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UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

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CHICAGO, ILLINOIS 60604

September 1976

# ENVIRONMENTAL IMPACT STATEMENT

# FINAL

## CUYAHOGA VALLEY INTERCEPTOR
## CLEVELAND REGIONAL SEWER DISTRICT

Environmental Protection Agency
Region 5 Library
230 South Dearborn Street
Chicago, Illinois 60604

ENVIRONMENTAL PROTECTION AGENCY

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

SEP 17 1976

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS, AND CITIZENS:

Enclosed is a copy of the Final Environmental Impact Statement for Phase I of the Cuyahoga Valley Interceptor in Cuyahoga and Summit Counties, Ohio.

In accordance with the provisions of the Guidelines of the Council on Environmental Quality (40 CFR 1500.11), no administrative action will be taken by this Agency until thirty days after receipt of the Environmental Impact Statement by the Council.

Sincerely yours,

George R. Alexander, Jr.
Regional Administrator

Enclosure

EPA-5-OH-CUYAHOGA-INT-76

# FINAL ENVIRONMENTAL IMPACT STATEMENT

PHASE I

CUYAHOGA VALLEY INTERCEPTOR

PROPOSED BY

THE CLEVELAND REGIONAL SEWER DISTRICT

Prepared by The

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION V

CHICAGO, ILLINOIS

with The Assistance Of

WAPORA, INC.

WASHINGTON, D.C.

APPROVED BY:

GEORGE R. ALEXANDER, JR.
REGIONAL ADMINISTRATOR

SEPTEMBER 1976

# SUMMARY SHEET

(X) Draft

( ) Final

U.S. Environmental Protection Agency Region V, Chicago

1. (X) Administrative Action

   ( ) Legislative Action

2. Description of the Action

Analysis of alternatives indicates that the overall needs of the Cuyahoga River Basin from Boston Township to Cleveland would be most adequately met by an interceptor adequate to provide regional treatment of sewage for 2020 area population. This statement is for Phase I, a seven mile, 90-inch maximum diameter interceptor sewer running from the Brecksville Sewage Treatment Plant to the Cleveland Southerly Sewage Treatment Plant, with eleven trunk sewers. Construction will be partly tunneled to avoid damage to the Cuyahoga Valley National Recreation Area.

Construction of this phase of the proposed interceptor will result in the abandonment of several existing treatment plants, as well as thousands of septic tank filter fields and the transfer of all wastewater treated by them to the Cleveland Southerly Treatment Plant. The Phase I service area is in Cuyahoga and Summit Counties, Ohio.

3. Environmental Impact

   a. Water

Operation of malfunctioning package plants and septic systems will be discontinued. This will result in reduced BOD, suspended solids, and fecal coliforms discharged to the Cuyahoga River and its tributaries. Dry weather low flow on the river and tributaries will be reduced, moderately in Phase I and significantly in later phases, making runoff proportionally more significant.

   b. Air Quality

Dust generated from construction may temporarily change ambient conditions. Although project generated sludge will be incinerated, the applicant will meet appropriate Ohio emission standards. No significant change in air quality within the Phase I service area is anticipated from implementation of this project.

   c. Land Use

Project construction will allow and probably cause growth to occur in the Phase I and later CVI service area, while establishing centralization of sewer service.

Representative Charles Vanik
Representative Louis Stokes
Representative Ronald Mottl
Representative James Stanton
Council on Environmental Quality
Environmental Protection Agency
Army Corps of Engineers, Buffalo, New York
U.S. Department of the Interior
Geological Survey
Fish and Wildlife Service
Department of Health, Education and Welfare
Forest Service
National Park Service

State

Ohio Environmental Protection Agency
Ohio Department of Natural Resources
Ohio Department of Health

Local

Cleveland Regional Sewer District
Cuyahoga County Regional Planning Commission
Northeast Ohio Areawide Coordinating Agency (NOACA)
Northeast Ohio Four County Planning Organization (NEFCO)

6. Dates

Draft statement made available to:

| | |
|---|---|
| The Council on Environmental Quality | Sept. 17, 1976 |
| The Public | Sept. 24, 1976 |

Acknowledgements

Portions of this Environmental Impact Study were taken from the 1974 draft Environmental Assessment prepared by Euthenics, Inc.; the 1975 Environmental Assessment prepared by Havens and Emerson; Cuyahoga Valley 1975, prepared for the Ohio Department of Natural Resources by several consultants; the Three Rivers Watershed District's 1970 Water Quality Management in the Central Cuyahoga Basin; and the Northeast Ohio Water Development Plan.

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Appendix

A Biological Water Quality Characteristics, Cuyahoga River Tributaries, 1969

B Methodology for Deriving Suburban Employment

C Bibliography

# CHAPTER 1
# BACKGROUND

## A. Project History and Goals

The Cuyahoga River Valley below Akron has undergone many changes in land and water use, which have shaped major land and water use objectives. For at least 6700 years the valley was an aboriginal hunting, fishing and agricultural area. Notable occupants included the Fort Builders, under whom the Valley was part of a transportation system reaching to Lake Superior and the Dakotas, and the Erie Indians, who occupied the entire valley until they were nearly annihilated by the Iroquois in the seventeenth century.

In the middle eighteenth century the valley became an important site of both French and English fur trading posts. Even before the revolution it had become the boundary between Indian and European-held land. The first permanent settlement occurred in 1786 near Valley View, and the economy developed on an agricultural basis for the next forty years.

Opening of the Ohio Canal, which ultimately linked Cleveland with Pittsburgh, brought about the transformation of the Ohio interior from an agricultural to an industrial economy and began a continuing process of abandonment of agricultural land.

The twentieth century saw an intensification of this pattern. The valley's two great cities grew and the river became an open sewer for their municipal and industrial discharges; even now treatment plant effluent forms 80 per cent of low flow at some points on the main channel near Akron. By the middle of the century the river was known as one of the most polluted in the country, the river that periodically caught fire. One of the chief regional water quality goals of the region is the reclamation of the Cuyahoga as a river with recreational, fishery, and aesthetic values.

In spite of the declining water quality, natural and historic values of the area made themselves felt. By 1975 there were over 12,000 acres of valley land in recreational use between Akron and Cleveland. Recognizing this, the U.S. National Park Service proposed and established the Cuyahoga Valley National Recreation Area, eventually to comprise 30,000 acres. Although still in the early stages of land acquisition, this Area may someday become the first national park within the boundaries of one or more major SMSA's. An important land use goal is securing the future integrity and environmental quality of the National Recreation Area.

The valley and its railroads and highways have been a major corridor between Akron and Cleveland, and a whole complex of Cleveland suburbs and exurbs have developed along it. Brooklyn Heights, Cuyahoga Heights, Garfield Heights, Valley View and

Brecksville are well known. Another important objective of land use and water quality planning is the diversion of growth and development into and constructive channels, avoiding urban sprawl, strip development and other blights.

There are many local problems and specific issues, but in the end the nature and future of the Cuyahoga River Valley below Akron will depend on how fully three goals are attained: cleansing and reclamation of the Cuyahoga river and its tributaries; preservation of the remaining natural and cultural values; rational, constructive growth, if any.

Any proposed treatment or other wastewater facility within the valley must be judged in the light of these goals (See Environmental Assessment Figures 6, 7, 10 and 11).

## B. Existing Water Quality Facilities and Agencies

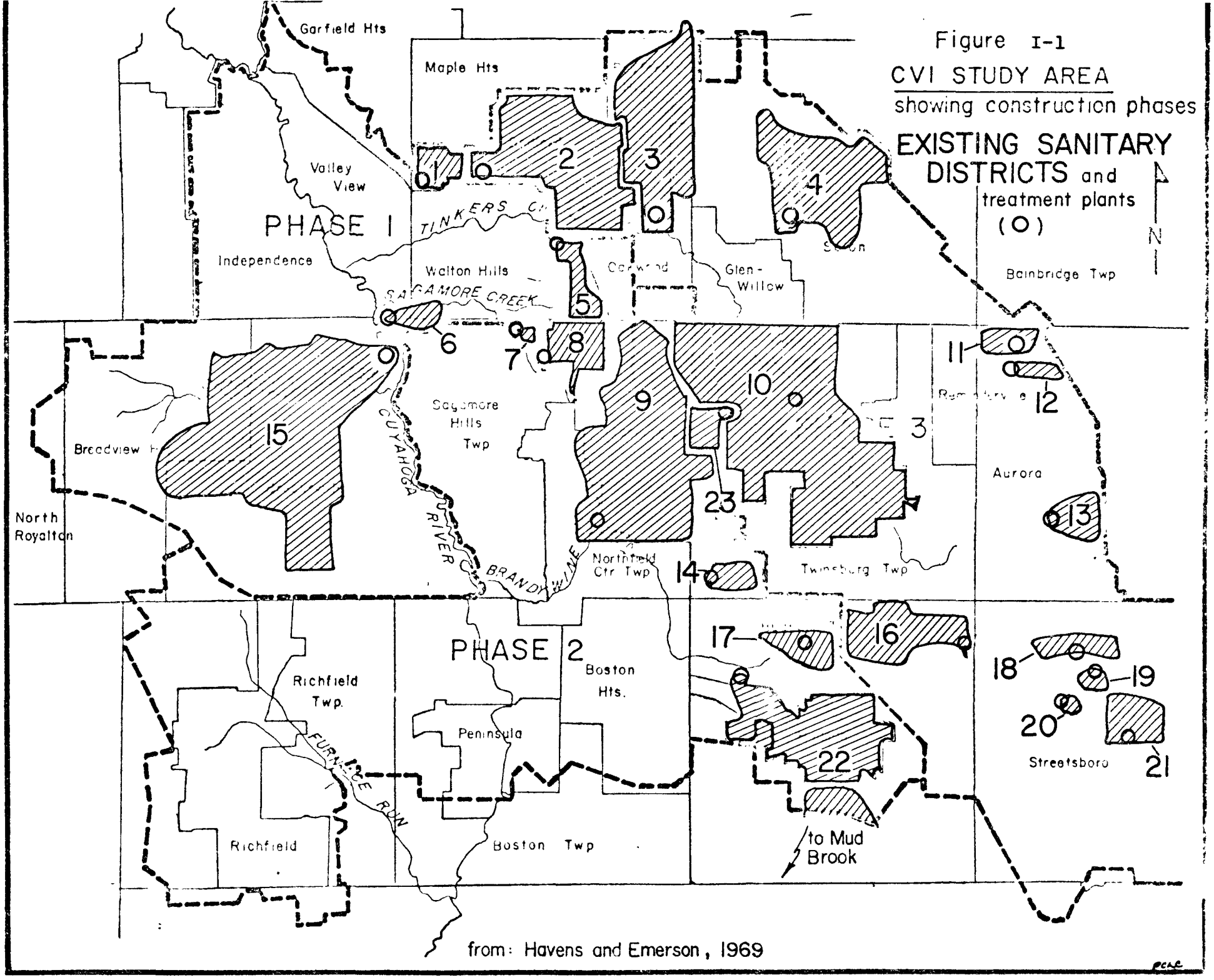
Figure 2 of the EA shows the Cuyahoga River and its tributaries between Akron and Cleveland. Wastewater treatment for Cuyahoga and Summit County municipalities and townships in the Akron-Cleveland corridor was handled as follows in 1970:

| Political Entity | Wastewater Treatment |
|---|---|
| Cuyahoga County | |
| Seven Hills | Cleveland Southerly |
| Independence | Cuyahoga County, Septic Tanks |
| Oakwood | Septic Tanks |
| Valley View | Septic Tanks, Private Systems |
| Solon | One City Plant & Septic Tanks |
| Bedford | City Plant |
| Bedford Heights | City Plant |
| Maple Heights | Cleveland Southerly and City Plant |
| Warrenville Center | Cleveland Southerly |
| Broadview Hieghts | Septic Tanks, Private and County |
| Brecksville | Cuyahoga County-Private Systems |
| North Royalton | Private Systems-Septic Tanks |
| Glenwillow | Septic Tanks |
| Beachwood | Septic Tanks |
| Brooklyn Heights | Cleveland Southerly-Private Systems |
| Summit County | |
| Sagamore Hills | County Plants, Private Systems, Septic Tanks |
| Northfield Village | Village Plant |
| Macedonia | County Plant |
| Twinsburg | City Plant |
| Reminderville | Septic Tanks |
| Twinsburg Township | Septic Tanks |
| Northfield Center Township | County Plants-Septic Tanks |

| Political Entity | Wastewater Treatment |
|---|---|
| Richfield Village | Septic Tanks-Private System |
| Richfield Township | Septic Tanks-Private System |
| Boston Township | Septic Tanks |
| Boston Heights Village | Septic Tanks |
| Peninsula | Septic Tanks |
| Hudson Township | County Plants |
| Hudson Village | Village Plant |
| Bath Township | Septic Tanks-Private Systems |
| Northampton Township | Septic Tanks-Akron |
| Akron | Akron |
| Cuyahoga Falls | Akron |
| Silver Lake | Akron |
| Stow City | Akron-1 small County Plant |
| Munroe Falls | Akron |
| Fairlawn | Akron |
| Copley Township | Akron, County and Septic Tanks |
| Portage County | |
| Aurora Village | Village Plant and 1 County Plant |

The approximate 1970 areas for municipal sewage treatment plants located in the CVI study area are shown in Figure I-1. Additional data on these plants are presented in Section 2 - Natural Environment, of this document. Smaller semi-public and industrial wastewater treatment facilities serve a number of establishments not served by the municipal sewers. These smaller facilities are located in Figure I-2 and are keyed to relevant information in Table I-2. The number of identified point source discharges in Phases I, II and III of the CVI study area are [98]. These discharges have a total effluent volume of [19.3] mgd. Design flows of the small treatment plants and actual 1975 dry weather flows of the larger plants, where available, were used to determine this effluent volume. Those areas not served by the facilities identified in Figures I-1 and I-2 generally rely upon septic tank disposal systems. The operation and distribution of these systems are discussed subsequently in Section 2 - Natural Environment.

Within the Akron-Cleveland Corridor the Northeast Ohio Area-wide Coordinating Agency (NOACA), serving Cuyahoga, Geauga, Lake, Lorain and Medina Counties; and the Northeast Ohio Four County Planning Organization (NEFCO), serving Portage, Summit, Stark, and Wayne Counties, share ultimate planning authority. NOACA is the designated regional A-95 clearing house. Under Section 208 of Public Law 92-500, NOACA is the responsible area waste treatment planning agency for almost the entire Cuyahoga watershed, including Portage and Summit County portions. NEFCO has existed for only about eighteen months and will perform the 208 planning for Portage and Summit Counties under contract to NOACA.




from: Havens and Emerson, 1969

Table I-1 Key to Existing Sanitary Districts Shown in Figure 1-1.

| | | 1975 Flow or Design Capacity/mgd |
|---|---|---|
| 1. | Maple Heights WTP | 0.55 |
| 2. | Bedford WTP | 2.39 |
| 3. | Bedford Heights WTP | 2.68 |
| 4. | Solon WTP | 2.30 |
| 5. | Walton Hills WTP | 0.41 |
| 6. | Hawthornden State Hospital WTP | 0.50 |
| 7. | Nagy Estate WTP | 0.03 |
| 8. | Northfield WTP | 0.585 |
| 9. | Macedonia SD #15 WTP | 1.75 |
| 10. | Twinsburg Township WTP | 2.09 |
| 11. | Aurora Pond WTP | 0.20 |
| 12. | Aurora Acres WTP | 0.06 |
| 13. | Four Seasons WTP | 0.16 |
| 14. | Macedonia SD #9 WTP | 0.13 |
| 15. | Brecksville WTP | 1.27 |
| 16. | Hudson Twp. SD #5 WTP | 0.128 |
| 17. | Hudson Twp. SD #17 WTP | 0.800 |
| 18. | Streetsboro SD #2 WTP | 0.120 |
| 19. | Arrowhead | 0.064 |
| 20. | Euclid Park WTP | |
| 21. | Gille Estate WTP | 0.250 |
| 22. | Hudson WTP | 0.80 |
| 23. | Macedonia SD #1 WTP | 0.090 |
| | | 17.357 mgd |

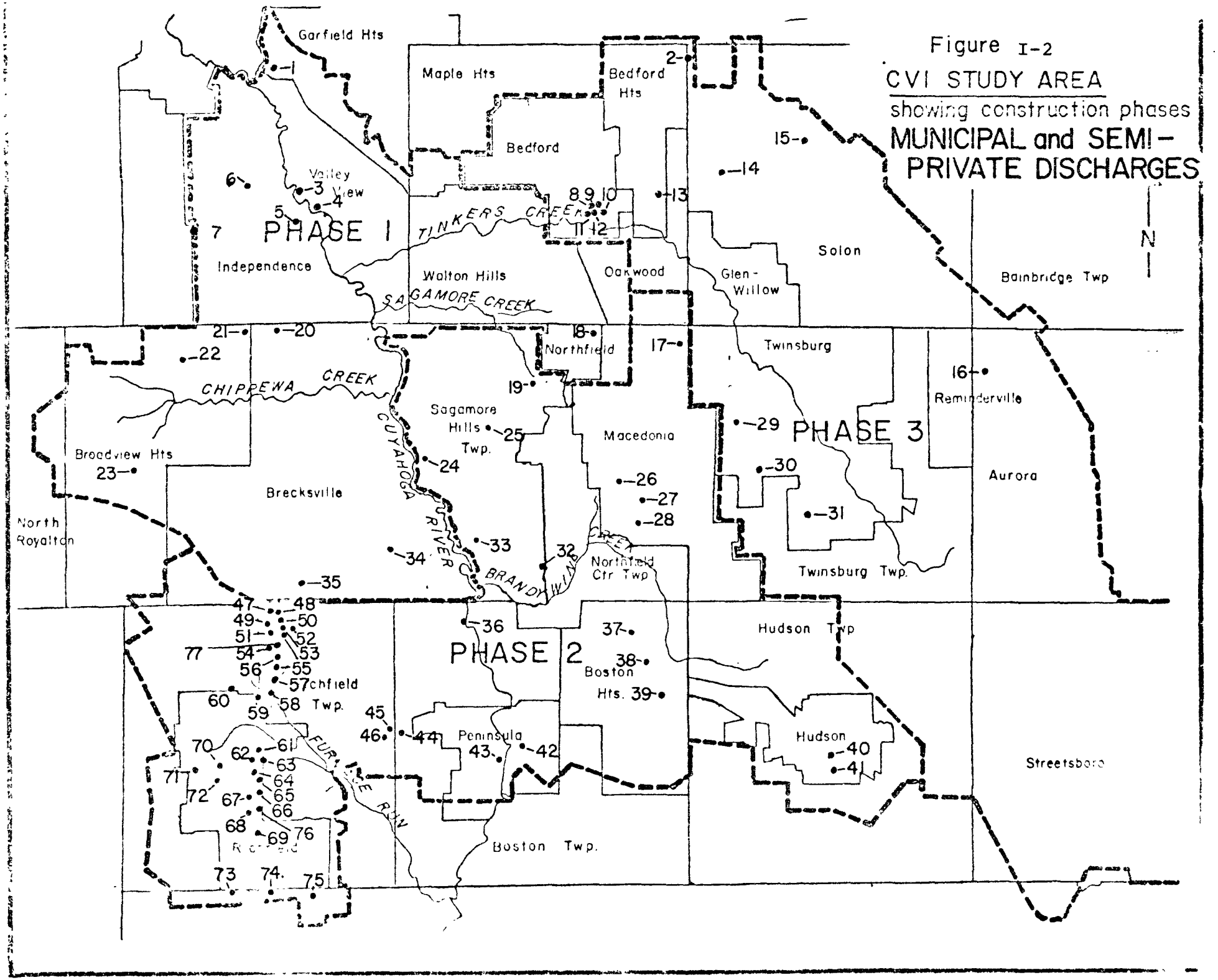


Figure I-2
CVI STUDY AREA
showing construction phases
MUNICIPAL and SEMI-PRIVATE DISCHARGES
N
PHASE 1
PHASE 2
PHASE 3
Garfield Hts
Maple Hts
Bedford Hts
Bedford
Valley View
Independence
Walton Hills
Oakwood
Glen-Willow
Solon
Bainbridge Twp
Northfield
Twinsburg
Reminderville
Sagamore Hills Twp.
Macedonia
Aurora
Broadview Hts
Brecksville
North Royalton
Northfield Ctr Twp
Twinsburg Twp.
Hudson Twp
Boston Hts.
Peninsula
Hudson
Streetsboro
Boston Twp.
TINKERS CREEK
SAGAMORE CREEK
CHIPPEWA CREEK
CUYAHOGA RIVER
BRANDYWINE CREEK
FURNACE RUN

Table I-2 - Key to Industrial and Semi-Public Dischargers Located in Figure I-2.

| | | Design Capacity/MGD |
|---|---|---|
| 1 | Allied Chemical | .050 |
| 2 | Lester Industries | .014 |
| 3 | Valley View | .070 |
| 4 | Hydraulic Press Brick | N.D. |
| 5 | Republic Steel Research | .167 |
| 6 | not known | N.D. |
| 7 | Seven Hills | .052 |
| 8 | Norandex Inc. | .400 |
| 9 | Ferro Corp. | .300 |
| 10 | Great Lakes Etching Co. | .0006 |
| 11 | Jay Mgf. Co. | .006 |
| 12 | Stalwart Rubber Co. | .010 |
| 13 | Walker China | .017 |
| 14 | Zircoa | .113 |
| 15 | Interpace Corp. | .050 |
| 16 | Walden | .160 |
| 17 | Con-Gas Service Corp. | .005 |
| 18 | Northfield Park Raceway | .002 |
| 19 | Fell Lake Park | .004 |
| 20 | Southern | .036 |
| 21 | Bramblewood | .025 |
| 22 | Broadview Heights | N.D. |
| 23 | Seneca Club Apts. | N.D. |
| 24 | Greenwood | .060 |
| 25 | Rushwood School | .006 |
| 26 | Consolidated Natural Gas | .007 |
| 27 | Car Rack Corp. | .003 |
| 28 | Universal Ohio Corp. | .002 |
| 29 | Lake Plata | .003 |
| 30 | Chrysler Corp. | .050 |
| 31 | Northern Ohio Paving Co. | .002 |
| 32 | Tecumseh Corrugated Box | .100 |
| 33 | Brandwine Ski | .008 |
| 34 | Echo Hill | .037 |
| 35 | Cities Service | .0001 |
| 36 | Boston Hills Ski | .005 |
| 37 | Boston Hills C.C. | .006 |
| 38 | Lucerne Products, Inc. | .004 |
| 39 | American Packaging | .003 |
| 40 | Hudson Plating | .005 |

| | | Design Capacity/MGD |
|---|---|---|
| 41 | G.M. | N.D. |
| 42 | Arthur Apts. | .002 |
| 43 | Boston Twp. Jr. High | .015 |
| 44 | Marathon Oil Co. | .002 |
| 45 | Sohio | .002 |
| 46 | Gulf Oil Co.-Holiday Inn | .002 |
| 47 | Yellow Freight System | .002 |
| 48 | Brushwood Motel | .002 |
| 49 | Great Lakes Swim Club | .008 |
| 50 | Summit Motel | .008 |
| 51 | Richfield Dairy Queen | .001 |
| 52 | Lake Motel | .010 |
| 53 | Rainbow Motel | .008 |
| 54 | Gastown | .005 |
| 55 | Sunoco | .010 |
| 56 | Gastown | .030 |
| 57 | Humble Oil Co. | .001 |
| 58 | Richfield Chur.of Christ | N.D. |
| 59 | Richfield Medical Ctr. | N.D. |
| 60 | Ohio 21 Corp.-Holiday Inn | N.D. |
| 61 | Consolidated Freightways | .055 |
| 62 | Lyons Transportation Co. | .005 |
| 63 | Akron Packing | .009 |
| 64 | Robin Wood Hills | N.D. |
| 65 | Cecor Corp. | .002 |
| 66 | PIE Freight Terminal | N.D. |
| 67 | Bender & Loudon Motor Fr. | N.D. |
| 68 | Bernard (PIE) | N.D. |
| 69 | not known | N.D. |
| 70 | Richfield Elem. School | .010 |
| 71 | Jones Dentist | .002 |
| 72 | Terry Point Inn | .002 |
| 73 | Terry Point Inn | .006 |
| 74 | Cities Service | N.D. |
| 75 | Revere Bd. of Education | N.D. |
| 76 | Derr Co. | N.D. |
| 77 | Tourest Restaurant | .013 |

TOTAL REPORTED = 1.746 MGD.

N.D. = No Data.

## C. Existing Problem and Proposed Solution

According to the Ohio Department of Natural Resources, water quality between Akron and Cleveland on the Cuyahoga River is poor. Filtrable and non-filtrable residual conductance, and chlorides are often high. Ammonia, cadmium, and PCB concentrations are often toxic to sensitive organisms. Fecal coliform levels show significant risk of illness to persons engaged in primary and secondary recreation. Aquatic populations comprise only a few pollution tolerant species.

Wastewater generated in the corridor between Cleveland and Akron is treated by a variety of scattered municipal, industrial, semi-public and small private treatment facilities. With the possible exception of a few septic tank disposal systems which use subsurface soil disposal of wastewater, all of this wastewater is discharged to the surface waters in the study area. Treatment efficiencies vary greatly from practically none in old septic tank systems to tertiary treatment in upgraded plants discharging to Tinker's Creek. Below Northhampton Township the Cuyahoga River receives effluent from at least ten treatment plants and a major industrial facility. Many industrial and municipal discharges occur downstream from the Southerly plant, further degrading water quality.

The applicant claims that population in the basin drainage area below Northampton is expected to increase from about 150,000 now to 333,000 by 2020. If present treatment methods are maintained, the heavy pollutant loading of the river should increase further.

To replace these existing treatment plants and septic systems, providing advanced treatment and greatly decreasing the pollution load on the river, Cleveland Regional Sewer District (CRSD), the applicant, has proposed phased construction of the Cuyahoga Valley Interceptor (CVI). This proposed 168 MGD interceptor is seven miles long and 96 inches in maximum diameter. Its first phase runs from the Brecksville treatment plant to the Cleveland Southerly treatment plant in Cuyahoga and Summit Counties, Ohio. If completed in all its phases it will receive sewage from an area ranging from Richfield Township in the west to Reminderville in the east, from Peninsula in the South to Garfield Heights in the north. Extensive improvements now underway at Cleveland Southerly will increase its capacity to serve as a regional treatment facility. See the Environmental Assessment, page 1, 2, 128-9, 132-6 and Figure 16.

The grant application is for the first of three phases, but where possible total program impact will be considered. Phase I includes the main interceptor, a lift station at Cleveland Southerly and eleven trunk sewers. Phase II includes the Brandywine Creek Interceptor south from Brecksville along the valley floor to Peninsula; an east leg serves Macedonia and Hudson in the Brandywine watershed and a west leg serves Richfield Village and Township. Phase III adds the Tinkers Creek Interceptor east from Independence, roughly paralleling Tinkers Creek southeast to Shalersville.

Final system size and capacity depend on present proposed interceptor sizing. The applicant proposes building Phase I and its trunks in the following lengths and sizes:

| Sewer | Length (feet) | Diameter (inches) |
|---|---|---|
| Main Interceptor, Brecksville to Tinkers Creek | 10,000 T* | 78 |
| Main Interceptor, Tinkers Creek to Cleveland Southerly | 25,000 T* | 96 |
| Brecksville Trunk | 19,000 | 30-48 |
| Brooklyn Heights Trunk | 4,700 | 21 |
| Garfield Heights Trunk 1 | 15,900 | 8-30 |
| Garfield Heights Trunk 2 | 900 | 15-21 |
| Hawthornden Trunk | 3,900 | 12-24 |
| Independence Trunk | 2,400 | 15-30 |
| Maple Heights Trunk | 12,500 | 15-27 |
| Northfield Trunk | 7,000 | 8-27 |
| Valley View Trunk 1 | 700 | 21 |
| Valley View Trunk 2 | 400 | 8-10 |
| Walton Hills Trunk | 31,000 | 8-36 |

T* = Tunneled

The Brecksville-Southerly interceptor proposal originated with the Cuyahoga County Board of Supervisors in late 1960. The Three Rivers Watershed District's 1970 Plan for Water Quality Management in the Central Cuyahoga Basin first proposed many of the trunks and extensions. Basic design was completed in 1972. The applicant, the Cleveland Regional Sewer District, submitted a draft environmental assessment to EPA Region 5 in June 1974, resubmitting it in October 1975, after much revision. The applicantion is for a Step 3 grant, with 75 percent Federal funding. Estimated project cost is $36,600,000. The project has a high state priority rating and is numbered C390764-010.

## D. Identified Issues

Environmental issues raised by the project have been identified largely by EPA Region 5 staff and the Ohio Department of Natural Resources. Local agencies and citizens' group have raised few or no objections to the project as yet. Issues include:

1. Impact on Parkland. Two miles of the proposed main interceptor are to be tunneled through existing parkland of the Cuyahoga Valley National Recreation Area. Another three miles follows the western boundary of such land. At least six of the proposed access shafts (manholes) are to be dug very close to or within Area boundaries.

2. Secondary Impact. Project construction, particularly in Phase II (Brandywine Creek Interceptor) will permit sewering of most of the remaining rural portions of the Akron-Cleveland Cuyahoga River Valley Corridor. Some secondary growth effects may be anticipated. Many communities served by this project, particularly Phases I and II, interact with parts of the Cuyahoga Valley National Recreation Area which is now in its initial stages of privately held land acquisition. Almost every Phase I and II community borders on the proposed National Recreation Area. Community development served by the proposed sewers in Phases I and II could impact the Recreation Area.

3. Low Flow Effects. The applicant states that removal of effluent discharges from the Cuyahoga River in the project area will result in low flow reductions of up to 82 per cent on some major tributaries. On several tributaries within the study area, interception of the existing wastewater flows would have the beneficial impact of reducing pollutant concentrations and loads in the streams. However, this would have the adverse impact of detracting from the scenic value of riffle and waterfall stream segments during low flow periods. In particular, the riffle and waterfall segments of Brandywine Creek and Tinkers Creek are major scenic attractions within the Cuyahoga Valley National Recreation Area. During 7 day - 10 year low flow conditions present effluent discharges represent 74 and 82 percent of stream flow respectively in these streams.

4. Sizing and Cost Effectiveness. Within the three phase service area the applicant projects 33 per cent growth by 1980, with progressively smaller increases thereafter. Recent census estimates of existing population for 1973 and 1974 indicate that for the moment population is increasing at a rate far lower than that projected, and declined 5 per cent in the Phase I service area from 1970 to 1973. If this trend continues it could call ultimate project sizing and cost effectiveness into question.

5. Cost Effectiveness of Phases II and III. Included in the wastewater flow projections for sizing Phase I interceptors are projected peak flows from Phase II (25 mgd) and Phase III (95 mgd). Combined, these flows represent 70 percent of the design flow in the 25,000 feet of tunneled interceptor between

Tinker's Creek and Southerly. No cost effective evaluation of alternatives to providing interceptors to Phases II and III has been performed. The areal extent of the three phases is shown in Figure 1-3. Questions about inclusion of Shalersville (east of Streetsboro, Portage County) and parts of Seven Hills, Cuyahoga County have not been completely resolved.

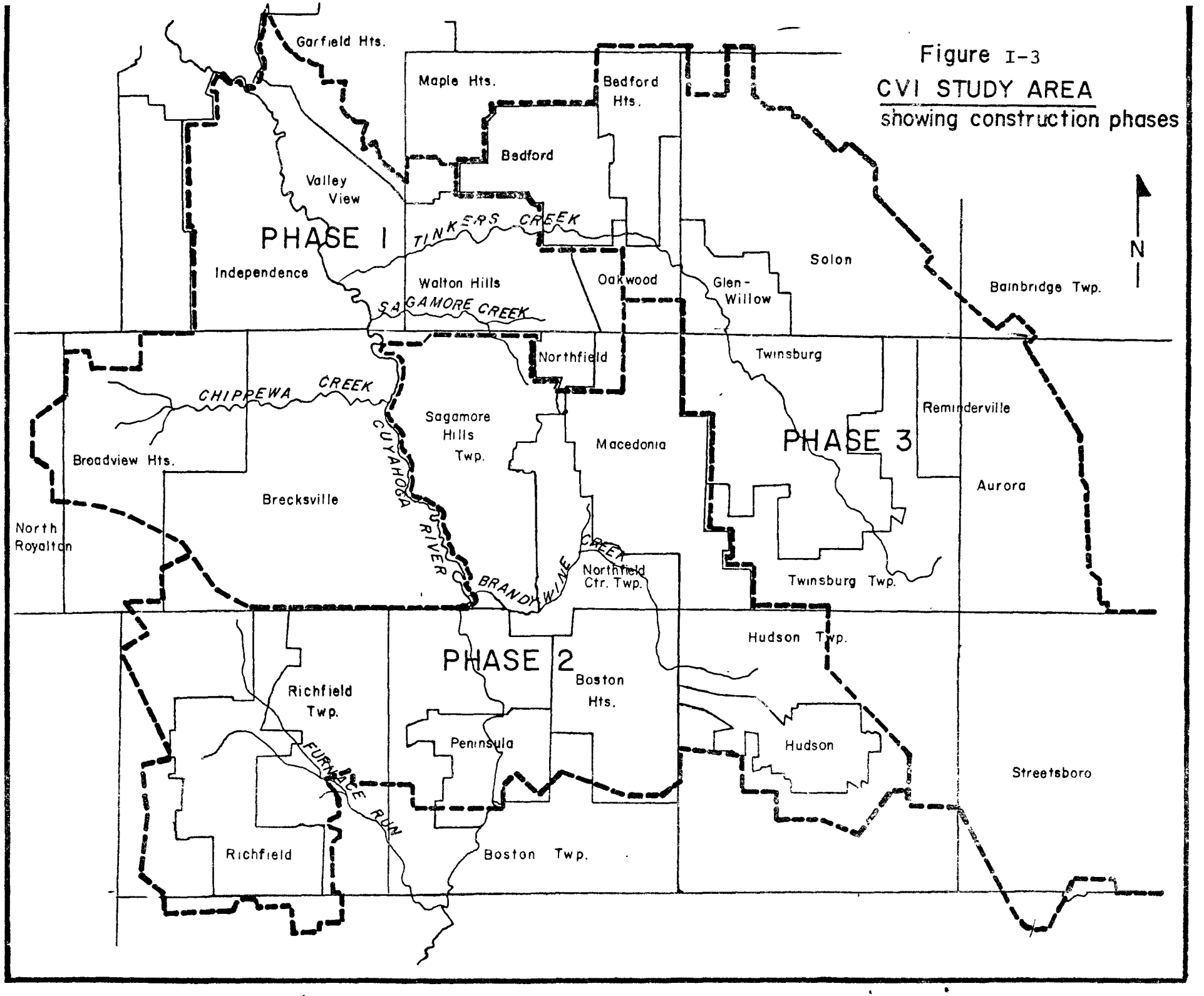



Figure I-3
CVI STUDY AREA
showing construction phases

# CHAPTER 2
# NATURAL ENVIRONMENT

## A. Natural Environment

### 1. Climate and Weather

The description on pages 8 and 9 of the Environmental Assessment is quite accurate, but some points can be expanded upon or clarified. Northeast Ohio, including the service area, is located in the north temperate zone. Its climate is humid with warm summers and cold winters. The mean annual temperature is about 50 degrees F. Average daily temperatures are about 72 degrees in July and 27 degrees in January. Maximum daily temperatures average about 83 degrees in July, ranging from 80 to 85, and low daily temperatures average 19 degrees in January, ranging from 13 to 21 degrees.

Northeast Ohio is located along a line of rain-producing cyclonic storms which move across the nation from west to east. The storm paths converge over the Great Lakes and leave by way of the St. Lawrence River Valley. Portions of the area are subject to tornadic winds. Extreme amounts of precipitation and long drought periods are relatively unknown. The critical growing periods of June and July average just over three and one half inches of rain, with slightly more in June.

The "snow belt" is an area about ten miles wide from north to south, centered about ten miles south of the lake, extending from the Cuyahoga River east into Pennsylvania. Prevailing winds from the lake are moisture laden. As they move across the cooler land mass the moisture condenses and drops in the form of snow or sleet. Chardon, approximatley 20 miles northeast of Valley View, is located in the heart of the snow belt and averages 106 inches of snow and sleet each year, compared with 50 at Cleveland and 48 at Akron.

Over the past five years Akron and Cleveland have experienced a pattern of increased precipitation compared with the early and mid-1960s. From 1960 to 1969 both annual and four month low (JASO = July, August, September and October) precipitation was consistently below average (about 36 inches annually). Since that time it has been consistently above average. Since 1967 there has been only one year with JASO precipitation below 10.5 inches (See Table 2-1). These figures are particularly important as the four months are normally the time of lowest streamflow, when effluent contributions are of greatest significance.

Table 2-1. Akron and Cleveland Precipitation

| Year | Akron Annual | Akron JASO | Cleveland Annual | Cleveland JASO |
|---|---|---|---|---|
| | (inches) | | | |
| 1960 | 27.08 | 7.97 | 31.91 | 13.14 |
| 1961 | 34.35 | 12.60 | 35.36 | 13.08 |
| 1962 | 28.98 | 12.30 | 31.58 | 12.71 |
| 1963 | 23.79 | 6.23 | 18.63 | 6.29 |
| 1964 | 40.82 | 12.93 | 31.40 | 9.71 |
| 1965 | 33.55 | 10.64 | 31.40 | 11.67 |
| 1966 | 29.64 | 8.76 | 31.96 | 10.21 |
| 1967 | 31.88 | 10.79 | 26.79 | 7.94 |
| 1968 | 35.47 | 11.37 | 34.73 | 11.66 |
| 1969 | 32.96 | 11.42 | 39.38 | 13.82 |
| 1970 | 38.23 | 12.41 | 33.66 | 12.20 |
| 1971 | 32.20 | 9.64 | 31.80 | 10.51 |
| 1972 | 43.88 | 18.47 | 48.34 | 17.37 |
| 1973 | 36.79 | 12.58 | 41.25 | 12.79 |
| 1974 | 42.21 | 13.93 | 39.85 | 9.44 |
| 1975 | ----- | 17.73 | ----- | 16.58 |

Of the mean annual precipitation of about 36 inches, about 15 inches runs off in streams. Thus an average of 23 inches is lost from stream flow to evaporation, transpiration, infiltration, and other natural extractions.

All losses from land area, such as transpiration and evaporation, may be reported as the difference between two measurements, precipitation and stream runoff. This loss is called evapotranspiration. The average annual water loss, or evapotranspiration varies only slightly from 21 inches along Lake Erie to 24 inches along the southern boundaries of the service area. Actual evaporation from lakes and reservoirs amounts to about seven inches per year in northeast Ohio.

Other evaporation is greatest during the warm months and is then most critical for agriculture. During the period from May through September, potential evaporation exceeds the normal rainfall by about seven inches.

In 1970 Akron had approximately 27.50 low level (150 meters or less) inversion occurrences per year. Cleveland had about 22.50.

2. Land

Topography

The description of area topography on pages 6 through 8 of the Environmental Assessment is quite accurate. Valley walls do rise from the floodplain at about 580 feet elevation to near 800 feet

at slopes of 10 to 35 per cent. Adjacent basin uplands do slope at less than ten per cent to elevations of 1100 to 1200 feet, and the uplands surrounded by the "V" of the Cuyahoga River drain northwest through Tinkers Creek and Brandywine Creek.

It should be stressed, however, that most valley slopes are 25 per cent or steeper. These occur primarily in the northern portion of the valley and in all tributaries. A small section of the valley at Peninsula and some upland sections of the valley possess moderate slopes in the 0 to 10 per cent range.

The west branch of the Cuyahoga River rises in Hampden Township, fourteen to fifteen transect miles from its mouth at Lake Erie in Cleveland. From its sources in rural Geauga County to its outlet, the river cuts a crooked "V" course, 100 miles in total length, and rains a relatively small 813 square mile watershed. Just south of the bottom of the "V" of the Cuyahoga is the Akron watershed divide, which crosses Ohio on a diagonal. All drainage north of this divide flows to Lake Erie while that which flows south eventually reaches the Ohio River.

Geologic processes have left a valley that is broad, with steep slopes traversed by numerous tributary streams and ravines The river basin is a broad, flat floodplain subject to inundation at varied frequencies. The basin width varies from 500 to 5000 feet and is composed of glacial and post-glacial deposits. Major tributaries in the proposed service area include Tinkers Creek, Furnace Run, Brandywine Creek, Yellow Creek and Slipper Run.

## Geology

The description on pages 2-9, 17-19, and Table 2 of the Environmental Assessment is accurate. Some clarification, however is needed of the sequential geologic and recent seismic history of the service area.

The major Cuyahoga River Valley topographic features as we now know them were created in the later Paleozoic Era. The youngest Paleozoic rock found in the valley forms the Cliffs of Boston and Ritchie ledges. Mississippian sandstone provides the base for the Peninsula. The Wisconsin glaciation, beginning about 65,000 years ago, was responsible for the most drastic changes in the drainage pattern in the Valley. The ice rounded the hilltops and scooped out valleys, only to fill valleys afterwards with glacial debris. Waterfalls developed where the river and its tributaries returned to the more stable pre-glacial channel. Erosion of bedrock in the river has moved Cuyahoga Falls upstream to its present location. Brandywine Falls, on the eastern edge of the valley, is another example of this process. Since the disappearance of the glaciers from this area, only minor changes have occurred in the last 6,500 years.

The Assessment does not mention seismic activity. Although the Cleveland metropolitan area is considered an area of minor seismic risk, it lies only about 50 miles southwest of an area of major seismic risk near the Pennsylvania border along Lake Erie. Moderate earthquakes (V or greater on the modified Mercalli scale) felt in the Cleveland area include:

| | |
|---|---|
| May 1, 1958 | V level earthquake in downtown Celveland. Many were alarmed. |
| May 26, 1955 | Mercalli V earthquake at Cleveland. Buildings creaked, windows rattled, rumbling sounds heard. |
| March 2, 1937 | VII level in western Ohio, centered at Sidney, Anna-felt at Cleveland. |
| March 8, 1937 | VI-VII level earthquake in western Ohio as above; felt more severly at Cleveland than March 2 earthquake. |
| September 9, 1928 | V level earthquake at Lorain and Cleveland. People rushed from houses, felt along Lake. |
| May 26, 1906 | V level earthquake felt at Fariport, Ohio with epicenter just south of Cleveland. Doors slammed, windows rattled. |

Technologists from the Seismic Detection Department of John Carroll University, who provide seismic data for the design of roads and other structures in Ohio and the Cleveland area, have provided the following information regarding the earthquakes intensities in the State of Ohio. The Cleveland area experiences mild tremors or earthquakes that frequently go undetected except by the seismic recorder located in the area. The earthquakes of greatest magnitude in the Cleveland region ranged from IV-VI on this scale as: "Felt by all, many frightened and ran outdoors, Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight."

Since the forces generated by an earthquake are greatest at the surface of the earth, the effects described above are the maximum experienced and subsurface forces are not of sufficient intensity to cause damage to subsurface structures such as pipelines. The region in Ohio subject to earthquakes of greater magnitude than experienced in the Cleveland area is located in the western part of the state, called the Anna area. However, the CVI study area would not be seriously affected by those earthquakes by virtue of its distance from this area.

There are areas in the Cuyahoga River Valley in which the subsurface soil is composed of 150 to 200 feet, and more, of glacial deposits. The test borings made along the route followed by the 96 to 84 inch tunneled interceptor show that the entire length of pipe is placed in firm to rigid clay soils or shale. The earthquake induced movement of subsurface structures placed in soft alluvial soils will be greater than that experienced by structures placed in the rigid shale strate.

There is one section of 96" pipe, 12,000 feet long, (Contract C that is placed entirely in shale. The pipe north and south of this section is placed in firm to rigid clay soil for the most part with the least rigid glacial deposits occurring between Tinker's Creek and the Brecksville wastewater treatment plant (Contract D). The earthquake induced movement of the subsurface pipe structure can be expected to be somewhat greater in the clay strata than that for pipe in the shale strata. Therefore, thedesign of the joints at the manholes and/or access holes located at the transition area between clay and shale should provide sufficient flexibility to minimize bending andshear stresses due to this potential difference in movement. The transition zones occur at the beginning and end of Contract C as designated in the original design drawings for the interceptor.

The problem of differential movement between pipelines and the manholes to which they are connected has been studied and field tests made using steel and concrete pipe. The results of these tests indicate that, "except for cases of great earthquakes in which the ground is destroyed, the movement of the ground and the movement of the pipe are roughly in agreement. Even in cases when large manholes are connected to the pipe, the ground, the manhole and the pipeline generally move together, but it is felt that at this time the manhole restricts the movement of the soil in the vicinity." These findings are based on studies made during the Matsushiro swarm earthquakes in Japan in 1965-1967.

vicinity." These findings are based on studies made during the Matsushiro swarm earthquakes in Japan in 1965-67.

Evaluations of these findings indicate that the potential damage to the main tunneled interceptors, in Phase I, can be considered to be very minor. However, it is recommended that the interceptor design criteria provide for the potential differential pipeline movement that may develop in transition areas where major subsoil strata changes occur, as described above.

Soils

The soils discussion on pages 13-17 of the Environmental Assessment and in Figure 3 is generally adequate and is confirmed by the U.S. Soil Conservation Service Soil Survey of Summit County. It should, however, be stressed that the majority of the trunk sewers will be laid through rough broken land, much of which is high in slope, unstable and subject to slippage.

U.S. Soil Conservation Service assessments of the engineering characteristics of service area soils are summarized below:

| Soil Series | Depth (inches) | Permeability (inches/hour) | pH | Shrink/Swell Potential |
|---|---|---|---|---|
| Berks | 0-12 | 2.0-6.3 | 5.1-5.5 | Low |
| | 12-30 | 2.0-6.3 | 5.1-5.5 | Low |
| | 30-60 | (Siltstone Bedrock) | | |
| Canadice | 0-9 | 0.2-6.3 | 5.1-6.0 | Low |
| | 9-38 | Less than .06 | 5.1-7.3 | High |
| | 38-60 | Less than .06 | 7.4-8.4 | High |
| Carlisle Muck | 0-55 | 2.0-6.3 | 5.6-6.5 | Variable |
| Chagrin | 0-7 | 0.63-2.0 | 5.6-7.8 | Low |
| | 7-28 | 0.63-2.0 | 5.6-7.8 | Low |
| | 28-60 | 2.0-6.3 | 5.6-7.8 | Low |
| Chili | 0-9 | 2.0-6.3 | 4.6-5.0 | Low |
| | 9-42 | 2.0-6.3 | 4.6-5.0 | Low |
| | 42-60 | 6.3-12.0 | 5.6-6.5 | Low |
| Ellsworth | 0-8 | 0.63-2.0 | 5.1-6.0 | Low |
| | 8-31 | 0.06-.20 | 4.6-6.5 | Moderate |
| | 31-60 | 0.06-.20 | 7.4-8.4 | Moderate |
| Fitchville | 0-10 | 0.63-2.0 | 5.1-6.0 | Low |
| | 10-29 | 0.2-0.63 | 4.6-5.5 | Low to Moderate |
| | 29-60 | 0.2-0.63 | 6.6-7.3 | Low |

| | | | | |
|---|---|---|---|---|
| Lobdell | 0-23 | 0.63-2.0 | 5.6-6.5 | Low |
| | 23-60 | 0.63-6.3 | 5.6-6.5 | Low |
| Mahoning | 0-8 | 0.63-2.0 | 5.1-6.5 | Low |
| | 8-38 | 0.06-0.20 | 5.1-6.0 | Moderate |
| | 38-50 | 0.06-2.0 | 7.4-7.8 | Moderate |
| Orrville | 0-30 | 0.63-2.0 | 5.1-6.5 | Low |
| | 30-60 | 0.63-2.0 | 6.1-6.5 | Low |
| Rittmann | 0-6 | 0.63-2.0 | 4.6-5.5 | Low |
| | 6-20 | 0.63-2.0 | 4.6-5.5 | Moderate |
| | 20-46 | 0.06-0.20 | 5.1-6.5 | Low |
| | 46-66 | 0.06-0.20 | 7.4-7.8 | Low |
| Glenford | 0-12 | 0.63-2.0 | 5.1-6.6 | Low |
| | 12-40 | 0.2-0.63 | 4.6-5.5 | Low to Moderate |
| Holly | 0-9 | 0.63-2.0 | 5.6-7.8 | Low |
| | 9-35 | 0.2-0.63 | 5.6-7.8 | Low |
| | 35-60 | 0.63-2.0 | 7.4-7.8 | Moderate |

In order to reach the service areas, the various trunk lines in Phase I must pass through areas of slopes exceeding 12 percent with varying stability. Four classes of instability are:

Class I. Somewhat Unstable

a) Well and excessively well drained soils derived of sands and gravels - erosion hazard on slopes of 12-18%.
b) Well drained loamy soils shallow over sandstone bedrock on slopes of 12-25%--erosion hazard, soil movement over the underlying sandstone bedrock.
c) Moderately well drained silty clay loam to clay loam till soils on slopes of 18%
d) Somewhat poorly to poorly drained fine textured soils shallow over shale bedrock - erosion hazard and soil movement over the underlying shale strata.

Class II. Moderately Unstable

a) Well and excessively well drained soils derived from sands and gravels - erosion hazard slopes of 18-25%
b) Well drained loamy soils, shallow over sandstone bedrock on slopes exceeding 25%
c) Moderately well drained silty clay loam till soils on slopes of 18-25%; erosion hazard and soil movement.
d) Moderately well drained silty soils on slopes of 12-18%, erosion hazard.

Class III. Highly Unstable

a) Well and excessively well drained soils derived from sands and gravels on slopes exceeding 25%, erosion hazard

b) Moderately well drained silty soils on slope of 18-25% erosion hazard and soil movement
c) Moderately well drained silty clay loam to clay loam (733-703) on slopes exceeding 25%, erosion hazard and soil movement.

Class IV. Very Highly Unstable

Areas of interbedded clays and silts on slopes exceeding 25%. These interbedded materials often contain occasional associated sand layers which act as aquifers. These deposits are subject to surface erosion, piping, slumping, earth slides, etc.

In most cases there are no feasible ways to avoid having to pass through these areas, although minor realignment may be considered on the Valley View No. 2 and Maple Heights lines. Throughout the engineering specifications, reference is made to re-sodding areas of steep slopes where trenching is necessary. Also, pipe anchors are specified for pipes located in areas coinciding with Class IV slopes.

Each trunk line which passes through an area of unstable slope is discussed below. Figure 2-1 shows the points at which trunk lines cross the Class IV slopes.

Valley View No. 2

This line crosses approximately 200 feet of Class IV slope, beginning on the east side of Canal Road and terminating at an existing 8 inch sewer line near the tope of the plateau.

The slope rises approximately 75 feet from Canal Road to the intersection with the existing 8 inch line. The proposed line parallels an existing 48 inch storm sewer from Canal Road to the crest of the hill.

The specifications call for 205 feet of 8 inch ductile pipe to be laid at a 22.4 percent grade approximately 10 feet below the existing grade. Pipe anchors are called for below every second bell.

There is no feasible way to avoid crossing this slope, but the aerial photograph shows signs of soil slump in the area which the pipe crosses. This situation should be examined to determine the magnitude of the problem, and its solution.

Garfield Heights Trunk No. 1

This line crosses approximately 200 feet of Class IV slope about 500 feet west of the Cleveland Electric Illuminating Company right-of-way. The vertical rise is about 60 feet from the manhole (STA. 20+00) to manhole (STA 22+00). The specifications call for 190 feet of 14 inch ductile pipe at a 36.05 percent grade, buried about 10 feet below the surface. Pipe anchors are specified at every other bell. There is no way to avoid this slope without increased disruption.

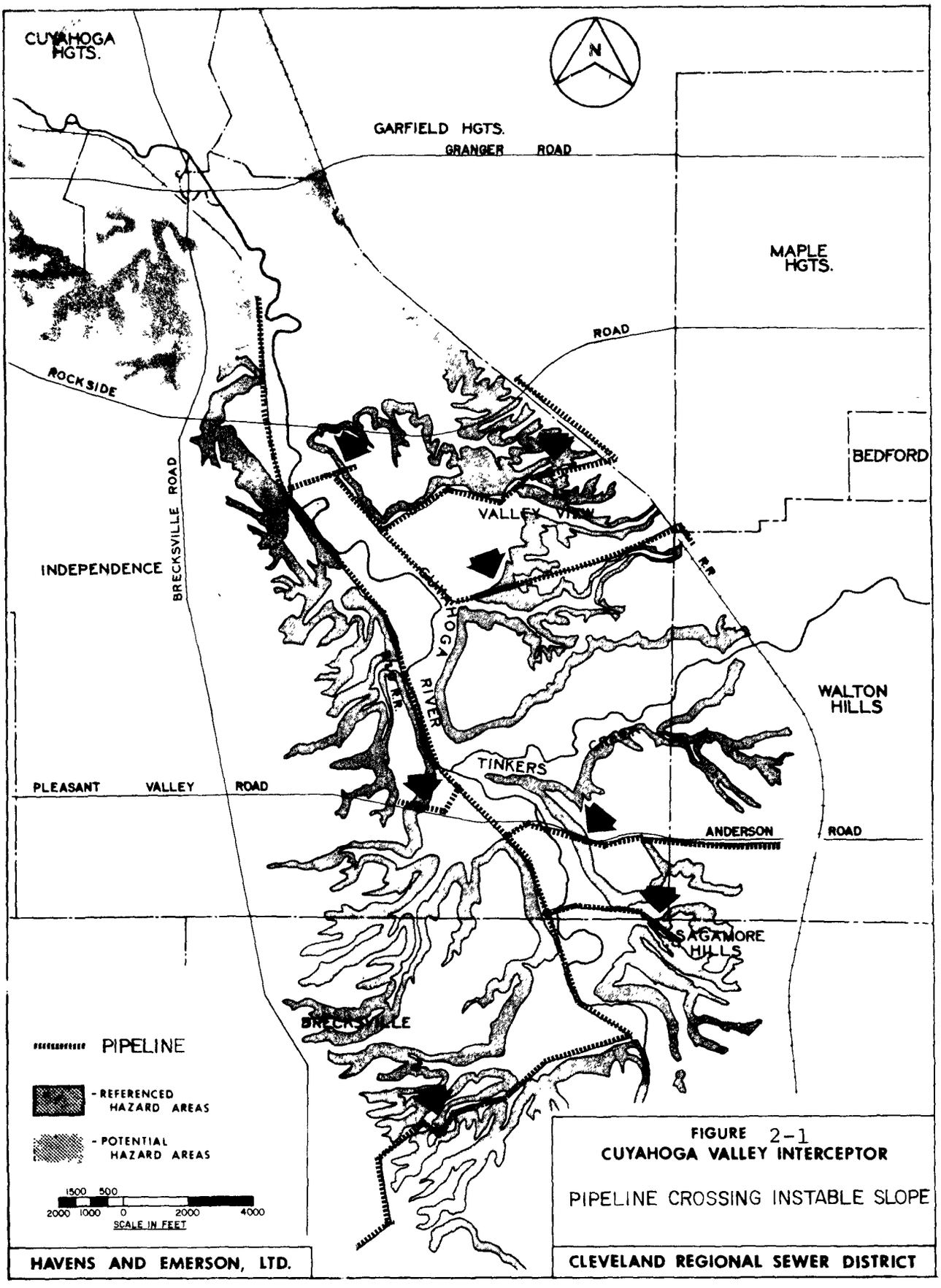



FIGURE 2-1
CUYAHOGA VALLEY INTERCEPTOR

PIPELINE CROSSING INSTABLE SLOPE

Maple Heights Trunk

The Alternative proposed by the EPA, that of following Schrieber Road to the railroad right-of-way and along the r.o.w. to the creek, up the creek to the Maple Heights s.t.p., has no engineering drawings for reference at this time. The large scales soil maps are used exclusively for soil instability information.

Going east, from the intersection of Schrieber and Hathaway Roads, approximately 1400 feet of Class IV slope is traversed. This line parallels Schrieber Road and crosses another section of Class IV slope about 3200 feet further from the endo of the first slope. This section appears to be right along the southern edge of Schrieber

Road, and continues intermittently for about 1200 feet. While the first slope cannot be avoided, the latter may be avoidable by moving thepipe to the north side of the road in the vicinity of the slope. This area requires further examination in order to fully minimize the impacts.

Brecksville Trunk

This line traverses approximately 250 feet of class IV slope between 77+22 and 74+78. The specifications call for 117 feet of 36 inch ductile pipe to be laid at 40.28 percent grade, a vertical rise of about 90 feet. Concrete pipe anchors are noted to be placed at 24 foot centers on this pipe.

Independence Trunk

This trunk line passes through an area of Class III slope along Pleasant Valley Road, beginning at STA 0+00, continuing to STA 11+24 near Riverview Road. Plans call for 1124 feet of 15 inch concrete pipe to be laid, 760 feet parallels Pleasant Valley Road and the remaining 364 feet angles off to the north towards Riverview Road. The approximate vertical rise is 70 feet, with thepipe buried about six to 10 feet below the ground surface.

Walton Hills Trunk

This line traverses about 700 feet of Class IV slope, beginning near the intersection of Canal Road and Pleasant Valley Road Extension. The total length of the pipeline on thegrade is 1322 feet, however, only a portion of that is considered to be in an unstable area. The vertical rise is about 60 feet, and the pipe is buried 6-10 feet below the surface.

Hawthornden Trunk

This line crosses about 400 feet of Class IV slope and about 800 feet of Class II slope. This line on the Class IV slope lies under a concrete roadway intersecting Sagamore Road at the Summit County line. It lies about 10 feet below the surface, and rises 50 feet. The line continues overland on Class II slope reaching a steep slope just below the Hawthornden treatment plants. There it rises about 60 feet to the existing sewer line.

Of the 29 municipalities in the study area, only five have sedimentation and erosion control ordinances. These are Brecksville, Brooklyn Heights, Garfield Heights, Solon, and Valley View, all of which are located in Cuyahoga County. Presently, none of the towns in Summit and Portage Counties that are within the study area have any erosion control regulations.

The existing ordinances are similar in most respects in that they require the developer to supply the Planning or Building Commision with copies of their development plan, including the erosion control measures. The ordinances recommend use of the Cuyahoga Soil and Water Conservation District guidelines and policies in developing the plan. The municipalities review the plans, as does the Conservation District. The Village of Valley View has more extensive requirements than the other towns in thatthey require a performance bond to be posted as part of the permit.

None of the ordinances specify an enforcement agency or control measures which would be used to enforce the permit. Valley View does provide for a fine in the event that the town finds that the terms of the permit are not being met.

Proposed rules and regulations and a model erosion and sediment control ordinance will be presented to the Ohio General Assembly in January 1977 by the Department of Natural Resources. This action is in response to a general lack of local controls, and will give the local governments the chance to adopt controls dealing with all aspects of erosion and sedimentation.

### Wetlands

Wetland areas within proposed service boundaries are well discussed on pages 72-3 of the Environmental Assessment, but must be considered in the light of additional information on pages 5, 6, 7 (paragraph 3), 14-16, 67, 69, 70 and Figure 3.

In general there are two major types of wetland to be considered. There is Cuyahoga Valley bottom wetland, much of it manmade, caused by the interruption of natural patterns of drainage by railroad and canal construction, often including abandoned portions of the canal, such as Stumpy Basin; and the upland wetlands, particularly of the Tinkers Creek drainage, largely natural, including areas such as the Streetsboro Bog and Aurora Pond.

Unfortunately, no attempt is made to quantify existing wetland area. This limitation is partly caused and compounded by the lack of a U.S. Soil Conservation Service Soil Survey for Cuyahoga County. Major service area wetlands include:

1) Tinkers Creek State Nature Preserve (upland), 786 acres, 75 per cent of which are wetlands.

2) Streetsboro Bog (upland), described in the Assessment as "vast", but not otherwise quantified.

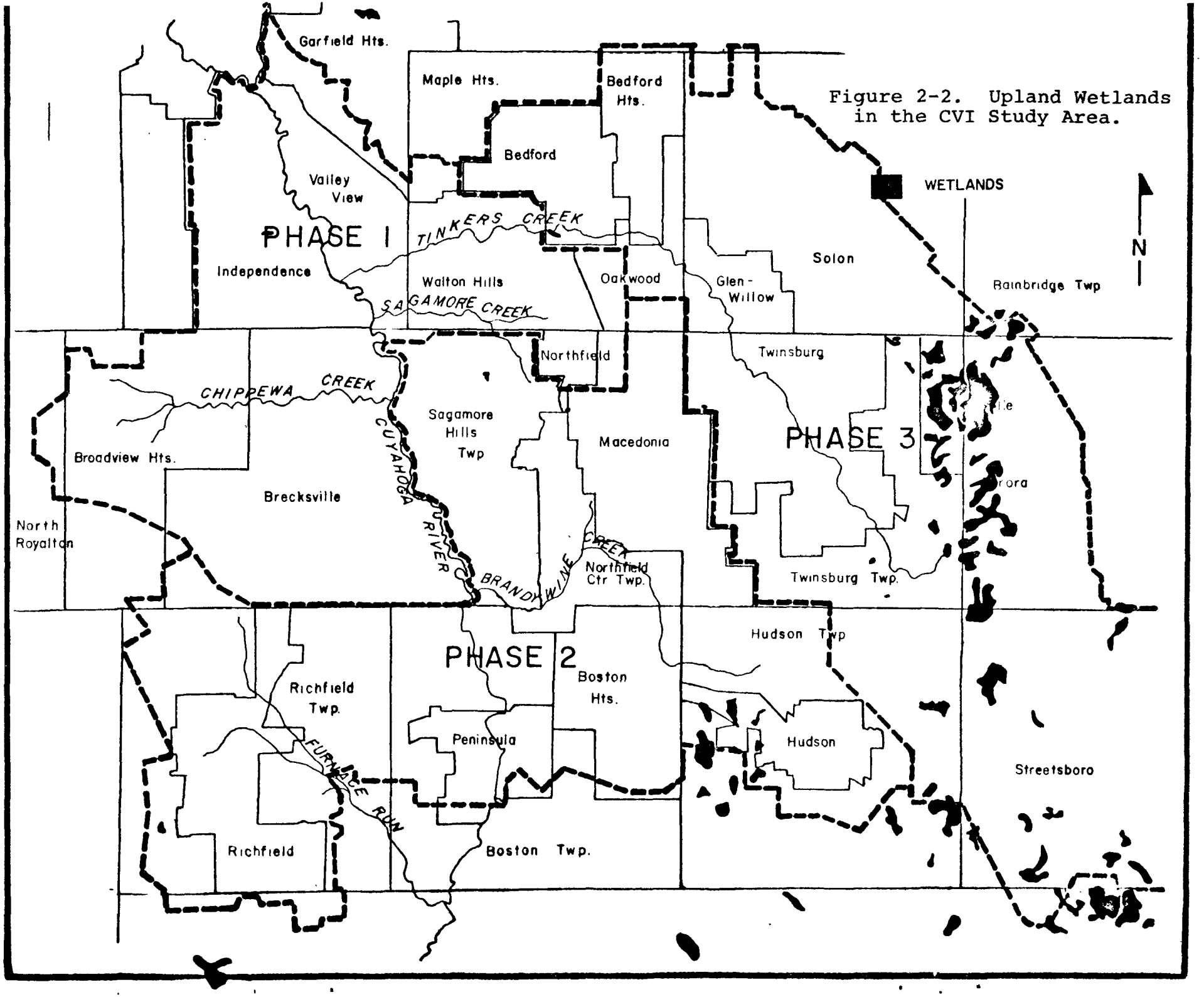



Figure 2-2. Upland Wetlands in the CVI Study Area.

3) Stumpy Basin (bottom), an abandoned portion of canal, includes considerable, though unquantified marsh area.

4) Reminderville Ledges (upland); at the base of an outcropping extending to Aurora Pond is a "vast" wetland area. Some portions have been filled in for a housing development.

5) Frame Bog (upland), 74 acres of virgin tamarack, owned by the Nature Conservancy and administered by Kent State University.

7) Trumbull Nature Reserve, 15 acres of swamp forest, mixed mesophytic forest and Tinkers Creek floodplain (upland), owned by the Nature Conservancy and used by Kent State University as a study area.

The upland wetlands provide significant water storage capacity in the Tinker's Creek and Brandwine Creek watersheds. The actual amount of storage provided has not been quantified and is difficult to assess. If the stored water is these poorly drained areas is contiguous with the underlying permanent water table, then their capacity to contribute to the seasonal low flow of Tinker's and Brandwine Creeks might not be greatly diminished by moderate construction activities nearby. However, if the stored water is perched above the permanent water table, i.e., contained by the impervious till soils, any measures to facilitate draining of the wetland areas, such as foundation drains, storm sewers, or drainage ditches, could have a detrimental impact on low flow contributions of the wetlands to the streams draining them.

Figure 2-2 shows the relationship between the upland wetlands and the area streams. Lacking a thorough inventory swamp symbols on U.S.G.S. topographic maps were used to prepare this figure.

3. Water

Water-Quality

The description of groundwater resources in the Environmental Assessment does not include useful information about groundwater recharge through the area's soils and about the role of groundwater in stream recharge. In addition, the groundwater section is primarily devoted to a discussion of septic tank sewage disposal system which, in almost all parts of the study area, do not impact seriously on the groundwater resources.

There are two significant types of groundwater aquifers in the CVI study area: the consolidated rock formations underlying glacial deposits and lenses of well sorted glacial deposits in the buried valleys.

Prior to the Plestocene glaciations, the topography in the study area was similar to that of the unglaciated Appalacian highlands to the east, i.e., steep-walled, branching valleys incised by rapidly flowing streams into the local sedimentary bedrock. The valleys were filled with various types of glacial deposits ranging from the well sorted sands and gravels of outwash deposits to clayey

lake-bottom deposits and poorly sorted "boulder clay" or till deposited in place as the glaciers melted. Nearly the entire surface of the study area was finally covered with up to 100 feet of the impervious till in the form of ground and end moraines. The depth of till has been reduced to a few feet over bedrock in some of the higher elevations to the east and west of the Cuyahoga River valley. In places where streams have been active in eroding the till, as in spots along Chipowa and Tinker's Creeks, the underlying bedrock is exposed.

Recharge to the bedrock layers through the tight till soils is slow except perhaps through small lenses of well sorted deposits. This, combined with the fact that almost all of the septic tank disposal systems discharge to streams, minimizes the probability of groundwater contamination from these systems.

The uppermost stratigraphic unit of the bedrock column is the Sharon conglomerate formation of the Pennsylvania system. This formation has the best groundwater availability characteristics of all the bedrock formations underlying the study area. It is present only in the highest elevations of the study area having been eroded away before and during the glaciations. Where present it provides adequate well water supplies for individual residences and small commercial developments. Also, where the contact between the Sharon conglomerate and the underlying formation is near the ground surface, springs often occur which are probably an important component of low flow in streams flowing across the contact.

The most productive aquifers in this region are well-sorted sand and gravel lenses within the buried valleys. Where wetlands and/or streams have some hydrologic connection with these subsurface lenses major industrial and municipal water supplies can be developed. In the CVI study area, the only such aquifer that has been mapped underlies the Brandywine Creek and Mud Brook watersheds just west of Hudson. This aquifer is the source of Hudson's municipal water supply. The Cuyahoga River valley also would appear to be a likely area for such aquifers as indicated by the high yield of two wells supplying the Jaite plant. However, end moraine which covers the valley in the Peninsula area and old lake-bottom sediments deposited in perhaps continuous, horizontal subsurface layers across the valley may prevent rapid recharge of any sand or gravel lenses that may be present.

In the headwaters of Brandywine Creek and Tinker's Creek underlain by the buried valleys the hummock areas left by the most recent glaciations have not been eroded to a smooth surface and numerous wetland areas remain. These areas are presented in Figure 2-2 and have been discussed in Section 2.A.2.

Additional information is also available in regard to the streamflow characteristics of the Cuyahoga River and at least one of its tributaries, including many things relevant to the present problem.

a. Cuyahoga Mainstream

U.S.G.S. streamflow records have been kept on the Cuyahoga River at Independence from 1921-23, 1927-35, and 1940 to the present. The river drains 707 square miles at the gaging station, which is three miles downstream from the mouth of Tinkers Creek. Over the period of measurement average discharge has been 768 cubic feet per second (about 496 MGD). Extreme discharges have been 24,800 cfs (16,020 MGD) on January 22, 1959 during a flood rated at about 100 year recurrence interval; and 14 cfs (9.04 MGD) on November 30, 1930. These figures do not include flow in the adjoining Ohio Canal, except at mainstream flows above 15,000 cfs when the channels merge.

