type: none"> ● Distance to Nearest Population ● Distance to Nearest Building ● Distance to Nearest Sensitive Environment ● Land Use ● Population Within 2-Mile Radius ● Number of Buildings Within 2-Mile Radius | | |
| Direct Contact | Observed Incident | <ul style="list-style-type: none"> ● Observed Incident | | |
| | Accessibility | <ul style="list-style-type: none"> ● Accessibility of Hazardous Substances | | |
| | Containment | <ul style="list-style-type: none"> ● Containment | | |
| | Toxicity | <ul style="list-style-type: none"> ● Toxicity | | |
| | Targets | <ul style="list-style-type: none"> ● Population Within 1-Mile Radius ● Distance to Critical Habitat | | |

S_M is a composite of the

migration routes:

$$S_M = \frac{1}{1.73} \sqrt{S_{GW}^2 + S_{SW}^2 + S_A^2}$$

where: S_{GW} = ground water route score
 S_{SW} = surface water route score
 S_A = air route score

The effect of this means of combining the route scores is to emphasize the primary (highest scoring) route in aggregating route scores while giving some additional consideration to the secondary or tertiary route if they score high. The factor 1/1.73 is used simply for the purpose of reducing S_M scores to a 100-point scale.

The ERS does not quantify the probability of harm from a facility or the magnitude of the harm that could occur. Although the factors have been selected in order to approximate both those elements of risk. It is a procedure for ranking facilities in terms of the potential threat they pose by describing:

- a the manner in which the hazardous substances are contained,
- the route by which they would be released,
- a the characteristics and amount of the harmful substances, and
- the likely targets.

The multiplicative combination of factor category scores is an approximation of the more rigorous approach which one would express the hazard posed by a facility as the product of the probability of a harmful occurrence and the magnitude of the potential damage.

The ranking of facilities nationally for remedial action will be based primarily on $S_M \cdot S_{FE}$ and S_{DC} may be used to identify facilities requiring emergency attention.

APPENDIX N

CALIFORNIA

N.1 Appendix **G**, 'Significant Effects,' and Appendix I, "Environmental Checklist Form," CEQA Guidelines

N.2 Public Health and Safety Element of a General Plan for **Petaluma, CA**

N-1
APPENDIX N.1

CEQA:
CALIFORNIA ENVIRONMENTAL QUALITY ACT
Statutes and Guidelines 1986

June 1986

Office of Planning and Research
Office of Permit Assistance
1400 Tenth Street
Sacramento, CA 95814
(916) 3224245 or ATSS 4924245

APPENDIX G

SIGNIFICANT EFFECTS

- A project will normally have a significant effect on the environment if it will:
- (a) Conflict with adopted environmental plans and goals of the community where it is located;
 - (b) Have a substantial, demonstrable negative aesthetic effect;
 - (c) Substantially affect a rare or endangered species of animal or plant or the habitat of the species;
 - (d) Interfere substantially with the movement of any resident or migratory fish or wildlife species;
 - (e) Breach published national, state, or local standards relating to solid waste or litter control;
 - (f) Substantially degrade water quality;
 - (g) Contaminate a public water supply;
 - (h) Substantially degrade or deplete ground water resources;
 - (i) Interfere substantially with ground water recharge;
 - (j) Disrupt or adversely affect a prehistoric or historic archaeological site or a property of historic or cultural significance to a community or ethnic or social group; or a paleontological site except as a part of a scientific study;
 - (k) Induce substantial growth or concentration of population;
 - (l) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system;
 - (m) Displace a large number of people;
 - (n) Encourage activities which result in the use of large amounts of fuel, water, or energy;
 - (o) Use fuel, water, or energy in a wasteful manner;
 - (p) Increase substantially the ambient noise levels for adjoining areas;
 - (q) Cause substantial flooding, erosion or siltation;
 - (r) Expose people or structures to major geologic hazards;
 - (s) Extend a sewer trunk line with capacity to serve new development;
 - (t) Substantially diminish habitat for fish, wildlife or plants;
 - (u) Disrupt or divide the physical arrangement of an established community;
 - (v) Create a potential public health hazard or involve the use, production or disposal of materials which pose a hazard to people or animal or plant populations in the area affected;
 - (w) Conflict with established recreational, educational, religious or scientific uses of the area;
 - (x) Violate any ambient air quality standard, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentrations;
 - (y) Convert prime agricultural land to non-agricultural use or impair the agricultural productivity of prime agricultural land;
 - (z) Interfere with emergency response plans or emergency evacuation plans.

APPENDIX I

ENVIRONMENTAL CHECKLIST FORM
 (To Be Completed By Lead Agency)

I. Background

- 1. Name of Proponent _____
- 2. Address and Phone Number of Proponent _____

- 3. Date of Checklist Submitted _____
- 4. Agency Requiring checklist _____
- 5. Name of Proposal, if applicable _____

II. Environmental Impacts

(Explanations of all "yes" and "maybe" answers are required on attached sheets.)

| | <u>Yes</u> | <u>Maybe</u> | No |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----|
| 1. Barth. Will the proposal result in: | | | |
| a. Unstable earth conditions or in changes in geologic substructures ? | --- | --- | |
| b. Disruptions, displacements, compaction or overcovering of the soil? | --- | --- | |
| c. Change in topography or ground surface relief features? | --- | --- | |
| d. The destruction, covering or modification of any unique geologic or physical features ? | --- | --- | |
| e. Any increase in wind or water erosion of soils, either on or off the site? | --- | --- | --- |
| f. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake? | --- | --- | |
| g. Exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards? | --- | --- | |

| | <u>Yes</u> | <u>Maybe</u> | <u>No</u> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----------|
| 2. Air. Will the proposal result in: | | | |
| a. Substantial air missions or deterioration of ambient air quality? | --- | --- | --- |
| b. The creation of objectionable odors? | --- | --- | |
| c. Alteration of air movement, moisture, or temperature, or any change in climate, either locally or regionally? | --- | --- | |
| 3. Water. Will the proposal result in: | | | |
| a. Changes in currents, or the course of direction of water movements, in either marine or fresh waters? | --- | --- | |
| b. Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff? | --- | --- | |
| c. Alterations to the course or low of flood Waters? | --- | --- | --- |
| d. Change in the amount of surface water in any water body? | --- | --- | |
| e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity? | --- | --- | --- |
| f. Alteration of the direction or rate of flow of ground waters? | --- | --- | --- |
| g. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations? | --- | --- | --- |
| h. Substantial reduction in the amount of water otherwise available for public water supplies? | --- | --- | --- |
| i. Exposure of people or property to water related hazards such as flooding or tidal waves? | --- | --- | --- |
| 4. Plant Life. Will the proposal result in: | --- | --- | |
| a. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops, and aquatic plants)? | --- | --- | |

| | <u>Yes</u> | <u>Maybe</u> | <u>No</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----------|
| b. Reduction of the numbers of any unique, rare or endangered species of plants? | --- | --- | --- |
| c. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species? | --- | --- | --- |
| d. Reduction in acreage of any agricultural crop? | --- | --- | --- |
| 5. Animal Life. Will the proposal result in: | | | |
| a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organism or insects)? | --- | --- | --- |
| b. Reduction of the numbers of any unique, rare or endangered species of animals? | --- | --- | --- |
| c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals? | --- | --- | --- |
| d. Deterioration to existing fish or wildlife habitat? | --- | --- | --- |
| 6. Noise. Will the proposal result in: | | | |
| a. Increases in existing noise levels? | --- | --- | |
| b. Exposure of people to severe noise levels? | --- | --- | |
| 7. Light-and Glare. Will the proposal produce new light or glare? | --- | --- | |
| 8. Land Use. Will the proposal result in a substantial alteration of the present or planned land use of an area? | --- | --- | |
| 9. Natural Resources. Will the proposal result in: | | | |
| a. Increase in the rate of use of any natural resources?. | --- | --- | |
| 10. Risk of Upset. Will the proposal involve: | | | |
| a. A risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions? | --- | --- | |

| | <u>Yes</u> | <u>Maybe</u> | No |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----|
| b. Possible interference with an emergency response plan or an emergency evacuation plan? | --- | --- | |
| 11. Population. Will the proposal alter the location, distribution, density, or growth rate of the human population of an area? | --- | --- | |
| 12. Housing. Will the proposal affect existing housing, or create a demand for additional housing? | --- | --- | --- |
| 13. Transportation/Circulation. Will the proposal result in:: | | | |
| a. Generation of substantial additional vehicular movement? | --- | --- | |
| b. Effects on existing parking facilities, or demand for new parking? | --- | --- | |
| c. Substantial impact upon existing transportation systems? | --- | --- | --- |
| d. Alterations to present patterns of circulation or movement of people and/or goods? | --- | --- | --- |
| e. Alterations to waterborne, rail or air traffic? | --- | --- | --- |
| f. Increase in traffic hazards to motor vehicles, bicyclists or pedestrians? | --- | --- | --- |
| 14. Public Services. Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas: | | | |
| a. Fire protection? | --- | --- | --- |
| b. police protection? | --- | --- | --- |
| c. schools? | --- | --- | --- |
| d. Parks or other recreational facilities? | --- | --- | |
| e. Maintenance of public facilities, including roads? | --- | --- | --- |
| f. Other governmental services? | --- | --- | --- |
| 15. Energy. Will the proposal result in: | | | |
| a. Use-of substantial amounts of fuel or energy? | --- | --- | --- |

| | <u>Yes</u> | <u>Maybe</u> | <u>No</u> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----------|
| b. Substantial increase in demand upon existing sources or energy, or require the development of new sources of energy? | --- | --- | --- |
| 16. Utilities. Will the proposal result in a need for new systems , or substantial alterations to the following utilities: | --- | --- | --- |
| 17. Human Health. Will the proposal result in: | | | |
| a. Creation of any health hazard or potential health hazard (excluding mental health)? | --- | --- | --- |
| b. Exposure of people to potential health hazards ? | --- | --- | --- |
| 18. Aesthetics. Will the proposal result in the obstruction of any scenic vista or 'view open to the public , or will the proposal result in the creation of an aesthetically offensive site open to public view? | --- | --- | --- |
| 19. Recreation. Will the proposal result in an impact upon the quality or quantity of existing recreational opportunities ? | --- | --- | --- |
| 20. Cultural Resources. | | | |
| a. Will the proposal result in the alteration of or the destruction of a prehistoric or historic archaeological site? | --- | --- | --- |
| b. Will the proposal result in adverse physical or aesthetic effects to a prehistoric or historic building, structure, or object ? | --- | --- | --- |
| c. Does the proposal have the potential to cause a physical change which would affect unique ethnic cultural values ? | --- | --- | --- |
| d. Will the proposal restrict existing religious or sacred uses within the potential impact area ? | --- | --- | --- |
| 21. Mandatory Findings of Significance. | | | |
| a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels , threaten to eliminate a plant or animal community , re- duce the number or restrict the range of a rare or endangered plant or animal or eliminate | | | |

| | <u>Yes</u> | <u>Maybe</u> | No |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------|-----|
| important examples of the major periods of California history or prehistory? | --- | --- | |
| b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.) | --- | --- | --- |
| c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.) | --- | --- | --- |
| d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? | --- | --- | --- |

III. Discussion of Environmental Evaluation
(Narrative description of environmental impacts.)

I v . Determination
(To be completed by the Lead Agency.)

On the basis of this initial evaluation:

I find that the proposed project **COULD NOT** have a significant effect on the environment, and a **NEGATIVE DECLARATION** will be prepared.

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A **NEGATIVE DECLARATION WILL BE PREPARED.**

I find the proposed project **MAY** have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT** is required.

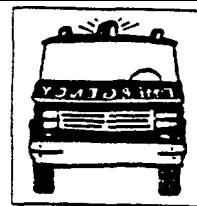
Date

Signature

For _____

(Note: This is only a suggested form. Public agencies are free to devise their own format for initial studies.)

11.: COMMUNITY HEALTH AND SAFETY



11.1 INTRODUCTION

This chapter covers safety, as prescribed by Safety Element provisions of the Government Code, Section 65302 (g); noise, as covered by Noise Element guidelines of the Government Code, Section 65302 (f); air quality; and water supply and quality, which are parts of the state mandated Conservation Element, Section 65302 (d). The major goals of this chapter are:

Goal 1. Strive to protect the community from injury, loss of life, and property damage resulting from natural catastrophes and any hazardous conditions.

Goal- 2. Strive to reduce the impact of pollutants on the well-being of Petalumans.

Goal 3. Provide an adequate, consistent, water supply to meet Petaluma's needs.

Goal 4. Maintain and improve, where possible, the water quality of Petaluma.

The underlying assumption of the first goal is that the City can reduce the hazards caused by certain natural occurrences if the probability of such conditions are known in advance and plans for dealing with them are prepared

All maps referred to in this chapter are found in the Technical Appendix and are available from the City's Department of Community Development and Planning. In addition, a "Development Constraints Map" at a scale of 1" = 1,000' shows the referral area of the Sonoma County Airports Land Use Commission; the various clear zones, approach zones, and transition zones surrounding the Petaluma Municipal Airport; floodways and flood plains; elevations above which water service is severely limited; and parcels covered by agricultural preserve ("Williamson Act") contracts.

11.2 OBJECTIVES, POLICIES, AND PROGRAMS

State law requires that a Safety Element address the protection of the community from any unreasonable risks associated with the effects of seismically induced surface

rupture, ground shaking, ground failure, tsunami, seiche, and dam failure: slope instability leading to mudslides and landslides; subsidence and other known geologic hazards; flooding; and wildland and urban fires.

The safety-related objectives, policies, and programs are divided into six sections: (1) emergency preparedness; (2) flood hazards; (3) seismic safety; (4) slope stability; (5) fire and police services; and (6) hazardous materials transportation and storage. Separate sections on noise, air quality, water supply, and water quality then follow.

11.3 EMERGENCY PREPAREDNESS

Defense against catastrophe combines avoidance of threatening situations with preparation of response plans. Quick action in an emergency can reduce injuries and damage.

Objectives:

(a) Increase public awareness of fire, seismic, and other natural hazards, and of methods to avoid or mitigate the effects of these hazards.

(b) Avoid land uses that threaten public safety and/or that may result in property damage.

(c) Ensure that critical facilities will function during and after a disaster.

Policy 1: The City shall maintain an updated disaster response plan.

The City has a disaster response plan and a City Disaster Council that meets regularly. The Disaster Council recommends changes to the disaster response plan, as needed. The disaster response plan has been adopted by reference in this General Plan, will remain in effect, and will be revised to meet changing conditions.

Policy 2: Essential emergency facilities shall be identified and provisions made to ensure that they will function in the event of a disaster.

Policy 3: Land uses in areas prone to natural hazards shall only be allowed with appropriate mitigation.

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Policy 4: *The City shall strive to educate the community about environmental hazards, measures which can be taken to protect lives and property, and methods for responding to various disasters.*

Policy 5: *The City shall cooperate with other public agencies to store, organize, distribute, and administer emergency medical equipment, supplies, services, and communications systems.*

Program (1) *Continue to update the City's disaster response plan.*

Program (2) *Identify specific facilities and lifelines critical to effective disaster response, and evaluate their abilities to survive and operate efficiently immediately after a major disaster. Designate alternative facilities for post-disaster assistance in the event that primary facilities become unusable.*

Part of a disaster response plan is identification of those facilities that will be relied upon in the event of catastrophe. Critical facilities are hospitals, fire stations, police stations, Civil Defense Headquarters, the Emergency Operations Center, gas, electric, and water lines, ambulance services, emergency broadcast services, and power plants. Bridges should be evaluated for structural ability to withstand a major disaster. Public facilities such as schools, auditoriums, and stadiums may be designated as alternative facilities.

The Fire Chief, as coordinator of the disaster response plan, heads the operation of the Emergency Operations Center, and will designate the appropriate critical and alternative facilities.

Program (3) *Continue to regulate development to assure adequate mitigation of safety hazards on sites having a history or threat of slope instability, seismic activity (including liquefaction, ground failure, and ground rupture), inundation from dam failure or flooding, or fire.*

Structural hazards result when man-made structures interact with natural hazards. The impact on life and property damage is multiplied when structural failure occurs. Structures should not be located where there is high risk unless there is appropriate mitigation. Critical facilities should avoid these areas entirely.

11.4 FLOOD HAZARDS

Flood hazards are considered in three categories: natural flooding, dam inundation, and mud and debris flows. Natural flooding results from major rainstorms that cause overflows of stream courses, and may be aggravated by inadequacies in local storm drain facilities. Dam inunda-

tion occurs in association with structural failure of a nearby water impoundment. Mud and debris flows originate in hillside areas having deep top soils with poor drainage characteristics.

Some locations in Petaluma have been and will be subject to flooding during a storm with a 1% chance of occurrence in any year — the 100-year flood, which has been set as the “base flood” standard for acceptable risk. The city has been designated as a “special flood hazard community” and is thereby eligible for flood insurance under the Federal Emergency Management Act (FEMA).

Should the Lawler Dam fail, there is potential for inundation along Adobe Creek. A geotechnical investigation of the Lawler Reservoir concluded that the embankments are basically stable and should not fail due to liquefaction, ground shaking, or single-break rupture were an earthquake with a Richter magnitude of 7 to occur along the Rodger's Creek Fault.

Objectives:

- (d) *Protect the community from risk of flood damage.*
- (e) *Continue to preclude new developments from compounding or impacting the potential for flooding in developed areas.*
- (f) *Further reduce the potential for flooding along the Petaluma River and along its tributaries.*

Policy 6: *The City shall maintain an updated flood control plan.*

Policy 7: *The City shall regulate land uses in flood-prone areas and should allow development in those areas only with appropriate mitigation.*

Limiting land uses to those that can sustain periodic flooding will have the greatest long-term benefits. Appropriate uses would be open space and recreation. Any higher density development most mitigate the downstream or upstream impacts.

Policy 8: *The City should promote community awareness regarding severity and extent of potential local flooding.*

Policy 9: *The City shall cooperate with the Sonoma County Water Agency to establish a flood management plan and program for the Petaluma River Watershed (approximately the same as the Petaluma Planning Referral Area) using the most current Sonoma County Water Agency Master Drainage Plan for the Petaluma River Watershed as a guide.*

Flooding hazards originate within the watershed. The Sonoma County Water Agency researches and initiates flood control projects within the county. Petaluma should lobby for funding and completing necessary projects in developed areas already experiencing flooding.

Policy 10: *The City shall continue to require fees, standards, and other measures to mitigate downstream impacts associated with new development.*

Proper drainage facilities will be required, and the City will also require mitigation of impacts that may be experienced downstream of the development site.

Policy 10.1: *The City shall periodically review and adjust flood mitigation fees for new construction.*

Program (4) *Enforce measures to minimize soil erosion and volume and velocity of surface runoff both during and after construction.*

The objective is to reduce flooding potential; this program aims to reduce surface runoff from areas that drain into streams and reservoirs. Specific techniques include retention, planting of vegetation, cross-slope furrows, grading, and other measures which prevent erosion. Ordinances to control soil erosion during construction should be strictly enforced.

Program (5) *Improve drainage channel capacity in ways that will preserve the natural character of the waterways.*

Program (6) *Continue to support the programs of the Sonoma County Water Agency to protect drainage channels and keep them clear of silt and debris.*

Program (7) *Adopt the most reasonable, sensitive, and effective proposal(s) of the Sonoma County Water Agency Master Drainage Plan in order to mitigate the 100-year flood.*

The City will pursue funding for and construction of the most reasonable, sensitive, and effective measures in the Master Drainage Plan.