The lowest recorded daily average flow was 21 cfs (13.56 MGD) on August 28, 1933. Assuming there was no effluent load at that time, the 12.5 MGD current low flow effluent load estimated by the applicant would produce a combined flow of 26 MGD, of which the effluent would comprise 48 per cent. The minimum recorded monthly average flow was 81.2 cfs (52.5 MGD) in September 1954; assuming a linear relationship of sewage to population (about 7 MGD effluent load), the present 12.5 MGD load would comprise a minimum of 21 per cent of such monthly low flow. The minimum flow (instantaneous) ever recorded at Independence was 14 cfs (about 9 MGD) on November 30 1930; assuming no effluent load in that figure a recurrence would mean that the additional 12.5 MGD would comprise about 58 per cent of a combined low flow of 21.5 MGD.

At Independence instantaneous and daily minimum streamflow have shown a substantial increase since 1967 (see Table 2-2). Unlike others in the basin, however, these increases have been roughly proportional to the increase in precipitation (see Table 2-1).

b. Tinkers Creek

U.S.G.S. streamflow records have been kept on Tinkers Creek at Bedford since November 1962. The Creek drains 83.9 square miles at the gage, which is five miles upstream from its mouth. Over the period of measurement average discharge has been 116 cfs (about 74 MGD). Extreme discharges have been 7220 cfs (about 4654 MGD) on July 20, 1969 and 5.2 cfs (3.36 MGD) on August 19, 1963. According to the applicant the 7-day, once in 10 year low flow is 5.8 MGD, of which 4.4 MGD (about 76 per cent) is effluent.

As mentioned the thirteen year daily discharge has been 3.38 MGD. At this time, assuming a linear relation of sewage to pollution, the sewage load was about 75 per cent of the Table 3 (EA) figure, or about 3.30 MGD. Thus for a one day once in thirteen year interval effluent would comprise over 97 per cent of streamflow, and possibly all of it.

Since 1963, however, minimum low flow figures have increased two to three times, by any of three criteria (see Table 2-2). Precipitation in both Akron and Cleveland has risen substantially in the past five years (see Table 2-1), but not to an extent proportional to the low flow increase. Furthermore, in years which JASO precipitation was comparable to earlier figure, the new larger low flows have been obtained.

The only other factor which might account for this increase in low flows is increased runoff. The heavy clay soils, although of limited permeability, hold water for a long time, and paving, shopping centers, and industrial parks transfer much water held in the soil to immediate runoff.

Much of the Tinkers Creek drainage basin land was once in agricultural land use, which has declined significantly since 1959. Summit County land use was ten per cent agricultural in 1969, compared with 16 per cent in 1964, 18 per cent in 1959,

Table 2-2 Cuyahoga River and Tinkers Creek Low Flows (cfs)

| | Cuyahoga River at Independence | | Tinkers Creek at Bedford | | |
|---|---|---|---|---|---|
| Water Year | Minimum Daily Average | Minimum (Instant) | Minimum Daily Average | Minimum Monthly Average | Minimum (Instant) |
| 1961 | 98 | 92 | | | |
| 1962 | 83 | 80 | | | |
| 1963 | 89 | 76 | 6.2 | 9.2 | 5.2 |
| 1964 | 73 | 64 | 5.8 | 8.55 | 5.3 |
| 1965 | 82 | 73 | 8.5 | 12.2 | 6.6 |
| 1966 | 81 | 74 | 7.3 | 14.6 | 6.5 |
| 1967 | 93 | 82 | 8.2 | 12.8 | 7.3 |
| 1968 | 123 | 111 | 10 | 22.3 | 9.3 |
| 1969 | 102 | 83 | 13 | 27 | 12 |
| 1970 | 115 | 96 | 11 | 17.7 | 9.9 |
| 1971 | 145 | 108 | 14 | 32.4 | 13 |
| 1972 | 76 | 61 | 14 | 38.6 | 11 |
| 1973 | 151 | 139 | 13 | 40.1 | 11 |
| 1974 | 198 | 175 | 16 | 36.8 | 14 |

and 48 per cent in 1948. Cuyahoga County land use was 3.6 per cent agricultural in 1969, compared with 5.8 per cent in 1964, and 7.1 per cent in 1959. In both counties agricultural use has declined by one third from 1964 to 1969 alone.

All of the above suggests that effluent may well now comprise a lower percentage of Tinkers Creek low flow than it has in the past, but that runoff will probably remain a major component of low flows whatever action is taken about effluent. Total removal of effluent could greatly increase the proportional role of runoff at time of low flow, with possible impacts on water quality.

c. Ohio Canal at Independence

The Ohio Canal is still operative below the headgates at Brecksville, about six miles upstream from Independence. Streamflow records have been kept on it at Independence from 1921 to 1923, 1927 to 1935, and 1940 to the present. Streamflow records are quite different from those for the Cuyahoga, since the canal is a regulated waterway. Extremes of discharge have been 277 cfs (about 179 MGD) on Jan. 22, 1959, just before the Cuyahoga River flood exceeded 15,000 cfs and the two channels merged, and no flow from July 2 to 7, 1950 and July 16 to August 19, 1959. In water year 1974 flow in the canal ranged from 27 to 89 cfs.

Water Quality - General

The description on pages 28 to 33 of the Environmental Assessment is quite accurate, but does not discuss recent water quality trends. In letters and statements to Region V personnel the applicant's representatives have stated that there has been no significant change in water quality since the late 1960's.

The Assessment's general observations on water quality are supported, but the claims of static water quality are disputed on page 16 and 17 of Cuyahoga Valley 1975, the Ohio Department of Natural Resource's, June 1975, consultant study of the Cuyahoga Valley National Recreation Area. Summarizing present conditions the report states:

> "Numerous water quality studies have been conducted on the Cuyahoga River and its tributaries since 1967. All available published information was summarized by Jack McCormick and Associates, Inc., and persons or agencies which has not published their findings were interviewed during July and August 1974.
>
> "Most chemical, physical and microbiological water quality parameters indicated that water quality in the Cuyahoga River in the study region was poor. Filtrable residue, specific conductance, chloride, and nonfiltrable residue periodically were high. High concentrations of oxygen demanding substances in the water occasionally caused low dissolved oxygen concentrations. The

water was rich in nutrients and could have sustained the growth of undesirable aquatic plants. Ammonia, cadmium, and polychlorinated biphenyl concentrations were high and may have been toxic to sensitive organisms. Fecal coliform concentration repeatedly were high enough to indicate a significant risk of illness to persons engaged in primary and/or secondary recreation. Temperature and pH values, however, were normal, and chromium, lead, nickel, and zinc concentrations probably were not too toxic to fish.

"Recent data indicated that dissolved solids and chloride concentrations are decreasing, and dissolved oxygen concentrations are increasing. Visual observations indicate that foam caused by detergents has become less of a problem than formerly. Improved treatment of wastewater by Akron industries and the Botzum wastewater treatment plant probably have been responsible for this improvement.

"High concentrations of polychorinated biphenyls, nutrients and bacteria are the principal water quality problems of the tributaries to the Cuyahoga River in the study region. Nutrients and fecal coliform bacteria concentrations were particularly high in Tinkers Creek, Brandywine Creek and Sagamore Creek. The principal cause of high nutrient and fecal coliform concentrations in these streams was wastewater discharges. Concentrations of polychlorinated biphenyls were high in Tinkers Creek, Brandywine Creek and Furnace Run. The source of polychlorinated biphenyls in the streams is not known.

"Although Brandywine Creek, Tinkers Creek and Chippewa Creek contained high concentrations of oxygen-demanding materials, dissolved oxygen concentrations in the tributaries were good because of natural aeration. Nonfiltrable residue concentrations were occasionally high in Yellow Creek, Brandywine Creek and Tinkers Creek. Filtrable residue, chloride, pH, temperature, methylene blue substances and metals were generally within established standards.

"Tinkers Creek, Brandywine Creek and Sagamore Creek were similar to the Cuyahoga River in water quality. Water quality in Furnace Run, Yellow Creek, Slipper Run and Spring Run was significantly better than in the Cuyahoga River. Water quality in Chippewa Creek was better than in the Cuyahoga River, but not as good as in Furnace Run.

Available U.S.G.S. water quality data and recent and earlier studies as summarized below generally support this evaluation. Dissolved oxygen levels in the Cuyahoga River mainstream at Independence have shown a relatively consistent increase since 1967 (see Table 2-3). Other parameters are shown in Table 2-4 through 2-7.

Table 2-3. Dissolved Oxygen (mg/l) Cuyahoga River at Independence - Monthly Range of Daily Extremes

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yearly Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | 1.5-9.0 | 7.1-10.7 | 8.1-12.1 | 10.1-12.4 | 10.0-12.7 | 9.0-11.0 | 5.8-11.5 | 3.9-8.2 | 2.6-7.1 | 2.2-5.8 | 2.8-6.1 | 3.3-8.1 | 1.5-12.7 |
| 1973 | 5.9-10.1 | 7.8-11.1 | 8.5-11.7 | 9.5-13.8 | 10.0-14.5 | 8.4-13.2 | 7.2-11.6 | 5.3-8.3 | 4.3-8.3 | 2.3-8.5 | 2.6-8.0 | 3.1-7.7 | 2.3-14.5 |
| 1972 | 2.9-7.0 | 4.9-13.1 | 9.6-13.8 | 8.7-13.1 | 8.9-12.2 | 8.1-12.8 | 5.3-11.3 | 3.7-9.4 | 3.6-8.1 | 2.8-7.6 | 3.4-7.1 | 3.2-9.4 | 2.9-13.8 |
| 1971 | 3.8-8.9 | 7.9-11.9 | 9.0-12.6 | 8.9-12.6 | 7.3-13.2 | 9.3-12.2 | 6.2-10.9 | 3.2-9.7 | 1.6-5.6 | 2.1-6.8 | 1.9-4.3 | 1.0-5.9 | 1.0-13.2 |
| 1970 | 3.0-7.0 | 4.6-11.5 | 7.0-10.7 | 2.9-10.4 | NA | NA | NA | NA | 4.2-7.5 | 1.7-5.2 | 2.1-6.0 | 1.0-8.2 | 1.0-11.5 |
| 1969 | 3.2-8.9 | 5.3-9.9 | 9.4-12.6 | 9.7-14.1 | 7.7-14.1 | 10.4-11.7 | 7.8-11.5 | 5.1-11.0 | NA | 0.8-2.4 | 1.9-4.2 | 1.0-7.4 | 0.8-14.1 |
| 1968 | 3.0-8.3 | 5.8-11.6 | 5.9-14.2 | 7.1-11.1 | NA | NA | 5.3-8.8 | NA | NA | 3.8-5.2 | 2.5-6.0 | 3.2-7.1 | 2.5-14.2 |
| 1967 | 1.5-6.6 | 2.3-11.3 | 7.2-11.3 | NA | 5.9-12.3 | 6.4-11.1 | NA | 4.1-9.4 | 1.6-4.9 | 2.6-6.8 | 1.4-5.7 | 2.9-4.6 | 1.4-12.3 |
| 1966 | 1.7-8.2 | NA | 2.3-6.2 | 3.2-8.8 | 0.0-10.8 | 5.5-9.7 | 8.3-9.2 | 4.0-8.7 | 0.0-8.9 | 0.0-6.5 | 0.3-3.8 | 1.1-5.8 | 0.0-10.8 |
| 1965 | | | | | | | | | | 1.8-7.0 | 0.5-6.7 | 1.7-5.8 | 0.5-7.0 |

Note: Underscoring indicates incomplete monitoring for each day of that month.

Table 2-4. Suspended Sediment, Cuyahoga River at Independence; Monthly Totals (Tons)

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yearly Total/ Yearly Streamf CFSD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | 8590 | 15137 | 17346 | 51876 | 5585 | 51673 | 64611 | 46752 | 14693 | 7242 | 12079 | 2423 | 298,009 386,434 CF |
| 1973 | 22697 | 23138 | 22435 | 9443 | 15876 | 54200 | 26098 | 27554 | 41354 | 8188 | 6175 | 4645 | 244,000+ 414,000 ( |
| 1972 | 2136 | 2991 | 37609 | 4826 | 8047 | 37892 | 82493 | 7790 | 54030 | 9355 | 1385 | 24565 | 273,121 371,078 C |
| 1971 | 6937 | 11423 | 18265 | 6877 | 74349 | 20072 | 1555 | 11298 | 19097 | 3504 | 425 | 16043 | 189,946 319,755 C |
| 1970 | 5286 | 3995 | 4889 | 15076 | 13957 | 23584 | 9589 | 5381 | 60147 | 9469 | 1876 | 8433 | 161,695 247,598 C |
| 1969 | 1283 | 40850 | 63492 | 40586 | 12727 | 8422 | 94136 | 81696 | 4364 | 10254 | 621 | 2250 | 452,970 372,077 C |
| 1968 | 412 | 1785 | 2731 | 41652 | 42274 | 13273 | 3174 | 25483 | 5624 | 27459 | 4511 | 6766 | 175,145 264,773 C |
| 1967 | 312 | 23228 | 22248 | 1911 | 15904 | 27390 | 10254 | 35778 | 225 | 325 | 354 | 1575 | 141,503 249,605 C |
| 1966 | 15593 | 4885 | 2290 | 7979 | 46487 | 38302 | 23064 | 9488 | 545 | 2232 | 5441 | 562 | 156,868 225,619 C |
| 1965 | 305 | 295 | 3679 | 52713 | 24320 | 17933 | 5686 | 1331 | 4765 | 3919 | 9583 | 2334 | 126,135 205,814 C |

Table 2-5. Dissolved Sulfate ($SO_4$), Cuyahoga River at Independence, Monthly Range of Measurements* (mg/l)

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yearly Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | 87-140 | 88-110 | 82-85 | 62-120 | 32-110 | 59-75 | 53-83 | 52-83 | 77-110 | 92 | NA | NA | 32-140 |
| 1973 | 61-120 | 59-100 | 68-89 | 67-92 | 74-100 | 54-100 | 60-81 | 71-86 | 52-90 | 84-120 | 91-130 | 98-160 | 52-160 |
| 1972 | 110-130 | 140-160 | 78-100 | 72-120 | 82-120 | 67-78 | 65-97 | 73-140 | 52-110 | 76-120 | 100-130 | 73-140 | 52-160 |
| 1971 | 68-110 | 93-120 | 79-99 | 74-130 | 53-130 | 56-75 | 90-130 | 86-120 | 94-140 | 83-120 | 120-160 | 91-130 | 53-160 |
| 1970 | 90-157 | 112-129 | 107-119 | 137-147 | 83-125 | 74-118 | 92-122 | 94-145 | 78-116 | 128-131 | 97-170 | 107-155 | 74-170 |
| 1969 | 43-63 | 63-56 | 34-67 | 44-17 | 32-44 | 29-60 | 33-63 | 48 | 58-86 | 69-40 | 51-106 | 60-128 | 34-128 |
| 1968 | | | | | | | 100-100 | NA | 98-118 | 68-121 | 104-126 | 96-141 | 68-141 |

Note*: Measured 2 to 3 times monthly.

Table 2-6. Dissolved Chloride (Cl), Cuyahoga River at Independence; Monthly Range of Measurements* (mg/l)

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yearly Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | 45-300 | 51-130 | 47-240 | 48-190 | 89-280 | 42-100 | 33-160 | 32-140 | 87-250 | 78 | -- | -- | 32-280 |
| 1973 | 29-95 | 25-66 | 59-98 | 44-190 | 60-170 | 36-150 | 39-66 | 48-62 | 35-83 | 62-220 | 75-140 | 77-170 | 25-220 |
| 1972 | 190-360 | 180-340 | 60-140 | 79-300 | 110-320 | 56-100 | 38-130 | 41-190 | 20-100 | 44-150 | 80-100 | 35-110 | 20-360 |
| 1971 | 38-170 | 54-160 | 56-110 | 75-280 | 74-220 | 50-140 | 99-240 | 79-150 | 67-260 | 110-410 | 190-220 | 94-310 | 38-410 |
| 1970 | 75-390 | 95-196 | 106-258 | 314-342 | 73-170 | 69-286 | 68-163 | 74-210 | 55-232 | 79-222 | 85-305 | 90-250 | 68-390 |
| 1969 | 90-295 | 58-210 | 34-124 | 34-90 | 30-43 | 28-97 | 36-270 | 74 | 200-365 | 47-344 | 213-370 | 45-460 | 28-460 |
| 1968 | | | | | | | 82-100 | NA | 74-132 | 33-200 | 95-240 | 71-340 | 33-340 |

Note*: Measured 2 or 3 times monthly.

Table 2-7. Specific Conductance, Cuyahoga River at Independence, Monthly Range of Daily Extremes (Micromhos).

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yearly Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | 474-1480 | 423-975 | 498-1300 | 396-1410 | 516-1600 | 225-1180 | 312-993 | 289-943 | 420-1230 | 369-1750 | 342-2040 | 507-1100 | 289-1750 |
| 1973 | 300-980 | 380-920 | 460-1460 | 540-1160 | 620-1550 | 350-1080 | 390-890 | 360-1100 | 320-1240 | 350-1440 | 370-1460 | 380-1270 | 300-1550 |
| 1972 | 740-1720 | 674-1900 | 407-1030 | 531-1460 | 676-1820 | 413-757 | 352-843 | 435-1240 | 258-1090 | 408-1100 | 452-1090 | 328-1640 | 258-1900 |
| 1971 | 430-1300 | 476-1120 | 337-981 | 604-1720 | 255-2000 | 444-868 | 696-1390 | 627-1340 | 738-1560 | 786-1900 | 1020-1900 | 528-1790 | 255-2000 |
| 1970 | 670-1940 | 530-1570 | 720-1680 | 820-1900 | 550-1120 | 480-1300 | 510-1020 | 640-1420 | 410-1430 | 500-1430 | 570-2000 | 600-1650 | 410-2000 |
| 1969 | 540-2000 | 410-1470 | 400-1040 | 360-1290 | 370-1450 | 530-1990 | 360-760 | 300-1100 | NA | 630-1070 | 780-1910 | 870-2000 | 300-2000 |
| 1968 | 750-1500 | 700-1500 | 660-1500 | 950-1620 | NA | NA | 560-1430 | NA | NA | 390-1090 | 380-1480 | 430-1730 | 430-1730 |
| 1967 | 1800-1500+ | 340-1630 | 360-1500 | 620-1500+ | 460-1430 | 398-1500+ | 620-910 | 320-920 | 630-1500+ | 810-1500+ | 920-1500+ | 720-1500+ | 320-1500 |
| 1966 | 400-1300 | NA | 1060-1290 | 770-1000 | 280-1500 | 330-1180 | 290-950 | 320-1080 | 770-1500+ | 500-1500+ | 640-1500+ | 610-1500 | 280-1500 |
| 1965 | | | | | | | | | | 510-1500 | 380 1500 | 640-1530 | 380-1500 |

Mainstream

According to Water Quality and Aquatic Biota in the Cuyahoga Valley Project Region, a consultant report prepared for the Ohio Department of Natural Resources in late 1974, specific conductance (an indirect measurement of filtrable residue) has decreased considerably on the Cuyahoga River mainstream in recent years. Prior to 1970 specific conductance in the Cuyahoga River averaged about 1060 micromhos per centimeter at Old Rockside Road, Independence. Beginning in 1972 specific conductance averaged about 710 micromhos. According to the Three Rivers Watershed Association this represented a reduction of approximately 200 milligrams per liter in filtrable residue (see Table 2-8). Similar reductions were observable upstream at Bolanz Road and downstream near Brecksville above the canal diversion dam. The Three Rivers Watershed Association attributed the lower conductance values to improved industrial waste handling in Akron. Specific conductance measured between October 1973 and March 1974 at Boston Mills Road, Station road behind the diversion dam, just below the diversion dam, and at Independence, averaged 593, 592, 592, and 626 micromhos per centimeter respectively. This indicates that the concentration of dissolved solids in the Cuyahoga River below Akron may still be decreasing. (See Tables 2-8 through 2-12.)

Chloride concentrations in the Cuyahoga River ranged from 44 to 341 milligrams per liter. Many of the observed chloride concentrations exceeded the 250 mg/l Ohio water quality standard. Most of the chloride data were obtained before 1972. Behind the diversion dam chloride concentrations in 1972 were generally lower than those in 1967 and 1970. Thus decreasing chloride concentrations may be associated with decreasing filtrable residue concentrations. (Tables 2-8 through 2-12.)

Nonfiltrable residue in the Cuyahoga River ranged from 0.0 to 2,192 milligrams per liter. Concentrations in excess of the proposed U.S. Environmental Protection Agency standard of 80 milligrams per liter were periodically observed. Low nonfiltrable residue concentrations between January and March 1974 were probably the result of low precipitation in the days preceding the sampling. (Tables 2-8 through 2-12.)

Dissolved oxygen concentrations in the Cuyahoga River ranged from 0.0 to 14.0 milligrams per liter and per cent saturations ranged from 0.0 to 118%. Dissolved oxygen concentrations periodically were less than the State of Ohio standards of 5.0 milligrams per liter as a daily average and 4.0 milligrams at any time. (Tables 2-8 through 2-12.)

Cuyahoga River oxygen profiles obtained in September 1973 showed dissolved oxygen trends within the study area. Dissolved oxygen generally declined about 2.0 to 3.5 mg/l between Bath Road (River Mile 37.4) and State Route 303 (River Mile 29.6). Most of the decline in dissolved oxygen concentrations was observed upstream of Bolanz Road. None of the concentrations, however, were less than the Ohio standard. Effluent from Botzum wastewater treatment plant was believed to be responsible for the

Table 2-8. Water Quality, Cuyahoga River at Independence, Ohio (USGS Gage *300 yards), 1968-75; Compiled from data of Three Rivers Watershed District, U.S. Army Corps of Engineers, U.S.G.S. Water Resources Division, and State of Ohio. See also regular monthly data in other tables.

| Date | pH | DO | BOD | COD | Spec. Cond. (Micrombos/cm) | Residue filt | Residue non filt | Phosphorus | Ammonia | Fecal Coliform/Strep (1000/100 ml) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 09/21/64 | - | 3.8 | - | - | - | - | - | - | - | - | - |
| 10/02/72 | - | 9.0 | - | - | - | - | - | - | - | - | - |
| 11/07/72 | - | 9.0 | - | | - | - | - | - | - | | |
| 04/09/73 | - | 9.6 | 3.0 | - | - | - | - | - | - | 2.1 | .35 |
| 04/23/73 | - | 8.8 | 6.1 | - | - | - | - | - | - | 5.1 | .93 |
| 05/07/73 | - | 8.8 | 3.1 | - | - | - | - | - | - | .39 | .25 |
| 05/21/73 | - | 9.0 | 4.7 | - | - | - | - | - | - | - | - |
| 06/05/73 | - | 5.9 | 8.4 | - | - | - | - | - | - | - | - |
| 06/07/73 | - | 8.0 | - | - | - | - | - | - | - | - | - |
| 06.18/73 | - | 5.6 | 6.1 | - | - | - | - | - | - | 2.6 | 1.6 |
| 08/21/73 | - | 6.0 | - | - | - | - | - | - | - | - | 24.0 |
| 09/11/73 | - | 6.2 | 32.0 | - | - | - | - | 1.0 | - | 46.0 | 2.2 |
| 09/27/73 | - | - | 10.0 | - | - | - | - | 1.1 | - | 19.0 | .82 |
| 10/11/73 | - | 5.4 | 0.6 | - | - | - | - | 0.5 | - | 1.3 | 2.4 |
| 10/16/73 | 7.7 | 6.0 | - | - | 450 | 700 | 100 | 3.6 | 0 58 | 2.0 | - |
| 10/23/73 | - | 7.0 | - | - | - | - | - | 0.8 | - | 5.6 | .78 |
| 11/06/73 | - | - | - | - | - | - | - | 0.4 | - | 1.1 | .45 |
| 11/16/73 | 8.2 | 11 | - | - | 550 | 700 | 100 | 2.2 | 2.8 | 25.0 | - |
| 11/19/73 | - | - | - | - | - | - | - | 0.5 | - | 1.2 | .30 |
| 12/05/73 | - | 8.0 | - | - | - | - | - | 0.4 | - | - | 6.9 |
| 12/13/73 | 7.5 | 13 | - | - | 500 | 400 | 50 | 1.6 | 2.6 | 0 | - |
| 12/19/73 | - | 12.0 | 9.0 | 36.0 | - | - | - | 0.500 | - | 5.9 | 2.6 |
| 01/03/74 | - | 12.8 | 8.0 | 20.0 | - | - | - | 0.0 | - | 2.9 | 2.0 |
| 01/16/74 | - | 10.0 | 61.0 | 88.0 | - | - | - | 0.4 | - | 15.0 | 15.0 |
| 01/18/74 | 8.3 | 8.0 | - | - | 640 | 51.8 | 8.2 | 0.15 | 3.2 | 4.6 | - |
| 01/30/74 | - | 11.4 | 8.0 | 24.0 | - | - | - | 0.0 | - | 2.2 | .76 |
| 02/13/74 | 8.5 | 10.5 | - | - | 1130 | 53.4 | 4.6 | 1.28 | 5.4 | 9.4 | - |
| 02/13/74 | - | 11.4 | 9.0 | 28.0 | - | - | - | 0.5 | - | 3.1 | .90 |
| 02/13/74 | - | 10.6 | - | - | - | - | - | 0.42 | - | 2.1 | .91 |
| 02/27/74 | - | 10.0 | - | - | - | - | - | 0.0 | - | 0.9 | .33 |
| 03/04/74 | 7.9 | 14 | - | - | 490 | 44.0 | 45.9 | 0.12 | 2.7 | 23 | - |

Table 2-8. (Continued)

| Date | pH | DO | BOD | COD | Spec. Cond. (Micrombos/cm) | Residue filt | Residue non filt | Phosphorus | Ammonia | Fecal Coliform/Strep (1000/100 ml) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 03/12/74 | - | 10.8 | - | - | - | - | - | .28 | - | 1.2 | .80 |
| 03/13/74 | - | 10.8 | - | - | - | - | - | 0.0 | - | 1.7 | .40 |
| 03/13/74 | - | - | - | 28.0 | - | - | - | - | - | - | - |
| 04/03/74 | - | 9.9 | - | - | - | - | - | .47 | - | 6.2 | 6.6 |
| 04/11/74 | - | 10.0 | 5.0 | 20.0 | - | - | - | 0.0 | - | - | - |
| 04/24/74 | - | 9.4 | 7.0 | 12.0 | - | - | - | 0.0 | - | .63 | .46 |
| 05/08/74 | - | 8.6 | - | - | - | - | - | .26 | - | 16.0 | 2.6 |
| 05/08/74 | - | 8.6 | - | - | - | - | - | .40 | - | 10.9 | 3.23 |
| 05/22/74 | - | 6.0 | 9.0 | 16.0 | - | - | - | .40 | - | 7.0 | .10 |
| 06/04/74 | - | 5.9 | - | - | - | - | - | .27 | - | 4.1 | .28 |
| 06/06/74 | - | 5.2 | - | 32.0 | - | - | - | .50 | - | - | - |
| 06/19/74 | - | 5.7 | 24.0 | 20.0 | - | - | - | .40 | - | .001 | .70 |
| 07/03/74 | - | 6.8 | 16.0 | 22.0 | - | - | - | 0.0 | - | 15.0 | .20 |
| 07/09/74 | - | 4.4 | - | - | - | - | - | .37 | - | 5.2 | .36 |
| 07/17/74 | - | 5.4 | 10.0 | 32.0 | - | - | - | .50 | - | 6.0 | 1.0 |
| 08/01/74 | - | 5.5 | 8.0 | 21.0 | - | - | - | 1.20 | - | 3.5 | .35 |
| 08/06/74 | - | 5.6 | - | - | - | - | - | .81 | - | 6.6 | .15 |
| 08/14/74 | - | 6.1 | 20.0 | 40.0 | - | - | - | 0.0 | - | 34.0 | 3.87 |
| 08/28/74 | - | - | 15.0 | 42.0 | - | - | - | .70 | - | 3.9 | 2.6 |
| 09/11/74 | - | 6.6 | - | - | - | - | - | .52 | - | 22.0 | .48 |
| 09/12/74 | - | 5.7 | 10.0 | 30.0 | - | - | - | .60 | - | 9.6 | .38 |
| 09/25/74 | - | 7.1 | 8.0 | 22.0 | - | - | - | .50 | - | 18.0 | .45 |
| 10/08/74 | - | 7.6 | - | 20.0 | - | - | - | .50 | - | 6.0 | .67 |
| 10/15/74 | - | 5.3 | - | - | - | - | - | .76 | - | 31.0 | 7.7 |
| 11/06/74 | - | 8.4 | 9.0 | 29.0 | - | - | - | .30 | - | - | - |
| 11/13/74 | - | 8.5 | - | - | - | - | - | .38 | - | 14.0 | 4.8 |
| 11/20/74 | - | 9.6 | - | - | - | - | - | 0.0 | - | - | - |
| 12/11/74 | - | 13.0 | - | - | - | - | - | 0.0 | - | - | - |
| 12/18/74 | - | 10.7 | - | - | - | - | - | .22 | - | 16.0 | 2.6 |
| 12/26/74 | - | - | - | - | - | - | - | .10 | - | - | - |
| 01/09/75 | - | 11.8 | - | - | - | - | - | .40 | - | - | - |
| 01/15/75 | - | 13.0 | - | - | - | - | - | .29 | - | 8.2 | 1.9 |
| 02/06/75 | - | 9.7 | 80.0 | 120 | - | - | - | .20 | - | - | - |
| 02/11/75 | - | 11.4 | - | - | - | - | - | .51 | - | 1.5 | .58 |
| 02/20/75 | - | 9.6 | 7.0 | 12.0 | - | - | - | .20 | - | - | - |

Table 2-8. (Continued)

| Date | pH | DO | BOD | COD | Spec. Cond. (Micrombos/cm) | Residue filt | Residue non filt | Phosphorus | Ammonia | Fecal Coliform/Strep (1000/100 ml) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 03/05/75 | - | 11.7 | 7.0 | 20.0 | - | - | - | .10 | - | 2.0 | 2.08 |
| 03/25/75 | - | 10.4 | - | - | - | - | - | .30 | - | 4.6 | .48 |
| 03/27/75 | - | 11.7 | 7.0 | 20.0 | - | - | - | .10 | - | .80 | .21 |
| 04/01/75 | - | 10.1 | - | - | - | - | - | .34 | - | 18.0 | 2.1 |
| 04/10/75 | - | 10.2 | - | 53.0 | - | - | - | .10 | - | 15.0 | 15.0 |
| 05/07/75 | - | 8.3 | - | - | - | - | - | .40 | - | 5.3 | .42 |
| 06/04/75 | - | 7.9 | - | - | - | - | - | .33 | - | 18.0 | 56.0 |
| 07/10/75 | - | 6.3 | - | - | - | - | - | .67 | - | 2.0 | .16 |
| 08/05/75 | - | 5.9 | - | - | - | - | - | .51 | - | 3.0 | .85 |
| 09/02/75 | - | 7.5 | - | - | - | - | - | .13 | - | 9.8 | .87 |
| 10/01/75 | - | 8.4 | - | - | - | - | - | .36 | - | 2.9 | .25 |
| 11/11/75 | - | 8.8 | - | - | - | - | - | .62 | - | 32.0 | 4.6 |

Table 2-9. Water Quality, Cuyahoga River at Boston Mills Road, 1967-74. Compiled from Three Rivers Watershed District and U.S. Army Corps of Engineers Data. Measurements are milligrams per liter unless otherwise specified. Data above line are averages, data below line are extreme.

| Date | pH | DO | BOD | COD | Spec Cond (Micrombos) | Residue Filt | Non Filt | Phosphorus | Ammonia | Chlorides | Fecal Coliform (1000 per 100 ml) | Nitrate-Nitrogen |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/67 | 7.4 | 7.7 | 6.1 | 10.2 | - | | 37 | - | - | - | - | - |
| 6/67 | 7.8 / 7.6-7.9 | 7.5 | 4.7 / 3.1-6.2 | 55.1 / 43.7-66.4 | - | | 21 / 19-22 | 0.8 | - | - | 46.5 / 1.0-92 | |
| 7/67 | 7.6 / 7.5-7.7 | 7.8 / 7.2-8.3 | 10.2 | 41.8 / 34.2-54 | - | | 21 / 12-25 | 1.10 / 0.51-2.1 | .34 / .21- .45 | 225 / 86-319 | 26.5 / 2.3-56.2 | 2.8 / 2.1-3.9 |
| 8/67 | 7.1 / 6.7-7.7 | 6.6 / 4.7-7.5 | 13.1 | 42.7 / 10.4-58 | - | | 23 / 12-32 | - | .54 / .048-0.69 | | 132 / 2.0-400 | 1.3 / 0.0-2.12 |
| 10/16/67 | 8.2 | 10.0 | | | 360 | 1100 | 100 | 1.6 | .95 | | 336 | 2.4 |
| 11/16/73 | 8.5 | 10.0 | | | 440 | 350 | 50 | 1.9 | 1.45 | | 150 | 3.1 |
| 12/13/73 | 8.1 | 14.0 | | | 500 | 200 | 100 | 1.7 | 4.0 | | 0.4 | 2.9 |
| 01/18/74 | 8.5 | 12.0 | | | 690 | 45.7 | 4.3 | 1.1 | 3.50 | | 2.4 | 2.4 |
| 02/13/74 | 8.4 | 11.5 | | | 1100 | 65.1 | 4.9 | 1.0 | 6.2 | | 0.5 | 0.85 |
| 03/04/74 | 8.3 | 14.0 | | | 470 | 34.25 | 5.75 | 0.21 | 2.2 | | 1.6 | 0.75 |

Table 2-10. Water Quality, Cuyahoga River at Station Mills Road, immediately below Ohio Canal Diversion Dam, 1973-74. Compiled from Three Rivers Watershed District and U.S. Army Corps of Engineers data. Measurements are milligrams per liter unless otherwise specified. Data above line are averages; data below line are extremes.

| Date<br>Date | pH | DO | Spec Cond (Micrombos/cm) | Non Filt Residue | Phosphorus | Ammonia | Nitrate-Nitrogen | Fecal Coliform (1000 per 100 ml) |
|---|---|---|---|---|---|---|---|---|
| 10/16/73 | 7.9 | 7.0 | 375 | 100 | 4.5 | 0.68 | 3.2 | 135 |
| 11/16/73 | 8.5 | 12.0 | 560 | 100 | 1.25 | 3.5 | 3.8 | 10 |
| 12/13/73 | 8.3 | 12.0 | 495 | 200 | 1.60 | 2.5 | 3.4 | 0.1 |
| 01/18/74 | 8.4 | 12.5 | 660 | 5.3 | 1.15 | 3.3 | 3.1 | 6.2 |
| 02/13/74 | 8.2 | 13.0 | 970 | 8.7 | 2.20 | 7.1 | 1.35 | 6.0 |
| 03/04/74 | 8.0 | 14.0 | 490 | 14.25 | 0.36 | 2.51 | 0.65 | 4.0 |

Table 2-11. Water Quality, Cuyahoga River at Riverview Road, 1967. Compiled from Three River Watershed District data. Measurements are milligrams per liter unless otherwise specified. Data above line are averages; data below are extremes.

| Date | pH | DO | BOD | COD | Spec Cond (Micrombos) | Residue Filt | Non Filt | Phosphorus | Ammonia | Chloride | Fecal Coliform (1000/100 ml) | Nitrate-Nitrogen |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/67 | 8.3 | 7.8 | 4.5 | 31 | - | - | 27 | 1.6 | 0.55 | 90 | 5.55 | 4.2 |
| | 8.0-8.5 | 7.5-8.0 | 3.7-5.2 | 30-32 | | | 25-29 | 1.0-2.1 | 0.35-0.75 | 75-105 | 0.4-10.7 | 4.2 |
| 8/67 | 7.4 | 4.5 | 5.8 | 29.7 | - | - | 22 | 1.95 | 0.70 | 193 | 309 | 3.97 |
| | 7.2-7.6 | 3.3-5.2 | 4.4-7.4 | 18.3-39 | | | 4-76 | 1.21-2.57 | 0.37-1.15 | | 37-700 | 0.45-11.98 |

Table 2-12. Water Quality, Cuyahoga River at Station Mills Road, behind Ohio Canal Diversion Dam, 1967-74. Compiled from Three Rivers Watershed District and U.S. Army Corps of Engineers data. Measurements are milligrams per liter unless otherwise specified. Data above line are average, data below line are extremes.

| Date | pH | DO | BOD | COD | Spec Cond | Residue Filt | Non Filt | Phosphorus | Ammonia | Chlorides | Fecal Coliform (1000/100 ml) | Nitrate-Nitrogen |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/67 | 7.4 | 5.2 | 3.7 | 25 | - | | 42 | - | - | 120 | - | - |
| 6/67 | 8.0 / 7.7-8.2 | 3.5 | 3.9 / 2.2-5.6 | 34 | - | | 7 | 0.86 / 0.47-1.3 | - | 169 | 44 | |
| 7/67 | 7.6 / 7.4-7.8 | 3.9 / 3.2-4.5 | 8.6 / 7.1-10 | 39.6 / 37.9-42 | - | | 14 / 10-20 | 1.12 / 0.99-1.2 | 0.58 / 0.35-0.77 | 275 / 221-341 | 23 / 20-26 | 4.5 / 0.7-8.5 |
| 8/67 | 7.2 / 7.2-7.3 | 1.8 / 1.0-3.0 | 9.2 / 3.7-16.3 | 35.8 / 13.2-44 | - | | 29 / 9.0-68 | 2.07 / 0.61-3.9 | 0.67 / 0.43-1.31 | 237 | 129 / 9.0-250 | 2.0 / 0.0-4.2 |
| 9/70 | 7.8 / 7.7-7.9 | 4.9 | - | 80 / 31-248 | 1031 / 549-1393 | 693 / 254-862 | 334 / 6.0-2192 | 1.2 / 0.3-1.8 | 4.4 / 1.7-6.6 | 192 / 135.274 | - | - |
| 10/72 | 7.8 / 7.2-8.4 | - | - | 86 / 39-361 | 697 / 455-861 | 509 / 397-541 | 32 / 13-99 | 1.75 / 0.83-4.85 | 2.0 / 1.4-3.0 | 106 / 86-131 | - | 1.4 / 0.4-1.7 |
| 7/73 | 7.6 / 7.3-7.8 | 6.2 / 4.4-8.4 | 12 / 8.4-19.3 | 29 / 20-39 | - | | 21 / 4.0-66 | 1.77 / 1.53-2.0 | 1.32 / 0.75-1.93 | - | - | 1.96 / 1.35-2.25 |
| 8/73 | 7.8 / 7.7-7.8 | 5.6 / 5.2-6.6 | 11.7 / 7.7-18.5 | 20 | - | - | 6 / 0.0-12 | 1.45 | 0.67 / 0.37-1.06 | - | - | 2.12 / 1.83-2.4 |
| 9/73 | 7.6 | 6.1 | 15.5 | 23 | - | - | 10 | 2.33 | 1.87 / 0.63-2.91 | - | 6.1 | 2.68 / 2.38-3.25 |
| 10/73 | 8.0 / 7.8-8.2 | 8.4 / 7.0-10.6 | 13.4 / 9.5-17.9 | - | - | - | 6.0 / 2.0-10 | - | - | - | - | - |

Table 2-12. (Continued)

| Date | pH | DO | BOD | COD | Spec Cond | Residue Filt | Non Filt | Phosphorus | Ammonia | Chlorides | Fecal Coliform (1000/100 ml) | Nitrate-Nitrogen |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/16/73 | 8.1 | 7.0 | | | 380 | 1800 | 100 | 3.4 | 0.80 | | 47 | 3.0 |
| 11/73 | 8.2 / 7.9-8.5 | 9.2 / 8.2-10.6 | 10.2 / 4.7-16.4 | 19.3 / 16-22 | - | - | 16.2 / 3.0-38 | 1.9 / 1.25-2.5 | - | - | - | - |
| 11/16/73 | 8.0 | 10.0 | | | 560 | 650 | 50 | 1.3 | 3.60 | - | 8 | 3.5 |
| 12/73 | 7.4 / 7.4-7.5 | 10.6 / 9.7-11.8 | 11.7 / 7.7-14.8 | 26 / 16-32 | - | - | 37 / 14-73 | 1.45 | - | - | - | - |
| 12/13/73 | 7.7 | 13.0 | - | - | 500 | 250 | 150 | 1.35 | 2.70 | - | 16.5 | 3.2 |
| 1/74 | 7.6 / 7.5-7.7 | 11.2 / 10.0-12.8 | 11.1 / 6.6-16.6 | 45 / 26-82 | - | - | 35.6 / 15-68 | 1.62 / 1.08-2.73 | 2.73 / 1.48-3.98 | - | - | 1/27 / 1.02-1.56 |
| 01/18/74 | 8.5 | 12.0 | - | - | 660 | 45.3 | 4.7 | 1.05 | 2.90 | - | 4.2 | 2.5 |
| 2/74 | 7.6 / 7.5-7.7 | 11.3 / 10.9-11.9 | - | 32.8 / 18-42 | - | - | 86.5 / 22.0-274 | 3.25 / 1.60-5.60 | 3.24 / 2.48-3.87 | | - | 0.82 / 0.32-1.14 |
| 02/13/74 | 8.3 | 12.0 | | | 940 | 80.1 | 7.9 | 1.12 | 7.0 | - | 13.3 | 1.30 |
| 3/74 | 7.45 / 7.4-7.5 | 10.9 / 9.9-11.7 | 14.9 / 9.8-22 | - | - | - | 95.8 / 24.0-228 | 2.20 / 0.88-3.13 | - | - | - | - |
| 03/04/74 | 7.4 | 14.0 | - | - | 510 | 44.5 | 10.5 | 0.21 | 2.2 | - | 1.6 | 0.75 |
| 4/74 | 7.5 / 7.4-7.5 | 8.9 / 8.8-8.9 | 7.1 / 4.5-8.8 | 32 / 26-37 | - | - | 26.0 / 25-27 | 1.44 / 1.12-1.73 | 3.22 / 3.22 | - | - | 0.82 |
| 5/74 | 7.5 / 7.4-7.6 | 7.0 / 5.7-8.0 | 10.5 / 6.6-16.6 | 30 / 18-41 | - | - | 45 / 22-60 | 1.83 / 1.38-2.50 | 1.63 / 1.05-2.20 | - | - | 0.82 / 0.70-0.93 |

decline in dissolved oxygen. Dissolved oxygen concentrations increased about 1.5 mg/l between State Route 303 and Boston Mills Road (River Mile 27), then decreased again 1 to 2 mg/l between Boston Mills Road and the Ohio canal diversion dam (River Mile 21.5). No consistent pattern of dissolved oxygen concentrations was observed below the diversion dam (Table 2-8 through 2-12).

Dissolved oxygen concentrations in the Cuyahoga River in the study area apparently have improved since 1967. Per cent oxygen saturation values were higher in 1973 and 1974 than in 1967. The Three Rivers Watershed District has compared minimum dissolved oxygen concentrations obtained in July and August 1967, and September 1973. In general minimum dissolved oxygen concentrations were 2 to 4 milligrams per liter higher in 1973 than in 1967. Most minimum dissolved oxygen concentrations in 1967 were less than the Ohio standard of 4.0 milligrams per liter, whereas none of the minimum concentrations in 1973 was less than the standard.

The improvement in dissolved oxygen is substantiated by dissolved oxygen data for the Cuyahoga River at Rockside Road (Independence). Data for 1971 were considered to be typical for the period 1967 to 1971. Dissolved oxygen concentrations in 1973 were generally about 1 milligram per liter higher than in 1971. Improvement in dissolved oxygen concentration was ascribed to improved municipal wastewater treatment plants.

Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) are measures of the concentration of oxygen demanding substances in a stream. BOD in the Cuyahoga River at Boston Mills Road, Brecksville (above diversion dam), and at Riverview Road, ranged from 2.2 to 22 milligrams per liter and COD ranged from 10.4 to 248 milligrams per liter. It has been suggested that BOD and COD concentrations of 1.5 and 9.0 milligrams per liter respectively are typical of rural streams and BOD and COD concentrations of 4.8 and 16.8 are typical of urban streams. Average BOD and COD concentrations in the study area were significantly greater than the typical urban stream values. Thus the concentrations of oxygen demanding materials in the Cuyahoga River in the study region is high.

Much of the oxygen demanding material in the Cuyahoga River came from the Botzum (Akron) wastewater treatment plant. River survey data from 1973 shows that above the Botzum plant 5 day BOD concentrations were generally less than 5 milligrams per liter. BOD concentrations below the plant were about 9.0 to 18 milligrams per liter higher than above it. There has been a steady reduction of the concentration of BOD in the effluent from the Botzum treatment plant. The 1968 average daily concentration was 30 milligrams per liter, whereas the average daily concentration in 1973 was 18 milligrams per liter. This improvement probably contributed to increasing dissolved oxygen concentrations in the river as it enters the study area.

Total phosphorus in the Cuyahoga River as measured at four stations at and below Boston Mills Road from 1967 to 1974 ranged from 0.11 to 5.60 milligrams per liter, all recorded total phosphorus concentrations were greater than the U.S. Environmental Protection Agency standard for the prevention of the growth of nuisance aquatic plants (0.1 mg/l). Nitrate-nitrogen concentrations at the four Cuyahoga River stations in the study area ranged from 0.0 to 11.98 milligrams per liter. Concentrations generally were high enough to sustain algal growth.

Combined nitrate and nitrite-nitrogen concentrations were measured during 1973 river surveys. Water below the Botzum (Akron) treatment plant was about 1 to 25 milligrams per liter higher in nitrate and nitrite-nitrogen than water above the plant. Thus the Akron sewage treatment plant was a principal source of combined nitrate and nitrite-nitrogen in the study region. There has been no consistent pattern of increase or decrease in nitrate and nitrite concentrations although some data suggest a decrease in both after 1967. A comparison of 1971 and 1973 river survey data indicated that nitrate and nitrite concentrations have increased below the Botzum-Akron treatment plant.

Ammonia concentrations at the four Cuyahoga mainstream stations ranged from 0.21 to 7.1 milligrams per liter. Many observed concentrations exceeded the Ohio standard of 1.5 milligrams per liter. Data from the September 1973 survey showed that effluent from the Botzum wastewater treatment plant increased ammonia concentrations in the Cuyahoga River by about 2.3 to 2.6 milligrams per liter. Within the study area ammonia concentrations generally decreased with increasing distance from the Akron plant. Ammonia concentrations in the effluent from the Botzum treatment plant have decreased in recent years because of the incorporation of some nitrification into the treatment process. Although some data indicates that ammonia concentrations in 1973 and 1974 generally were higher than in 1967, a comparison of 1971 and 1973 river survey data indicates that ammonia concentrations below the Botzum wastewater plant have decreased.

Chemical data on detergent concentrations in the Cuyahoga River were not available. Visual inspection of the river by Akron environmental groups has indicated that foaming in the Cuyahoga River has decreased in the past several years.

At Brecksville (above canal diversion dam) cadmium concentrations exceeded Ohio state standards (0.005 milligrams per liter) on four of six measurements during water year 1974. At Boston Mills Road Ohio standards were exceeded once in water year 1974. Recorded chromium and zinc concentrations were below Ohio standards at all six measurements. Polychorinated biphenyls in the Cuyahoga River were measured by the U.S. Environmental Protection Agency in 1973. At River Mile 37.1 (Martin Road, about 0.3 miles below Bath Road) and 21.5 (Route 82) PCB concentrations of 55 nanograms per liter (ng/l) and 86 ng/liter as Arachlor 1254 were observed. These concentrations were far in excess of the proposed USEPA

standard of 2 ng/liter. It was concluded that the cities of Kent, Akron, and Cleveland, and undetermined sources on Tinkers Creek (see Water Quality Tributaries, next page) were the major contributors of polychorinated biphenyls to the Cuyahoga River.

Fecal coliform bacteria concentrations in the Cuyahoga River at five stations at and below Boston Mills Road ranged between 0.0 and 700,000 per 100 ml measurements made between 1967 and 1974. The Ohio State fecal coliform standard is a maximum of 200 per 100 ml as a 30 day geometric mean and a maximum of 400 per 100 ml in 10 per cent of all samples during a 30 day period. A concentration of 400 per 100 ml also is the proposed U.S. Environmental Protection Agency standard for primary contact recreation. Most fecal coliform concentrations exceeded 400 organisms per 100 ml. Fecal coliform concentration also often exceeded USEPA standards for secondary contact recreation of 4000 organisms per 100 ml.

Tributaries

According to the same report from August to November 1973, specific conductance in the tributaries ranged from 450 to 1,100 micromhos per centimeter in Brandywine Creek and 325 to 725 micromhos per centimeter in Tinkers Creek. The specific conductance values for Brandywine Creek were greater than those for Tinkers Creek. The average specific conductance measured in Brandywine (690 micromhos per centimeter) was higher than the specific conductance in the Cuyahoga River between October 1973 and March 1974, whereas the average specific conductance measured in Tinkers Creek was similar (596 micromhos per centimeter) to that of the Cuyahoga River. (Tables 2-13, 14, 15.)

The high oxygen demand in Chippewa Creek at Harris Road was caused by leachate from a sanitary landfill entering a tributary of Chippewa Creek upstream of Harris Road. After the measurements of water quality were made in 1969 adjustments were made in landfill operations and storm runoff was diverted from the tributary. Presumably these measures have reduced the concentration of oxygen demanding material in Chippewa Creek. In spite of the high oxygen demand in Brandywine Creek, Chippewa Creek and Tinkers Creek, dissolved oxygen concentrations generally were acceptable for the maintenance of aquatic life because of good natural reaeration, although high dissolved oxygen levels do not guarantee a community of high diversity.

Concentrations of oxygen demanding materials in Sagamore Creek, Slipper Run, Spring Run, Yellow Creek and Furnace Run were less than in the Cuyahoga River. Furnace Run was particularly low in oxygen demanding materials. BOD and COD concentrations generally were only slightly above those expected in a rural stream.

Total phosphorus concentrations in the tributaries ranged from 0.0 to 34 milligrams per liter. Phosphorus concentrations

Table 2-13. Location of surface water quality sampling stations in tributaries of the Cuyahoga River.

| STATION | TRIBUTARY | LOCATION | TRIBUTARY RIVER MILE |
|---|---|---|---|
| YCL | Yellow Creek | Riverview Road | 0.1 |
| FR1 | Furnace Run | Riverview Road | 0.2 |
| FR2 | Furnace Run | Bush Road | 6.8 |
| SR1 | Slipper Run | Bush Road | 0.1 |
| SPR1 | Spring Run | Riverview Road | 0.2 |
| BC1 | Brandywine Creek | Jaite Mill | 0.1 |
| BC2 | Brandywine Creek | Old Route 8 | 3.0 |
| CC1 | Chippewa Creek | Riverview Road | 0.3 |
| CC2 | Chippewa Creek | Harris Road | 3.5 |
| SC1 | Sagamore Creek | Canal Road | 0.1 |
| SC2 | Sagamore Creek | Sagamore Road | 2.7 |
| SC3 | Sagamore Creek | Houghton Road | 3.2 |
| TC1 | Tinkers Creek | Canal Road | 0.2 |
| TC2 | Tinkers Creek | Dunham Road | 0.8 |

Table 2-14. Results of chemical and physical analysis of surface water samples. Cuyahoga River Tributary Streams; May, 1967 - November, 1973.

| STATION | DATE | DISSOLVED OXYGEN (MG/L) RANGE | OXYGEN SATURATION (X) AVERAGE | OXYGEN SATURATION (X) RANGE | BIOCHEMICAL OXYGEN DEMAND (MG/L) AVERAGE | BIOCHEMICAL OXYGEN DEMAND (MG/L) RANGE | CHEMICAL OXYGEN DEMAND (MG/L) AVERAGE | CHEMICAL OXYGEN DEMAND (MG/L) RANGE | TOTAL PHOSPHORUS (MG/L) AVERAGE | TOTAL PHOSPHORUS (MG/L) RANGE | NITRATE-NITROGEN (MG/L) AVERAGE | NITRATE-NITROGEN (MG/L) RANGE | METHYLENE BLUE ACTIVE SUBSTANCES (MG/L) AVERAGE | METHYLENE BLUE ACTIVE SUBSTANCES (MG/L) RANGE | FECAL COLIFORM BACTERIA (THOUSANDS/ 100 ML) AVERAGE | FECAL COLIFORM BACTERIA (THOUSANDS/ 100 ML) RANGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YC1 | 6-9/69 | 7.0-12.0 | 101 | 74 -141 | 2.7 | 1.1- 3.8 | 28 | 12- 43 | - | | 0.15 | - | - | - | 4.2 | 0.29- 6.4 |
| FR1 | 5-9/67 | 5.0- 9.5 | 85 | 52 -116 | 1.1 | 0 - 3.5 | 8 | 2- 18 | 0.16 | 0.0 - 0.3 | 0.31 | 0.0 - 0.71 | - | - | 4.2 | 0.1 - 21 |
| | 6-9/69 | 7.1-12.4 | 104 | 78 -153 | 1.2 | 0.1- 3.0 | 16 | 8- 23 | - | - | 0.20 | 0.15- 0.25 | - | - | 0.5 | 0.19- 0.81 |
| FR2 | 6-9/69 | 8.5-11.5 | 115 | 92 -138 | 2.6 | 1.3- 3.9 | 18 | - | - | - | 0.15 | - | - | - | 0.11 | - |
| SR1 | 6-9/69 | - | 83 | - | 4.7 | - | - | - | - | - | - | - | - | - | 1.0 | - |
| SPR1 | 6-9/69 | - | 136 | - | 5.0 | - | | - | - | - | - | - | - | - | 0.0 | - |
| BC1 | 6-9/69 | 6.4-10.5 | 90 | 68 -119 | 14.3 | 8.0-30.0 | 71 | 52- 96 | 3.64 | - | 0.88 | 0.40- 1.50 | - | - | 168.5 | 2.5 -500 |
| | 8/73 | 4.6- 5.8 | 58 | 46 - 70 | 13.1 | 5.2-21.0 | 45 | 32- 64 | 2.0 | 1.0 - 2.9 | 0.36 | 0.22- 0.52 | 0.26 | 0.19-0.34 | 8.5 | 0.86-15.0 |
| | 9/73 | 4.9-11.0 | 75 | 44 -131 | 21.2 | 8.8-29 | 30 | 4- 48 | 3.3 | 2.2 - 5.7 | 0.79 | 0.54- 0.90 | 0.31 | 0.18-0.43 | 9.0 | 1.1 - 23 |
| | 10/73 | 5.4- 7.4 | 62 | 52 - 72 | 15 | 12 -17 | 30 | 28- 32 | 0.6 | - | 0.21 | 0.15- 0.27 | 0.16 | 0.15-0.18 | 15.9 | 5.8 - 26 |
| BC2 | 6-9/69 | 0.5- 7.1 | 41 | 5 - 80 | 8.5 | 4 -15 | 293 | 40-790 | 1.68 | - | 1.03 | 0.85- 1.20 | - | - | 108.5 | 6.8 -380 |
| CC1 | 6-9/69 | 6.7- 8.0 | 85 | 74 - 95 | 5.5 | 4.0- 7.0 | 39 | - | - | - | 0.05 | - | - | - | 2 | 0 - 4 |
| CC2 | 6-9/69 | 5.2-12.2 | 102 | 56 -150 | 32.3 | 9 -55.5 | 172 | - | - | - | 0.20 | - | - | - | 12.9 | 9 - 16.8 |
| SC1 | 5-9/67 | 5.5- 8.0 | 74 | 61 - 98 | 4.1 | 2.7- 6.0 | 20 | 11- 26 | 0.85 | - | - | - | - | - | 72 | 10 -234 |
| | 6-9/69 | 5.8- 9.6 | 88 | 64 -109 | 3.6 | 3.2- 4.0 | 32 | - | - | - | 0.80 | - | - | - | 43 | 0 - 65 |

Table 2-14. (Continued)

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SC2 | 6-9/69 | 5.3-13.6 | 104 | 58 -160 | 9.0 | 4 -14 | 78 | - | - | - | 1.40 | - | - | - | 2.0 | 0.58- 3.5 |
| SC3 | 6-9/69 | 5.5- 6.9 | 66 | 58 - 75 | 3.8 | 2.6- 5.0 | 39 | - | - | - | 0.70 | - | - | - | 5.25 | 0.9 - 9.6 |
| TC1 | 8/73 | - | - | - | 5 | - | 12 | - | 3.5 | - | 2.93 | - | - | - | - | - |
| | 9/73 | 6.5- 9.5 | 82 | 75 -109 | 9.75 | 2.8-22 | 17.5 | 8- 26 | 11.2 | 2.75-34 | 3.17 | 2.08- 4.28 | - | - | - | - |
| | 10/73 | 7.9- 8.7 | 79 | 71 - 92 | 4.6 | 4.2- 5.0 | 28.5 | 20- 37 | 2.75 | - | 2.42 | 1.91- 2.93 | - | - | - | - |
| | 11/73 | - | 96 | - | 11.0 | - | 56 | - | 1.10 | - | 0.27 | - | 0.19 | - | 2.7 | - |
| TC2 | 5-9/67 | 9.1-10.0 | 109 | 101 -117 | 8.7 | 3.8-10 | 30 | 21- 36 | 2.58 | 1.47- 3.55 | 5.78 | 0.73- 7.76 | - | - | - | - |
| | 6-9/69 | 7.7- 9.0 | 93 | 85.6-102 | 9.2 | 3 -17 | 56 | 34- 96 | 2.75 | - | 0.56 | 0.2 - 1.0 | - | - | 229 | 0 -345 |

Table 2-15. Results of chemical and physical analysis of surface water samples from tributary streams of the Cuyahoga River, May 1967 to November 1973[a].

| STATION | DATE | pH AVERAGE | pH RANGE | FILTRABLE RESIDUE (MG/L) AVERAGE | FILTRABLE RESIDUE (MG/L) RANGE | SPECIFIC CONDUCTANCE (MICROMHO/CM) AVERAGE | SPECIFIC CONDUCTANCE (MICROMHO/CM) RANGE | CHLORIDE (MG/L) AVERAGE | CHLORIDE (MG/L) RANGE | NONFILTRABLE RESIDUE (MG/L) AVERAGE | NONFILTRABLE RESIDUE (MG/L) RANGE | TEMPERATURE (°C) AVERAGE | TEMPERATURE (°C) RANGE | DISSOLVED OXYGEN (MG/L) AVERAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YC1 | 6-9/69 | - | 7.9-8.2 | 348 | 321-375 | - | - | 25 | 24- 26 | 131 | 29- 233 | 21.0 | 19 -24 | 9.1 |
| FR1 | 5-9/67 | - | 7.1-8.1 | 464 | - | - | - | 81 | 74- 87 | 17 | 3- 76 | 22.1 | 17 -26.5 | 7.5 |
| | 6-9/69 | - | 7.8-8.2 | 459 | 459-459 | - | - | 50 | 49- 50 | 14 | 11- 18 | 22.8 | 20.6-27 | 9.0 |
| FR2 | 5-9/69 | 7.9 | 7.7-8.0 | 461 | - | - | - | 57 | - | 12 | - | 22.7 | 20.0-25.5 | 10.0 |
| SR1 | 6-9/69 | 7.9 | - | - | - | - | - | - | - | - | - | 20.0 | - | 8.5 |
| SPR1 | 6-9/69 | 8.0 | - | - | - | - | - | - | - | - | - | 25.0 | - | 11.4 |
| BC1 | 6-9/69 | - | 7.6-7.8 | 454 | 367-560 | - | - | 46 | 26- 71 | 56 | 34- 76 | 20.7 | 18.9-22 | 8.0 |
| | 8/73 | 7.3 | 6.8-7.9 | 537 | 412-660 | 730 | 480-1100 | 97.8 | 66-140 | 24.8 | [illegible]- 52 | 21.2 | 16 -26 | 5.3 |
| | 9/73 | 6.9 | 6.5-7.5 | 536 | 403-624 | 730 | 450-1100 | 129 | 88-150 | 31 | 0- 48 | 16.2 | 10.6-25 | 7.5 |
| | 10/73 | 7 | - | 456 | 381-531 | 530 | 410-650 | 78.5 | 57-100 | 16.5 | 2- 31 | 15 | 15 | 6.4 |
| BC2 | 6-9/69 | - | 7.3-7.8 | 469 | 388-572 | - | - | 52 | 28- 81 | 4592 | 23-12699 | 20.5 | 19.5-22.0 | 3.7 |
| CC1 | 6-9/69 | 7.8 | 7.4-8.1 | 381 | - | - | - | 21 | - | 3 | - | 22.9 | 20.7-25 | 7.4 |
| CC2 | 6-9/69 | 7.8 | 7.6-8.1 | 425 | - | - | - | 27 | - | 29 | - | 23.6 | 20.2-27 | 8.7 |
| SC1 | 5-9/67 | - | 6.9-8.0 | 450 | 410-619 | - | - | 168 | 117-220 | 18 | 3- 61 | 23.3 | 21 -26 | 6.5 |
| | 6-9/69 | 7.5 | - | 338 | - | - | - | 92.5 | 34-151 | 10 | - | 21.5 | 21 -22 | 7.7 |

Table 2-15. (Continued)

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SC2 | 6-9/69 | 7.8 | 7.7-8.0 | 334 | - | - | - | 31 | - | 27 | - | 21.3 | 20.8-23.8 | 9.4 |
| SC3 | 6-9/69 | 7.7 | 7.5-7.9 | 339 | - | - | - | 67 | - | 11 | - | 19.3 | 18.6-20.1 | 6.2 |
| TC1 | 8/73 | 7.0 | - | 476 | - | 720 | - | 91 | - | 22 | - | 24 | - | - |
| | 9/73 | 6.7 | 6.0-7.0 | 554 | 486-628 | 665 | 620-725 | 104 | 77-121 | 13.5 | 4- 32 | 17.4 | 13 -22.5 | 8.0 |
| | 10/73 | 6.5 | 6.0-7.0 | 479 | 392-566 | 564 | 520-609 | 53.5 | 38- 69 | 37.5 | 7- 68 | 14.5 | 11 -18 | 8.3 |
| | 11/73 | - | - | 374 | - | 325 | - | 57 | - | 34 | - | 4.5 | - | 12.4 |
| TC2 | 5-9/67 | - | 7.0-7.7 | 490 | - | - | - | 90 | - | 15 | 7- 24 | 22.0 | 21 -24 | 9.6 |
| | 6-9/69 | - | 7.8-7.9 | 405 | 113-661 | - | - | 34 | 6- 81 | 53 | 9- 83 | 21.4 | 20.8-22.5 | 8.4 |

[a]Data for 1967 and 1969 were collected by Havens and Emerson, Ltd. (1970). Data for Brandywine Creek and Tinkers Creek in 1973 were collected by the Ohio Environmental Protection Agency and Eco-Labs, Inc., respectively (Ohio Environmental Protection Agency, 1974).

in the tributaries generally exceeded the proposed USEPA standard (0.1 milligrams per liter) for the prevention of the growth of nuisance aquatic plants. The highest total phosphorus concentrations were observed in Tinkers Creek and Brandywine Creek; phosphorus concentrations there were similar to those observed in the Cuyahoga River. Total phosphorus concentrations in Sagamore Creek were lower than in the Cuyahoga River but still high. In Chippewa Creek and Furnace Run total phosphorus concentrations were lower than in the Cuyahoga River by approximately a factor of ten.

Nitrate-nitrogen concentrations in the tributaries ranged from 0.0 to 7.76 milligrams per liter. Concentrations in Tinkers Creek, Brandywine Creek and Sagamore Creek generally were high enough to sustain algal growth, and were similar to concentrations in the Cuyahoga River. High concentrations were caused primarily by wastewater discharges to the creeks. Normal concentrations were observed in Chippewa Creek, Yellow Creek and Furnace Run.

The concentrations of methylene blue active substances in Tinkers Creek at Canal Road (River Mile 0.2) on November 7, 1973 was 0.19 milligrams per liter. In Brandywine Creek the concentrations were less than the State of Ohio standard of 0.5 milligrams per liter.

Metal concentrations in Brandywine Creek were measured at the Jaite Mill during the summer of 1973. No arsenic, hexavalent or total chromium, lead, selenium, silver or zinc was detected on either June 25 or July 13, and no mercury was detected on June 25. Concentrations (micrograms per liter) of other metals measured were:

| Date | Barium | Copper | Manganese |
|---|---|---|---|
| 6-15 | 0 | 20 | 350 |
| 7-13 | 100 | 10 | 160 |
| 8-8 | -- | 10 | 180 |
| 8-15 | -- | 0 | 120 |

Barium and copper concentrations were less than the State of Ohio standards of 800 and 500 micrograms per liter, respectively. Total manganese concentrations were less than the Ohio standard (1000 micrograms per liter).

Concentrations of polychlorinated biphenyls measured near the mouth of Tinkers Creek, Brandywine Creek and Furnace Run on May 16 and 17, 1973 were 482 nanograms per liter, 180 ng/l, and 48 ng/l as Arachlor 1254 respectively. PCB concentrations in each of the three streams exceeded the proposed U.S. Environmental Protection Agency standard of 2 nanograms per liter. The source of PCB's in these streams is not known. PCB concentrations in Brandywine Creek and Tinkers Creek were greater than PCB concentrations in the Cuyahoga River in the study area, whereas the concentrations in Furnace Run were less than in the Cuyahoga River.

Concentrations of fecal coliforms in the tributaries ranged from 0.0 to 500,000 organisms per 100 ml. These concentrations generally exceeded both the State of Ohio standard of a maximum of 400 organisms per 100 ml and the proposed U.S. Environmental Protection Agency standard for secondary contact recreation of 4000 organisms per 100 ml. Fecal coliform concentrations in Tinkers Creek, Brandywine Creek and Sagamore Creek were higher than in the other tributaries and were caused by the discharge of wastewater to the creeks. Fecal coliform concentrations in Brandywine Creek were lower in 1973 than in 1969. (Table 2-14, 15.) Other tributary water quality measurements are in Tables 2-16 to 2-21.

The Ohio Department of Natural Resources evaluation is also consistent with the earlier 1970 Three Rivers Watershed District survey of Cuyahoga tributaries in its Plan for Water Quality Management in the Central Cuyahoga Basin. Although some of the pollution measurements have changed, the description of local reaeration conditions is quite useful. This is summarized below, by tributary.

Tinkers Creek: Tinkers Creek originates in a flat plateau in Streetsboro Township. The area has numerous swamps and several lakes, which are generally in the eutrophic stage. Water quality is good, although nutrient-rich. The stream gradient is flat, and reaeration is low. As the water flows downstream effluent from the Streetsboro wastewater plants enters at Route 303. Both Gille Estates and Arrowhead Estates wastewater have entered. There is, however, no substantial effect on the streams from these two minor pollution sources other than a higher coliform count. The biological condition at this station indicates a slightly polluted condition. The physical character of this reach is swamplike. The water is clear with a slight greenish-brown color typical of eutrophic waters. The BOD and DO are generally acceptable, with BOD averaging 3 mg/l and DO averaging 6.7 mg/l. The BOD is typical of eutrophic swamp water and is mainly due to natural decay processes. Chemical results indicate enrichment, with a phosphorus concentration of 0.76 mg/l and a nitrate concentration of 0.44 mg/l. These values are somewhat higher than streams in the area that do not receive effluent discharges. The stream in this region met then current water quality standards except for coliform bacteria.

Between Route 303 and Route 14 two additional effluents - Streetsboro Sanitary District No. 2 and Western Reserve Estates, enter the stream. Again the load is small and the Streetsboro effluent flow in a tributary stream about 2 miles before reaching Tinkers Creek. Consequently its effect is somewhat diminished. Biological data from samples near Route 14 indicates eutrophic water quality. The physical appearance does not change from that near Route 303 upstream. The BOD remains nearly the same also; however, in two cases the DO did go below 5.0 mg/l. Chemical analysis showed an increase of chlorides and nitrates. Coliform bacteria remained high. The stream in that reach met water quality standards except for coliform bacteria and

Table 2-16. Dissolved Sulfate, Tinkers Creek at Bedford, Bi-monthly Measurements (Mg/L).

| Water Year | Nov | Jan | Mar | Apr | May | Jun | Aug | Sep | Yearly Range |
|---|---|---|---|---|---|---|---|---|---|
| 1974 | 78 | | 53 | 56 | | | 36 | | 36-78 |
| 1973 | - | 70 | 67 | | - | 82 | - | 73 | 67-82 |
| 1972 | - | 76 | 45 | | 46 | - | | 38 | 38-76 |
| 1971 | - | 69 | - | | 74 | 71 | 64 | - | 64-74 |
| 1970 | - | - | - | | - | - | | 94 | |
| 1969 | | | | | | | 59 | | |
| 1968 | | | | | | | 88 | | |
| 1967 | | | | | | | 76 | | |

Table 2-17. Specific Conductance, Tinkers Creek at Bedford, Quarterly or Bimonthly Measurements (Micrombos).