Program (8) *Encourage landowners who desire development of flood plain parcels to develop plans and funding mechanisms to prevent flooding.*

No development should be allowed which would raise the level of the 100-year flood. Infill development may still be desirable in some flood prone areas, however, and may be allowed with sufficient planning and mitigation to avoid flooding.

11.5 SEISMIC SAFETY

Earthquakes originate as shock waves generated by movement along an active fault. The primary seismic hazards

are ground shaking and the potential for ground rupture along the surface traces of the fault. Secondary seismic hazards result from the interaction of ground shaking with existing soil and bedrock conditions, and include liquefaction, settlement, landslides, tsunamis (tidal waves) and seiches (oscillating waves in enclosed water bodies).

ACTIVE FAULTS. Two active faults affect the Petaluma area: the San Andreas Fault and the Healdsburg-Rodgers Creek Fault. The Tolay Fault zone was identified as an Alquist-Priolo Special Studies Zone, and thus a Hazard Management Zone in the previous seismic safety element. On the basis of a subsequent fault evaluation report, the California Division of Mines and Geology removed the special studies zone designation and this General Plan removed the Hazard Management Zone for the Tolay Fault (see Technical Appendix). Nevertheless, site-specific geotechnical field studies should be required for proposed developments on or in the immediate vicinity of the Tolay Fault ■

Objective (g): *Minimize risks associated with seismic activity.*

Policy 11: *Establish acceptable levels of risk/life safety standards and bring buildings up to the same standard.*

Policy 12: *The City shall require dynamic ground-motion analyses and responsive structural design for all new high-occupancy structures and structures whose continued functioning in the event of a disaster is critical, and continue to have plan checks for these buildings performed by a licensed structural engineer.*

Policy 13: *The City shall avoid placement of critical facilities and high-occupancy structures in areas prone to ground failure during an earthquake.*

The following critical facilities are assigned a very low level of acceptable risk: structures with high or involuntary occupancy; utilities; communication lines; transportation, police, fire and medical facilities; and structures whose failure may be hazardous to large areas.

Program (9) *Enforce safety standards for design of new and existing structures. Give priority to identification of critical public facilities and high-occupancy structures which present unacceptable levels of risk.*

Program (10) *Contract with a licensed geologist for independent review, analysis, and recommendations of geotechnical reports and development plans for projects in hazardous areas. Refer geologic/seismic investigations to the geologist for review and assessment.*

Program (11) Record information on potential geologic hazards with parcel or subdivision maps.

Program (12) Identify potentially seismically hazardous buildings, defined as "all public and private buildings intended for human habitation, except buildings having five living units or less, constructed prior to enactment of local co&s requiring earthquake resistant design and constructed with unreinforced masonry bearing walls," and establish a mitigation program based on type of use, level of occupancy, and/or type of construction. The mitigation program must address the need to balance the objectives of earthquake mitigation, historic preservation, and economic viability.

Program (13) Develop programs to increase public awareness of seismic hazards and to educate the community on procedures that can help to minimize injury and property loss before, during, and after an earthquake.

Programs for public education on any safety subject should include steps individuals can take to prepare their own or their family's emergency preparedness plan for various situations.

Program (14) Establish standards and specifications for masonry fences and soundwalls placed on a&b soil so they will be capable of withstanding seismic forces and wind loading.

11.6 SLOPE STABILITY

Landslides are most likely in hillside locations under conditions where (1) rock strata parallels surface slopes; (2) high clay content absorbs excess water, (3) displacement has fractured a fault zone; or (4) the bases of slopes have been removed by erosion or people. Landslides can be triggered by periods of heavy rainfall, human actions or earthquakes.

Objective (h): Minimize injury and property damage resulting from landslides and mass movements.

Policy 14: The City shall continue to require soil and geologic investigations in areas prone to slope instability—or to mass movements associated with seismic activity—prior to development. Both on-site and off-site hazardous impacts should be considered by the City in its development review process.

Policy 15: Soil analysis and erosion mitigation shall be required prior to issuance of use permits for all development proposed on sites prone to erosion.

Policy 16: Development—including any land alteration, grading for roads, and structural development—shall not be permitted in areas of slope instability or other geologic concerns until mitigating measures are taken to limit potential damage to levels of acceptable risk.

Landslide prone areas may be stabilized through removing, redistribution, compacting or otherwise stabilizing hazardous earth masses, installing soildrainage devices, butressing, and carefully landscaping and irrigating. Other appropriate engineering methods may be acceptable.

Policy 17: Encourage clustering of development away from areas considered unsuitable for development.

Policy 18: Replanting of vegetation following development shall be required on slopes prone to instability. Drought-resistant plants shall be used for landscaping on slopes where excess watering might induce landslides and/or erosion

Program (15) Institute fines for violations of the City's "grading and erosion control" ordinance, in addition to the penalties already set forth.

The City will monitor developments in accordance with the provisions of existing ordinances and will institute fines for non-conforming activities.

11.7 FIRE AND POLICE SERVICES

Fire and crime can be prevented by active fire and police departments that plan for emergencies and anticipate problem areas. At the same time, the City needs to establish a rate for new development that maintains the City's ability to provide effective fire and police services.

The City has identified wildland fire hazards in the Planning Referral Area. The Petaluma Fire Department currently operates under mutual aid agreements with Sonoma County and nearby cities including Santa Rosa, Cotati, Rohnert Park, Penngrove and Novato. The County contracts with the Penngrove Fire Protection District for service in some parts of the Petaluma Planning Referral Area. Volunteer fire companies are ready for fire protection in other areas. The County's Wildlands Fires Hazard map is contained in the Technical Appendix and is incorporated into this General Plan by reference.

The location, spread and size of urban fires are less predictable than wildland fires. The assessment of potential damage from urban fires must concentrate on the public buildings and other facilities whose high occupancy or critical functions justify a low level of acceptable risk. All high-rise or contiguous buildings, multi-story apartments, mobile homes, commercial and industrial uses of flammable substances, hazardous materials or explosives, and all older structures lacking modern fire safety features should be given careful attention.

Criteria for determining fire hazard areas within the urban limit line have been developed by the Petaluma Fire Department. Open spaces are mapped and subject to weed abatement either by the owner directly or by the Fire Department which will contract the work and then place a lien on the property for the costs. High value districts downtown are subject to a business inspection program in order to identify hazardous buildings. Numerous buildings are identified on a pre-fire list. Floor plans, additional structural information and pertinent fire-fighting information is then gathered to assist in responding to emergency calls.

Objectives:

- (i) **Maintain safety services at an approved level.**
- (j) **Prevent loss of life and property due to fire or crime.**
- (k) **Incorporate fire-prevention measures into development planning.**

Policy 19: The City shall continue to assure a four-minute response time for emergency vehicles unless other fire suppression measures approved by the fire chief have been instituted.

There are three fire stations in the city: 1001 North McDowell Boulevard, 831 South McDowell Boulevard, and 198 D Street. Response times within the city are four minutes for initial response and seven minutes for backup response. These response times will not increase in newly developing areas unless alternative plans are put in effect for the sites. (A four-minute response area map is located in the Technical Appendix.)

Policy 20: Emergency access routes shall be kept free of traffic obstacles, such as railroad tracks in disrepair, drainage swales, and illegally parked vehicles.

Major access routes from fire and police stations to various areas of the city shall be kept clear to the extent possible.

Evacuation routes may be adopted and updated as part of the disaster response plan of the City Fire Department. The routes should be flexible to respond appropriately to various emergencies — flood, fire, or earthquake — and may need to change at the peak of an emergency because of unforeseen obstructions.

Policy 21: Fire hazards shall be mitigated where appropriate with proper siting, use of fire-resistant materials and landscaping, and/or installation of early warning systems (alarms and sprinklers).

The City Fire Department has adopted the Uniform Fire Code and the National Fire Code to address peak load water supply requirements, minimum road widths, and

clearances around new structures. The codes have been directing new construction for about twenty years and include recommendations on the type of exterior building materials in urban and rural construction. Any specific restrictions or changes to these codes shall be made in accordance with the General Plan and shall reflect the changing need in Petaluma.

Policy 22: Continue to require landowners to clear vacant lots of excessive vegetation.

Policy 23: All landscaping within 50 feet of buildings in fire hazard areas shall be fire-resistant.

Policy 23.1: Consider using a portion of the urban separator as a fire break in fire hazard areas.

Program (I 6) Install traffic-signal override systems for emergency vehicles on all significant streets.

Program (I 7) Periodically update fire-protection requirements for new construction and remodeled buildings to reduce the impact of planned growth on fire department capabilities.

Program (I 8) Institute and enforce an ordinance requiring use of fire-resistant exterior materials on all new buildings constructed in high fire-hazard areas.

Program (I 9) Restrict the use of motorcycles and off-road recreational vehicles in fire hazard areas.

Program (I 20) Continue fire education programs in the elementary and secondary schools.

11.8 HAZARDOUS MATERIAL TRANSPORTATION & STORAGE

“Hazardous materials” covers a large number of substances that are a danger to the public. These include toxic metals, chemicals, and gases; flammable and/or explosive liquids and solids; corrosive materials; infectious substances; and radioactive material.

The City currently has a Hazardous Materials Response Plan, which is adopted by reference in this General Plan. Its goals are to contain and identify hazardous materials spills and to implement evacuation programs as needed.

The intent of this section of the General Plan is to develop a Hazardous Materials Management Plan, with emphasis on prevention as opposed to clean-up. It envisions employing land use controls to reduce the handling of hazardous materials in residential and other sensitive areas; transportation restrictions to reduce the risk of spills; and information programs to build public awareness to the dangers, provide information to those who handle the materials, and improve compliance with regulations.

Objective (1): *Protect the community's health, safety, welfare, natural resources, and property through regulation of authorized (and elimination of unauthorized) use, storage, transport; and disposal of hazardous materials, with specific focus on problem prevention.*

Policy 24: *Tk City shall establish an ordinance governing tk use, storage, transport, and disposal of hazardous materials.*

The City's Hazardous **Materials** Response Plan should be transformed into a **comprehensive Hazardous Materials Management Plan**, and be adopted by ordinance so that **requirements for individuals and private businesses will be clearly known and enforced**. The ordinance may be updated as **necessary**, but shall remain in compliance with the General Plan. The Hazardous **Materials Management Plan and ordinance should be —**

- developed in concert with industry, community groups, and other government agencies;
- effective, **workable**, and **fair**;
- a model for private industry;
- a source of information to the public with respect to **technical and administrative** developments in the **field**.

Program (21) *Adopt a disclosure ordinance which includes tk following elements:*

- *A strict definition of "hazardous materials" beyond that included in the Glossary of this General Plan.*
- *A requirement that tk City's fire department be notified of all use, storage, and transport of hazardous materials.*

Notification should include emergency phone numbers of technical advisors, business activities, storage maps, inventory statements, **descriptions** of emergency equipment and procedures, and any changes in types or **amount of materials** stored within **24 hours** of such change,

- *Procedures for safe handling, discharge, and storage of hazardous materials.*
- *Means for continual enforcement of the County's Hazardous Materials Response Plan.*
- *A collection program for household toxic wastes.*
- *Designation of specific routes within the city for transport of hazardous materials.*

Program (22) *Establish special zoning designations and environmental review processes that limit tk location of industry, research, and business facilities using hazardous materials. Safe distances should be required between tkse firms and residential areas, groundwater recharge areas, and waterways.*

Program (22.1) *Expand and strengthen existing City programs where appropriate to fill in tk gaps in the current array of federal, state, and local hazardous materials management efforts. Specifically—*

- *Encourage effective implementation of workplace safety regulations.*
- *Assure that hazardous materials information is available to users and employees.*
- *Improve information gathering and availability and cooperation within and among City programs.*
- *Continue to support, improve tk convenience of, and provide permanent funding for a household hazardous waste disposal program.*
- *Continue and expand present efforts to prevent ground water and soil contamination.*
- *Support local enforcement of all hazardous materials regulations.*
- *Protect residents from avoidable industrial and commercial accidents and mishandling of hazardous materials.*
- *Obtain authority for hazardous materials regulations, inspection, and enforcement through a formal agreement between tk City and tk State Department of Health Services.*

Program (22.2) *Strongly encourage federal and state agencies to accelerate efforts we evaluate human health impacts from, and to establish legally enforceable standards for, hazardous materials.*

Program (22.3) *Support efforts to gather kalth information in tk city and state to help public health officials identify tk causes of illnesses related to hazardous materials.*

Program (22.4) *Support efforts to require state funding for state-mandated local programs for hazardous materials.*

11.9 NOISE

Petaluma experiences noise from autos and trucks on Highway 101 and local arterials, the Municipal airport, the Petaluma Speedway at the Fairgrounds and several industrial uses: Sunset Line and Twine Plant, located at Jefferson and Ervin; Clover Creamery, 91 Lakeville Street at Madison; California Cooperative Creamery, Western and Baker; Morris Shell Processing plant, at the Petaluma River near the D Street bridge; and Santa Fe Pomeroy, on the Hopper Street Extension. The City has a noise ordinance, but can strengthen its standards by applying the California Office of Noise Control guidelines for land use compatibility (shown in Figure 11-1). Noise contour maps for future potential noise levels along major trafficways show the distances that are necessary to reduce noise levels to an acceptable level (see Technical Appendix).

In 1985, a population of 4,064, residing in a total of 1,563 dwelling units, was exposed to high noise levels (60 dBA or higher) along major traffic arterials. At buildout, 3,023 dwelling units with a population of 7,860 are expected to be exposed to high noise levels, (See Figure 11-2, p. 125.)

Objective (m): *Minimize the amount of noise that future development creates and the amount of noise to which the community is exposed.*

Policy 25: *Strictly enforce local noise standards.*

Noise standards set for land use categories on Figure 11-1 define acceptable conditions for use. Outdoor and indoor noise standards are used to review new proposals and to delineate areas already exposed to high noise levels. Noise levels will be studied for new developments which are noise generators or sensitive receptors (residences, schools, churches, hospitals, etc.). Interior noise levels for single and multi-family residential buildings will be mitigated to provide a level of $L_{dn} 45$. $L_{dn} 60$ is established as the reasonable noise level for exterior use areas. Areas around the airport and major trafficways will be checked to ensure satisfactory interior sound levels.

Policy 26: *Tk overlapping noise levels for acceptability in Figure 1 I-1 shall be interpreted to require application of the quieter standard unless it can be shown that the circumstances of the project allow for a less conservative interpretation based on tk specific type of use, tk benefits of the project, and ability w mitigate the noise impacts.*

Policy 27: *Require sound buffers (particularly landscaped buffers), open space, or other mitigation measures between residential areas and areas producing higher noise levels, such as freeways, commercial sites, and industrial developments to achieve the sound level reduction necessary to produce noise-compatible land uses.*

Soundwalls, densely vegetated areas, and open spaces reduce noise levels by buffering and distancing noise sources from sensitive areas. New commercial and industrial development will be required to contribute financially to sound buffers planned by the City near the site.

Program (23) *In or&r to limit tk effect of noise-producing activities on people, revise tk City's noise ordinance to include at least tk following provisions upon new and, where applicable, existing development.*

a. Adopt noise compatibility standards for various land uses as shown in Figure I I-1.

b. Require acoustical studies for new development projects in areas having a CNEL greater than normally acceptable for the land use proposed.

c. Require acoustical analysis for new residential development within a 60 L_{dn} contour (generally within 750 feet of a stationary source such as tk Petaluma Speedway and industrial sources previously described).

d. Stipulate use of the current standard A-weighted sound levels.

e. Require setbacks or other mitigation measures between zoning districts and between noise-generating and noise-sensitive uses.

f. Wkn feasible and appropriate, limit construction activities to that portion of the day when tk number of persons occupying a potential noise impact zone is lowest.

g. Utilise natural shielding effects offered by topography in tk design of tk construction phasing.

h. Require use of mufflers and muffler maintenance on construct& vehicles.

i. Require placement of stationary construction equipment, such as compressors, as far as possible from developed areas, and require use of acoustic shielding with such equipment when feasible and appropriate.

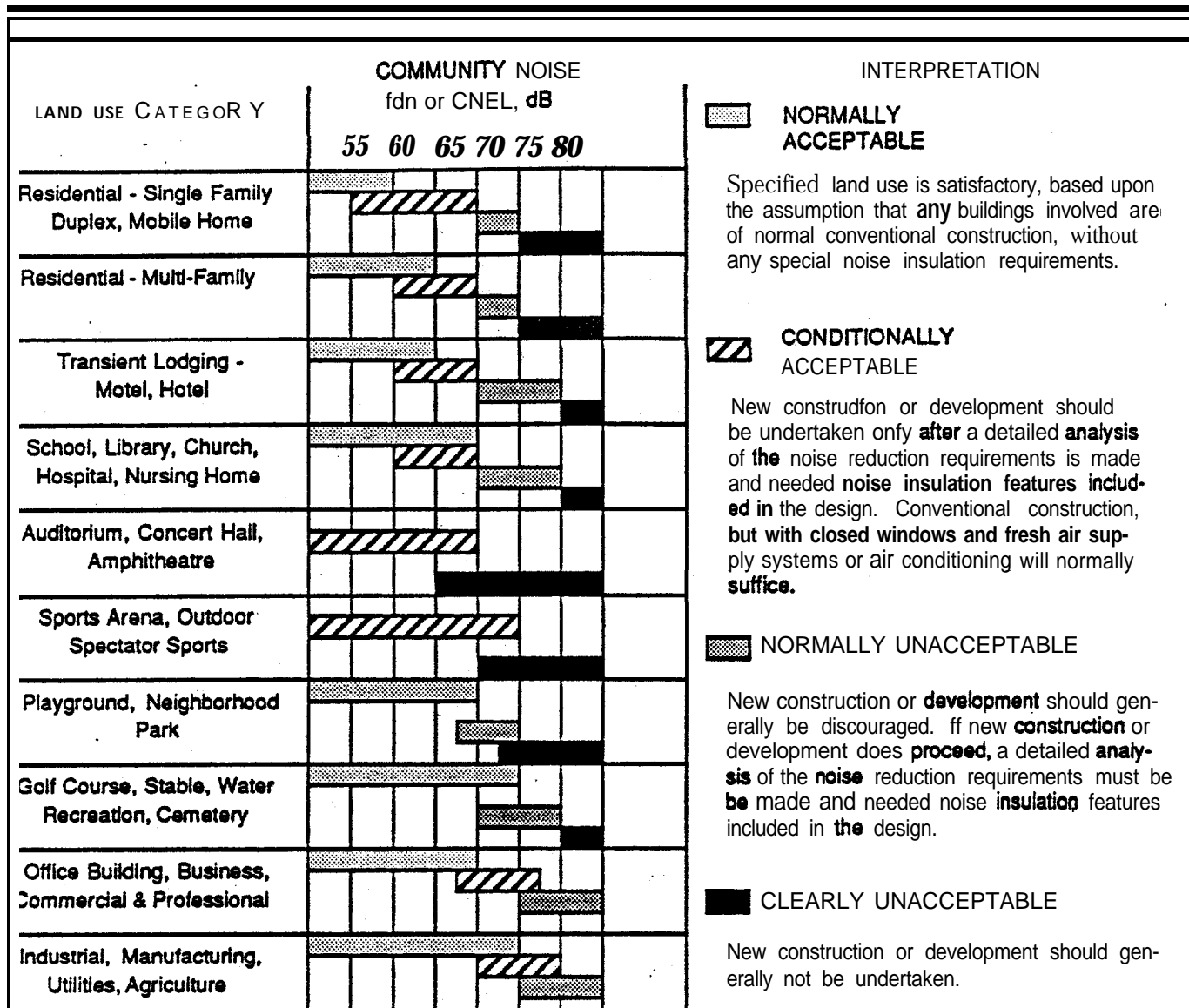
j. Plan road networks with c&de-sac and cluster courtyards to reduce traffic passing residential units.

k. Require construction of berms or walls between arterials and new residential developments to establish an exterior noise level of 60 L_{dn} for outdoor living areas.

l. Discourage orientation of window and door openings on residential units that face noise sources that exceed tk noise compatibility standard.

m. Discourage location of bedrooms on tk sides of residences closest to noise sources that exceed noise compatibility standards.

n. Require placement of fixed equipment, such as air conditioning units and condensers, inside or in tk walls of new buildings or on roof-tops of central units in order to reduce noise impacts on surrounding units.