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yr. Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | | 490 | - | | | - | | | | | 430 | | 430-490 |
| 1973 | | 459 | | 671 | | 615 | | 661 | | 735 | | 953 | 459-735 |
| 1972 | | 764 | | 687 | | 934 | 338 806 | 605 | 327 | 412 | | 293-933 | 293-933 |
| 1971 | | 318 | | 964 | | 756 | | 764 | | 725 | | 582 | 318-964 |
| 1970 | 335 | 278 | | 240 | | 278 | | 289 | | 307 | | | 240-335 |
| 1969 | | | 638 | | 738 | | | | 634 | | 820 | | 634-820 |
| 1968 | | | | | | | | | | | 1040 | | |
| 1967 | | | | | | | | | | | 659 | | |

Table 2-18. Dissolved Chloride, Tinkers Creek at Bedford, Bi-monthly Measurements (Mg/L).

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yr. Range. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | | 41 | | | | 52 | 56 | | | | 36 | | 36-56 |
| 1973 | | | | 100 | | 87 | | | | 91 | | 150 | 87-150 |
| 1972 | | | | 120 | | | 35 | | 26 | | | 26 | 26-120 |
| 1971 | | | | 180 | | | | 140 | | 89 | 220 | | 89-220 |
| 1970 | 58 | | 178 | | 40 | | 70 | | 118 | 63 | | 75 | 40-178 |
| 1969 | | | 82 | | 116 | | | | 62 | | 132 | | 62-132 |
| 1968 | | | | | | | | | | | 178 | | |

Table 2-19. Reaction, Tinkers Creek at Bedford (pH)

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Yr. Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1974 | | 8.1 | | | | 7.5 | 8.0 | | | | 8.0 | | 7.5-8.0 |
| 1973 | | | 7.3 | | 8.2 | | - | | 8.2 | | 8.4 | | 7.3-8.4 |
| 1972 | | | | 7.1 | | | 7.6 | | 8.1 | | | 8.1 | 7.1-8.1 |
| 1971 | | | | 7.7 | | | | 8.1 | | 7.2 | 6.8 | | 6.8-8.1 |
| 1970 | | | | | | | | | | | | 6.8 | |
| 1969 | | | | | | | | | | | 7.9 | | |
| 1968 | | | | | | | | | | | 8.4 | | |
| 1967 | | | | | | | | | | | 8.4 | | |

Table 2-20. Sediment Load, Tinkers Creek at Bedford, Monthly Totals, 1972 and 1974.

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|
| 1974 | 7697 | 3026 | 9061 | 6985 | 5946 | 2659 | 1141 | 3721 | 1461 |
| flow(CFSD) | 4470 | 717 | 5868 | 1511 | 2428 | 2495 | 905 | 4255 | 282 |
| 1972 | | | 11393 | 7354 | 3667 | 4773 | | | |
| flow (CFSD) | | | 3210 | 7163 | 2438 | 7607 | | | |

Table 2-21. Miscellaneous Water Quality Data, Tinkers Creek at Canal Road. All measurements are in milligrams per litter, unless otherwise indicated.

| Date | DO | BOD | COD | Phosphorus | Fecal Coliform (1000/100 ml) | Fecal Streptococci (1000/100 ml) | Phenols (Micrograms/liter |
|---|---|---|---|---|---|---|---|
| 12/26/74 | 13.0 | - | - | .10 | 1.2 | 3.0 | 0 |
| 01/09/75 | 12.2 | - | 20.0 | .30 | - | - | 0 |
| 02/06/75 | 11.2 | 8.0 | 20.0 | .20 | .120 | .48 | 0.2 |
| 02/20/75 | 12.7 | 3.0 | 8.0 | .10 | - | - | - |
| 03/05/75 | 11.2 | 4.0 | 20.0 | .10 | .10 | .20 | 2 |
| 04/10/75 | 11.0 | 2.0 | 16.0 | .10 | .12 | .012 | 2 |

occasional low DO. It might still be termed a relatively unpolluted zone.

Pond Brook, a major tributary originating at Aurora Pond, joins Tinkers Creek below Route 14. Downstream of this junction to Route 91 there are several locations where the bedrock is the streambed. Riffles and small waterfalls in the vicinity of Old Mill Road and Route 14 provide good reaeration. The water in this reach has a typical greenish brown to yellow color although the transparency is high. There is no change in the BOD and DO conditions. Dissolved oxygen averages 5.5 mg/l during the morning of the months. The coliform count decreased, probably due to dilution and time decay. Nitrates and phosphorus values are relatively unchanged and chlorides have decreased, again probably due to dilution. The relatively constant values of nitrates and phosphorus with the small waste loads would indicate that the primary source of both these constituents is urban land runoff. The water quality here is enriched, but well recovered from the upstream pollution loads.

Between Route 91 and Glenwood Road, the present Twinsburg wastewater plant effluent enters the Creek. The effects of this effluent are noticeable by an increase in turbidity and a change to a brown color. Biology indicated a zone of recent pollution. BOD and DO conditions both changed. BOD increased to an average of 6 mg/l and the DO decreased to an average of 4.5 mg/l. Kjedahl nitrogen increased by two to three times, indicating recent pollution. Nitrates became lower, which may indicate low dissolved oxygen conditions at some times and places. Coliform bacteria also increase but not greatly. The water quality in this reach is highly enriched and is a zone of recent pollution. The reach downstream of the Twinsburg efflunent became degraded and did not meet the current water quality standards with respect to DO or coliform bacteria.

Below Glenwood Road the natural reaeration is low and the pollutional load further lowers the dissolved oxygen. An additional load is imposed by the Solon Wastewater plant before Richmond Road. By that point the physical appearance is brown and turbid. The BOD at this station averaged 10 mg/l and the DO average dropped to 3.9 mg/l. Nitrates remained low and Kjeldahl nitrogen remained high. Phosphorus also increased to 1.9 mg/l and chlorides are nearly double upstream values. Coliform counts increase to over 1,000,000 total coliform per 100 ml. Fecal coliforms increase to over 100,000 per 100 ml. The ratio of fecal coliform to total coliform indicates an increase in pollution from warm-blooded animals. This reach is in a zone of recent pollution and did not meet current water quality standards for DO or coliform bacteria.

Downstream from Richmond Road the water quality is further degraded by the effluent from the Bedford Heights treatment plant. Physical appearance and biological observations indicate further degradation. Downstream of Route 8 and the waterfalls the gradient increases through the Bedford Gorge and natural reaeration increases the dissolved oxygen to above water quality standards.

This high dissolved oxygen content is maintained until the Cuyahoga River is reached, even though the water quality is seriously degraded and the BOD average 9.2 mg/l. The biology in this reach does not recover even though the DO is high. The total coliform count average exceeded 500,000 per 100 ml and fecal coliform exceeded 200,000 per 100 ml. The entire reach downstream from Route 8 met present water quality standards with the exception of coliform criteria, even though the pollutional load is excessively high.

Brandywine Creek: Brandywine Creek flows through Hudson into Pine Lake and then to Lake Forest, both of which provide a long storage time. The Hudson Village trickling filter plant discharges its effluent into the creek downstream of Lake Forest. During low flow conditions the Hudson effluent probably makes up 60 per cent of the total flow. The flat gradient downstream does not allow for recovery before the Macedonia No. 9 Summit County plant discharges into the creek. The slope remains flat, and recovery is minimal until the Macedonia No. 15 plant is reached. The Macedonia No. 15 Plant is also operated by Summit County and is the largest input of pollution load to Brandywine Creek. From this plant to the edge of the Cuyahoga River flood-plain the gradient is steep and dissolved oxygen is high, even with the high BOD and COD load. At the Cuyahoga River flood-plain, the grade flattens out, and the effluent from the Jaite Paper Mills is discharged into the Creek. Downstream of this point the dissolved oxygen suffers both due to the decreased slope providing less aeration and to the increasing waste load.

More specifically, water quality at Prospect Road was generally good, except for periodic upsets by discharges from the Connecticut Colony plant. The DO was generally good and BOD averaged 4.2 mg/l during this study. Bacteria counts were high, indicating pollution. Downstream of this station, the stream enters Pine Lake and Lake Forest where water quality is improved by long term storage. As the outflow from these two ponds flow downstream, it encounters the Hudson plant effluent, which generally overburdens the natural flow. Although the average DO was 5.2 mg/l, the concentration was below 5.0 mg/l two of the four times samples were taken. Benthic organisms at this station were all of the pollution tolerant type. This site is typical of a zone of recent pollution.

Downstream of Hudson, the reaeration is low and two additional wastewater plant effluents (Macedonia No. 9 and No. 15) cause a degradation of water quality. Construction in this area caused further degradation by sedimentation during the summer of 1969; high values of suspended and total solids were observed at Old Route 8. There the biota was limited to sludgeworms and the physical appearance would indicate a zone of recent pollution. BOD increased to an average of 8.5 mg/l, COD average 293 mg/l and total coliform bacteria counts averaged near 500,000 per 100 ml.

Just downstream from Old Route 8 Brandywine Creek enters the area of the Cuyahoga River Valley wall. Here the stream cuts through a shale gorge with steep gradients and several waterfalls, which rapidly increase dissolved oxygen. Also Indian Creek, a major tributary, enters providing some additional good quality dilution water. Dissolved oxygen increased to an average of 8.0 mg/l even though the BOD averaged 14 mg/l and COD was 71 mg/l. Again this points to the inability of dissolved oxygen to accurately portray water quality. The physical appearance is gray with an effluent odor. Near the Cuyahoga River the effluent from the aerated lagoon of the Jaite Paper Mill enters Brandywine Creek. This effluent adds additional pollution, but the effects are not apparent by the time the Creek enters the Cuyahoga River.

Brandywine Creek is generally polluted downstream from the Hudson Plant. The quality would not meet water quality standards because of physical appearance, bacteriological quality, and occasional DO depressions.

Sagamore Creek: The Sagamore Creek watershed is the smallest of those studied, with a drainage area of 6.7 square miles. Three small wastewater plants discharge their effluent into the creek. The effluent from the Northfield Village plant is of poor quality and is a major pollution load on the creek. Nagy Home Estates is a privately operated plant, although the Summit County Sanitary Engineer had planned to take over the operation in late 1969. At the lower end of Sagamore Creek, the Hawthornden State Hospital Plant discharges effluent into the creek. The gradient of Sagamore Creek is steep; consequently, dissolved oxygen is not a problem in the lower reaches.

Upstream tributaries of Sagamore Creek are basically intermittent flowing rivulets except for Willow Lake outlet and the tributaries receiving effluent from Northfield Village and Nagy Estates. The stream gradient is steep, and generally the substrate is unstable gravel and shale fragments.

From Sagamore Road to the Cuyahoga River the stream is apparently in a recovery zone; stream biota is varied and plentiful. Hawthornden Hospital also enters this reach, but the combination of steep gradient, unstable substrate and high aeration maintains a reasonably good biotic community. During the summer of 1969 the BOD and suspended solids were high, indicating pollution.

The high nitrogen content also reflects pollution and the majority of nitrogen was in the form of organic and ammonia (measured as Kjeldahl nitrogen) which further indicates recent pollution. Bacterial counts were over 100,000 total coliforms per 100 ml at Canal Road. Upstream of Houghton Road the quality does not change materially. The quality may be affected by septic tank discharges.

Sagamore Creek would meet the present water quality standards of the Ohio EPA except for the bacterial criteria. The creek would be considered to be in a zone of recovery for its entire length.

Chippewa Creek: The Chippewa Creek watershed is almost entirely within the communities of Brecksville, Broadview Heights and North Royalton. The watershed has an area of 17.7 square miles and a 1970 population of about 24,000 people.

The upstream half of the watershed, generally above Harris Road, is within Broadview Heights and North Royalton, two communities without centralized waste treatment. There are seven package plants discharging effluent into Chippewa Creek as well as a sanitary landfill with improper drainage. Downstream of Harris Road there are no major pollution loads. This portion is within Brecksville and much of this lower portion is within the Metropolitan Park System. Wastewater from Brecksville goes to the Cuyahoga County plant which discharges effluent to the Cuyahoga River. The county planned to incorporate Broadview Heights and North Royalton into the service area which would then cover the entire Chippewa Creek Basin.

Chippewa Creek shows the effect of pollutants throughout its length. A slight gray color, the presence of detergent foam and a noticeable effluent odor were generally observed. Rubbish is frequently noted along the stream course, especially in the vicinity of the bridges.

Most of the package plants serve housing developments, schools or large apartment complexes, and most are producing a low quality effluent, which is discharged into branches of the creek containing relatively small flows.

During the study period (in 1969) the single most damaging effluent entered by way of a southerly tributary branch between Avery and Harris Roads. This creek carries the leachate from a sanitary landfill. At its worst, the effluent was an opaque, reddish brown color with an odor similar to rotten garbage. The principal effect on Chippewa Creek was a fish kill extending for approximately two miles downstream. The numbers of fish noted as dead or in severe distress were established as several hundred, primarily the stoneroller (a minnow) and various small sunfish.

Biology of the stream below Harris Road indicates a moderate to heavy pollution load. Upstream of Harris Road, above the landfill, the benthic organisms become more diverse. The population of some species indicates a moderate pollution load is present. The stream gradient is sufficient to produce adequate aeration, and dissolved oxygen is usually at or close to saturation throughout its length. Chemical analysis indicated a high BOD averaging 32 mg/l at Harris Road. Kjeldahl nitrogen, COD, and solids were also high, reflecting the low quality of the sanitary fill leachate. Dissolved oxygen was relatively high,

again indicating its limitation as a significant parameter in small streams. Chippewa Creek would not meet current water quality standards due to the high coliform counts, toxic nature of the landfill discharges and visible evidence of pollution. The stream is in a zone varying from excessive enrichment to a zone of recent pollution.

Furnace Run: The Furnace Run watershed is one of the least developed of any in the study area. The drainage area is 22.3 square miles, and the terrain is generally rugged with a steep stream gradient. There are no major communities within the watershed and it is largely undeveloped except for the Village of Richfield. Much of the creek is within the Furnace Run Reservation Park. Presently there are no wastewater treatment plants discharging to the creek, and the pollution load from surface runoff and septic tanks is minor.

Throughout its length Furnace Run has a physical appearance and biological population typical of a clean water stream. The DO is high and BOD is low. Nutrients are also low. Chlorides were high during both the 1967 and 1968 survey. A source could not be located during the summer work; however, there are several oil wells in the watershed that may be discharging brine to the creek.

Slipper Run: Slipper Run flows through the Village of Peninsula on the west side of the Cuyahoga. The watershed is just north of the Furnace Run watershed, and although it is small it is in an area that may develop rapidly. Part of Richfield Village, north of the Ohio Turnpike and I-77, is within this watershed.

During the summer of 1969, one sampling station was established at Riverview Road. The physical appearance indicates an unpolluted stream. The creek, as it passes through Peninsula, is in a wooded ravine. Stream biota was varied. One sample taken for chemical analysis indicated the stream may be receiving some effluent - probably septic tank drainage from the houses in Peninsula along Route 303. This stream has a high water quality and meets existing standards, except for coliform counts, and would be considered relatively unpolluted.

4. Natural Vegetation and Wildlife

The description of communities and habitat on Pages 39-45 and the list of species in Appendix B-2 are generally accurate, although the upland sandpiper and common tern are considered to be endangered in the state by the Ohio Department of Natural Resources, and the osprey is now classified as a nationally endangered species by the U.S. Department of Interior Fish and Wildlife Service.

The applicant states that none of the birds breed in the Cuyahoga River Valley. The eagles, *Haliaetus leucocephalus*, have a wide range and are seen periodically in the valley but

nest in other areas of the state. The sharp-shinned hawk winters in the valley and is a possible rare breeder, but nesting is not recently reported. The peregrine falcon and Kirtland warbler migrate through the Valley in the spring and fall. The Indiana Bat is known as a summer resident in Southeast Ohio and can be expected in the Cuyahoga Valley; lack of suitable caves probably precludes hibernation in the area.

As briefly mentioned on Page 142 of the Assessment, there is a breeding colony of the spotted salamander (Ambystoma maculata) along Sagamore Road on the Hawthornden trunk. This species is listed in the "Ohio List Proposed" as an endangered species within Cuyahoga County. Although its normal habitat north of Sagamore Road is within Cuyahoga County, in the spring the population moves south across the road to ponds used for breeding purposes. Eradication of the spotted salamander from Cuyahoga County is chiefly a result of urbanization.

Of the species listed on Pages 39-45, the Ohio Department of Natural Resources Division of Wildlife rates the density of cottontail rabbit at about 200 to 400 per square miles. The best rabbit cover in the area are the bottomlands, where small agricultural holdings meet the brushy growth of the slopes.

The Cuyahoga Valley is an area of relatively low ringnecked pheasant density, less than seven birds per square mile. Local populations along the valley bottom are higher. The northern and part of the western edge of Summit County has a population of one to seven birds per square mile, concentrated around the sweet cornfield south of the Peninsula area and north of Bath Road.

Bobwhite quail are also considered to occur in relatively low density - less than ten coveys (or 150 birds) per square miles. Quail like a mixture of cover types and are found in the bottomlands at the edge of field openings and cropland in the valley.

White-tailed deer populations were estimated in 1973 as being about 0.5 deer per square mile of area in Cuyahoga and Summit County. The wooded areas of the Cuyahoga Valley which are approximately 90 per cent undeveloped have served as the reservoir from which deer populations have expanded. Of 134 square miles of suitable deer range in Summit County, approximately 80 per cent is located within the proposed Cuyahoga Valley National Recreation Area. Cuyahoga County has about 65 square miles of suitable deer range, most of which is within the Cleveland Metropolitan Park System (some of which will become part of the recreation area).

Approximately two fox squirrels per acre of woodlot occur in the Cuyahoga Valley. Since the area is secondary range for gray squirrels, they occur in somewhat smaller numbers, being centered in the larger woodlots and around cities and parks. Black squirrels, considered a color phase of gray squirrels are found in the Kent, Hudson and other town parks and residential areas.

The Cuyahoga River Valley falls on the western edge of the secondary range of the ruffed grouse. Grouse are present in the Richfield and Bath areas and maintain breeding populations despite the area's urbanization pressures.

At least one nesting wild turkey hen has been verified within the proposed boundaries of the Cuyahoga Valley National Recreation Area.

The Cuyahoga River is considered an excellent wood duck area, producing an estimated 2.35 wood ducks per stream mile per year. This duck is the most numerous Ohio waterfowl and comprises 26 to 30 per cent of the annual waterfowl kill.

Little or nothing, however, is said of existing aquatic communities. Speaking in general terms, Cuyahoga Valley 1975 states:

> Few studies have been conducted on the phytoplankton, periphyton, and fishes of the Cuyahoga River and its tributaries.
>
> Although plant nutrients are abundant in the River, toxic wastes, high turbidities and poor substrates inhibit the growth of aquatic plants in the study region. A few species of algae have been observed in the river.
>
> The only benthic invertebrates commonly collected in the river between Bath Road and Rockside Road were sludge worms (Tubificidae), midge larvae (Chironomidae), and an air breathing snail (*Physa* sp.). The dominance of these pollution tolerant forms is indicative of gross organic pollution and generally poor water quality. Densities of sludge worms (4 per square foot) collected near Bolanz Road suggested that this section of the River was also affected by toxic wastes.
>
> The presence of benthic invertebrates sensitive to pollution in Slipper Run, Yellow Creek, and Furnace Run was consistent with the chemical data which indicated these tributaries were of good water quality.
>
> Existing fish populations were limited to a few tolerant species and a small number of other species, some of which may have been displaced from cleaner tributary sources during spates and floods. The presence of the brook stickleback, however, is considered unusual. This species is not common in Ohio, and is usually found only in the coldest, clearest springs and brooks which have an abundance of aquatic vegetation (Ohio DNR, n.d.). Recent collections in the Cuyahoga River by Dr. Andrew White of John Carroll University included twelve other fishes. Surveys in the tributaries indicated that breeding populations of several species of fish were present.

This estimate of existing aquatic communities is consistent with 1969 studies of the tributary aquatic communities made for the Three Rivers Watershed District's Plan for Water Quality Management in the Central Cuyahoga Basin.

The consultant firm preparing this study, noting the unreliability of dissolved oxygen and other chemical water quality indicators in an area of high slope gradient and natural reaeration, carried out biological surveys and computed an index of biological diversity (B.I.) to aid in assessment of water quality. The result, however, was a full survey of existing aquatic communities summarized below for Tinkers Creek. A more extended discussion of each tributary, including lists of species at various locations, is included in Appendix A.

Tinkers Creek: At Route 303 west of Streetsboro, the Creek was slighted polluted, but with pollution sensitive bryozoans present among a diverse population including fish. At Route 14 near the Summit-Portage County line, benthic samples indicated eutrophic water quality. Fish, mayflies, sludgeworms, gill-breathing snails, and other organisms associated with cleaner water were found.

At Route 91 north of Twinsburg, the most abundant animals were mayflies, represented by both crawling and burrowing types. Three representative surveys gave results of an average population of 285 per square meter. Tube building types of caddis larvae are common. Some aquatic beetles and crayfish were found, but they are not numerous. Leech egg cases and one adult leech were counted. No fish were collected or seen.

Between Route 91 and Glenwood Road benthic samples indicate a change in water quality. An absence of caddis larvae and an increase in midge larvae are the first signs of an increased pollution load. Aquatic plants and crayfish are abundant. Wading and seining the stream showed both in general distribution over 50 yards reach of the stream. Three to four runs of a four foot seine yielded from five to eighteen mature crayfish, but no fish. The snail Physa, usually abundant in this situation was found, but it was not common. Midge larvae were common and no caddis larvae could be found.

Downstream from the Richmond Road Bridge sampling indicated further degradation. Animals present are primarily sludgeworms, midge fly larvae and the snail Physa. Mayfly nymphs and caddis larvae are absent.

Below Route 8 benthos does not recover despite high natural reaeration. Midge fly larvae and the snail Physa are the most common macroorganisms. Bass reportedly were seined during the summer at Canal Road, although none were captured during the study.

According to the 1974 Ecological Monitoring of the Cuyahoga River, prepared by the Biology Department of Akron University for the Buffalo District of the Army Corps of Engineers, benthic invertebrate communities sampled in the Cuyahoga River mainstream below Akron (including stations at Boston Mills, Brecksville above and below the canal diversion dam, and Independence), consist almost exclusively of pollution-tolerant oligochaetes (sludge worms), air breathings snails (Physa sp.) and chironomids. Clean-water organisms account for less than five per cent of the benthic fauna. The number of insect species, as high as 79 above Akron at Hiram Rapids, declines to less than 30 at each station below Akron.

Shannon-Weaver species diversity indices for benthic invertebrates were prepared during this same survey. Values above 3.0 are usually characteristic of high quality waterways while values less than one are commonly found in badly polluted waters. In the upper reaches of the Cuyahoga, values average slightly less than 3.0, but at the five stations below Akron values decline sharply, averaging less than 1.0 at Boston Mills and Brecksville above the canal diversion dam.

The survey also indicated that the major components of the Cuyahoga River periphyton were diatoms (Bacillariophyceae). The variety of diatoms were greatest in the upper river and lowest at stations below Akron. Approximately 140 species were recovered at Hiram Rapids, but less than half this in some areas below Akron (ranging from about 65 at Boston Mills to about 97 at Brecksville above the dam).

Sixty-eight species of fish were known to occur in the Cuyahoga River mainstream before 1950. Presently few fish can survive the chronic organic pollution and frequent toxic conditions which characterize the river below Akron. According to the U.S. Department of Interior Bureau of Outdoor Recreation, the river no longer constitutes a viable fishing resource. Investigations in 1971 and 1972 by Dr. Andrew White of John Carroll University included samplings at Rockside Road and the base of the falls in Peninsula. Fishes collected included the white sucker, golden shiner, emerald shiner, blacknose dace, creek chub, silverjaw minnow, fathead minnow, stoneroller, goldfish, stickleback, green sunfish, bluegill, and black bullhead. The physical appearance of several of these fish indicated that they represented a true riverine population and were not accidental strays washed into the river from adjacent lakes, ponds or tributaries. Most fishes collected were hardy species with rather broad ranges of tolerance. This represents a change from earlier 1968 studies in which no fish at all were recorded below Akron.

Algae

In recent years the incidence of algae in the Cuyahoga River mainstream is apparently decreasing. In 1968 a biological survey of the Cuyahoga watershed was conducted. Algae was collected at everyone of eleven sampling stations between Bath Road and Rockside Road (Independence). The blue-green alga Oscillatoria sp. was collected at every one of these sights, and of eight of eleven sights was the only alga found. Two green algae (Stigeoclonium sp. and Cladophora sp.) grew on rocks in riffle area in the vicinity of Ohio Route 303, Boston Mills Road, and Rockside Road. Spirogyra sp. and Euglena sp. also were collected at the latter station, which was considered to be in a zone of recovery from heavy organic pollution.

In a later (1971) investigation conducted by the Army Corps of Engineers few algae were observed. One genus, probably Oscillatoria sp., was reported from the river segment between the Akron wastewater treatment plant and the mouth of Furnace Run. A few additional species were observed in the recovery zone from the effluent of the Akron (Botzum) treatment plant between Furnace Run and a diversion dam at Station Road. Oscillatoria sp. was the only alga collected downstream from the diversion dam to the Cleveland Southerly wastewater treatment plant.

Although plant nutrients are abundant in the river, toxic wastes, high turbidities, and poor substrates inhibit the growth of aquatic plants throughout the middle and lower segments of the river.

5. Sensitive Natural Areas

The Ohio Department of Natural Resources listing and other listings of natural areas on Pages 68-72 of the Environmental Assessment, the wetland description on Pages 72-3, and Figures 9 (Natural Areas) and 12 (slope instability areas) are quite accurate. The brief mention of the Sagamore Road salamanders on Page 142, however, does not describe the size and extent of the community involved, nor does it allow evaluation of the worth of the protective measures being taken.

Two significant cave areas, both to be incorporated in the Cuyahoga Valley National Recreation Area and not mentioned in the Assessment, are the Deep Lick Cave, about 1.5 miles southwest of Brecksville near the Sleepy Hollow Golf Course, and Ice Box Cave, about 3,000 feet northwest of the Center of the Virginia Kendall Park in Boston Heights.

Most of the steep slope areas and unstable slope areas in the study area are contained within the proposed Cuyahoga National Recreation Area. Streams crossing the steep slope areas have produced riffles and waterfalls of significant scenic value to the park.

Steep slope areas which will be affected by Phase I of CVI outside of the park are the ravine south of Schrieber Road (Maple

Heights trunk) and the ravine north of Weise Road (Brecksville trunk). Both of these ravines, because of their steep slopes, continue to support mature stands of native vegetation. The preliminary corridors for Phases II and III of CVI do not appear to encroach on major natural areas outside of the Cuyahoga Valley National Recreation Area (Section IV.B.).

Previous delineations of sensitive natural areas in the CVI study area, outside of the CVNRA planning area have been limited in scope and have not even mentioned mature forest stands and/or prime wildlife habitat. The Northeast Four County Planning Organization (NEFCO) has mapped physical deterrents to development in Summit, Geauga, and Portage Counties. Mapping categories included floodplains, steep slopes (12-24%, steep-slopes (25% or greater), and organic soil. Delineated areas included most of the natural areas mentioned in the draft EIS.

In addition to these areas, scattered stands of mature forest should be protected. Preservation types should include: hemlock-beech forest, beach-oak-tuliptree forest, beech-maple forest, and lowland forest. Mapping of these stands also was beyond the scope of this project.

An inventory alone, however, will not insure the protection of any of these sensitive natural areas. Legal constraints, now lacking, are required to deter their destruction. Until legal guidelines are adopted by local governments and the State, forests will continue to be haphazardly cleared and wetlands, such as at Reminderville, will continue to be filled.

## B. Manmade Environment

### 1. Air

#### a. Air Quality

The discussion of air quality and state air quality standards on Pages 9-12 and in Table 1 of the Environmental Assessment is quite accurate, although the 1974 geometric mean particulate level recorded at Twinsburg was 79 micrograms per cubic meter, and not 76.84. Some additional data collected in 1975 on particulate, sulfur oxides and nitrogen oxides have been made available for the two monitoring stations most distant from the industrial centers of Cleveland and Akron. These data are presented in Table 2-22. Unfortunately, the particulate monitoring station of Valley View was discontinued in early 1973 so that no data is available for sulfur oxides and nitrogen oxides in the northern industrially developed part of the study area. Air quality monitoringstations are presently being installed or are scheduled for installation shortly by the Cleveland Air Pollution Control Agency in Solon, Bedford and Brecksville. No data has yet been generated by these stations, however.

Table 2-22 - Geometric Mean Total Suspended Particulate Concentrations Observed in the Project Area ($\mu g/m^3$)

| Location | Year 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|
| Peninsula | -- | 65 | 54 | 51 | 57 |
| Twinsburg | -- | 77 | 75 | 79 | 70 |
| Valley View | 179 | 178 | 184 | -- | -- |

Note: The primary standard for particulates is 75 $ug/m^3$; the secondary standard guideline is 60 $\mu g/m^3$.

Arithmetic Mean Gaseous Contaminant Concentrations Observed in the Project Area April through December 1975 ($\mu g/m^3$)

| Location | $SO_2$ | $NO_2$ |
|---|---|---|
| Peninsula | 28 | 29 |
| Twinsburg | 32 | 39 |

Note: The $SO_2$ standard is 80 $\mu g/m^3$, and the $No_2$ standard is 100 $\mu g/m^3$.

Source: Personal communication, Jerry J. Garro, Air Monitoring Officer, Akron Regional Air Pollution Control, 11 Aug. 1976.

The 1974 mean particulate level at Twinsburg is above national annual primary standards (75 micrograms per cubic meter) and Valley View's 1973 mean more than doubles it, exceeding national 24 hour primary standards ten times. Valley View, as the applicant points out, is close to the industrial development of the lower Cuyahoga, but Twinsburg is in an area of comparatively modest development and is presently surrounded by large areas of open land (see Figure 9 of EA); when ambient particulate levels exceed national standards, particulate production associated with primary and secondary development (if any) arising from the project should be carefully considered.

b. Noise

No extensive noise measurements exist for the Cuyahoga Valley between Cleveland and Akron. In 1970 the Cleveland Standard Metropolitan Statistical Area (SMSA) had registrations of 527 motor vehicles per 1,000 population, and 10 motorcylces per 1,000 population; a recent USEPA publication used this incidence of vehicle registration as an index of noise pollution, the Cleveland SMSA ranking 25th and 9th lowest, respectively, among 65 SMSA's with population over 50,000. The Akron SMSA with vehicle registrations of 563 per 1,000 and 15 per 1,000, ranked 37th and 28th lowest, respectively. Cleveland Hopkins Airport, the principal Cleveland commercial airport, is about eight miles east of some portions of the service area (Seven Hills, North Royalton), close enough to have some impact under certain takeoff and landing conditions.

c. Odor

No systematic discussion of this problem occurs in the Assessment. Reference is made on Page 25 to existing odor problems in Garfield Heights, and to the odor problems from septic tanks after ten to twenty years.

Certain tributary watersheds within the Cuyahoga River Basin are cited as odor problem areas in the 1970 Plan for Water Quality Management in the Central Cuyahoga Basin. These included Brandywine Creek below old Route 8 (see Water Quality), and Chippewa Creek throughout its length, but particularly in the vicinity of the landfill site (see Water Quality). With the exception of the landfill leachate, all of the odor sources apparently stem from septic or sewage treatment effluent.

During the course of 48 water quality samplings (twelve each at Boston Mills, Brecksville above the canal diversion dam, Brecksville below the dam, and Independence) made during water year 1974 by the University of Akron Department of Biology, an odor of "foul decomposing sewage" was constantly noticed on the river.

2. Land Use

a. Existing Land Use - General

The responsibilities for land and related planning functions in Ohio derive from a complex mixture of laws, and involve agencies and practices at several levels of government. The basis of regulations in the CVI District is State law in the form of a municipal planning code which outlines duties and powers of local governments (Ohio Revised Code 713.0., 713.05 1969). Most on-going decisions about land use are delegated to the local governments. Local powers of condemnation are supplemented by those of Federal and State governments for highway, enviornmental, park, military, and other clearly public purposes.

County governments for the most part serve an advisory function with respect to local land-use planning. Local governments in Ohio are required by State law to submit subdivision requests, utility, road and other special plans for County review and comment. But the implementation of land-use control has rested largely upon the local governments and their special bodies, such as local planning commissions, zoning boards, and inspectors of buildings. Local comprehensive plans are mixtures of descriptions of present uses and statements of intent regarding local goals. The central point of control is the zoning map and ordinance which lists and defines allowable uses. These use guidelines are intended to be observed, and plans approved, before construction permits are issued.

County planning commissions and their staffs are collectors and disseminators of information. They serve to initiate policy questions and directions, and to aid in the capital expenditure function of County governments. The County planning commissions may give or contract for planning consulting services to local governments, depending on goals, political cooperation, and feelings of local officials.

Regional planning bodies, even further removed from the legal local government base, attempt to serve similar advisory purposes for larger populations and areas. They appear to have served chiefly as collectors and analysts of information, as forums for gatherings of local and County officials, and as centers for raising of policy questions and initiatives in response to broad changes and problems. The regional organizations in Ohio lack taxing power, and their effectiveness is expressed primarily by the aggregate decisions of numerous individual municipalities.

The very general land use description on Page 52 of the Environmental Assessment and the more systematic ones on Pages 61-2 (Transportation), Pages 62-3 (Utilities), Pages 63-73 (Park and Natural Areas) and 73-75 (Historical and Archaeological sites) are accurate as far as they go. Figure 6 (Existing Land Use) is also adequate, although it has numerous points of difference with the Ohio DNR land use map on Page 29 of Cuyahoga Valley 1975; the DNR map has a much more precise definition of the boundaries of development and shows the extent of strip development much more clearly. The natural areas listing does not include Deer Lick Cave or Icebox Cave, named as natural areas in the Cuyahoga Valley Recreation Area plan.

Beyond this, however, there is relatively little discussion of local land use patterns and trends, or quantification of land use in Phase I communities, particularly those near the Cuyahoga Valley National Recreation Area. These are summarized below.

b. Existing Land Use - Local

Brecksville: The focal point for development in the City of Brecksville is the intersection of Brecksville Road and State Route 82. Small businesses, schools and churches are dominant in this area. Considerable light industrial development is present along Brecksville Road in the southern portion of the city. The Veterans Administration Hospital is located in this vicinity. Some scattered business establishments are also located along Riverview Road in the eastern portion of the city near the Cuyahoga River.

Small residential subdivisions are located on interior streets throughout much of the community. Strip residential development is also present along many of the local roads. A new apartment complex has been developed along Brecksville Road in the northern part of the city, this development includes a number of small retail business and service facilities.

Much of the land of Brecksville is occupied by the Brecksville Reservation of the Cleveland Metropolitan Park System. This park occupies 2,365 acres within the city and includes a golf course, riding stable facilities and a nature center.

The Brecksville Reservation occupies 78.6 per cent of the 3,223 acres proposed for the Cuyahoga Valley National Recreation Area. About 165 acres of the remainder of the total area proposed is presently developed, with much of this area (85 acres) consisting of roads and railroad right-of-way. Commercial development occupies 27 acres (0.8 per cent) of the total proposed area, this acreage consisting of residential establishments along Riverview Road. Much of the 28 acres of residential land affected is also in the same area. About 688 acres (21.4 per cent) of the proposed area in the City of Brecksville is presently undeveloped.

Independence; Residential development in the City of Independence (1974) occupied 1,250 acres or 22 per cent of the total land area of the city. This development is largely on interior streets throughout the community. The focal point of commercial development is the area along Brecksville Road north of Stine Road where small stores and services predominate. Considerable industrial development is present along Pleasant Valley Road east of Brecksville Road. In all 2,477 acres of Independence are developed, comprising 43 per cent of the city's total land area. Recreational land use total 32 acres, largely representing municipal parks and athletic fields.

The proposed Cuyahoga Valley National Recreational Area (CVNRA) would occupy less than 7 per cent of the total land area of Independence. About 86.6 per cent of this land is presently undeveloped, with considerable area subject to flooding. The major developed land use is a quarry north of Pleasant Valley Road and west of the river.

Independence Land Use

| Classification | Acres, Total City | Per Cent, Total City |
|---|---|---|
| Residential | 1250 | 21.8 |
| Commercial | 70 | 1.2 |
| Industrial | 385 | 6.7 |
| Terminal and Utilities | NA | NA |
| Transportation | 623 | 10.9 |
| Public and Quasi-public | 98 | 1.7 |
| Subtotal "Developed" | 2477 | 43.0 |
| Parks and Recreation | 32 | 0.5 |
| Undeveloped | 3252 | 57.0 |
| Total Acreage | 5729 | 100.0 |

Northfield Center Township: Almost 40 per cent of the land of Northfield Center Township is developed, largely as residences and roads. Of these 1,394 developed acres, 752 are classified as residential. Residential development in Northfield Center is largely single-family units on interior streets, these residential areas being found throughout the township. Approximately 11.9 per cent of the township is occupied by transportation facilities, largely representing Welcome Airport and I-271 right-of-way. The Aurora Road - Cleveland - Massillon Road intersection represents the focal point of development for the community and is an area dominated by small businesses and schools. There is presently no recreational land use in Northfield Center.

About 205 acres of Northfield Center are within the proposed CVNRA boundaries, about 5.8 per cent of total township land use. The major developed area included in the proposal is a junkyard in the southwest corner of the township. Much of the affected land area is steeply sloped and wooded and therefore not readily developable. The park proposal would result in little loss of residential or commercial development in Northfield Center Township.

## Northfield Center Township Land Use

| Classification | Acres Total Subdivision | Percent Total Subdivision |
|---|---|---|
| Residential | 752 | 21.2 |
| Commercial | 34 | 1.0 |
| Industrial | 15 | 0.4 |
| Terminals and Utilities | 27 | 0.8 |
| Transportation | 422 | 11.9 |
| Public & Quasi-public | 144 | 4.1 |
| Extractive | -- | -- |
| Subtotal "Developed" | 1394 | 39.4 |
| Parks and Recreation | -- | -- |
| Undeveloped | 2144 | 60.6 |
| Total Land Area | 3538 | 100.0 |

Peninsula Village: Approximately 346 acres of the Village of Peninsula are "developed" land. Most of this development is concentrated near the focal point of the community, the intersection of State Route 303 and Riverview Road, with strips of residential development along roads in other areas of the village. Limited industrial development has occurred off Akron-Peninsula Road north of State Route 303.

About 757 acres (24.3 per cent) of Peninsula are presently classified as "Park and Recreation" land uses. Included are Deep Lock Quarry Metropolitan Park, Brandywine Golf course, and parts of Camp Mantoc (Boy Scouts), Camp Ledgewood (Girl Scouts), and Stumpy Basin, the natural area owned by Kent State University. Also included in this category are several new acquisitions by the Ohio Department of Natural Resources.

The proposed Cuyahoga Valley Recreation Area proposal includes about 67.9 per cent of the total land area of Peninsula. Of the 2,111 acres of land included in the proposal, only 92 acres are currently in a developed state, with 45 of these acres occupied by roads and railroad right-of-way. About 757 acres, one third of the total proposal, are presently developed for recreational activities. Much of the remaining undeveloped land within the proposed park area is steeply sloped and unsuitable for development other than for recreational activities.

Peninsula Village Land Use

| Classification | Acres Total Subdivision | Percent Total Subdivision |
|---|---|---|
| Residential | 142 | 4.6 |
| Commerical | 38 | 1.2 |
| Industrial | 6.2 | 0.2 |
| Terminals & Utilities | 2 | 0.1 |
| Transportation | 124 | 4.0 |
| Public & Quasi-public | 26 | 0.8 |
| Extractive | 8 | 0.3 |
| Subtotal "Developed" | 346 | 11.1 |
| Parks and Recreation | 757 | 24.3 |
| Undeveloped | 2009 | 64.6 |
| Total Area | 3112 | 100.0 |

Richfield Township: Approximately 1,600 acres (13.9 per cent) of Richfield Township are presently developed, primarily residences, commercial establishments, and roads. Much of this area (693 acres) is classified in the transportation category and includes I-77, I-271, and the Ohio Turnpike, as well as open-access roads. The area shows some indications of urban sprawl, with strips of development along the roads and highways. Scattered residential subdivisions are found in several sections of the township.

Over 1,700 acres (14.9 per cent) of Richfield Township are presently classified as "Park and Recreation" lands. This includes Camp Hilaka (Girl Scouts), Furnace Run Metropolitan Park, and undeveloped areas owned by the Akron Metropolitan Park Board and by the State of Ohio.

The most significant new land use in Richfield is the new Coliseum on State Route 303 near I-271. The opening of this new facility may stimulate further commercial development along State Route 303. Also along State Route 303, the first phase of Briarwood Village, a new planned unit development, is near completion (August 1974). This first phase includes 144 townhouses on 45 acres of land. The total proposal would entail 1,700 units, including 1,024 apartments, 570 townhouses, and 160 single family units and would cover nearly 500 acres. Another townhouse development is in the planning stage and would be built on Brecksville Road crossing the Richfield Township and Village line.

Little development has occurred within the boundaries of the proposed Cuyahoga Valley Recreation Area. Only 47 acres (2.0 per cent) of the proposed park area is presently developed for "residential" land use. The Akron Metropolitan Park Board and the State of Ohio already owns 1,219 acres (52.5 per cent) of the proposed area. Much of the remaining land along Furnace

Run has a slope of greater than 25 per cent and may be considered undevelopable. Therefore, while the proposal entails 20.1 per cent of the total land area of Richfield Township, much of this area is unsuitable for land uses other than recreation.

Richfield Township Land Use

| Classification | Acres Total | Acres Subdivision | Per Cent Total | Per Cent Subdivision |
|---|---|---|---|---|
| Residential | 560 | | 4.8 | |
| Commercial | 125 | | 1.1 | |
| Industrial | 4 | | 0.0 | |
| Terminals & Utilities | 32 | | 0.3 | |
| Transportation | 693 | | 6.0 | |
| Public and Quasi-public | 188 | | 1.6 | |
| Extractive | -- | | -- | |
| Subtotal "Developed" | 1602 | | 13.9 | |
| Park and Recreation | 1716 | | 14.6 | |
| Undeveloped | 8227 | | 71.3 | |
| Total Area | 11545 | | 100.0 | |

Richfield Village: Over 1,500 acres (29.6 per cent) of Richfield Village has been developed primarily as residences, businesses and motor freight terminals. The intersection of State Route 303 and State Route 176, commonly known as the West Richfield area, is the focal point for development for the village. Strips of development are present along the roads and highways of the remainder of the community. Residential subdivisions are scattered throughout the village.

The major commercial development in Richfield Village is in a strip along Cleveland-Massillon Road. South of I-271, trucking terminals, truck service facilities, and gas stations predominate along the highway. The turnpike interchange area in the northern section of the village is specialized towards motels, gas stations, and restaurants.

No residential, commercial or industrial land is within the proposed boundaries of the Cuyahoga Valley National Recreation Area in Richfield Village. The land involved is presently occupied by Furnace Run Metropolitan Park and also by the I-77 Cleveland-Massillon Road interchange. The proposed park would include approximately two per cent of the existing Richfield Village land area.

Richfield Village Land Use

| Classification | Acres Total Subdivision | Per Cent Total Subdivision |
|---|---|---|
| Residential | 843 | 16.5 |
| Commercial | 79 | 1.6 |
| Industrial | 20 | 0.4 |
| Terminals & Utilities | 133 | 2.6 |
| Transportation | 375 | 7.3 |
| Public & Quasi-public | 65 | 1.3 |
| Extractive | -- | -- |
| Subtotal "Developed" | 1515 | 30.8 |
| Park and Recreation | 58 | 1.1 |
| Undeveloped | 3536 | 69.2 |
| Total Area | 5109 | 100.0 |

Sagamore Hills Township: Residential land use occupies 933 acres (12.7 per cent) of the total land area of Sagamore Hills. Single family units are found both in strips along major roads and in small subdivisions on interior street throughout the township. Little commercial or industrial development is present. Public and quasi-public uses cover 5.1 per cent of the township land area, most of this acreage representing Hawthornden State Hospital. Total developed land uses occupy 1,657 acres in Sagamore Hills, comprising 22.5 per cent of the total township land area.

Greenwood Village is the major new land use in the township. This planned unit development presently includes about 516 units covering 120 acres and consists of condominiums, apartments and single family dwellings. The developer of Greenwood Village is presently in receivership, and no further construction is currently anticipated.

Parks and recreational land uses occupy 564 acres (7.7 per cent) of Sagamore Hills. Much of this acreage represents a portion of the Brecksville Reservation of the Cleveland Metropolitan Park System. Also within the township are the Brandywine Ski Area and Fell Lake Park, a private swim club.

The proposed Cuyahoga Valley National Recreation Area would occupy 27.2 per cent of the total land area of Sagamore Hills. About 504 acres, 25.3 per cent of the proposal area, are curently utilized for recreational land uses, namely Brandywine Ski Area and the Brecksville Reservation.

The Tecumsuh Corrugated Box Company is within the proposed park area and uses 17 acres of land for industrial purposes. Much of the 1,090 acres of undeveloped land included in the proposed area is subject to flooding and other lands in the

proposed park area are steeply sloped making them rather unsuitable for residential or commercial development.

Sagamore Hills Land Use

| Classification | Acres Total Subdivision | Per Cent Total Subdivision |
|---|---|---|
| Residential | 933 | 12.5 |
| Commercial | 11 | 0.0 |
| Industrial | 20 | 0.0 |
| Terminals & Utilities | 5 | 0.0 |
| Transportation | 312 | 4.3 |
| Public & Quasi-public | 376 | 5.1 |
| Extractive | -- | -- |
| Subtotal "Developed" | 1657 | 22.6 |
| Parks and Recreation | 564 | 7.7 |
| Undeveloped | 5100 | 69.7 |
| Total Land Area | 7322 | 100.0 |

Valley View Village: Residential land use in Valley View is mostly in strips along the major roads. A few interior residential streets are found in the Stone Road area. Numerous industrial and business facilities are located in the two industrial parks within the village. One industrial park is just north of Pleasant Valley Road in the southern part of the village. The other, Valley View Industrial Park, is directly south of Rockside Road. A large sand and gravel operation is located north of Tinkers Creek Road.

The Cuyahoga Valley Recreation Area would occupy 311 acres of Valley View. About 16.4 per cent of this area is already occupied by the Brecksville Reservation of Cleveland Metropolitan Park System. The remainder is undeveloped flood plain land near the Cuyahoga River and the Ohio Canal.

Walton Hills Village: Residential development in Walton Hills is found both on local roads and interior streets in the central southern part of the village. The eastern portion of the village along State Route 8 is highly industrialized and includes the Ford Stamping Plant and numerous smaller industries. Recreational land usage covers much of the village, including a private golf course and the Bedford and a smaller portion of the Brecksville Reservations of the Cleveland Metropolitan Park.

The proposed Cuyahoga Valley Recreation Area would affect only the existing Brecksville reservation and Bedford Reservation of Walton Hills. Total park acreage in the village would be about 1,476 acres out of 4,814 total village acres.

c. Existing Land Use - Systematic

Residential: Despite a tight housing market, a substantial amount of residential construction took place in the study area from 1970 to 1974. Change in the number of family housing units in the Cuyahoga County portion of the study area was as follows:

Occupied Family Units

| Place | 1970 (October) | 1974 (October) |
|---|---|---|
| Bedford | 5452 | 5517 |
| Bedford Heights | 4464 | 5499 |
| Brecksville | 2495 | 2802 |
| Broadview Heights | 3033 | 3679 |
| Garfield Heights | 12580 | 12709 |
| Independence | 1998 | 2036 |
| Maple Heights | 10077 | 10573 |
| Seven Hills | 3462 | 3881 |
| Solon | 3209 | 3746 |
| Valley View | 441 | 471 |
| Walton Hills | 667 | 686 |
| | 47,878 | 51,599 |

These figures are not adjusted for those areas only partially within the study area.

Archaeological Sites: The Cuyahoga Valley is an area rich with archaeological and historical sites, many of them as yet uninvestigated. During an archaeological survey commissioned by the applicant for one of the several proposed interceptor routes, three sites of archaeological interest were found, near proposed access areas 3, 4, and 5, and are typical of the extent of unexplored sites within the river basin between Akron and Cleveland.

The evidence for prehistoric cultural remains in access area 3 consisted of a single charcoal and rock-filled storage pit located upon a low knoll in the extreme northeastern portion of CVI's access area in the vicinity of Independence, Ohio. While no artifacts were recovered from this cultural feature, its stratigraphic position renders virtually certain its aboriginal affiliations. It appears that this knoll represents a prehistoric campsite, occupied when this landform represented an older stream terrace along a now abandoned river channel. The investigating agency (Cleveland Museum of Natural History) strongly recommended that no ground disturbance take place in the referenced portion of access area 3.

Evidence for prehistoric cultural remains in access area 4 was found in all five small test excavation units on the low ridge west of the C.E.I. powerline in the vicinity of Independence, Ohio. In all test excavation units upon this knoll prehistoric cultural materials were encountered in the upper, plow-disturbed 6-10". Additional cultural materials were recovered below the plow zone

from a thin truncated A(1) soil horizon. In two test sites located along the southeastern portions of the ridge, partially in situ aboriginal storage pits were encountered. Artifacts recovered included complete and broken fragments of projectile points and scrapers, burned and broken faunal materials, and ceramic shreds. These materials suggests associations with the prehistoric Whittlesey population which occupied the Tuttle Hill site upon the uplands to the northwest. Small specialized economic campsites associated with these large Late Woodland villages are rare and highly significant in terms of possible information. The agency recommended that no ground disturbance take place on any portions of access area 4 west of the powerline maintenance road. Should ground alteration be necessary they recommended that complete archaeological salvage excavations be funded to recover all significant information.

Four access area 11 test sites, south and west of Hillside Road, yielded broken flint cores and waste flakes from within a thin zone underlying an upper 20 cm of plow-disturbed loams and a secondary zone 35 to 40 cm thick. This zone also contained a single intact projectile point of a type named either Hardin Barbed or Stringtown Spurred-Stemmed, which are assigned to the period 7000-5000 B.C. It appears that the materials recovered from the test excavations represent undisturbed portion of another nearby site which had been cut by the western right-of-way of the railroad embankment. The agency strongly recommended that no construction activity take place in that portion of the access area.

d. Proposed Land Use

The future land use information shown in Figure 7 through 9 and on page 52 (general), 62 (transportation), 62-3 (utilities) and 63-66 (recreation area) of the EA is generally accurate, although at this time it is difficult to calculate the effects of the proposed National Recreation Area on surrounding land use. There have been proposals to limit high rise development around the park boundaries, and some Ohio Department of Natural Resource reports have suggested that limitations on development within the area may encourage peripheral development.

Public Law 93-555 created the Cuyahoga National Recreation Area. The purpose of the act was to preserve approximately 29,000 acres of the Cuyahoga River Valley between Akron and Cleveland, Ohio. The National Park Services )Draft General Management Plan" (1976) indicated that 7,000 acres will be purchased, 10,000 acres will be incorproated at less-than-fee interest, 10,000 acres of existing park lands will be donated to NPS, and approximately 2,800 acres of quasi-public and public recreation land will remain exclusive of National Park Service ownership.

As shown by the figures above, a significant portion (about 44% of the land area included in the National Recreation Area already is classified as "park and recreation" land. Major public recreation areas are owned by the Akron Metropolitan Parks (2,442 acres), the Cleveland Metropolitan Parks (4,094), and the Ohio

Department of Natural Resources (3,343). These lands will be turned over to NPS at some future time. The 2,800 acres of quasi-public and public recreation land includes Blossom Music Center (810 acres), Scout Camps (1,079 acres), Camp Mueller (193 acres), Hale Farm and Village (186 acres), Scout Camps (1,079 acres), Camp Mueller (193 acres), Hale Farm and Village (186 acres), public ski areas and golf courses (470 acres), and other smaller parcels of land. The locations of existing and proposed recreation lands within the NPA are illustrated in Figure (2-3).

The acquisition of land within the park was assigned general priorities in the National Park Service's draft plan. They follow in decreasing order of priority:

- The floodplain/river basin areas, to link existing recreation lands in a "spine" along the Cuyahoga River.
- Key parcels on the uplands and slopes.
- Scenic easements at the park periphery.

Mr. William Birdsel, Superintendent of the National Recreation Area, has given "top priority" during this fiscal year (1977) to the purchase of lands in the NRA between Rockside Road and Tinker's Creek Road. Future acquisitions will extend generally from north to south through the valley. The Corps of Engineers, acting for the National Park Service, has budgeted $3 million for fiscal 1976, $2 million for the transitional 1976-77 quarter, and $5,700,000 for fiscal 1977 land acquisition in the proposed area.

As of 21 July 1976, the National Park Service had acquired 246.04 acres. Most of this early land acquisition appears random and to have been in response to local interest who wanted to sell. These acquisitions are listed below by township:

| | Acres |
|---|---|
| Bath | 12.23 |
| Boston Township | 90.08 |
| Richfield Township | 2.0 |
| Boston Heights | 65.32 |
| Northampton Township | 44.36 |
| Brecksville | 5.95 |
| Peninsula | 26.10 |
| | 246.04 |

Other acquisitions have been made by the Akron Metropolitan Park Service (226.82 acres) and by the Cleveland Metropolitan Park District (39 acres).

The only cost data available on recent acquisitions is for 148.37 acres purchased in Summit County through the Corps of Engineers at a cost of $848,230, or $5717 per acres. The National

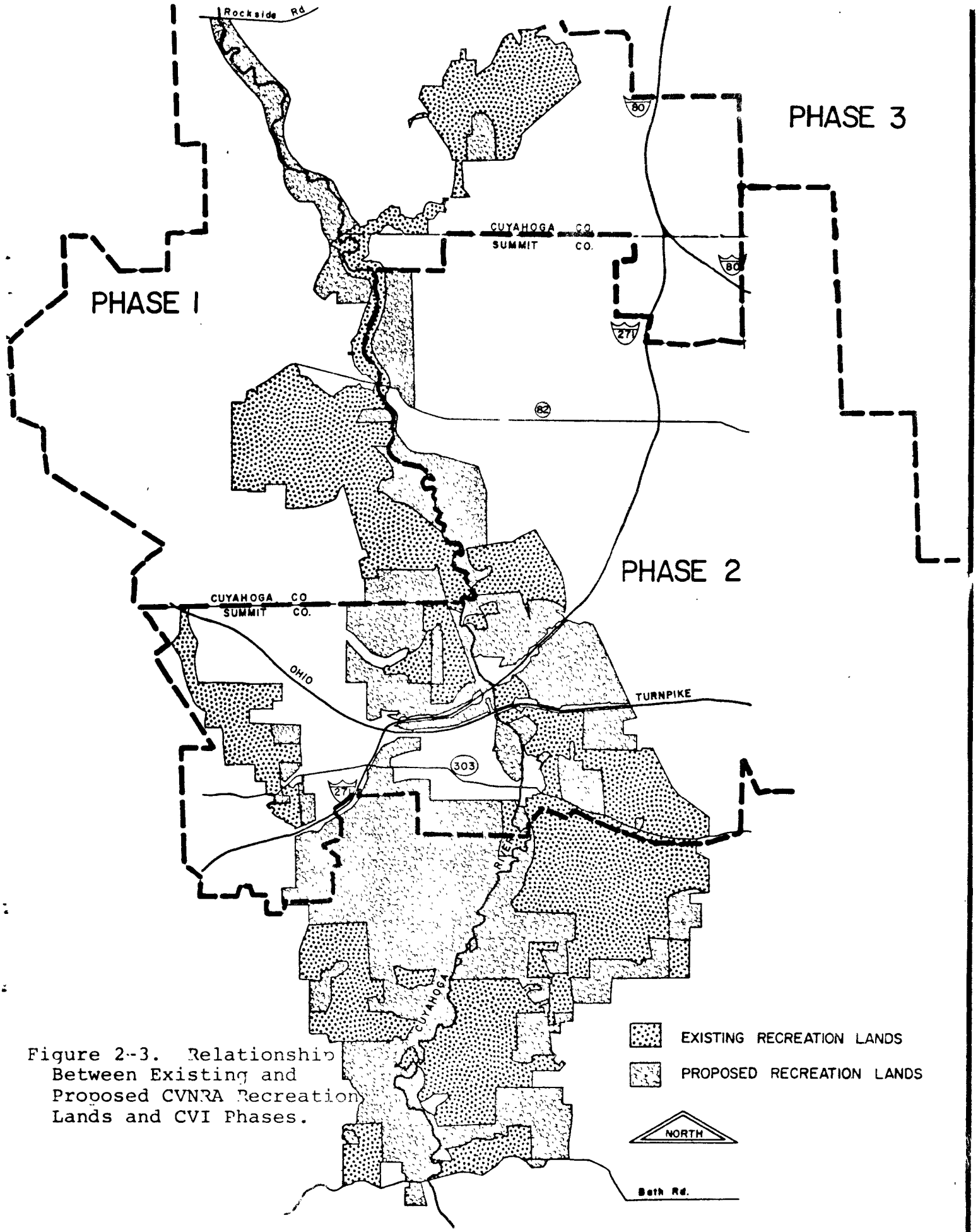



Figure 2-3. Relationship Between Existing and Proposed CVNRA Recreation Lands and CVI Phases.

Table 2-23. Current Land Use, Proposed Cuyahoga Valley National Recreation Area

| Subdivision | Boston Heights | Boston Township | Brecks-ville | Indepen-dence | Northfield Center | Penin-sula | Richfield Township | Richfield Village | Sagamore Hills | Valley View | Walton Hills |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Residential | 36 (2.6%) | 216 (2.6%) | 28 (0.9) | 4 (1.1) | 3 (1.5) | 45 (2.1) | 47 (2.0) | - | 53 (2.7) | - | - |
| Commercial | 4 (0.3%) | 10 (0.1%) | 27 (0.8%) | 2 (0.6) | - | - | - | - | - | - | - |
| Industrial | - | 17 (0.2%) | - | - | 13 (6.3) | - | - | - | 17 (0.8) | - | - |
| Transportation | 28 (2.0) | 440 (5.2%) | 85 (2.6) | 11 (3.3) | 3 (1.5) | 45 (2.1) | 53 (2.3) | 55 (54) | 34 (1.7) | 3 (1.0) | 2 (0.1) |
| Terminals & Utilities | - | - | 2 (0.1) | 9 (2.6) | - | - | 14 (0.6) | - | - | - | - |
| Public & Quasi-public | - | 26 (0.3%) | 2 (0.1) | - | - | 2 (0.1) | - | - | - | - | - |
| Extractive | - | 30 | 21 | 21 | - | - | - | - | - | - | - |
| Subtotal "Developed" | 68 (4.9%) | 739 (8.7%) | 165 (5.1) | 47 (13.4) | 19 (9.3) | 92 (4.2) | 114 (4.9) | 55 (53.9) | 104 (5.2) | 3 (1.0) | 2 (0.1) |
| Parks & Recreation | 762 (55.0) | 2980 (35.6%) | 2370 (73.5) | - (-) | - (-) | 757 (36) | 1219 (52.5) | 47 (46) | 504 (25.3) | 51 (16.4) | 1474 (99.9) |
| Undeveloped | 556 (40.1%) | 4723 (55.9%) | 688 (21.4) | 303 (86.6) | 186 (90.7) | 1262 (59.8) | 990 (42.6) | - | 1381 (69.4) | 257 (82.6) | - |
| Total NRA Area | 1386 (100%) | 8442 (100%) | 3223 (100) | 350 (100) | 205 (100) | 2111 (100) | 2323 (100) | 102 (100) | 1989 (100) | 311 (100) | 1476 (100) |
| Per Cent of Subdivision Land Area | 31.5% | 87.8% | 26.50% | 6.1% | 5.8% | 67.8% | 20.1% | 2.0% | 27.2% | 7.8% | 30.7% |

Park Service utilizes local appraisers to determine the fair market for a parcel prior to the commencement of negotiations. Mr. Birdsel did not believe that the prices being paid for park land has been escalated owing to the potential construction of the CVI (Interview, Mr. William Birdsel, Superintendent, NRA, 22 July 1976).

Most of the land scheduled for inclusions in the NRA in the Phase I service area of CVI, is eitherowned currently by the Cleveland Metropolitan Parks (Bedford Reservation and Brecksville Reservation), will be purchased by the National Park Service during this fiscal year (Rockside Road to Tinker's Creek Road), or, barring financial difficulties, will be purchased next year prior to the construction of CVI. Therefor, it is not expected that Phase I of the CVI will affect the price paid for land to be included in the NRA. Should the National Park Service opt to obtain additional lands east of Canal Road or west of the Baltimore and Ohio Railroad (see Section V.B.1.b.) after the construction of CVI, land prices for parcels in these areas could be increased greatly.

The National Park Service has been mandated by the enabling legislation, to "substantially complete the land acquisiton program ... within six years [December 1980]". The acquisition of parkland would likely, therefore, be completed before Phase II of the CVI is constructed, depending on how rapidly decisions are made to proceed with the planning and construction of Phase II area sewerage facilities Phase III of the CVI will have no effect on the price paid for land to be included in the NRA.

The effect of land acquisition on the proposed recreation area on communities considered the object of possible sewer service is summarized in Table 2-23.

3. Water Quality and Quantity (Manmade)

a. Problems

Existing water quality problems are accurately discussed on pages 24-26 and 30-33 of the Environmental Assessment and also in the Natural Environment - Water section of this report. Water quality problems of the lower Cuyahoga River are well known. There are, however, a number of points concerning the manmade water environment that need clarification or even correction.

In March 1975, there were a total of 25 domestic sewage treatment plants in the possible service area, with a total capacity of at least 19.77 million gallons per day (MGD) (see Table 2-24). Earlier studies indicated that these plants vary widely in quality of treatment.

The Environmental Assessment (Table 17, Page 86-7) includes a gaging survey of the operation at nineteen local treatment plants. This table is useful, but contains awkwardly expressed figures for acreage served. The "tributary acres" column is a

Table 2-24. Domestic Sewage Treatment Plants, Boston, Heights to Garfield Heights

| Location | Name | Capacity (MGD) | 1975 JASO Average Flow (MGD) | 1975 JASO Average $BOD_5$ (mg/l) |
|---|---|---|---|---|
| Aurora | Aurora Acres | .060 | .06 | 5. |
| | Four Seasons | .120 | ND | ND |
| | Geauga Lake | .200 | .10 | ND |
| | Jackson | .500 | .30 | 3.6 |
| | Waldon | .160 | ND | 1.5 |
| Bedford | Bedford | 4.0 | 2.00 | 27.0 |
| Bedford Heights | Bedford Heights | 2.5 | 2.20 | 13.0 |
| Brecksville | Brecksville | 1.0 | 1.00 | 14.7 |
| | Echo Hills | .040 | .01 | 11.6 |
| | Southern Estates | .025 | .04 | 25 |
| Broadview Heights | Avery Meadows | .040 | .035 | 20 |
| | Briarwood | .040 | ND | ND |
| | Bramblewood | .020 | .01 | 20 |
| | Seneca Hills Apts. | .080 | ND | ND |
| | Vinyard Apts. | .100 | ND | ND |
| Hawthornden State | Hospital | .500 | ND | ND |
| Garfield Heights | Garfield Heights | .130 | .06 | 15 |
| Hudson Village | Hudson Village | .550 | .55 | 35+ |
| Hudson Township | Connecticut Colony No. 17 | .030 | ND | ND |
| | Hudson Industrial School | | | |
| | Hudson Township No. 5 | .128 | ND | ND |
| Independence | Fuhrmeyer Road | .250 | ND | ND |
| | Independence | .100 | ND | ND |
| Macedonia | Macedonia No. 1 | | | |
| | Macedonia No. 9 | | ND | 25 |
| | Macedonia No. 15 | 1.0 | 1.0 | 38 |
| Northfield | Northfield | .500 | .55 | 25 |
| | Nagy | | ND | 10 |

Table 2-24. Domestic Sewage Treatment Plants, Boston, Heights to Garfield Heights Cont.

| Location | Name | Capacity (MGD) | 1975 JASO Averages Flow (MGD) | BOD5 (mg/l) |
|---|---|---|---|---|
| Reminderville | Aurora Shores No. 29 | .050 | .09 | 5 |
| Richfield | Ohio Sports Center | .255 | ND | ND |
| | Richfield Hills | .250 | 0* | |
| Sagamore Hills | Greenwood | .130 | ND | 75 |
| Solon Central | Solon Central | 2.40 | 1.7 | 20 |
| Streetsboro | Arrowhead Trails | .064 | ND | 4 |
| | Gille Estates | .444 | .25 | 4 |
| | Humphrey Estates | .030 | ND | ND |
| | Streetsboro No. 2 | .120 | ND | ND |
| Twinsburg | Twinsburg No. 1 | 2.20 | 1.6 | 2 |
| Valley View | Canal Road | .035 | ND | ND |
| | Pleasant Valley | .035 | ND | ND |
| Walton Hills | Walton Hills | .750 | .5 | 8 |

* The development for which this plant was built has not been started.

Table 2-25. Actual Sewered Area for Plants listed in Table 17, Page 86-7, Environmental Assessment

| Plant | Sewered Area (acres) | Inflow (gallons per acre/day) |
|---|---|---|
| Brecksville STP | 1827 | 4045 |
| Maple Hts. STP | 870 | 2736 |
| Macedonia #15 (includes Northfield) | 2148 | 2551 |
| Twinsburg STP (Sch.) | 1286 | 2068 |
| Solon STP (combined) | 1649 | 3274 |
| Bedford STP (Woods) | 2066 | 5740 |
| Bedford Hts. (Total of all Three) | 2405 | 8378* |
| Northfield STP (woods) | 563 | 426 |
| Greenwood STP | 100 | 6600 |
| Hudson STP (BIS) | 1519 | 1810 |
| Walton Hills STP | 451 | 1220 |

listing of total acreage of the nominal service are of each plant, including areas not now sewered. The actual sewered area is somewhat smaller for each plant, and is included in Table 2-25. Inflow per acre sewered is also indicated and shows the great range from plant to plant.

Another major source of pollution to the area's streams is the great number of privately owned septic tank sewage disposal systems serving residences and small commercial establishements. The design of these systems has changed somewhat since their initial widespread use in the 1940's so that only generalizations about their effectiveness can be made. It was recognized very early that disposal of septice tank effluents in subsoil distribution fields was not feasible due to the impermeability of the great majority of soils in the study area. As a result, nearly all of the septic tank disposal systems in use consist of a holding tank, which may either be septic or aerated, subsurface filter bed with overdrains, underdrains and 18 inches of sand between, and an outfall sewer discharging either to a storm sewer or to an all-weather stream. The useful life of such systems is limited. Clogging of the sand proceeds at a rate dependent upon the solids loading applied. Initial clogging actually improves the filtration provided. After an average of 7 years, however, the clogging becomes complete and the filter fails.

Since fiscal constraints prevent routing governmental inspections of operating septic tank disposal systems, repair of failed systems depend upon the good conscience of the owner or complaints from neighbors. The ease with which filter beds can be bypassed, the remoteness of some discharge points, and the difficulty of tracing failures when many houses discharge to a common storm sewer all insure that an unknown but probably sizeable percentage of the sewage from these septic tank disposal systems receives only the settling and partial digestion provided by the septic or aerobic tank.

Table 2-26 shows typical values for relevant pollutants in septic tank effluents and in filter bed effluents. Average values for the pollutants in the private disposal systems in theCVI study area should fall between these values. There is no local data available on the actual effluent quality from these systems. Neither is there any survey information available on the present condition of installed systems. Taking into consideration the problems mentioned above in remedying failures and the fact that a majority of these systems were installed more than seven years ago, estimates of the average pollutant concentrations in local private system effluents were made and are included in Table 2-26.

The number of these systems and the population served by them can only be estimated in the absence of local survey data. Both the Cuyahoga County and Summit County Health Departments maintain files of the system permits issued from approximately 1959 to the present. However, permits are not removed when the house is connected to municipal sewer. Also Cuyahoga County's permits are filed by

Table 2-26 - Typical Pollutant Concentrations in Effluents from Septic Tank Disposal Systems

| Parameter | Units | Septic Tank Effluent[1] | Filter Bed Effluent[2] Preceded by Septic Tank | Estimated Average for CVI Systems |
|---|---|---|---|---|
| $BOD_5$ | mg/l | 130 | 9 | 50 |
| Suspended Solids | mg/l | 54 | 7 | 30 |
| Total Nitrogen | mg/l-N | 51 | -- | 40 |
| Inorganic Nitrogen | mg/l-N | 36 | 21 | 30 |
| Total Phosphorus | mg/l-P | 14 | -- | 12 |
| Ortho phosphate | mg/l-P | 11 | 7 | 9 |
| Fecal Coliforms | #per 100 ml. | $6.5 \times 10^5$ | $.7 \times 10^3$ | $1 \times 10^4$ |

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[1] Data from Otis, R. J. and Boyle, W. C., "Performance of Single Household Treatment Units," Journal of the Environmental Engineering Division, ASCE Vol. EE1, February 1976; p. 175. Figures are the averages of 112 effluent samples taken from six home septic tanks

[2] Data from Sauer, D.K., Boyle, W. C., and Otis, R. J. "Intermittent Sand Filtration of Household Wastewater under Field Conditions" Small Scale Waste Management Project, University of Wisconsin, Wisconsin; No date.

road making estimation of system numbers in Cuyahoga County municipalities infeasible at present. The Summit County Health Department was able to provide annual number of permits issued for Boston, Hudson, Richfield and Sagamore Hills townships (including villages) covering the period 1959 to August 1976. These numbers are presented in Table 2-27. Of particular note are the decrease in total permits after the first three years of the permitting program and the nearly constant rate of permit issuance since 1962. The high number of permits 1959-1961 is suspected of being due to permissive design requirements early in the permitting program combined with local growth pressures. In the absence of municipal sewers and stricter standards for septic tank disposal systems, the issuance of approximately 75 to 100 permits per year may be expected in the near future in the Phase II area represented by these townships.