Noise Source Characteristics

The land use-noise compatibility recommendations should be viewed in relation to the specific source of the noise. For example, aircraft or railroad noise is normally made up of higher single noise events than auto traffic, but occurs less frequently. Therefore, different sources yielding the same composite noise exposure do not necessarily create the same noise environment.

Suitable Interior Environments

One objective of locating both single and multi-family residential units relative to a known noise source is to maintain a suitable interior noise environment no greater than 45 dB CNEL or L_{dn}. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to a noise source.

Source: State of California, Office of Noise Control, 1975.

Figure 11-1: Land Use/Noise Compatibility Standards.

| | <u>60dBA L_{dn}/CNEL or higher</u> | <u>65 dBA L_{dn}/CNEL or higher</u> | <u>70 dBA L_{dn}/CNEL or higher</u> | <u>More than 75 dBA or higher</u> |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-------------------------------------------|
| <u>EXISTING (1986)</u> | | | | |
| Dwelling Units | 1,563 | 513 | 166 | b |
| Residents ^a | 4,064 | 1,334 | 432 | b |
| <u>BUILDOUT OF CURRENT GENERAL PLAN</u> | | | | |
| Dwelling Units | 2,833 | 1,075 | 334 | 20 |
| Residents ^a | 7,366 | 2,795 | 868 | 52 |
| <u>BUILDOUT OF PROPOSED GENERAL PLAN</u> | | | | |
| Dwelling Units | 3,023 | 1,157 | 382 | 20 |
| Residents ^a | 7,860 | 3,008 | 993 | 52 |
| ^a Assumes 2.6 residents per dwelling unit. | | | | |
| ^b No dwelling units or residents in this category. | | | | |
| Source: Earth Metrics Incorporated, 1986-87; City of Petaluma Department of Community Development and Planning, 1987. | | | | |

Figure 11-2: Comparison of Population Noise Exposure Levels in the **Petalunta** Planning Referral Area.

o. Strengthen noise standards in the City's Zoning Ordinance for industrial and commercial operations.

p. Limit local trucking to specific routes, times and speeds.

q. Establish appropriate noise-emission standards to be wed in connection with the purchase, we, and maintenance of City vehicles.

r. Limit the noise impact and duration of grading operations.

s. Restrict noise-producing maintenance activities in parks during peak-use hours, nighttime, and early morning hours.

t. Limit noise levels emitted from electronic-sound devices, such as radios and tape players.

Program (24) Periodically monitor noise levels from flight operations at the Petaluma Municipal Airport to enforce existing noise standards.

See the section on "Residential Peace and Quiet" in Chapter 10, Transportation, page 111, for other programs relating to reducing noise caused by vehicles.

11.10 AIR QUALITY

Petaluma is in a unique position among Bay Area cities with respect to air quality because the nearest air monitoring stations in San Rosa, Sonoma, and **San Rafael** register relatively few days of **polluted air** for the region. The last 15 years have seen continued improvements in local air quality.

Air quality is managed by the regional Bay Area Air Quality Management District (**BAAQMD**). The goal of air quality regulatory agencies is **attainment** of the ambient air quality standards. The 1982 Bay Area Air Quality Plan seeks to control stationary and mobile sources of air pollution in **order** to meet these **standards**. In keeping with the **plan**, Petaluma will not **allow** any development which would result in any of the following. (1) singly or cumulatively cause violation of **any State** ambient air quality **standard**; (2) generate a **significant** amount of air pollution unaccounted for in the Bay Area Air Quality Plan; or (3) **conflict** with any **regulation** of the BAAQMD or adopted control measure in the Air **Quality Plan**.

Petaluma has no industry in the largest **industrial** emissions class (**greater** than 0.05 tons of emissions per day), and should discourage such **industries from** locating here.

Objective (n): Maintain or improve Petaluma's air quality.

Policy 27: *Tk City shall request that tk Bay Area Air Quality Management District (BAAQMD) monitor carbon monoxide, hydrocarbons, and particulate emissions by local industry, traffic, and residences. and tk City will assist in tk enforcement of hits on tkse pollutants.*

Policy 28: *Tk City shall regulate local point sources w cowoi pollutant discharge.*

Program (25) Implement measures to improve traffic flow, minimizing tk stop and go traffic that intensifies hydrocarbon and carbon-monoxide pollution.

Approximately 85 **percent** of the air pollution in **Petaluma** derives **from** motor **vehicle** emissions. Reductions in the number of vehicles or in obstacles to free-flowing **traffic** will benefit air quality. (See Transportation **Programs 1, 2, 5, 14,** and 24-39 in Chapter 10.)

Program (26) Request that BAAQMD moniwr fireplace and wood-bwning stove emissions wkn air quality at any of the Santa Rosa, Sonoma, or San Rafael monitoring stations drops below wnbient air quality standards.

Carbon monoxide and particulates **from** burning wood can raise emissions of these air contaminants by 30 percent

The City can request mat BAAQMD include a **survey** of wood-burning stove and fireplace emissions of **particulates** and carbon monoxide in their data collection on wood burning in the Bay Area.

11.11 WATER SUPPLY

The City of Petaluma in 1986 provided water service to a population of about 38,000 within an area of approximately 8,500 acres. **The** sources of Petaluma's water supply are 12 local wells, 6 connections (turnouts) to the Sonoma **County** Water Agency (**SCWA**) aqueduct, and a plant which treats water from the Lawler Reservoir and the Adobe Creek watershed. The SCWA aqueduct **carrying** water **from** northern Sonoma County currently supplies 75 percent of **Petaluma's** water. The recent Water System Capacity Study, prepared for the City and adopted by reference in this General Plan, recommends changes to these water supply sources to improve water **quality** and to meet the needs of a growing population.

Objectives:

(o) Anticipate new or peak demand for water and develop adequate supplies.

(p) Carry out capital improvement projects that will enhance the efficiency of the supply system and insure adequate supplies for the future.

(q) Cooperate with the Sonoma County Water Agency and the State to obtain **financing and construction of water-related facilities.**

Policy 29: Tk City shall maintain an updated water service plan.

Revisions to the water service plan **will** be made to incorporate the changing needs of the city while remaining consistent with the **General Plan**.

Policy 30: The City shall incorporate needed water facilities into its capital improvements program.

Recommended water facilities include an additional SCWA aqueduct turnout, new **storage tanks**, improvements to the Lawler supply system and ongoing maintenance of **pumps** and piping. These capital costs should be planned for and **spread over the** twenty-year planning period.

Policy 31: *The City shall determine the demand for water for the expected population within the Petaluma water service area; and shall consider the impacts of a peak drought or peak fire-fighting demand and determine how it would operate during a drought.*

The annual water requirements for the water service area are expected to increase from 1,990 million gallons in 1982 to 3,610 million gallons in the year 2010. The average water demand is based on 145 gallons per capita per day, and the maximum day demands are 2.0 times the average day demand. Minimum water service pressures should be maintained above 30 pounds per square inch while fighting.

Policy 32: *Alternative funding mechanisms for construction activities related to water supply should be sought.*

The Water System Capacity Study anticipates increased connection fees and water use charges. These increased charges are scheduled to meet the major costs of supply system improvements. Additional funds should be sought, however, from the U. S. Soil Conservation Service, the California Department of Water Resources, and the Sonoma County Water Agency to assist with construction.

Program (27) *Reconstruct the Lawler Water Treatment Plant* to increase its capacity and water quality.

Program (28) *Construct storage reservoirs, especially in areas where new development at higher elevations will require increased water pressure.*

A new pressure zone (Zone IV), described in the Water System Capacity Study, is necessary to serve the eastern side of the water service area at elevations above 60 feet

Program (29) *Construct a new Sonoma County Water Agency aqueduct turnout to cross the Petaluma River to the East side.*

A new SCWA turnout across the river from Petroleum Lane is a cost-effective alternative for supplying the rapidly growing eastern area without paralleling or replacing long lengths of existing transmission mains. The addition of the turnout would greatly improve peak-hour pressure.

11.12 WATER QUALITY

The Petaluma Planning Referral Area is based primarily on the Petaluma River watershed. The Petaluma River is a tidal estuary with tides affecting the height of the river north of the Washington Street bridge. Most of the marshland south of the city serves as an overflow basin for flood waters.

The principal tributary of the Petaluma River, San Antonio Creek, drains the southwesterly portion of the basin and is the only tributary with year round flow. Other tributaries are Lichau Creek, Willow Brook, Lynch, Washington, Adobe, Ellis, Capri, Corona, Liberty, McBrown, Freeman, Kizer, Wiggins, Stark, Wilson, Gibson, Marin and Thompson Creeks. Runoff from the upper watershed of Adobe Creek is impounded in a reservoir and used for city drinking water.

The major polluter of the watershed areas is agriculture. The Petaluma River is polluted by agricultural and industrial wastes, and at times of high rainfall residential sewage occasionally enters the river. In addition, septic tank discharges find their way into the creeks, especially in north Petaluma.

Sampling of supply sources indicates generally high water quality, although there are signs of iron bacteria in some of the wells, and the water in the Lawler supply creek system is so turbid after winter storms that the treatment plant must be temporarily shut down. Nitrate contamination in well water in the West Petaluma Specific Plan area is a potential health hazard. Nitrates are produced by aerobic stabilization of organic nitrogen and indicate pollution from surface sources such as septic tank leach fields, fertilizer, or livestock and poultry farms.

Objectives:

(r) *Insure safe drinking water for all Petalumans.*

(s) *Protect areas that are critical to the maintenance of water quality, including critical groundwater recharge areas.*

(t) *Decrease the loss of topsoil and the deterioration of water quality that results from erosion and sedimentation.*

Policy 33: *The City shall maintain an updated sewage/ wastewater treatment plan.*

Plan revisions shall be made to incorporate the changing needs of the city while remaining consistent with the General Plan.

Policy 34: *The City should seek State aid and other resources to monitor groundwater and surface water quality.*

Policy 35: *The City shall preserve adequate vegetative cover and prevent development which increases erosion and sedimentation potential along stream or in unstable soil areas.*

Petaluma General Plan

Policy 36: *The City shall seek to preserve public and private watershed lands as permanent open space.*

Policy 37: *The City shall seek controls to protect potential groundwater recharge areas and streambanks from urban encroachment.*

Policy 38: *Runoff-induced flooding, erosion, sedimentation, and pollution resulting from new development and from agricultural areas should be reduced.*

Policy 39: *Require a hydrologic analysis of runoff and drainage from new development.*

Sediments from steep, erosive areas can lower the drainage capacity of the river and stream channels. Organic pollutants from manure, chemical fertilizers, and malfunctioning septic tanks are increased with high runoff and can cause odor.

Program (29.1) *Work with tk County to reduce agriculture-related contamination of groundwater and streams flowing into tk Petaluma River.*

Program (30) *Inspect tk inside of water tanks and storage reservoirs every five years.*

The American Water Works Association recommends that the interior lining of water tanks be inspected for corrosion not less than once every five years.

Program (3X) *Continue to chlorinate well water for iron bacteria and expand this practice to all City-operated wells.*

Chlorinating well water was started in response to water quality samples that indicated iron bacteria in the water. This is an inexpensive way of improving water quality.

Program (32) *Require a 100-foot depth of seal on all new wells. Ensure that unused wells are properly abandoned and sealed in accordance with State or County standards.*

Program (33) *Recommend that tk County maintain established standards for new wells and septic tanks that will insure proper groundwater quality. Urge the County, when reviewing development applications, to examine tk combined impacts of new septic tanks placed in proximity.*

The County must examine the cumulative impacts of the allowed development densities in the West Petaluma Specific Plan area and compare the results to established water quality standards. Test wells should be required prior to issuing any building permits.

Program (34) *Use discretionary permits to control construction of impervious surfaces in groundwater recharge areas.*

Permeable soils are the only areas where groundwater can be recharged directly. Paving and other impervious surfaces reduce the groundwater recharge and increase runoff and flooding potential.

Program (35) *Do not extend tk urban limit line into areas where urban encroachment will impact groundwater recharge.*

The Sonoma County General Plan identifies groundwater recharge areas around Petaluma (see Technical Appendix).

Program (36) *Enforce Chapter 70 of tk Uniform Building Code to prevent erosion and sedimentation.*

Program (37) *Adopt an ordinance to control, monitor, and enforce strict erosion control procedures for any development involving soil displacement.*

This program supports policy 38, which requires the reduction of erosion, sedimentation, and pollution from new development.

Program (38) *Identify all PCB sources within tk city.*

Program (39) *Work with Pacific Gas & Electric to identify any of their sites within tk city that may have hazardous materials buried underground.*

Figure 11-3: Guide to Health and Safety Goals, Objectives, Policies, Programs, and Implementation,

| <u>Objectives</u> | <u>Policies</u> | <u>Programs</u> | <u>Body Responsible for Implementation¹</u> | | | | | |
|-----------------------------------------------------------------------------------------|-----------------|-----------------|--------------------------------------------------------|----|----|----|----|----|
| | | | CC | CM | PD | PW | BD | FR |
| Goal 1: Protect the community from natural catastrophes and hazardous conditions | | | | | | | | |
| Emergency Preparedness | | | | | | | | |
| a,b,c | 1-5 | 1 | | | | | | |
| a,b,c | 1-5 | 2 | | | . | . | . | . |
| a,b,c,h | 1-5 | 3 | | | . | . | . | . |
| Flood Hazard | | | | | | | | |
| d,e,f | 7,10 | 4 | | | . | . | . | . |
| d,e,f | 6,7, | 5 | | | . | . | . | . |
| d,e,f | 7,8,9, | 6 | | | . | . | . | . |
| d,e,f | 6,9 | 7 | | | . | . | . | . |
| d,e,f | 10,10.1 | 8 | | . | . | . | . | . |
| Seismic Safety | | | | | | | | |
| g | 11,12,13 | 9 | | . | | | . | . |
| g | 12,13 | 10 | . | . | . | . | . | . |
| g | 13 | 11 | | | . | . | . | . |
| g | 11,12,13 | 12 | | | . | . | . | . |
| g | 11,12,13 | 13 | | | . | . | . | . |
| g | 11,14 | 14 | | . | | . | . | . |
| Slope Stability | | | | | | | | |
| h | 14-18 | 15 | . | | | . | | |
| Fire & Police Services | | | | | | | | |
| i,j | 19,20 | 16 | | . | | . | . | . |
| j,k | 21,23 | 17 | . | | | . | . | . |
| j,k | 21,22,23,23.1 | 18 | . | | | . | . | . |
| j | 22 | 19 | . | | | . | . | . |
| j | | 20 | . | | | . | . | . |
| Goal 2: Reduce impact of pollutants on Petalumans | | | | | | | | |
| Hazardous Material Transportation and Storage | | | | | | | | |
| l | 24 | 21 | . | | | | . | . |
| l | 24 | 22 | . | | . | . | . | . |
| l | 24 | 22.1 | | | . | . | . | . |
| l | 24 | 22.2 | . | | | | . | . |
| l | 24 | 22.3 | | | | | . | . |
| l | 24 | 22.4 | . | | | | . | . |

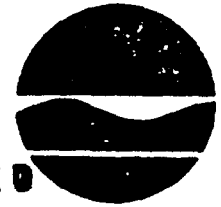
(Guide continues on page 130.)

APPENDIX 0

NEW YORK

- 0.1 Policy **Memorandum** on Health Risk Assessment
- 0.2 EIS: SCA Arc Pyrolysis Project, Table **of** Contents
- 0.3 Environmental Assessment Form used **for New** York Environmental Assessments

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-



RECEIVED
Dept. of Env. Cons.
Henry G. Williams
Commissioner

June 25, 1987

AUG 19 1987

DIVISION OF
REGULATORY AFFAIRS

MEMORANDUM

TO: Regional Air Pollution Control Engineers
Bureau Directors
Section Chiefs

FROM: Hr. Hovey (Originator: J. Davis/R. Majewski) 87-AIR-23

SUBJECT: Municipal Solid Waste Combustion Facilities - Health Risk Permitting Issues

Health Risk Assessment

Any application for air permits to construct a new municipal solid waste incineration (MSWI) facility which may have a significant impact on the environment will require preparation of a Draft Environmental Impact Statement (DBIS) under the State Environmental Quality Review Act (SEQRA). Within such a DRIS there should be an evaluation of the health risks associated with emissions of air contaminants of most concern from such plants since such potential impacts may be of utmost importance.

If the DEIS does not, or cannot because it is prepared at a preliminary stage, address such risks, or if the information provided is inadequate to allow the Department to make necessary decisions for issuance of permits, a supplemental DEIS will be required at the time of application for permits. Such supplemental DEIS will be a requirement for a determination of complete application for facilities where such potential impacts exist.

A health risk assessment is necessary at the time of permit application to allow the Department to determine if the requirements of 6NYCRR 617.9 have been adequately addressed at the time when a decision must be made on the application. Such information is also necessary to determine if compliance with the requirements of 6 NYCRR 257-1.4(b) has been satisfactorily demonstrated.

Impacts of criteria contaminants (suspended particulates, SO₂, NO₂, CO, O₃, lead) attributable to the project should be compared to existing ambient air quality standards.

The selection of contaminants that will be subject to a health risk analysis is the responsibility of the applicant. However, the contaminants listed in Table 1, at a minimum, should be included in such an evaluation.

In addition, when a health risk assessment is not performed for any contaminant listed in Table 1, or any other contaminant projected by the applicant, a

justification as to why this assessment is not included should be provided on a contaminant specific basis. If sufficient justification is not provided, the Department may require additional **information, i.e.**, a specific health risk assessment.

In evaluating the health risks, **all** routes of exposure should be addressed including inhalation, **dermal** contact and ingestion. Risk assessment methods, procedures and models should be acceptable to both the **Department of Health (DOH)** and the Department of Environmental Conservation (**DEC**).

As part of the application review process, the acceptability of the risks identified and evaluated in the **EIS** will be considered in establishing permissible emission **amounts** in Section G of the incinerator **permit** application or Section F should the **facility** qualify as a Stationary Combustion Installation and require use of that form.

It should be **recognized that** information provided in Section G of the **Incinerator Permit to Construct/Certificate to Operate (PC/CO)** application form or Section F of the Stationary Combustion Installation **PC/CO** application form is not enforceable, **per se**, **as** discussed in **Air Guide-10**. Unless an emission **limit** established by law or regulation or a specific numerical special permit condition applies, emissions of a contaminant are only limited to levels which are demonstrated to show compliance with an appropriate **ambient** air quality standard **or are** found to be acceptable **in terms** of risk assessment in cases where no ambient **air quality** standard has **been** established.

Emission Estimates

1. All emission **estimates** used to estimate risks must be reviewed to determine if they are adequately **documented** and referenced.

2. If emission **estimates** used are found to be reasonable and appropriate by **DEC**, no further **documentation** will be required.

3. If **any** emission estimate appears to be unreasonably low or inappropriate, additional **justification** will be requested.

a. If sufficient justification is provided, **and** health risks are found to be **acceptable**, the emission **estimate** used to **estimate this** health risk will be established as a permissible emission level in **the Permit** to Construct (Section G or F depending on the application **form**).

b. If justification is not possible, but health risks are found to be acceptable, the emission **estimated** will be established as a permissible emission as in **(a) above**.

c. If sufficient justification is **not** provided, and/or health risks are found to be **marginal** or **unacceptable**, it will be staff's position to **recommend denial** of **permits**.

Emission Testing

Emission tests should be established as a special permit condition for all contaminants for which a health risk **assessment** is performed, as well as those **emissions** for which standards or limits have **been** established by regulation or special permit condition.

A. **(i)** If emissions measured during stack testing required by DEC exceed an amount set by law or regulation or a specific numerical special permit

condition, the source will be considered to be in violation and appropriate action will be initiated.

(ii) Other than specific numerical special permit conditions (i.e. emission limits) beyond those established by law or regulation, any special permit conditions written to address emissions of any unregulated toxic contaminant will prescribe a procedure to be followed in the event any emissions are greater than presented in the permit application. This procedure is described in the following sections **B** and **C**.

B. If emissions of contaminants, other than those addressed by A **(i) above, exceed** the amounts listed in Section **G** (or **F**) as permissible emissions, the applicant will be provided the opportunity to, within a reasonable time period, identify measures for reducing emissions below such permissible amounts and re-testing. Permission for continued operation during this period must be requested by the applicant/source owner and approved by DEC.

c. If, after re-testing as indicated in B above, emissions of any contaminants so affected show continued exceedance of any associated permissible emission level, the applicant will be allowed to apply for a new CO to change the permissible emission level established on the previous PC or CO to reflect the emission levels found during testing. Such action is subject to **SEQRA** and will require a **determination** as to whether such an increase in permissible **emissions** is significant.

(1) If the **increase** is found to be insignificant, a negative declaration will be prepared, the permissible emission level will be **changed**, and the CO issued, if all other requirements have been satisfied.

(11) If the increase is found to be significant, the applicant will be required to demonstrate why the Increased emission level should be allowed. This demonstration must include a health **risk** assessment for each contaminant emitted in amounts **exceeding** the initially approved permissible emission levels. Public hearings will be required to provide opportunity for public **comment**. The **Commissioner** of DEC will **determine** if the risk associated with any increased emission level is acceptable. If the increased emissions are found to be acceptable, the permissible emission level will be changed and the CO issued, again if **all** other requirements have been satisfied. If not, the Commissioner may identify steps to be taken to mitigate impacts, or he may deny the CO.

Coordination

Any portion of the review of a **MSWI** facility involving health risk assessment or coordination with the **New York State Department of Health** will be done or coordinated **by the Bureau of Air Toxics (BAT)**. Other portions of the review for such facilities will be coordinated by the Bureau of Source Control (BSC) through agreement with the appropriate Regional Office.

These provisions are effective **immediately** for **any** applications for **MSWI** facilities not determined complete as of the-date of this **memorandum**.

cc: Regional Directors of **Environmental Quality Engineering**
87-2-29

TABLE 1

CONTAMINANTS REQUIRING A HEALTH RISK ANALYSIS

PCDD/PCDF (expressed as **2,3,7,8-TCDD** equivalents using the **Eaton** method)

Arsenic

Cadmium

Chromium

Manganese

Mercury

Nickel

PAH

Vanadium

Zinc

Formaldehyde

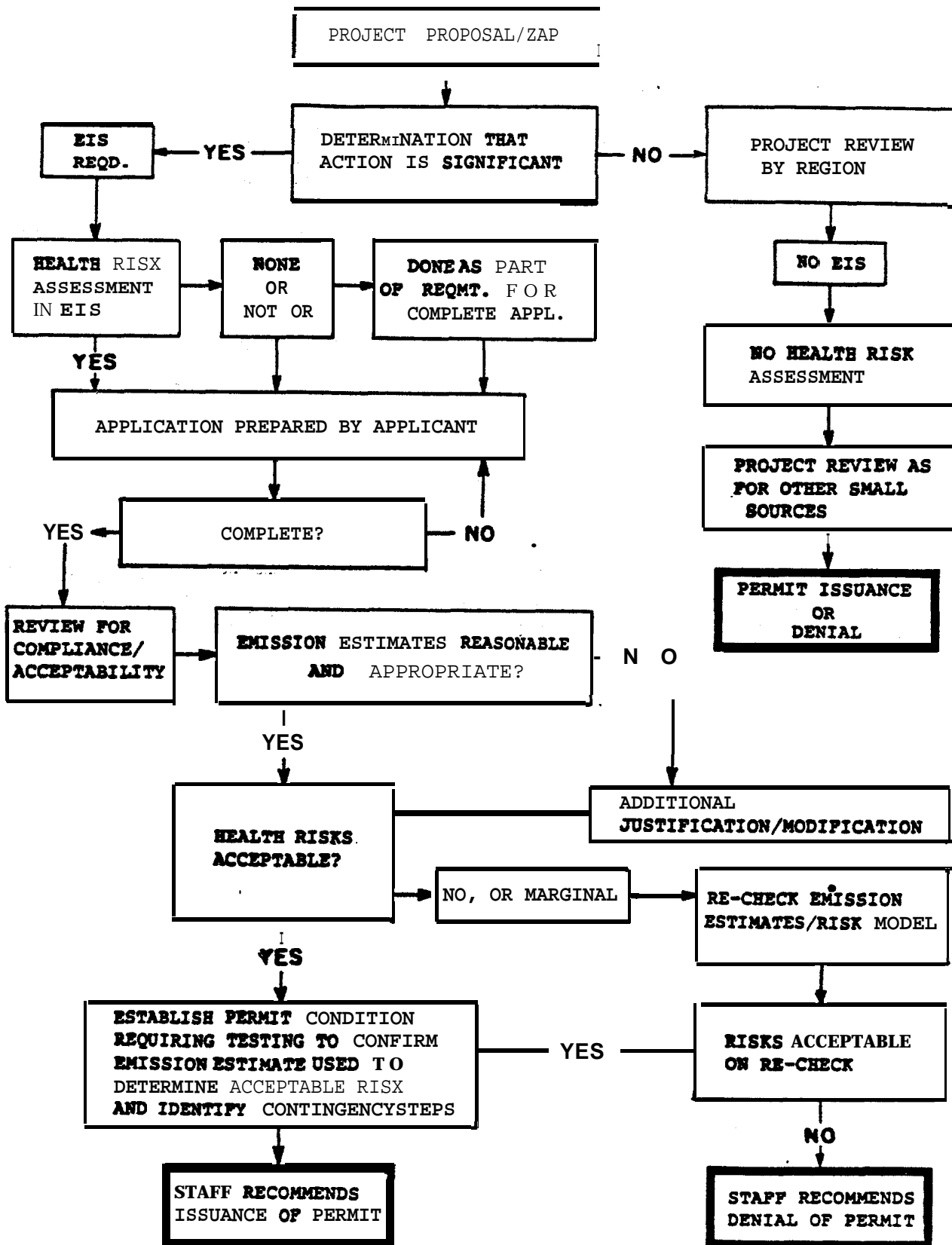
Chrysene

BAP

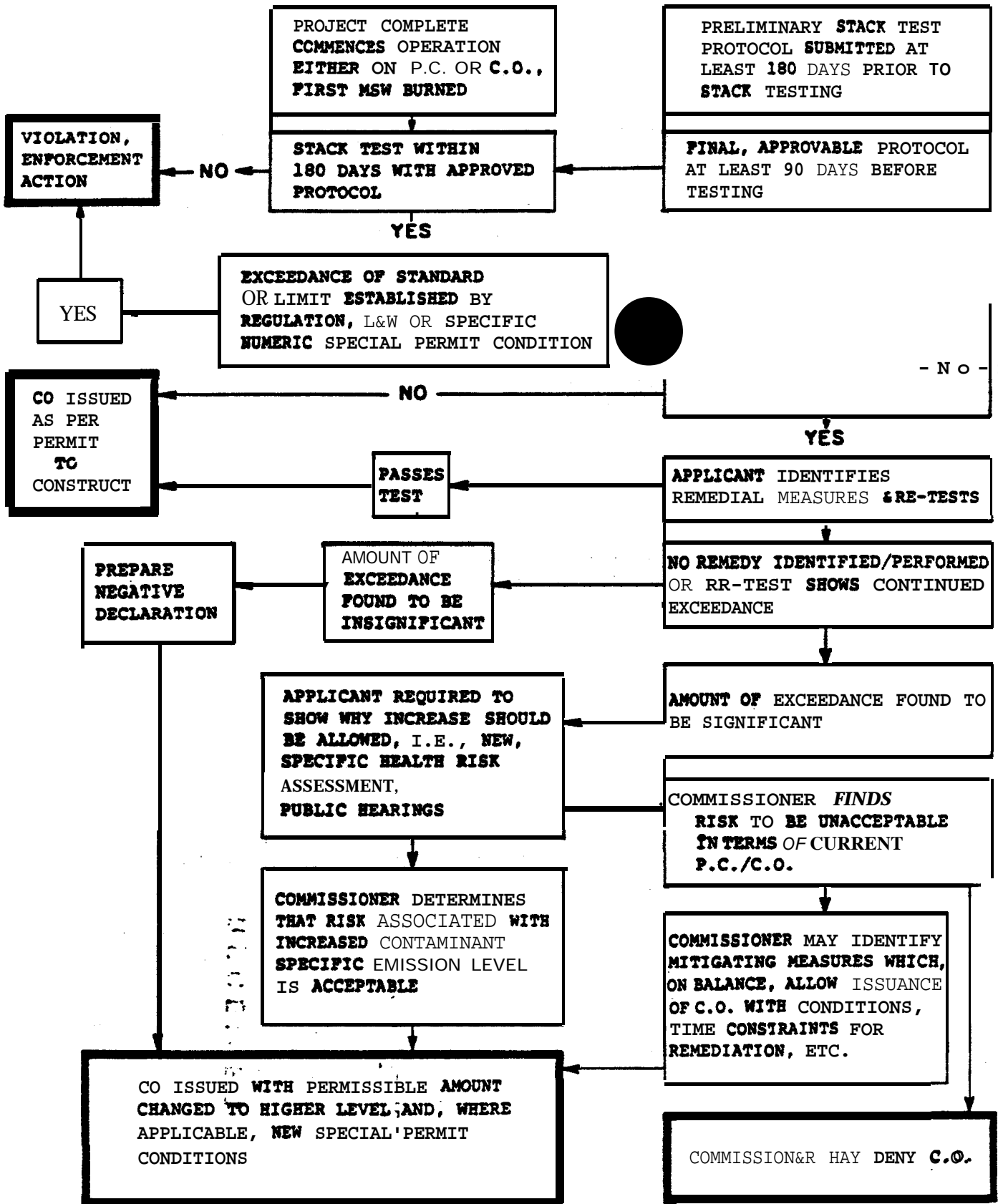
PCB

Hydrogen Chloride

PERMIT TO CONSTRUCT DECISION MAKING
FOR MUNICIPAL SOLID WASTE INCINERATION PROJECTS
WITH RESPECT TO RISK ASSESSMENT



**CERTIFICATE TO OPERATE DECISION MAKING
FOR MUNICIPAL SOLID WASTE INCINERATION PROJECTS**



APPENDIX 0.2

SUPPLEMENT TO THE ARC PYROLYSIS PROJECT
ENVIRONMENTAL IMPACT STATEMENT
PUBLIC HEALTH RISK ASSESSMENT **STUDY**
OF THE
DEMONSTRATION TESTING PROGRAM
FOR THE
PCB DESTRUCTION **UNIT**
ARC PYROLYSIS PROJECT
MODEL CITY, NEW YORK

prepared for:

SCA CHEMICAL SERVICES, INC.
P.O. BOX 200
1550 BALMER ROAD
MODEL CITY, NEW YORK 14107

prepared by:

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201 Willowbrook Boulevard
Wayne, New Jersey 07470
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Revised
21 July 1986

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APPENDIX 0.3

State Environmental Quality Review
FULL ENVIRONMENTAL ASSESSMENT FORM

Purpose: The full EAF is designed to help applicants and agencies determine, in an orderly manner, whether a project action may be significant. The question of whether an action may be significant is not always easy to answer. Frequently, there are aspects of a project that are subjective or unmeasurable. It is also understood that those who determine significance may have little or no formal knowledge of the environment or may be technically expert in environmental analysis. In addition, many who have knowledge in one particular area may not be aware of the broader concerns affecting the question of significance.

The full EAF is intended to provide a method whereby applicants and agencies can be assured that the determination process has been orderly, comprehensive in nature, yet flexible to allow introduction of information to fit a project or action.

Full EAF Components: The full EAF is comprised of three parts:

- Part 1: Provides objective data and information about a given project and its site. By identifying basic project data, it assists a reviewer in the analysis that takes place in Parts 2 and 3.
Part 2: Focuses on identifying the range of possible impacts that may occur from a project or action. It provides guidance as to whether an impact is likely to be considered small to moderate or whether it is a potentially large impact. The form also identifies whether an impact can be mitigated or reduced.
Part 3: If any impact in Part 2 is identified as potentially-large, then Part 3 is used to evaluate whether or not the impact is actually important.

DETERMINATION OF SIGNIFICANCE-Type 1 and Unlisted Actions

Identify the Portions of EAF completed for this project: [] Part 1 [] Part 2 [] Part 3

Upon review of the information recorded on this EAF (Parts 1 and 2 and 3 if appropriate), and any other supporting information, and considering both the magnitude and importance of each impact, it is reasonably determined by the lead agency that:

- [] A. The project will not result in any large and important impact(s) and, therefore, is one which will not have a significant impact on the environment, therefore a negative declaration will be prepared.
[] B. Although the project could have a significant effect on the environment, there will not be a significant effect for this Unlisted Action because the mitigation measures described in PART 3 have been required, therefore a CONDITIONED negative declaration will be prepared.*
[] C. The project may result in one or more large and important impacts that may have a significant impact on the environment, therefore a positive declaration will be prepared.
. A Conditioned Negative Declaration is only valid for Unlisted Actions

Name of Action

Name of Lead Agency

Print or Type Name of Responsible Officer in Lead Agency

Title of Responsible Officer

Signature of Responsible Officer in Lead Agency

Signature of Preparer (If different from responsible officer)

Date

PART I-PROJECT INFORMATION

Prepared by Project Sponsor

NOTICE: This document is designed to assist in determining whether the action proposed may have a significant effect on the environment. Please complete the entire form, Parts A through E. Answers to these questions will be considered as part of the application for approval and may be subject to further verification and public review. Provide any additional information you believe will be needed to complete Parts 2 and 3.

It is expected that completion of the full EAF will be dependent on information currently available and will not involve new studies, research or investigation. If information requiring such additional work is unavailable, so indicate and specify each instance.

| | | |
|----------------------------------------------------------------------|--|------------------------------|
| NAME OF ACTION | | |
| LOCATION OF ACTION (Include Street Address, Municipality and County) | | |
| NAME OF APPLICANT/SPONSOR | | BUSINESS TELEPHONE () |
| ADDRESS | | |
| CITY/PO | | STATE ZIP CODE |
| NAME OF OWNER (If different) | | BUSINESS TELEPHONE () |
| ADDRESS | | |
| CITY/PO | | STATE ZIP CODE |
| DESCRIPTION OF ACTION | | |

Please Complete Each Question-Indicate N.A. if not applicable

A. Site Description

Physical setting of overall project, both developed and undeveloped areas.

1. Present land use: Urban @Industrial Commercial Residential (suburban) Rural (non-farm)
 Forest Agriculture Other _____

2. Total acreage of project area: _____ acres..

| APPROXIMATE ACREAGE | PRESENTLY | AFTER COMPLETION |
|-------------------------------------------------------------|-------------|------------------|
| Meadow or Brushland (Non-agricultural) | _____ acres | _____ acres |
| Forested | _____ acres | _____ acres |
| Agricultural (Includes orchards, cropland, pasture, etc.) | _____ acres | _____ acres |
| Wetland (Freshwater or tidal as per Articles 24, 25 of ECL) | _____ acres | _____ acres |
| Water Surface Area | _____ acres | _____ acres |
| Unvegetated (Rock, earth or fill) | _____ acres | _____ acres |
| Roads, buildings and other paved surfaces | _____ acres | _____ acres |
| Other (Indicate type) _____ | _____ acres | _____ acres |

3. What is predominant soil type(s) on project site? _____

a. Soil drainage: Well drained _____ % of site Moderately well drained _____ % of site
 Poorly drained _____ % of site

b. If any agricultural land is involved, how many acres of soil are classified within soil group 1 through 4 of the NYS Land Classification System? _____ acres. (See 1 NYCRR 3701.

4. Are there bedrock outcroppings on project site? Yes No

a What is depth to bedrock? _____ (in feet)

5. Approximate percentage of proposed project site with slopes: 0-10% _____ % 10-15% _____ %
 15% or greater _____ %
6. Is project substantially contiguous to, or contain a building, site, or district, listed on the State or the National Registers of Historic Places? Yes No
7. Is project substantially contiguous to a site listed on the Register of National Natural Landmarks? Yes No
What is the depth of the water table? _____ (in feet)
9. Is site located over a primary, principal, or sole source aquifer? Yes No
10. Do hunting, fishing or shell fishing opportunities presently exist in the project area? Yes No
11. Does project site contain any species of plant or animal life that is identified as threatened or endangered?
 Yes No According to _____
Identify each species _____
12. Are there any unique or unusual land forms on the project site? (i.e., cliffs, dunes, other geological formations)
 Yes No Describe _____

13. Is the project site presently used by the community or neighborhood as an open space or recreation area?
 Yes No If yes, explain _____
14. Does the present site include scenic views known to be important to the community?
 Yes No
15. Streams within or contiguous to project area: _____
a. Name of Stream and name of River to which it is tributary _____

16. Lakes, ponds, wetland areas within or contiguous to project area:
a. Name _____ b. Size (In acres) _____
17. Is the site served by existing public utilities? Yes No
a) If Yes, does sufficient capacity exist to allow connection? Yes No
b) If Yes, will improvements be necessary to allow connection? Yes No
18. Is the site located in an agricultural district certified pursuant to Agriculture and Markets Law, Article 25-AA, Section 303 and 304? Yes No
19. Is the site located in or substantially contiguous to a Critical Environmental Area designated pursuant to Article 8 of the ECL, and 6 NYCRR 617? Yes No
20. Has the site ever been used for the disposal of solid or hazardous wastes? Yes No

B. Project Description

1. Physical dimensions and scale of project (fill in dimensions as appropriate)
- a. Total contiguous acreage owned or controlled by project sponsor _____ acres.
- b. Project acreage to be developed: _____ acres initially; _____ acres ultimately.
- c. Project acreage to remain undeveloped _____ acres.
- d. Length of project, in miles: _____ (If appropriate)
- e. If the project is an expansion, indicate percent of expansion proposed _____ %;
- f. Number of off-street parking spaces existing _____; proposed _____
- g. Maximum vehicular trips generated per hour _____ (upon completion of project)?
- h. If residential: Number and type of housing units:
- | | One Family | Two Family | Multiple Family | Condominium |
|------------|------------|------------|-----------------|-------------|
| Initially | _____ | _____ | _____ | _____ |
| Ultimately | _____ | _____ | _____ | _____ |
- i. Dimensions (in feet) of largest proposed structure _____ height; _____ width; _____ length.
- j. Linear feet of frontage along a public thoroughfare project will occupy is? _____ ft.