The study area population that depends upon these private systems is roughly estimated to be 45,000. This figure was developed by estimating 1975 study area population served by municipal sewers from data in the Infiltration/Inflow study for the Southerly treatment plant and then subtracting this from the estimated 1975 population of the study area. The number of 45,000 is felt to be low, if anything. Based upon the service area boundaries for the municipal collection systems, Figure 1-1, (Havens & Emerson, 1970), the 1970 populations of the municipalities, and information about private systems reported in the appendix to the Infiltration/Inflow study, the 45,000 persons served by private systems has been apportioned to the municipalities, or parts thereof, in the study area. These estimates are presented in Table 2-28. Per capita sewage generation is estimated to be 75 gallons per capital per day.

One of the major sources of pollution, other than direct discharge to streams, is urban, suburban and rural runoff. Table 2-29 gives average pollutant concentrations from separate system urban stormwater runoff calculated for the Three Rivers Watershed District (the entire Cuyahoga Basin comprises about 60 per cent of the District). These concentrations vary as does the imperviousness, a measure of the degree of urbanization. The concentration of phosphorus and nitrogen tends to be less in dense urban areas because of the scarcity of lawn and green spaces.

b. Uses

The Environmental Assessment contains a brief mention of areawide water use on page 88 (paragraph 1). It cites the Cleveland Southerly Infiltration/Inflow Analysis to justify an average combined domestic and industrial wastewater flow figure of 105 gallons per capita per day (GPCPD). The table from which this was computed, however (see Table 2-30), shows considerable local variations in water use, with the highest per capita rate occurring in the industrial areas near the city and also along Tinkers Creek below Solon. The heavy industrial activity in these areas resulted in per capita water use figures

Table 2-27- Home Sewage Systems Installed in Selected Summit County Municipalities, 1959-1976.

| | Boston | Hudson | Richfield | Sagamore Hills | Total |
|---|---|---|---|---|---|
| 1959 | 27 | 53 | 65 | 83 | 228 |
| 1960 | 24 | 61 | 90 | 128 | 303 |
| 1961 | 33 | 43 | 61 | 78 | 215 |
| 1962 | 20 | 33 | 16 | 34 | 103 |
| 1963 | 19 | 21 | 29 | 40 | 109 |
| 1964 | 29 | 21 | 34 | 34 | 118 |
| 1965 | 27 | 37 | 36 | 35 | 135 |
| 1966 | 21 | 33 | 37 | 38 | 129 |
| 1967 | 20 | 13 | 30 | 25 | 88 |
| 1968 | 24 | 16 | 41 | 25 | 104 |
| 1969 | 17 | 20 | 35 | 27 | 99 |
| 1970 | 16 | 11 | 30 | 24 | 81 |
| 1971 | 22 | 14 | 34 | 47 | 117 |
| 1972 | 26 | 21 | 31 | 34 | 112 |
| 1973 | 17 | 18 | 28 | 39 | 91 |
| 1974 | 16 | 29 | 28 | 22 | 85 |
| 1975 | 16 | 20 | 24 | 18 | 78 |
| 1976* | 11 | 9 | 5 | 20 | 45 |
| | 375 | 473 | 655 | 741 | 2244 |

* Through 6 August 1976.

Source: Personal Communication, Mr. Robert L. Roseler, Summit County Health Department, 12 August 1976.

Table 2-28- Estimated Residential Population Served by Private Septic Tank Sewage Disposal Systems by Municipality

| Phase I | Population Served |
|---|---|
| Independence | 7,400 |
| Valley View | 1,400 |
| Broadview Heights | 9,000 |
| Oakwood | 2,500 |
| Walton Hills | 2,500 |
| Brecksville | 4,500 |
| Seven Hills | 400 |
| | 27,700 |
| **Phase II** | |
| Boston Heights | 900 |
| Boston Township | 2,200 |
| Hudson Township | 200 |
| Richfield | 3,200 |
| Richfield Township | 1.700 |
| Peninsula | 700 |
| Northfield Center Township | 200 |
| Sagamore Hills | 5,000 |
| | 14,100 |
| **Phase III** | |
| Glenwillow | 500 |
| Solon | 1,000 |
| Reminderville | 200 |
| Twinsburg | 500 |
| Streetsboro | 600 |
| Anrora | 400 |
| | 3,200 |

NOTE: Municipalities which are essentially completed sewered are assumed to have no private septic tank disposal systems.

Table 2-29. Separate System Stormwater Runoff Characteristics, Three Rivers Watershed

| | Rural | Urban | Dense Urban |
|---|---|---|---|
| Imperviousness | 5% | 25% | 55% |
| Suspended Solids | 200 mg/l | 300 mg/l | 500 mg/l |
| BOD | 3 mg/l | 20 mg/l | 30 mg/l |
| COD | 50 mg/l | 150 mg/l | 200 mg/l |
| Total Volatile Solids | 35 mg/l | 110 mg/l | 140 mg/l |
| Suspended Volatile Solids | 25 mg/l | 80 mg/l | 105 mg/l |
| Phosphorus as P | 0.2 mg/l | 0.7 mg/l | 0.5 mg/l |
| Nitrogen as N | 2.0 mg/l | 3.1 mg/l | 2.2 mg/l |
| Chlorides | 60 mg/l | 160 mg/l | 166 mg/l |

Table 2-30

METERED WATER CONSUMPTION IN THE CUYAHOGA VALLEY INTERCEPTOR AREA

| Municipality | 1973 Water Usage in Cu. Ft. Per Day | Estimated Connected Population | Average Per Capita Usage Cu. Ft. Per Day | Usage in Gallons Per Day |
|---|---|---|---|---|
| Bedford | 326,410 | 18,421 | 17.72 | 132.55 |
| Bedford Heights | 266,033 | 13,925 | 19.10 | 142.87 |
| Brecksville | 159,655 | 10,555 | 15.13 | 113.17 |
| Broadview Heights | 114,907 | 12,463 | 9.22 | 68.96 |
| Garfield Heights | 444,022 | 42,367 | 10.48 | 78.39 |
| Hudson | 66,310 | 4,363 | 15.20 | 113.70 |
| Independence | 134,594 | 7,974 | 16.88 | 126.26 |
| Macedonia | 45,216 | 4,600 | 9.82 | 73.52 |
| Maple Heights | 429,625 | 34,937 | 12.30 | 92.00 |
| North Royalton | 116,882 | 12,902 | 9.06 | 67.76 |
| Oakwood | 24,266 | 2,491 | 9.74 | 72.87 |
| Solon | 281,638 | 13,728 | 20.52 | 153.49 |
| Twinsburg | 67,049 | 7,000 | 9.58 | 71.65 |
| Valley View | 20,438 | 1,769 | 11.55 | 86.39 |
| Walton Hills | 174,202 | 2,923 | 59.60 | 445.79* |

Note: Water usage in all communities except Hudson is based upon Cleveland Water Department records.

*A large number of high water usage industries are located in Walton Hills.

more than twice (or, in the case of Walton Hills more than six times) those of largely residential communities such as Garfield Heights.

Considerable changes are projected in the rate of industrial water use (and thus dicharges), both on an absolute and per capita basis. The Northeast Ohio Water Development Plan projects an absolute rise in Cuyahoga County industrial water use through 1990 and a decline thereafter (see Table 2-31a); when adjusted according to its own population figures, NEOWDP per capita industrial use steadily declines, dropping by about one third by 2020. In contrast, Summit County industrial water use increases about 12 per cent on an absolute basis and declines 27.5 per cent on a per capita basis.

In order to gain better insight into present domestic and industrial water consumption, 1975 water billing records for the communities served by the City of Cleveland water system were made available through CRSD. Two sets of water use data are maintained by the City. Residential, commercial and very small industrial water users fall into a use category defined by the size of water service tap, 5/8 inch to one inch diameter. Records for heavier users are kept separately.

A summary of 1975 domestic water consumption by community is provided in Table 2-31a. The data shows a surprisingly constant average daily consumption per connection with a high of 268 gallons per connection per day for Broadview Heights to a low of 231 gallons per connection per day for Oakwood. These figures can not be converted to per capita consumption because the number of persons per connections is not known. Therefore, in municipalities which are entirely within the CVI study area for which all of the water supply is believed to be provided by the City system, 1975 population estimates (see Section 2.B.4.b.) were used with appropriate domestic water consumption rates from Table 2-31a. Per capita daily water consumption rates for these municipalities are shown in Table 2-31a. These communities have developed to a point where private water supplies have probably been largely discontinued. The communities with the higher per capita consumption, furthermore, are more mature in terms of commercial development thereby realizing greater non-residential (commercial and very small industry) water consumption than in the lower use communities.

Therefore, in consideration of the facts (1) that domestic consumption is composed of both residential and commercial/small industry contributors, (2) that the degree of non-residential water consumption increases as communities mature and (3) many of the CVI communities will be approaching developmental maturity by 2020, it is reasonable that the future per capita domestic water consumption will be higher than the present average for these six communities, 66.1 pgd. A figure of 70 gpcd would be appropriate considering the data and the above interpretations of it.

Table 2-31. Industrial Water Demand Projections 1980-2020, from Northeast Ohio Water Development Plan

| | Private Supply | Public Supply | Total Supply | Total Per Capita |
|---|---|---|---|---|
| | (Cuyahoga & Lake Counties) | | | |
| 1980 | 212.5 | 211.1 | 432.6 | 197 GPCPD |
| 1990 | 192.1 | 248.0 | 440.1 | 172.25 |
| 2000 | 110.3 | 263.9 | 374.2 | 132.2 |
| 2010 | 93.4 | 274.7 | 368.1 | 121.60 |
| 2020 | 72.2 | 280.4 | 352.6 | 114.8 |
| | (Summit County) | | | |
| 1980 | 13.5 | 24.3 | 37.8 | 68.7 GPCPD |
| 1990 | 9.3 | 28.4 | 37.7 | 52.25 |
| 2000 | 4.1 | 33.8 | 37.9 | 47.7 |
| 2010 | 2.2 | 37.9 | 40.1 | 48.00 |
| 2020 | 0.8 | 41.2 | 42.0 | 49.79 |

Table 2-31a. Water Consumption for CVI Communities Using the City of Cleveland Water Supply System by CVI Phase.

| | No. of Accounts | MGD | Gal./Day |
|---|---|---|---|
| CVI Phase I Communities | | | |
| Independence | 1980 | .480 | 242 |
| Maple Heights | 1802 | .451 | 250 |
| Bedford Heights | 2505 | .647 | 258 |
| Oakwood | 464 | .107 | 231 |
| Brecksville | 2466 | .652 | 264 |
| Northfield Village | 964 | .230 | 238 |
| Walton Hills | 640 | .160 | 250 |
| Broadview Heights | 2404 | .645 | 268 |
| (*) | 13225 | 3.372 | 255 |
| | (Total) | (Total) | (Average) |
| CVI Phase II Communities | | | |
| Northfield Center | 642 | .154 | 241 |
| Sagamore Hills | 472 | .115 | 245 |
| Macedonia | 1379 | .337 | 245 |
| | 2493 | .606 | 243 |
| | (Total) | (Total) | (Average) |
| CVI Phase III Communities | | | |
| Solon | 3101 | .808 | 260 |
| Twinsburg | 1475 | .368 | 249 |
| | 4576 | 1.176 | 257 |
| | (Total) | (Total) | (Average) |

*Valley View and Bedford are not included in this list because of incomplete data available for them.

Source: Computer printout of 1975 water billing records made available by CRSD.

Table 2-31b. Per Capita Domestic Water Consumption in CVI Municipalities Served Entirely by City Water Service

| Municipality | 1975 Population[1] | 1975 Municipality Water Consumption (mgd) | Per Capita Water Consumption (gpcd) |
|---|---|---|---|
| Independence | 6647 | .480 | 72.2 |
| Walton Hills | 2486 | .160 | 64.4 |
| Northfield | 4400 | .230 | 52.3 |
| Solon | 11000[2] | .808 | 73.5 |
| Macedonia | 6160 | .337 | 54.7 |
| Brecksville | 9678 | .652 | 67.4 |
| | 40371 (Total) | 2.667 (Total) | 66.1 (Average) |

[1] EPA-RPI or NEFCO estimates from Section 2.B.4.b.

[2] Adjusted downward from 13,426 to reflect the fact that a sparsely populated part of the City of Solon is outside of the CVI study area.

Since groundwater aquifers in most of the study area are able to provide adequate water supplies only for low-density residential development, meeting future water supply demands in presently unserved areas along the southern tier of townships within Phases II and III of the CVI study area will depend upon extension of the City of Cleveland water system. Without significant improvements to the water system as analyzed in the 1972 Parson, Brinkerhoff, Quade and Douglas study, "Greater Cleveland Water Supply Systems Development Plan," it is unlikely that the wastewater flows projected for the CVI study area will be realized. Treatment facilities, arterial transmission lines, distribution mains, pumping stations and storage facilities all require some degree of renovation of expansion. The 1972 study identified several areas within the CVI study area that were calculated for 1970 to experience low water pressure during peak demand periods. The most serious problems were noted for transmission mains in Bedford Heights and Solon. While recent population declines in the Cleveland metropolitan area may have reduced peak demand somewhat since 1970, it is evident that the present system is at or near its capacity.

Improving and extending the water supply systems faces some institutional problems. Rates cited in the above study paid by suburban users are two to four times as high as those paid by users in the City of Cleveland. In addition court ordered rate increases have purportedly not been sufficient to support the maintenance and capital costs necessary to improve the system.

While no substantive evidence has been reviewed which would support this possibility, the lack of a reliable water supply (especially in the higher, most developable portions of the study area) and uncertainty over the outcome of the court suit may have acted to constrain growth in developing communities of CVI. In the future, lacking substantial water service from the Akron water supply, failure to improve the Cleveland water system would almost certainly prove to be an insurmountable obstacle to any growth in the CVI study area except for low-density residential development using groundwater as the water supply.

In order to gain better insight into present water use patterns, and to serve as a basis for wastewater flow projections 1975 water billing records were made available through CRSD for CVI communities served by the City of Cleveland water system. Two sets of water billing records are maintained by the City. Records for customers having five-eights to one inch diameter water service taps are computerized and maintained separately from the records for customers with larger water service taps. The customers which have small diameter taps are expected to be residential and small commercial water users. All of the water consumption by these small users is considered to be domestic.

In addition to the major industrial water accounts, a number of residential and commercial accounts are included in the listings of large-tap water customers. Industrial water users were identified and the records for domestic, large-tap users were tabulated separately. Yearly water use reported in thousands of cubic feet was converted to million gallons per day assuming that all small tap users and large tap users which could be identified as trailer parks, apartments or condominiums would have seven day per week or 365 days per year usage. Usage for large commercial users was assumed to be six days per week or 310 per year and industrial, five days per week or 260 per year.

The available water consumption data is summarized in Table 2-32. Because not all of these municipalities are entirely within the CVI study area or else depend substantially on other sources of water such as wells, reliable per capital domestic consumption rates can be derived for only six of the communities listed in Table 2-32. Population, domestic water consumption and per capita domestic water consumption for these six municipalities are presented in Table 2-33. The older, more highly developed municipalities (Walton Hills, Solon and Independence) have higher per capita usage than the average for these communities and, because of their development maturity, represent increased commercial contributions per capita than less developed communities. Considering that the less developed communities in the CVI study area will, with time, approach the consumption rates found for these mature municipalities, a design per capita consumption higher than the average for all six communities seems appropriate. A figure of 70 gpcd for domestic water consumption is supported by the data and considerations described.

Industrial water consumption is not adequately described as an extrapolation of municipality population. Land suitability and employment are more closely related to how much industrial water usage will be realized and where it will be used. The cost of water, proximity to railroads and proximity to major highways are additional considerations in where industry will locate.

The heaviest industry water use occurs in manufacturing concerns as compared with retail trade, wholesale trade and services. Manufacturing employment is detailed and discussed in Section 2.B.5 of this report. 1972 Manufacturing Employment from Table 2-34 and 1975 industrial water usage from Table 2-32 for Bedford, Bedford Heights, Walton Hills and Solon are used to calculate a per employee water consumption. The data for this calculation is presented in Table 2-34. The 125 gpd calculated by this method is felt to be somewhat high since water consumption for non-manufacturing industries is included in the calculation with only manufacturing employees.

c. Management

The description on pages 36 through 39 of the Assessment is basically accurate. The Northeast Ohio Water Development Plan of 1972, was prepared by the Ohio Department of Natural Resources, an agency not mentioned in the referenced pages, in partial fulfillment of the requirements of Sections 201, 208, and 303 of Public Law 92-500. Four federal, six state, and twelve local agencies participated.

Table 2-32 - Domestic Water Consumption for CVI Communities Served by the City of Cleveland Water Supply System.

| CVI Phase I Communities | Small Accounts (5/8" to 1" diameter tap) (mgd) | Large Residential and Commercial Accounts (greater than 1" diameter tap) (mgd) | Industrial Accounts (mgd) |
|---|---|---|---|
| Independence | .480 | 0[c] | 0[c] |
| Maple Heights | .451 | .070 | .006 |
| Bedford Heights | .647 | .256 | .367 |
| Oakwood | .107 | 0 | .015 |
| Brecksville | .652 | 0[c] | 0[c] |
| Northfield Village | .230 | .001 | .003 |
| Walton Hills | .160 | .113[a] | 1.114 |
| Broadview Heights | .645 | 0[c] | 0[c] |
| Bedford | b | .050 | .385 |
| Garfield Heights | b | .025 | .058 |
| Valley View | b | .039 | .051 |
| **CVI Phase II Communities** | | | |
| Northfield Center | .154 | .008 | 0 |
| Sagamore Hills | .115 | .071 | .007 |
| Macedonia | .337 | .020 | .073 |
| **CVI Phase III Communities** | | | |
| Solon | .808 | .049 | .385 |
| Twinsburg | .368 | .033 | .050 |

[a]An average daily flow of 0.245 mgd for Western Reserve Psychiatric Center is not included in this figure since population figures for the Center are not included in population figures for Walton Hills.

[b]Small account data was not available for these municipalities.

[c]Large account data was not available for the e municipalities. It is assumed that no large accounts are kept in Brecksville Independence and Broadview Heights.

Table 2-33 - Per Capita Domestic Water Consumption in CVI Municipalities Served Entirely by City Water Service

| Municipality | 1975 Population[1] | 1975 Domestic Water Consumption (mgd) | Per Capita Water Consumption (gpcd) |
|---|---|---|---|
| Independence | 6647 | .480 | 72.2 |
| Walton Hills | 2486 | .181 | 72.8 |
| Northfield | 4400 | .231 | 52.5 |
| Solon | 11000[2] | .857 | 77.9 |
| Macedonia | 6160 | .357 | 57.9 |
| Brecksville | 9678 | .652 | 67.4 |
| | 40371 (Total) | 2.731 (Total) | 67.6 (Average) |

[1]EPA-RPI or NEFCO estimates from Section 2.B.4.b.

[2]Adjusted downward from 13,426 to reflect the fact that a sparsely populated part of the City of Solon is outside of the CVI Study area.

Table 2-34 - Manufacturing Employment and Industrial Water Consumption for Selected CUI Communities.

| Community | 1972 Manufacturing Employment | 1975 Industrial Water Consumption Rate gpd | per Employee Manufacturing Water Consumption (gallons per employee-day) |
|---|---|---|---|
| Bedford | 3,000 | 385,000 | 128 |
| Bedford Heights | 3,700 | 367,000 | 94 |
| Walton Hills | 5,800 | 1,114,000 | 192 |
| Solon | 5,300 | 385,000 | 73 |
| | 18,000 | 2,251,000 | |

$$\text{Average} = \frac{2,251,000}{18,000} = 125 \text{ gallons per employee-day}$$

d. Flood Control

The brief description on pages 26 and 27 is quite accurate. Final land acquisition for the Cuyahoga Valley National Recreational Area will end the possibility of development of a large portion of the Cuyahoga Valley main floodplain from Boston Heights downstream to the mouth of Tinkers Creek.

4. Demography and Economics

a. Existing Conditions

Existing Conditions - Demographic Factors

Population changes are the net result of several interdependent factors which can be analyzed separately and in combinations to provide a descriptive base for reviewing population projections. Factors considered here are migration, fertility rates and housing. Employment and economics are analyzed in a subsequent section.

Migration - 1973 estimates of population available in Current Population Reports, Series P-26 (U.S. Department of Commerce, 1975) and local data on births and deaths have been used by Weld as a basis for estimating net migration (Weld, 1976). A detailed summary of this data for Cuyahoga County is presented in Table 2-35. The data show for the first three years of this decade that out-migration exceeded natural increases in both the City of Cleveland and the Cuyahoga County suburbs.

With net out-migration of 88,600 and natural increase of only 15,500, the City of Cleveland appears to have lost 73,100 inhabitants (almost 10 percent of its population) between April 1970 and July 1973.

This average loss of 22,500 persons per year over 3.5 years is almost double the City's average loss of 12,500 per year during the 1960's, when population fell by 14 percent over a ten-year period.

In the suburbs, natural increase due to the excess of births over deaths amounted to only 14,100 persons. (1.4 percent of the 1970 population of 969,956). This was not enough to offset a net loss due to out-migration of 16,500 persons.

As a result the population of suburban Cuyahoga County appears to have remained relatively unchanged, or perhaps fallen slightly, between 1970 and 1973. This is in contrast to the decade of the 1960's when the suburban population grew by 198,111 persons (26 percent.).

Contrary to what one might expect, therefore, suburban Cuyahoga County has not gained population at the expense of the central city. Instead it appears that almost one sixth of the County's 105,100 loss due to out-migration comes from the suburbs.

Table 2-35-Estimated population and sources of population change for the City of Cleveland and Cuyahoga County suburbs, 1970-1973

(Weld 1976)

| | Cuyahoga County | City of Cleveland | County Suburbs |
|---|---|---|---|
| 1970 (Revised) | 1,720,835 | 750,879 | 969,956 |
| 1973 (Revised) | 1,645,300 | 677,800 | 967,500 |
| Change 1970-1973 | | | |
| Amount | -75,500 | -73,100 | -2,400 |
| Percent | -4.4 | -9.7 | -0.3 |
| Components of Change | | | |
| Births | 85,700 | 44,600 | 41,100 |
| Deaths | 56,100 | 29,100 | 27,000 |
| Natural Increase | | | |
| Amount | +29,600 | +15,500 | +14,100 |
| Percent | +1.7 | +2.1 | +1.5 |
| Net Migration | | | |
| Amount | -105,100 | -88,600 | -16,500 |
| Percent | -6.1 | -11.8 | -1.7 |

Sources: Revised estimates of total population for 1973 are taken from Current Population Reports Series P-25 N. 580 and adjusted downward by 1,800 persons to make them consistent with the final estimate for Cuyahoga County published in CPR, Series P-26, No. 122. Births and deaths are taken from Ohio Division of Vital Statistics, Report of Vital Statistics for Ohio, 1970-1973. Net migration is the difference between net change and natural increase. Note that both natural increase and net migration for Cuyahoga County differ from the figures shown in previous reports due to the use of new data on births and deaths. All estimates have been rounded to the nearest hundred after calculation.

Nor is there any indication of a significant move to nearby Counties. Net migration for these Counties between 1970 and 1973 is shown below. Lake and Lorain Counties experienced a net outlfow, while in-migration to Medina County offset less than half the loss from suburban Cuyahoga County.

Net Migration, 1970-1973

| | |
|---|---|
| City of Cleveland | -88,600 |
| Suburban Cuyahoga County | -16,500 |
| Geauga County | + 900 |
| Lake County | - 1,500 |
| Lorain County | - 2,900 |
| Medina County | + 6,100 |
| Total Five Counties | -102,500 |

Net migration has also been calculated for counties in the Akron SMSA and appropriate numbers are reported in Table 2-36.

Table 2-36 shows a situation in Summit County that resembles that in Cuyahoga County, namely, a net loss of 5.2 percent. Only Portage County with a much small population (only 18.7 percent of the Akron SMSA in 1970) shows a tiny increase.

The net out-migration from the seven large Ohio SMSA's of 246,000 persons more than offset an increase in population due to an excess of birth over deaths of 207,900. Because the remainder of the State gained only 15,600 inhabitants through in-migration, it appears that 94 percent of the net out-migration from the seven metropolitan areas represents a movement out of Ohio to other States, rather than a movement only from cities to suburbs, or from metropolitan to rural areas. More than half of this population loss from migration (127,400) came from the Cleveland four-county SMSA.

Birth Rates - Contributing to the reduced population growth rates, and apparently tied to migration trends, is a large reduction in birth rates. In 1970 there was a total of 30,397 births or 17.7 births per thousand population in Cuyahoga County. In 1974, there were only 21,274 births of 12.9 births per thousand in Cuyahoga County. This decrease in the birth rate of approximately 27 percent is considerably higher than the nationwide decrease over the same period of 19 percent. The drop in births by 5-year female age cohorts shows the greatest drop in the 20-24 year group. If this drop is due primarily to postponement of births, then the decrease in birth rate may be a short term reversible phenomena. However, the concurrent increase in net out-migration suggests that females of child-bearing age moving out of the area may be a major component of the birth rate decrease. This component would more likely represent a long term phenomena that would be reversible only with a major reversal in migration patterns.

Housing Trends - The construction of new housing, its location, its location, cost and type, are strongly dependent upon population trends, availability of capital and the economic position (real or perceived), of individuals entering the housing market.

Table 2-36- U.S. Bureau of Census Estimates of the population change and net migration for the Akron, Ohio, SMSA, 1970-1974 (Weld 1976).

| | Population | | Change | | Net Migration | |
|---|---|---|---|---|---|---|
| | 1970 | 1974 | Number | Percent | Number | Percent |
| Summit County | 553,371 | 540,100 | +3,300 | -2.4% | -29,000 | -5.2% |
| Portage County | 125,868 | 131,200 | +5,400 | +4.3% | + 200 | +0.2% |
| Akron SMSA | 679,239 | 671,300 | -7,900 | -1.2% | -28,800 | -4.2% |

Population trends, especially the markedly low birth rate and suspected out-migration of young adults, are the basis for estimating a decline in persons per household. The U.S. Bureau of the Census has estimated a nationwide drop of 10 percent in the average household size. This estimate, as discussed by Weld (Weld, 1976), was based upon 38 special censuses carried out during 1975. If this change is applied to the 1970 average of 3.36 persons per household for the 13 CVI communities in Cuyahoga County, the 1975 figure would be 3.02 persons per household. Compared to this, the"EPA-RPI" estimate of 3.18 and the "RPI" estimate of 3.27 persons per household in Cuyahoga County in 1975 are both conservative and tend to overestimate 1975 population. (See Section 2.B.4.a. Existing Conditions-County.

At the time that household size was decreasing in Cuyahoga County, housing starts continued but a lesser pace than in previous years. County housing starts steadily declined from an average 11,423 per year in the 1959's to 9,742 per year in the 1960's to 4,850 per year from October 1970 to October 1974. The relative attractiveness of the CVI study area to new development is indicated by the fact that 21 percent (3,705 units) of the increase in occupied family units for Cuyahoga County occurred within the 13 CVI communities within that county.

Existing Conditions - County

1960 and 1970 census figures on page 54 of the Environmental Assessment and the "splits" of them for the proposed study area on page 55 are basically valid. In some cases the extraction of a figure for areas only partially within the study area was accomplished by a simple division according to area.

Estimates of current (1975-6) population are valuable not only as an indication of existing conditions, but also as a suggestion of the forms growth has taken since 1970 and thus as a cross-check of the various population projections. Table 2-37 shows 1960 and 1970 census figures and a variety of 1970 to 1975 estimates for Cuyahoga and Summit Counties, Ohio.

The 1973 figure is from the "P-25" estimates of the Bureau of the Census. These were based on:

a) An estimate of natural increase based on reported birth and death statistics or on estimated figures where reported data was not available.

b) An estimate of net migration developed from individual administrative records.

c) An estimate of change to "special" populations not accounted for above.

In other parts of the country, crosscheck of these estimates with actual special censuses indicate a possible margin of error ranging from 5 to 15 per cent. In general, comparison of these

Table 2-37. Census and Population Estimates, Cuyahoga and Summit Counties.

| | 1960 | 1970 | 1973 | 1974(Oct) | 1975 |
|---|---|---|---|---|---|
| (Cuyahoga County) | | | | | |
| Census | | 1,721,300 | 1,647,066 | | |
| RPI | | | | 1,727,250 | 1,728,572 |
| EPA-RPI | | | | 1,651,160 | 1,663,650 |
| NEO | | | | | 1,800,000+ (Est.) |
| DEMOS E | | | | | 1,749,177 |
| RPC | | | | | 1,719,200 |
| NOACA | | | | | 1,718,900 |
| (Summit County) | | | | | |
| Census | | 553,371 | 546,111 | | |
| NEFCO (1976) | | | | | 562,550 |
| NEO | | | | | 594,000 (Est.) |
| DEMOS E | | | | | 576,200 |

figures with revised Real Property Inventory estimates (see below) indicate a substantial consistency between the two, although the "P-25 estimates", which are made for all municipalities and townships, are generally somewhat lower for the Cleveland area and occasionally slightly higher.

The Real Property Inventory of Metropolitan Cleveland ("RPI" in the tables) prepares actual annual tabulations of reported data including the number of dwelling units in each Cuyahoga County municipality and township. Using these figures a private agency prepares estimates of the existing population, multiplying the number of dwelling units by the average 1970 family size (less a progressive annual decrease of .02 persons per family per year). This has resulted in a calculated family size decrease of about .09 persons per family through October 1974. The resulting estimates of existing population are somewhat higher than the "P-25 estimates".

The "RPI" estimates of family size decrease have been suggested as being too small. A decrease of 0.18 persons per family through October 1974 has been recommended. When this is d[illegible], RPI estimates are lowered somewhat and become generally comparable to, but slightly higher than, the "P-25 estimates". These revised figures are labelled "EPA-RPI" in Table 2-37.

The Real Property Inventory also prepared projections of population through 1980, based on an arithmetical projection of 1970-74 housing growth, combined with the decreasing family size factor described above. 1975 RPI and EPA-RPI estimates are derived from this projection.

The P-25, RPI, and EPA-RPI figures are valuable, because they are an indication of what is actually happening in the study area. The other figures in the table are 1975 figures from earlier projections. The "NEO" figure comes from the Northeast Ohio Water Development Plan of 1972, and is based on the Battelle Memorial Institute's DEMOS model; this model has been criticized as projecting a pattern of growth in the City of Cleveland and its nearer suburbs that is the reverse of what is actually happening. In addition the "NEO" version of this model uses the old Bureau of the Census "C" series fertility table, declared obsolete in 1972. The "DEMOS E" figure represents basically the same model with more recent "E" series fertility tables.

The Cuyahoga County Regional Planning Commission (RPC) and the Northeast Ohio Areawide Coordinating Agency (NOACA) figures are based on the same model assuming a substantial decline in Cleveland city population and a larger growth rate in the peripheral area. This model is due to be replaced by a new cohort survival model by mid-1976. The Tri-County (Tri-Co) Regional Planning Commission figure was prepared by a predecessor of the current Northeast Ohio Four-County Planning Organization (NEFCO). The NEFCO figure is a 1975 estimate by that organization of existing population.

Table 2-37 indicates static or negative growth in Cuyahoga County; the revised RPI and P-25 estimates both suggest a moderate decline. Summit County has apparently undergone a small increase; the "P-25 estimate", DEMOS "E", and the NEFCO estimates are in relatively close agreement.

Existing Conditions - Intermediate

The availability of the local RPI estimates for Cuyahoga County represents a unique opportunity to crosscheck the P-25 estimates and evaluate projections of proportionate growth among the various zones of Cuyahoga County development. Within the study area, four such zones can be recognized: the City of Cleveland itself; an inner belt of suburbs including major residential and industrial areas; a middle group with similar character but a lower degree of development, and an outer group with only modest industrial development and a lower residential density. These four zones are defined for Cuyahoga County in Table 2-38.

In Summit County, as shown in Table 2-39, four distinct zones of development are encountered as one moves north from Akron towards Cleveland: Akron itself; an inner belt of suburbs closely associated with it; an outer belt of suburbs and townships at the southern end of the Cuyahoga Valley National Recreation Area; a transitional zone of townships and municipalities not clearly within the orbit of either city; and several suburbs in the far north that are tributar, to Cleveland and are properly combined with the "outer group" in Cuyahoga County.

Table 2-40 shows population estimates for 1970 through 1975 for the four Cuyahoga County zones. These estimates suggest several things:

a) Cleveland is undergoing a substantial decline in population, apparently at a slightly slower rate than suggested by the Cuyahoga County RPC, but definitely not increasing, as the NEO suggests.

b) The inner group of suburbs is growing at or below the rate projected by the CCRPC and is basically static.

c) The middle group is growing more slowly (about 1/3 to 1/2 the rate) than the RPC projections.

d) The outer group (Brecksville) is growing more slowly than projected, but because only one town is under consideration, generalization is hazardous.

e) The growth in housing that is taking place is being largely offset by a decrease in family size.

f) Taken as a whole the Cuyahoga County suburbs have been relatively stable with less than 2 per cent growth through 1975. Recorded growth has been well below the RPC-projected total (about one sixth to one seventh).

Table 2-41 shows similar estimates for the five Summit County zones. The NEFCO 1975 estimate is a new one, prepared within the last year. In order to produce figures comparable with those of the Northeast Ohio Water Development Plan (which does not separate township figures), municipalities only were used for the transitional zone. These estimates suggest several things:

a) Akron is undergoing a decline in population, but so far it is a modest one not fully comparable to that of Cleveland.

b) The inner group of Akron suburbs is also declining at a similar rate.

c) The outer belt of Akron suburbs is increasing at a rate very close to that projected by the Tri-County RPC projections.

d) The transitional and Cleveland-outer belts are growing, but at rates ranging from 7 to 10 per cent below RPC projections.

Table 2-38. Cuyahoga River Corridor Zones of Development
Cuyahoga County

A. Cleveland

B. Inner Suburbs
- Bedford
- Bedford Heights
- Garfield Heights
- Independence
- Maple Heights
- Valley View
- Seven Hills

C. Middle Suburbs
- Broadview Heights
- Glenwillow
- Oakwood
- Solon
- Walton Hills

D. Outer Suburbs
- Brecksville Heights

Table 2-39. Cuyahoga River Corridor Zones of Development
Summit County

A. Akron
B. Inner Suburbs
   - Cuyahoga Falls
   - Munroe Falls
   - Silver Lake
C. Outer Suburbs
   - Bath Township
   - Northampton Township
   - Stow
D. Transitional
   - Boston Heights
   - Boston Township
   - Hudson
   - Hudson Township
   - Reminderville
   - Richfield
   - Richfield Village
   - Peninsula
E. Cleveland Outer Suburbs
   - Macedonia
   - Northfield
   - Northfield Center
   - Sagamore Hills Township
   - Twinsburg
   - Twinsburg Township

Table 2-40. Population Estimates and Projections 1973-75, Cuyahoga River Corridor Zones of Development - Cuyahoga County

| | 1970 | 1973 | 1974 | 1975 |
|---|---|---|---|---|
| A. Cleveland | | | | |
| Census | 750,903 | 678,615 | | |
| RPC | | | | 650,000 |
| RPI | | | 708,107 | 698,597 |
| EPA-RPI | | | 674,679 | 668,333 |
| B. Inner Suburbs | | | | |
| Census | 114,581 | 111,272 | | |
| RPC | | | | 122,600 |
| RPI | | | 118,235 | 119,047 |
| EPA-RPI | | | 114,439 | 114,960 |
| C. Middle Suburbs | | | | |
| Census | 29,125 | 30,767 | | |
| RPC | | | | 39,000 |
| RPI | | | 33,477 | 34,440 |
| EPA-RPI | | | 32,676 | 33,301 |
| D. Outer Suburb (Brecksville) | | | | |
| Census | 9,137 | 8,925 | | |
| RPC | | | | 11,500 |
| RPI | | | 9,997 | 10,188 |
| EPA-RPI | | | 9,492* | 9,678* |
| E. Middle and Inner Combined (less Brecksville) | | | | |
| Census | 143,706 | 142,069 | | |
| RPC | | | | 161,500 |
| RPI | | | 151,712 | 153,487 |
| EPA-RPI | | | 145,780 | 148,261 |

* Includes allowance for persons living in group quarters.

Table 2-41. Population Estimates and Projections 1973-75, Cuyahoga River Corridor Zones of Development Summit County.

| | 1970 | 1973 | 1974 | 1975 |
|---|---|---|---|---|
| A. Akron | | | | |
| Census | 275,424 | 261,520 | | |
| 3 County | | | | 282,000 |
| NEFCO (1975) | | | | 267,600 |
| B. Inner Suburbs | | | | |
| Census | 57,109 | 55,224 | | |
| 3 County | | | | 58,800 |
| NEFCO (1975) | | | | 55,310 |
| C. Outer Suburbs | | | | |
| Census | 33,061 | 36,585 | | |
| 3 County | | | | 38,500 |
| NEFCO (1975) | | | | 39,790 |
| D. Transitional Zone (municipalities only) | | | | |
| Census | 7,161 | 7,939 | | |
| 3 County | | | | 10,700 |
| NEFCO (1975) | | | | 10,020 |
| E. Cleveland Outer (municipalities only) | | | | |
| Census | 17,090 | 17,475 | | |
| 3 County | | | | 20,200 |
| NEFCO (1975) | | | | 17,960 |

Existing Conditions - Local

Tables 2-42 and 2-43 show 1973, 1974 and 1975 population estimate (from sources described above) for individual communities and townships in the study area. Cuyahoga County communities are grouped according to middle, inner or outer group location.

In some cases sudden and unforeseen growth may take place. In Reminderville construction of one housing development has begun raising population drastically above the 1974 estimate. NEFCO has estimated the 1975 population as being as high as 1,690, and the Cleveland Regional Sewer District has projected a rise to 6,000 by 1980.

The final column of Tables 2-42 and 2-43 show 1972 U.S. Census Bureau estimates of per capita income in the proposed service study area. Table 2-44 shows the cost of three different standards of living in the Cleveland SMSA in October 1975, as calculated by the U.S. Department of Labor. Table 2-45 shows various manufacturing, employment, and payroll figures for municipalities with the study and service area.

b. Projections

Projections - County

Tables 2-46 shows Cuyahoga County projections through 2020. The only one of these not discussed previously is the "NOACA" (1975) entry. This is the revised NOACA projection developed by King in "Review of NOACA Area Population Projections" (May 1975). As discussed previously local and areawide figures suggest that the Cuyahoga County RPC model is the most accurate description of what is happening in Cuyahoga County, with only one minor exception. The newest NOACA figure, only slightly smaller than the 1972 RPC projection, can be accepted as an indication of what is likely to happen through the year 2000. The DEMOS pattern suggests a moderate rise and leveling off between 2000 and 2020; when combined with the later NOACA projection this would produce a figure of about 1,740,000 by 2020.

King's evaluation and revision of NOACA projections for Summit County are more significant, being down about 5 per cent from the Tri-County RPC 1972 projections by 2000. Assuming a 2000-2020 growth roughly proportional to that described by the Tri-County and DEMOS projections, a population of 750,000 to 760,000 by 2020 is not unlikely. This is shown in Table 2-46.

A recent (1975) Akron Metropolitan Transportation Study projection contains figures generally similar to NOACA's, and NEFCO representatives have stated that they consider it generally reliable. NEFCO itself has prepared an estimate of current Summit County population that is generally consistent with the two projections. For the present there is an apparent consensus

Table 2-42. Population and Income Estimates, 1972-1975, Cuyahoga River Corridor, Cuyahoga County

| | Census 1970 | P-25 1973 | RPI 1974 | EPA-RPI 1974 | RPI 1975 | EPA-RPI 1975 | RPC 1975 | P-25 (Income) 1972 |
|---|---|---|---|---|---|---|---|---|
| A. Inner Group | | | | | | | | |
| Bedford | 17,552 | 17,582 | 17,180 | 16,661 | 17,097 | 16,433 | 19,000 | $4060 |
| Bedford Hts. | 13,063 | 13,296 | 16,924 | 16,442 | 17,782 | 17,110 | 14,500 | $4521 |
| Garfield Hts. | 41,417 | 39,325 | 40,712 | 30,017 | 40,555 | 39,115 | 43,000 | $4042 |
| Independence | 7,034 | 6,914 | 6,947 | 6,861 | 6,928 | 6,647 | 8,600 | $5292 |
| Maple Heights | 34,093 | 32,700 | 35,016 | 34,045 | 35,221 | 34,230 | 35,500 | $3935 |
| Valley View | 1,422 | 1,455 | 1,456 | 1,413 | 1,464 | 1,425 | 2,000 | $3629 |
| | 114,581 | 111,272 | 118,235 | 114,439 | 119,047 | 114,960 | 122,600 | |
| B. Middle Group | | | | | | | | |
| Broadview Hts. | 11,463 | 12,029 | 13,585 | 13,317 | 14,057 | 13,518 | 16,500 | $4408 |
| Glenwillow | 508 | 480 | 581 | 562 | 593 | 576 | 700 | $5066 |
| Oakwood | 3,127 | 3,583 | 3,387 | 3,278 | 3,445 | 3,295 | 3,400 | $3471 |
| Solon | 11,147 | 11,896 | 13,379 | 13,036 | 13,792 | 13,426 | 15,200 | $4959 |
| Walton Hills | 2,508 | 2,779 | 2,545 | 2,483 | 2,553 | 2,486 | 3,200 | $5067 |
| | 28,753 | 30,767 | 33,477 | 32,676 | 34,440 | 33,301 | 39,000 | |

C. Outer Group (Brecksville)

(See Table 2-32).

Table 2-43. Population and Income Estimates, 1972-75, Cuyahoga River Corridor, Summit County

| | Census 1970 | P-25 1973 | 3 County 1975 | NEFCO 1975 | P-25 In 1972 come |
|---|---|---|---|---|---|
| A. Inner Group | | | | | |
| Cuyahoga Falls | 49,678 | 47,698 | 50,800 | 47,500 | $4236 |
| Munroe Falls | 3,794 | 3,882 | 4,300 | 4,450 | $3934 |
| Silver Lake | 3,637 | 3,644 | 3,700 | 3,360 | $8329 |
| | 57,109 | 55,224 | 58,800 | 55,310 | |
| B. Outer Group | | | | | |
| Bath Township | 7,552 | 7,988 | 8,000 | 8,280 | $6432 |
| Northampton Twp. | 5,662 | 5,823 | 8,000 | 6,710 | $4486 |
| Stow | 19,847 | 22,774 | 22,500 | 24,800 | $4166 |
| | 33,061 | 36,585 | 38,500 | 39,790 | |
| C. Transitional Group | | | | | |
| Boston Heights | 846 | 834 | 900 | 800 | $4510 |
| Boston Twp. | 2,196 | 2,230 | 1,650 | 1,580 | $4770 |
| Hudson | 3,933 | 4,666 | 4,650 | 4,900 | $6351 |
| Hudson Twp. | 4,462 | 4,590 | 5,300 | 5,370 | $5941 |
| Reminderville | 215 | 216 | 350 | 1,690 | $4735 |
| Richfield | 3,228 | 3,273 | 3,700 | 3,280 | $3695 |
| Richfield Twp. | 1,715 | 1,764 | 2,350 | 1,840 | $3855 |
| Peninsula | 692 | 682 | 750 | 670 | $4034 |
| | 17,287 | 18,255 | 19,650 | 20,130 | |
| D. Cleveland Outer Group | | | | | |
| Macedonia | 6,375 | 6,123 | 7,700 | 6,160 | $3874 |
| Northfield | 4,283 | 4,508 | 4,700 | 4,400 | $3752 |
| Northfield T. | 4,364 | 4,488 | 5,600 | 4,650 | $3969 |
| Sagamore Hills | 6,756 | 6,521 | 8,900 | 8,250 | $4395 |
| Twinsburg | 6,432 | 6,844 | 7,800 | 7,400 | $3990 |
| Twinsburg T. | 1,415 | 1,455 | 1,650 | 1,490 | $2852 |
| | 29,625 | 29,939 | 36,350 | 32,350 | |

Table 2-44. Autumn 1975 Cleveland SMSA Family Budgets and Comparative Indices Budget standards of living as calculated by Bureau of Labor Statistics, for family of four. 1975 U.S. average figure = Index of 100

| | Lower Budget | | Intermediate Budget | | Higher Budget | |
|---|---|---|---|---|---|---|
| Food | Amount | Index | Amount | Index | Amount | Index |
| Total | 2980 | 101 | 3788 | 99 | 4814 | 100 |
| At Home | 2519 | 98 | 3135 | 97 | 3792 | 98 |
| Away | 461 | | 653 | | 1022 | |
| Housing | | | | | | |
| Total | 1732 | 93 | 3730 | 106 | 5464 | 102 |
| Shelter | 1289 | 93 | 3019 | 87 | 3791 | |
| Rent | 1289 | 93 | 2013 | 112 | 2207 | 78 |
| Own Home | - | - | 3351 | 87 | 4071 | 106 |
| Furnishings | 443 | | 785 | | 1494 | |
| Transportation | | | | | | |
| Total | 692 | 99 | 1312 | 103 | 1629 | 98 |
| Auto Owners | 960 | 102 | 1366 | 102 | 1629 | 98 |
| Clothing | 801 | 104 | 1151 | 104 | 1681 | 1'4 |
| Personal Care | 301 | 122 | 399 | 120 | 556 | 118 |
| Medical Care | 798 | 98 | 804 | 98 | 840 | 98 |
| Other Consumption | 478 | 107 | 894 | 108 | 1461 | 107 |
| Other Items | 435 | | 714 | | 1197 | |
| Social Sec. & Disab. | 567 | | 825 | | 825 | |
| Personal Income Tax | 943 | 93 | 2094 | 94 | 3915 | 91 |
| Total Budget | 9727 | 99 | 15,711 | 102 | 22,392 | 100 |

1. The family consists of an employed husband, age 38, a wife not employed outside the home, an 8 year old girl and a 13 year old boy.

2. Housing includes shelter, house furnishings, and household operatio The higher budget also includes an allowance for lodging away from home city. Renter costs include average contract rent, plus the costs of required amounts of heating fuel, gas, electricity, water, specified equipment and insurance on household contents. Homeowner costs include interest and principal payment plus taxes; insurance on house and contents; water; refuse disposal, heating fuel, gas, electricity, water, specified equipment; and home repairs and maintenance costs.

Table 2-44. Autumn 1975 Cleveland SMSA Family Budgets and Compara
Cont'd. Indices Budget standards of living as calculated by Bur
of Labor Statistics, for family of four.
1975 U.S. average figure = Index of 100

3. Average costs of auto owners and non-owners was weighed as follows: Lower Budget 65 per cent owners 35 per cent non-owners. Intermediate Budget 95 per cent owners 5 per cent non-owners. Higher budget is 100 per cent owners.

4. Other family consumption includes the average costs for reading, recreation, tobacco products, alcoholic beverages, education, and miscellaneous expenditures.

5. Other items includes allowances for gifts and contributions, life insurance and occupational expenses.

Table 2-45. Manufacturing Establishments, Employment, and Production, Cuyahoga River Corridor, 1963-72. Towns with over 450 employees.

| (Town and Date) | Manufacturing Establishments | | Employees | | Production Workers | | | Value Added by Manufacturing | New Capital Expenditures |
|---|---|---|---|---|---|---|---|---|---|
| | Total | 20 or more Employees | Total | Payroll (million $) | Total | Man-Hours (millions) | Wages (million $) | (million $) | |
| Bedford | | | | | | | | | |
| 1972 | 60 | 26 | 3000 | 26.7 | 2400 | 4.4 | 20.4 | 41.6 | 1.6 |
| 1967 | 72 | 28 | 3100 | 22.0 | 2300 | 4.6 | 14.0 | 42.3 | 1.8 |
| 1963 | 72 | | 6200 | | | | | 78.3 | |
| Bedford Heights | | | | | | | | | |
| 1972 | 62 | 33 | 3900 | 34.3 | 2900 | 5.9 | 22.1 | 68.1 | 4.3 |
| 1967 | 57 | 27 | 3500 | 26.8 | 2600 | 5.4 | 17.7 | 49.8 | 5.3 |
| Brecksville Heights | | | | | | | | | |
| 1972 | 13 | 8 | 800 | 10.4 | 300 | .6 | 2.5 | 6.4 | .1 |
| 1967 | 12 | 4 | 600 | 5.9 | 200 | .3 | 1.1 | 2.5 | .1 |
| Garfield Heights | | | | | | | | | |
| 1972 | 67 | 23 | 1500 | 15.0 | 1100 | 2.2 | 9.5 | 31.3 | 1.6 |
| 1967 | 65 | 23 | 2000 | 14.2 | 1500 | 3.2 | 8.7 | 26.0 | |
| 1963 | | | 1400 | | | | | 17.5 | |
| Independence | | | | | | | | | |
| 1972 | 28 | 15 | 2000 | 24.1 | 800 | 1.7 | 7.7 | 15.7 | .8 |
| 1967 | 23 | 18 | 1500 | 13.9 | 800 | 1.9 | 7.0 | 15.7 | .9 |
| Hudson - 1973 only | 17 | 4 | 700 | 6.0 | 500 | .9 | 3.4 | 16.5 | .7 |
| Maple Heights | | | | | | | | | |
| 1972 | 47 | 17 | 2100 | 21.6 | 1500 | 3.1 | 13.6 | 39.9 | 1.3 |
| 1967 | 34 | 14 | 2500 | 20.3 | 1800 | 4.0 | 14.0 | 43.9 | 1.7 |
| 1963 | | | 2300 | | | | | 29.6 | |
| Solon | | | | | | | | | |
| 1972 | 72 | 45 | 5300 | 52.1 | 3400 | 7.0 | 28.9 | 119.0 | 4.9 |
| 1967 | 50 | 43 | 3500 | 26.2 | 2600 | 5.3 | 17.3 | 53.1 | 14.9 |
| Twinsburg | | | | | | | | | |
| 1972 | 20 | 6 | | | | | | | |
| 1967 | 13 | 7 | | | | | | | |
| Walton Hills | | | | | | | | | |
| 1973 | 29 | 12 | | | | | | | |

Table 2-46. Population Projections, Cuyahoga County 1975-2020

| | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Census | 1,720,835 | | | | | | | | |
| RPI (1975) | | 1,729,894 | 1,735,183 | | | | | | |
| EPA-RPI (1975-6) | | 1,683,650 | 1,603,777 | | | | | | |
| RPC (1972) | | 1,719,000 | 1,723,000 | 1,736,000 | 1,742,000 | | | | |
| NOACA (1972) | | 1,722,500 | 1,724,900 | 1,736,300 | 1,746,500 | 1,741,600 | 1,741,000 | | |
| DEMOS "C" (NEO) (1970) | | | 1,917,850 | | 2,184,657 | | 2,389,550 | 2,500,976 | 2,492,349 |
| DEMOS "E" (1972) | | 1,749,200 | 1,790,500 | 1,837,000 | 1,877,800 | 1,906,100 | 1,922,600 | | |
| NOACA (1975) | | | 1,727,000 | | 1,735,000 | | 1,733,000 | | |

Population Projections, Summit County 1975-2020

| | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Census | 553,371 | | | | | | | | |
| 3 County RPC | | 585,850 | 618,550 | 646,250 | 673,150 | 694,500 | 721,800 | 766,950 | 798,700 |
| DEMOS "C" | | | 634,201 | | 721,503 | | 794,810 | 835,294 | 843,483 |
| DEMOS "E" | | 576,200 | 601,400 | 623,400 | 649,900 | 668,500 | 683,400 | | |
| NOACA 1975 | | | 587,000 | | 639,000 | | 684,000 | | 750,000-760,000 |
| AMATS (1975) | | 562,550 | 582,616 | | 648,314 | | 690,314 | | 750,000-760,000 |

among NOACA, NEFCO, the Akron Metropolitan Transit Study (AMATS) and Battelle Institute as to the course of development in Summit County through 2020.

Projections - Intermediate

Table 2-47 shows projected populations for Cleveland and the various groups of suburbs listed in Table 2-38. Figures from the Real Property Inventory, the Revised RPI, and the Bureau of the Census' P-25 estimates, and the opinions of population specialists of the Cuyahoga County RPC and NOACA all suggest that:

a) The Cuyahoga County RPC projections are much more descriptiv of what is happening in Cleveland and its inner suburbs than NEO projections and are more reliable as to what is likely to happen. RPI estimates suggest Cleveland may not be declining at quite the RPC rate, but is close to it.

b) The middle groups of suburbs is growing at a rate below that in the RPC; available figures are actually more consistent with the DEMOS "C" in the Northeast Ohio Water Development Plan.

c) Overall suburban population is growing at a rate slower than projected, with Cleveland and the inner suburbs matching the lower rates of RPC, and the middle suburbs matching the lower NEO figures.

Table 2-48 shows projected population for Akron and the various Summit County zones as defined in Table 2-39. The table includes the Akron Metropolitan Area Transportation Study and NEFCO's own 1975 estimates. The AMATS projection is well regarded by NEFCO, although there has been some question about its projection of growth and decline for Akron. The new projections and 1975 estimates suggest:

a) Akron population is declining and will decline modestly through 1990, when it will begin to increase, ending about 5 per cent below the Tri-County projections.

b) The inner belt of suburbs, having declined through 1975, will again begin to grow in a manner generally proportionate to the Tri-County projections.

c) The outer belt of suburbs will continue to grow consistent with Tri-County and AMATS projections.

d) The transitional area will grow at a rate well below the Tri-County projection (excluding Reminderville) and generally consistent with the Northeast Ohio WPD and AMATS projections.

e) The Cleveland Outer Suburbs will be well below (almost 25 per cent by 2000) Tri-County projections and again generally consistent with AMATS.

Table 2-47. Population Projections 1975-2020 Cuyahoga River Corridor, Cuyahoga County

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| A. Cleveland | | | | | | |
| RPI | 651,046 | | | | | |
| RPC | 575,000 | 525,000 | 500,000 | | | |
| NEO | 738,860 | | 788,356 | 833,148 | 856,746 | 846,191 |
| B. Inner Suburbs | | | | | | |
| RPI | 123,108 | | | | | |
| EPA-RPI | 114,198 | | | | | |
| NEO | 135,675 | | 158,578 | 175,615 | | 184,864 |
| RPC | 130,800 | 134,500 | 134,400 | | | |
| C. Middle Suburbs | | | | | | |
| RPI | 38,602 | | | | | |
| EPA-RPI | 35,947 | | | | | |
| NEO | 37,289 | | 45,534 | 51,538 | | 55,111 |
| RPC | 46,300 | | 55,600 | | | |
| D. Outer Suburbs (Brecksville) | | | | | | |
| RPI | 11,144 | | | | | |
| EPA-RPI | 9,625 | | | | | |
| NEO | 15,397 | | 19,262 | 22,010 | 23,529 | 23,694 |
| RPC | 16,000 | 19,500 | 20,500 | | | |

Table 2-48. Population Projections 1975-2020 Cuyahoga River Corridor, Summit County.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A. Akron | | | | | | | | |
| NEO | | | | 321,164 | | | | |
| 3 County RPC | 282,000 | 286,000 | 289,100 | 292,600 | 295,100 | 300,000 | 361,056 | 362,785 |
| AMATS | 267,600 | 267,034 | | 277,037 | | 286,041 | | |
| B. Inner Suburbs | | | | | | | | |
| NEO | | 66,016 | | 75,351 | | 83,142 | 87,450 | 88,343 |
| RPC | 58,800 | 60,950 | 62,100 | 63.200 | 64,550 | 65,800 | 67,850 | 69,300 |
| AMATS | 55,310 | 60,603 | | 64,002 | | 67,095 | | |
| C. Outer Suburbs | | | | | | | | |
| RPC | 38,500 | 43,100 | 48,400 | 52,500 | 55,400 | 56,800 | 60,100 | 62,400 |
| AMATS | 39,790 | 38,614 | | 51,723 | | 56,495 | | |
| (Stow Only) | | | | | | | | |
| NEO | | 26,707 | | 32,591 | | 37,119 | 39,649 | 40,351 |
| RPC | 22,500 | 24,500 | 27,000 | 29,500 | 31,000 | 32,000 | 33,400 | 34,000 |
| AMATS | 24,800 | 23,995 | | 30,091 | | 33,523 | | |
| D. Transitional Area (Municipalities Only) | | | | | | | | |
| NEO | | 12,379 | | 15,375 | | 17,649 | 18,923 | 19,297 |
| RPC | 10,700 | 13,700 | 15,950 | 17,750 | 19,500 | 20,950 | 23,500 | 25,800 |
| AMATS | 10,020 | 11,715 | | 14,027 | | 15,387 | | |
| E. Cleveland Outer Suburbs (Municipalities Only) | | | | | | | | |
| NEO | | 22,316 | | 26,894 | | 30,457 | 32,443 | 32,981 |
| RPC | 20,200 | 24,500 | 28,000 | 33,200 | 35,100 | 40,600 | 45,500 | 49,500 |
| AMATS | 17,960 | 22,174 | | 27,926 | | 29,091 | | |

## Projections - Local

Having considered the county and zonal projections for the proposed study area, and the existing conditions for the individual municipalities and townships, it is then possible to consider individual local projections and evaluate them.

### Cleveland Inner Suburbs

Bedford:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 16,684 | | | | | |
| EPA-RPI | 15,904 | | | | | |
| NEO | 20,529 | | 23,919 | 26,454 | 27,840 | 27,820 |
| RPC | 20,500 | 21,500 | 22,000 | | | |

To all indications Bedford will be below the RPC figures through 1980. Inner area information suggests the RPC projection is more accurate. If the rolloff in growth rate continues, it should result in a figure of aobut 23,000 by 2020.

Bedford Heights:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 22,072 | | | | | |
| EPA-RPI | 19,600 | | | | | |
| NEO | 19,288 | | 24,467 | 28,127 | 30,153 | 30,405 |
| RPC | 16,000 | 17,000 | 17,400 | | | |

Thus far growth has been relatively consistent with the Northeast Ohio projection and substantially higher than the RPC projection. The smaller family sizes implicit in the Series "E" fertility tables suggests a leveling off after 1990, generally consistent with the RPC projections. This would produce a figure of about 25,000 by 2020.

Garfield Heights:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 39,772 | | | | | |
| EPA-RPI | 37,031 | | | | | |
| NEO | 47,209 | | 54,243 | 59,585 | 62,497 | 62,348 |
| RPC | 43,500 | 43,000 | 42,000 | | | |

To all indications Garfield Heights population is static or declining, in common with Cleveland. RPI, EPA-RPI and zonal totals suggest RPC's concept of an essentially static Garfield Heights is valid, with a population of about 43,000 to 44,000 through 2020.

Independence:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 6,831 | | | | | |
| EPA-RPI | 6,383 | | | | | |
| RPC | 11,300 | 13,000 | 13,500 | | | |
| NEO | 7,868 | | 8,939 | 9,764 | 10,212 | 10,174 |

Independence, if it has been growing at all, has been growing at a rate far below either of the projections. Provisionally, the NEO projection of 10,100 through 2020 may be valid.

Maple Heights:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 36,247 | | | | | |
| EPA-RPI | 33,951 | | | | | |
| RPC | 37,000 | 37,000 | 36,000 | | | |
| NEO | 39,123 | | 44,996 | 49,451 | 51,881 | 51,763 |

RPI and other growth in Maple Heights is far more consistent with the RPC projections. It has been suggested that Maple Heights may reach 40,000 by 1980, but this should be followed (if the increase is not completely undone by decreasing family size), by a leveling off consistent with the RPC, so that the 2020 population should be more than 40,000.

Seven Hills:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 16,106 | | | | | |
| EPA-RPI | 13,816 | | | | | |
| NEO | 18,292 | | 23,049 | 26,420 | 28,285 | 28,503 |
| RPC | 15,500 | | 16,000 | 16,500 | | |

To all indications from the P-25, RPI, and EPA-RPI (plus the zonal figures) Seven Hills is growing consistently with the RPC projections. This would put the 2020 population at about 20,000 or possibly lower.

Valley View:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 1,502 | | | | | |
| EPA-RPI | 1,435 | | | | | |
| NEO | 1,718 | | 2,014 | 2,234 | 2,354 | 2,354 |
| RPC | 2,500 | 3,000 | 3,500 | | | |

To all indications the NEO figure is much more consistent with local growth through 1980, and its 2020 figure of 2,354 may well be valid.

Cleveland Middle Suburbs

Broadview Heights:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 16,415 | | | | | |
| EPA-RPI | 15,431 | | | | | |
| NEO | 15,564 | | 19,312 | 21,988 | 23,437 | 23,611 |
| RPC | 19,500 | 21,500 | 22,500 | | | |

While the two projections increase at different rates, they both level off at about 23,500 in 2020. Thus far growth seems to follow the NEO rate.

Glenwillow:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 654 | | | | | |
| EPA-RPI | 618 | | | | | |
| CRSD | 800 | | 1,000 | 1,200 | 1,400 | 1,600 |
| RPC | 800 | 900 | 1,000 | | | |

There is no indication that Glenwillow is growing at anything near the rate projected by RPC or CRSD (no NEO projection), or whether CRSD's is based on anything but a projection of the 1980-90 RPC growth rate out to 2020. In the absence of other projections, however, the 2020 figure of 1,600 may be accepted.

Solon:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 15,858 | | | | | |
| EPA-RPI | 14,838 | | | | | |
| RPC | 19,500 | 23,000 | 25,000 | | | |
| NEO | 15,716 | | 19,487 | 22,181 | 23,669 | 23,813 |

Thus far Solon, like the Cleveland-middle belt of suburbs, has grown consistently with the lower NEO projections. 23,813 seems acceptable for 2020, if no objections are raised to the Series "C" fertility figures; otherwise some downward revision may be called for.

Oakwood:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 3,734 | | | | | |
| EPA-RPI | 3,248 | | | | | |
| RPC | 3,500 | 3,600 | 3,700 | | | |
| NEO | 2,698 | | 2,869 | 3,011 | 3,090 | 3,049 |
| RPC | 4,000 | | 5,000 | 6,000 | 7,000 | 8,900 |

While NEO's 1980 figure looks low, the RPC figure has apparently been accurate so far, and a figure of 4,800 by 2020 is not unreasonable.

Walton Hills:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 2,594 | | | | | |
| EPA-RPI | 2,431 | | | | | |
| NEO | 3,211 | | 3,875 | 4,358 | 4,623 | 4,638 |
| RPC | 3,800 | 4,200 | 4,400 | | | |

Thus far actual growth in Walton Hills has been marginal or negative. Tentatively, a modest decline from the NEO projection might be anticipated, due to decreased fertility ("E" table) and family size, with about 4,200 people by 2020.

Cleveland Outer Group

Brecksville Heights:

| | 1980 | 1985 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| RPI | 11,144 | | | | | |
| EPA-RPI | 9,625 | | | | | |
| NEO | 15,397 | | 19,262 | 22,010 | 23,529 | 23,694 |
| RPC | 16,000 | 19,500 | 20,500 | | | |

Brecksville Heights is not growing at nearly the pace of either projection, as is its group of suburbs. The difference in fertility tables (Series "E") and decreasing family size would suggest a downward revision of the NEO projections to about 20,500 by 2020.

Sagamore Hills Township:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| Tri-Co RPC | 8900 | 10,500 | 12,600 | 14,000 | 15,500 | 17,000 | 19,800 | 22,000 |
| NEFCO Est. | 8250 | | | | | | | |
| AMATS | | 7283 | | 8463 | | 9573 | | |

The AMATS projection is consistent with P-25 estimates and is much more current that the Tri-County estimate. Projection of its figure would reach about 13,000 by 2020.

Macedonia:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 6160 | | | | | | | |
| NEO | | 8495 | | 10,324 | | 11,737 | 12,535 | 12,745 |
| Tri-Co RPC | | 9500 | 11,500 | 14,600 | 16,100 | 17,800 | 20,500 | 21,500 |
| AMATS | | 8681 | | 13,047 | | 13,468 | | |

The AMATS figure is regarded by NEFCO population experts as "suspiciously high". This and the lower NEFCO 1975 estimate suggest the lower NEO figure may be valid, with about 13,000 people by 2020.

Northfield:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO 1975 | 4400 | | | | | | | |
| Tri-Co RPC | 4700 | 5400 | 6000 | 6600 | 7200 | 7800 | 9000 | 10,000 |
| NEO | | 5229 | | 6125 | | 6845 | 7245 | 7341 |
| AMATS | | 6543 | | 7092 | | 7038 | | |

The recent AMATS projection, with its steep rise through 1980 and gradual levelling off thereafter is relatively consistent in its ultimate population figures with the NEO projection which is in turn most consistent with current growth in Northfield. A compromise figure of about 6950in 2000, increasing to about 7100 by 2020 seems reasonable.

Northfield Center Township:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 4560 | | | | | | | |
| Tri-Co RPC | 5600 | 6850 | 7350 | 8000 | 8700 | 9500 | 10,600 | 12,000 |
| AMATS | | 5849 | | 7888 | 8672 | | | |

The NEFCO projection is more consistent with current growth, and projected growth for the outer Cleveland suburbs as a whole. A gradual increase to about 10,500 by 2020 is consistent with available information.

Twinsburg:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 7400 | | | | | | | |
| Tri-Co RPC | 7800 | 9600 | 10,500 | 12,000 | 11,800 | 15,000 | 16,600 | 18,800 |
| NEO | | 8592 | | 10,445 | | 11,875 | 12,673 | 12,895 |
| AMATS | | 6950 | | 7787 | | 8595 | | |

The AMATS projection is more current, but is slightly inconsistent with NEFCO's 1975 estimate. A compromise of the NEO and NEFCO figures would produce a 2020 figure of 11,500.

Twinsburg Township:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 1490 | | | | | | | |
| Tri-Co. RPC | 1650 | 1900 | 2100 | 2200 | 2300 | 2400 | 2600 | 2900 |
| AMATS | | 1554 | | 2796 | | 3324 | | |

On a short-term basis, the AMATS figure is more consistent with current growth, and would level off at about 3700. This figure may be used, although the Tri-Co figure of 2900 may also be valid.

Transitional Zone:

Boston Heights:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 800 | | | | | | | |
| Tri-Co RPC | 900 | 1000 | 1100 | 1250 | 1400 | 1500 | 1700 | 1800 |
| AMATS | | 1238 | | | | | | |

The NEFCO estimate is well below the Tri-County projection, which is in turn lower than AMATS. The Tri-County figure of 1800 may well be valid.

Hudson

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 4900 | | | | | | | |
| NEO | | 5041 | | 6119 | | 6953 | 7419 | 7548 |
| Tri-Co RPC | 4650 | 6200 | 6750 | 7250 | 7850 | 8350 | 9200 | 10,000 |
| AMATS | | 5263 | | 6057 | | 6604 | | |

The AMATS and NEO projections are relatively consistent with each other. A compromise figure of 7200 by 2020 may be reasonable.

Hudson Township

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 5300 | | | | | | | |
| Tri-Co RPC | 5370 | 5295 | 7400 | 8000 | 8650 | 9200 | 9700 | 10,000 |
| AMATS | | 6500 | | 6471 | | 7371 | | |

Either figure is consistent with area growth. An increase to 8500 by 2020 is not unreasobable.

Reminderville:

All projections for Reminderville are extremely low. NEFCO estimates 1690 people in Reminderville in 1975, and over 2000 by 1980. A figure of 6,000 by 2020 is not unreasonable.

Richfield Township:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 1840 | | | | | | | |
| Tri-Co. RPC | 2350 | 3000 | 3700 | 4500 | 5250 | 5700 | 6300 | 7000 |
| AMATS | | 1473 | | 2117 | | 2749 | | |

The AMATS projection for Richfield Township is behind NEFCO's 1975 estimate, but the Tri-County 1975 projection is far ahead of it. An accomodation between the two at about 4500 by 2020 seems justified.