2. How much natural material (i.e., rock, earth, etc.) will be removed from the site? _____ tons/cubic yards
3. Will disturbed areas be reclaimed? Yes No N/A
- a. If yes, for what intend purpose is the site being reclaimed? _____
- b. Will topsoil be stockpiled for reclamation? Yes No
- c. Will upper subsoil be stockpiled for reclamation? Yes No
4. How many acres of vegetation (trees, shrubs, ground covers) will be removed from site? _____ acres.
5. Will any mature forest (over 100 years old) or other locally-important vegetation be removed by this project?
 Yes No
6. If single phase project: Anticipated period of construction _____ months, (including demolition).
7. If multi-phased:
- a. Total number of phases anticipated _____ (number).
- b. Anticipated date of commencement phase 1 _____ month _____ year, (including demolition).
- c. Approximate completion date of final phase _____ month _____ year.
- d. Is phase 1 functionally dependent on subsequent phases? Yes No
8. Will blasting occur during construction? Yes No
9. Number of jobs generated: during construction _____ ; after project is complete _____
10. Number of jobs eliminated by this project _____
11. Will project require relocation of any projects or facilities? Yes No If yes, explain _____
12. Is surface liquid waste disposal involved? Yes No
- a. If yes, indicate type of waste (sewage, industrial, etc.) and amount _____
- b. Name of water body into which effluent will be discharged _____
13. Is subsurface liquid waste disposal involved? Yes No Type _____
14. Will surface area of an existing water body increase or decrease by proposal? Yes No
 Explain _____
15. Is project or any portion of project located in a 100 year flood plain? Yes No
16. Will the project generate solid waste? Yes No
- a. If yes, what is the amount per month _____ tons
- b. If yes, will an existing solid waste facility be used? Yes No
- c. If yes, give name _____ ; location _____
- d. Will any wastes **not go** into a sewage disposal system or into a sanitary landfill? Yes No
- e. If Yes, explain _____
17. Will the project involve the disposal of solid waste? Yes No
- a. If yes, what is the anticipated rate of disposal? _____ tons/month.
- b. If yes, what is the anticipated site life? _____ years.
18. Will project use herbicides or pesticides? Yes No
19. Will project routinely produce odors (more than one hour per day)? Yes No
20. Will project produce operating noise exceeding the local ambient noise levels? Yes No
21. Will project result in an increase in energy use? Yes No
 If yes, indicate type(s) _____
22. If water supply is from wells, indicate pumping capacity _____ gallons/minute.
23. Total anticipated water usage per day _____ gallons/day.
24. Does project involve Local, State or Federal funding? Yes No
 If Yes, explain _____

| | | | |
|------------------------------------|----------------------------------------------------------|-------|-------|
| City, Town, Village Board | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| City, Town, Village Planning Board | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| City, Town Zoning Board | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| City, County Health Department | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| Other Local Agencies | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| Other Regional Agencies | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| State Agencies | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |
| Federal Agencies | <input type="checkbox"/> Yes <input type="checkbox"/> No | _____ | _____ |

C. Zoning and Planning Information

1. Does proposed action involve a planning or zoning decision? Yes No
 If Yes, indicate decision required:
 zoning amendment zoning variance special use permit subdivision onsite plan
 new/revision of master plan resource management plan other _____
2. What is the zoning classification(s) of the site? _____
3. What is the maximum potential development of the site if developed as permitted by the present zoning?

4. What is the proposed zoning of the site? _____
5. What is the maximum potential development of the site if developed as permitted by the proposed zoning?

6. Is the proposed action consistent with the recommended uses in adopted local land use plans? Yes No
7. What are the predominant land use(s) and zoning classifications within a 1/4 mile radius of proposed action?

8. Is the proposed action compatible with adjoining/surrounding land uses within a 1/4 mile? Yes No
9. If the proposed action is the subdivision of land, how many lots are proposed? _____
 a. What is the minimum lot size proposed? _____
10. Will proposed action require any authorization(s) for the formation of sewer or water districts? Yes No
11. Will the proposed action create a demand for any community provided services (recreation, education, police, fire protection)? Yes No
 a. If yes, is existing capacity sufficient to handle projected demand? Yes No
12. Will the proposed action result in the generation of traffic significantly above present levels? Yes No
 a. If yes, is the existing road network adequate to handle the additional traffic? Yes No

D. Informational Details

Attach any additional information as may be needed to clarify your project. If there are or may be any adverse impacts associated with your proposal, please discuss such impacts and the measures which you propose to mitigate or avoid them.

E. Verification

I certify that the information provided above is true to the best of my knowledge.

Applicant/Sponsor Name _____ Date _____
Signature _____ Title _____

If the action is in the Coastal Area, and you are a state agency, complete the Coastal Assessment Form before proceeding with this assessment.

Responsibility of lead Agency

General information (Read Carefully)

- In completing the form the reviewer should be guided by the question: Have my responses and determinations been reasonable? The reviewer is not expected to be an expert environmental analyst.
- Identifying that an impact will be potentially large (column 2) does not mean that it is also necessarily significant. Any large impact must be evaluated in PART 3 to determine significance. Identifying an impact in column 2 simply asks that it be looked at further.
- The Examples provided are to assist the reviewer by showing types of impacts and wherever possible the threshold of magnitude that would trigger a response in column 2. The examples are generally applicable throughout the State-and for most situations, But, for any specific project or site other examples and/or lower thresholds may be appropriate for a Potential Large Impact response, thus requiring evaluation in Part 3.
- The impacts of each project, on each site, in each locality, will vary. Therefore, the examples are illustrative and have been offered as guidance. They do not constitute an exhaustive list of impacts and thresholds to answer each question.
- The number of examples per question does not indicate the importance of each question.
- In identifying impacts, consider long term, short term and cumulative effects.

Instructions (Read carefully)

- Answer each of the 19 questions in PART 2. Answer Yes if there will be any impact.
- Maybe answers should be considered as Yes answers.
- If answering Yes to a question then check the appropriate box (column 1 or 2) to indicate the potential size of the impact. If impact threshold equals or exceeds any example provided, check column 2. If impact will occur but threshold is lower than example, check column 1.
- If reviewer has doubt about size of the impact then consider the impact as potentially large and proceed to PART 3.
- If a potentially large impact checked in column 2 can be mitigated by change(s) in the project to a small to moderate impact, also check the Yes box in column 3. A No response indicates that such a reduction is not possible. This must be explained in Part 3.

IMPACT ON LAND

1. Will the proposed action result in a physical change to the project site?
NO YES

Examples that would apply to column 2

- Any construction on slopes of 15% or greater, (15 foot rise per 100 foot of length), or where the general slopes in the project area exceed 10%.
- Construction on land where the depth to the water table is less than 3 feet.
- Construction of paved parking area for 1,000 or more vehicles.
- Construction on land where bedrock is exposed or generally within 3 feet of existing ground surface.
- Construction that will continue for more than 1 year or involve more than one phase or stage.
- Excavation for mining purposes that would remove more than 1,000 tons of natural material (i.e., rock or soil) per year.
- Construction or expansion of a sanitary landfill.
- Construction in a designated floodway.
- Other impacts _____

2 Will there be an effect to any unique or unusual land forms found on the site? (i.e., cliffs, dunes, geological formations, etc.) NO YES

Specific land forms: _____

| 1 Small to Moderate Impact | 2 Potential Large Impact | 3 Can Impact Be Mitigated By Project Change |
|--------------------------------------|------------------------------------|----------------------------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |

IMPACT ON WATER

3. Will proposed action affect any water body designated as protected? (Under Articles 15, 24, 25 of the Environmental Conservation Law, ECL) NO YES

Examples that would apply to column 2

Developable area of site contains a protected water body.

- Dredging more than 100 cubic yards of material from channel of a protected stream.
- Extension of utility distribution facilities through a protected water body.
- Construction in a designated freshwater or tidal wetland.
- Other impacts: _____

4. Will proposed action affect any non-protected existing or new body of water? NO YES

Examples that would apply to column 2

- A 10% increase or decrease in the surface area of any body of water or more than a 10 acre increase or decrease.
- Construction of a body of water that exceeds 10 acres of surface area.
- Other impacts: _____

5. Will Proposed Action affect surface or groundwater quality or quantity? NO YES

Examples that would apply to column 2

- Proposed Action will require a discharge permit.
- Proposed Action requires use of a source of water that does not have approval to serve proposed (project) action.
- Proposed Action requires water supply from wells with greater than 45 gallons per minute pumping capacity.
- Construction or operation causing any contamination of a water supply system.
- Proposed Action will adversely affect groundwater.
- Liquid effluent will be conveyed off the site to facilities which presently do not exist or have inadequate capacity.
- Proposed Action would use water in excess of 20,000 gallons per day.
- Proposed Action will likely cause siltation or other discharge into an existing body of water to the extent that there will be an obvious visual contrast to natural conditions.
- Proposed Action will require the storage of petroleum or chemical products greater than 1,100 gallons.
- Proposed Action will allow residential uses in areas without water and/or sewer services.
- Proposed Action locates commercial and/or industrial uses which may require new or expansion of existing waste treatment and/or storage facilities.
- Other impacts: _____

6. Will proposed action alter drainage flow or patterns, or surface water runoff? NO YES

Examples that would apply to column 2

- Proposed Action would change flood water flows.

| | 1 Small to Moderate Impact | 2 Potential Large Impact | 3 Can Impact Be Mitigated By Project Change | |
|--|-------------------------------------|-----------------------------------|------------------------------------------------------|-----------------------------|
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
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| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

| | 1 Small to Moderate Impact | 2 Potential Large Impact | 3 Can Impact Be Mitigated By Project Change | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------|------------------------------------------------------|-----------------------------|
| • Proposed Action may cause substantial erosion. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Proposed Action is incompatible with existing drainage patterns. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Proposed Action will allow development in a designated floodway. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Other impacts: _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| IMPACT ON AIR | | | | |
| 7 Will proposed action affect air quality? <input type="checkbox"/> NO <input type="checkbox"/> YES Examples that would apply to column 2 | | | | |
| • Proposed Action will induce 1,000 or more vehicle trips in any given hour. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Proposed Action will result in the incineration of more than 1 ton of refuse per hour. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Emission rate of total contaminants will exceed 5 lbs. per hour or a heat source producing more than 10 million BTU's per hour. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Proposed action will allow an increase in the amount of land committed to industrial use. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Proposed action will allow an increase in the density of industrial development within existing industrial areas. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Other impacts: _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| IMPACT ON PLANTS AND ANIMALS | | | | |
| 8 Will Proposed Action affect any threatened or endangered species? <input type="checkbox"/> NO <input type="checkbox"/> YES Examples that would apply to column 2 | | | | |
| • Reduction of one or more species listed on the New York or Federal list, using the-site, over or near site or found on the site. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Removal of any portion of a critical or significant wildlife habitat. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Application of pesticide or herbicide more than twice a year, other than for agricultural purposes. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Other impacts: _____ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 9 Will Proposed Action substantially affect non-threatened or non-endangered species? <input type="checkbox"/> NO <input type="checkbox"/> YES Examples that would apply to column 2 | | | | |
| • Proposed Action would substantially interfere with any resident or migratory fish, shellfish or wildlife species. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| • Proposed Action requires the removal of more than 10 acres of mature forest (over 100 years of age) or other locally important vegetation. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> NO |
| IMPACT ON AGRICULTURAL LAND RESOURCES | | | | |
| 10 Will the Proposed Action affect agricultural land resources? <input type="checkbox"/> NO <input type="checkbox"/> YES Examples that would apply to column 2 | | | | |
| • The proposed action would sever, cross or limit access to agricultural land (includes cropland, hayfields, pasture, vineyard, orchard, etc.) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

- Construction activity would excavate or compact the soil profile of agricultural land.
- The proposed action would irreversibly convert more than 10 acres of agricultural land or, if located in an Agricultural District, more than 2.5 acres of agricultural land.
- The proposed action would disrupt or prevent installation of agricultural land management systems (e.g., subsurface drain lines, outlet ditches, strip cropping); or create a need for such measures (e.g. cause a farm field to drain poorly due to increased runoff)
- Other impacts: _____

IMPACT ON AESTHETIC RESOURCES

11. Will proposed action affect aesthetic resources? NO YES
(If necessary, use the Visual EAF Addendum in Section 617.21, Appendix B.)

Examples that would apply to column 2

- Proposed land uses, or project components obviously different from or in sharp contrast to current surrounding land use patterns, whether man-made or natural.
- Proposed land uses, or project components visible to users of aesthetic resources which will eliminate or significantly reduce their enjoyment of the aesthetic qualities of that resource.
- Project components that will result in the elimination or significant screening of scenic views known to be important to the area.
- Other impacts: _____

IMPACT ON HISTORIC AND ARCHAEOLOGICAL RESOURCES

12. Will Proposed Action impact any site or structure of historic, pre-historic or paleontological importance? NO YES

Examples that would apply to column 2

- Proposed Action occurring wholly or partially within or substantially contiguous to any facility or site listed on the State or National Register of historic places.
- Any impact to an archaeological site or fossil bed located within the project site.
- Proposed Action will occur in an area designated as sensitive for archaeological sites on the NYS Site Inventory.
- Other impacts: _____

IMPACT ON OPEN SPACE AND RECREATION

13 Will Proposed Action affect the quantity or quality of existing or future open spaces or recreational opportunities?

Examples that would apply to column 2 NO YES

the permanent foreclosure of a future recreational opportunity.

- A major reduction of an open space important to the community.
- Other impacts: _____

| 1 Small to Moderate Impact | 2 Potential Large Impact | 3 Can Impact Be Mitigated By Project Change |
|-------------------------------|-----------------------------|----------------------------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | cl | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| cl | <input type="checkbox"/> | <input type="checkbox"/> yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| cl | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| cl | cl | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| cl | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | cl | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | cl | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| a | a | <input type="checkbox"/> Yes <input type="checkbox"/> No |

IMPACT ON TRANSPORTATION

14 Will there be an effect to existing transportation systems? NO YES

Examples that would apply to column 2

- Alteration of present patterns of movement of people and/or goods.
- Proposed Action. will result in major traffic problems.
- Other impacts: _____

IMPACT ON ENERGY

15. Will proposed action affect the community's sources of fuel or energy supply? NO YES

Examples that would apply to column 2

- Proposed Action will cause a greater than 5% increase in the use of any form of energy in the municipality.
- Proposed Action will require the creation or extension of an energy transmission or supply system to serve more than 50 single or two family residences or to serve a major commercial or industrial use.
- Other impacts: _____

NOISE AND ODOR IMPACTS

16. Will there be objectionable odors, noise, or vibration as a result of the Proposed Action? NO YES

Examples that would apply to column 2

- Blasting within 1,500 feet of a hospital, school or other sensitive facility.
- Odors will occur routinely (more than one hour per day).
- Proposed Action will produce operating noise exceeding the local ambient noise levels for noise outside of structures.
- Proposed Action will remove natural barriers that would act as a noise screen.
- Other impacts: _____

IMPACT ON PUBLIC HEALTH

17. Will Proposed Action affect public health and safety? NO YES

Examples that would apply to column 2

- Proposed Action may cause a risk of explosion or release of hazardous substances (i.e. oil, pesticides, chemicals, radiation, etc.) in the event of accident or upset conditions, or there may be a chronic low level discharge or emission.
- Proposed Action may result in the burial of "hazardous wastes" in any form (i.e. toxic, poisonous, highly reactive, radioactive, irritating, infectious, etc.)
- Storage facilities for one million or more gallons of liquified natural gas or other flammable liquids.
- Proposed action may result in the excavation or other disturbance within 2,000 feet of a site used for the disposal of solid or hazardous waste.
- Other impacts: _____

| 1 Small to Moderate Impact | 2 Potential Large Impact | 3 Can Impact Be Mitigated By Project Change |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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IMPACT ON GROWTH AND CHARACTER OF COMMUNITY OR NEIGHBORHOOD

18. Will proposed action affect the character of the existing community?
 NO YES

Examples that would apply to column 2

- The permanent population of the city, town or village in which the project is located is likely to grow by more than 5%.
- The municipal budget for capital expenditures or operating services will increase by more than 5% per year as a result of this project.
- Proposed action will conflict with officially adopted plans or goals.
- Proposed action will cause a change in the density of land use.
- Proposed Action will replace or eliminate existing facilities, structures or areas of historic importance to the community.
- Development will create a demand for additional community services (e.g. schools, police and fire, etc.)
- Proposed Action will set an important precedent for future projects.
- Proposed Action will create or eliminate employment.
- Other impacts: _____

| 1 Small to Moderate Impact | 2 Potential Large Impact | 3 Can Impact Be Mitigated By Project Change |
|-------------------------------|-----------------------------|----------------------------------------------------------|
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19. Is there, or is there likely to be, public controversy related to potential adverse environmental impacts?
 NO YES

If Any Action in Part 2 Is Identified as a Potential Large Impact or If You Cannot Determine the Magnitude of Impact, Proceed to Part 3

Part 3—EVALUATION OF THE IMPORTANCE OF IMPACTS

Responsibility of Lead Agency

Part 3 must be prepared if one or more **impact(s)** is considered to be potentially large, even if the impact(s) may be mitigated.

Instructions

Discuss the following for each impact identified in Column 2 of Part 2:

1. Briefly describe the impact.
2. Describe (if applicable) how the impact could be mitigated or reduced to a small to moderate impact by project change(s).
3. Based on the information available, decide if it is reasonable to conclude that this impact is important.

To answer the question of importance, consider:

- The probability of the impact occurring
- The duration of the impact
- Its irreversibility, including permanently lost resources of value
- Whether the impact can or will be controlled
- The regional consequence of the impact
- Its potential divergence from local needs and goals
- Whether known objections to the project relate to this impact.

(Continue on attachments)

APPENDIX P

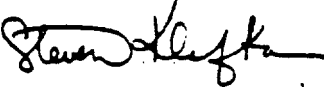
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P.1 EIS: Excerpt, Resource Recovery Plant (Waste Incinerator), Eau Claire,
Wisconsin

APPENDIX P.1

DATE: May 13, 1987 **FILE REF:** 4560

TO: American Resource Recovery Bureau of Air Management File

FROM: Steven Klafka, P.E. - AM/3
Environmental Engineer 

SUBJECT: Addendum to New Source Review #86-SJK-081: Assessment of Deposition Impacts of Proposed Resource Recovery Incineration Facility at Net. Richmond, Wisconsin

Introduction

American Resource Recovery of Waukesha, Wisconsin has proposed a 115 ton per day mass burn refuse incineration facility. It would be located one mile west of New Richmond, Wisconsin. Combustion gases would flow through a boiler to generate steam and electricity, then an electrostatic precipitator for air pollution control.

New Source Review #86-SJK-081 dated February 18, 1987 recommended approval of the air pollution control permit. An extensive review of the stack emissions and their impact on air quality was conducted. No short term standard (one-hour to one year average) would be exceeded. Lifetime exposure to carcinogens (i.e. As, Cd, Cr, Ni, PAH, PCB and PCDD/F) was evaluated. Total risk from all carcinogens via inhalation was predicted to be less than one in one million. Public comments were received during the 30-day comment period and at a hearing held April 20th in New Richmond. Among the comments, it was pointed out that no analysis was conducted which determined the fate of stack emissions. Of primary concern was the bioaccumulation of dioxin in the food chain after depositing on the ground or surface waters. This addendum to the review of the air permit application addresses this issue.

Procedure

This analysis follows the procedures outlined in a similar 1987 study conducted by Stevens and Gerbec for an RDF burning plant proposed for Elk River, Minnesota.¹ Air concentrations and deposition of dioxin (TCDD equivalent) over land, ponds, rivers and fishable lakes was first determined. The environmental fate of dioxin on soil, on plant surfaces and in water bodies was projected. Next, the bioconcentration and distribution of dioxin in animals and fish was estimated considering their exposures to dioxin in the air, food and water. Lastly, human ingestion of dioxin by inhalation and the food chain was determined and extrapolations made of the potential cancer risk due to the exposure.

Listed below is the conclusions of their analysis on the proposed Elk River, Minnesota RDF burning facility:

TO: American Resource Recovery Air Management file**Non-foodchain Dioxin Exposure**

| | |
|----------------|-------------|
| Inhalation | 0.03 pg/day |
| Soil Ingestion | 0.03 |
| Dermal contact | <u>0.00</u> |
| Subtotal | 0.06 pg/day |

Foodchain Dioxin Exposure

| | |
|------------------------|--------------|
| Milk and Milk Products | 5.04 pg/day |
| Beef | 4.50 |
| Pork | 0.55 |
| Lamb | 0.34 |
| Chicken | 0.00 |
| Egg | <u>0.00</u> |
| Non-fish Subtotal | 10.43 |
| Fish | 30.58 |
| Subtotal | 41.01 pg/day |

Overall Human Dioxin Exposure 41.07 pg/day TCDD Equivalents

Predicted Cancer Risk Level

Risk = $\frac{(\text{Exposure}) (\text{Correction for 20 year plant life}) (\text{Unit risk factor})}{\text{Average weight of exposed individual}}$

$$= \frac{(41.1 \times 10^{-9} \text{ mg/day}) (0.86) (156,000) (\text{mg/kg/d})^{-1}}{70 \text{ kg}}$$

$$= 7.9 \times 10^{-5}$$

Predicted human exposures to dioxin through, non-inhalation routes' (i.e. soil and food ingestion) are essentially proportional to deposition rates for dioxin. Therefore, the procedures used by Stevens and Gerbec will be used to determine non-inhalation exposures to dioxin near the proposed New Richmond incinerator. Corrections will be made using deposition rates predicted by Wisconsin DNR staff for the New Richmond facility and the location of local water bodies.

The TCDD equivalent emissions used for the New Richmond analysis are 1.18×10^6 pounds per hour, 0.25×10^{-6} pounds per ton of refuse burned and 32.27 ng/Nm^3 , dry corrected to 12% CO₂

TO: American Resource Recovery Air Management File

Analysis

Deposition over Land

The deposition rate over land used by Stevens and Gerbec was based on a maximum air concentration of 0.0312 pg/m³ TCDD Equivalents and an average deposition velocity of 0.3 cm/sec. Therefore, the deposition over land (i.e. soil and plants) is calculated as follows:

Deposition Over Land

(Elk River)

$$\begin{aligned} A &= 0.0312 \text{ pg/m}^3 \times 0.3 \text{ cm/sec} \times 0.01 \text{ m/cm} \times 3600 \text{ sec/hr} \times 8760 \text{ hrs/yr} \\ &= 2952 \text{ pg/m}^2/\text{yr} \\ &= 2.95 \text{ ng/m}^2/\text{yr TCDD Equivalents} \end{aligned}$$

Predicting Deposition

Evaluation of the procedures currently used to predict deposition reveals there are several predominant methods in use. The first method utilizes a conservative default deposition velocity of 1 cm/sec. This velocity is applied to predicted air concentrations obtained through dispersion modeling of stack emissions. The second method is that used by the U.S.EPA and the New York Department of Environmental Conservation. In this case, the Industrial Source Complex (ISC) dispersion model is used with its deposition option. The last method utilizes an average deposition velocity calculated from work by Sehmel.²

All three methods produced maximum deposition rates within an order of magnitude of each other for the New Richmond facility. These maximum deposition rates are shown below:

Deposition Over Land

(New Richmond)

$$\begin{aligned} A (1 \text{ cm/sec}) &= 0.015 \text{ pg/m}^3 \times 1 \text{ cm/sec} \times 0.01 \text{ m/cm} \times 3600 \text{ sec/hr} \times 8760 \text{ hrs/yr} \\ &= 4730 \text{ pg/m}^2/\text{yr} \\ &= 4.73 \text{ ng/m}^2/\text{yr} \end{aligned}$$

$$A (\text{ISC}) = 2.36 \text{ ng/m}^2/\text{yr}$$

$$\begin{aligned} A (\text{Sehmel}) &= 0.015 \text{ pg/m}^3 \times 0.186 \text{ cm/sec} \times 0.01 \text{ cm/sec} \times 3600 \text{ sec/hr} \times 8760 \text{ hrs/yr} \\ &= 880 \text{ pg/m}^2/\text{yr} \\ &= 0.88 \text{ ng/m}^2/\text{yr} \end{aligned}$$

TO: American Resource Recovery Air Management File

For the New Richmond incinerator analysis it will be assumed that 1) the soil and plants receive the maximum deposition rates, 2) domesticated animals will be similar to those on farms evaluated by Stevens and Gerbec, and 3) food consumption patterns are similar to those used by Stevens and Gerbec. In this case, an individual is assumed to consume soil and food (e.g. milk, beef, pork, etc.) developed from the most exposed air, soil, and plants. To make the analysis more site specific, dioxin exposure through fish consumption is evaluated separately. While animals are exposed to dioxin by inhalation and drinking water, these routes contribute little to the resulting human exposure. Therefore, no adjustment was made to correct for the differences in these exposure routes for animals between the Elk River and New Richmond analysis.

$$\text{Inhalation Dioxin Exposure} = 0.03 \text{ pg/day} \times \frac{0.015 \text{ pg/m}^3}{0.0312 \text{ pg/m}^3} = 0.01 \text{ pg/day}$$

$$\text{Soil Dioxin Exposure} = 0.03 \text{ pg/day} \times \frac{4.13 \text{ ng/m}^2/\text{yr}}{2.95 \text{ ng/m}^2/\text{yr}} = 0.05 \text{ pg/day}$$

(1 cm/sec)

$$\text{Soil Dioxin Exposure} = 0.03 \text{ pg/day} \times \frac{2.36 \text{ ng/m}^2/\text{yr}}{2.95 \text{ ng/m}^2/\text{yr}} = 0.02 \text{ pg/day}$$

(ISC)

$$\text{Soil Dioxin exposure} = 0.03 \text{ pg/day} \times \frac{0.88 \text{ ng/m}^2/\text{yr}}{2.95 \text{ ng/m}^2/\text{yr}} = 0.01 \text{ pg/day}$$

(Sehmel)

$$\text{Non-Fish Foodchain Dioxin Exposure} = 10.43 \text{ pg/day} \times \frac{4.13 \text{ mg/m}^2/\text{yr}}{2.95 \text{ ng/m}^2/\text{yr}} = 16.72 \text{ pg/day}$$

(1 cm/sec)

$$\text{Non-Fish Foodchain Dioxin Exposure} = 10.43 \text{ pg/day} \times \frac{2.36 \text{ mg/m}^2/\text{yr}}{2.95 \text{ ng/m}^2/\text{yr}} = 8.34 \text{ pg/day}$$

(ISC)

$$\text{Non-Fish Foodchain Dioxin Exposure} = 10.43 \text{ pg/day} \times \frac{0.88 \text{ mg/m}^2/\text{yr}}{2.95 \text{ ng/m}^2/\text{yr}} = 3.11 \text{ pg/day}$$

(Sehmel)

Stevens and Gerbec evaluated dioxin exposure via fish consumption considering deposition on fishable lakes over a four county area. An air concentration of 0.010 pg/m³ and a deposition velocity of 0.1 cm/sec were used. Therefore, the deposition rate was 0.315 ng/m²/yr. It was assumed that all the fish consumed by an individual would come from the lakes in this four county area.

This deposition rate is higher than rates predicted for areas two or more miles from the New Richmond incinerator using the Sehmel or U.S. EPA methods for predicting deposition. It will be assumed for a worst case scenario that a person regularly consumes fish caught within the two mile radius around the incinerator. Surface waters in this area include Hatfield Lake, Strand Lake, and the Willow River.

Estimates are made for Hatfield Lake. It is located one mile from the incineration, approximately 80 acres in size, and an average depth of 7 feet-

TO: American Resource Recovery Air Management File

Hatfield Lake Deposition

Surface Area = 80 acres x 4046.9 m²/acre = 323,752 m²

Volume = 323,752 m² x 7 ft x 0.3048 m/ft = 690,757 m³

Dioxin Input (1 cm/sec) =
$$\frac{(0.0126 \text{ pg/m}^3)(1 \text{ cm/sec})(0.01 \text{ m/cm})(3600 \text{ sec/hr})(8760 \text{ hrs/yr})(323,752 \text{ m}^2)}{690,757 \text{ m}^3}$$

= 1862 pg/m³/yr

Dioxin Concentration in Lake (1 cm/sec) = $\frac{\text{Dioxin Input}}{k_e t}$

$$= \frac{1862 \text{ pg/m}^3/\text{yr}}{(1.2 \times 10^{-3}) \text{ day}^{-1} \times 365 \text{ days/yr}}$$

= 4252 pg/m³

= 4.25 pg/L

The uptake of dioxin from the water by fish and by humans is proportional to the water dioxin concentration. Exposure is extrapolated from Stevens and Gerbec who calculated 30.58 pg/day of human exposure to dioxin in fish with a dioxin concentration in lake water of 0.28 pg/L.

Exposure to Dioxin Via Fish = 30.58 pg/d x $\frac{4.25 \text{ pg/L}}{0.28 \text{ pg/L}}$
(1 cm/sec)

= 464.16 pg/d

The dioxin concentration in lake water is also proportional to the deposition rate.

Exposure to Dioxin Via Fish = 464.16 pg/d x $\frac{0.86 \text{ ng/m}^2/\text{yr}}{3.97 \text{ ng/m}^2/\text{yr}}$
(U.S.EPA)

= 100.46 pg/d

Using Sehmel's method, the deposition velocity over water is 0.103 cm/sec. The dioxin concentration in lake water is proportional to the deposition velocity.

Exposure to Dioxin Via Fish = 464.16 pg/d x $\frac{0.103 \text{ cm/sec}}{1 \text{ cm/sec}}$
(Sehmel)

= 47.81 pg/d

TO: American Resource Recovery Air Management File

Summary of Worst Case Dioxin Exposure Near New Richmond Incinerator

(pg/day)

| | <u>1 cm/sec Method</u> | <u>ISC Method</u> | <u>Sehmel Method</u> |
|--------------------|----------------------------|-----------------------|--------------------------|
| Inhalation | 0.01 | 0.01 | 0.01 |
| Soil | 0.05 | 0.02 | 0.01 |
| Non-fish Foodchain | 16.72 | 8.34 | 3.11 |
| Fish-Hatfield Lake | <u>464.16</u> | <u>100.46</u> | 47.81 |
| | 480.94 | 108.83 | 50.94 |

Summary of Cancer Risk Level Assuming 20 Years Plant Life

$$\text{Risk (1 cm/sec Method)} = \frac{480.94 \times 10^{-9}}{70} \times 0.86 \times 156,000 = 9.21 \times 10^{-4}$$

$$\text{Risk (ISC Method)} = \frac{108.83 \times 10^{-9}}{70} \times 0.86 \times 156,000 = 2.09 \times 10^{-4}$$

$$\text{Risk (Sehmel Method)} = \frac{50.94 \times 10^{-9}}{70} \times 0.86 \times 156,000 = 9.76 \times 10^{-5}$$

Non-Dioxin Emissions

This analysis only addressed exposure to dioxin coming from the proposed refuse incineration facility. Emission estimates have been made for other known or suspected carcinogens such as arsenic, cadmium, chromium, nickel, polycyclic aromatic hydrocarbons and polychlorinated biphenyls. Using the ratio between the unit risk value for each of these pollutants and that for 2, 3, 7, 8 - TCDD, the non-dioxin emissions can be roughly converted to dioxin equivalent emissions. If this is done, the inhalation toxicity of the non-dioxin emissions are roughly nine times greater than the predicted dioxin/furan emissions. Assuming similar modes of deposition, environmental half lives and bioavailability as TCDD, the food chain risks predicted here may be nine times greater. Further analysis is necessary for the non-dioxin pollutants since they may be emitted in the gaseous phase (i. e. PAH), have negligible half lives (i. e. trace metals) or not be accumulated in the food chain.

Conclusion

The previous analysis evaluating the impact of stack emissions from the proposed American Resource Recovery refuse incinerator facility addressed only

TO: American Resource Recovery Air Management File

exposure via inhalation. Total combined cancer risk from seven known or suspected carcinogens was predicted to be less than 1×10^{-6} for inhalation. The analysis conducted here shows that risk from non-inhalation routes of exposure range from 9.76×10^{-5} to 9.21×10^{-4} . This only considers exposure to polychlorinated dibenzo - p - dioxin and polychlorinated dibenzofurans.

Recommendations

This rough analysis indicates that non-inhalation routes of exposure are significant. Additional measures should be considered to reduce the emissions and impact. Other resource recovery facilities have achieved emission levels for trace metals and organics, two orders of magnitude lower than those anticipated for the New Richmond facility equipped with an ESP.³ These lower emissions have been primarily achieved as a result of 1) improved combustion, 2) more efficient particulate control (i.e. fabric filter-baghouses or high SCA electrostatic precipitators), and 3) the use of dry scrubbing systems to condense and agglomerate trace metals and organics.⁴ Being that the combustion system (i.e. Cadoux technology) is fixed, it is recommended that the proposed electrostatic precipitator be replaced with a dry scrubber/fabric filter baghouse air pollution control system (DS/FF).

This impact analysis was based on projected TCDD Equivalent emissions of 32.3 ng/Nm^3 , dry @ 12% CO₂ (i.e. 1.18×10^{-6} #/hr.). It is suggested that a TCDD Equivalent limitation of 3 ng/Nm^3 be included in the air permit. Other DS/FF equipped facilities have achieved emissions as low as 0.108 ng/Nm^3 .⁵

The limitations for other pollutants should be reduced to insure proper operation of the control system and reductions in trace metals and organics. Suggested limits are a particulate limit of 0.015 gr/dscf @ 12% CO₂, a sulfur dioxide limit of 50 ppmv @ 12% CO₂, a lead limit of 1.07×10^{-4} gr/dscf @ 12% CO₂ (0.71% of the particulate emissions), and a hydrogen chloride limit of 50 ppmv @ 12% CO₂. All these limitations have been easily achieved with DS/FF air pollution control systems.³ Stack tests would verify compliance with these limitations. Continuous monitoring of the scrubbing liquid flow rate, inlet temperature to the baghouse and pressure drop across the baghouse would indirectly verify long-term compliance between stack tests.

It is expected that with the DS/FF control equipment, the emissions and deposition impacts of the proposed New Richmond resource recovery incineration facility will be significantly reduced.

It is recommended that the air permit be issued contingent upon the installation and use of the dry scrubber/fabric filter baghouse control system

TO: American Resource Recovery Air Management File

References

- 1 **Stevens, J. and Gerbec, E., Dioxin in the Foodchain: A Model for Calculating Health Risk from RDF Incinerators, University of Minnesota, March 25, 1987.**
- 2 **Sehmel, G., Particle and Gas Dry Deposition: A Review, Atmospheric Environment Vol. 1, pp. 983-1011.**
- 3 **Midwest Research Institute, Municipal Waste Combustion Study: Emission Data Base for Municipal Waste Combustion (Review Draft), January 7, 1987.**
- 4 **Clarke, M., Emission Control Technologies for Resource Recovery Facilities, Paper presented at Symposium on Environmental Pollution in the Urban Area, March 15, 1986.**
- 5 **Ogden Projects, Xnc., Executive Summary of Stack Tests at Marion County Solid Waste-to-Energy Facility conducted September 22 to October 8, 1986, Brooks, Oregon.**

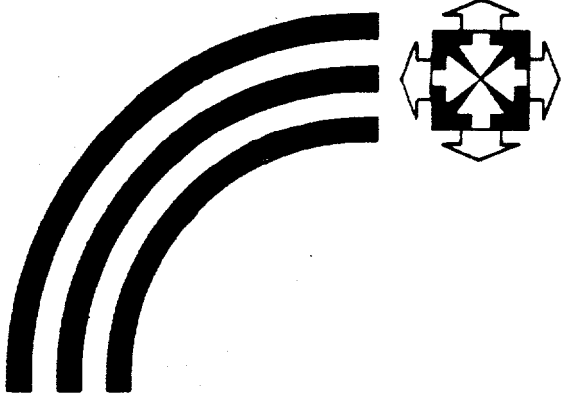
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**cc: D. Theier - AM/3
P. Didier - SW/3
H. Druckemiller - EA/6
T. Woletz - WCD
R. Dunst - TS/2**

APPENDIX Q

EUROPE

- Q.1 Letter and Covering Note from Centre for Environmental Management and Planning (CEMP)
- Q.2 European Economic Community Environmental Impact Directive, Annex III
- Q.3 World Health Organization, Suggestions for research based on report, Health and Safety Component of Environmental Impact Assessment: Case-study Analysis of Environmental Assessments of Chemical Industry Projects (unpublished report)



APPENDIX Q.1

CENTRE FOR ENVIRONMENTAL MANAGEMENT AND PLANNING

Our ref: RC62/MD

Your ref:

14 October 1987

Ms J S Simon
8 Assiniboine Road
Appt. 1501 North Yorks
Ontario MSJ 1L4
CANADA

Dear Jennifer,

We have pleasure in forwarding to you our report which comprises a review of some 20 environmental statements and assessments covering a range of projects in ten countries in Europe and Scandinavia. Obviously the study has not been comprehensive and has been, of necessity, confined somewhat selectively to those reports that could be obtained and reviewed within the short period of time available. As proposed in Mr Clark's interim report a number of the statements obtained were in summary form and it is not clear in most of these cases which organizations, consultants etc were involved in the preparation of the parent report or what 'scope had been determined.

Where relevant, we have indicated this limitation in the **attachement**. Our review has addressed the questions- enumerated in your " Proposal for Research" with reference confined to the documents reviewed by specifically answering questions 7-21 in the questionnaire **that you prepared**. We have not **summarised the national legislation or the agencies involved in requirements for and reviewing of EIAs**. As you can see, several of the cases were from countries outside the EEC or **preceeded** the EEC environmental impact directive (85/337/EEC); however this draft directive has been a strong influence on the development of EIA procedures in Europe, and in Scandinavia during the time reviewed.

It may be worth noting, that the preamble to the directive mentions that "the best environmental policy consists in preventing the creation of pollution of nuisances at source..." and states "the effects of a project on the environment must be assessed in order to take account of concerns to protect human health...". Article 3 requires the EIA to identify, describe and assess "... the direct and indirect effects of a project on..." inter alia human beings, fauna and

flora. However, the specific requirements for health related information for projects falling within the Directive is confined under Article 5 (**Annexs III**) to "... an estimate of . . . emissions (**..noise, vibration etc**)" and a "description of the aspects of the environment likely to be significantly affected including population, fauna" etc.