Richfield Village:

| | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|---|
| NEFCO Est. | 3280 | | | | | | | |
| Tri-Co RPC | 3700 | 4500 | 5500 | 6000 | 6400 | 6900 | 8000 | 8800 |
| AMATS | | 4979 | | 5853 | | 6304 | | |

Richfield Village's growth through 1975 is reasonably consistent with either projection. Comparison of these figures with combined Richfield Township and Village figures from NEO suggests a compromise figure of 7500 may be valid for 2020.

Miscellaneous:

Aurora:

| | 1975 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| NEFCO Est. | 7850 | | | | | |
| NEO | | 9684 | 13,389 | 17,222 | 20,421 | 22,495 |
| AMATS | | 10,213 | 15,268 | 17,861 | | |

Through 2000 the two projections are fairly consistent with each other, and with 1973 and 1975 estimates.

Bainbridge:

No projections other than CRSD's are immediately available, and its 2020 projection of 1100 does not seem unreasonable.

Shalersville:

| | 1975 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| NEFCO Est. | 5100 | | | | | |
| AMATS | | 7076 | 8710 | 11,294 | | |

The CRSD projections of uncertain source, suggest approximately 10,500 people by 2020. Some planning representatives have cited the AMATS figure as somewhat high, suggesting that the CRSD figure may well be acceptable.

Streetsboro:

| | 1975 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|
| NEFCO Est. | 8170 | | | | | |
| AMATS | | 11,323 | 15,806 | 21,420 | | |
| NEO | | 9978 | 13,132 | 16,489 | 19,319 | |
| CRSD | | 11,100 | 15,000 | 18,500 | 20,800 | 22,500 |

Streetsboro's population has increase only marginally through 1975. The slightly lower figure of 21,154 may well be valid.

Table 2-49. 2020 Population Projections Adjusted for CVI Study Area

| | 2020 Population Total Subdivision | 2020 Population CVI Area |
|---|---|---|
| **Phase I** | | |
| Brecksville Heights | 20,500 | 20,500 |
| Broadview Heights | 23,500 | 18,700 |
| Garfield Heights | 44,000 | 13,900 |
| Independence | 10,200 | 10,200 |
| Maples Heights | 40,000 | 6,800 |
| Northfield Village | 7,100 | 7,100 |
| Oakwood | 4,800 | 4,800 |
| Sagamore Hills Township | 13,000 | 6,500 |
| Seven Hills | 20,000 | 1,550 |
| Valley View | 2,350 | 2,350 |
| Walton Hills | 4,200 | 4,200 |
| | 189,650 | 96,600 |
| **Phase II** | | |
| Boston Heights | 2,000 | 2,000 |
| Boston Township | 2,300 | 900 |
| Hudson Village | 7,500 | 7,500 |
| Hudson Township | 8,500 | 4,550 |
| Macedonia | 12,750 | 12,750 |
| Peninsula | 1,400 | 1,000 |
| Richfield Township | 4,500 | 4,500 |
| Sagamore Hills | 13,000 | 6,500 |
| Northfield Center Township | 10,500 | 10,500 |
| | 62,450 | 50,200 |
| **Phase IIIA** | | |
| Bedford | 23,200 | 23,200 |
| Bedford Heights | 25,000 | 22,750 |
| Glenwillow | 1,600 | 1,600 |
| Solon | 23,800 | 16,950 |
| | 73,600 | 64,500 |
| **Phase IIIB** | | |
| Aurora | 22,300 | 13,000 |
| Bainbridge Township | 2,000 | 1,100 |
| Hudson Township | 8,500 | 3,950 |
| Reminderville | 6,000 | 6,000 |
| Shalersville | 10,600 | 8,500 |
| Streetsboro | 21,150 | 21,150 |
| Twinsburg | 11,500 | 11,500 |
| Twinsburg Township | 3,700 | 3,700 |
| | 85,750 | 68,900 |

| | | | |
|---|---|---|---|
| I. | 96,600 | CRSD Population: | 333,000 |
| II. | 50,200 | CRSD Revised Population: | 313,000 |
| IIIA. | 64,500 | EPA Population: | 280,200 |
| IIIB. | 68,900 | | |
| | 280,200 | | |

Table 2-50. Range of Projected Populations, CVI Service and Study Area (Total Subdivisions), 1980-2020.

| Community | 1980 Total Range | 1980 Probable Range | 2020 Total Range | 2020 Probable Range |
|---|---|---|---|---|
| (Phase I) | | | | |
| Brecksville | 9600-16,000 | 9600-11,200 | 15,000-24,000 | 19,000-21,000 |
| Broadview Hts. | 15,500-19,500 | 15,500-16,500 | 22,000-27,000 | 22,500-23,500 |
| Garfield Hts. | 37,000-47,000 | 37,000-43,000 | 31,000-62,000 | 41,000-43,000 |
| Independence | 6400-11,000 | 6500-7500 | 6300-17,000 | 9500-12,000 |
| Maple Heights | 30,500-39,000 | 34,000-37,000 | 32,000-52,000 | 34,000-43,000 |
| Northfield | 5500-6500 | 5500-6500 | 7000-10,000 | 7500-8500 |
| Oakwood | 2600-4000 | 3250-3750 | 3000-8900 | 4500-5500 |
| Sagamore Hills | 6000-10,500 | 6300-7800 | 10,500-22,500 | 12,000-14,000 |
| Seven Hills | 15,000-18,000 | 15,000-16,000 | 19,000-28,000 | 20,000-22,000 |
| Valley View | 1435-2500 | 1500-1700 | 1600-3500+ | 1900-2500 |
| Walton Hills | 2400-3800 | 2500-2800 | 2200-5400 | 4000-4800 |
| | 131,935-177,800 | 136,650-153,750 | 149,600-260,300 | 175,900-197,300 |
| (Phase II) | | | | |
| Boston Hts. | 720-1250 | 1000-1200 | 1500-2000 | 1700-1900 |
| Boston Twp. | 600-700 | 600- 700 | 300-110 | 800-1100 |
| Hudson Village | 5000-6200 | 5200-6200 | 7200-10,000 | 7200-7800 |
| Hudson Twp. | 5100-6500 | 5300-6500 | 7800-10,000 | 8200-9000 |
| Macedonia | 5700-9500 | 6100- 8000 | 12,000-21,500 | 12,500-13,500 |
| Peninsula | 650-800 | 670- 800 | 1300-1400 | 1300-1400 |
| Richfield Twp. | 1450-3000 | 1800-2300 | 3000-7500 | 4000-4500 |
| Northfield Ctr. | 4600-7500 | 5850-6250 | 10,000-12,000 | 10,000-12,000 |
| Sagamore Hills | (See Phase I.) | | | |
| | 23,820-35,450 | 26,520-31,900 | 42,900-65,500 | 45,200-51,200 |
| (Phase IIIA) | | | | |
| Bedford | 15,500-20,500 | 16,500-17,500 | 22,000-27,500 | 23,000-24,000 |
| Bedford Heights | 13,500-22,000 | 16,000-20,000 | 18,000-30,500 | 19,000-28,000 |
| Glenwillow | 600-800 | 600- 700 | 1000-1600 | 1000-1600 |
| Solon | 9000-19,500 | 10,000-11,500 | 23,000-25,000 | 23,000-25,000 |
| | 38,600-62,800 | 43,100-49,700 | 64,000-84,600 | 66,000-78,600 |
| (Phase IIIB) | | | | |
| Aurora | 9600-10,200 | 9600-10,200 | 20,500-22,500 | 20,500-22,500 |
| Bainbridge TWP | | | 2000 | 2000 |
| Hudson Township | (See Phase II) | | | |
| Reminderville | 200-2000 | 1700-2000 | 250-8000 | 5500-6500 |
| Shalersville | 5800-7100 | 6000-7000 | 9500-12,000 | 10,000-11,000 |
| Streetsboro | 8500-11,300 | 9000- 9500 | 21,000-23,000 | 21,000-23,000 |
| Twinsburg Vill. | 6950-9600 | 8000- 9000 | 10,000-19,000 | 11,000-12,500 |
| Twinsburg Twp. | 1550-1900 | 1550-1700 | 2900-3700 | 3300-3700 |
| | 32,600-42,100 | 35,850-39,400 | 69,900-90,200 | 73,300-81,200 |

5. Economics

a. The SMSA's

The economy of the two SMSA's in which the CVI study area is located is impressive in size and variety but has deep-rooted structural difficulties that have become increasingly evident in recent years. They show up in a long-run slow rate of growth in population and employment by comparison with United Sates SMSA's as a whole, and in absolute declines in population and employment in the two cities since the late sixties. The principal reasons for this are the drop in the birth-rate and a net out-migration of people and jobs from the area. The former is common throughout the U.S., however, and is probably less important than the out-migration, which is in turn explained by (1) the pull of markets growing relatively faster outside the area and by (2) the disproportionate dependence of the two cities and SMSA's on manufacturing activity, which locally is growing much less fast than non-manufacturing in term os employment.

The size and variety of the economy of the area is described here, and is followed by an examination of recent trends in population and employment in the two SMSA's -- the latter with the help of shift-share analysis. The consequences for the suburbs are then examined, including those municipalities of the study area.

The two SMSA's with the addition of Lorain County now constitute the Akron/Cleveland/Lorain Standard Consolidated Statistical Area (SCSA).

The area is centrally located in the U.S. economy. Within 500 miles are more than 60 percent of U.S. production measured by value of shipments and U.S. bank deposits, and more than 50 percent of North America's population and retail sales. The SMSA ranks ninth in personal income, effective buying income and value of manufacturing shipments. It ranks sixth among SCSA's in employment. Its value-added in manufacturing and its receipts from services exceed thos of 37 of the 50 states, while its wholesale sales exceed those of 36 states.

The SCSA has 15 airports, one being the eighth busiest in the U.S., eight interstate highways, more than 150 over-the-road common carriers, 50 freight forwarding companies, and four trunk line railroads. In 1972 Ohio ranked second among states (behind Michigan) in estimated value of export shipments by manufacturing establishments, and the Cleveland SMSA ranked ninth among SMSA's/ The air/ship/truck split is unknown.

The area has nine colleges and universities, 400 research laboratories, (claimed as the nation's "fourth-largest concentration") 22,000 employed in research, and is headquarters for 42 of the nation's top 1000 corporations by sales on the list of Fortune Magazine, placing it third in the U.S. in number oflarge companies behind New York City and Chicago. The largest corporate employers in the Cleveland SMSA are Ford, General Motors, Ohio Bell Telephone,

Republic Steel, and General Electric. The largest employers in the City of Cleveland are the U.S. Government, the Cleveland Board of Education, the City of Cleveland, Republic Steel and Ohio Bell Telephone.

Table 2-51 presents population data for the period 1910-1975 comparing the U.S., the two SMSA's and cities, and the suburbs. It shows 1) that the SMSA's have declined as a percent of U.S. population since 1960, 2) that the rank of both Akron and Cleveland among cities has declined since 1920, and 3) that between 1950 and 1960 the suburbs overtook the cities. Between 1970 and 1974 the Akron SMSA fell from 54th to 57th among SMSA's and Cleveland fell from 14th to 17th. In this four-year period the two SMSA's have consistently lost population because of large losses in the City of Cleveland and smaller losses (both absolutely and relatively) in the City of Akron. Meanwhile, suburban growth grew between 1970 and 1973, but has fallen 1973-74.

Data on city, and suburban employment by place-of-work is not available but has been estimated for projection purposes. Tables 2-52 and 2-53 give non-agricultural employment by place of work spanning 1964-70 for the Akron SMSA and 1960-75 for the Cleveland SMSA. They present a shift-share analysis in comparison with the U.S. They show that employment in both grew comparing 1960, 1964, and 1970, but that comparing 1970 and 1975 the Akron SMSA grew by less than one percent, while the Cleveland SMSA lost employment. (Data not presented shows for both the Akron and Cleveland SMSA's loss 1970-1971 and an increase in 1972-3-4, with a loss again 1974-1975.) In comparison with the U.S. however, both SMSA's lost jobs throughout the period, i.e., their growth was less. In shift-share analysis two elements explain differential region/U.S. growth. The first is the "local-factor' shift-effect, in which a sector of economic activity is growing in a region at a different rate from the rate the sector has nationally. This directly measures a region's changing comparative advantage in the production of that good. If the rate of growth in a sector regionally is less than its growth nationally, the region's comparative advantage in that sector is presumed to be declining, and conversely. The second element is the "composition" effect. A region's share of sectors growing, stable or declining nationally gives its economy a bias that is conceptually distinct from its comparative advantage. The two elements may cancel or reinforce each other. An example of cancellation is when a region is growing in employment at the same rate as the nation because the proportion of its workers employed in growth industries is greater than the national average (composition) but its offset by growth in these and/or other sectors less than that occurring nationally (local factor-shift). The Akron and Cleveland SMSA's present a pattern of downward reinforcement over the period 1960-75. All their sectors are growing less rapidly than the same sectors nationally. And the proportion of their workers engaged in slow growth industries is greater than the national proportion. The former is, however, much the more important, i.e., the two SMSA's competitive position has evidently declined. The decline is especially marked in the period 1970-75.

Table 2-51. Population. U.S., Akron and Cleveland SMSA's, Cities and Suburbs 1910-1975 (millions)

| | 1975 | Per Cent | Rank | 1974 | Per Cent | Rank | 1973 | Per Cent | Rank | 1972 | Per Cent | Rank | 1971 | Per Cent | Rank | 1970 | Per Cent | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U.S. | 213.1 | 100 | - | 211.4 | 100 | - | 209.8 | 100 | - | 208.2 | 100 | 0 | 206.2 | 100 | 0 | 203.8 | 100 | - |
| SMSA's | | | | | | | | | | | | | | | | | | |
| Ak + Cleve SMSA | | | | 2.655 | 1.26 | | 2.679 | 1.28 | | 2.694 | 1.29 | | 2.738 | | | 274.3 | 1.35 | |
| Ak SMSA | | | | .671 | | 57 | .675 | | | .676 | | | .680 | | | .679 | | 54 |
| Ak | | | | .276 | | | .262 | | | | | | | | | .275 | | 52 |
| Cleve SMSA | 1.96 | | | 1.984 | | 17 | 2.004 | | | 2.018 | | | 2.058 | | | 2.064 | | 14 |
| Cleve | .64 | | | .655 | | | .678 | | | .691 | | | | | | .751 | | 10 |
| AK + Cleve Cities | | | | .931 | | | .940 | | | | | | | | | 1.026 | | |
| Suburbs | | | | 1.724 | | | 1.739 | | | | | | | | | 1.717 | | |

| | 1960 | Per Cent | Rank | 1950 | Per Cent | Rank | 1940 | Per Cent | Rank | 1930 | Per Cent | Rank | 1920 | Per Cent | Rank | 1910 | Per Cent | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U.S. | 179.3 | 100 | | 151.3 | 100 | | 131.7 | | | 122.8 | | | 105.7 | | | 92.0 | | |
| SMSA's | | | | | | | | | | | | | | | | | | |
| Ak + Cleve SMSA's | 2.515 | 1.4 | | 2.015 | 1.33 | | | | | | | | | | | | | |
| AK SMSA | .605 | | | .482 | | | | | | | | | | | | | | |
| Ak | .290 | | | 45.275 | | | 38.245 | | | 36.255 | | | 34.208 | | | 32.069 | | 38 |
| Cleve SMSA | 1.910 | | | 1.533 | | | 1.320 | | | 1.288 | | | 1.013 | | | .699 | | |
| Cleve | .876 | | | 8.915 | | | 7.878 | | | 6.900 | | | 6.797 | | | 5.561 | | 6 |
| Ak + Cleve | 1.167 | | | 1.190 | | | 1.123 | | | 1.155 | | | 1.005 | | | .630 | | |

Table 2-52. Nonagricultural Employment Trends. U.S. & Akron SMSA 1964-75 (000).

| SIC # | | U.S. 1975 | U.S. 1970 | U.S. 1964 | Akron SMSA 1975 | Akron SMSA 1970 | Akron SMSA 1964 | 1970-75 | 1964-70 | | 1970-75 | 1964-70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | 76985 | 70593 | 58331 | 246.3 | 244.5 | 198.6 | 18.3 | -5.0 | ΔEsth | -20.3 | +4.1 |
| 10-14 | Mining | 745 | 623 | 634 | 0.2 | 0.2 | 0.3 | 0 | -0.1 | minus | | |
| 15-17 | Contract Constir. | 3457 | 3381 | 3050 | 7.1 | 8.3 | 6.6 | -1.4 | +1.0 | ΣΔ Esit | -18.3 | -5.0 |
| | Mfg. | 18347 | 19349 | 17274 | 83.8 | 96.1 | 88.2 | -11.4 | -2.7 | | | |
| | Durables | 4019 | 4002 | 3414 | 29.2 | 32.2 | 25.6 | | | | | 9.1 |
| 32 | Stone,Clay & Glass | 614 | 640 | 614 | 2.0 | 2.4 | 2.5 | -0.3 | -0.2 | | | |
| 34 | Fab. Metals | 1336 | 1380 | 1190 | 15.5 | 17.0 | 14.1 | -1.0 | +0.6 | | | |
| 35 | Machinery | 2069 | 1982 | 1610 | 11.7 | 12.8 | 9.0 | -1.7 | +1.7 | | | |
| | Non-Durables | 3277 | 3411 | 3065 | 40.5 | 47.3 | 48.8 | | | | | |
| 20 | Food & Kindred | 1676 | 1782 | 1750 | 2.8 | 3.7 | 3.7 | -0.7 | -0.1 | | | |
| 28 | Chem. & Allied | 1013 | 1049 | 879 | 3.2 | 3.6 | 3.6 | -0.3 | -0.7 | | | |
| 30 | Rubber & Plastics nec | 588 | 580 | 436 | 34.5 | 40.0 | 41.5 | -6.1 | -15.2 | | | |
| * | Other | 11051 | 11936 | 10795 | 14.1 | 16.6 | 13.8 | -1.3 | +1.3 | | | |
| 40-49 | Transpn. CU | 4498 | 4493 | 3951 | 14.0 | 14.7 | 13.4 | -0.7 | -0.5 | | | |
| 50-59 | Whole/Ret Trade | 16947 | 14914 | 12160 | 52-1 | 48.4 | 37.4 | -2.9 | +2.5 | | | |
| 60-67 | Fin Ins Real Est | 4223 | 3688 | 2957 | 8.0 | 7.0 | 5.8 | 0 | -0.2 | | | |
| 70-89 | Sen | 13-95 | 11612 | 8709 | 42.1 | 34.3 | 24.2 | +0.8 | +2.0 | | | |
| 91-93 | Gov | 14773 | 12535 | 9596 | 39.0 | 35.4 | 22.8 | -2.7 | +5.6 | | | |

* 19/21-27/29/31/33/36-39

Table 2-53. - Nonagricultural Employment Trends, U.S. and Cleveland SMSA 1960-1975 (000)

| SIC# | | U.S. 1975 | U.S. 1970 | U.S. 1960 | Clevelands MSA 1975 | Clevelands MSA 1970 | Clevelands MSA 1960 | ΣΔ Esih 1970-75 | ΣΔ Esih 1960-70 | 1970-75/1960-70 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | 76,985 | 70,593 | 54,234 | 849.4 | 855.1 | 700.3 | -74.7 | -51.1 | ΔΣEsth -83.1 -56.4 |
| 10-14 | Mining | 745 | 623 | 712 | 1.5 | 1.5 | 0.5 | - 0.3 | + 1.1 | Minus |
| 15-17 | Contract Constructor | 3,457 | 3,381 | 2,885 | 29.1 | 32.2 | 32.9 | - 3.8 | - 6.4 | ΣΔEsih -74.7 -51.1 |
| | Manufacturing | 18,347 | 19,349 | 16,796 | 256.2 | 296.1 | 282.8 | -23.6 | -38.5 | |
| | Durables | 9,003 | 8,854 | 7,264 | 173.4 | 198.4 | 196.8 | | | Equals - 8.4 - 5.3 |
| 25 | Furniture | 1,008 | 460 | 383 | 2.8 | 3.6 | 4.0 | - 5.1 | - 1.2 | |
| 33 | Primary Metals | 1,180 | 1,316 | 1,231 | 33.4 | 37.8 | 41.6 | - 3.3 | - 6.6 | |
| 34 | Fabricated Metals | 1,336 | 1,380 | 1,135 | 36.8 | 40.9 | 41.4 | - 2.8 | - 9.4 | |
| 35 | Machinery | 2,069 | 1,982 | 1,479 | 46.2 | 50.0 | 43.9 | - 6.0 | - 8.8 | |
| 36 | Electrical Machinery | 1,761 | 1,917 | 1,467 | 26.9 | 30.4 | 25.0 | - 1.0 | - 2.3 | |
| 37 | Transportation | 1,649 | 1,799 | 1,569 | 27.3 | 35.7 | 40.9 | - 5.4 | -11.2 | |
| | Non-Durables | 9,901 | 10,495 | 9,532 | 53.5 | 97.7 | 86.2 | | | |
| 20 | Food | 1,676 | 1,782 | 1,790 | 9.1 | 12.7 | 15.1 | - 2.8 | - 2.3 | |
| 22 | Textiles | 902 | 976 | 924 | 3.0 | 4.7 | 5.3 | - 1.3 | - 0.9 | |
| 23 | Apparel | 1,235 | 1,365 | 1,233 | 6.1 | 7.8 | .8 | - 1.0 | - 0.8 | |
| 26 | Paper | 643 | 706 | 601 | 4.6 | 5.4 | 4.4 | - 0.3 | + 0.2 | |
| 27 | Printing | 1,079 | 1,102 | 911 | 15.1 | 17.0 | 15.0 | - .15 | - 1.1 | |
| 28 | Chemicals | 1,013 | 1,049 | 828 | 15.6 | 17.0 | 14.5 | - 0.8 | - 1.1 | |
| 19/21/24/ 29-32/38/ 39 | Other | 2,796 | 3,515 | 3,245 | 29.3 | 33.1 | 23.9 | + 3.0 | + 7.0 | |
| 40-49 | Transportation etc. | 4,498 | 4,493 | 4,004 | 47.7 | 50.9 | 46.6 | - 3.3 | - 1.4 | |
| 50-50 | Wholesale etc. | 16,947 | 14,914 | 11,392 | 195.4 | 182.7 | 145.4 | -12.4 | - 7.7 | |
| 60-67 | Finance etc. | 4,223 | 3,688 | 2,669 | 43.6 | 42.0 | 31.9 | - 4.5 | - 2.1 | |
| 70-89 | Services | 13,995 | 11,612 | 7,423 | 158.6 | 137.4 | 87.9 | - 7.2 | - 0.1 | |
| 91-93 | Government | 14,773 | 12,535 | 8,353 | 117.3 | 112.2 | 72.1 | -14.9 | + 4.0 | |

Tables 2-52 and 2-53 are now described and the results discussed in shift-share terms.

The numbers in the total row and the Esih column of the two tables are calcualted by:

(1) Esih 70-75 = Esi 75-(Eui75/Eui70xEsi70)

(2) Esih 60-70 = Esi70-(Eui70/Eui60xEsi70)

where E = employment

S = an SMSA

i = a sector

h = hypothetical

Esih is the factor-shift element. Equation (1) calculates what employment in the sector in the SMSA in 1975 would have been if it had grown in the SMSA between 1970 and 1975 at the same rate as it did nationally and then subtracts this from the actual 1975 employment figure. A negative result means that the sector in the region declined relative to the sector in the national (even though employment in the sector in the region may have increased absolutely). Summed across the sectors (rows) this gives the total factor-shift for the SMSA's sectors of economic activity. For the Akron SMSA he result is Esih = 18.3 for 1975.

The net shift in total employment is calculated by the same method:

(3) Esth70-75 = Est75-(Eut75/Eut70xEst70)

where t = total employment.

The last term calculates what total employment would have been if the SMSA had grown at the same rate as the nation. This is then subtracted from what total employment actually was in the SMSA. For the Akron SMSA the result is -20.3. Thus it lost 20,300 jobs that it would have had if it had grown at the national rate. The local factor effect of -18.3 accounts for most but not all of the loss. The difference -20.3-(-18.3) = -2.0 is theloss attributable to the composition effect.

The local-factor element predominated because the big rubber sector lost jobs absolutely in the Akron SMSA but grew slightly in the U.S. comparing 1970 and 1975. This loss was not made up by gains (relative to national growth) in the other sectors: only in the Services sector did the Akron SMSA grow relative to the nation. At the same time the composition effect is slight because, except for the rubber sector, the percentageof its workers in any sector does not differ significantly from the national percentage. The

1964-70 result shows that the Akron SMSA grew faster than the nation despite a net relative downward shift across all sectors. The composition effect outweighed the competitive loss.

In the Cleveland SMSA the local-factor element (competitive loss) predominated in both periods. It was so large that it was only slightly added to by the composition loss. This loss resulted mainly from the fact that twenty percent of its employment was concentrated in SIC 33-37 in 1975, as compared with only 10 percent in the nation. These sectors declined absolutely in employment-nationally in the period 1970-1975 whereas all other sectors combined grew by 11 percent in the same period.

The shift-share analysis, although itself having little explanatory power, focuses attention on different elements at work in the trends. It leads to several conclusions.

The recession accounts at least in part for the 1970-75 job loss which is much more severe than for the earlier periods. The area's automobile orientation is the main reason. The loss is however a long-run structural trend reflecting a shift in the location of important manufacturing industries out of the SMSA's: suburban employment is not growing to match theloss in the cities. The composition of the area's employment -- its concentrationin slow-growing industries -- adds to the competitive loss.

It should be noted, however, that the loss of employment in manufacturing, the basic sector for the two SMSA's has not caused a proportionate drop in employment in the other sector generally regarded as non-basic. In fact the non-basic/basic employment ratio (non-manufacturing/manufacturing) far from being fixed, has consistently increased for both SMSA's during the period 1960-75: from 1.5 to 2.0 for Cleveland and from 1.27 to 1.9 for Akron. By comparison the U.S. ratio has risen from 2.2 to 3.2 over the same period. This suggests three things. First, the non-basic sectors are acting as a cushion to employment declines. Second, the higher U.S. ratios may indicate that the SMSA's can still grow in the non-basic sectors even with continued decline in the basic sectors. Third, that theloss of market demand caused by unemployment is to some extent offset not only by support payments but also by the fact that wages and salaries in the manufacturing sector are higher than in other sectors and may be growing relatively. It should be noted that the loss of employment in manufacturing sectors is a natural consequence of technological innovation. Industry relocation/retraining schemes are as yet inadequate to cope with this technology-related job loss. In terms of real output, however, durable goods grew much faster than GNP between 1948 and 1973 -- by 251 versus 159 percent respectively.

b. The CVI Study Area - Existing Conditions

Table 2-54 gives 1970 population data for the 31 CVI Study Area jurisidictions plus 1972 employment data for selected jurisdictions and sectors of economic activity. (Data on total employment for all jurisdictions is not available). It shows that the area is small relative to the SMSA's, constituting only 8.4 percent of their total population in 1970. Some of the jurisdictions lie partly outside the study area. The 1975 population figure given in the Environmental Assessment for residents of the jurisdictions living within the study area was 149,100, ie., 5.4 percent (CRSD). Of the 31 jurisdictions the top seven, all within Cuyahoga County, accounted for 61 percent of the study area population in 1970. The jurisdictions of the study area are well-to-do relative to the cities of Akron and Cleveland and to the two SMSA's. Table 2-54 shows that for selected study area jurisdictions (places with 2500 or more inhabitants) the 1970 median income of families and unrelated individuals ranged from $10,533 to $18,091 with an average of $13,299, as compared with a range of $1,107 to $11,407 for the two cities and SMSA's.

Table 2-54 shows that Manufacturing is the major sector of economic activity in the CVI study area in terms of employment. The ratio of 1972 employment in Manufacturing (by place of employment) to 1970 population (0.174) for selected CVI jurisdictions -- cities with 450 or more Manufacutring employees - was much higher than the ratios for Retail Trade (0.06), Wholesale Trade (0.04) and Selected (0.02), the next most important sectors.

The manufacturing employment population ratio for these CVI communities taken together (0.174) is almost exactly the same as the combined ratio for the Cities of Cleveland and Akron (0.177) These municipalities, all of which are in Phases I or III A of the CVI Study area contribute significantly to the fact that the ratio for all CVI jurisdictions taken together(0.151) is significantly higher than for suburban Cuhahoga County jurisdictions outside the study area (0.095). Table 2-55 shows that manufacturing employment in the Cuyahoga County suburbs within the study area is heavily concentrated (75 percent) in five SIC 2-digit sectors (SIC 33-37: primary metals; fabricated metals, machinery excluding electrical; electrical machinery and supplies; transportation equipment including motor vehicles). This is true for the CVI study area as a whole (7) as well as for the cities of Akron and Cleveland.

The importance of manufacturing in the study area, its concentration there in the same sectors as in the two cities, the fact that it is a basic sector of economic activity, i.e., that it creates jobs in the tertiary sector especially, and the interindustry linkages indicate that the economy of the study area is heavily dependent on trends in the two cities.

Table 2-56 shows recent trends in employment data for selected jurisdictions and sectors, and for the SMSA's and the cities. The trends in the SMSA's and cities were analyzed earlier. Although the CVI jurisdictions are too few for firm conclusions to be drawn, it appears

Table 2-54. Population and Employment. SMSA's, Cities, Suburbs and Study Area.

| | 1970 Population (000) | 1972 Manufacturing Employment (000) | 1972 Manufacturing Employment/1970 Population | 1972 Retail Trade Employment (000) | 1972 Retail Trade Employment/1970 Population | 1972 Wholesale Trade Employment (000) | 1972 Wholesale Trade Employment/1970 Population | 1972 Selected Services Employment | 1972 Selected Services Employment/1970 Population | 1969 Median Income of Families and Unrelated Individuals |
|---|---|---|---|---|---|---|---|---|---|---|
| Akron SMSA | 679.2 | 94.4 | .139 | 38.4 | .057 | 11.1 | .016 | 14.4 | .021 | $11,047 |
| Akron | 275.4 | 50.5 | .183 | 16.8 | .061 | 6.7 | .024 | 84.0 | .031 | 10,051 |
| Cleveland SMSA | 2063.7 | 268.6 | .120 | 115.6 | .056 | 50.9 | .02[illegible] | 61.1 | .030 | 11,407 |
| Cleveland | 750.9 | 131.0 | .174 | 41.4 | .055 | 27.8 | .037 | 36.8 | .049 | 9,107 |
| Ak+Cleve SMSA | 2742.9 | 363.0 | .132 | 154.0 | .056 | 62.0 | .022 | 75.5 | .028 | |
| Ak+Cleve | 1026.3 | 181.5 | .177 | 58.2 | .057 | 34.5 | .034 | 45.2 | .044 | |
| Suburbs | 1717.1 | 181.5 | .106 | 95.8 | .056 | 27.5 | .016 | 30.3 | .018 | |
| CVI Jurisdict. | 232.4 | | | | | | | | | |
| Selected CVI Jurisdict.[1] | | 25.7 | .174 | 12.2 | .060 | 6.8 | .043 | 4.03 | .020 | 13,299 |
| Cuyahoga County | | | | | | | | | | |
| Bedford | 17.6 | 3.0 | .170 | 1.3 | .076 | 0.3 | .018 | 0.49 | .001 | 12,077 |
| Bedford Heights | 13.1 | 3.9 | .298 | 0.5 | .036 | 1.3 | .096 | 0.53 | .041 | 11,853 |
| Brecksville | 9.1 | 0.8 | .088 | 0.5 | .050 | 0.3 | .036 | 0.21 | .023 | 18,091 |
| Broadview Heights | 11.5 | | | 0.2 | .014 | 0.2 | .017 | 0.40 | .035 | 14,128 |
| Garfield Heights | 41.4 | 1.5 | .036 | 1.4 | .034 | 0.9 | .021 | 0.38 | .009 | 11,610 |
| Glenwillow | 0.5 | | | | | | | | | |
| Independence | 7.0 | 2.0 | .286 | 0.8 | .110 | 1.1 | .016 | 0.55 | .079 | 14,260 |
| Maple Heights | 34.1 | 2.1 | .062 | 3.7 | .109 | 0.9 | .021 | 0.57 | .017 | 11,793 |
| Oakwood | 3.1 | | | | | | | 0.08 | .026 | 10,533 |
| Seven Hills | 12.7 | | | 0.3 | .023 | | | 0.03 | .002 | 14,881 |
| Solon | 11.5 | 5.3 | .461 | 1.2 | .103 | 1.4 | .119 | 0.31 | .027 | |
| Valley View | 1.4 | | | | | | | | | |
| Walton Hills | 2.5 | 5.8[e] | 2.320 | 0.3 | .100 | | | 0.04 | .016 | 13,716 |
| Geauga County | | | | | | | | | | |
| Bainbridge | 1.1 | | | | | | | | | |
| Portage County | | | | | | | | | | |
| Aurora | 6.6 | 0.6 | .091 | 0.1 | .021 | | | 0.15 | .023 | 11,277 |
| Shalersville | 5.0 | | | | | | | | | |
| Sheetsboro | 8.0 | | | 0.3 | .043 | | | 0.03 | .004 | |
| Summit County | | | | | | | | | | |
| Boston Heights | 0.9 | | | | | | | | | |
| Boston Township | 1.5 | | | | | | | | | |
| Hudson | 3.9 | | | | | | | | | |
| Hudson Township | 4.5 | 0.7 | .156 | 0.4 | .089 | | | 0.24 | .053 | 17,937 |
| Macedonia | 6.4 | | | 0.2 | .025 | 0.2 | .031 | 0.08 | .013 | 13,249 |
| Northfield | 4.3 | | | | | | | | | |
| Northfield Township | 4.4 | | | 0.6 | .130 | | | 0.12 | .027 | 11,988 |
| Peninsula | 0.7 | | | | | | | | | |
| Reminderville | 0.2 | | | | | | | | | |
| Richfield | 3.2 | | | 0.3 | .078 | | | | | |
| Richfield Township | 1.7 | | | | | | | | | |
| Sagamore Hills | 6.8 | | | | | | | | | |
| Twinsburg | 6.4 | | | 0.3 | .050 | 0.3 | .050 | 0.12 | .019 | 12,095 |
| Twinsburg Township | 1.4 | | | | | | | | | |

(1) Totals may not add because of rounding

Table 2-55. Population and Manufacturing Employment. Cuyahoga County, Jurisdictions and Study Area.

| | 1970 Population | 1971 Manufacturing Employment | Employment/ Population Ratio | Employment In Sic 33-37 | Employm In SIC 33-3 % Mfr. Em |
|---|---|---|---|---|---|
| Cuyahoga County | 1720835 | 250879 | .146 | 179460 | .715 |
| Cleveland | 750879 | 149777 | .199 | 96285 | .643 |
| Suburbs | 969956 | 101102 | .104 | 87173 | .822 |
| Outside Study Area | 804395 | 76173 | .095 | 64584 | .848 |
| Within Study Area | 165561 | 24929 | .151 | 18591 | .746 |
| Bedford | 17552 | 2693 | .153 | 1705 | .633 |
| Bedford Heights | 13063 | 4549 | .348 | 2616 | .575 |
| Brecksville | 9137 | 290 | .032 | 192 | .662 |
| Broadview Heights | 11463 | 9 | .001 | 2 | .222 |
| Garfield Heights | 41417 | 1973 | .048 | 14[illegible] | .716 |
| Glenwillow | 526 | 122 | .232 | 22 | .186 |
| Independence | 7034 | 1100 | .156 | 803 | .730 |
| Maple Heights | 34093 | 2259 | .066 | 1748 | .774 |
| Oakwood | 3127 | 262 | .084 | 256 | .977 |
| Seven Hills | 12700 | 1 | -- | 0 | -- |
| Solon | 11519 | 5632 | .489 | 4255 | .756 |
| Valley View | 1422 | 558 | .392 | 365 | .654 |
| Walton Hills | 2508 | 5481 | 2.185 | 5214 | .951 |

Table 2-56. Employment in Selected Sectors 1958-72.

| | Manufacturing Employment (000) | | | | Retail Trade Employment (000) | | | | Wholesale Trade Employment (000) | | | | Selected Services Employment (000) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1972 | 1967 | 1963 | 1958 | 1972 | 1967 | 1963 | 1958 | 1972 | 1967 | 1963 | 1958 | 1972 | 1967 | 1963 | 1958 |
| Akron SMSA | 04.4 | 101.1 | 90.7 | 88.6 | 38.4 | 33.3 | 28.9 | 27.0 | 11.1 | 10.0 | 8.7 | 7.6 | 14.4 | 10.6 | 8.6 | 8.1 |
| Akron | 50.5 | 63.0 | 58.7 | 54.6 | 16.8 | 17.8 | 16.0 | 17.4 | 6.7 | 7.3 | 6.4 | 6.2 | 8.4 | 6.9 | 5.8 | 6.0 |
| Cleveland SMSA | 268.6 | 306.8 | 280.3 | 273.7 | 115.6 | 107.9 | 94.2 | 92.0 | 50.9 | 50.5 | 45.2 | 44.2 | 61.1 | 49.2 | 39.9 | 38.6 |
| Cleveland | 131.0 | 171.3 | 168.9 | 180.8 | 41.4 | 48.2 | 47.0 | 60.5 | 27.8 | 33.1 | 33.2 | 37.8 | 36.8 | 32.5 | 26.8 | 31.5 |
| Ak+Cleve SMSA | 363.0 | 407.9 | 371.0 | 362.3 | 154.0 | 141.2 | 123.1 | 119.0 | 62.0 | 60.5 | 53.9 | 51.8 | 75.5 | 59.8 | 48.5 | 46.7 |
| Ak+Cleve | 181.5 | 233.3 | 227.6 | 235.4 | 58.2 | 66.0 | 63.0 | 77.9 | 34.5 | 40.4 | 39.6 | 44.0 | 45.2 | 39.4 | 32.6 | 37.5 |
| Suburbs | 181.5 | 174.6 | 143.4 | 126.9 | 95.8 | 75.2 | 60.1 | 41.1 | 27.5 | 20.1 | 14.3 | 7.8 | 30.3 | 20.4 | 15.9 | 9.2 |
| CVI Jurisdict. | | | | | | | | | | | | | | | | |
| Selected CVI Jurisdict.[1] | 18.6 | 15.8 | (9.9) | (6.0) | 10.11 | 7.02 | 6.28 | | 5.27 | 3.99 | 3.09 | | 3.17 | 1.60 | 2.93 | |
| Cuyahoga County | | | | | | | | | | | | | | | | |
| Bedford | 3.0 | 3.1 | 6.2 | 3.2 | 1.33 | 1.21 | 0.82 | | 0.31 | 0.5[illegible] | 0.44 | 0.11 | 0.19 | 0.21 | 0.22 | 0.18 |
| Bedford Heights | 3.9 | 3.5 | | | 0.47 | 0.11 | 0.11 | | 1.26 | 1.02 | 0.55 | | 0.53 | 0.14 | 0.89 | |
| Brecksville | 0.8 | 0.6 | | | 0.45 | 0.42 | 0.40 | | 0.33 | 0.31 | 0.06 | | 0.21 | 0.12 | 0.89 | 0.02 |
| Broadview Heights | | | | | 0.16 | 0.10 | 0.05 | | | | | | 0.40 | 0.03 | 0.01 | |
| Garfield Heights | 1.5 | 2.0 | 1.4 | 1.1 | 1.40 | 0.88 | 0.83 | | | | | | 0.38 | 0.29 | 0.28 | 0.15 |
| Glenwillow | | | | | | | | | | | | | | | | |
| Independence | 2.0 | 1.5 | | | 0.77 | 0.49 | 0.54 | | 1.14 | 0.49 | 1.08 | | 0.55 | 0.29 | 0.12 | 0.02 |
| Maple Heights | 2.1 | 2.5 | 2.3 | 1.7 | 3.71 | 3.29 | 3.03 | | 0.86 | 0.66 | 0.28 | 0.13 | 0.57 | 0.37 | 0.31 | 0.10 |
| Oakwood | | | | | | | | | | | | | | | | |
| Seven Hills | | | | | | | | | | | | | | | | |
| Solon | 5.3 | 2.6 | | | 1.18 | 0.40 | 0.34 | | 1.37 | 0.93 | 0.68 | | 0.31 | 0.14 | 0.20 | 0.08 |
| Valley View | | | | | | | | | | | | | | | | |
| Walton Hills | | | | | | | | | | | | | | | | |
| Geauga County | | | | | | | | | | | | | | | | |
| Bainbridge | | | | | | | | | | | | | | | | |
| Portage County | | | | | | | | | | | | | | | | |
| Aurora | | | | | 0.14 | 0.12 | 0.08 | | | | | | | | | |
| Shalersville | | | | | | | | | | | | | | | | |
| Sheetsboro | | | | | | | | | | | | | | | | |
| Summit County | | | | | | | | | | | | | | | | |
| Boston Heights | | | | | | | | | | | | | | | | |
| Boston Township | | | | | | | | | | | | | | | | |
| Hudson | | | | | | | | | | | | | | | | |
| Hudson Township | | | | | | | | | | | | | | | | |
| Macedonia | | | | | | | | | | | | | | | | |
| Northfield | | | | | | | | | | | | | | | | |
| Northfield Township | | | | | | | | | | | | | | | | |
| Peninsula | | | | | | | | | | | | | | | | |
| Reminderville | | | | | | | | | | | | | | | | |
| Richfield | | | | | | | | | | | | | | | | |
| Richfield Township | | | | | | | | | | | | | | | | |
| Sagamore Hills | | | | | | | | | | | | | | | | |
| Twinsburg | | | | | 0.32 | 0.21 | 0.15 | | | | | | | | | |
| Twinsburg Township | | | | | | | | | | | | | | | | |

that the study area has grown steadily in Wholesale Trade, Retail Trade and Selected Services at rates comparable to those of the suburbs as a whole. In Manufacturing, on the other hand, the individual jurisdictions of the study area appear to have lost employment between 1967 and 1972, although not at the same rate as the two cities combined (The growth shown for the sum of the seven jurisdictions of the study area between 1967 and 1972 results largely from the doubling of employment in Solon; five of the seven jurisdictions lost employment.)

The suburbs of the two SMSA's combined show an increase in Manufacturing. Thus in this sector decentralization is possibly causing the suburbs to gain jobs at the expense of the cities. The recent recession is responsible at least in part for the pattern shown in comparing 1967 and 1972, during which the cities have been harder hit both relatively and absolutely than the suburbs. Because the dominant manufacturing sectors are durables (including for Akron the non-durables of SIC 30: rubber and plastic products, and tires) which tend to lead the cycle on the downturn and the upturn, the 1967-72 comparison may exaggerate the longer-run city/suburbs trend.

Tables 2-57 and 2-58 summarize recent trends in employment, firm size and industrial land use for Cuyahoga County and selected study area jurisdictions. Table 2-57 data is taken from a different source from that presented in Table 2-56. It should first be noted that Table 2-57's 1971 Manufacturing employment figures differ markedly, both up and down, from Table 2-56's 1972 Manufacturing employment figures for the same selected study area jurisdictions in Cuyahoga County (although the figures for earlier years are the same in the two tables). The reason for the difference is unknown but must be imputed to either or both of two reasons: a differential downturn/upturn comparing 1972 and 1971 depending on the jurisdiction or differences in reporting and/or sampling. The result is that, contra Table 2-56, Table 2-57 shows a slight increase in Manufacturing employment in 1971 over 1967 for the Cuyahoga County study area jurisdictions, and a much smaller drop in Cleveland. Table 2-57 shows that the jurisdictions have grown faster in employment 1967-71 than the suburbs. It shows also that the number of employees per firm has declined between 1967 and 1972 for the county, Cleveland, the suburbs and the jurisdictions of the study area within the county. More surprising, it shows that the number of employees per firm in the study area jurisdictions is the same as in Cleveland and much lower than for the county's suburbs as a whole. The explanation for the differences between the study area and the rest of the Cuyahoga suburbs appears to lie in the fact that three other suburbs have large numbers of employees concentrated in a few large plants: Brook Park (SIC 33); Cuyahoga Heights (SIC 33); Euclid (SIC 33-37). This suggests that the lower cost of land is an important determinant of industrial decentralization where large plants are concerned. Without further study one cannot

Table 2-57. Manufacturing Employees and Firms, Cuyahoga County, Jurisdictions and Study Area. 1958-1971.

| | Employees (000) | | | | Firms | | | | Employees (%) | | Employees/ Firms | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1971 | 1967 | 1963 | 1958 | 1971 | 1967 | 1963 | 1958 | 1971 | 1967 | 1971 | 1967 |
| Cuyahoga County | 250.9 | 277.3 | 257.2 | 255.2 | 3594 | 3658 | 3751 | 3688 | 100.0 | 100.0 | 70 | 76 |
| Cleveland | 149.8 | 171.3 | 168.9 | 183.3 | 2396 | 2537 | 2821 | 2978 | 59.7 | 61.8 | 63 | 68 |
| Suburbs | 101.1 | 106.0 | 88.3 | 71.8 | 1198 | 1121 | 930 | 710 | 40.3 | 38.2 | 84 | 95 |
| Selected Study Area Jurisdictions | 21.2 | 19.2 | (9.9) | (6.1) | 326 | 279 | 146 | 126 | 8.4 | 6.9 | 65 | 69 |
| Bedford | 2.7 | 3.1 | 6.2 | 3.3 | 55 | 72 | 74 | 70 | 1.1 | 1.1 | 49 | 43 |
| Bedford Heights | 4.5 | 3.5 | NA | NA | 71 | 57 | NA | NA | 1.8 | 1.3 | 63 | 61 |
| Brecksville | 0.3 | 0.6 | NA | NA | 9 | 12 | NA | NA | 0.1 | 0.2 | 33 | 50 |
| Garfield Heights | 2.0 | 2.0 | 1.4 | 1.1 | 64 | 65 | 44 | 37 | 0.8 | 0.7 | 31 | 31 |
| Independence | 1.1 | 1.5 | NA | NA | 28 | 23 | NA | NA | 0.4 | 0.5 | 39 | 65 |
| Maple Heights | 2.3 | 2.5 | 2.3 | 1.7 | 40 | 35 | 28 | 19 | 0.9 | 0.9 | 58 | 71 |
| Solon | 5.6 | 3.5 | NA | NA | 68 | 50 | NA | NA | 2.2 | 1.3 | 83 | 70 |

Table 2-58. Land Used for Industry in Cuyahoga County - 1948-69 (Acres).

| | 1969 | 1959 | 1954 | 1948 | 1969 % | 1948 % |
|---|---|---|---|---|---|---|
| Cuyahoga Co. | 21344 | 13721 | 10883 | 8921 | 100.0 | 100.0 |
| Cleveland | 10015 | 7886 | 7076 | 5980 | 46.9 | 67.0 |
| Suburbs | 11329 | 5835 | 3807 | 2941 | 53.1 | 33.0 |
| Study Area | 4527 | 1859 | 1013 | 642 | 21.2 | 7.2 |
| Bedford | 83 | 118 | 97 | 81 | 0.6 | 0.9 |
| Bedford Heights | 767 | 206 | 122 | 0 | 5.6 | -- |
| Brecksville | 367 | 85 | 4 | 28 | 2.7 | 0.3 |
| Broadview Heights | 83 | 5 | -- | 5 | 0.6 | 0.1 |
| Garfield Heights | 839 | 426 | 193 | 211 | 6.1 | 2.4 |
| Glenwillow | 165 | 49 | 165 | 17 | 1.2 | 0.2 |
| Independence | 367 | 199 | 77 | 84 | 2.7 | 0.9 |
| Maple Heights | 289 | 233 | 108 | 137 | 2.1 | 1.5 |
| Oakwood | 118 | 24 | 23 | 0 | 0.9 | -- |
| Seven Hills | 53 | 9 | 0 | 9 | 0.4 | 0.1 |
| Solon | 917 | 247 | 66 | 13 | 6.7 | 0.1 |
| Valley View | 153 | 94 | 43 | 57 | 1.1 | 0.6 |
| Walton Hills | 326 | 164 | 115 | 0 | 2.4 | -- |

tell if the suburbs of the study area will attract such plants or if they will continue to attract the smaller plants.

The study area jurisdictions do not appear to have land constraints greater than those of the three suburbs with very large plants. Table 2-58 presents data on industrial land use in Cuyahoga County for the period 1948-1969. It shows that the amount of such land has increased absolutely for the county, Cleveland, the suburbs and for the study area jurisdictions within the county. These last have increased fastest. Over this period the 13 Cuyahoga County jurisdictions have increased industrial land use sevenfold. As a result, their share of the county's total has risen from 7 to 21 percent. The suburbs share in industrial land use as a whole rose from 33 to 53 percent, while the City declined from 67 to 47 percent. As compared with the 49 Cuyahoga County suburbs as a whole, the 13 jurisdictions have a more-than-relative share of industrial parks; 18 of 42.

c. Projection and Constraints

Table 2-59 presents historical, present and projected employment trends and projected employment trends for the two SMSA's, the suburbs and the study area. Figure 2-4 gives the results graphically. The data for the SMSA's combined and individually for the period 1950-75 is taken directly from the OBERS-E and OBES series. The da a for the years 1960 and 1970 for the suburbs and the CVI Study Area was calculated as described in Appendix B. The projections for the SMSA's are of three kinds. The top one is taken direct from OBERS-E. The middle one is adjusted from the OBERS-E series by applying to it the ratio .934, which was obtained by dividing the OBES projections of the 1980 employment level for Ohio by the OBERS-E projection for the state for the year. The OBES projection for the state is lower for three main reasons; (1) it incorporates a lower fertility rate (1,900 versus 2,100 births per 1000 women); (2) it assumes greater out-migration and less in-migration; and (3) it adopts a higher unemployment rate. All three reflect recent trends that have caused a divergence from the OBERS-E series. This is discussed later. The state differential is used to lower the OBERS-E projection for the SMSA's in the belief that these three recent trends have affected the SMSA's at least as heavily as the state as a whole. But it seemed prudent to present a still lower projection for the SMSA's not only because it now appears likely that the SMSA's are disproportionately affected by the lower birth-rate, migration and unemployment but also because of the shift-share analysis undertaken earlier.

Figure 2-4 shows the relative losses in employment in all sectors over the period 1970-75 in the two SMSA's individually and combined. The graph shows the precipitous employment decline antedating even the mild slump of 1970-71, a climb back and another fall with the recession of 1974-75. The drop in that period is almost entirely accounted for by the drop in the durable goods sectors in both SMSA's. A return even to the mid-level of 1,245,000 jobs

Table 2-59. Employment Trends and Projections Akron and Cleveland SMSA's, Suburbs and CVI Study Area

| AREA | 1950 | 1960 | | 1970 | | 1980 | | 1985 | | | | | 1990 | | | 2000 | | | 2020 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | WAPORA* | | | WAPORA* | | | | | | WAPORA* | | | WAPORA* | |
| | Obers-E | Obers-E | Obes- | Obers-E | Obes- | Obers-E | Obes- | Obes-Based Revision | Alternative | Obers-E | Obes-Based Revision | Alternative | Obers-E | Obes-Based Revision | Alternative | Obers-E | Obes-Based Revision | Alternative | Obers-E | Obes-Based Revision | Alternative |
| Akronand Cleveland SMSA | .824 | .957 | .898 | 1.102 | 1.100 | 1.318 | | 1.245 | 1.175 | 1.355 | 1.280 | 1.208 | 1.395 | 1.318 | 1.244 | 1.507 | 1.424 | 1.344 | 1.608 | 1.519 | 1.434 |
| Akron SMSA | .182 | .220 | .198 | .263 | .245 | .316 | | | | .323 | | | .331 | | | .356 | | | .377 | | |
| Akron | | | .150* | | .134* | | | | | | | | | | | | | | | | |
| Cleveland SMSA | .642 | .737 | .700 | .839 | .855 | 1.002 | | | | 1.032 | | | 1.064 | | | 1.151 | | | 1.231 | | |
| Cleveland | | | .502* | | .463* | | | | | | | | | | | | | | | | |
| 5 Cities | | | .652* | | .582* | | | | | | | | | | | | | | | | |
| Suburbs | | | .246* | | .518* | | | | | | | | | | | | | | | | .860 |
| CVI Study Area | | | | | .070* | | | | | | | | | | | | | | | | |
| Ohio | 3.068 | 3.522 | | 4.124 | 4.148 | 5.025 | 4.694 | | | | | | | | | | | | | | .116 |

* Obtained as described in the Appendix

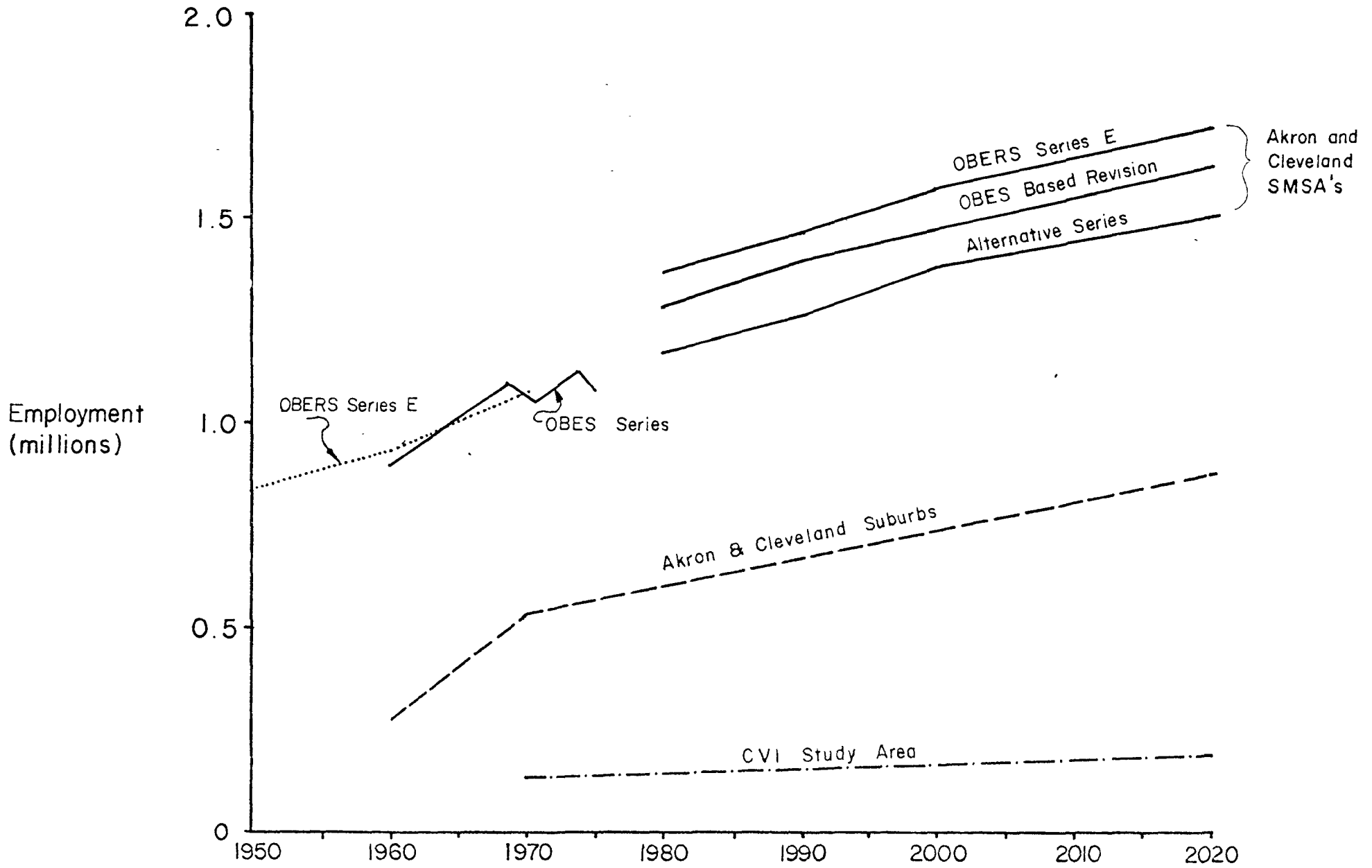


figure 2-4 Employment Trends and Projections - Akron and Cleveland SMSA's, Combined Suburbs and CVI Study Area

by 1980 appears unlikely. The estimate of 1,175,000 jobs by 1980 would be a seven percent increase over the decade. Thereafter, growth is assumed to follow the OBERS-E pattern. The OBERS-E growth rate for 1980-2020 results in a smaller increase in employment over the period because the 1980 base is lower.

Because of the economic links between the cities and the suburbs which have both recorded losses in manufacturing employment we have assumed that the suburbs will grow at a much slower rate in the future than they did in the sixties -- at a (non-compound) rate of 13 percent per decade between 1970 and 2020, as compared with a more than doubling in the period 1960-70. Even so, growth at this level would lead to the suburbs' accounting for 60 percent of total SMSA employment by the year 2020 (if our adjustment in the OBERS-E projection is used for comparison). This proportion appears to be somewhat high, but a study of the relative growth of cities and their hinterland is needed as elsewhere to establish where on the (presumed) Gomperts S-shaped curve (of suburban to SMSA employment) these suburbs are. The lack of time-series data on employment for the suburbs has been referred to. The attempt made to overcome this lack (described in Appendix B) was therefore necessary, but has obvious shortcomings the finer the level of detail. For the jurisdictions of the study area we have made the gross assumption that they will grow as a whole at the same rate as the suburbs, to a level of 116,000 employees by 2020. The relationship of employment in manufacturing to employment in the tertiary sectors also needs careful study for the study area, which appears to have a higher proportion of manufacturing employment than is typical for suburbs. In the economy as a whole the non-basic/basic employment ratio is declining in a way that does not suggest where if anywhere the ratio will begin to harden.

To translate employment figures into population figures (which is much less defensible for small suburban jurisdictions than for SMSA's) we have assumed that the employment/population ratio of .302 for the suburbs in 1970 (518,000 employees/1,717,100 residents -- see Tables 2-54 and 2-55) applies also to the study area. The OBERS-E series calculates an employment/population ratio of 0.38 for the non-SMSA portion of BEA Economic Area 068 which includes 72 counties stretching from Ashtabula to Erie and south to Coshocton. With the decline in the birth rate and the increasing entry of women into the labor force, this ratio is projected by OBERS-E to rise from 0.38 to 0.44 by the year 2020. Using this same rate of increase, our 0.302 for CVI communities would rise to 0.35. When divided into the projected employment figure of 116,000 for the jurisdictions of the study area this results in a population projection for CVI communities of 374,193 by 2020, which is lower than the total of 411,450 presented in Table 2-49. This may, nevertheless, be on the high side because the employment/population ratio is suspiciously low. On the other hand the suburbs of the study area may tend to grow faster than the suburbs as a whole given their less-developed nature. If the 1970 ratio of CVI population served/residents is adopted for 2020 as for 1970 (when it was 0.64 -- 149,000/232,400) this would imply a population level of 240,070 people served by the year 2020.

The purpose of this analysis of employment trends was not, however, to yield population projections set in concrete: the step-down nature of the analysis, and its simplifying assumptions would make such a purpose especially absurd for small areas. Rather its purpose has been to show how the economy of the area is inextricably linked to economic trends in the cities and the SMSA's as a whole.

The simplifying assumptions adopted have been made explicit. The assumptions underlying the SMSA projections, which are of central importance given the foregoing, are now discussed.

The OBERS-E series projects population, employment, personal income, and earnings by industry for the U.S., states, regions, and SMSA's to 2020. Its national projections are control totals for the state, regional and SMSA projections. The national assumptions are an economy in approximate equilibrium; a fertility rate of 2,100 births per 1000 women by 2005; an unemployment rate of four percent; and increase in the private sector of 2.9 percent in output per man-hour per year. For its regional projections OBERS assumes a continuation of past trends modified with the help of locally knowledgeable people. The basic past trends projected include a regional convergence toward the national average in employment/population ratios, earnings per worker and per capita income; employees shifting from low- to high-growth areas; and no sharp breaks with past trends in the location of basic industries. In a recent report the BEA has compared the OBERS-E projections (interpolated) for the states with actual levels of economic activity in the states in 1973: nonfarm earnings; total earnings; total personal income; population. For each variable Ohio's level had been overestimated, the deviations ranging from 1.1 to 2.7 percent. Earnings were overestimated because of substantial overestimates of the nonmanufacturing sectors (except mining and construction which were substantially underestimated). For the region including Ohio "nearly every major industry expands at below-average rates in the next two decades." Exceptions noted are the non-automotive transportation equipment and government sectors. Despite this, OBES' projections show a lower 1980 figure for both population (11,141,955) and employment (4,694,145) than the OBERS-E series (11,650,600 and 5,025,100 respectively). The reasons for this were given earlier. Our view is that recent events (and OBERS-E tracking) render the OBES projections the more credible. Thus the long-run OBERS-E trends to 2020 are modified by the 1980 differential between the OBES and OBERS-E series, and applied to the SMSA's. It is probable that the OBES-based (lower) projections are still on the high side for the SMSA's. The estimate of them as probably high reflects numerous considerations.

The SMSA's are affected relatively more than the state by the slowdown in the number of in-migrants from the south and the out-migration of residents. The relatively slow-growing industries are concentrated more in the SMSA's than in the state as a whole.

(Offsetting this of course is the fact that the fastest-growing industries -- those in the tertiary sector -- are concentrated more in the SMSA's than in the state as a whole). The outlook for the major manufacturing sectors of the two SMSA's is complicated by the impact of the 1974-5 recession. The shift-share analysis showed clearly its effect in relative losses in all sectors* compared with the U.S. for both the Akron and Cleveland SMSA's. The automobile industry, which it is estimated employs 15 in parts and supplies for every 10 directly employed was hard hit. The auto-related industries in the area suffered as a consequence. The longer-run trends suggest a slower rate of automobile manufacturing growth than in the sixties because of increased auto imports. On the other hand, the new Volkswagen plant in Pennsylvania plans eventually to make U.S. built Rabbits. Its location in the U.S. reflects primarily the hardening of the Deutschmark versus the dollar since 1971, this making German goods dearer. Its decision to locate in Pennsylvania rather than Ohio (which was also considered) appear to reflect the favorable concessions granted VW by the state. Its decision to locate in this area means, however, that Ohio is close enough to the center of gravity of the market to be competitive as a location. The wide range of auto-supporting industries in the Cleveland SMSA continues to be an inducement to locate. And U.S. manufacturers are increasingly turning to the production of smaller autos. The tire industry in Akron was deeply affected by the recession. Fewer autos were bought; tire inventories increased; trucking firms replaced tires from unused vehicles; auto passengers miles fell with declining real incomes and the higher cost of gasoline; Federal procurement declined drastically. But these are temporary phenomena and an upturn is expected. Longer-run factors affecting this sector include the trend toward the longer-lasting radial tire (in the recession the major U.S. auto manufacturers replaced the higher-priced and more profitable radials to reduce sticker prices); differential labor costs comparing this area and the south, together with the shift in the location of market demand; the apparently permanent reduction in driving speeds. The fabricated metals industry, which serves the construction industry was affected by a reduction in both housing and industrial starts. The recession factors here included a tight market for hour mortgages and industrial capacity; idle industrial capacity; inflation. Longer-run considerations include uncertainties of fuel supplies, and emission standards which lead to a postponement of power-generating facilities; and an apparent reduction in the rate of growth of demand for power. The primary metals sector especially is affected in a recession. Inventories were drawn down, and marginal plants close except for peak-demand periods. Longer-run factors include the relatively high cost of land for expansion in the old-established cities; the high cost of pollution control equipment which renders obsolescent plants more marginal; and the relative obsolescence of Ohio's industrial equipment. The natural gas curtailments have apparently led some glass manufacturers to

* except other manufacturing (Cleveland) and Services (Akron).

locate where intrastate gas is available. The long-run energy outlook and its effect on the local economy is not clear. As regards natural gas, East Ohio Gas has not curtailed residential or commercial customers but has curtailed industrial customers, at an average of 18 percent in 1975. It has since 1971 refused new industrial customers and since 1975 has refused new commercial and residential customers. The recession and the mild winters 73-74 and 74-75 combined to dampen the effect of curtailments on the area. The longer-run outlook depends on relative price shifts in the domestic market and on foreign suppliers. East Ohio Gas supplier (The Consolidated Gas Supply Corporation) expects LNG from Algeria to come on stream in 1977, at a rate which would provide about 15 percent of Consolidated's precurtailment (1970) supplies. The Future Requirements Committee in 1973 projected a 1980 shortfall of supply of about 25 percent in 1980. Whether or not this will occur depends not only on domestic prices and increasing LNG imports but also on exploration for new reserves domestically; the technology and costs of SNG (synthetic natural gas from coal); natural gas imports from Canada; the substitution of fuel oil. It should be noted that both the OBERS-E and OBES projections do not take energy constraints into consideration.

# CHAPTER 3
# ALTERNATIVES

## A. General Information

The thirty-page presentation and analysis of alternatives on pages 78-84, 89-116 and Tables 18 through 25 of the Environmental Assessment is generally adequate for the Phase I service area.

There is little question that the two interceptor alternatives (Southerly CVI and Southerly Dual Interceptor) would have the greatest impact on water quality, as they could remove most of the present effluent discharges within the proposed Phase I service area and do not discharge them to the basin until the effluent discharge point of Cleveland Southerly on the Cuyahoga River. Some proportion of private septic tank-filter bed sewage system discharges will probably remain in the service area due to unfavorable economics involved in extending collectors to low density sections of the study area.

Cost comparisons in Table 24 of the Environmental Assessment suggest that the Southerly-CVI alternative is the most cost effective for the Phase I service area. The relatively constant cost of the interceptor for different sizes indicated in Table 26 through 31 suggests that even if Phase I is built for the full three phase service area, the No Action, Multi-plant, and other alternatives for Phase II and III will not be rendered unfeasible. Existence of an interceptor with capacity sufficient to serve these areas could, however, promote a piecemeal approach to expansion in subsequent phases and would make future calculations of alternatives' cost effectiveness change in favor of using that capacity.

## B. Phased Expansion

The design of interceptors considered for Phase I in the CSRD's alternatives were based upon wastewater flow estimates for the ultimate CVI service area. i.e., Phases I, II, and III. The Phase I area was projected to yield 53.4 mgd of wastewater by 2020. This is about 31 percent of the flow originally projected in the Environmental Assessment to be contributed by all three phases. Phase II would contribute another 24.8 mgd or 14 percent and Phase III would contribute 94.0 mgd or 55 percent if all of Shalersville and Streetsboro are included in the service area.

In Phases II and III, population growth, the presence or absence of industrial development the cost effectiveness of removing I/I, and other planning factors yet to be considered could appreciably alter the projected waste flows or could indicate that some alternative would be preferable to sewering the later phases, or part of them, to Southerly.

Phase II - One local planning agency has suggested that service not be extended to the proposed Phase II service area. It has also been suggested that if Akron and Cleveland SMSA population remains basically static, as some projections suggest, peripheral growth encouraged by the sewers might come at the expense of Cleveland or

Akron and their inner suburbs. Such suggestions can only be eva ated when more is known of the sizing, routing, and construction schedule for Phase II.

The Cleveland Regional Sewer District commented on this pos. bility when evaluating the Jaite plant alternative (see below) in its report on the "CVI Extension into Northwest Summit County":

> "The wastewater management study for the Cleveland-Akron Metro politan and Three Rivers Watershed Areas conducted by the Corp of Engineers in 1970 to 1973 found it highly unlikely that the Boston-Peninsula area would be sewered in the projected future due mainly to the fact that the projected densities are so low that the population would be too widely dispersed to make it economically feasible to develop a sewer system in this area. The combined effects of the possibility of a population growth at a rate slower than that projected in the Master Plan for Northwest Summit County and the possibility that areas such the Boston-Peninsula will not be fully sewered, or even sewered at all, because of widely dispersed populations, substantially incrases the risk of objectionably high cost to the users of Northwest Summit County. This risk would be increased even further if the actual cost of constructing the system proved to be higher than the engineering estimates.

Apparently this is one of the reasons for CRSD's utility approa to rates for the proposed service area. Even should Phase II area be excluded, the 24.8 mgd reduction in design flow would only result in construction one size small for the Phase I interceptor.

The Ohio Environmental Protection Agency has recently recommend that 201 Facilities Planning be initiated immediately for the Phase II area. OEPA has suggested that construction on Phase II should be completed by 1980. (See letter, Section 7.). At present OEPA is committing no funds to upgrading existing plants in Phase II in anticipation of extension of CVI sewers to relieve the plants.

In order to evaluate the sensitivity of Phase I design to feasible alternatives for Phase II, the need to provide sewer service to various parts of Phase II are evaluated and methods to meet recogni needs are evaluated.

Three distinct 'need" areas are recognized within Phase II East of the proposed boundary for the Cuyahoga Valley National Recreational Area a substantial amount of development and currently sewer areas exist. Problems with overloading and maintenance of the sewage treatment facilities in this area have been mentioned in the Environmental Assessment. Because of good transportation access by rail and highway, the area is likely to see continued industrial, commercial and residential growth. Pressure to expand sewer services is expected to be great.

Three generalized alternatives would address the sewerage needs of this area: 1) Connect existing sewage collector system to a tunneled extension of CVI via a trunk sewer paralleling Highland Road

(suggested in the Environmental Assessment); 2) Connect existing sewage collector systems to Phase I of CVI via a trunk sewer routed along Highland Road, the abandoned Penn Central railroad bordering the edge of the Cuyahoga Valley, Sagamore Road and the Hawthornden trunk of Phase I; and 3) Construct a new sewage treatment facility within the area or expand and upgrade Macedonia #15.

The first generalized alternative was assumed in the design of Phase I. No alteration of Phase I design would be necessary if this alternative proves to be cost-effective and environmentally sound. Disadvantages of this alternative include reduction of flow in Brandywine Creek, inability to service much of the upland portions of Sagamore Hills and Northfield Center by gravity sewers, and the necessity of constructing a trunk line across slope instability areas (partially mitigated if the Highland Road highway easement is follows).

The second generalized alternative could have an effect upon the design of the Hawthornden trunk sewer in Phase I in that the increased design flow would necessitate a large trunk. The need for capacity in the Phase I tunneled interceptor between Brecksville and the Hawthornden trunk would be reduced by the design flows from the eastern part of Phase II although the cost-effectiveness of maintaining uniformity in tunnel size may argue against any change in size for the interceptor. The primary disadvantages of this alternative is reduction of flow in Brandywine Creek. In at least one place along the Penn Central right-of-way, it appears that ductile iron pipe will have to be suspended along railroad trestle to maintain grade across a small stream valley. Large, currently unsewered section of Sagamore Hills and Northfield Center Townships would be tributary to this trunk sewer by gravity. None of this sewer would enter the CVNRA except for that part of the Hawthornden trunk already proposed in Phase I. A slope of approximately .26 percent could be maintained along this trunk line permitting a comparatively small diameter sewer to handle design flows.

The third general alternative for providing adequate sewer service to the eastern portion of Phase II envisions treatment within the areas with effluent discharge to Brandywine Creek. The primary justification for this alternative is maintenance of flow over Brandywine Falls during low flow periods. For any alternative which includes treatment and discharge, the advantages of flow maintenance must be weighed against the toxic effects of chlorine residuals and ammonia in the effluent. In small streams where a high percentage of low flow would be treated effluent, these compounds are likely to exceed tolerance limits for many aquatic species in the stream. Nitrification and alternate means of disinfection could circumvent the toxicity problems. A further disadvantage of the treat and discharge alternative is thatlarge portions of Sagamore Hills and Northfield Center Township would not be tributary by gravity to a plant on Brandywine Creek.

The second "need" area in Phase II is the segment of Cuyahoga Valley National Recrreation Area lying within Phase II boundaries. See Figure 2-3. Existing development in the proposed park area includes the village of Peninsula and the small settlement of Boston. These areas presently utilize private septic tank sewage disposal

systems which discharge effluent directly to the Cuyahoga River. Fecal coliform concentrations in the Cuyahoga River near Peninsula often exceeded the United States Environmental Protection Agency Standard (5,000 organisms/100 ml maximum; Jack McCormick & Associat' Inc. L947). The pollutant contribution from Peninsula is unknown but is likely a very small percentage of the total pollutant load in the Cuyahoga River at that point.

The population of Peninsula (currently 700 persons) is expected to roughly double by 2020 (EPA 1976) and heavy commercial development is expected (NPS 1976). Unless some sort of centralized sewerage is provided, Peninsula's contribution to the River's pollutant load can only incrase.

Recreational facilities planned for the CVNRA within Phase II are another souce of need for sewerage facilities. The National Park Service has provided estimates of future park attendance and per capita wastewater genration which have been used to estimate future waste generation from CVNRA areas within Phase II. The ultimate peak park attendance in Phase II of CVI is estimated to be 10,500 persons generating 3.5 gallons per visit for a total of approximately 37,000 gallons peak daily flow at ultimate development of the park. The National Park Service has, to date, not made specific plans for handling sewage generated within the CVNRA.

Overall, the sources of wastewater within this central part of Phase II are expected to be dispersed with perhaps the greatest single future source being the village Peninsula. Depending upon the amount of commercial development that is allowed in Peninsula, Total 2020 wastewater generation for this part of Phase II is unlikely to exceed 0.2 mgd. Attaining this rate will probably be dependent upon provision of a public water supply in Peninsula.

Alternatives for handling this wastewater include 1) construction of a tunneled extension of CVI as proposed in the Environmental Assessment and 2) treatment and discharge to the Cuyahoga River.

Unlike Phase I of CVI, Phase II will generate extensive construction activities within the Cuyahoga National Recreation Area. Phase II of CVI as currently proposed would adversely affect the CVNRA by:

- The construction of access shafts and attendant roads the NRA.

- The construction of trunklines to pickup flows from other parts of Phase II and from scattered recreation areas within the CVNRA.

- Increased potential for incompatible development at Peninsula.

Benefits will result from:

o The elimination of the discharge of inadequately treated wastewater and/or septic leachates to the Cuyahoga River.

o The provision of a wastewater collection system to serve the southern two-thirds of the CVNRA.

At first glance, the adverse effects and benefits attributable to Phase II of CVI appear identical to those described for Phase I. The benefits, however, are not singular to the proposed plan (See Section 4.B.) and the environmental costs and disruption to the CVNRA will be substantial:

a. Access Shafts

The number of access shafts needed for Phase II of CVI in the CVNRA has not been specified. The main interceptor in Phase II would extend for approximately 9.5 miles (50,100 feet). Assuming an average distance of 1000-2000 feet between access shafts, at least 25, and maybe as many as 50, construction sites will be required in the CVNRA. If two acres are required at each site for construction activities, 50 to 100 acres of the Park will be disrupted.

Most of the main interceptor for CVI, Phase II, lies in Park Zone 4 (NPS 1976a). The primary themes for this zone are education and natural history. The area predominantly is covered by old field or scrub vegetation. Construction activities will not be compatible with proposed Park activities.

b. Trunk Lines

Open trenching for trunk lines in the valley slopes could be limited to existing road crust, thereby minimizing disruption of vegetation in the CVNRA. The National Park Service is concerned about open trenching and its potential effects on the CVNRA, but will reserve comment until more detailed plans have been prepared and environmental studies are complete (Interview, Mr. William Birdsel, 22 July 1976).

c. Increased growth in Peninsula

As described in the draft Environmental Assessment of the CVNRA (NPS 1976), visitor support services are expected to proliferate in the Valley. Peninsula with its rich historic heritage will undergo heavy pressure for commercial development. Current constraints include lack of sewerage and a shortage of water.

Phase II of CVI will eliminate one problem as Peninsula. However, water supply may continue to act as a constraint. Given adequate water and sewer service, if Peninsula desires to maintain its rural-historic-small town character in the face of a National Recreation Area, local authorities will have to enact architectural controls and subsequently enforce them.

An alternative to extension of CVI is to construct several s treatment facilities near the points of sewage generation. Althou the National Park Service has called for tertiary treatment of wast and return to Cuyahoga Valley aquifers, this may not be feasible considering the nature of soils in the area. Any small plants would probably have to discharge directly to the Cuyahoga River after tertiary treatment. The advantage of this alternative is that dis tion of the park by sewer construction will be avoided. Careful design and attentive operation of such small plants would be necess to prevent malfunction and discharge of poorly treated effluents.

The third need area of Phase II is Richfield Township outside and to the west of the CVNRA. The decision to extend sewer service west of the valley to Richfield Village appears to be based on the present lack of centralized sewerage facilities there and the generally poor capacity of the soil to absorb effluent from septic tank leaching fields (Dalton, Dalton, Little, Newport 1973). The same report concluded that it was imperative that centralized sewerage facilities be built before further development occurred in the Richfield area.

The Furnace Run Watershed which includes Richfield Village is the least developed in the area, and Furnace Run exhibits the best water quality extant in any tributary of the Cuyahoga River downstream of Akron (ODNR 1975). The pollution load from surface runoff and septic tanks to Furnace Run is minor (Dalton, Dalton, Littel, Newport 1973) although a number of discharge permits for small establishements have been issued which total 120,000 gallons per day design capacity. In addition, a treatment plant serving a subdivision has been permitted to discharge to Furnace Run with a design capacity of .25 mgd. The subdivision has been built, however. More recently, a major sports coliseum has been built near the intersection of Routes 271 and 303 in the Furnace Run Watershed. Highly variable flows are treated at the coliseum and discharged by a gravity sewer paralleling Stein Road to the Cuyahoga River. This gravity sewer was sized to carry all of Richfield's projected wastewater to CVI in Phase II.

The Northeast Ohio Four County Planning Organization (NEFCO) envisions residential, commerical, and industrial growth occurring predominantly east of the Valley along the State Route 8 corridor (Interview, Mr. Chuck Larlham, NEFCO, 22 July 1976). Vacant land in the Richfield area has been described as having low suitability for development in terms of accessibility and the availability of supportive services (NOACA 1974). Furthermore, the expected cost-benefit ratio for supplying sewer facilities west of the Valley was very low (NOACA 1974).

Based on the above statements it is apparent that extending CVI west of the Valley is inconsistent with regional planning goals (e.g., developing areas east of the Valley), may draw development away from the east side of the valley, and induce growth in the Richfield area. Furthermore, claimed benefits of improved water

quality in the Cuyahoga River will not be realized by sewering existing populations in the Richfield area, since the pollutant load is presently very small.

If detailed facilities planning ultimately establishes a need for a centralized sewer system in Richfield Village and Township, and if the non-CVI alternatives for other parts of Phase II are cost-effective and environmentally more attractive, there remains an alternative for exporting the area's sewage to Southerly, i.e., pumping collected sewage flows north into the Chippewa Creek watershed to be picked up by the Brecksville trunk of Phase I. Under this alternative, the design of the Brecksville trunk would have to be reconsidered to assure that it could handle the flows from Richfield.

The above analysis of sewerage needs and alternatives for the various parts of Phase II is presented with the purpose of showing that there are feasible alternatives to CVI in Phase II which avoid what is considered to be significant disruption to the park. Due to the high cost of tunneled interceptor and the length that would be required (approximately 50,000 feet) to serve Phase II, it also appears that a considerable monetary savings could be realized if some combination of non-CVI alternatives prove after detailed study to be acceptable for Phase II areas.

The impact of the design of Phase I of various alternatives outlined above are summarized in Table 3-1. Because of 1) potential environmental disruption of the park by CVI in Phase II, 2) the availability of alternatives, and 3) the impacts of these alternatives on Phase I design, Phase II facilities planning should proceed concurrently with Step II work for Phase I of CVI.

Phase III - At present, the municipal treatment plants within Phase III are being upgraded and expanded to provide tertiary treatment for 1995 projected sewage flows. Construction of an interceptor into this area is not planned until 1995. None of the Phase III communities border on the CVNRA. Any relationship between sewerage planning in Phase III and CVNRA appears to be limited to effluent discharges to Tinker's Creek which passes through the Bedford Reservation. The same question must be answered here as for Phase II area discharges in Brandywine Creek, i.e, does the augmentation of low flows with effluent justify the pollutant loading that would result from tertiary-treated effluent? As is indicated by the pollutant loading analyses presented in Section 5.C.3. of this report, the estimated percentage of all pollutants in these creeks in 2020 due to tertiary level effluents is small. This percentage will vary widely with changes in stream flow, however. At high stream flows, the effluent pollutants will be negligible in proportion to non-point source pollutants. However, at low flow nearly all pollutants in the stream could be from effluents.

Design flows in the CVI main interceptor between Tinker's Creek and Southerly include an allocation of approximately 95 mgd for Phase III, or 57 percent of the total design flow (168 mgd) for CVI.

Table 3-1. Impacts of Generalized Non-CVI Alternatives for Phase II Areas on Design of Phase I CVI.

| Alternative | Impact on Phase I Design |
|---|---|
| East side of CVNRA | |
| Upland trunk sewer along Penn Central right-of-way to Hawthornden trunk of Phase I. | Revise size of Hawthornden trunk. |
| Treatment and discharge to Brandywine Creek estimated 20. mgd average flow | Potential reduction in main interceptor by one size. |
| CVRNA | |
| Treat and discharge to Cuyahoga River from several small treatment plants estimated .2 mgd average flow. | No impact. |
| West Side of CVNRA | |
| Pump from Furnace Run watershed to Brecksville trunk of Phase I. | Revise size of Brecksville trunk. |

Alternatives for management of Phase III wastewaters include 1) continuing with the proposed plan, i.e., providing tertiary treatment until 1995 and provide for Phase III 2020 flows in Phase I of CVI 2) provide tertiary treatment for Phase III until 1995 and construct an interceptor to Southerly parallel to Phase I below Tinker's Creek or 3) continue to provide tertiary treatment in the Phase III area after 1995.

The proposed plan would remove treated effluents from Tinker's Creek in 1995 thereby reducing low flows as discussed in the Environmental Assessment.

Both of the Phase III alternatives which envision a sewer extending the length of Tinker's Creek allow for maximum development of the area with minimum reliance upon pumping stations. With the exceptionof the wetland areas between Streetsboro, Aurora and Solon, Phase III appears to have a high percentage of developable land which could realize considerable pressure for residential and industrial uses. The main difference between these two alternatives is cost. Using the projections in the Environmental Assessment for design flows in the various CVI Phases and using the interceptor slope published in the design drawings (.08 percent), the necessary size of CVI below Tinker's Creek without Phase III flows would be 72". Using the costs per foot of tunneled interceptor published in the Environmental Assessment increased to reflect current costs, the difference in cost between the proposed 96" interceptor and a 72" interceptor would be $112.50 per foot or $3.8 million for the 34,000 foot length of the main interceptor between Tinker's Creek and Southerly. This would be a short term savings. If the Tinker's Creek flows were sewered separately to Southerly in 1995, the cost of constructing a 78" interceptor from Tinker's Creek to Southerly to transport the Phase III 2020 flows would be $17.4 million at today's prices if no I/I rehabilitation was undertaken. However, if 70 percent of the metered inflow from Solon, Bedford Heights and Bedford could be removed (=28 mgd) then the new tunneled interceptor required would only have to carry 67 mgd and could have a diameter 66" at a cost of $15.9 million.

Sewerage needs could, however, be met in Phase III by further expansion of the tertiary treatment plans now planned or in place in Phase III. The long term cost effectiveness of following this alternative depends upon actual growth experienced over the next 20 years in Phase III and the costs of upgrading individual treatment plants vs. building a Tinker's Creek trunk line plus including Phase III capacity into Phase I of CVI. Unfortunately no preliminary design was made available for Tinker's Creek trunk so that relative costs can not be determined for all three Phase III alternatives. 201 Facilities Planning should proceed immediately along with planning for Phase II as a precondition for the Step II grant for Phase I at CVI.

C. Capital Cost Comparison of Proposed and Alternative Phase II Plans.

Proposed Plan

The proposed plan for transporting wastewater to the Phase I interceptor requires the installation of the following system:

1. Approximately 11,500 feet of 18 inch R.C. gravity pipe.

2. Approximately 5000 feet of 8 inch forced main and a pumping station.

The above system will serve Richfield and transport their wastewater to the beginning of a tunneled interceptor located at Peninsula near the Cuyahoga River. This interceptor will follow in a northerly direction to Jaite, at which point it will increase in size and continue in a northerly direction to connect with the Phase I interceptor at Brecksville. The two interceptor sections are composed of:

1. Approximately 1900 feet of 24 inch tunneled pipe from Peninsula to Jaite installed at a slope, S = .002.

2. Approximately 2100 feet of 54" tunneled pipe installed at a slope, S = .0007.

3. Approximately 6000 feet of 42 inch R.C. gravity pipe from the tunneled interceptor, following Highland Road east, to the Brandywine Trunk sewer.

The transport piping system described above will not be included in the alternative plan. The remainder of the proposed Phase II, piping system, the Upland Brandywine Creek Trunk, will be common to both plans.

Installed Cost of Proposed Phase II System

Richfield to Peninsula

| | | |
|---|---|---|
| 1. | 11,500 feet of 18" R.C. gravity pipe - | $.3565 Million |
| 2. | 5,000 feet of 8" force main - | .1100 Million |

Peninsula to Brecksville

| | | |
|---|---|---|
| 3. | 19,000 feet of 24" tunneled interceptor - | 5.700 Million |
| 4. | 21,000 feet of 54" tunneled interceptor - | 9.190 Million |
| 5. | 6,000 feet of 42" R.C. gravity sewer | .246 |
| | Total Installed Cost-Proposed Plan | $15.6025 Million |

## Alternative

The alternative plan for Phase II requires the installation of the following system:

1. Approximately 5,000 feet of 18 inch R.C. gravity pipe

2. Approximately 9,500 feet of 8 inch force main and a pumping station.

The above system will serve Richfield and transport its wastewater to the Brecksville Trunk north of the Veterans Hospital on Old Route 1.

The communities located on the east side of the Cuyahoga River will be served by the following system:

1. Approximately 14,000 feet of 24 inch R.C. pipe, installed at a slope S = .005 following natural grade. This pipe will begin at Boston Heights and follow a northerly direction to Highland Ave., connecting to the proposed Brandywine Creek Trunk.

2. Approximately 30,000 feet of 48 inch R.C. pipe, installed at a slope S = .002, following natural grade. This pipe will follow the abandoned railroad right of way, north to Sagamore Road, connecting to the proposed Hawthornden Trunk.

The municipalities of Peninsula and Boston Township will be served by a 0.7 MGD, AWT plant. This design capacity will satisfy a projected combined population of 1,500 in the year 1995 for these communities.

Installed Costs of Alternative Phase II Plan

Richfield to Brecksville

| | | |
|---|---|---|
| 1. | 5,000 feet of 18 inch R.C. gravity pipe - | $0.155 Million |
| 2. | 9,500 feet of 8 inch force main Boston Heights to Brecksville | 0.209 Million |
| 3. | 14,000 feet of 24 inch R.C. gravity pipe | 0.546 |
| 4. | 30,000 feet of 48 inch R.C. gravity pipe | 1.575 |
| | Total Pipe Cost | 2.485 |
| 5. | Install a 0.7mgd AWT plant | 2.100 |
| | Total installed cost - Alternate Plan | $4.585 Million |

Economic Analysis of Phase II Plans:

Reduced installed costs for Alternative vs. Proposed Plan for Phase II.

| | |
|---|---|
| Total Cost Proposed Plan - | $15.6025 M |
| Total Cost Alternate Plan - | 4.5850 |
| Reduction in installed costs | $11.0175 M |

Based on the above capital costs the alternate plan requires the minimum capital investment.

D. Capital Cost Comparison of Proposed and Alternatives for Phase III Plans.

The proposed plan for Phase III is to install a wastewater transport system for a distance of approximately 21 miles of Trunk sewer. This system will begin in the area of Streetsboro and travel in a north-westerly direction and connect to the Phase I interceptor at Tinker's Creek.

Alternate 1 - will elminate the 21 mile Trunk line by installation of 5 AWT plants sized to accommodate the 1995 projected population. These plants will then be expanded to satisfy the projected 2020 year population. The 96 inch tunneled interceptor required for Phase I will be reduced to a 72 inch tunneled interceptor by vir of the reduced design flow attributable to Phase III.

Alternate 2 is similar to alternate 1 except in the year 1995, operation of the 5 AWT plants is discontinued. Instead the 21 mile Tinker's Creek Trunk system is installed along with a 78 inch tunneled interceptor parallel to the 72 inch main interceptor installe in Phase I.

Installed Costs of Proposed Phase III

Capital Costs for Treatment at Southerly of 80 mgd Phase III

design flow (34 mgd wastewater and infiltration and 46 mgd of inflow).

| | | |
|---|---|---|
| 1. | Wastewater & infiltration - 34 X $956000/Mgd - | $32.5 Millior |
| 2. | 28 Percnet of 46 mgd inflow - X $224325/Mgd - | 2.9 Millio. |
| 3. | 72 Percent of 46 mgd inflow - X $ 50229/Mgd - | 1.6 Milli |
| | Total lost for treatment at Southerly | $37.0 Milli |

Capital Cost for Conveyance of 80 Mgd

1. 25,000 feet of 96 inch tunneled interceptor @ $600. 15.0 Million

2. Tinker's Creek Trunk - 21 miles (built in 1995) 7.0 Million

Summary

| | | | |
|---|---|---|---|
| 1978 Capital Investment | $37 + 15. | = | 52.0 Million |
| 1995 Capital Investment | | | 7.0 Million |

Installed Costs of Alternate 1, 5 AWT Plants for 1995 and updated for 2020.

A - Treatment Plants

| | | Cap. Inv. 1978 | 1995 Additional Cap. Inv. |
|---|---|---|---|
| 1. | Bedford | 7.02 | 2.25 |
| 2. | Bedford Heights | 8.05 | 5.46 |
| 3. | Solon | 7.35 | 5.06 |
| 4. | Twinsburg, Aurora, Macedonia | 9.78 | 6.60 |
| 5. | Streetsboro, Remindersville | 4.10 | 6.83 |
| | | $36.3 Million | $26.2 Million |

B - Reduction in Phase I Interceptor Size

25,000 feet of 96" tunneled interceptor @$600/ft - $15.0 Million

25,000 feet of 72" tunneled interceptor @$487.50/ft 12.2 Million

Reduction in Capital Cost $ 2.8 Million

Summary

| | |
|---|---|
| 1978 Capital Investment | 36.2 Million |
| 1978 Reduction in Capital Investment | 2.8 Million |
| 1995 Capital Investment | 26.2 Million |

Installed Costs of Alternate 2, 5 AWT Plants
to 1995 Then Salvaged

Installation of Tinker's Creek Trunk, 21 miles, and 2,500 feet of 78 inch tunneled interceptor from Tinker's Creek to southerly treatment.

| | | |
|---|---|---|
| 1. | Five AWT plants to 1995 - | 36.3 Million |
| 2. | Salvage Value of 5 AWT plants (25%) | 9.0 Million |
| 3. | Tinker's Creek Trunk, 21 miles | 7.0 Million |
| 4. | 25,000 feet of 78 inch tunneled interceptor @ $512.50 = | 12.8 Million |

Summary

| | |
|---|---|
| 1978 Capital Investment - | 36.2 Million |
| 1995 Capital Investment 7.0 + 12.8 - | 19.8 Million |
| 1995 Credit for Salvage Value of Facilities | 9.0 Million |

Economic Analysis of Capital Investment of the
Proposed Phase III Plan, and Alternates
1 and 2.

In order to equate 1978 dollars, and those invested in 1995, the capital investment dollars required in 1995 will be discounted over 17 year at 7 percent. The discount factor is 0.3177 for these conditions. Based on this the Present Worth of the three plans are composed as follows:

| Phase III | 1978 Capital Investment Million | 1978 Reduction In Capital Investment For 72" vs. 96" Pipe Million | 1995 Cap. Inv. Discounted by 0.3166 Million | 1995 Salvage Value of AWT. Plants Million | Net Present Worth Million |
|---|---|---|---|---|---|
| Proposed Plan | 52.0 | 0 | 2.22 | 0 | $54.22 |
| Alternate -1 | 36.2 | (-2.8) | 8.3 | 0 | 41.70 |
| Alternate -2 | 36.2 | (-2.8) | 6.27 | (-2.85) | 36.82 |

The present worth of alternate 2 is $17.4 million less than for the proposed plan and $4.88 million lower than for alternate 1. Therefore this is the least cost plan assuming that 0 & M costs are roughly equal regardless of which plan is adopted.

E. Slope of the Interceptor

The slope of the main interceptor is a significant parameter affecting design flow capacity of the tunneled interceptors. The design drawings showed that the slope of the 96 inch and 78 inch interceptors was .08-.07 and .06 percent respectively. These are very low values and it is apparent that increasing these slopes would possibly provide sufficient increases in capacity to permit the reduction in the size of these conduits.

Review of the detail design plans indicates that a principal consideration governing the level at which the main interceptors may be placed is the need to run trunk lines under the Cuyahoga River. There are four such trunk lines included in Phase I of the project. It is noted that these trunk lines have 1.0 percent to 0.6 percent slopes beginning at drop man holes on the east side of the river. The pipes entering these manholes from the area served are as much as 10 feet above the pipe leaving the manhole and passing under the river to connect to the main interceptor. Thus, in each case it is possible to raise these trunk lines without interfering with the discharge from the area served by reducing the slopes of these trunk lines and raising the elevation of the entire interceptor. This approach permits an increase of the slope of the main interceptor by about 80 percent. As a result it is possible to reduce the interceptor north of Tinker's Creek from 96 to 84 inches diameter and the 78 inch pipe to 70 inches. This evaluation is predicated on a 132.7 mgd design flow (see Section 4). The results of slope analysis are summarized in Table 3-2. The proposed interceptor sizes and slopes listed are those shown on the design plans. The "alt." (alternative) values shown are suggested alternative pipe elevations, sizes and capacities. The cost reductions generated by increasing the slope of the interceptor and decreasing its size from the 96" and 78" is tabulated below:

| | | |
|---|---|---|
| 96" | reduced to 84" | reduces installed cost by $1.56 Million |
| 78" | reduced to 60" | reduces installed cost by $ .625 Million |
| | | Total Reduction in Cost $2.187 |

There would be cost reductions other than those attributable to reduced interceptor size. Many of the manholes and access holes will be from 2 to 25 feet shallower. The cost reductions would be fairly substantial particularly for those access shafts that can be reduced in depth by 15 to 25 feet.

Table 3-2. Proposed and Alternate Slope Configurations and Pipe Capacity.

| CONTRACT | LOCATION | EXISTING GRADE ELEVATION | INTERCEPTOR Invert Elev. Prop. | Invert Elev. Alt. | Slope % Prop. | Slope % Alt. | PIPE SIZE & CAPACITY Proposed Pipe Diam. | Proposed Cap. MDG | Alternate Pipe Diam. | Alternate Cap. MGD | PH. I-II-III 2020 DESIGN FLOW MGD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A | Lift Station | 590 | 544.1 | 540.0 | .08 | .145 | 96 | 168 | 84 | 165 | 132.7 |
| | | 590 | 548.8 | 548.5 | .08 | .145 | 96 | 168 | 84 | 165 | 132.7 |
| B | Valley View #1 | 615 | 551.8 | 554.0 | .08 | .145 | 96 | 168 | 84 | 165 | 132.7 |
| | Trunk | River 580 | 560-556 | 560-557 | .60 | .45 | 21 | 8 | 21 | 7 | 0.8 |
| | | 603 | 554.0 | 558.0 | .08 | .145 | 96 | 168 | 84 | 165 | 132.7 |
| C | Valley View #2 | | 555.3 | 560.5 | .07 | .134 | 96 | 158 | 84 | 158 | 132.7 |
| | Trunk | River 584 | 564-557 | 568-564 | 1.0 | .57 | 30 | 26 | 30 | 21 | 6.1 |
| | Tinker's Creek | 608 | 562.6 | 572.5 | .07 | .12 | 96 | 158 | 84 | 152 | 132.7 |
| D | Walton Hills | 608 | 566.1 | 578.5 | .06 | .10 | 78 | 85 | 60 | 54 | 51.1 |
| | Trunk | River 600 | 583-569 | 585-581 | .60 | .2 | 36 | 34 | 42 | 30 | 4.2 |
| | Hawthornden | 622 | 568 | 582.0 | .06 | .10 | 78 | 85 | 60 | 54 | 51.1 |
| | Trunk | River 600 | 578-570 | 586-584 | .10 | .25 | 24 | 15 | 30 | 21 | 3.0 |
| | Brecksville | 620 | 570.7 | 595 | .06 | .28 | 78 | 85 | 60 | 92 | 51.1 |

There would be cost increases attending the implementation of the increases in the slope of the interceptor. These occur at the lift station which would be increased in depth by five feet. In addition, two access chambers and four manholes would be increased in depth by one to four feet. The Walton Hills Trunk would be increased form a 36" to a 42" pipe for a distance of 2000 of which 100 feet would be tunneled pipe. The Hawthornden trunk would be increased in size from 24" to 30" diamater pipe for a distance of 575 feet.

A review of the year 2020 population served by these two trunks indicates that they are oversized as proposed, however. Therefore, it may not be necessary to increase the size of these trunk lines.

The only reason, other than the elevation of trunks tunneled under the river, which would prohibit changing the interceptor slope would be soil conditions. If soils through which the interceptor will pass have lower bearing strength than soils at greater depth as now planned, then a case could be made for not raising the slope of the interceptor. However, the only portion of the main interceptor which would be raised and which would also be in glacial soil is that above Tinker's Creek (contract D of the 1975 design specifications). Four soil boring samples within this contract segment were tested for unconfirmed compressive strength. Unconfined compressive strength in these four samples ranged from 900 to 1300 pounds per square foot (PSF). The lowest value, 900 PSF, was at a depth comparable to the present design elevation of the interceptor at the point of boring. The other three values, 1170 to 1300 PSF, occurred at higher elevations comparable to the elevation of an interceptor with the alternate, increased slope.

In order to not preclude the alternative of an extended CVI in Phase II by raising the invert 25 foot at Brecksville, the potential slope of a tunneled interceptor starting at Peninsula and remining at least 20 feet below the river bed was estimated from USGS topographic maps. The river falls in excess of .1 percent from Peninsula to Brecksville. Considering that either the main interceptor of Phase II (as shown in the Environmental Assessment) or a trunk paralleling Highland Road would pass under the Cuyahoga River at Jaite, the slope of a sewer passing 20 feet under the river at that point (stream bed elevation approximately 635 feet M.S.L.) and joining a raised CVI at Brecksville could be as great as .075 percent (15 feet in 20,000). This appears to be the most critical segment of the main line in Phse II.

F. Other Alternatives

Another alternative discussed during 1972 and 1973, but eventually rejected and not discussed in the Environmental Assessment among the various alternatives was the construction of a sub-regional plant near the site of the present Jaite Paper Mill at the mouth of Brandywine Creek.

This plant, which would serve the Richfield-Furnace Run-Boston-Peninsula area, has the disadvantage of discharging effluent and incinerating sludge in the midst of the Cuyahoga Valley National Recreation Area and was not discussed in the Assessment, probably because it did not immediately affect the Phase I area.

# CHAPTER 4
# DESCRIPTION OF PROPOSED ACTION

## A. General

The proposed action is construction of the Phase I Cuyahoga Valley Interceptor, lift station, and trunk sewers as discussed on pages 130-136 and in Figures 21, but not 23 or 24 of the Environmental Assessment, with alternate routings of the trunk sewers and alterations to protect archaeological sites as described below. A description of some of the trunk alternatives is provided on pages 105 to 109 and in Figures 17-19 of the Environmental Assessment, with cost figures in Table 23.

In his letter of November 14, 1975, the Director of the Cleveland Regional Sewer District stated that the Brooklyn Heights trunk sewer is being redesigned and the proposed lift station plans are being reviewed to reduce costs.

## B. Routing

The construction we propose differs from CRSD's in four ways:

1) It adopts alternatives "B" and "C" for the Brecksville Trunk. These alternatives not only avoid disturbance and erosion of the Chippewa Creek stream bed, but when used together are actually more economical. (See Page 106 EA).

2) It adopts alternative "B" for the Maple Heights Trunk, thus avoiding disturbance and erosion of the creek stream bed.

3) It adopts phased construction of the Hawthornden trunk, thus avoiding disturbance of the breeding migration of the Sagamore Road spotted salamander colony.

4) It adopts the changes proposed by Dr. David Brose as part of his archaeological survey of the proposed CVI route, including:

a) Shifting of the Hillside trunk connection to the east east side of the CVI to safeguard the Access Area 11 site.

b) Elimination of ground disturbance in the northeastern portion of Access Area 3.

c) An archaeological salvage of proposed Access Area 4.

## C. Sizing Rationale

The sizing we propose is slightly below that suggested by the Cleveland Regional Sewer District in the Environmental Assessments. Although revised design parameters (summarized below) differ appreciabl from the applicant's, the cumulative effect of these is to strongly support modest downsizing.

Individual design considerations are:

1) Population Projections

CRSD's final design population was 313,000 people in 2020 for a 169 MGD sewer. As analyzed in Chapter 2, EPA's own range of projections for the total 2020 service area centered around 280,000. Both NOACA and the Cuyahoga County Regional Planning Commission are now preparing new projections, based on a cohort-survival model. These should be issued by July or August, 1976, and may provide an important cross-check on the EPA projection and ranges of population. The 280,000 population is, however, essentially a compromise figure, as likely to be unattained as exceeded, and should be tentatively useful as a base for sizing.

2) Water Use

Water use in 1975 within the developed sections of the study area can be taken as a guide to water use in 2020 throughout the study area. The analysis of water billing records presented in Section 2.B.3 indicates that developing areas show relatively low per capita domestic water consumption rates. As commercial and public facilities development follow the residential development, domestic water consumption rates increase to a level just above 70 gallons per capita per day (gpcd). Since the study area should not have achieved full development by 2020, the figure of 70 gpcd is used to estimate future domestic water consumption for the study area. Applying this rate to the populations predicted in Table 2-49 for the CVI phases, the 2020 domestic water usage would be:

| | |
|---|---|
| Phase I | 6.762 mgd |
| Phase II | 3.514 mgd |
| Phase IIIA | 4.515 mgd |
| Phase IIIB | 4.823 mgd |
| | 19.614 mgd |

Since not all metered water is disposed of as sanitary wastewater, this figure would be somewhat high if used as a domestic wastewater projection. An accepted consumptive loss is 20 percent. However, no consumptive loss will be included here in order to provide a conservative estimate that will account for greater growth or higher water consumption rates than predicted.

The second major source of wastewater will be industry. A generous wastewater estimate of 125 gallons per manufacturing employee was calculated in Section 2.B.3. The employment: population ratio derived in Section 2.B.5 for the study area in 2020 was 0.35. Using the CVI population projections in Table 2-49 with this ratio, the 2020 study area employment would be 98,000 of which 50 percent would be manufacturing employees if 1972 proportions between manufacturing and total employment stabilize. (But see Section 2.B.5).

The most suitable and attractive areas for manufacturing plants in the CVI study area are found in the upland regions east of the Cuyahoga Valley. Extensive rail and highway routes in this area and the relatively even terrain are likely to attract industry. The presently high costs of treated water in the outlying suburbs (see Section 2.B.3) may act to deter industrial development. Other areas that already have industrial facilities and/or have some relatively even terrain are the northern part of Phase I near the Cuyahoga River and drainage divides in Phases I and II west of the Cuyahoga Valley National Recreational Area. Considering the present distribution of manufacturing employment (see Section 2.B.5, Table 2-54) and the attractiveness of land in the various Phases of CVI, the distribution of manufacturing employment and industrial water consumption by phase is estimated to be:

| | 2020 Manufacturing Employment | 2020 Industrial Water Consumption |
|---|---|---|
| Phase I | 15,000 | 1.875 mgd |
| Phase II | 5,000 | .625 |
| Phase IIIA | 20,000 | 2.500 |
| Phase IIIB | 9,000 | 1.250 |
| | 49,000 | 6.125 |

As with domestic water use, some portion of this water will not be returned to the sewerage systems. Also, depending on industry decisions in regard to joint treatment; some of the wastewater may be treated and discharged to streams by industry. Considering the entire amount of projected water use as sewage, therefore, makes these projections a very liberal industrial wastewater estimate for 2020.

A minor amount of water consumption and wastewater generation will result from use of the CVNRA. The National Recreation Area, if developed in accordance with the draft general management plan (NPS 1976), will be capable ultimately (after 1966) of serving between 6 million and 8 million visits annually. A visit is counted as one person attending the park facilities for a day. Seventy-five percent (4.5-6 million) of that yearly use is expected to occur during the period from 1 April to 31 October (By telephone, Mr. Michael Donnelly, Planner, NPS, 2 August 1976). A yearly average of from 19,000 to 28,000 visitors per day theoretically would be expected at the park. The NPS draft management plan states that proposed facilities could ultimately accommodate between 35,000 and 45,000 people per day while providing for an "optimal visitor experience."

Existing metropolitan parks and other recreational facilities in the NRA area currently serve between 3 million and 3.5 million visits per year. NPS projects that the NRA will be visited by 4.7 million persons annually by 1986, and by 6.3 million persons annually by 1996. No further projections were given, but that the park would reach its ultimate capacity (8 million visits annually) sometime after 1996.

The maximum visitor capacities have been disaggregated and assigned to each of the ten management zones designated in the draft park plan (NPS 1976). Projected water demand (potable) varies with the types of activities specified for each zone and ranges from 5 gallons/person/day to 20 gallons/person/day.

By 1996, total potable water demand will equal 94.5 million gallons per year, assuming a generous water consumption figure of 15 gallons per person per visit-day. Assuming a peak-day use of 45,000 persons, the peak daily demand would be 675,000 gallons. By the time the ultimate visitor use of the park is reached, the yearly demand will increase to 120 million gallons. Existing projections do not include sufficient data to allow calculations of peak daily demand once the ultimate visitor capacity is reached. No supply for this water has been specified by NPS.

The NPS estimated that each visitor to the park would generate 3.5 wastewater gallons per day. By 1996 total wastewater flows would equal 22 million gallons per year, and 28 million gallons per year when the ultimate park capacity is reached. Peak daily wastewater flows will approach 157,500 gallons per day for the active park.

Park areas in the Phase I Service Area of CVI would daily serve from 11,500 persons to 14,500 persons, or about 33% of the ultimate visitor capacity. Peak wastewater flows from this section of the park, 53,000 gallons per day, can easily be handled by CVI.

Park areas in the Phase II Service Area of CVI would serve daily from 8,500 persons to 10,500 persons, or about 24 percent of the ultimate visitor capacity. Peak wastewater generation would be 69,000 gallons per day. The remainder of the park, which will receive about 43 percent of the use, is outside the CVI study area. This southern end of the park could be served by Phase II of the CVI, if its service area were extended to the south.

Phase III of the CVI will not serve any segment of the NRA.

In addition to inside-the-park wastewater generation, approximately 26 percent of park visitors are likely to seek overnight accommodations near major entrances to CVNRA. At ultimate usage of the park, approximately 11,300 persons on peak days will need such facilities. Assuming they all are accommodated in Phases I and II of CVI in proportion to park usage in those phases and that each person generates 30 gpd that would not be attributable to ordinary commercial wastewater flows (a portion of the 70 gpcd domestic wastewater generation rate), then Phase I overnight visitor wastewater flows would be .15 mgd and Phase II .19 mgd.

Anticipated 2020 water consumption by CVI phase and by type of consumption is summarized in Table 4-1. These water consumption projections are carried forward as projected wastewater generation figures without taking deductions for consumptive losses. This

results in wastewater flow projections that are perhaps 20 percent high. These flows are doubled in Table 4-1 to show the design peak wastewater flow rate for each phase in 2020.

3) Inflow

CRSD's inflow figure has two components:

a. measured inflow from existing sewered areas as tabulated in Table 17 of the Assessment, and

b. calculated inflow for existing sewered areas not metered.

Of the Assessment's 84.4 MGD of inflow 59.7 MGD is existing metered inflow and 24.7 MGD is calculated unmetered inflow. The method of calculation is described on page 88 of the Assessment. All inflow figures have been adjusted for a standard design precipitation of 0.88 inches in one hour with a one year recurrence interval.

a. Metered Inflow

Five of the nineteen plants metered, with about 35 per cent of the nominal acreage, contributed about 75 per cent of the metered inflow.

| Plant | Population Served | Nominal Acreage | Dry Weather Sewage Flow(MGD) (includes infilt) | Metered Design |
|---|---|---|---|---|
| Bedford Hts. 15" | 1500 | 520 | 0.80 | 13.78 |
| Bedford STP | 19,000 | 2050 | 2.39 | 11.86 |
| Brecksville | 7800 | 3700 | 1.27 | 7.39 |
| Bedford Hts. eld. | 12,200 | 2050 | 1.83 | 6.36 |
| Macedonia #15 | 7981 | 1908 | 1.75 | 5.48 |
| | 29,481 | 10,228 (35%) | 8.04 | 44.87 (75%) |

At these plants inflow is between three and seventeen times dry weather flow. A cost-effective reduction of 20 per cent (9 MGD) by 2020 is not unreasonable, as some of the combined sewers will age and need replacement. Individual infiltration and inflow studies of the various contributing systems are underway, but will not be completed for at least a year. The high inflow figures also suggest that should the interceptor turn out to be underdesigned by 2020 additional capacity might be obtained by inflow reduction. The applicant, in its Cleveland Southerly Infiltration and Inflow Study, treated the whole Southerly service area as a unit, concluding that for the total Southerly service area it would be cost effective to pump and treat the entire I&I component.

Table 4-1. 2020 Water Consumption and Wastewater Flow Projections for CVI by Phase and Type of Water Use.

| | Domestic (mgd) | Industrial (mgd) | CVRNA (mgd) | Park-Related Commercial (mgd) | Total (mgd) | Wastewater Flow (Totals x 2) (mgd) |
|---|---|---|---|---|---|---|
| Phase I | 6.762 | 1.875 | .053 | .150 | 8.84 | 16.7 |
| Phase II | 3.514 | .625 | .060 | .190 | 4.40 | 8.8 |
| Phase IIIA | 4.515 | 2.500 | 0 | 0 | 7.02 | 14.4 |
| Phase IIIB | 4.823 | 1.250 | 0 | 0 | 6.07 | 12.2 |
| | | | | | | 53.1 |

b. Unmetered Inflow

As shown in Table 2-24, the actual sewered area used to calculate inflow rate per acre is considerably smaller than that shown in Table 17 of the Assessment. The 4000 gallons per acre per day figure developed on page 89 is relatively high for two reasons:

1. The very high (at least 27,000 Gallons Per Acre Per Day) inflow figure for the Bedford Heights 15" plant is averaged in, significantly distorting the inflow rate.

2. The rate generated is applied throughout the total service area. A phased calculated inflow figure would produce the following approximate results:

| Phase | Unmetered Sewered acreage | Phase Inflow Rate (GAD) | Calculated Inflow (MGD) |
|---|---|---|---|
| I | 2485.0 | 2845 | 7.06 |
| II | 517.5 | 2244 | 1.16 |
| IIIa | 117.5 | 6230 | 0.73 |
| IIIb | 3085.0 | 2068 | 6.38 |
| | | | 15.33 |

4. Infiltration

Infiltration was calculated in the Southerly I/I report for new collecto sewers and for sewer service areas not metered in the I/I study. The method used there depended upon service area acres as the common denominator between metered and unmetered or future systems. Since specifications for infiltration in new sewers is based upon the inch-miles of sewer constructed, not acres served, it would be more accurate to project future infiltration based upon estimates of sewerage required to serve populations (present and future) which are presently unsewered. Also, calculated infiltration in the Environmental Assessment uses an unreported acreage figure for unmetered but presently sewered areas. The only published infiltration figure which includes the calculated infiltration in existing sewers refers to 1980 infiltration and apparently includes an allowance for 17,000 acres of newly sewered (1975-1980) service area.

Infiltration for unmetered, existing sewered acres is calculated by applying the 500 gpad of the Environmental Assessment to actual unmetered, sewered acreage by phase as follows:

| Phase | Unmetered Sewered Acreage | Phase Infiltration Rate (gpad) | Recalculated Unmetered Infiltration (mgd) |
|---|---|---|---|
| I | 2485.0 | 500 | 1.24 |
| II | 517.5 | 500 | .26 |
| IIIA | 117.5 | 500 | .06 |
| IIIB | 3085.0 | 500 | 1.54 |
| | | | 3.10 |

In order to estimate the amount of sewer in inch-miles required to serve existing unsewered population and new development, the number of inch-miles of sewer per 1000 people served in Brecksville was calculated from service area population (7,800 reported in the Southerly I/I Analysis and the Environmental Assessment) and the sewer pipe inventory (251 inch-miles reported in the Southerly I/I Analysis). The 32.2 inch-miles of sewer per 1000 population will likely over-estimate the actual amount of sewer to be constructed since the sewered area population density in Brecksville (4.27 persons per sewered acre) is low for areas with central sewage facilities.

Populations served by private septic systems (existing unsewered) from Table 2-28 and 1975-2020 population increases predicted by the EPA-RPI and NEFCO projections in Tables 2-42 and 2-43 adjusted by the ratio of 2020 populations in and out of the study area (see Table 2-49), were added by municipalities to calculate populations that will require new sewers. Summaries of populations and infiltration by phase are presented in Table 4-2.

EPA specifications for new sewer construction set a maximum for infiltration of 200 gallons per day per inch-mile (gpdin) of sewer. Aging of sewer pipes will cause this rate to increase over time.

The infiltration rate used in Table 4-2 is 600 gpdin assuming that infiltration will triple. The use of this safety factor plus the overestimation of future sewer requirements caused by using Brecksville data combine to make the 3.25 mgd future CVI infiltration rate a high figure.

Total infiltration in each phase of CVI in 2020 would be the sum of metered infiltration recalculated unmetered infiltration and future infiltration in new sewers. These values are:

| Phase | Metered Infiltration (mgd) | Recalculated Unmetered Infiltration (mgd) | Future Infiltration (mgd) | 2020 Total (mgd) |
|---|---|---|---|---|
| I | .64 | 1.24 | 1.20 | 3.08 |
| II | .95 | .26 | .74 | 1.95 |
| IIIA | 3.17 | .06 | .46 | 3.69 |
| IIIB | 1.54 | 1.54 | .85 | 3.93 |
| | | | | 12.65 |

## 5. Cost-Effective Evaluation of I/I Rehabilitation

A letter dated 10 May 1976 from the Director of OEPA certifies that "the Cuyahoga Valley Interceptor may be subject to excessive infiltration/inflow as defined in 40 CFR 35.927." (See Section 7). The cost effective analysis of I/I Rehabilitation reported in the Cleveland Southerly Infiltration and Inflow Study (CRSD, 1975) concluded

Table 4-2. Future Infiltration

| Phase | Population Requiring New Sewers by 2020 (1000 persons) | Inch Miles per 1000 Persons[a] (in-mi/1000) | Future Sewer Needed (in-mi) | Future Infiltration at 600 gpdi (mgd) |
|---|---|---|---|---|
| I | 62.26 | 32.2 | 2005 | 1.20 |
| II | 38.06 | 32.2 | 1225 | .74 |
| IIIA | 23.86 | 32.2 | 768 | .46 |
| IIIB | 44.28 | 32.2 | 1426 | .85 |
| | | | | 3.25 |

[a]Based on population served and pipe inventory for Brecksville.

that, for the entire Southerly service area, it was not cost-effective to rehabilitate existing sewers. However, the analysis considered only two alternatives: attempting to remove all I/I and treating all I/I. The cost-effectiveness of identifying the most easily remedied sources of I/I and an estimate of how much peak flow reduction could be achieved cost-effectively is not analyzed. Also because most of the sewers in the CVI study area are relatively new and have a much lower proportion of combined sewers, the difficulty of rehabilitation reflected in rehabilitation cost estimates presented in the I/I analysis probably does not pertain to the smaller CVI study area. Considering that more than half the design flow for CVI is I/I, a more specific analysis of rehabilitation cost effectiveness and the effects of rehabilitation on CVI design flows seems appropriate.

In order to evaluate the possible cost effectiveness of selectively rehabilitating sewers, the six CVI municipalities with the most significant inflow are analyzed using data from the CRSD report except for Solon for which a detailed I/I study has been completed (Floyd G. Browne & Assoc., 1974). The six municipalities are Brecksville, Macedonia, Hudson Township, Bedford, Bedford Heights and Solon. Since Brecksville is the only municipality for which a sewer size inventory is published in the I/I report, the assumption was made for the five municipalities excluding Solon that the amount of installed sewer per 1000 users is the same in the other five municipalities as in Brecksville. Further, it was assumed that the intensive rehabilitation program costed out in the I/I report for the entire Southerly service area would be performed but would only be 70 percent effective in removing both infiltration and inflow to be conservative. The rehabilitation program costed for Southerly envisioned a complete physical survey, inspecting and cleaning 50 percent, replacing 50 percent of the sewers and repairing or replacing 15 percent of the sewer connections. It is felt that 50 percent replacement of sewers in these municipalities is very conservative and not necessary in the short run. Replacing this proportion of sewer would concurrently include repair or replacement of most improper house connections. To avoid double counting but also to remain conservative, the 50 percent replacement figure is used to account for both replacing irreparable sewer and remedying improper house connections.

The amount of I/I removed from these six municipalities would be a total of approximately 40 mgd as tabulated in Table 4-3. Also in Table 4-3 the costs for rehabilitation calculated by the method described above are presented.

The costs for transporting and treating this amount of I/I must be weighed against the cost of rehabilitation. Conveyance costs were calculated as the difference in cost between various sizes of the main line interceptor that would be attributable to I/I reduction only. No cost savings from reducing trunk sewer sizes is included. The cost of treatment for infiltration was determined assuming that infiltration would receive complete treatment of Southerly. However, only 28 percent of inflow was assumed to

Table 4-3. Assumed Reduction in I/I for Six CVI Municipalities at 70 Percent Reduction.

| Municipality | Reduction in: Infiltration (mgd) | Inflow (mgd) | | Rehabilitation Cost (million dollars) |
|---|---|---|---|---|
| Brecksville | .27 | 5.17 | | 1.300 |
| Macedonia | .67 | 3.84 | | .567 |
| Hudson Twp. | .11 | 1.93 | | .538 |
| Bedford | .34 | 8.81 | | 2.269 |
| Bedford Heights | .48 | 14.10 | | 1.715 |
| Solon* | .46 | 3.50 | | .485 |
| | 2.33 | 37.35 | = 39.68 mgd | 6.874 |

*Data for Solon is from Floyd G. Browne & Assoc., 1974.

Note: Costs are in terms of January 1976 dollars.

receive complete treatment because of design flow 72 percent of the inflow would be bypassed after transport and primary treatment. A summary of transport and treatment costs is presented in Table 4-4. This table assumes that 70 percent of I/I in the six municipalities cited is removable.

The total cost for transport and treatment of the 40 mgd, therefore, is calculated to be $8,519,000. The net cost benefit of rehabilitating the sewer systems in these four municipalities, is:

| | |
|---|---|
| $8,519,000 | Transport and treatment (No rehabilitation) |
| -$6,874,000 | Rehabilitation |
| $1,645,000 | |

It is emphasized that this analysis is based upon some assumptions which are not verified by field data. With the exception of using service area population in Brecksville to estimate the amount of sewers in other municipalities, however, the assumptions made are comparable to those made by CRSD in the prior cost benefit on the entire Southerly service area.

The time required to perform the sewer evaluation surveys necessary to acquire field data is a minimum of four to six months. Because the field work for evaluation surveys is best conducted during the period of February to May, the construction of Phase I CVI could be delayed should it be desired to redesign the interceptor on the basis of adequate I/I information.

Regardless of the impact of I/I rehabilitation on the design of the Phase I interceptor, the information derived from detailed sewer studies in the entire CVI study area is necessary for future sewer facilities planning. This data collection and analysis should proceed immediately in the form of Sewer System Evaluation Surveys for all of the existing collector systems in the study area as part of the Step II grant for Phase I CVI.

6. Design Flows

Incorporating the above considerations and estimates, Table 4-5 shows projected 2020 design flows for CVI by phase and source of flow.

These projections are based on several assumptions that cause the flows to be quite high:

- That the entire 2020 residential population will be served by central sewage facilities. This would require sewering all future low density residential areas and elimination of all existing private septic tank sewage disposal systems. Elimination of private septic tank systems which discharge to streams is highly desirable but practically infeasible considering the

Table 4-4. Transport and Treatment Costs for I/I in Six CVI Municipalities. Based upon cost data from CRSD, 1974.

Treatment

| | | |
|---|---|---|
| Infiltration | Capital costs | $956,000/MGD |
| | O&M costs | 181,215/MGD |
| 28 percent of inflow provided full treatment | Capital costs | 224,325/MGD |
| | O&M costs | 9,702/MGD |
| 72 percent of inflow bypassed after primary treatment | Capital costs | 50,229/MGD |
| | O&M costs | 9,702/MGD |

Transport - Entire mainline CVI can be reduced by one size with removal of 70 percent of I/I from the above six communities.

Brecksville to Tinker's Creek: 78" to 72"
$25/foot x 10,000 feet = $250,000

Tinker's Creek to Southerly: 96" to 90"
$62.50/foot x 25,000 feet = $1,747,500

Note: Costs are in terms of January 1976 dollars.

Table 4-5. Design Flows 2020

| Phase | Wastewater (mgd) | Infiltration (mgd) | Metered Inflow* (mgd) | Calculated Inflow (mgd) | Total (mgd) |
|---|---|---|---|---|---|
| I | 17.7 | 3.08 | 9.08 | 7.06 | 36.9 |
| II | 8.8 | 1.95 | 7.80 | 1.16 | 19.7 |
| IIIA | 14.4 | 3.69 | 31.73 | .73 | 50.6 |
| IIIB | 12.2 | 3.93 | 3.11 | 6.38 | 25.6 |
| | | | | | 132.7 |

*Minus 20 percent for the 5 metered service areas with highest inflow.

economics of sewering low density areas and continuing state and local practice of permitting these systems.

- That there will be no consumptive water losses between water metering and waste disposal. Water losses have been discounted in these projections to account for any unpredictable increases in wastewater generation.

- That all industrial wastewater will be picked up by CVI. The economics of industrial pretreatment with joint final treatment with municipal wastes versus complete treatment by industry may work against some large industries with incompatible pollutants agreeing to joint treatment.

- That only 20 percent of inflow in the five worst metered collection systems be eliminated. Preliminary costing of inflow removal in the six municipalities with the greatest inflow problems indicates that it could be cost effective to conduct extensive rehabilitation programs if 70 percent of inflow is removed. Sanitary sewer evaluation surveys in many sections of the United States indicate that 80 to 90 percent of inflow is usually cost effective to remove. At 70 percent removal for these six municipalities the total design flow in Table 4-5 would be reduced to approximately 100 mgd.

- That all peak flows will occur at the same time in some section of the main interceptor. All of the flows have been added arithmetically, thereby implicitly assuming that wastewater flow peaks and inflow peaks from each of the tributary service areas will coincide. Time of concentration studies have not been conducted to determine the probability of this possibility.

## 7. Conclusion

Notwithstanding considerations of interceptor slope, I/I rehabilitation and alternatives for Phases II and III, a 90 inch diameter interceptor from Tinkers Creek to Southerly and a 66 inch interceptor from the Brecksville sewage treatment to Tinkers Creek would be able to carry the projected flows at the slopes called for in existing design drawings.

Resolution of slope, I/I and phasing considerations would require further analysis and investigation that would require six to nine months to complete at a minimum. I/I and phasing need to be studied for reasons other than design considerations in Phase I. Sewer system evaluation surveys of the collector systems in the entire CVI study area and facilities planning including environmental assessments for Phases II and III should, therefore, proceed immediately. The possible cost savings due to altering the slopes of the main interceptor must be weighed against the time delay involved in reassessing the design slopes.

# CHAPTER 5
# ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

## A. General-Environmental Assessment

The discussion of environmental effects and mitigative measures on pages 137 to 163 is generally quite valid. The project will result in a substantial reduction in BOD and suspended solids discharged to the Cuyahoga River and its tributaries; it will reduce groundwater contamination and allow more consistent treatment of effluent than now possible. This is particularly true in the case of industrial discharges now served by small package plants.

At the same time it will result in lower minimum flow, particularly on some of the tributaries, and will produce the impacts normally associated with sewer construction (loss of trees and vegetation, disposal of spoil, etc). All of these positive and negative impacts are summarized on pages 162 to 163 of the Assessment.

The applicant has planned many useful mitigative measures for use during both the design and construction stages. These measures, summarized below, have been planned to limit impact on sites of archaeological value.

In spite of this, and in spite of the overall excellence of the Assessment, a number of important effects are not discussed, difference of opinion with state agencies and even previous drafts of the same asssessment are not clarified, and several possible mitigative measures are ignored. Discussion of these additional points follows.

## B. General-Cuyahoga Valley National Recreation Area

### 1. The Cuyahoga Valley 1975 Utilities Study.

The conclusion of the Assessment were generally confirmed by the consultant utilities study prepared for the Ohio Department of Natural Resources and used in the Cuyahoga Valley 1975 study. Early portion of this study suggest CVI might be acceptable should changes in construction now planned be undertaken, but goes on to consider questions of secondary and other impact:

#### Assessment of Utility Impacts

##### a. Water and Sewer Facilities

At the northern end of the valley, the proposed Phase I of the Cuyahoga Valley Interceptor Sewer (CVI) will provide service to the communities of Independence, Brecksville, Valley View, and portions of Walton and Sagamore Hills. If the currently proposed construction method is carried out, this line would be tunneled the entire length within the park thus minimizing the potential environmental damages. Tunneling also permits much greater spacing between manholes (1000-2000 feet) and thus

less disturbance to the natural landscape. Sealed manholes at-grade are proposed for a portion of its length from the Brecksville plant to Tinkers Creek Road. However, it is admitted in the CVI environmental assessment that the length of this airtight run will probably cause sewage to turn septic. From Tinkers Creek Road north to Rockside Road manholes are proposed to be elevated above the floodplain. This would create a series of unnatural mounds through the valley floor even with the proposed 50 to 1 side slopes. It is suggested that an alternate method of ventilating the trunk line must be found which will then permit all manholes to be placed at-grade. This, coupled with the tunneling of trunk lines, would appear to make the existence of the CVI, Phase I, within the park acceptable.

According to the projections of the growth and economic activity by both Tri-County Planning Commission and AMATS the area along the east side of the valley will experience significant growth during the next 20 years.* Water distribution lines already extend as far south as Northfield Center Township. Akron water extends northward into the southeastern corner of Northampton Township and also north of Cuyahoga Falls. Lines and facilities to close the gap will most likely occur within the next 5 to 10 years, thus providing the entire eastern side of the valley with adequate water.

The problem at this time that confronts the eastern side and therefore acts as a constraint on development is access to sewer facilities of adequate capacity. There is presently a building ban in effect in the Macedonia-Northfield Center Township area due to inadequacies related to the Macedonia sewer treatment plant. A recent decision by the Ohio EPA** favors servicing this area via the Cuyahoga Valley Interceptor (CVI) and emphasizes the need for accomplishing this within this decade. More specifically, this involves the second phase of the CVI which will extend southward from the existing Brecksville plant, then eastward to connect to the Macdonia plant and other smaller plants in the Hudson area.

Although there were plans developed by the Summit County Sanitary Engineer to expand and upgrade the Macedonia plant, these have apparently been abandoned in favor of the Phase II CVI. The location of this line in the valley as shown on the Utility Location Map is only a first approximation. It is recommended that because of the sensitive nature of the soils, underlying bedrock, heavy forested areas and other ecological considerations in the valley, alternative locations outside the valley should be studied.

The forecast for growth population and economic activities along the western side of the valley over the next twenty years are considerably less than those along the eastern side. This is partly

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*Population Forecast, 1970-2020, Regional Study #53, Tri-County Regional Planning Commission, October, 1972. Population Project 1970-1990, Cuyahoga Regional Planning Commission, Sept '72

**June 4, 1974 letter from Ohio EPA to the Summit County Engineer.

due to the already developed nature of Independence and Brecksville and partly based on the potential for development in the Richfield-Bath Township area.

The bulk of the undeveloped Richfield-Bath area has large lot zoning, inadequate land capabilities for septic systems and no immediate plans to provide sewer and water service to the area. Thus, it is unlikely that growth in this area will occur rapidly. However, there are two small areas which are exceptions to this general premise. Both are served by a small, recently constructed sewage treatment plant and one is served by Akron water. A 200,000 GPD plant at Furnace Run is designed to serve an estimated 570 single family dwelling units. These units are to be located west of Furnace Run near SR 303. The other area is around the Mileti Sports Coliseum which recently constructed a 220,000 GPD treatment facility. This plant is estimated to be approximately twice the capacity needed for the coliseum. The excess capacity will apparently serve either additional housing units or commercial facilities, such as hotels and restaurants.

[EPA note: Recent information provided by NEFCO explains that the 570 unit subdivision has failed for unstated reasons but that the wastewater treatment plant that would have served it has been installed.]

Akron water does serve only the Mileti Coliseum, by contractual agreement with Akron. Any subdivision or community wishing Akron water would have to enter into a similar agreement for the extensions of new lines from Akron. This would appear unlikely to occur unless the potential water buyer could also provide adequate sewer facilities.

Acquisition of the park will mean control of most of the water courses which contain flows adequate to support discharge of any major treatment plant effluent. This is generally true for Furnace Run, its tributaries, and some of the minor tributaries of the Cuyahoga River. This suggests that acquisition of the park will provide a certain amount of control over the density of potential development around the periphery of the park boundary until such time as municipal sewers become available. There are practically no areas within or around the park which are considered adequate for septic systems under the revised criteria of Ohio EPA (See Septic Absorption Systems Map Exhibit XI, Soils/Geology Report).

[EPA note: The above paragraph implies that the National Park Service will have jurisdiction over effluent discharges to streams passing through CVNRA. This is not the case. Ohio Environmental Protection Agency and local health boards are the responsible agencies for permitting effluent discharges to surface water of Ohio].

In the center of the valley, although not entirely within the park boundary, is the Village of Peninsula. On August, 197. Peninsula was officially placed on the National Register of Hist. Places. Although its population is modest (700) it is already the valley's community center and focal point of many visitors wishing to experience the recent restoration of historic and other buildings

within the town. With the establishment of the park, more rapid development can be expected. This coupled with its visitor attractiveness will create pressure in the near future for provision for adequate water and waste water treatment facilities. Phase III of the CVI could come south to Peninsula and Akron water could come north. This would increase pressure for additional development. To control this possibility acquiring scenic easements in the area outside the park boundary should be considered.

2. Specific Inpacts of Phase I on CVNRA

Phase I of the Cuyahoga Valley Interceptor will directly and indirectly impact the Cuyahoga National Recreation Area (NRS). Major adverse effects will result from:

- o The construction of six access shafts and attendant roads.
- o Increased development pressures along the eastern and western boundaries of the NRA.

Benefits will result from:

- o The elimination of the discharge of inadequately treated wastewater to the Cuyahoga River.
- o The provison of a wastewater collection system to serve the northern third of the NRA.

a. Access Shafts

At least six access shafts (12-17) will be needed in the NRA. Each site will require from 1 acre to 2 acres and an access road. Each access raod will connect to the nearest road and will consist of a 30-foot permanent easement and a 30-foot temporary easement. The only exception is access area 17. Because of the sensitive nature of this lowland forest and scrub area, CRSD will acquire a wider permanent easement for access to the site. An ecologist/forester will be employed to selectively route the road to the construction site to minimize disruption of high quality vegetation, wildlife habitat, and drainage. The other access roads (to sites 12-16) could disturb from 0.03 acre to 1.65 acres, each.

Use of the railroad right-of-way for access to sites 15 and 16 should be considered. A haul road could be cleared just west of, and parallel to, the railroad. This would shorten the length of access road needed to each site and eliminate the disruption of higher quality lowland forest habitat between Riverview Road and the construction sites. Consideration also should be given to eliminating the stagnant water condition between sites 15 and 16 which is caused by the ponding of water against the railroad embankment. During construction of the haul road, a culvert could be installed under the railroad embankment to eliminate this situation.

Additional access shafts could be required should there be an equipment failure or some unanticipated snag in the tunneling operation. The CRSD is letting construction contracts separately so that each contractor will bore through relatively homogeneous substrate, and thus minimize the probability of equipment hang ups and the need for additional construction sites in the NRA.

The six planned access areas in the NRA are located between Tinkers Creek Road and the southern terminus of Phase 1. They generally lie west of the Baltimore and Ohio Railroad embankment and east of Riverview Road.

Most of this land will be acquired by NPS via scenic easements and no special park activities are planned on this land (NPS 1976). When construction activities have been completed, a sealed, 12-feet by 15-feet, concrete slab containing a manhole will be the only structure that will remain.

Access roads to each shaft site should be designed to shield the concrete slab and manhole from the view of visitors using the B&)O Railroad. Proper drainage under the access roads should be provided to prevent the ponding of water which could prevent the establishment of natural vegetation and concurrently supply additional breeding habitat for mosquitoes. Any large ruts at construction sites also should be filled.

CRSD has stated that access sites will be allowed to revegetate naturally. Owing to the transitory nature and quick recovery capacity of floodplain vegetation, the at grade concrete slab will likely be concealed from view within one growing season. NPS, the US Fish and Wildlife Service, ODNR, and other interested agencies should be contacted to develop appropriate management strategies, if deemed appropriate, to enhance the value of these areas to local wildlife. Special consideration will be required at sites 13 and 14 which presently are disturbed.

Depending on the construction method used by each contractor, additional surface disruption along the alignment of the tunnel between access shafts could occur. Some tunneling techniques require air holes and/or alignment holes. CRSD has recently provided graphics indicating that such techniques will be banned from use along segments of the tunneled interceptors and trunks where access routes to hole locations would substantially disrupt high quality vegetation or wildlife habitat.

3. Induced Development Adjacent to CVNRA Due to Phase I

Construction of the Cuyahoga Valley Interceptor will add impetus to pressures for development of areas adjacent to the NRA. About 5,600 feet of the Maple Heights-Garfield Heights trunk will parallel Canal Road. The area immediately east of Canal Road (roughly between Rockside Road and Sagamore Road), presently not proposed for inclusion in the NRA and previously not sewered, will become prime for commercial development. Depending on the types of controls applied to this area by local government (Valley View Village) future development may or may not be compatible with the NRA.

The section of the NRA bounded by Canal Road is open land including the major features of theOhio and Erie Canal and Alexander Mill. The National Park Service anticipates the utilization of Alexander Mill as a "historic scene setter" for visitors entering the park from the north along Canal Road. It is imperative that the use of land along Canal Roal be controlled to preserve and to some degree create a "historic" flavor. The National Park Service should consider acquiring scenic easements on the lowland areas east of Canal Road to guarantee that strip development does not occur.

A similar situation may be generated on lands immediately west of the Baltimore and Ohio Railroad embankment south of Rockside Road. The National Park Service declared that the B&O Railroad line will be an essential component of the internal transportation system of the park (PPS 1976). It is hoped that the railroad will become the major public access to the park from Cleveland and Akron. Commercial establishments will vie for developable land west of the railroad near train stops. No stops have been designated yet by NPS. To insure the integrity of this northern gateway to the park the NPS might need to acquire additional lands outside the current park boundary. A less certain alternative is the application of architectural controls by local government.

4. Park-peripheral Commercial Demand

The Environmental Assessment of the management plan for the Cuyahoga National Recreation Area describes three alternative use plans (NPS 1976b). Alternative C of this Assessment most closely resembles the strategy presented in the "Draft General Management Plan" (NPS 1976a). Regardless of the alternative selected, the National Park Service does not plan to provide overnight facilities at the Cuyahoga National Recreation Area (Interview, Mr. William Birdsel, NPS, 22 July 1976).

"The development of the CVNRA and the ensuing influx of recreationalists will provide major incentives for improving and expanding visitor support services (e.g., gas stations, restaurants, private recreational facilities, and specialty shops) in the valley" (NPS 1976a). It is highly probable that this prospective commercial growth will take place at the immediate periphery of the Park because of the scarcity of land in the Valley.

The National Park Service estimated that benefits to the local economy would be $6.15 million annually. This figure was based on a 4.1 million-person increase in annual visitation and on $1.50 spent per person per day.

Visitation projections for the Cuyahoga National Recreation Area in 1990 were based on the following assumptions:

- 5 percent of users would be from outside the region
- 21 percent of users would be from outside the Cleveland-Akron metropolitan area
- 73 percent of users would be from within the metropolitan area, including more than a 66 percent repeat estimate.

Based on these projections about 26 percent (1,779,214 persons) of the annual visitors may require overnight accommodations. On a given peak day (45,000 persons), therefore, 11,700 persons conceivably could be seeking some sort of overnight lodging. Wastewater flows generated by commercial enterprises serving this number of persons have been included in Phase I and Phase II CVI projections.

Based on the existing information prepared by the National Park Service, it is not possible to estimate what percentage of this visitation will require camp grounds, motels, or hotels. Nevertheless, it is safe to assume that commercial establishments will proliferate on the uplands flanking the National Recreation Area to meet the demand, because no steps have been taken by agencies to forestall this eventuality. Pressure for park related commercial development will be greatest along roads to major park entrances. Many of these areas will not realize this development unless centralized sewer facilities are provided. Phase I of CVI and, potentially, Phase II could eliminate this restriction on commercial development.

5. Mitigating Measures for Impacts of Commercial Development on Neighboring CVNRA Communities

Under the guidance of regional and local planning agencies, the municipalities adjacent to the current boundary of the Cuyahoga Valley National Recreation Area (CVNRA) have formed the Cuyahoga Valley Park Communities Council. The primary goals of the Committee are:

- To gain insight into local concerns.
- To work with the National Park Service to insure a compatible final design and management plan for the CVNRA.
- To prepare the communities for development pressures intrinsic to the CVNRA.