The review of the **EIAs** and **EISs** and the following general comments should therefore be seen in the light of the limited guidance that the Directive offers on the inclusion of health considerations in environmental impact assessments.

- Even although a number of the projects were conducted in countries outside the EEC, the influence of the EEC Directive and other policy statements may tend to preclude consideration of human health aspects within **EIAs** . This may also be favoured by the tradition to separate the consideration of health and environment e.g. in different regulatory agencies. Health is often considered as an aspect of safety: this is borne out by the greater consideration given to human health in the **EIAs** relating to the nuclear industry, where perceived risks to human health are probably greater.

- From the limited evidence there is tendency to consider the day to day operation of a project rather than consider potential incidents which could have a far greater effect on human health. **On** the other hand, there is no clear evidence of greater consideration either to health effects "within the factory fence" or to effects arising from **exposure** of humans in the external environment.

- It is clear from some of the statements that separate documentation on health exists. It was not possible to obtain any such documentation or to determine the extent to which it would be publicly available. **Indeed,we** are aware of a number of documents, produced by members of the petrochemical **industry, that** are not made available to the public.

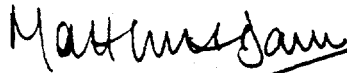
- Health does not appear to have been identified as a major issue in preliminary "scoping" of **EIAs**, where this was undertaken and does not appear to have emerged as an issue during public consultation.

I hope that these observations, and the reviews submitted in the attached report are of value to you. You will notice that I have appended a number of papers that discuss the health component of EIA for your interest.

Should you require any clarification of points mentioned in our submission, please do not hesitate to contact me.

Kind regards

Yours sincerely

A handwritten signature in black ink that reads "Matthew H Davies". The signature is written in a cursive style and is positioned above a solid black horizontal line that extends across the width of the signature.

Matthew H Davies
Projects Manager

COVERING NOTE

The purpose of this covering note is to make explicit a number of points pertinent to the study conducted by ourselves. Principally, it discusses the method adopted by the research team, emphasising the assumptions made during the research **and** highlighting the major limitations which were experienced. In addition, it provides some comment on the relationship between health impact assessment and EIA, as sought by the questionnaire.

Due to the difficulty experienced in obtaining a sufficient number of suitable studies, particularly those conducted in Scandinavian countries, a number of summary EIA reports were examined as an alternative. Whilst it must be stressed that these summaries were not accompanied by supporting information, the breadth of investigation was made explicit in each case. Thus, the degree to which health implications were considered could be clearly established.

In all cases, documents were reviewed in order to satisfactorily answer Questions 7-21 posed in the questionnaire provided. It was considered not possible to answer Questions 1-6 as these relate more to the context within which **EIAs** were undertaken rather than to the individual reports.

The fundamental assumption made during this exercise is that the documents reviewed describe the complete range of studies undertaken. Where health did not appear to be considered, within the scope of what was examined, it was assumed that additional documents relating specifically to health did not exist.

As mentioned in our letter, this exercise did not examine the legislative procedures within which EIA is either required or undertaken. It is not possible therefore to comment on the existence or otherwise of a procedural requirement for health to be incorporated within the scope of an EIA. Our observations regarding the European Communities Directive on Environmental Assessment are included in our letter however.

It is perhaps prudent to highlight the major limitations of this investigation as it inevitably has bearing on the conclusions drawn. It stems from the difficulty experienced, in part due to the confidentiality of many reports, in obtaining examples of sufficient relevance and quality to merit review. In the absence of any available yardstick with which to assess suitability, the observations made during this investigation are limited by the degree to which the sample is representative of studies undertaken in Europe. In addition, inevitably, time and financial resources have imposed limitations on the exercise.

With respect **to** the nine questions posed in Section 4.2 of the Interim Report, a number of points may be made.

First is that whilst the questions are of a generic nature and would produce equivalent responses in Europe to those in North America, it must be noted that the legislative context of EIA within Europe is not, as yet, well established. Concerns within Europe are more fundamental and it is likely that the wish would prevail to establish EIA more firmly, postponing attention to the incorporation of health to a later date.

Secondly, as indicated in our letter, health has traditionally been considered a part of safety rather than environment, though the adequacy of this is undetermined. Thus, whilst it may not be considered during the course of EIA, it does not necessarily follow that health considerations are omitted from the planning process.

Thirdly /

40

Thirdly, and more by way of an academic observation, the questions presuppose the adequate incorporation of health within EIA and seems to preclude observations from cases where health is considered an integral part of EIA. Of potential value therefore would be an attempt to determine whether examples exist which illustrate the integration of HIA and EIA, and if so, what elements can be identified that make this arrangement successful and desirable.

Our own comments on the questions posed follow. Please note that a number of questions cannot be answered and so have been omitted.

DO YOU CONSIDER THE FOLLOWING COMPONENTS OF A HEALTH IMPACT ASSESSMENT IMPORTANT TO INCLUDE IN EIA?

- INVOLVEMENT OF HEALTH PROFESSIONALS FROM THE BEGINNING?

Yes, but not necessarily members of the medical profession, but rather those with a technical knowledge of the implications of certain elements of the proposal to human health.

- STUDY OF BASELINE HEALTH DATA?

Yes, but within realistic time and cost boundaries.

- STUDY OF CRITICAL SUBPOPULATIONS?

Yes, where appropriate.

- STUDY OF POTENTIAL IMPACTS TO FUTURE GENERATIONS?

Yes, within realistic time projections.

- STUDY OF POTENTIAL IMPACTS TO:

RESIDENTS DURING PLANT CONSTRUCTION?

Yes, within a clearly defined geographical area.

CONSTRUCTION WORKERS?

Yes, but distinct from statutory "health and safety" considerations which already exist.

FUTURE EMPLOYEES AT OPERATION PLANT?

As above.

- REVIEW OF EXISTING STUDIES AND LITERATURE?

If available.

- REVIEW OF SHORT AND LONG-TERM IMPACTS?

Yes, if clearly defined.

- Public/

PUBLIC PARTICIPATION?

Yes, means must be sought to avoid "alarmist" situations developing. Genuine participation should be sought.

- STUDY OF ACCUMULATIVE EFFECTS?

Yes.

- INVESTIGATION OF MITIGATION MEASURES?

Yes, and the manner in which they are implemented.

- DEVELOPMENT OF EMERGENCY RESPONSE PROCEDURES?

Yes, this should be expanded beyond the nuclear industry.

- DEVELOPMENT OF MONITORING PROGRAMME?

Yes, this should form part of an auditing exercise, undertaken to review the predictions made during the assessment and to assess the effectiveness of mitigation and of administrative procedures.

DO YOU HAVE ANY SUGGESTIONS ON HOW TO MAKE HEALTH IMPACT ASSESSMENT AN ACHIEVABLE AND PRACTICAL COMPONENT OF EIA?

No further comment.

WHAT IMPROVEMENTS, IF ANY, DO YOU RECOMMEND FOR HEALTH IMPACT ASSESSMENT IN EIA?

There is a need to ensure that the assessment process is reiterative and that experience generated from one assessment is **utilized** in the next. Auditing is an essential but as yet insufficiently **recognized**, element of EIA. It is perhaps of greater importance, in assessing effects to human health, that predictions are accurate and thus mitigation designed, appropriate.

- DO YOU **KNOW** OF ANY AREAS IN HEALTH IMPACT ASSESSMENT WHERE RESEARCH IS URGENTLY NEEDED?

Again more of a comment related to EIA generically, but there is a need to establish with greater precision the relationship between impact assessment and policy formulation. The role of **HIA** in, not only health policy formulation, but policy making within a wider context, must be increased.

DO YOU NEED PROCEDURAL GUIDELINES.....?

No further comment.

WOULD NATURAL AMBIENT STANDARDS ESTABLISHED FOR A WIDE VARIETY OF CHEMICALS AND POLLUTANTS ASSIST THE HEALTH ASSESSMENT PROCESS?

Yes, but a situation should not be encouraged where the objective is to merely meet standards. The objective of assessment is to predict effects and avoid them as necessary rather than to assure compliance with certain standards.

This/

This covering note has attempted to place in context the investigation undertaken of European experience in health impact assessment. The overriding point to stress in conclusion, is that only next year does EIA become mandatory within EEC member states. As such, health impact assessment is not made explicit and is likely to reflect in part a lack of awareness of the relationship between EIA and **HIA**. Impact assessment, in practical terms, is still relatively immature within Europe, and this must be borne in mind when considering the findings of this investigation.

M.H. Davies
October 1987

ANNEX III

INFORMATION REFERRED TO IN ARTICLE 5 (1)

1. Description of the project, including in particular :
 - a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases,
 - a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used,
 - an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.
2. Where appropriate, an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.
3. A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.
4. A description (1) of the likely significant effects of the proposed project on the environment resulting from:
 - the existence of the project,
 - the use of natural resources,
 - the emission of pollutants, the creation of nuisances and the elimination of waste ;
 and the description by the developer of the forecasting methods used to assess the effects on the environment.
5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment
6. A non-technical summary of the information provided under the above headings.
7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.

(1) This description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.

APPENDIX Q.3

SUGGESTIONS FOR RESEARCH

Excerpt from the WHO report: The Health and Safety Component of Environmental Impact Assessment: Case-study Analysis of Environmental Assessments of Chemical Industry Projects

Topics for discussion and further research:

- "The relationship between EIA and EHIA. Should EHIA be a subsection of an EIA or a separate document?
- How should the WHO/EURO EHIA model process be applied to industrial projects? Does the application proposed in this report require refinement?
- Are present EIA methods sufficient for the identification and assessment of health impacts? There is need for guidance on appropriate methods.
- The problem of communication to the public of negative health effects remains. Should EHIAs always be public documents or are there circumstances when confidentiality is justified?
- Should health effects be quantified in terms of morbidity and mortality when such computations are possible, or are qualitative descriptions of health effects preferable?
- Does EHIA have a role in the resolution of conflicts of interest, where negative health impacts affect one group and benefits accrue elsewhere. Are there compensation possibilities?
- Decision rules. Should a "de minimis" approach be used for negative effects, or are other criteria such as risk/benefit or comparative risk appropriate?
- Is there value in proposing standard definitions of toxicity and other hazards (of EEC "Seveso" Directive) and standard descriptive probabilistic terms for consistent use in EHIAs?"

APPENDIX R

PARTICIPANT RESPONSES TO SURVEY QUESTIONS #21-32

SECTION 4.2 GOVERNMENT AND HEALTH RESPONSES TO SURVEY QUESTIONS

In addition to questions regarding current practice, the survey contained questions seeking:

- 1) Suggestions for possible components of health impact assessment in EIA;
- 2) Suggestions for establishing and/or improving the assessment of health impacts in EIA;
- 3) Suggestions for future research activities in health aspects of EIA.

This section presents the responses from government personnel and health professionals to questions on these subjects.

QUESTION: "Do you think a health impact assessment should be a required component of EIA processes in your province?"

Government Responses: Most everyone interviewed from government approves of requiring an assessment of risks to human health as part of an EIA process if potential health impacts appear to be a significant concern. Some provinces and territories note that they would first need to develop a more formal **Environmental Assessment (EA)** process before health could be integrated into it. Many provinces also note that because the conditions will vary from case to case, the level of detail in the health component of the EIA should not be predetermined. **Specific comments made by government respondents include:**

- Health assessment "should not necessarily be a structured procedure;"
- Health "should be addressed as a matter of course;"
- Health assessment "is already included" in EIA;
- "It is a legislated requirement now;"
- "Where significant impacts on health are anticipated, an analysis of the consequences must be done;"
- Health Impact assessment should be required "for certain projects where health impacts are a major concern;"
- "With increasing development, health issues are becoming more important;"
- "With the present procedure, the proponent may proceed without having anticipated all potential impacts."

One government respondent does not believe that health impact assessment should be a required component of EIA, noting that requiring a health impact assessment would be redundant "as the existing system meets health needs."

Health Responses: All health professionals approve of including a health impact assessment as part of EIA but not necessarily as a required component of EIA. Specific comments made by health professionals include:

- Health impact assessment should be a component of EIA "because the ultimate impact is the effect on human health;"
- Health impact assessment is important "to insure that both short and long term effects on health are assessed;"
- Health impact assessment is important to include in EIA "because present system is reactive, not preventative. Present screening procedures [for health issues] should be built into the environmental assessment process (not all projects need health impact assessment but all should be screened the same way to find out which do);"
- Health impact assessment should be a component of EIA "if health issues are relevant to the topic being addressed;" that is, "if potential health impacts exist, they should be addressed."

QUESTION: "Do you consider the following component⁶ of a health impact assessment important to include in EIA?"

Government Responses: The following table displays the government responses to the above question. Most of the responses are in the affirmative. Some participants provide responses other than "yes" or "no." The table displays all comments given. Any repetition, however, has been eliminated.

TABLE 5.1 Environment Participants' Views on Possible Components of Health Impact Assessment

| Component | Yes | No | Other |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Involvement of health professionals from the beginning | Yes; when appropriate. | | Was recommended for the beginning. |
| Study of baseline health data | Yes; when appropriate. If data are available, for example, in a regional or county office, then it should be required. Must be within reasonable time and cost limitations. | No, not on a routine basis. | This is very difficult to do and very costly; but if it is important for the siting of a project, for example, then it should be required. |
| Study of potential mitigation costs | Yes; if, when appropriate | No, not on a routine basis | |
| Study of potential impacts on sensitive areas | Yes; but only where sensitive areas are identified and within reasonable time limitations. | No, not on a routine basis | Unreasonable responsibility exists |
| Study of potential impacts on: <ul style="list-style-type: none"> - sensitive populations - construction workers - future employees at operating plant | Yes; when appropriate and within appropriate national geographical considerations | No, may already be covered by OSHA, Health, and Safety | Yes, also dependent on nature of the project Same as above. |
| | Yes; when appropriate | Same as above | |

TABLE 5.1 Environment Participants' Views on Possible Components of Health Impact Assessment (continued)

| Component | Yes | No | Other |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Review of existing studies and literature | Yes; when appropriate. | No; may not be necessary. | |
| Review of short and long term impacts | Yes; when appropriate and if clearly defined. | | |
| Public participation | Yes; but the public should be involved in a productive manner; public should be involved when appropriate. | No; should not be involved in screening proposals; process would get too onerous. | |
| Study of cumulative exposures/health effects | Yes; when appropriate; but no proven methodology available. | | |
| Investigation of mitigation measures | Yes; when appropriate and should include the manner in which they are implemented. | | |
| Development of emergency response procedures | Yes; when appropriate. | | |
| Development of monitoring program | Yes; when appropriate. | | Not necessarily human health monitoring; State-of-the-Art monitoring may be sufficient. |

Health Responses: Table 4.2.2 displays the responses given by health professionals to this question. Again, many of the responses are in the affirmative, with qualifying comments. Any repetition has been eliminated.

TABLE 4.2.2 HEALTH RESPONSES TO QUESTION 22: "Do you consider the following components of a health Impact assessment important to include in. EIA?"

| Component | Yes | No | Other |
|--------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------|
| involvement of health professionals from the beginning | Yes; when appropriate; It may not be necessary from beginning | | |
| Study of baseline health data | Yes; when appropriate | No; because no proven methodology exists | |
| Study of critical subpopulations | Yes; when appropriate; would only require a literature review, no original studies; | | |
| Study of potential impacts to future generations | Yes; when appropriate | | No proven methodology exists; is it feasible? |
| Study of potential impacts to: | | | |
| - residents during plant construction; | Yes; when appropriate; obtain information through literature | | Depends on the project |
| - construction workers | Same as above comment | | |
| - future employees at operating plant | Same as above comment | | |
| Review of existing studies and literature | Yes; when appropriate | | |

TABLE 4.2.2 HEALTH RESPONSES TO QUESTION 22: "Do you consider the following components of a health impact assessment important to Include in EIA?"
(continued)

| Component | Yes | No | Other |
|----------------------------------------------|------------------------------------------------------|----|-------|
| Review of short and long term impacts | Yes; when appropriate | | |
| Public participation | Yes; when appropriate | | |
| Study of cumulative exposure/health effects | Yes; when appropriate; but need a proven methodology | | |
| Investigation of mitigation measures | Yes; when appropriate | | |
| Development of emergency response procedures | Yes; when appropriate | | |
| Development of monitoring program | Yes; when appropriate | | |

One health **respondent** provides an additional component: examination of multi-media sources. That is, identifying the **media** through which humans may be exposed to a **substance** (air, water, soil, food via skin, lungs, ingestion) **and assessing possible** exposures and dose-responses.

QUESTION: "Do you have any suggestions on how to make health impact assessment an achievable and practical component of EIA?"

Government Responses: Many of the government respondents suggest that health impact assessment may become a more achievable and practical component of EIA by involving health professionals in the assessment process. Some of the

respondents whose provinces have no formal EIA process suggest that an EIA policy be developed that includes health concerns as well as biophysical and socio-economic concerns. Other respondents suggest improving communication between the departments which should be involved in the EIA process (e.g., Environment, Health, Labour, etc). Specific comments have been grouped according to similarity:

"Establish contact with the Health Department for representation within the existing EA Panel structure." "Need to establish "health representation in the process." "Need more active involvement by the Health Department." "Get the Health Department more directly involved;"

"Need EIA guidelines first." "Need to develop EIA in which health is addressed along with biophysical and socio-economic concerns;"

Promote communication and coordination among the various groups/agencies that address health issues in EAs. For example, designate a central coordinating liaison (e.g., Ministry of Health) to coordinate health input and to facilitate cooperation and communication among groups/agencies. "initiate discussions among proponent, departments, and public early in the process to define the important health (and other) issues and concentrate efforts in those areas."

- Develop facility-specific guidelines (e.g., waste incineration projects, highway construction projects, etc.) that outline an appropriate process to assess health issues in the EA. An appropriate body to accomplish this may be a joint federal-provincial group that has health and environmental representatives. Conduct a literature search/review to compare similar project experiences and present findings and recommendations. Develop simpler methods which are documented and more accessible (e.g., models of risk evaluation, clear standards, etc.). Prepare documentation that includes "mental and physical health indicators" in addition to general guidelines on health impact assessment.
- "Increase resources -- time, money, personnel -- so the job can be done well."

Health Responses: The responses from health professionals include:

- An "independent review" (by the Canadian Public Health Association) of issues concerning health impact assessment and of possible health impact assessment procedures should be conducted and should include public input.
- Existing laws and regulations that contain requirements to assess potential health impacts should be enforced.

- **Health representatives should be added to the process. The “integration of resource and health structures at all levels”** should be improved.
- **More** epidemiological studies should be conducted.
- More expertise in the health area is needed. For example, risk assessment and epidemiological expertise and toxicological and environmental health information and resources should be developed in all provinces, but especially in those where such resources **are lacking**.
- A **policy** is needed to “encourage or require” **screening** procedures regarding health impacts.
- Need an EIA Statement of Policy with clearly defined roles for health professionals.

QUESTION: “What Improvements, if any, do you recommend for health impact assessment in EIA?”

Government Responses: This question is **similar** to the **previous** one. While

some responses are the same, new ideas surfaced. These are **listed** below:

Need a more formal **review** procedure for EIA and health impacts.