In addition to the local municipalities, seven planning groups attend Committee meetings. These include the Northeast Four County Planning Organization (NEPCO), the Summit County Council of Governments, the Summit County Planning Commission, the Akron Metropolitan Area Transportation Study (AMATS), the Cuyahoga County Planning Commission, the Cuyahoga Valley Park Federation, and the National Park Service.

The Committee currently is reviewing various sign and zoning ordinances to better prepare local municipalities to deal with future and present development pressures. It is hoped that through the efforts of the Committee, development which may be induced by the Park will be compatible with (at least tolerable by) the traditional trends of development in the area and with proposed activities within the CVNRA.

6. Increase in Costs of Park Land Due to CVI

No evidence has been found that indicates that prices paid for park land has or will be increased by speculative buying related to development of CVI.

7. CVI Relationship to CVNRA Sewerage Needs

The National Park Service has not prepared formal statements on the treatment of wastewater flows generated in the NRA. The following general guidelines were contained in the Draft General Management Plan (NPS 1976):

> *The existing utility systems within the valley, particularly water and liquid and solid waste treatment are not capable of servicing facilities much beyond the present level of development and use.*
>
> *The National Park Service will encourage and support the upgrading of sewage facilities serving developed areas within and near the park boundary.*
>
> *The National Park Service generally will oppose federal treatment plant and other facility outfalls that fail to recharge Cuyahoga Basin aquifers. Tertiary treatment and aquifer recharge will be employed wherever feasible at park facilities.*

The third guideline above, if followed, would preclude the necessity of providing centralized sewer service to park area. However, the feasibility of the guideline has not been evaluated.

C. Additional Specific Effects and Mitigative Measures

1. Primary Effects-Natural Environment

a. Water Quantity

Reduction in low flows in study area streams will result from the interception of numerous point source effluent discharges. The largest of these point sources, the municipal and semi-public discharges, will be intercepted as soon as the various phases of CVI are completed since trunk sewers will, as in Phase I, be specifically located and designed for that purpose. Most of the existing industrial discharges are located in close proximity to currently sewered areas or to areas that will likely be reached by extension of sewers. Phase I will facilitate the sewering of several developed areas currently depending on discharging septic tank-filter field sewage disposal systems, i.e., Valley View, Independence, Walton Hills and part of Seven Hills, Brecksville, Broadview Heights and North Royalton.

Date presented in Table 5-1 can be used to compare the present expected low flows (1968 Base Flow plus 1975 Sewage Flow and 1975 Septic Tank Flow) with low flows if all existing point sources are eliminated (1968 Base Flow). Phase I will intercept sewage flows only in Sagamore Creek, Chippewa Creek and part of Tinkers Creek. The estimated septic tank flows will be intercepted only to the extent that new collector systems are installed in these watersheds. Collector sewers are not included in the application for Phase I.

It is evident from the data in Table 5-1 that significant low flow reductions will occur in any of these watersheds when sewage flows are intercepted.

Of particular concern would be the reduction of low flows in Brandywine and Tinkers Creeks. Both of these creeks form scenic falls that are major attractions in the CVNRA. Interception of effluents in these creeks would occur primarily as a result of sewering Phases II and III to Southerly.

Low flows in these creeks after interception of sewage will be due to groundwater and wetland flows and cultural additions such as yard and farm irrigation, car washing, fire hydrant flushing, etc. The expected increase in dependence on Lake Erie as the water supply source for the area may result in groundwater storage gains which could, in turn, increase the groundwater contribution to low flow. In the opposite direction, however, development of wetland areas could reduce this source of water storage, thereby depleting low flows. Cultural contributions would likely increase.

None of these low flow sources can be quantified with available data. These changes in low flow contributions will gain signficance if and when sewage effluents are removed from the area streams.

Increases in flood flows in the area could occur as a result of increased development. This increase would occur as a result of decreased permeability and decreased time of travel. The most significant effect would probably be due to decreased time of travel, or time of concentration as it is usually referred. Time of concentration affects the duration of the storm necessary to cause the maximum flood. As the time of concentration is decreased shorter and more intense storms become more significant. Time of concentration is affected by the slope, drainage pattern, roughness and other factors. The installation of storm sewers in an area can significantly decrease the time of concentration of an area. It it is assumed that the development of the CVI will be accompanied by installation of storm sewers there can be significant increases in the flood intensities in the streams. The magnitude of the effects would be a function of the design of the storm sewer system and therefore cannot be assessed in this study.

Table 5-1. 7 day ten year Flow Analysis for Cuyahoga Valley Interceptor

| Watershed | Base[1] Flow 1968 mgd | Sewage[1] Flow 1968 mgd | Sewage[2] Flow 1975 mgd | Septic Tank[2] Flow 1975 mgd |
|---|---|---|---|---|
| Tinkers Creek | 1.70 | 5.80 | 12.12 | 0.64 |
| Sagamore Creek | 0.0 | 0.68 | 1.20 | 0.32 |
| Chippewa Creek | 0.10 | 0.06 | 0.18 | 0.90 |
| Brandywine Creek | 0.35 | 0.19 | 2.57 | 0.32 |
| Furnace Run | 0.06 | 0.00 | 0.12 | 0.29 |
| Cuyahoga Mainstem | (Direct) | 3.30 | 1.58 | 1.34 |
| TOTAL | 96.0 | 10.03 | 17.77 | 3.81 |

[1] Source: Havens and Emerson 1970.

[2] Values developed for this study.

b. Water Quality

Removal of Phase I effluent should result in improved BOD and suspended solids levels on Chippewa Creek and the Cuyahoga mainstem. Some other pollutants, however, should show relatively little change. Ammonia levels are largely determined by the Akron-Botzum treatment plant; this plant is now being upgraded, and ammonia levels, now ranging from 0.37 to 7.1 mg/l should then decrease. Akron STP effluent and local runoff should also keep other nutrient levels at an excessively high level. Although the source of PCBs in the basin has not yet been determined, experience elsewhere suggests that landfill leachate may be a likely source; if this is the source of the PCBs, not only will they not be removed by the CVI, but in later phases, particularly on Tinkers Creek, concentrations under low flow conditions could be increased several times.

Changes in annual pollutant loadings to area streams due to intercepting existing effluent flows have been calculated and are presented in Section 5.C.3.c.

c. Sagamore Road Salamanders

It is important to note that the Hawthornden trunk is being constructed along existing roadways, and that not only will it be constructed after the normal breeding season, but it also should not increase the width of the open corridor the amphibians must cross during the breeding season.

d. Trunk Sewer Impact on Tributary Stream Valleys

The Maple Heights and Brecksville trunk sewers were originally proposed to be built in part along two undeveloped (and because of their steep slope largely undevelopable) creekbeds. In the case of both trunks the area to be excavated is prime forest. All this makes the failure of the assessment to discuss the merits of alternate routes even more inexplicable.

Discussion of the Brecksville and Maple Heights trunk impacts on pages 143, 144-5, and 147-8 indicate that the trunks proposed will follow small stream valleys up the wall of the Cuyahoga Valley itself through prime mature forest. The unstable nature of area soils and the steep slope, over 25 per cent, raise possibilities of greatly increased erosion which may not be fully checked for years, despite replanting and other mitigative measures (page 148, EA).

On the Brecksville trunk this damage could be completely avoided by adopting Alternatives "B" and "C" (pages 106, 110, EA) which follows Old Royalton and Weise Road right of way, leaving the Chippewa Creek streambed intact. These alternatives are not only preferable in terms of impact, but cost an estimated $12,000 less than those selected in the Assessment.

Similarly Maple Heights Alternative "B" follows the unnamed creek for less than one tenth the distance of alternative A, leaving most of seven thousand feet of prime forested streambed intact, for an estimated $29,000 more (pages 107-8 and Figure 18, EA).

Thus significant damage to areas unlikely otherwise to be developed can be avoided for a total cost of $18,000.

The situation on the Walton Hills trunk is not nearly as serious. Although a portion of the trunk crosses one of the forks of Sagamore Creek between Walton Hills Road and Dunham Road, the slopes are much more moderate, 40 to 100 feet over about one quarter mile, the stream is considered to be intermittent according to U.S.G.S. topographic maps, the length involved is about one seventh that affected by the previous two trunks, and the affected trees are generally secondary growth timber on old pastures and cultivated land.

The alternatives (pages 108-9 and Figure 19, EA) including the unidentified alternative "C", are very expensive ($600,000 to $900,000 more) for the relatively small acreage affected. It is doubtful whether the alternatives even approach cost-effectiveness. The applicant might, however, consider construction during early or mid-summer to allow grass plantings and other measures to control erosion before late fall rains.

As discussed in Section 2.A.2, aerial photographs in engineering plans show signs of soil slump along the route proposed by the Valley View #2 trunk line. Damage to sewer laid through such areas would result in exfiltration which could accelerate the rate of soil slumping. On-site soil investigations are required in this area.

The Walton Hills trunk Alternative "B" parallels Schreiber Road and for a portion of its length appears to be very close to Class IV soils that might possibly be avoided. Design of this sewer should minimize the amount of Class IV slopes traversed by the open cut for the sewer.

Where trunk sewers traverse steep, unstable slopes, existing design drawing call for use of ductile iron pipe with concrete anchors at every other pipe junction. Use of ductile iron pipe should provide the maximum stability in these unfavorable soil conditions.

e. Soil Erosion from Sewer Construction

Erosion of soil due to construction of the tunnel should be negligible. The small access sites should be easily protected from soil losses with staked hay bales.

Erosion during construction of trunk lines installed by open cut methods will be potentially more significant. Design specifications prepared by Cuyahoga County, and now property of CRSD, require that trenches on steep slopes be sodded after sewer construction. This should significantly reduce erosion in these areas if the timing interval between trench opening and closing is minimized by management of construction schedules.

Clearing of access right of ways for the trunk sewers and the actual trench opening will increase soil erosion particularly where rainfall runoff concentrates. Much of the trunk sewer will be constructed along existing roadways, thereby reducing the amount of right of way clearing and providing access to the construction operations directly instead of via construction roads. On all trunk sewers, management of construction schedules to minimize the time interval between trench opening and closing followed by timely reseeding of disturbed earth should effectively reduce potential soil erosion due to pipe construction.

2. Primary Effects-Manmade Environment

a. Historic and Archaeological Site-Phase I

As described earlier in this statement, the archaeological survey of Dr. Brose, of the Cleveland Natural History Museum, recommended three specific steps to protect the archaeological sites uncovered:

1) avoidance of all ground disturbing activity on specified portions of Access Areas 3 and 11, and

2) salvage of the Access Area 4 site prior to construction.

The applicant has agreed to this, has undertaken the necessary changes in design, and is conducting discussions with property owners prior to commissioning the salvage (see CRSD's letter of November 14,1975).

The Ohio State Historical Preservation Officer, (letter of January 13, 1976), has approved these measures, with the additional recommendation that Dr. Brose be contacted should evidence of archaeologic remains be found during actual construction.

b. Archaeological and Historic Sites-Later Phases

The alignment of later phases is not yet certain, but Tables 15 and 16 and Figures 10 and 11 of the Assessment indicate literally dozens of historical and archaeologic sites in the service area of later phases. According to Cuyahoga Valley 1975 many hundreds of sites, undiscovered or uninvestigated, exist within the Akron-Cleveland corridor. Any future CVI construction should show the same high degree of care exhibited on Phase I.

3. Secondary Effects-Natural Environment

a. Fisheries

Although the CVI will remove large amounts of BOD and dissolved solids from the service area streams, it is uncertain whether this will have a significant impact on Cuyahoga River mainstem fisheries. These are largely limited by ammonia discharged from the Akron-Botzum treatment plant; it is only as this ammonia is reduced during the coming years that numbers and species of fish will be able to expand significantly within the National Recreation Area. Even then, PCB concentrations may be such as to rule out human consumption.

b. Algae

Although occasionally high algae measurements have occurred on the Cuyahoga River, algae growth and blooms are limited by toxic discharges, periodically low dissolved oxygen in summer, and by the relatively high turbidity of the river. Construction of the CVI Phase I and later phases will remove significant quantities of BOD, suspended solids and toxic industrial discharges, but will have only a minor effect on the heavy nutrient load received from Akron STP discharges and local runoff. The natural turbidity of the Cuyahoga River is high, so these changes may have only a minor effect on algae growth, but at least a minor chance exists for algae blooms of increased size and duration.

Such blooms would be particularly unfortunate, as the ultimate effect of CVI construction, Akron treatment plant upgrading, and land acquisition for the National Recreation Area may be to render the river fit for at least some contact recreation.

c. Water Quality

Interception of wastewater flows and transport out of the CVI study area to Southerly will improve water quality in area streams both in terms of concentration and annual load. Development that occurs in the study area will increase non-point source pollutant loads. In order to assess the relative changes in pollutant loadings, non-point, recognized point source and septic tank pollutant loads have been estimated and projected to 2020 for the study area as a whole and for two major streams, Tinkers and Brandywine Creeks.

1) Non-point Source Loadings

Development of land is widely recognized as having the effect of increasing pollutant loadings to streams. In order to evaluate the increase in non-point source pollutant loadings to study area streams and to develop a base against which to evaluate the impact of proposed sewerage plants, 1970 and 2020 non-point pollutant loadings for total load (mostly dust and dirt), $BOD_5$, total phosphorus, total nitrogen and fecal coliforms were estimated.

For purposes of this analysis the non-point source pollution is defined as urban runoff. This was considered justified by the fact that land use figures in the Draft Environmental Impact Statement (EPA 1976) and the Cuyahoga County Solid Waste Management Study (Stanley Consultants, 1973) indicated that the area was 48 percent developed in the Phase I area, 52 percent developed in the Phase IIIA area but only 22 percent developed in the part of the Phase II area for which land use figures were available. See Table 5-2 for the figures used in these calculations. Despite the fact that parts of the area are not extensively developed at this time, the population increases projected indicate that this will not be the case for long.

Table 5-2. Land Use for Cuyahoga Valley Interceptor Area

| MUNICIPALITY | TOTAL AREA | RESIDENTIAL | COMMERCIAL | INDUSTRIAL | VACANT | TRANSPORT | EXEMPT |
|---|---|---|---|---|---|---|---|
| Brecksville Heights | 12691 | 3862 | 48 | 230 | 7924 | 622 | |
| Broadview Heights | 8314 | 3764 | 157 | 14 | 3978 | | 400 |
| Garfield Heights | 4448 | 1672 | 248 | 332 | 1662 | | 573 |
| Maple Heights | 3552 | 1442 | 198 | 201 | 1539 | | 171 |
| Northfield Village | 563 | 450 | 0 | 0 | 113 | | |
| North Royalton | 13523 | 7430 | 224 | 54 | 5480 | | 335 |
| Oakwood | 2234 | 831 | 67 | 57 | 1220 | | 58 |
| Sagamore Hills | 7322 | 933 | 387 | 25 | 5664 | 312 | |
| Seven Hills | 3296 | 1953 | 134 | 0 | 961 | | 249 |
| Valley View | 4000 | 1333 | 56 | 87 | 2432 | | 92 |
| Walton Hills | 4814 | 1679 | 192 | 191 | 2695 | | 58 |
| -- | | | | | | | |
| Peninsula | 3112 | 142 | 64 | 64 | 2766 | 124 | |
| Richfield Township | 11545 | 560 | 313 | 36 | 9943 | 693 | |
| Richfield Village | 5109 | 843 | 144 | 153 | 3594 | 375 | |
| Northfield Township | 3538 | 758 | 178 | 42 | 2144 | 422 | |
| -- | | | | | | | |
| Bedford | 3107 | 1164 | 128 | 157 | 1358 | | 300 |
| Bedford Heights | 2933 | 874 | 46 | 487 | 1400 | | 125 |
| Glenwillow | 1856 | 436 | 31 | 727 | 638 | | |
| Solon | 12992 | 4572 | 750 | 653 | 6695 | | 318 |

The method used to estimate the amount of non-point pollution is that described in McElroy et al (1976). Basically this method projects the urban load as a function of curb miles in the area. To determine the curb mile estimates for the area we used a correlation reported in McElroy, between population density and curb miles per acre*. Once the total amount of curb miles is estimated the urban pollution is determined by multiplying a constant loading factor by the curb mile estimates. The factors used (in pounds per curb mile per day) were:

| | |
|---|---|
| Dust and Dirt | 291.000 |
| $BOD_5$ | 5.791 |
| Total P | 0.853 |
| Total N | 2.739 |
| Fecal Coliforms | 58.1 (Billions) |

The population figures for 2020 for the Study Area were obtained from the Draft Environemntal Impact Statement. The population for 1970 was obtained from reported 1970 Census figures in the Draft Environmental Statement where they were given. If the 1970 population figures were not given in the DEIS then they were obtained from the Euthenics-Polytech report (1972). The area (in acres) of the parts of the various municipalities within the study area were obtained from the Euthenics-Polytech report. Where the boundaries of the study area had been changed since the Euthenics-Polytech study the area within the study area was estimated from topographic maps.

The urban pollution load was estimated for the parts of the municipalities within the study area. Since the study area boundaries corresponded generally with the boundaries of the local drainage, pollutional loads calculated for municipalities were assumed to all end up in the study area and not flow to adjacent drainage basins. Some jurisdictions crossed drainage area boundaries within the study area. For example, part of Sagamore Hills drains to Sagamore Creek, part to Brandywine Creek and part directly to the Cuyahoga. Since it was decided to estimate the pollutional loads by major drainage areas an approximate allocation of loads from municipalities to the various drainage areas was developed. The distribution of the laod from each jurisdiction to the various drainage areas is shown in Table 5-3.

Urban pollution loads were calculated for each jurisdiction or part thereof within the study area and then the loads were distributed to the drainage basin. No attempt was made to determine the variation of population within the jurisdiction along drainage boundary lines. In view of the simplicity of the method used to determine the loads, uncertainties about where future development would occur and a general scarcity of data it was felt that to do so would be an unjustified refinement.

* $CM = 0.078 - 0.0668 \times (0.839)^{PD}$
Where CM is curb miles per acre and PD is popultion density in people per acre.

Table 5-3. Distribution of Urban Pollution Loads by Drainage Basin

| MUNICIPALITY | DISTRIBUTION |
|---|---|
| Phase I | |
| Brecksville | 1/3 Mainstem, 2/3 Chippewa Creek |
| Broadview Heights | Chippewa Creek |
| Garfield Heights | Mainstem |
| Independence | Mainstem |
| Maple Heights | Tinkers Creek |
| Northfield Village | Sagamore Creek |
| North Royalton | Chippewa Creek |
| Oakwood | Tinkers Creek |
| Sagamore Hills (part 1) | 1/2 Mainstem, 1/2 Sagamore Creek |
| Seven Hills | Mainstem |
| Valley View | Mainstem |
| Walton Hills | 1/2 Tinkers Creek, 1/2 Sagamore Creek |
| Phase II | |
| Boston Heights | Brandywine Creek |
| Boston Twp. | Mainstem |
| Hudson Village | Brandywine Creek |
| Hudson Twp. (part 1) | Brandywine Creek |
| Macedonia | Brandywine Creek |
| Peninsula | Mainstem |
| Richfield Twp. | Furnace Run |
| Richfield Vill. | Furnace Run |
| Sagamore Hills (part 2) | 1/2 Mainstem, 1/2 Brandywine Creek |
| Northfield Twp. | Brandywine Creek |
| Phase IIIA | |
| Bedford | Tinkers Creek |
| Bedford Heights | Tinkers Creek |
| Glenwillow | Tinkers Creek |
| Solon | Tinkers Creek |
| Phase IIIB | |
| Aurora | Tinkers Creek |
| Bainbridge | Tinkers Creek |
| Franklin Twp. | Tinkers Creek |
| Hudson Twp. (part 2) | Tinkers Creek |
| Reminderville | Tinkers Creek |
| Shalersville | Mainstem |
| Streetsboro | Tinkers Creek |
| Twinsburg Vill. | Tinkers Creek |
| Twinsburg Twp. | Tinkers Creek |

In evaluating the impact of future urban pollution loadings several factors must be taken into account. First, the loadings calculated are average annual loadings. As McElroy, et al, point out it takes about one half inch of rainfall to wash off about 90 percent of the dust and dirt. Therefore during dry periods there is essentially no urban loading on the stream. Conversely during and after storms the loading on the streams is much higher than the calculated figures. Second, there are any number of methods of reducing urban pollution which can be implemented between now and 2020. Examples of these methods are street sweeping and silt traps. In view of the fact that most of the area does not have storm sewers, as the area develops and is sewered the storm sewer design could include strucutral measures to mitigate the urban runoff problem. For these reasons the estimates of urban runoff pollution for 2020 should probably be taken as an estimated upper bound.

A computer program was developed to perform the calculations necessary to estimate the urban pollution. The calculations were performed on a jurisdictional basis. The estimates of urban pollution for 1970 are shown in Table 5-4. The estimates for 2020 are shown in Table 5-5 , and the difference between 1970 and 2020 loads are shown in Table 5-6.

Once the pollutional loads for the portion of each jurisdiction were distributed to the stream basins as described above. The resulting estimates for each stream basin are given in Table 5-7. The results show that urban pollutional loads are expected to increase by about 35 percent between 1970 and 2020. As pointed out above this increase assumes no treatment of the stormwater runoff and is an average annual figure.

2) Municipal and Domestic Point Sources

Available data on the location, size and treatment efficiencies of identified point sources was assembled and used as the basis for calculating present pollutant loads from these sources discharged to area streams. 1975 BOD and flow figures presented in Table 2-24 for major point sources were used in these calculations except where BOD values were less than 10 mg/l. In view of the fact that even tertiary treatment normally results in BOD concentrations around 10 mg/l, the minimum value used was 10 mg/l. Where no BOD data was available, secondary treatment and a BOD of 30 mg/l were assumed. Similarly, values for other parameters were assumed under secondary treatment to be: suspended solids - 30 mg/l, and fecal coliforms - 200 per 100 ml. Pollutant concentrations in tertiary treated effluent were assumed to be: BOD - 10 mg/l, suspended solids - 12 mg/l, fecal coliforms - 200 per 100 ml. Nutrient concentrations in secondary effluent used were 8 mg/l for total phosphorus and 25 mg/l for total nitrogen. In tertiary treatment with phosphorus removal, these concentrations are 1 mg/l total phosphorus and 25 mg/l total nitrogen. For the many small treatment plants, only design flow was available so this was used as average daily flow.

# Table 5-4. 1970 Urban Runoff Pollution Loads.

**Phase I**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 1970 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BRECKSVILLE HTS | 71567. | 1424. | 210. | 674. | 14296. |
| BROADVIEW HTS | 49604. | 987. | 145. | 467. | 9909. |
| GARFIELD HTS | 16675. | 332. | 49. | 157. | 3331. |
| INDEPENDENCE | 40673. | 809. | 119. | 383. | 8125. |
| MAPLE HTS | 14234. | 283. | 42. | 134. | 2843. |
| NORTHFIELD VILL | 9940. | 198. | 29. | 94. | 1986. |
| NORTH ROYALTON | 0. | 0. | 0. | 0. | 0. |
| OAKWOOD | 16902. | 336. | 50. | 159. | 3376. |
| SAGAMORE HILLS | 30207. | 601. | 89. | 284. | 6034. |
| SEVEN HILLS | 4225. | 84. | 12. | 40. | 844. |
| VALLEY VIEW | 18030. | 359. | 53. | 170. | 3602. |
| WALTON HILLS | 24216. | 482. | 71. | 228. | 4837. |
| PHASE TOTAL | 296272. | 5896. | 868. | 2789. | 59183. |

**Phase II**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 1970 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BOSTON HTS | 16077. | 320. | 47. | 151. | 3212. |
| BOSTON TWP | 15013. | 299. | 44. | 141. | 2999. |
| HUDSON VILL | 19166. | 381. | 56. | 180. | 3829. |
| HUDSON TWP | 14983. | 298. | 44. | 141. | 2993. |
| MACEDONIA | 41691. | 830. | 122. | 392. | 8328. |
| PENINSULA | 7670. | 153. | 22. | 72. | 1532. |
| RICHFIELD TWP | 40738. | 811. | 119. | 384. | 8138. |
| RICHFIELD VILL | 27446. | 546. | 80. | 258. | 5483. |
| SAGAMORE HILLS | 30207. | 601. | 89. | 284. | 6034. |
| NORTHFIELD TWP | 25175. | 501. | 74. | 237. | 5029. |
| PHASE TOTAL | 238165. | 4739. | 698. | 2242. | 47576. |

**Phase III A**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 1970 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BEDFORD | 48339. | 962. | 142. | 455. | 9656. |
| BEDFORD HTS | 36850. | 733. | 108. | 347. | 7361. |
| GLENWILLOW | 7934. | 158. | 23. | 75. | 1585. |
| SOLON | 55564. | 1106. | 163. | 523. | 11099. |
| PHASE TOTAL | 148687. | 2959. | 436. | 1400. | 29702. |

**Phase III B**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 1970 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| AURORA | 31831. | 633. | 93. | 300. | 6359. |
| BAINBRIDGE TWP | 1481. | 29. | 4. | 14. | 296. |
| FRANKLIN TWP | 1435. | 29. | 4. | 14. | 287. |
| HUDSON TWP | 18807. | 374. | 55. | 177. | 3757. |
| REMINDERVILLE | 5244. | 104. | 15. | 49. | 1048. |
| SHALERSVILLE | 0. | 0. | 0. | 0. | 0. |
| STREETSBORO | 78243. | 1557. | 229. | 737. | 15630. |
| TWINSBURG VILL | 42704. | 850. | 125. | 402. | 8531. |
| TWINSBURG TWP | 25137. | 500. | 74. | 237. | 5021. |
| PHASE TOTAL | 204883. | 4077. | 600. | 1929. | 40927. |

# Table 5-5. 2020 Urban Runoff Pollution Loads.

**Phase I**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 2020 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BRECKSVILLE HTS | 103184. | 2053. | 302. | 971. | 20612. |
| BROADVIEW HTS | 72309. | 1439. | 212. | 681. | 14444. |
| GARFIELD HTS | 23813. | 474. | 70. | 224. | 4757. |
| INDEPENDENCE | 48971. | 975. | 143. | 461. | 9782. |
| MAPLE HTS | 15520. | 309. | 45. | 146. | 3100. |
| NORTHFIELD VILL | 11623. | 231. | 34. | 109. | 2322. |
| NORTH ROYALTON | 0. | 0. | 0. | 0. | 0. |
| OAKWOOD | 21086. | 420. | 62. | 199. | 4212. |
| SAGAMORE HILLS | 31251. | 622. | 92. | 294. | 6243. |
| SEVEN HILLS | 3972. | 79. | 12. | 37. | 794. |
| VALLEY VIEW | 20945. | 417. | 61. | 197. | 4184. |
| WALTON HILLS | 29325. | 584. | 86. | 276. | 5858. |
| PHASE TOTAL | 382000. | 7602. | 1119. | 3596. | 76308. |

**Phase II**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 2020 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BOSTON HTS | 20030. | 399. | 59. | 189. | 4001. |
| BOSTON TWP | 15936. | 317. | 47. | 150. | 3183. |
| HUDSON VILL | 27025. | 538. | 79. | 254. | 5398. |
| HUDSON TWP | 18050. | 359. | 53. | 170. | 3606. |
| MACEDONIA | 58522. | 1165. | 171. | 551. | 11690. |
| PENINSULA | 9589. | 191. | 28. | 90. | 1916. |
| RICHFIELD TWP | 53304. | 1061. | 156. | 502. | 10648. |
| RICHFIELD VILL | 39580. | 788. | 116. | 373. | 7906. |
| SAGAMORE HILLS | 31251. | 622. | 92. | 294. | 6243. |
| NORTHFIELD TWP | 39710. | 790. | 116. | 374. | 7933. |
| PHASE TOTAL | 312997. | 6229. | 917. | 2947. | 62524. |

**Phase III A**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 2020 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BEDFORD | 54459. | 1084. | 160. | 513. | 10879. |
| BEDFORD HTS | 48839. | 972. | 143. | 460. | 9756. |
| GLENWILLOW | 11250. | 224. | 33. | 106. | 2247. |
| SOLON | 77540. | 1543. | 227. | 730. | 15489. |
| PHASE TOTAL | 192088. | 3823. | 563. | 1808. | 38372. |

**Phase III B**

CUYAHOGA VALLEY INTERCEPTOR
URBAN POLLUTION LOADING FOR 2020 CONDITIONS

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| AURORA | 60166. | 1197. | 176. | 566. | 12019. |
| BAINBRIDGE TWP | 3861. | 77. | 11. | 36. | 771. |
| FRANKLIN TWP | 2225. | 44. | 7. | 21. | 444. |
| HUDSON TWP | 22650. | 451. | 66. | 213. | 4525. |
| REMINDERVILLE | 18759. | 373. | 55. | 177. | 3747. |
| SHALERSVILLE | 0. | 0. | 0. | 0. | 0. |
| STREETSBORO | 116495. | 2318. | 341. | 1097. | 23271. |
| TWINSBURG VILL | 56410. | 1123. | 165. | 531. | 11268. |
| TWINSBURG TWP | 32384. | 644. | 95. | 305. | 6469. |
| PHASE TOTAL | 312951. | 6228. | 917. | 2946. | 62515. |

Table 5-6. Change in Urban Runoff Pollution Loads, 1970-2020.

Phase I

CUYAHOGA VALLEY INTERCEPTOR
CHANGE IN URBAN POLLUTION LOADING FROM 1970 TO 2020

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BRECKSVILLE HTS | 31617. | 629. | 93. | 298. | 6316. |
| BROADVIEW HTS | 22705. | 452. | 67. | 214. | 4536. |
| GARFIELD HTS | 7138. | 142. | 21. | 67. | 1426. |
| INDEPENDENCE | 8298. | 165. | 24. | 78. | 1658. |
| MAPLE HTS | 1286. | 26. | 4. | 12. | 257. |
| NORTHFIELD VILL | 1682. | 33. | 5. | 16. | 336. |
| NORTH ROYALTON | 0. | 0. | 0. | 0. | 0. |
| OAKWOOD | 4184. | 83. | 12. | 39. | 836. |
| SAGAMORE HILLS | 1045. | 21. | 3. | 10. | 209. |
| SEVEN HILLS | -252. | -5. | -1. | -2. | -50. |
| VALLEY VIEW | 2915. | 58. | 9. | 27. | 582. |
| WALTON HILLS | 5109. | 102. | 15. | 48. | 1021. |
| PHASE TOTAL | 85728. | 1706. | 251. | 807. | 17125. |

Phase II

CUYAHOGA VALLEY INTERCEPTOR
CHANGE IN URBAN POLLUTION LOADING FROM 1970 TO 2020

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BOSTON HTS | 3953. | 79. | 12. | 37. | 790. |
| BOSTON TWP | 923. | 18. | 3. | 9. | 184. |
| HUDSON VILL | 7859. | 156. | 23. | 74. | 1570. |
| HUDSON TWP | 3068. | 61. | 9. | 29. | 613. |
| MACEDONIA | 16831. | 335. | 49. | 158. | 3362. |
| PENINSULA | 1919. | 38. | 6. | 18. | 383. |
| RICHFIELD TWP | 12566. | 250. | 37. | 118. | 2510. |
| RICHFIELD VILL | 12133. | 241. | 36. | 114. | 2424. |
| SAGAMORE HILLS | 1045. | 21. | 3. | 10. | 209. |
| NORTHFIELD TWP | 14535. | 289. | 43. | 137. | 2904. |
| PHASE TOTAL | 74832. | 1489. | 219. | 704. | 14948. |

Phase III A

CUYAHOGA VALLEY INTERCEPTOR
CHANGE IN URBAN POLLUTION LOADING FROM 1970 TO 2020

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| BEDFORD | 6120. | 122. | 18. | 58. | 1223. |
| BEDFORD HTS | 11989. | 239. | 35. | 113. | 2395. |
| GLENWILLOW | 3315. | 66. | 10. | 31. | 662. |
| SOLON | 21977. | 437. | 64. | 207. | 4390. |
| PHASE TOTAL | 43401. | 864. | 127. | 409. | 8670. |

Phase III B

CUYAHOGA VALLEY INTERCEPTOR
CHANGE IN URBAN POLLUTION LOADING FROM 1970 TO 2020

| NAME | TOTAL LOAD | BOD5 | TOTAL PHOS | TOTAL NIT | F-COLI BILLIONS |
|---|---|---|---|---|---|
| AURORA | 28335. | 564. | 83. | 267. | 5660. |
| BAINBRIDGE TWP | 2380. | 47. | 7. | 22. | 475. |
| FRANKLIN TWP | 790. | 16. | 2. | 7. | 158. |
| HUDSON TWP | 3843. | 76. | 11. | 36. | 768. |
| REMINDERVILLE | 13515. | 269. | 40. | 127. | 2700. |
| SHALERSVILLE | 0. | 0. | 0. | 0. | 0. |
| STREETSBORO | 38253. | 761. | 112. | 360. | 7641. |
| TWINSBURG VILL | 13706. | 273. | 40. | 129. | 2738. |
| TWINSBURG TWP | 7247. | 144. | 21. | 68. | 1448. |
| PHASE TOTAL | 108068. | 2151. | 317. | 1017. | 21588. |

Table 5-7. Estimated Urban Runoff Pollution Loads by Basin.

| | 1970 Urban runoff Loads Dust and Dirt (lb/day) | BOD5 (lb/day) | Total N (lb/day) | Total P (lb/day) | Fecal Coli (billion day) |
|---|---|---|---|---|---|
| Mainstem Cuyahoga | 156350. | 3111. | 1472. | 459. | 31232. |
| Tinkers Creek | 396813. | 7895. | 3737. | 1162. | 79267. |
| Brandywine Creek | 132196. | 2631. | 1243. | 387. | 26408. |
| Chippewa Creek | 97315. | 1936. | 916. | 285. | 19440. |
| Sagamore Creek | 37152. | 740. | 350. | 109. | 7420. |
| Furnace Run | 68184. | 1357. | 642. | 199. | 13621. |
| Total | 888010. | 17670. | 8360. | 2601. | 177388. |
| | 2020 Urban Runoff Lodas | | | | |
| Mainstem Cuyahoga | 204501. | 3759. | 1777. | 554. | 37731. |
| Tinkers Creek | 478762. | 11071. | 5238. | 1629. | 111126 |
| Brandywine Creek | 163337. | 3562. | 1685. | 524. | 35749. |
| Chippewa Creek | 141098. | 2808. | 1328. | 413. | 28185. |
| Sagamore Creek. | 41912. | 834. | 394. | 123. | 8372. |
| Furnace Run | 92884. | 1849. | 875. | 272. | 18554. |
| Total | 1122494. | 23883. | 11297. | 3515. | 239717. |
| | Change from 1970 to 2020 | | | | |
| Mainstem Cuyahoga | 32526. | 646. | 306. | 97. | 6523. |
| Tinkers Creek | 159495. | 3174. | 1500. | 467. | 31861. |
| Brandywine Creek | 46769. | 930. | 440. | 138. | 9344. |
| Chippewa Creek | 43783. | 871. | 413. | 129. | 8747. |
| Sagamore Creek | 4760. | 94. | 45. | 15. | 951. |
| Furnace Run | 24699. | 491. | 232. | 73. | 4934. |
| Total | 312032. | 6206. | 2936. | 919. | 62360. |

| | Percent Change from 1970 to 2020 |
|---|---|
| Mainstem Cuyahoga | 20.8 |
| Tinkers Creek | 40.2 |
| Brandywine Creek | 35.4 |
| Chippewa Creek | 45.0 |
| Sagamore Creek | 12.8 |
| Furnace Run | 36.2 |
| Total | 35.1 |

(All other loads change in the same ratios since they were calculated as a fixed percentage of the Dust and Dirt Load.)

Projections of wastewater flow for each watershed were simple, straight line increases from 1975 to 2020 based upon current discharges for each watershed multiplied by the ratio of 2020 to 1975 approximate watershed populations using distribution of municipal populations equivalent to the distributions of municipal land areas listed in Table 5-3.

Two sets of load projections were developed. One projection assumed that all existing point sources would remian in use through 2020 with secondary treatment until 1980 and tertiary treatment with phosphorus removal after 1980. This projection serves as a baseline against which the changes resulting from complete interception by CVI can be compared.

The second point source load projection assumes that both Phase I and Phase II will be operable by 1980 thereby intercepting all point sources by that time. Phase III wastewaters, previously treated to tertiary levels with phosphorus removal, are assumed to be intercepted by CVI in 1995.

The locations of quantifiable point sources in relation to their receiving streams are presented diagrammatically in Figure 5-1. Locations of point sources as described in available materials, especially point source inventory maps prepared by NOACA, were transferred to U.S.G.S. topographic maps from which both stream lengths and point source locations were measured.

3) Septic Tank Discharges

Nearly all of the residences and small commercial establishments in the study area not connected to centralized sewer systems depend on discharging septic tank-filter bed disposal systems. Estimated populations by municipality dependant upon these systems were given in Table 2-28. Assuming 75 gallons discharged per person per day and the average concentrations of pollutants present in septic tank discharges estimated and presented in Table 2-26, pollutant loads from these sources were estimated by municipality and disaggregated to wastersheds according to the proportions listed in Table 5- 3. It was assumed that a negligible number of discharging septic tanks would be permitted in the future. Further, it was assumed that all septic tanks would be intercepted as CVI is installed in each phase. These last two assumptions are obvious over simplifications but still serve the purposes of projection.

The calculated pollutant loads for each watershed are presented in Table 5- 9.

4) Synthesis of Pollutional Loadings

Figures 5- 2 through 5- 8 show changes in pollutant loadings for the entire study area and for Tinkers and Brandywine Creeks.

Figure 5-1. Locations of Quantifyable Point Sources in Relation to Receiving Streams -- Future CVI Study Area.

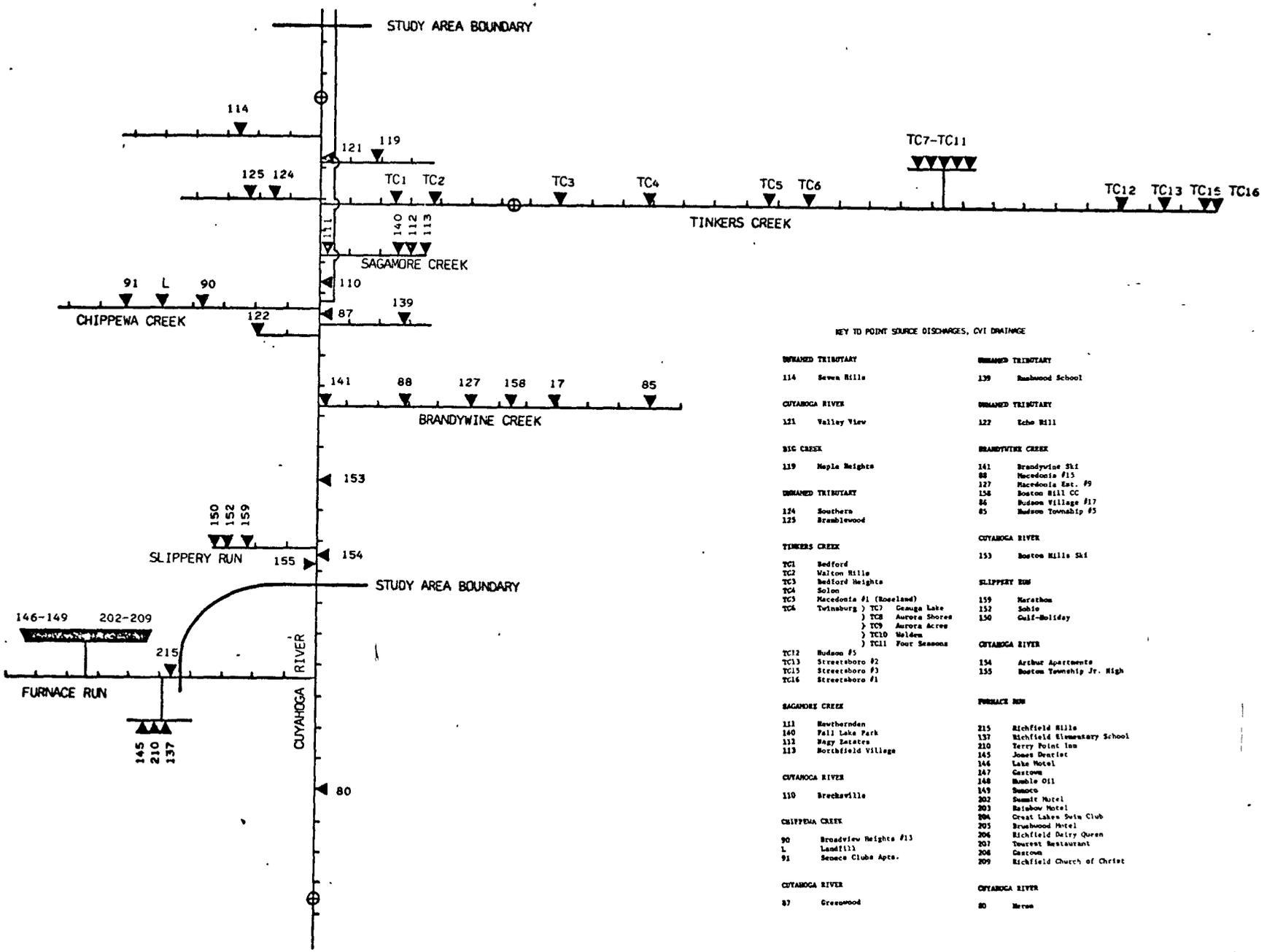

Table 5-8. Pollutant Loads from Point Sources by Watershed.

| | SS (lb/day) | $BOD_5$ (lb/day) | N (lb/day) | P (lb/day) | F. Coli (Billions) | Effluent Flow (mgd) |
|---|---|---|---|---|---|---|
| **1975 Loads from Point Sources** | | | | | | |
| Cuyahoga Mainstem | 395.9 | 250.7 | 329.0 | 105.5 | .240 | 1.58 |
| Tinkers Creek Ph.III | 3166.8 | 1860.0 | 1924.5 | 844.3 | 6.692 | 11.71 |
| Tinkers Creek Ph. I | 102.4 | 3.4 | 85.4 | 27.3 | .222 | 0.41 |
| Brandywine Cr. | 642.6 | 752.3 | 535.5 | 171.3 | 1.364 | 2.57 |
| Chippewa Cr. | 45.0 | 45.0 | 37.5 | 12.0 | .095 | .18 |
| Sagamore Cr. | 279.6 | 250.2 | 233.0 | 74.6 | .593 | 1.20 |
| Furnace Run | 91.7 | 91.5 | 76.5 | 24.4 | .199 | .37 |
| Total | 4723.6 | 3283.7 | 3222.1 | 1259.4 | 9.405 | 18.02 |
| **1980 Secondary Tmt.** | | | | | | |
| Cuyahoga Mainstem | 445.1 | 277.2 | 370.8 | 118.5 | .945 | 1.78 |
| Tinkers Cr. Ph. III | 3565.1 | 2075.0 | 2971.1 | 950.6 | 7.541 | 13.27 |
| Tinkers Cr. Ph. I | 109.9 | 37.0 | 91.6 | 29.3 | .232 | 0.44 |
| Brandywine Cr. | 710.6 | 830.0 | 592.0 | 189.4 | 1.506 | 2.84 |
| Chippewa Cr. | 45.0 | 45.0 | 37.5 | 12.0 | .095 | .18 |
| Sagamore Cr. | 290.8 | 285.9 | 242.4 | 77.6 | .617 | 1.16 |
| Furnace Run | 101.7 | 101.5 | 84.8 | 27.0 | .220 | .41 |
| Total | 5268.2 | 3655.5 | 4390.2 | 1404.4 | 11.156 | 20.08 |
| **1980 Tertiary Tmt.** | | | | | | |
| Cuyahoga Mainstem | 197.8 | 150.6 | 370.8 | 14.8 | .945 | 1.78 |
| Tinkers Cr. Ph. III | 1427.0 | 118.0 | 2971.1 | 118.8 | 7.541 | 13.27 |
| Tinkers Cr. Ph. I | 44.0 | 37.0 | 91.6 | 3.7 | .232 | 0.44 |
| Brandwine Cr. | 284.4 | 237.0 | 592.0 | 23.9 | 1.506 | 2.84 |
| Chippewa Cr. | 18.0 | 15.0 | 37.5 | 1.5 | .095 | .18 |
| Sagamore Cr. | 116.4 | 96.9 | 242.4 | 9.8 | .617 | 1.16 |
| Furnace Run | 40.6 | 34.0 | 84.8 | 3.4 | .220 | .41 |
| Total | 2128.2 | 1759.5 | 4390.2 | 175.9 | 11.156 | 20.08 |
| **1995 Tertiary Tmt.** | | | | | | |
| Cuyahoga Mainstem | 252.8 | 202.7 | 485.3 | 19.4 | 1.237 | 2.33 |
| Tinkers Cr. Ph. III | 1587.0 | 1234.0 | 3304.2 | 132.2 | 8.383 | 14.82 |
| Tinkers Cr. Ph. I | 47.0 | 39.0 | 97.9 | 3.9 | .248 | .47 |
| Brandywine Cr. | 368.4 | 306.8 | 767.0 | 30.8 | 1.952 | 3.68 |
| Chippewa Cr. | 20.0 | 16.7 | 41.7 | 1.7 | .106 | .20 |
| Sagamore Cr. | 129.4 | 107.7 | 269.4 | 10.8 | .686 | 1.29 |
| Furnace Run | 51.6 | 45.5 | 107.7 | 4.4 | .278 | .52 |
| Total | 2456.2 | 1952.4 | 5073.2 | 203.2 | 12.893 | 23.31 |
| **2020 Tertiary Tmt.** | | | | | | |
| Cuyahoga Mainstem | 346.8 | 272.6 | 680.9 | 27.1 | 1.735 | 3.27 |
| Tinkers Cr. Ph. III | 2599.0 | 2134.0 | 5473.8 | 216.4 | 13.733 | 25.62 |
| Tinkers Cr. Ph. I | 69.0 | 57.0 | 143.7 | 5.8 | .365 | .69 |
| Brandywine Cr. | 506.4 | 421.8 | 1054.3 | 42.2 | 2.684 | 5.06 |
| Chippewa Cr. | 23.0 | 19.2 | 47.9 | 1.9 | .122 | .23 |
| Sagamore Cr. | 150.4 | 125.2 | 313.2 | 12.6 | .797 | 1.50 |
| Furnace Run | 69.6 | 57.8 | 145.2 | 5.9 | .373 | .70 |
| Total | 3764.2 | 3087.6 | 7859.0 | 311.9 | 19.809 | 37.07 |

Table 5- 9. 1975-80 Septic Tank Loads for CVI Area by Basin.

| | Suspended Solids (lb/day) | BOD (lb/day) | Total N (lb/day) | Total P (lb/day) | Fecal Coliform (Billions) | Population (Billions) |
|---|---|---|---|---|---|---|
| Cuyahoga | 333 | 555 | 445 | 134 | 50534 | 17800 |
| Tinkers Creek Phase I | 70 | 117 | 94 | 28 | 10646 | 3750 |
| Tinkers Creek Phase III | 90 | 150 | 120 | 36 | 13627 | 4800 |
| Brandywine | 79 | 133 | 106 | 32 | 12066 | 4250 |
| Chippewa | 224 | 374 | 300 | 90 | 34068 | 12000 |
| Furnace Run | 73 | 122 | 98 | 29 | 11072 | 3900 |
| Sagamore Creek | 80 | 134 | 108 | 32 | 12208 | 4300 |
| Total Ø 1 & 2 | 859 | 1435 | 1150 | 345 | 130594 | 46000 |
| Total Ø 3 | 90 | 150 | 120 | 36 | 13627 | 4800 |
| GRAND TOTAL | 949 | 1585 | 1270 | 381 | 144221 | 50800 |

First, in Figures 5-2, 5-3 and 5-4 the relative amounts of BOD, total phosphorus and total nitrogen in Tinkers Creek as reduced by tertiary treatment in 1980, intercepted by CVI in 1980 (Phase I) and 1995, and remaining in 2020 given tertiary treatment and no interception of septic tanks. Significant results demonstrated by these figures are that (1) point sources and septic tank discharges represent relatively small proportions of annualized loads for BOD and phosphorus but are proportionately more significant for total nitrogen and (2) interception of point sources and septic tanks will have their greatest effect on nitrogen loading because tertiary treatment as assumed for future plants in the watersheds will not remove significant amounts of nitrogen as it would for BOD and phosphorus.

The net results of interception and tertiary treatment on these pollutant loadings in Tinkers Creek is shown in Figure 5-5 According to these estimations total interception of wastewater would reduce total phosphorus loadings by 15 percent compared to continuing tertiary treatment until 2020. More sizeable reductions in BOD and total nitrogen are evident. Increases in non-point sources of BOD offset reductions due to interception. Net 1975-2020 reductions in pollutant loadings would be realized for phosphorus whether interception or tertiary treatment is used.

Figure 5-6 presents the loading results graphically for Brandywine Creek for BOD, N and P. Generally the same conclusions can be derived from this figure as from the figure for Tinkers Creek although the loading changes for Brandywine Creek are simpler due to different assumptions about sewerage facilities.

Projections of BOD, N and P loadings for all CVI watersheds were totalized and are presented in Figure 5-7.

Projections for suspended solids (sediment) and fecal coliforms are presented in Figure 5-8. Due to the amount of dirt and dust contributed by non-point sources, virtually the entire load of suspended solids to study area streams is from these sources. The organic suspended solids contributed by point sources is negligable compared to non-point sources. A considerable reduction in fecal coliform loadings would occur if all sewage flows were intercepted.

### 5) Relationship between Pollutant Loadings and Pollutant Concentrations

Because pollutant loadings from non-point sources are strongly dependent on rainfall and, therefore, highly variable in time, the loads discussed in the previous paragraphs cannot be divided by any stream flow parameter to predict pollutant concentrations. Instead the pollutant concentrations will vary widely and should be greatest during heavy runoff periods.

Minimum pollutant concentrations would likely be realized during intermediate flow periods when grounwater and wetland runoff provide a maximum proportion of stream flow. During low flow conditions, however, the proportion of flow and pollutant concentrations attributable to point sources and septic tank discharges

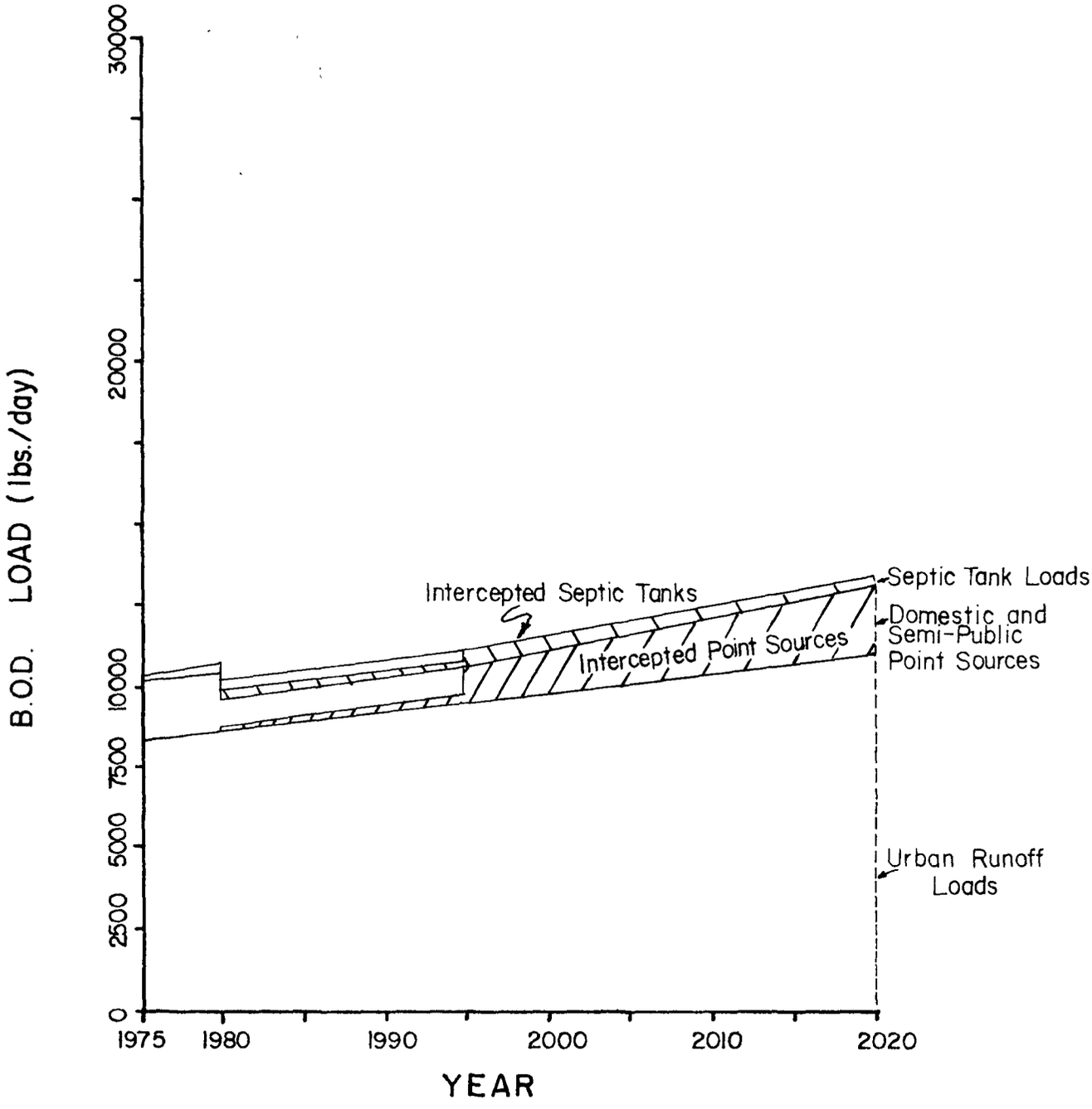


figure 5-2. Analysis of Impact of C.V.I. on B.O.D. Loadings for Tinkers Creek Basin

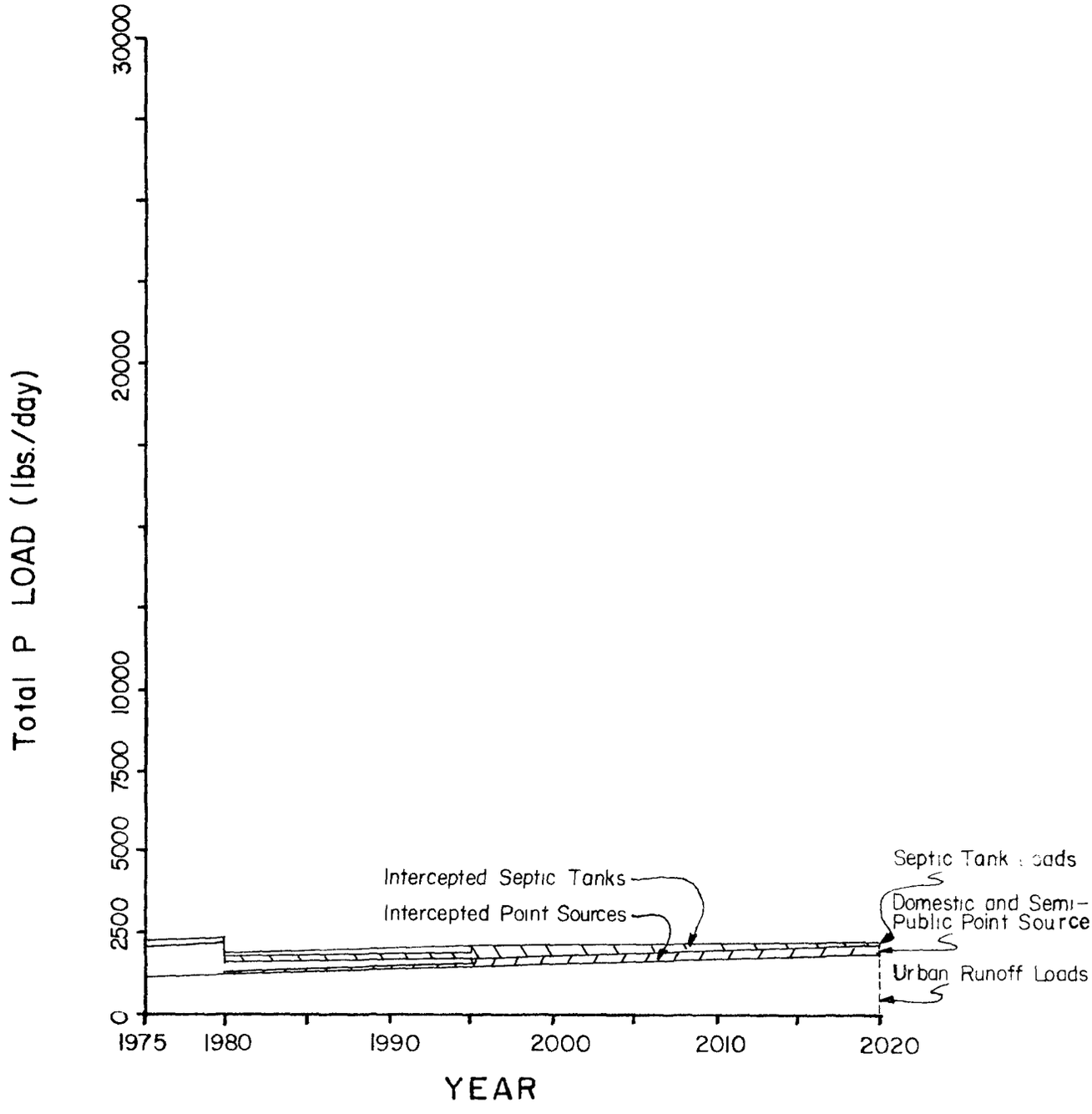


figure 5-3. Analysis of Impact of C.V.I. on Total P Loadings for Tinkers Creek

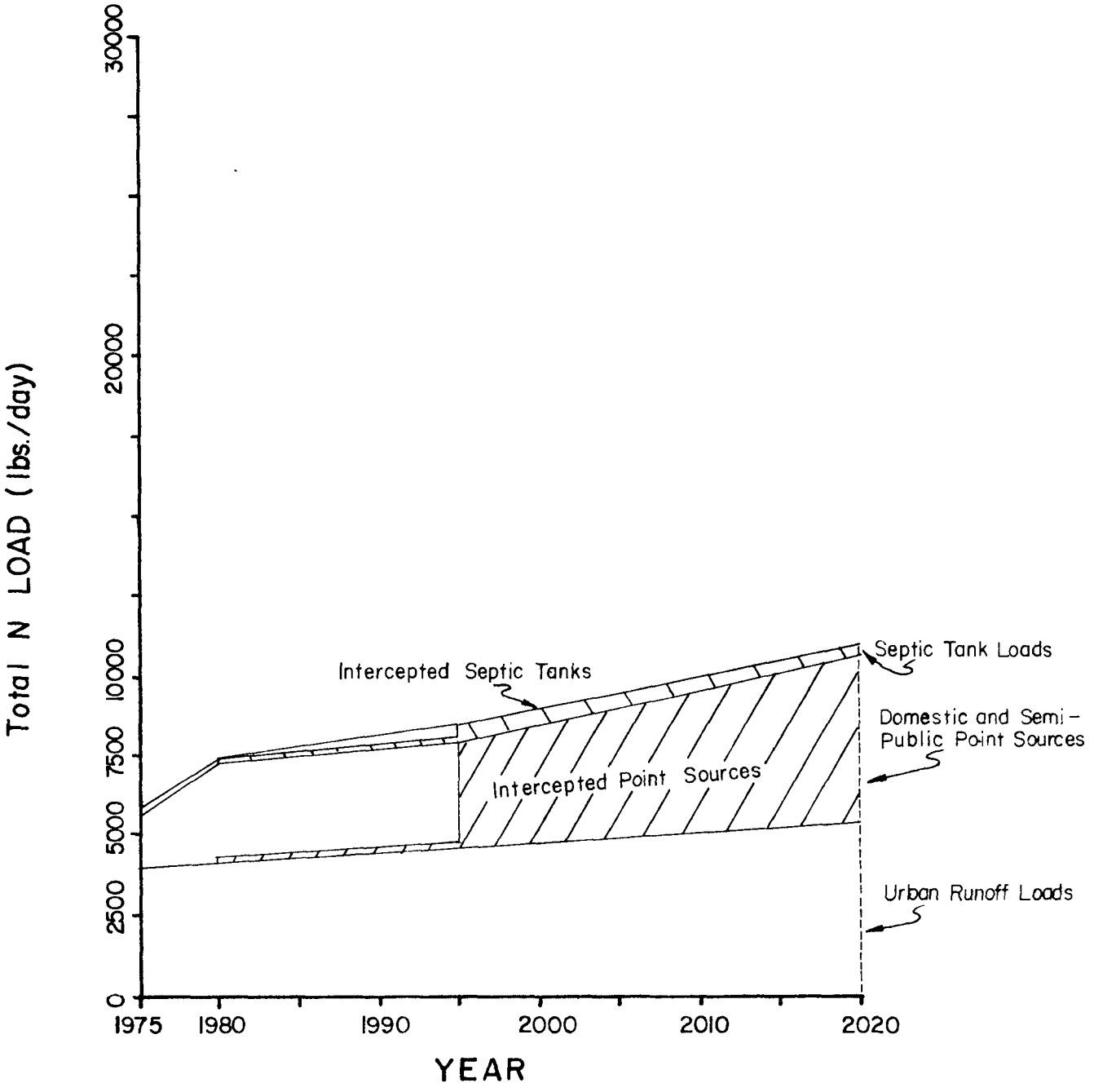


figure 5-4. Analysis of Impact of C.V.I. on Total N Loadings for Tinkers Creek

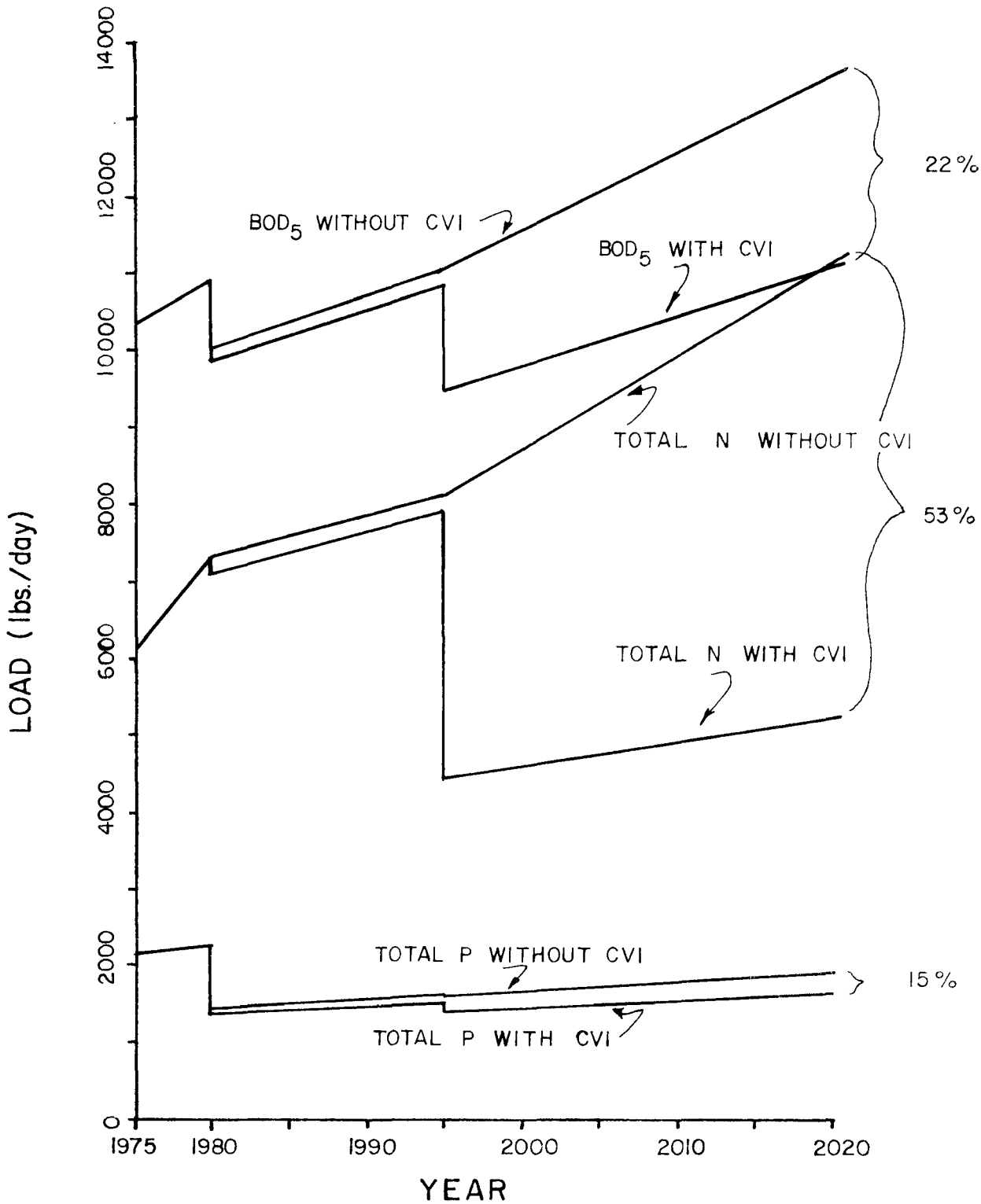


figure 5-5. Analysis of Impact of C.V.I. on Pollutant Loadings for Tinkers Creek



PCLC

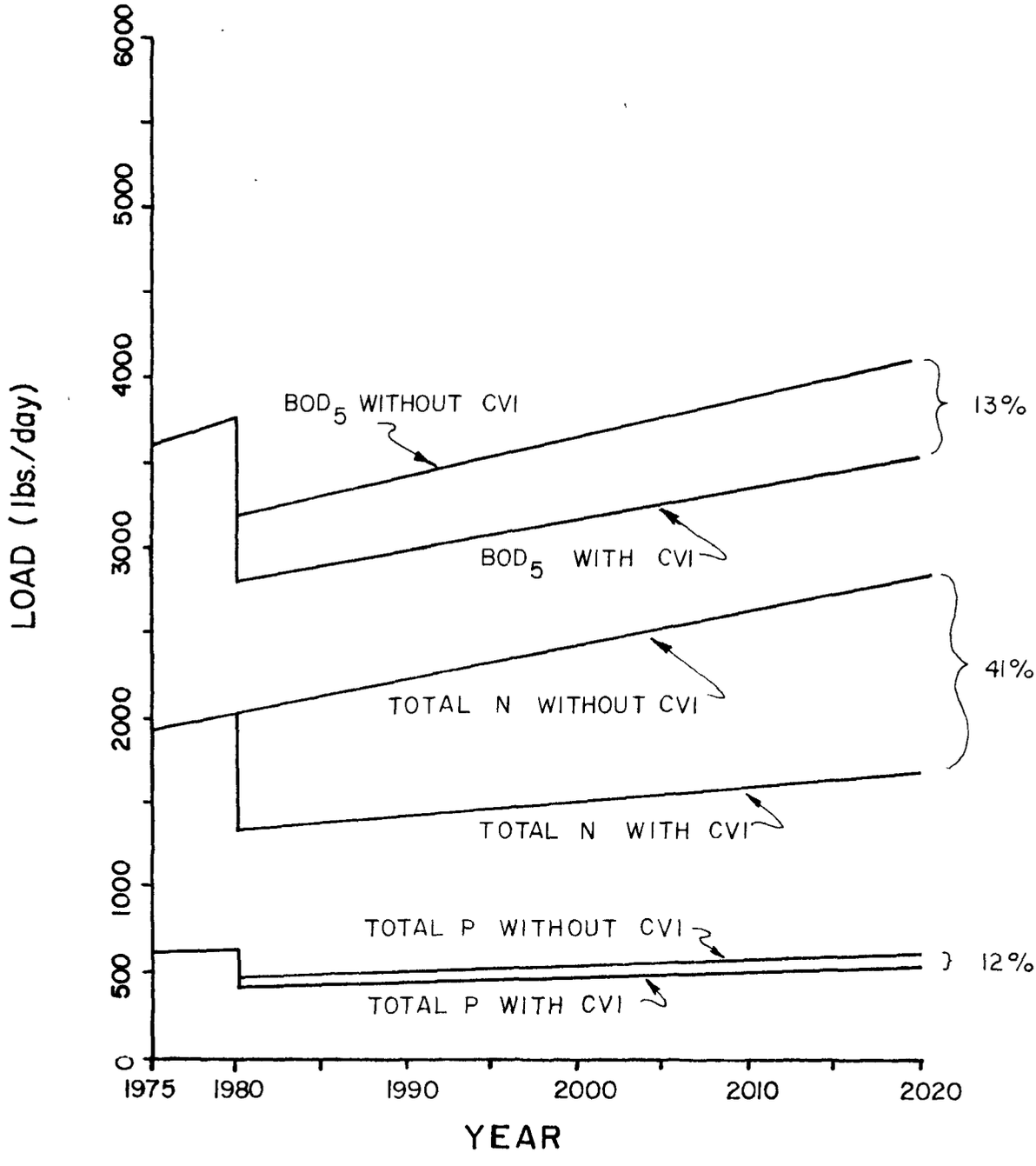


figure 5-6. Analysis of Impact of C.V.I. on Pollutant Loadings for Brandywine Creek

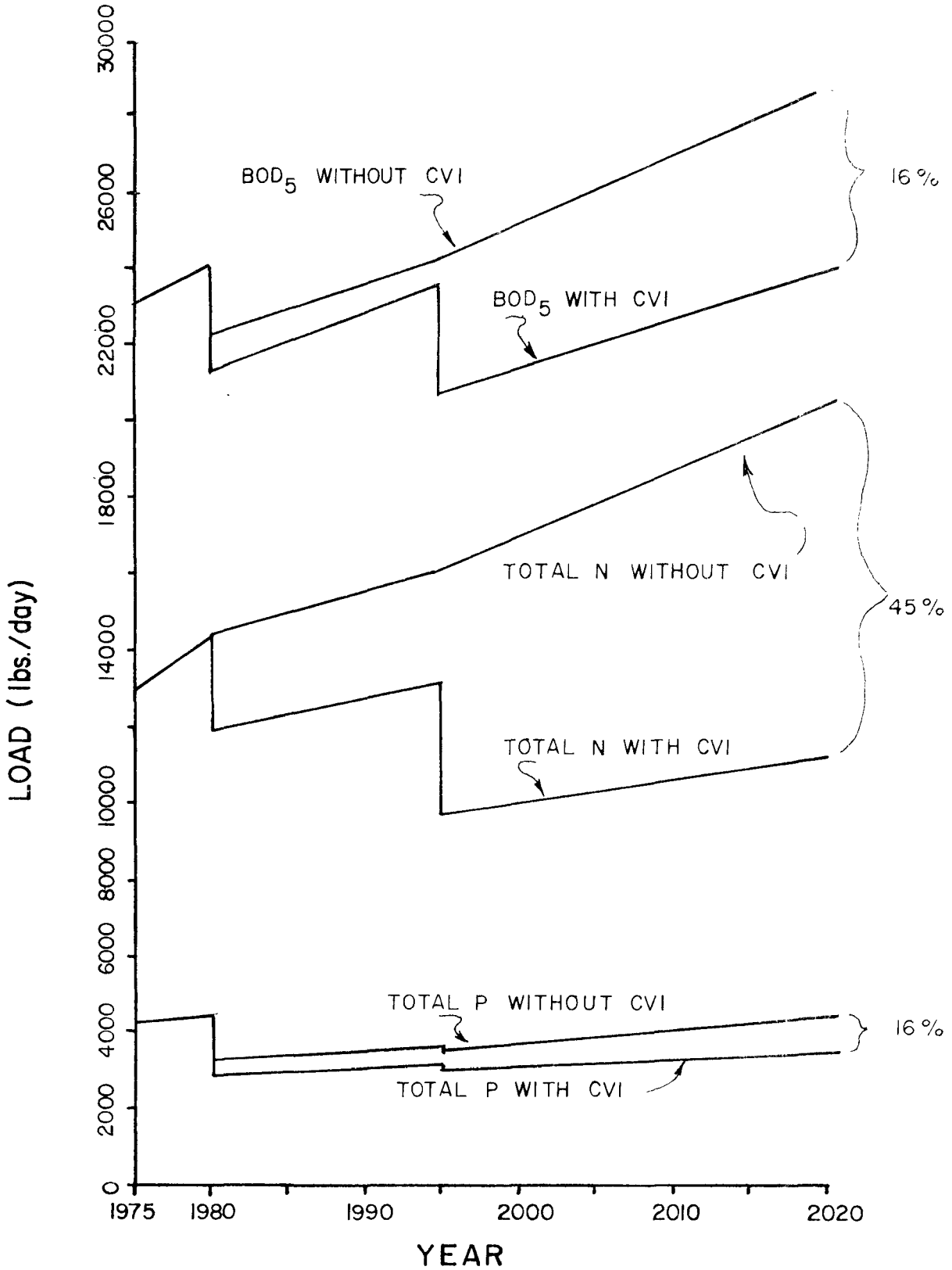


figure 5-7. Analysis of Impact of C.V.I. on Pollutant Loadings for the Entire Study Area

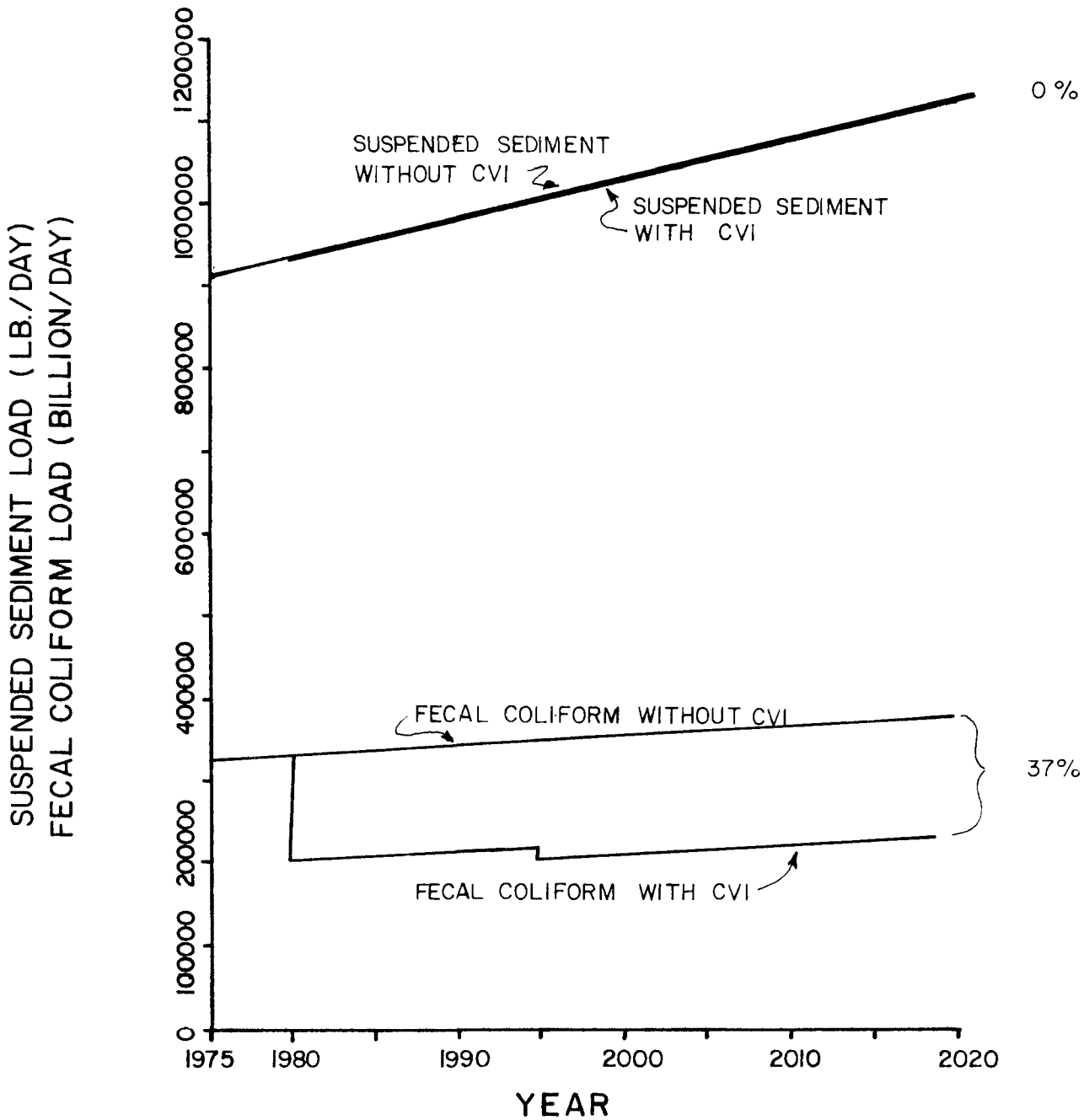


figure 5-8. Analysis of Impact of C.V.I. on Pollutant Loadings for the Entire Study Area

will increase until stream concentrations of these pollutants approach the average effluent concentrations. Average effluent concentrations will depend upon both the thoroughness with which septic tanks are intercepted and the decisions reached in regard to intercepting point sources in Phase II and III.

d. Soil Erosion

Residential, commercial and industrial development that will be facilitated by centralized sewer system, whether converted to CVI or not, will result in disruption of natural soil surfaces and consequent acceleration of soil erosion.