Need a greater general awareness of health, the environment, and procedures that may be used to safeguard both. Need to ensure that health is seen as a potential issue in **EAs**.

Need to include “health” impact assessment in EIA process. Must include a proper referral system so the Departments of Health and Labour know about projects that are being processed. Must have some kind of Cabinet decree requiring them to **participate** when health is a concern.

Need more direction from the Department of Health.

Need clear **methods** for consistently applying information on potential health impacts to **decision-making** and for balancing this information with information on other potential impacts.

Health Responses: As in the government responses, the health responses to this question are similar to those in the previous question. Additional remarks

include:

- Need better public Input into health and other components of EIA
- Need to investigate the **possibility** of statutorily requiring **health Impact** assessment as part of EIA.
- Need to strengthen and improve enforcement of environmental laws to protect environment and human health.
- Need better **information** on chemicals used in production processes and on the by-products that are generated and discharged into the environment (**e.g., how** chemicals react with each other, how by-products affect the environment **and health, etc.**).
- Need guidelines and checklists for screening and other components of health Impact assessment.
- Need **a** document that is directed at health personnel **explaining** the EIA process and giving concrete examples which illustrate how health personnel may fit into process.

QUESTION: "Do you know of **any areas in health impact assessment where research is urgently needed?**"

Government Responses: Areas of research include:

- Need better Information on the behaviour of toxic chemicals in the environment and on their effects on the environment and human health.
- Need to develop simulation models, **risk analysis, toxicology** analysis, **toxicology data bases, and** "an approach **which** looks at the total human environment."
- Need more precise data on dose-effect relationships.
- Need methodologies to assess cumulative exposure and health effects, potential health effects to future generations, and baseline health status.
- Need to educate health professionals as to the importance of considering the environment in **medicine**.
- Need to develop guidelines for Department of Health and health professionals detailing where they can get involved In the EIA process and how. Also, need guidelines for Department of the Environment detailing when they can involve health professionals.
- Need to develop guidelines for conducting health impact assessment **as** part of EIA for each type of project where health may be a concern.

Health Responses: in addition to what may be inferred from the suggestions made by health professionals in the previous questions, health professionals suggested the following research to improve health impact assessment:

- Need to research “*multi-media sources;” that is, how health may be affected by a substance which has entered the environment and been exposed to humans through more than one medium (e.g., air, water, soil, food via skin, lungs, ingestion).
- Need to research low-dose and long-term effects of pollutants on environment and on human health.
- Need to develop an epidemiological methodology that may be used to assess how much exposure to a substance causes harm.

QUESTION: “Do you need procedural guidelines or a ‘how-to’ guide to assist EIA practitioners in human health’ impact assessment?” “What type of guidelines do you need?” “Do you think the guidelines or ‘how-to’ guides should be standardized nationally?”

Government Responses: Most government participants are in favor of many different “how-to” guides. Only one respondent does not support the development of guidelines because he is concerned that the guidelines “would not apply to the complex processes” that presently address health issues in his province. The majority of those in favor of the idea think that the guidelines should be standardized nationally for a number of reasons. They note that national guidelines for different aspects of health impact assessment could:

- Facilitate comparison of data across Canada;
- Help establish similar health standards across Canada;
- Provide uniformity in applying health impact assessment across Canada;
- Provide a “format for more detailed provincial/territorial guidelines.”

A number of respondents warn, however, that although the guidelines may be developed nationally, they should be flexible enough to allow for regional variations and special circumstances. One respondent suggests two ways in

variations and **special circumstances**. One respondent suggests two ways in which the guidelines and "how-to" guides could be **standardized** nationally: **either** a committee with full provincial representation may be formed to develop a "**national**" approach without federal **facilitation** or the federal government **may** take a lead role in gathering provincial input for the development of the national guidelines.

Guidelines or "how-to" guides recommended for development include:

- **Guidelines** which discuss the types of projects **which** are likely to need a health impact assessment and the kinds of health issues that may be raised for each type of **project**;
- Guidelines outlining **generic** approaches for conducting health impact assessment which are specific to types of projects (i.e., the type of health impact assessment conducted will most likely vary depending on the type of project -- sewage treatment, waste incineration, highway construction, nuclear power plant siting, etc.);
- Reference manual with standards and objectives for each sector of activity (e.g., mining, sewage treatment, waste incineration, etc.) and with a summary of how the standards have been developed, for what region, and how they may be used;
- "How-to" Guides on assessment methodologies (e.g., risk assessment methodologies, and when they are developed, methodologies for assessing potential health **Impacts** for future generations, methodologies for assessing cumulative exposure and health effects, methodologies for **assessing baseline health status, etc.**).

Health Responses: All health professionals are in favor of a number of guidelines and "how-to" guides. They support **national** guidelines for the following reasons:

- National handbooks will **standardize** practices and will allow for easy comparison of projects;
- National guidelines **will** assist the smaller **provinces** that do not have the resources to develop **their** own;
- National guidelines **will** help cut down on costs and save time because health **professionals**, contractors, and government personnel will not have to reinvent the wheel each **time** a health impact assessment is needed;

One respondent noted that if national guidelines are developed, they should be as flexible as possible and should provide a "minimum standard" to allow for variations and regional differences.

The types of documents needed include:

- Guidelines that address the typical health questions that may arise in projects and that discuss methodologies that may be used to answer these questions. This list of questions and the procedures should be nationally applicable;
- Guidelines that describe what EIAs are and how they should be used and how health should be integrated into the process. Practical examples should be included.

QUESTION: Would national ambient standards established for a wide variety of chemicals and pollutants assist the health assessment process?

Government Responses: Most of the government respondents are in favor of national ambient standards for the following reasons:

- The province would not have to re-develop standards which have been developed elsewhere;
- They would provide uniformity;
- They would aid in establishing design criteria and objectives at the beginning of a project;
- Some provinces do not have the expertise to develop standards of their own.

One respondent suggests that the standards could even be internationally developed, decreasing the amount of repetition and making better use of existing knowledge. A few respondents oppose national standards because either the province already has standards which are considered to be better than national standards or the respondent feels that national standards would not be

applicable to northern climates and ecological **condit ions**. Finally, one respondent notes that many national standards are **available** but the levels at which the environment may be affected are usually not **explicit**.

Health Responses: Most health professionals are In favor of national ambient standards for the following reasons:

- National standards **would reduce the amount** of work **required** of a province;
- National standards would reduce the amount of work per **project** that is necessary to determine the levels at **which** a substance **will** affect the environment and human health.

Other comments made by health respondents suggest that the standards should be **easily** accessible and should be **listed** with descriptions of how the standards were set and on what they were based. Also, one respondent **comments** that multi-media standards should be established (**i.e.**, for each substance, standards should be established for air, water, **soil**, food) and perhaps Internationally determined.

A couple of respondents are opposed to national standards for two reasons: 1) one feels that the **provincial** standards are better In that they account for **geographic** diversity, and 2) one feels that national "ranges" would be better; that is, the respondent prefers **"a range of values [rather than one number]** between 'probably completely harmless' levels to 'Just detectable environmental damage' levels.'

QUEST ION: **"Do clearinghouses of health data exist in your province?"**

Government Responses: The **majority** of government respondents are unsure whether clearinghouses of health data **exist** In **their** province, Indicating that these sources of data are not used In many EIA processes. Other respondents

note that mortality and morbidity data are available, but as yet they have not been used in EIA. Many respondents are in support of establishing a clearinghouse (or clearinghouses) as it would be useful in EIA and would reduce the need to conduct original research. Most are in favor of a national (some are in favor of an international) clearinghouse because a great deal of useful data would be available to all provinces and territories. One suggestion is to have a national data base to which all provinces could connect and which would allow each province to enter and retrieve province-specific data as well as access data from around the country. Whatever type of clearinghouse is established, however, one respondent stresses that an educational package would have to be developed to inform the user what data are available, how to access the data, and how to interpret the data.

Types of information that would be useful to gather and store in a clearinghouse include:

- Health-based standards/objectives (e.g., water quality standards/objectives, noise standards, emissions standards);
- Statistics on cancer, deaths, etc.;
- Library of toxicological and epidemiological studies;
- Library of carcinogenic, mutagenic, teratogenic studies.

Those respondents which listed a number of clearinghouses they use to access health data note that they use various health data in EIA for a number of purposes, including the comparison of lists of emissions with lists of carcinogens and statistics on deaths and diseases due to these carcinogens.

Health Responses: Some health professionals in provinces whose government counterparts responded that they are unsure whether clearinghouses of health data exist list a number of sources of health data in the province. All health respondents support the establishment of a national clearinghouse to increase

the amount and type of data available. In addition to Information and **statistics on mortality, morbidity, diseases, and deaths, specific information on the characteristics of populations (e.g., age, sex, occupation, and other census data) would be useful.**

QUESTION: "Should the federal government play a stronger role in providing assistance to provinces regarding health impact assessment in EIA?"

Government Responses: The majority of government participants responded

"yes." They suggest that the federal government:

- Develop a set of national ambient standards for commonly encountered chemicals, pollutants, etc.;
- Provide review personnel in provincial EIAs and participate in provincial EIAs upon request;
- Develop methodologies and procedural guidance on how to conduct health components in EIA;
- Provide advice when sought;
- Develop a data bank;
- Participate in research and development of health impact assessment in EIA;
- Facilitate the integration of health and environment professions/ ministries;
- Launch a Joint provincial-federal board to develop guidelines and to review provincial, territorial, and federal EIA processes to determine where health can become integrated into EIA more effectively.

One respondent replied "no" to the question, opting for site- and project-specific assessments that are provincially determined.

Health Responses: Most of the health participants responded affirmatively to the question. One respondent replied "no," being confident of the province's capability to address health issues in EIA. The respondents who replied "yes" suggest that the federal government:

- Provide both advisory and procedural assistance;
- Establish national ambient standards;
- Assist provinces in upgrading their knowledge in the area;
- Develop an EIA policy describing how health should fit into EIA;
- Develop "how-to" guides for various components of health impact assessment.

APPENDIX S

BIBLIOGRAPHY

BIBLIOGRAPHY

- Andrews, William and John Higham. Protecting the B.C. Environment: A Catalogue of Project Review Processes (Vancouver: Environment Canada) December 1986.
- Bates, David V., Murray, James W., and Valter Raudsepp. "Detailed Table of Contents," Royal Commission of inquiry Into Uranium Mining: Health and Environmental Protection, Commissioners' Report. October 30, 1980.
- British Petroleum. Hope Brook Mine, Newfoundland Environmental Impact Statement, Hope Brook Gold, Inc., August 1986.
- Department of Indian Affairs and Northern Development, Northern Environmental Protection. Environmental Review Procedures for the Northern Region. May 1981.
- Environmental Resources Limited. Environmental Health Impact Assessment of Irrigated Agricultural Development Projects: Guidelines and Recommendations (Copenhagen: World Health Organization, EURO) 1983.
- Environmental Resources Limited. Environmental Health Impact Assessment of Urban Development Projects: Guidelines and Recommendations (Copenhagen: World Health Organization, EURO) 1985.
- Federal Environmental Assessment and Review Office. The Federal Environmental Assessment and Review Process (Ottawa: Ministry of Supply and Services Canada) 1980. Cat. No. En 106-4/1987.
- _____. Guide for Environmental Screening (Ottawa: Ministry of Supply and Services Canada) 1978. Cat. No. En 21-26/1978.
- _____. Initial Assessment Guide (Ottawa; Ministry of Supply and Services Canada) 1986. Cat. No. En 105-36/1986.
- _____. Report of the Environmental Assessment Panel: Beaufort Sea Hydrocarbon Production and Transportation, July 1984, Report No. 25 (Ottawa: Ministry of Supply and Services Canada) 1984. Cat. No. En 105-30/1984.
- _____. Report of the Environmental Assessment Panel: Eldorado Uranium Refinery, R.M. of Corman Park, Saskatchewan, Report No. 13 (Ottawa: Ministry of Supply and Services Canada) 1980. Cat. No. En 105-15/1980.
- _____. Report of the Environmental Assessment Panel: Hibernia Development Project, Newfoundland, December 1985, (Ottawa: Ministry of Supply and Services Canada) 1986. Cat. No. En 105-34/1986.
- _____. Report of the Environmental Assessment Panel: Second Nuclear Reactor, Point Lepreau, New Brunswick, Report No. 29 (Ottawa: Ministry of Supply and Services Canada) 1985. Cat. No. En 105-33/1985.
- _____. "Terms of Reference for the Review of Military Flying Operations Based at Goose Bay, Labrador." 1987.

Food and Drug Administration. "Rules and Regulations: Food and Drug Administration implementing Regulations for NEPA." Federal Register, Friday, April 26, 1985 (Vol. 50, No. 81).

Freshwaterbay Offshore Base Ltd. Freshwaterbay Offshore Base Environmental Impact Statement (St. John's, Nfld: Govt. of Nfld. and Labrador) 1986.

Government of Nfld. and Labrador. Environmental Assessment: A Guide to the Process (Nfld. and Labrador: Ministry of Environment), no date.

Gouvernement du Quebec. Projet d'Inclinateur modulaire de BPC par la compagnie Sanexen International Inc. Dossier No. 3211-20-04, November 1986.

Manitoba Environmental Assessment and Review Agency. An Environmental Assessment and Review Process for Proposed Provincial Projects (Manitoba: Department of Mines, Resources, and Environmental Management) 1986.

Manitoba Hydro. Limestone Generating Station Environmental Impact Statement, Appendix B: "issues Not Expected to Require Impact Assessment," February 1985.

Maritime Nuclear. Lepreau II Environmental Impact Statement, "Table of Contents," May 1984.

Ministry of the Environment of Quebec. General Guide for the Environmental Assessment of Industrial Projects, May 1987.

Monnig, Edward C. "Analysis of Human Health Risks of USDA Forest Service Use of Herbicides to Control Noxious Weeds in the Northern Region" (unpublished report prepared for the USFS), February 1986.

Nova Scotia Environmental Control Council. "Report and Recommendations to the Ministry of Environment following a Public Hearing on the Proposed Tidewater Quarry In Halifax County," Halifax, NS, August 1984.

Ontario Ministry of Environment. General Guidelines for the Preparation of Environmental Assessments (Ontario: Ontario Ministry of Environment) January 1981.

Office of Planning and Research. The California Environmental Quality Act (Sacramento: OPR) June 1986.

_____. State of California General Plan Guidelines (Sacramento: OPR) 1987.

PEEM, Secretariat. Panel of Experts on Environmental Management for Vector Control (PEEM): Report on the Third Meeting, Rome, September 1983.

Regional Municipality of Peel. Investigations for Landfill Sites in Areas I, II, and VI in the City of Brampton, Report No. 1, "Overview and Recommendations;" Report No. 7, "Health and Safety Report". (Peel : Regional Municipality of Peel) March 1987.

Saskatchewan Environment and Public Safety. Saskatchewan Environmental Assessment and Review Process, June 1987.

- _____. Project-Specific Guidelines for the Preparation of an Environmental impact Statement: University of Saskatchewan Proposed Waste incinerator, June 1987.
- _____. Radon Surveys in Saskatchewan, Mines Pollution Control Branch Progress Report, March 1985.
- Saskatchewan Health. "Respiratory Illness in **Estevan**" (unpublished report) 1985.
- US Agency for International Development. Environmental Design Considerations for Rural Development Projects (Washington, DC: US AID) 1980.
- US Department of Agriculture, Forest **Service**. Environmental impact Statement: intermountain Region Noxious Weed and Poisonous Plant Control Program (Ogden, UT: **USFS**) October 1986.
- US Department of the Army.- Draft Environmental impact Statement of the Ground Based Free Electron Laser Technology integration Experiment, White Sands Missile Range, NM (Alabama and Texas: Corps of Engineers) September 1986.
- _____. Environmental Impact Statement: -Chemical Stockpile Disposal Program (MD: . Department of the Army) July 1, 1986.
- US Department of the Interior, Bureau of Land **Management**. Environmental Impact Statement: Supplement to the Northwest Area Noxious Weed Control Program (Oregon: **BLM**) October 1986.
- US EPA. Environmental impact Guidelines for New Source Coal Mines and Coal Cleaning Facilities (Washington, DC: Office of Federal Activities, EPA) October 1981. EPA **130/6-81-002**.
- _____. Environmental impact Guidelines for New Source Leather Tanning and Finishing industries (Washington, DC: Office of Federal Activities, EPA) August 1980. EPA **130/6-80-002**.
- _____. Environmental Impact Guidelines for New Source Phosphate **Fertilizer** Manufacturing **Facilities** (Washington, DC: Office of Federal Activities, EPA) October 1981. EPA **130/6-81-003**.
- _____. Environmental Impact Assessment **Guidelines** for Selected New Source industries (Washington, DC: Office of Federal Activities, EPA) October 1975.
- _____. **Environmental** Impact Statement: Henry W. Pirkey Power Plant Unit- I/South **Hallsville**; Surface Lignite Mine Project/Harrison County, TX (Dallas: US EPA Region VI) March 1982, EPA **906/9-82-004**; September 1982, EPA **906/9-82-011**.
- _____. Environmental Impact Statement: O'Hare Water Reclamation Plant and **Solids** Pipeline, Metropolitan Sanitary District of Greater Chicago (Chicago: US EPA Region V) March 1975.
- _____. Environmental impact Statement: Wastewater Treatment Facilities/ City of Ft. Worth, **Tarrant County, TX** (Dallas: US EPA Region VI) April 1984, EPA **906/9-84-001**; July 1983, EPA **906/9-83-008**.

- _____. "US EPA Guidelines for Carcinogenic Risk Assessment." Federal Register, Wednesday, September 24, 1986, pp. 33992-34003 (Vol. 51, No. 185).
- _____. "US EPA Guidelines for Exposure Assessment." Federal Register, Wednesday, September 24, 1986, pp. 34042-34054 (Vol. 51, No. 185).
- _____. "US EPA Guidelines for Health Risk Assessment of Chemical **Mixtures**." Federal Register, Wednesday, September 24, 1986, pp. 34014-34025 (Vol. 51, No. 185).
- _____. "US EPA Guidelines for the Health Assessment of Suspect Developmental **Toxicants**." Federal Register, Wednesday, September 24, 1986, pp. 34028-34039 (Vol. 51, No. 185).
- _____. "US EPA **Guidelines** for Mutagenicity Risk Assessment." Federal Register, Wednesday, September 24, 1986, pp. 34006-34012 (Vol. 51, No. 185).
- _____. Public Health and Environmental Exposure Assessments Unison PCB Separation Facility, Henderson County, KY (Atlanta: US EPA Region IV) August 1986, EPA **904/9-86-141**.
- _____. Superfund Guidance on Feasibility Studies Under CERCLA (Washington, DC: Office of Emergency and Remedial Response) June 1985, **EPA/540/G-85-003**.
- _____. Uncontrolled Hazardous Waste Site Ranking System: A Users Manual (HW-10). Originally published in the July 16, 1982 Federal Register; 1984.
- World Health Organization. The Health and Safety Component of Environmental Impact Assessment: Case-study Analysis of Environmental Assessment of Chemical Industry Projects (unpublished report for WHO prepared by the Centre for Environmental Management and Planning and Istituto Superiore di Sanita) 1986.
- _____. Health and Safety Component of Environmental Impact Assessment: Report on a WHO meeting, Copenhagen 24-28 February 1986, Environmental Health Series **Publication** No. 15 (Copenhagen: WHO Regional Office for Europe) 1987.

APPENDIX T

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