At present there are no soil erosion control ordinances in Summit County. Of the five soil erosion control ordinances in Cuyahoga County, only one, Valley View, requires performance bonding and has provisions for fines in the event of non-compliance. None of the ordinances designate a responsible local official for enforcement of the ordinances.

4. Secondary Effects-Manmade Environment

a. General

The question of secondary impact of sewer construction and its role in inducing growth an development has been the subject of controversy in the Environmental Assessment.

CRSD, on pages 153-157 of the Assessment, after qualifying its answer with an extended discussion of the arguments for an against induced growth, states that:

> "Once the CVI is installed, it would appear that development might be a little easier than at present. However, since the area surrounding the river and the park, particularly the eastern portion, has been planned for growth by the Regional Planning Commission, and has adequate transportation facilities to Akron and Cleveland and electric facilities the area will undergo substantial growth. The lack of available sewers has not appeared to be a significant deterent in the past. Individual package plants have been used and will continue to be used as a means of waste disposal, unless a public facility is provided. The major constraint to development is the provision of water, particularly to the western portions around Richfield. However, plans have been developed to provide the area with public water from Cleveland.
>
> "The trunks to the CVI may tend to induce development. The trunks have been sized for ultimate development and although they are primarily designed to intercept existing sewage plants, growth may occur along the route of the trunk.

The summary of the assessment of utility impacts cited in Cuyahoga Valley 1975 is somewhat more definite:

> "Current projections of population growth and economic activity indicate the area along the east side of the valley will experience significant growth within the next 20 years. It is expected that within the next 5 to 10 years this entire area will be provided with adequate water service. The lack of sewer facilities of adequate capacity acts as the major constraint on development at this time. Growth projections for the west side of the valley are significantly less than those for the eastern side. This is due to the already developed nature of the northern communities and the development potential in the southern areas. Much of the latter areas have large lot zoning, inadequate land capabilities for septic systems, and no immediate plans to provide sewer and water service. Thus rapid growth in these regions is unlikely.

It has been suggested (see Chapter 3) that such funding also removes most economic barriers to expansion into areas of low density development.

In its earlier (1974) draft Environmental Assessment CRSD addressed the question of induced growth much more directly (Draft Assessment, Pages 46-51), although heavily qualifying any direct acknowledgement of induced growth:

> "The social and economic impacts resulting directly and indirectly from the Cuyahoga Valley Interceptor will be of major significance in terms of the growth of the region, the change in land usage and the increase in land values.
>
> "The interceptor is not being built, however, for the purpose of inducing development, but rather to correct existing pollution problems.
>
> "With the exception of the cities of Maple Heights, Garfield Heights, and Cuyahoga Heights, which have little land available for further residential development, the Interceptor will probably have considerable effect on the rate of growth of communities within its drainage area. The sewer will, make possible increased development and construction in the municipalities of Independence, Brecksville, Valley View, Walton Hills, Brooklyn Heights, and Northfield. This effect is somewhat mitigated by the fact that the construction of the interceptor in these areas not only eliminates

existing pollution problems, but provides a means for residential development without accompanying water pollution effects. Growth in these communities is far more related to their location and access to a metropolitan area, a minimum concentration of population; their history of recent growth; and their economic base. The availability of a major interceptor sewer, in and of itself, is no guarantee of economic or population growth.

"The projected population increases in the CVI communities will likely be responsible for some destruction of vegetation and wildlife habitat, increased storm storm runoff and erosion, increase traffic and residential heating related air pollution, etc. These effects, however, are caused by people and not by the sewer. While the sewer will have some effect in terms of inducing residential development, it is not true that this growth is a direct result of the sewer.

"The possibility exists that the interceptor may encourage zoning changes to permit higher density multi-unit residential and commercial activities. The minimum lot size zoning in areas of present septic tank use may well be modified when the sewer system becomes available. At present time none of the communities that use septic systems in the Phase I drainage area have plans to decrease their minimum lot size or to modify their present zoning regulations. These communities have zoning plans which contain a mixture of industrial, commerical, and residential area, and it is questionable whether these areas would change simply because of the interceptor.

"The City of Independence is presently building a temporary treatment facility to handle the sewage flow, until the Cuyahoga Valley Interceptor is completed. In 1970, only twenty percent of the population of Independence was served by sewers. By 1980, every residence and business in Independence will be connected into the Cuyahoga Valley Interceptor. It has been predicted that the population of Independence will increase from 7,034. One of the main reasons for the increase is the development of business and industry in the City. The sewer will enable the development of the extensive industrial zoned lands along the eastern corporation line; however, the City will remain predominately a residential community with single family housing.

"The Village of Valley View presently has no residential sanitary sewers. The only sanitary sewers are located in the two industrial parks in the Village. The Village will build sanitary sewers to tie into the Valley View Trunks 1 and 2 after the Cuyahoga Valley Interceptor is completed, and will probably be totally sewered by the year 2000. The land south of Rockside Road between Canal Road and the Cuyahoga River will be part of the proposed Cuyahoga Valley National Park. The sewer will not cause any change in this planned land use. The development in the Village will increase enormously once the sewer is built. Although the population of Valley View was projected to increase from 1422 in 1970 to 8000 in 1980 and eventually to 20,000 in the year 2020, more recent projections have lowered this figure substantially.

"The City of Brecksville presently has sanitary or combination sewers serving all of its population. The population of Brecksville is expected to increase from 8,790 in 1970 to 13,500 in 1980 and 37,000 in the year 2020. The Cuyahoga Valley Interceptor and the Brecksville Trunk have adequate capacity to handle the increased flow.

"The Cuyahoga Valley Interceptor should have little effect on the development of the Cuyahoga River floodplain in this area since the City of Brecksville recommended in its 1967 Master Plan that no residential structure should be permitted to be erected in the fifty year floodplain, and that the floodplain land should be limited to agriculture, parks, open spaces, and recreation. There is no reason to assume that this recommendation will be modified. The Brecksville Trunk Sewer will cause increased development of Brecksville, but the development should be in line with the zoning plans developed by the City.

"The Cuyahoga Valley Interceptor will necessitate a modification of the existing Brecksville collection system. The City presently has both sanitary and combined sewers. During storm periods the capacity of the existing treatment plant is often exceeded and untreated wastewater is discharged directly into the Cuyahoga River. The Cuyahoga Valley Interceptor and the Brecksville Trunk will be able to carry this additional storm water flow initially, but as the area develops the capacity of the sewer will be exceeded if the storm water is not eliminated from the system. Combined sewers may eventually be replaced with separate storm sewers and sanitary sewers. The Village of Walton Hills is presently separated into two major areas. The area along its eastern border between Bedford and Northfield is zoned for industry while the remainder of the Village is zoned for country homes or park land, except for a small business area

at the intersection of Walton Road and Alexander Road. Presently over twenty percent of the community is served by sanitary sewers. By 1990, all of the community will be served by the Cuyahoga Valley Interceptor. The present land zoning should not be affected by the trunk sewer, although it is projected that the population will grow to approximately 16,000 by the year 2020.

"The Village of Northfield has been plagued with inadequate sewage treatment facilities for a number of years. At the present time its treatment plant is at least 25% overloaded and orderly growth and development has been retarded by a State imposed building ban. Construction of the Walton Hills trunk will permit the resumption of the Village's orderly growth in accordance with the local zoning and land use plan.

"The Village of Brooklyn Heights will not experience any significant land use changes due to the Brooklyn Heights Trunk. The area wherein the Trunk is located is now zoned industrial and should remain unchanged in the future.

"Sagamore Hills Township will not experience any changes in land use or population growth due to the Hawthornden Trunk Sewer since this trunk sewer will only serve the Hawthornden State Hospital in Sagamore Hills.

CRSD concluded its 1975 evaluation:

> "Generally it is felt that the sewers will have a negligible effect on the growth of the area compared with other growth factors.

It also stated:

> "The installation of a large sewer with excess capacity creates a situation whereby growth is needed to make future payments on the outstanding debt. This is not the case with the proposed action since the CRSD will not fund the sewer on local assessments, but by revenue from the total CRSD service area."

b. Air Quality Impacts

The principal primary effect of the construction of the Cuyahoga Valley Interceptor on air quality would be increased dust levels caused by the associated land clearing and excavating operations. Excessive dust levels can be prevented by such standard techniques as the wetting of dry, dusty areas. Any on-site waste incineration, if conducted in accordance with state and local regulations, should pose no serious problem to the maintenance of air quality. Emissions of particulates, carbon monoxide, hydrocarbons and nitrogen oxides from construction equipment, as well as those from the personal vehicles of those working on the construction project, should present no significant difficulties. The potential secondary effects of the Cuyahoga Valley Interceptor on air quality, which cannot be quantified with any reasonable degree of certainty, are described below.

The average concentrations of particulate matter observed in the project area are presented in Table 2-22. Since sampling is only conducted intermittently, the second-highest 24-hour levels would not be directly comparable to the applicable standards (which may be exceeded only once in a full year) and are thus not presented. While it is believed that the very high particulate levels recorded at Valley View (which averaged 184 $\mu g/m^3$, nearly 2.5 times the 75 $\mu g/m^3$ annual primary standard, and is also known to have exceeded the 250 $\mu g/m^3$ 24-hour state standard 10 times in 1973) are indicative of a predominantly localized problem in the lower Cuyahoga Valley, which may be solved by improved industrial source controls; the levels measured at other locations in the project area have also been unacceptable (Twinsburg averaging 5 percent over the annual primary standard in 1974, and exceeding the 150 $\mu g/m^3$ 24-hour secondary standard at least twice). Any increased development or activity in the project area may therefore be expected to result in additional violations of ambient particulate standards.

Sulfur Dioxide

The average concentrations of sulfur dioxide monitored in the project area are shown in Table 2-22. Again, short-term levels have not been presented. However, sulfur dioxide levels observed in the project area are generally well within the applicable standard. In any case, sulfur dioxide levels approaching ambient standards are almost always attributable to specific large sources, such as fossil fuel-fired power plants, that may be controlled utilizing available technology. Communications with the local utilities indicate that there are no plans to construct a new power plant in the project area. Therefore, the construction of the Cuyahoga Valley Interceptor cannot be considered as a threat to the maintenance of ambient sulfur dioxide standards.

Other Contaminants

Concentrations of carbon monoxide, hydrocarbons, nitrogen dioxide and photochemical oxidants are ordinarily a problem only in areas with very high traffic densities, and are thus believed to be low in the project area at the present time, though only thelevels of nitrogen dioxide have been measures there. These are also presented in Table 2-22, and are well within the applicable standard.

Carbon monoxide concentrations may be presented from exceeding the applicable ambient standards by means of appropriate transportation planning measures and highway design techniques. Hydrocarbon, nitrogen dioxide and photo-chemical oxidant levels are ofgreat concern only in the case of geographically large and very highly developed areas, since photochemical smog formation occurs on a large scale rather than in isolated cases. Emissions of all the vehicle-related air contaminants discussed in this paragraph will be greatly reduced nation-wide as more efficient pollution control devices are installed on new automobiles, and as new cars replace the old ones on the roads.

## Conclusion

In summary, of all the principal air contaminants, only total suspended particulates may be expected to exceed the applicable ambient standards partly as an indirect result of the construction of the Cuyahoga Valley Interceptor. Such violations would be an indirect result of area growth, cannot be reliably quantified and may be avoidable through theincreased utilization of efficient particulate control equipment and techniques by industrial emission sources. There is the possibility that decentralization of industry and population in a metropolitan area that is not growing rapidly in total, such as Cleveland, may actually result in a reduction in air contaminant levels in the central city.

### c. Transportation Impacts

Although it does not appear that there will be any surges of development in the CVI Study Area, it is believed that the past pattern of low density spread and scattered development of both residential and non-residential land will continue. If so, a continued dependence upon the automobile seems likely for a comparatively high proportion to total trips. It would therefore appear logical to expect either that the existing roadways will need to be upgraded or that the construction of new roadways to meet new demands will be required. Unfortunately, the Ohio Department of Transportation, which has the primary responsibility of planning new construction in the CVI Study area, is currently unable to undertake any long range plans due to the lack of funds. Therefore, ODOT is cancelling any long range projects until Federal funds are available.

According to Mr. Harry Meyers, the Ohio Department of Transportation is only considering roadway construction for the period between 1977 and 1981. Within the CVI Study Area, the State is contemplating only one project. That is, the reconstruction of State Road 8 from Graham Road in Cuyahoga Falls to Route 303 in Boston Heights. Construction is to start in the Spring. The estimated cost is $12 million, with the local share to be approximately five percent.

If funds are secured after 1981, ODOT expects to continue the reconstruction of State Road 8 from Route 303 to Route 271 in Macedonia. The estimated construction cost for this phase of the reconstruction is $10 million (present dollars).

d. Undeveloped Land

The amount of undeveloped land subject to development pressures is of concern in evaluating the impacts of community growth to be served by proposed sewers. The Environmental Assessment cites a total of 81,700 undeveloped acres in the three phases of the CVI study area. It was also estimated that approximately 50 percent, or about 40,000 acres, could be estimated as unsuitable for development because of topography and soil limitations. For the sake of conservatively estimating the level of residential development that could be accommodated within the undeveloped land, it might be assumed that another 20,000 acres would be necessary for utility right-of-ways, highways, public or quasi-public use, commercial development and industrial development. Also assuming several mixes of single family and milti-family dwelling units at conservative (low) densities, the future increases in study area population that could be housed on those 20,000 acres can be calculated as shown in Table 5-10.

According to these calculations, the projected increase in study area population between 1975 and 2020, 131,000 persons, could be accommodated on the assumed amount of available land only if more than 10 percent of residentially developed land is used for multi-family dwellings. If developmental densities are very low, future developmental pressures may result in development of land unsuitable for development for environmental or structural reasons.

This brief evaluation of undeveloped land is not intended to quantify the exact number of buildable acres or to promote multifamily residential development. It is intended to show (1) that properly developable land is limited to some extent in the study area, and (2) that with unguided low density development, future demand for land may result in incroachment on land that might properly be left undeveloped. Existing sewered areas and areas opened to development offer the potential for increasing residential densities in land that can justifyably be developed. Opening up new land areas also could increase opportunities fordevelopment of land which provides its highest use while vacant.

Maximizing the benefits of centralized sewerage facilities while minimizing the detriments requires knowledge of land capabilities and environmental factors in land development coupled with motivation to assure that land sees its best use. Accumulating the knowledge and applying the motivation to zoning decisions are the functions of a multiplicity of municipal, county and regional agencies.

Table 5-10. Hypothetical Future Populations that Could be Housed on 20,000 Acres of Developable Land, with Various Housing Mixes.

| SINGLE FAMILY | | | | | MULTI-FAMILY | | | | | TOTAL | | DENSITY | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percent of Residential Developed Land | Assumed Units Per Acre | Total Units | Assumed Persons Per Unit | Residential Population | Percent of Residentially Developed Land | Assumed Units Per Acre | Total Units | Assumed Persons Per Unit | Residential Population | Units | Increase in Population | Persons per Future Residential Acre | Persons per Total Present Undeveloped Acre |
| 50 | 1.5 | 15,000 | 3.5 | 52,500 | 50 | 5 | 50,000 | 2.5 | 125,000 | 65,000 | 177,500 | 8.875 | 2.19 |
| 67 | 1.5 | 20,100 | 3.5 | 70,350 | 33 | 5 | 33,000 | 2.5 | 82,500 | 68,100 | 152,850 | 7.64 | 1.88 |
| 90 | 1.5 | 27,000 | 3.5 | 94,500 | 10 | 5 | 10,000 | 2.5 | 25,000 | 37,000 | 119,500 | 5.98 | 1.47 |
| 100 | 1.5 | 30,000 | 3.5 | 105,000 | 0 | 0 | 0 | 0 | 0 | 30,000 | 105,000 | 5.25 | 1.29 |

## D. Conclusions

The need for centralized sewage collection facilities in Phase I is evident. Removal of septic tank effluent from an area almost totally unsuited for filter fields, of poorly treated industrial discharges from a stream still heavily loaded with pollutants, and transfer of all these to a plant with a consistently high level of treatment are very valuable improvements.

In bringing these improvements about, however, two important criteria must be met:

1. avoidance of unnecessary harmful impacts in the project construction itself, and

2. Institution of planning steps to insure the cost effectiveness and environmental soundness of alternatives for future sewerage facility improvements in Phases II and III of the CVI study area.

CRSD has taken a number of reasonable precautions to limit harmful primary projects impacts. Additional design revisions and mitigating measures to improve the cost effectiveness and environmental soundness of Phase I to be incorporated into Step II design are:

1. Main interceptor sizing of 90 inches inside diameter below Tinkers Creek (Contracts A, B, and C) and 66 inches inside diameter between the Brecksville sewage treatment plant and Tinkers Creek (Contract D). This sizing incorporates the revised flow projection described herein and assumes only minor reductions in inflow and no revision of sewer slopes from those originally proposed in engineering design documents.

2. Adoption of alternate routes B for the Maple Heights trunk sewer and B and C for the Brecksville trunk. These simple and economical changes will not only preserve some of the last remaining prime forest of northeastern Ohio, but will limit erosion to Chippewa Creek and Swan Creek.

3. Implementation of all recommendations of Dr. Brose's archeological survey as published in the Environmental Assessment.

4. Preparation of soil erosion control specifications to include at least resodding of open trench construction areas as described in existing engineering drawings and similarly for the alternate routes to be followed by the Brecksville and Maple Heights trunks; reseeding of all other open trench construction areas within a reasonably short period after trench closing; construction management provisions to minimize the time period between trench excavation and closing.

5. Timing of Hawthornden trunk construction to avoid the Sagamore Road salamander breeding season.

6. On-site soil inspections and testing along the Valley View #2 trunk near its terminus and Maple Hill trunk along Schreiber Road to determine optimal placement of these sewers.

7. Incorporation of flexible joints into the main tunneled interceptor at manholes and pipe joints near shale/ soil transition zones.

8. Use of railroad right-of-ways to reach access sites 15 and 16 to preserve high quality lowland forest.

9. Prohibition of air or alignment holes or vegetation clearing for other purposes in areas designated in revised graphics submitted by CRSD (Personal communication with Mr. Gerald Peters, 5 August 1976-see Agency Comments).

Preliminary cost-effectiveness and environmental analysis for Phase II and III sewage facilities suggest that there are viable alternatives to proposed CVI extensions. Many actions now being taken (interceptor capacity at the Milete Sports Complex, Tertiary treatment plant construction underway in the Phase III area, Ohio EPA's freeze on Phase II plant upgrading, and CVI Phase I construction itself) affect the value of different service approaches. Certifiably cost-effective and environmentally sound alternatives for future area service can only be produced by facilities planning now. The Phase I Step 2 grant should therefore require three major planning steps, with a proposed schedule to be submitted for approval within 120 days of any grant award for Phase I design:

1. A complete Sewer System Evaluation Survey (SSES) for the entire proposed three phase service area, with a point-by-point survey of infiltration and inflow sources and recommendations to be implemented for cost-effective removal of infiltration and inflow. Ohio EPA (See May 10, 1976 letter in Chapter 7) has certified that CVI may be subject to excessive infiltration and inflow. The CRSD infiltration and inflow analysis for Cleveland Southerly is not useful as a planning tool for CVI area projects.

2. Initiation of full facilities planning (including an Environmental Assessment) for Phase II. This plan should include full consideration of alternatives suggested in Chapter 3. Ohio EPA (See June 4, 1974 letter in Chapter 7) has specifically recommended accelerated CVI construction for Phase II. Phase II badly needs clarification of what form it will take. Environmental issues include local scenic and natural values. (Brandywine Falls), strong support for local land use planning decisions (for Richfield and other western areas), and reconciliation of sewerage needs and tunnel impact in the Cuyahoga Valley National Recreation Area.

3. Initiation of full facilities planning (including an environmental assessment) for the Phase III area. The start of

this planning may be delayed until completion of the sewer system evaluation survey. Consideration should at least include those alternatives discussed in Chapter 3.

No EPA commitment to Phase I construction should imply any commitment to any course of action for later phases.

There is little doubt that CVI Phase I even at its revised capacity is significantly oversized. Much of this is due to the change in design and sizing standards that has occurred in the last ten years. Had there now been an SSES and later phase planning information, as much as 20 percent of projected construction cost might have been saved. The very serious water quality problems that exist in the Phase I area, and CRSD's strong commitment to remedying them requires that this project proceed without delay, but in the future it is vital that major projects not be undertaken without a full planning foundation.

## CHAPTER 6
## RELATIONSHIP BETWEEN LOCAL SHORT TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

The local short term uses of CVI service are land are for the proposed interceptor, constructed as part of a wastewater treatment system, and the commercial, residential, and industrial development induced by it. Long term productivity of the available habitat and open land in the study area as a wildlife resource and as a land resource for future agricultural or urban use will be affected by short term land use decisions.

A short term decision has immediate and long term effects. Immediate temporary effects during construction of the project would be local disruption of traffic, increased noise levels, removal of vegetation and potential erosion of bare soils. In general, these impacts are inconsequential compared with long term benefits for the water quality of the study area. Long term effects include changing the water quantity and quality of both surface and ground water, generally improving the quality but decreasing the quantity. Another long term effect is a decrease in the amount of open land available for wildlife or agricultural use.

Another short term impact might be an increase in land values and development pressure, slowing or obstructing land acquisition for the Cuyahoga Valley National Recreation Area.

Importance of the long term productivity of the study area as a wildlife resource is limited by the prospective development of the Cuyahoga Valley National Recreation Area, and the existence of sizable acreages of land undevelopable because of slope, which factors together put a "floor" under the total amount of undeveloped area. For each phase, but particularly Phase II, the community and regional need for open space and recreation areas must be weighed against the economic benefits of committing open land to an interceptor which would accelerate use of more open land for industrial, commercial, and industrial development. Both of these in turn must be weighed against uncertain prospects for growth and development for both the study area and the two SMSAs with which it is associated.

# CHAPTER 7

## FEDERAL/STATE AGENCY AND PUBLIC PARTICIPATION

### A. Pre-EIS Comments

A hearing on the final environmental assessment was held on November 5, 1975, between eleven representatives of CRSD and its consulting firm and eight members of local environmental groups. There is not any indication that this was a public meeting, but CRSD's summary is attached, as part of the November 14, 1975, letter referenced elsewhere.

Also attached is the CRSD letter of August 5, 1976 concerning access sites and airholes; the Ohio State Historic preservation officer's letter of January 13, 1976; the July 19, 1974 letter of the Director the the Ohio Department of Natural Resources; and the October 21, 1975 letter of the executive director of NOACA, agreeing with the funding of the Project. Both the Ohio DNR and SHPO requirements for approval have been met.

Also included are June 4, 1974 and May 10, 1976 letters from the Ohio Environmental Protection Agency, the first supporting accelerated Phase II construction and the second certifying excessive infiltration and inflow.

An extended period of agency and public coordination took place during and after preparation of the 1974 draft environmental assessment. Objections raised during this time, chiefly by the Ohio Department of Natural Resources, were among the major factors contributing to the redesign of the CVI. Public meetings at the time (March 28, 1974) also led to the first consideration of the Sagamore Road salamander community.

### B. Draft EIS Comments and EPA Response

Copies of the Draft EIS were sent to 250 agencies, citizen organizations, local governments, individuals. Comments were received from one individual, nine local government agencies (including the applicant and both local A-95 clearinghouses) three citizens organizations, one state environmental agency (acting as clearinghouse), and three federal agencies.

In general many of these comments expressed the same concerns: most felt that further study of secondary impacts, particularly on the recreation area was needed; most supported the alternate trunk routings; and many expressed strong concern about low flow reductions and the safety of the Sagamore Road salamanders. To thoroughly research these and other questions raised a consultant firm, WAPORA, Inc., was retained to perform special study of secondary impacts, low flow reduction, cost effective sizing, and many other concerns. Rather than repeat the same answers over and over, our responses reference those places in the new text where the question raised may be found.

A. Pre-EIS Comments

CLEVELAND REGIONAL SEWER DISTRICT
801 ROCKWELL · CLEVELAND, OHIO 44114 · TEL 216/781-6600

JAMES P. HARRIS
CHIEF ENGINEER

August 5, 1976

Mr. Gerald O. Peters, Jr.
6900 Wisconsin Avenue, N.W.
Washington, D.C. 20015

RE: CVI - EIS

Dear Mr. Peters:

In response to your questions concerning the construction of the CVI we have the following answers.

1. The work areas around each access chamber average about one acre or less of land. The total acreage of land for permanent and temporary easements is approximately 66.6 acres, of which 38.8 acres are permanent easements and 27.8 acres temporary. The area provided for construction and for material storage at the access shafts totals 24.3 acres, 12.8 acres of which is permanent easement, but all of which is specified to be returned to a condition comparable to that which existed prior to the construction. About 8.2 acres additional is contained in access roadways, most of which are presently used as such by the Cleveland Electric Illuminating Company, and all of which will be restored to the present status.

   Property maps for the four Interceptor Contracts (A, B, C and D) are attached. Permanent easements are colored in red and temporary easements in green.

2. It is anticipated that the Contractor will want air and alignment holes in those areas where he is permitted to do so by the specifications. The specs provide stationing limitations on where the Contractor may install the holes. The Contractor will not be allowed to work (at the surface) in any area of ecological or environmental concern. (Areas where air and alignment holes will be prohibited are shaded on the attached maps.)

3. Air and alignment holes were utilized on the Northwest Interceptor Project. However, much of NWI was in or closely adjacent to public right-of-way and environmental limitations were not a factor of concern.

4. Necessity for installing air and alignment holes is usually determined by the Contractor as he discovers underground conditions effecting his method of operation. In general holes adjacent to access shafts are preferred in order to ensure correct and accurate transfer of line and grade down to the tunnel. In long runs between access shafts, changes of direction or changes in surrounding materials the holes do permit greater ease for the Contractor in maintaining line and grade; however, it is feasible to construct the tunnel through those areas where drop holes are prohibited.

5. The air and alignment holes are normally 8" diameter lined holes located on the centerline of the tunnel. Installation is by a drill rig, the same as used for making test borings, and surface disruption consists solely of getting the vehicle to and from the site, plus the hole. Subsequent to the tunnel construction, the Contractor is required to remove the lining, refill the hole and return the effected area to its original status.

6. We do not contemplate the installation of anymore access shafts beyond those provided on the plans. As the Contractor will bear all cost of additional shafts we feel he will only ask to install one in an emergency. He will still need written permission from CRSD before he can do so. Additionally, our experience on the NWI indicates no need for additional access.

7. Upon completion of the work the only visible sign remaining will be a concrete slab measuring 11'-8" by 14'-8", at grade. The surrounding area will be regraded and reseeded. Vent pipes will not be required.

8. Temporary easements, as with permanent easements where any surface disruption has occurred, will be restored to the condition which existed prior to the construction. All unusable materials are to be removed from the site and disposed of by legal means (the Contractor being responsible for obtaining any permits necessary for the disposal). The areas used and disturbed shall be restored properly.

9. CRSD will engage the services of a qualified dendrologist to mark those trees in temporary easements which may not be removed. No tree larger than 2" diameter can be removed by the Contractor from a permanent easement without prior written approval from CRSD and must be replaced with like species.

Should you desire additional information, please contact Erwin Odeal of my staff.

Very truly yours,

CLEVELAND REGIONAL SEWER DISTRICT

James P. Harris
Chief Engineer

JPH:pak

Attachments

c.c. Andrew T. Ungar
Erwin J. Odeal

November 14, 1975

U. S. Environmental Protection Agency
Region V
230 South Dearborn
Chicago, Illinois 60604

Attention: Mr. Michael MacMullen, Planning

Re: Environmental Assessment, Cuyahoga Valley Interceptor

Dear Mr. MacMullen:

Enclosed herewith are two (2) copies of Volume I and II of the revised Cuyahoga Valley Interceptor Environmental Assessment Statement. These printed copies of Volume I, will replace the xerox copies sent to you on October 17, 1975.

Appendix "D" of Volume II contains the Archeological survey conducted by Dr. David Brose of the Archeological Laboratory of the Cleveland Museum of Natural History. This survey was undertaken in accordance with the procedures specified by the Ohio Historical Preservation office. In his report Dr. Brose noted: "With the exception of the test excavations in portions of CVI Access Areas #3, #4 and #11 noted in Section VI of this report, no evidence of prehistoric cultural material was encountered" (Page 23, Appendix D).

In the case of Access Shaft #3 and #11 the CRSD will follow Dr. Brose's recommendation that all ground-disturbing construction activity be avoided. To accomplish this end on site #11, the Hillside Trunk connection will be shifted to the east side of the CVI mainline.

Because the relocation of Shaft #4 would be extremely difficult from a technical standpoint, the CRSD is pursuing obtaining permission from the affected property owners for Dr. Brose to salvage the area prior to construction. We will advise you further on this matter at the conclusion of our discussions with the property owners.

In addition, the Western Reserve Historical Society has advised the Ohio Historical Preservation office that no Historical or Architectural Treasures will be adversely affected by the CVI project.

To facilitate expeditious review of the Assessment, CRSD will distribute copies to Ohio EPA, Ohio Department of Natural Resources, National Park Service, Ohio Historical Office, Cleveland and Akron Metropolitan Park District, Northeast Ohio Areawide Coordinating Agency and several other local groups.

As agreed, we are also transmitting under separate cover one (1) set of the detailed construction plans for the CVI mainline and trunks to aid in your review of the assessment. As a result of the Environmental Assessment, several changes have

Attention: Mr. Michael MacMullen November 14, 197[illegible]

been made in the project, some of which are not shown on the plans being submitted. Since it is possible that additional changes may be required after Ohio and US-EPA's review of the Assessment Statement, the District would prefer to make all changes in the plans and specifications at one time after the Assessment is approved. No construction will proceed without the submission and approval of final drawings and specifications showing all changes.

The following changes will be incorporated in the project, although not shown on detailed plans at this time:

1. In order to minimize environmental impacts, eleven (11) manholes will be deleted. A list of those to be deleted is included as attachment "A".

2. The size of the mainline interceptor will be reduced from 108 inches in diameter to 96 inches in diameter between Stations 100+00 to 344+70 and from 84 inches in diameter to 78 inches in diameter between Stations 344+70 to 447+38.

3. Plans for the Brooklyn Heights Trunk are not being submitted at this time since it will be redesigned to reduce costs.

4. The C.V.I. Pump Station is presently undergoing intensive review in order to reduce costs.

Since completion of the Assessment, we have met with representatives of all significant local environmental groups to discuss the project and our revised Assessment. A copy of our staff notes on the meeting is enclosed as Attachment "B". As the notes indicate, there were no objections raised to the project at the meeting, and it is our feeling that a negative declaration would not be protested locally.

Should you have any questions or comments, please contact Erwin Odeal of my staff.

Very truly yours,

CLEVELAND REGIONAL SEWER DISTRICT

Andrew T. Ungar, Director

ATU/bl
enclosures
cc: D. C. Hasbrouck, OEPA
J. P. Harris
L. C. Rego
E. J. Odeal

ATTACHMENT "A"

MANHOLES TO BE DELETED FROM CUYAHOGA VALLEY INTERCEPTOR PLANS.

| | |
|---|---|
| CONTRACT A: | STATION 104+80 |
| | STATION 148+00 |
| CONTRACT B: | STATION 169+00 |
| CONTRACT C: | STATION 230+50 |
| | STATION 251+00 |
| | STATION 296+50 |
| | STATION 318+00 |
| | STATION 333+00 |
| CONTRACT D: | STATION 358+00 |
| | STATION 386+50 |
| | STATION 438+00 |

ATTACHMENT B

CLEVELAND REGIONAL SEWER DISTRICT
INTERNAL CORRESPONDENCE

☐ ADMINISTRATION
☐ EASTERLY
☐ WESTERLY
☐ SOUTHERLY
☐ CONTROL CENTER
☐ LABORATORY

TO: E.J. Odeal

DATE: 5 November 75

FROM: Wm. Lutz

SUBJECT: CVI Environmental Assessment
Meeting November 5, 1975
Page 1 of 3

On November 5, 1975, representatives of the CRSD staff, and Havens and Emerson, met with several local environmentalist to discuss the CVI Environmental Assessment Statement which has recently been completed.

The following people were in attendance:

| | |
|---|---|
| James Sanders | CRSD |
| Charles J. Vasulka | CRSD/Western Cuyahoga Audabon Society |
| Paul Murphy | CRSD |
| Nicholas M. DeVito | CRSD Trustee |
| Tony Jordan | CRSD |
| Wm. Lutz | CRSD |
| Frank Weissman | CRSD |
| Andrew Ungar | CRSD |
| Erwin Odeal | CRSD |
| Ellen M. Knox | Sierra Club |
| Michael D. Duermit | Ohio Conservation Foundation |
| George H. Watkins | Three Rivers Watershed District |
| Harvey R. Swack | Cuyahoga Valley Park Federation |
| Wayne G. Rogers | NOACA |
| Leonard Zavarella | NOACA |
| Mrs. James H. Angel | Citizens for Land & Water Use |
| N.E. Hopson | H & E |
| H.N. Merkle | H & E |
| Janet Hutchinson | League of Women Voters |

Mr. Ungar began the meeting with a short review of the project, and the Public Hearing on the Environmental Assessment Statement held about 1½ years ago at the Cuyahoga Heights Village Hall. Mr. Ungar noted that there had been many changes in the project since that first meeting, and the District had endeavored to address and accommodate every concern over the project raised at that time. Specifically, the project had been changed from open-cut construction through the valley with several stream modifications to a complete tunnel all the way from the Southerly Plant to the Brecksville Treatment Plant. In addition, the District had made several efforts to accommodate environmental considerations by moving shaft locations. Mr. Ungar turned the meeting over to Erwin Odeal who provided a brief introduction to Henry Merkle from Havens &

Emerson. All the members of the group were familiar with Mr. Merkle's work and his knowledge of the valley.

Mr. Merkle presented the project using the same format as been employed in prior meetings with Ohio and U.S. EPA's, and with the representatives of the National Park Services and the Akron and Cleveland Metropolitan Park districts. Mr. Merkle utilized slides and the District maps to discuss each shaft site and the changes that had been made to accommodate environmental problems. Mr. Merkle also discussed each of the trunks and noted that, with the exception of the Brecksville and Maple Heights trunks, he saw no real environmental problems. The Brecksville and Maple Heights trunks presented a trade-off between the most economical route and potential environmental considerations since they follow stream valleys.

Mrs. Angel asked questions about efforts to reduce infiltration/inflow into the sewers and the quality control which would be utilized for sewer construction. E.J. Odeal assured her that I/I studies had been completed and the best construction practices would be utilized to keep infiltration/inflow to a minimum. Mr. Ungar assured her that CRSD would have its own inspectors on the job who would keep close track of quality control.

Mr. Watkins was concerned about the clean-up of debris on the site lest they be washed into the stream. Tony Jordan noted that the specifications require the contractor to clean-up the site and that these specifications would be rigorously enforced.

Mr. Duermit asked about provisions for erosion control. Tony Jordan noted that because the shaft sites are minimal in size, erosion will not be a significant problem. Adequate provisions will, however, be incorporated to minimize erosion during construction. Because of the bulk of the soil is clay or shale in nature erosion should be minimized.

Mrs. Angle was concerned about the possibility of the sewer pipe being over loaded because of the large depth of the sewer. Mr. Ungar assured her that the pipe had been properly designed to carry the weight of the over burden.

After Henry Merkel completed his presentation, Ed Hopson explained the population projections, land use considerations, sewer size, and economic analysis that had gone into the Assessment of the sewer project. He indicated that population projections were not simply a total of local projections, but were conservative in nature and had been reconciled against the OBERS projections for the total area and found to be reasonable.

Based on these conservative population projections and a development pattern consistent with local zoning, H & E reduced the maximum pipe size from 108" to 96" for the mainline CVI. The 108" pipe had been based on an ultimate design for

the service area.

Hopson noted the size and capacity of the CVI should not encourage excessive growth upon the areas served since the project is not being assessed but rather is being financed on the utility concept by the CRSD. At such, there will be no economic pressure on adjacent land owners to develop in order to pay assessments.

Mr. Odeal also noted to the group, which was extremely familiar with the valley, that there are literally hundreds of package plants in the area and the unavailability of sewers to date has not represented any significant impediment to development. In fact the proliferation of these plants has caused some real difficulity and perhaps the absence of sewers has encouraged a lower quality development than might have come about if sewers were available. A question was raised by Mrs. Angel concerning CRSD's ability to control the quality of the construction of sewers coming into the CVI. Mr. Ungar assured her that CRSD has complete regulatory control over the quality and type of all connections.

All attendees at the meeting were pleased and satisfied with CRSD efforts. Mrs. Angel indicated that her organization would give whatever support is required. Mrs. Hutchinson commended the District on an exceptionally fine job in the preparation of the Assessment. Mr. Swack seemed particularly pleased with the work. He expressed some concern that the sewer be adequate to serve the development that may come in around the park. He was assured that the sewer while not being over designed, had sufficient capacity to accommodate localized land use changes around the park should local communities desire to permit certain kinds of commercial development to accommodate park activities.

In conclusion there were no unfavorable remarks generated nor was there any indication that any of the groups would file a protest should EPA decide to make a negative declaration on the need for a Environmental Impact Statement.

WL:pak

January 13, 1976

Andrew T. Ungar, Director
Cleveland Regional Sewer District
801 Rockwell
Cleveland, Ohio 44114

Re: Cleveland Regional Sewer District
Cuyahoga Valley Interceptor Project
EPA Construction Grant No. C 390764

Dear Mr. Ungar:

The Ohio Historic Preservation Office has reviewed "The Archaeological Survey of the Cuyahoga Valley Interceptor Project" prepared by Dr. David S. Brose and the related attachments and letters. This office has also contacted Dr. Brose concerning the salvage excavations in CVI Access Area #4. The Preservation Office wishes to express its appreciation for your concern regarding nonrenewable cultural resources and your cooperation and support in identifying possible historic and archaeological sites.

Providing that the recommendations of Dr. Brose are followed in Access Areas #3 and #11, the documentation meets the review criteria established by the Ohio Historic Preservation Office in accordance with Federal regulations. I would like to make one further recommendation concerning the construction phase of the project. Please advise all project supervisors and construction engineers that should evidence of archaeological remains be encountered during actual construction, Dr. Brose or this office should be notified immediately.

This letter represents acknowledgement of compliance with preservation procedures and formal approval to proceed with the project.

Sincerely,

Dr. Thomas H. Smith
Director, Ohio Historical Society
State Historic Preservation Officer

THS:de

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-8727

74 AUG 2 P3:22

July 19, 1974

Dr. Ira L. Whitman, Director
Ohio Environmental Protection Agency
361 East Broad Street
Columbus, Ohio 43215

Dear Ira:

I have reviewed recent construction changes proposed by the Cleveland Regional Sewer District to minimize adverse installation impacts of the Cuyahoga Valley Interceptor.

I endorse proceeding with Phase I construction based upon project modification to include the following C.R.S.D. proposals:

- Tunnelled installation of all interceptor and trunk lines within the boundaries of the Cuyahoga Valley Park.

  Man-holes to be installed at-grade and made water tight as opposed to elevated and vented within the park boundaries.

  Elimination of all river channel relocations within the park boundaries. This includes elimination of channel work near Stone Road.

  Minimization of surface soil and vegetation disruption at man-hole and pour-hole sites within the park boundaries.

With the incorporation of these construction changes, Phase I appears to have no unacceptable aspects and should proceed. I still have reservations about construction and operation of future phases of this project and reserve judgement and endorsement pending review of a formal Environmental Impact Statement.

I must say that I am pleased with the extent of cooperation offered by C.R.S.D. in dealing with D.H.P. concerns in Phase I. My qualified support of this phase is therefore assured.

Sincerely,

WILLIAM B. NYE
Director

WBN:jkd

cc: Andrew Unger, Cleveland Regional Sewer District

NORTHEAST OHIO
AREAWIDE COORDINATING AGENCY
439 The Arcade, Cleveland, Ohio 44114
Phone (216) 241-2414

DONALD G. SIMMONS
President

FREDERICK E. J. PIZZEDAZ
Executive Director

October 21, 1975

Mr. Michael MacMullen
Unit Coordinator - Planning Branch
U.S. Environmental Protection Agency
230 South Dearborn
Chicago, Illinois 60604

RE: Cuyahoga Valley Interceptor,
Phase I, Step 3

Dear Mr. MacMullen:

This letter is written in regard to NOACA's review of 201 application for the Cuyahoga Valley Interceptor, Phase I, Step 3 (C390764-010). Under Phase I, the Cuyahoga Valley Interceptor Sewer will serve all or part of the communities of Brooklyn Heights, Independence, Valley View, Garfield Heights, Maple Heights, Brecksville, Walton Hills, Broadview Heights, Sagamore Hills, and Northfield.

The Cuyahoga Valley Interceptor will extend from the Southerly Wastewater Treatment Center through the Cuyahoga River Valley to the existing Brecksville Treatment Plant. The entire length of the Interceptor will be constructed by tunnelling between the Southerly Treatment Center and the Brecksville Treatment Plant.

We understand that the Cleveland Regional Sewer District has submitted its final environmental impact assessment to U.S. EPA and we found that this project is consistent with existing regional and areawide planning. It will be coordinated with NOACA's 208 planning process. We recommend that this project be funded.

If further information is needed, please do not hesitate to call.

Yours truly,

Frederick E.J. Pizzedaz
Executive Director

cc: Carl Wilheim, Ohio EPA
Douglas Williams, U.S. EPA
Bob Gill, Ohio EPA
Andrew Ungar, Director, CRSD

State of Ohio Environmental Protection Agency, Box 1049, 450 East Town Street, Columbus, Ohio 43216 (614) 469-3543

June 4, 1974

Re: Northwest Summit County
Proposed Sewerage Recommendation

Mr. Jack Garner
Summit County Sanitary Engineer
19 North High Street
Akron, Ohio 44308

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
JUN 6 - 1974
PLANNING BRANCH - Region V
FILE NO.

John J. Gilligan
Governor
Dr. Ira L. Whitman
Director

Dear Mr. Garner:

The staff of the Ohio Environmental Protection Agency has reviewed and analyzed the reports and testimony regarding the various proposed alternatives for a sewerage service system in Northwest Summit County. Based upon staff recommendations, it is my decision that the most feasible and environmentally satisfactory solution to the problem is to provide service to Northwest Summit County at the Cleveland Southerly Treatment Plant via an accelerated development of the Cuyahoga Valley Interceptor, CVI. This decision envisions the CVI will be completed this decade.

Reaching this decision has involved judging the various impacts of a large number of issues. The staff investigated four alternative systems:

1. Service at the proposed Brandywine Treatment Plant.
2. Service at the Cleveland Southerly Plant via an accelerated development of the CVI.
3. Interim expansion of Macedonia 15, construction of a Furnace Run Plant, and future connection to Cleveland and Akron systems respectively.
4. Service at a number of package plants distributed throughout the area.

Each alternative was judged for its effects on water quality, the environment, feasibility, and other factors. Alternative four was rejected early in the decision process because it was considered to be an unsatisfactory short-run solution that could hinder and would delay the creation of a satisfactory



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long-term sewerage system. It was also recognized that Macedonia 15, Hudson Village, Greenwood, and Connecticut Colony Plants have immediate needs that cannot be met by the alternative four approach.

Alternative three was eliminated because this proposal represented an interim solution to a problem that can now be more permanently resolved in nearly the same time frame. No one appeared to be very enthusiastic about trying to meet water quality standards with a rather costly but temporary plant at Macedonia 15. With alternatives three and four judged unacceptable, the staff had its greatest difficulty deciding between the remaining alternatives.

One of the causes of the difficulties was that a number of issues were handled equally well or with insignificant differences. For example, a cost-effective analysis of the proposals using federal guidelines resulted in insignificant differences. After discarding a number of factors, the staff felt that three elements (meeting water quality standards, environmental impact on the proposed park, and the need to adhere to a previously adopted acceptable and progressing general plan) significantly favored alternative two.

First, it is the staff's judgment that alternative one will cause a slight violation of water quality standards at the canal diversion dam. Secondly, the adverse environmental impact of a plant near or within the proposed park would be greater in the long run than the temporary effects of the interceptor construction. Much of the short term impact of alternative two can be avoided or minimized with careful design and close coordination with the Ohio Department of Natural Resources. However the long term impact of alternative one, with the intrusion of a plant in or near the proposed park, was judged to have a significant impact on the potential recreational usage. Third, the planning process itself requires not only competent preparation (including public input), the ability to make necessary adjustments in the plan as time and other factors dictate, but also necessitates overall adherance to the proposed development plan and a reluctance to allow major changes without significant reasons for those changes. Given these three factors, the staff recommends alternative two.

Having accepted this recommendation, I recognize that building of the Cuyahoga Valley Interceptor, on an accelerated basis, can only be accomplished if federal, state, and local officials

will cooperate. A number of very important issues will have to be dealt with before construction can begin. It is my hope that the agency will be able to assist Summit County and the Cleveland Regional Sewer District in resolving these issues in a mutually satisfactory manner.

Should you have any further questions or wish to meet with me or my staff, please call.

Very truly yours,

Ira L. Whitman
Director

ILW/or

cc: William B. Nye
Summit County Commissioners
Raymond Robinson Jr.
George Watkins
Akron Metropolitan Parks
Congressman Seiberling
Harlan Hirt

May 10, 1976

James A. Rhodes
Governor
Ned E. Williams, P.E.
Director

Mr. Todd Cayer, Chief
Construction Grants Branch
U. S. EPA, Region V
230 South Dearborn
Chicago, Illinois 60604

OhioEPA

Re: CRSD - CVI
I/I Analysis
C 390764 010

Dear Mr. Cayer:

It is hereby certified that, in my professional judgment, the Cuyahoga Valley Interceptor may be subject to excessive infiltration/inflow as defined in 40CFR 35.927. It is further certified that:

1. The treatment works for which this grant application is made will not be changed by any rehabilitation program and will be a component part of any rehabilitated system.

2. That the Grantee has assured that any necessary sewer system evaluation will be continued on a schedule acceptable to the State.

3. That any resulting rehabilitation program will be conducted on a schedule consistent with treatment works construction and satisfactory to the Regional Administrator.

Very truly yours,

Ned E. Williams, P.E.
Director

NEW/rm



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B. Draft EIS Comments and EPA Response

State of Ohio Environmental Protection Agency, Box 1049, 361 East Broad Street, Columbus, Ohio 43216 (614) 466-8565

August 19, 1976

Re: Draft EIS - Cuyahoga Valley Interceptor - USEPA

James A. Rhodes
Governor
Ned E. Williams, P.E.
Director

Mr. Gene Wojcik
Planning Branch
EIS Preparation Section
USEPA Region V
230 South Dearborn Street
Chicago, Illinois 60604

OhioEPA

Dear Mr. Wojcik:

The Ohio Environmental Protection Agency, acting as lead agency and review coordinator for Federal Environmental Impact Statements, has received comments on the above referenced Draft EIS from sections of this Agency and the Ohio Department of Natural Resources. The following comments constitute those received by this Agency as of August 12, 1976.

General

All reviewers commenting had praise for the quality of the document as set forth in draft form. The state of Ohio has been actively involved with this project for several years, and is in agreement with the concept and construction techniques being utilized on the project. All necessary mitigative measures appear to have been met and applied on the project, thus protecting and enhancing the Cuyahoga River Basin through this area to the greatest extent possible.

The following comments are made with regard to physiographic limitations and considerations for proposed developments in the project area.

Specific

1. The proposed action is in compliance with the goals of the Shoreland Management Program. The Cleveland Regional Sewer District's proposed pump station at the Southerly Wastewater Treatment Plant must be flood-protected to an elevation of 602.5 msl. in order to conform to "Ohio Flood Plain Regulation Criteria."



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2. There appears to be no significant adverse impacts on any of the existing known natural areas or nature preserves in the project area. It is recommended that every possible mitigative action be taken to avoid disturbance to the salamander populations in the Sagamore Road area. Any questions or issues regarding the project's effects on natural areas should be brought to the attention of the Division of Natural Areas and Preserves, ODNR.

3. Of primary concern is the impact of constructing trunk sewers through areas within and adjacent to the Cuyahoga Valley NRA, specifically sewers traversing valley walls. Page 144, first sentence, states "...trunk sewers in the proposed parkland are being tunnelled...." While it is known that the trunk sewers will be constructed primarily by open cut methods, it remains unclear as to the method of construction to be employed in ascending the valley walls. Page 143, first paragraph, describes a 30 foot easement for the Brecksville and Maple Heights Trunks. Clarification must be provided on all activities related to trunk line construction affecting the Cuyahoga Valley NRA.

4. Concerning trunk sewer alignments, the state has been informed by the applicant that the Brecksville trunk alternative alignment as proposed by USEPA may traverse areas with severe soil stability problems. We have also been informed that the extensive forested area which the trunk was originally going to bisect has been, to a great extent, destroyed by new, ongoing development. We would suggest that USEPA give consideration to these facts in the preparation of the Final EIS.

5. While the general geology and physiography of the CVI study area is sufficiently discussed, it is felt that more specific and detailed information should have been presented in description of the physical environment along the Phase I interceptor tunnel. For example, it is noted in Part II, Appendix C, Exhibits 1-7, that an array of borings apparently have been taken along the Phase I tunnel alignment, and incorporation of the logs and any interpretations from these borings in the EIS would have been an appropriate part of the project description.

6. It is suggested that the proposed CVI alignment be delineated on figures 3-12, Part II of the EIS, in order to more clearly present the relationships between the interceptor and various facets of the environment.

7. Erosion, slumping, mudflows, and land slides are potential hazards, especially in the slope instability areas identified in Figure 12 (Part II). Appropriate erosion control and structural measures (as suggested on Page 78) will undoubtedly be required to minimize the hazard.

8. Page 15 (Part II) - A typograhpical error was noted on the 6th line from the top of the page. Instead of Carlisle muds the soil type name should be Carlisle muck.

9. Page 142, Biology: The last sentence, first paragraph, should read "construction management methods...to protect these amphibians."

We appreciate the opportunity to review the Draft EIS and look forward to receipt of the Final EIS.

Very truly yours,

Ned E. Williams, P.E.
Director

NEW/mam

Response

Problems of traversing valley walls results of borings are discussedin Chapter 2.A.2. Almost all agencies contacted thus far and most individuals have recommended the Brecksville trunk alternatives discussed in Chapters 4 and 5; on-site observation indicates that within the Chippewa creek valley the lower portion of the streambed is relatively intact. Suggested CVI Phase I alignment is now shown in several figures of the Statement to allow the recommended presentation.

On page 142 CRSD presumably meant herpetiles, rather than reptiles.

NOACA
Northeast Ohio Areawide Coordinating Agency

JAMES F PATTERSON
President

FREDERICK E. J PIZZEDAZ
Executive Director

August 16, 1976

Mr. George R. Alexander, Jr.
U.S. EPA - Region V
Chicago, Illinois 60604

Dear Mr. Alexander:

The Draft Environmental Impact Statement for Phase I of the Cuyahoga Valley Interceptor has been reviewed by the Northeast Ohio Areawide Coordinating Agency. Two copies of the Policy Board resolution on this matter are attached.

It should be pointed out that many of the recommendations contained in the Board resolution have already been taken into consideration by the Cleveland Regional Sewer District. This situation is partially due to the fact that this Draft EIS was prepared some time ago and doe not reflect the recent developments regarding the Cuyahoga Valley National Recreation Area. Therefore, it should be understood that one review was based on the Draft as it was presented to us, and resolution 76-227 accurately reflects our comments on that Draft.

As a NOACA function, we plan to follow up on the status of this project, and we would appreciate receiving a copy of the final EIS.

Sincerely,

Frederick E. J. Pizzedaz
Executive Director

cc: Cleveland Regional Sewer District

RECEIVED
AUG 20 1976
EPA REGION 5
OFFICE OF REGIONAL ADMINISTRATOR

400 The Arcade • Cleveland, Ohio 44114 • (216) 241-2414

No. 76-227

RESOLUTION OF THE BOARD
OF THE
NORTHEAST OHIO AREAWIDE COORDINATING AGENCY

WHEREAS, the U.S. Environmental Protection Agency has submitted for review and comment a Draft Environmental Impact Statement on the Cuyahoga Valley Interceptor sewer project; and

WHEREAS, the Northeast Ohio Areawide Coordinating Agency, as the recognized Metropolitan Clearinghouse in the five Northeast Ohio Counties of Cuyahoga, Geauga, Lake, Lorain, and Medina has, through the established project notification and review system the mechanism to solicit comments regarding this type of study; and

WHEREAS, the Board of NOACA has determined it advisable to obtain comments from governmental units, agencies, and committees with respect to said study, having delegated that authority to NOACA staff; and

WHEREAS, this Board has received appropriate input as determined by NOACA staff:

NOW, THEREFORE, BE IT RESOLVED by the Board of the Northeast Ohio Areawide Coordinating Agency:

Section 1. That the Draft Environmental Impact Statement on the Cuyahoga Valley Interceptor sewer project submitted by the U.S. Environmental Protection Agency has had appropriate review and it is recommended that the draft be accepted as presented with the following modifications.

a. Manhole covers in the area from Tinkers Creek to Rockside Road should be flush to the ground as this area is now part of the Cuyahoga Valley National Recreation Area (CVNRA).

b. The Draft should consider the handling of sewage created by the development of centers in the CVNRA.

c. Alternative B or C should be chosen for the Brecksville Trunk line so as to protect the natural environment.

d. The Draft should consider the effects of new commercial and residential construction, enhanced by the availability of new sewers, on the water table in the Cuyahoga Valley.

e. The Draft should consider non-point sources in the land use planning.

f. CRSD should consider coordinating the required land acquisition for the project with the land acquisition schedule for the CVNRA so as not to cause increased land values due to sewer availability, and thus higher expense for park land acquisition.

g. The entire Draft in general should be updated to include considerations of and coordination with the CVNRA.

Section 2. BE IT FURTHER RESOLVED that the Executive Director be and is hereby authorized to transmit a certified copy of this resolution to the applicant as well as to appropriate State and Federal agencies.

Certified to be a true copy of
a Resolution of the Board of the
Northeast Ohio Areawide Coordinating
Agency dated August 4, 1976

Arthur E. Joreski
Arthur E. Joreski, Secretary

The City of Garfield Heights
5555 TURNEY ROAD
GARFIELD HEIGHTS, OHIO 44125

OFFICE OF THE MAYOR

RECEIVED
JUL 21 1976
FREDERICK E. J. PIZZEDAZ
A. P. O. EXECUTIVE DIRECTOR

July 20, 1976

Mr. Frederick E. J. Pizzedaz
Executive Director
NOACA
400 The Arcade
Cleveland, Ohio 44114

Dear Mr. Pizzedaz:

Please be advised that the City of Garfield Heights wholeheartedly endorses the development of the Cuychoga Valley Interceptor Sewer and suggest that every effort be made to resolve differences, if any, regarding the Environmental Impact Statement so that the project can go forward forthwith.

Sincerely,

Raymond A. Stachewicz
Mayor

RAS:ir

cc: Andrew T. Ungar, Director
Cleveland Regional Sewer District

# BROOKLYN HEIGHTS VILLAGE

MUNICIPAL CENTER

345 Tuxedo Avenue

Brooklyn Heights, Ohio 44131

749-4300


420

August 12, 1976

Mr. George R. Alexander, Jr.
Regional Administrator
U.S. Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, Illinois 60604

Gentlemen:

We have read the draft of the Environmental Impact Statement for Phase I of the Cuyahoga Valley Interceptor in Cuyahoga and Summit Counties, Ohio, and are in basic agreement with the statement. I feel it will have no adverse affect upon us, infact, the CVI should be a great asset to the Village of Brooklyn Heights. The only detriment would be a delay in construction.

As Mayor, I urge you to do everything possible to hasten the beginning of this project.

Very truly yours,

Robert D. Cusick

Mayor Robert D. Cusick
Village of Brooklyn Heights

RECEIVED

AUG 1 _ 1976

EPA REGION 5
OFFICE OF REGIONAL
ADMINISTRATOR

RDC:clb

Response

Portions of this project within the National Recreation Area will be tunnelled, with flush manhole covers. CVNRA generated sewage and its disposal is discussed in Chapter 2.B.2.d and 5.B. As discussed in Section 5, impacts on the water table should be minor, due to the generally impermeable nature of most service area soils. An expanded discussion of the future role of non-point sources is found in Chapter 5.C.3. Coordination of the project with the CVNRA land acquisition is discussed in 2.B.2.d.

Cleveland Metroparks System
55 Public Square
Cleveland, Ohio 44113
(216) 621-1054

Metroparks

July 15, 1976

U.S. Environmental Protection Agency
Region V
230 S. Dearborn St.
Chicago, Illinois 60604

Attn: George R. Alexander, Jr.
Regional Administrator
Planning Branch - EIS Preparation Section

Gentlemen:

We have reviewed the U.S. EPA Environmental Impact Statement for the Cuyahoga Valley Interceptor Sewer System.

Since we have been in the original consultation with the Cleveland Regional Sewer District on this phase, many of our previous suggestions have been considered and taken into account.

We believe this is in the best public interests and will not harm the Parks except for the installation of the manholes for access to the trunk lines. We favor Alternates B or C to minimize disturbance to Chippewa Creek in the Brecksville Area and Sagamore Creek in the Walton Hills Area.

I would suggest that the Soil Conservation Service be contacted regarding their concern with siltation into Chippewa Creek and Sagamore Creek.

Sincerely,

Harold Schick
Executive Director

HS:PC



Board of Park Commissioners
John F. Ray, Jr., President Paul D. White, Vice President Lee C. Howley, Vice President
Harold Schick, Executive Director O Dale Graham, Deputy Director Lou E. Tsipis, Deputy Director
David G. Dinger, Executive Secretary

Response

The SCS has been repeatedly contacted during preparation of the final EIS. Additional erosion concerns are discussed in Chapter 5.A.3.

Walter, Haverfield, Buescher & Chockley
Attorneys at Law
1215 Terminal Tower
Cleveland, Ohio 44113
216/781-1212

Paul W. Walter
D. Rusk Haverfield
Loyal V. Buescher
F. Wilson Chockley, Jr.
Homer W. Giles
Arthur P. Steinmetz
Robert L. Musser
J. Robert Malloy
Michael T. McMenamin
David R. Williams
Thomas H. Baughman
Robert S. Horbaly
Charles T. Richl
Robert M. Bloom
David E. Schreiner

of Counsel
Henry J Williams

August 10, 1976

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AUG 12 1976
EPA REGION 5
OFFICE OF REGIONAL ADMINISTRATOR

Mr. George R. Alexander
Regional Administrator
United States Environmental
Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

RE: Cleveland Regional Sewer District - Preliminary Environmental Review

ATTENTION: Planning Branch, EIS Preparation Section

Dear Mr. Alexander:

The undersigned is Solicitor for the Village of Cuyahoga Heights and receipt is acknowledged of your communication of July 23, 1976 in the captioned matter.

The Southerly Sewage Treatment Plant operated by the Cleveland Regional Sewer District is located in the Village of Cuyahoga Heights. Therefore, the Village of Cuyahoga Heights has a vital interest in the amount of sewage that will be treated at the Southerly Sewage Treatment Plant. The Village has no objection to including the Phase One area defined in your communication, but has strong objection to the inclusion of the Phase Two area which would include Stronsville B and C Districts, North Royalton Districts A and B, Medina Sewer District 300, Columbia Township, the Grayton Pump Station area and North Olmsted.

The Village has had to live with the nuisances emanating from the Southerly Plant for approximately 50 years. Although the operation under the Cleveland Regional Sewer District is some improvement over the

operation formerly conducted by the City of Cleveland, it is still a nuisance and the introduction of more sewage to the Southerly Plant will make it extremely difficult, if not impossible, to operate this plant in a nuisance free manner.

The municipalities comprising the area proposed to be added to the Southerly Plant's drainage area have in recent years, at considerable expense, constructed their own sewage treatment plants. It is safe to say that none of these plants are fully paid for at this time. To abandon these plants and build the necessary interceptor sewers to pipe the sewage the great distances to be covered seems to us to be an enormous economic waste. The money could be better spent in improving the facilities at the Southerly plant so that the present load can be handled efficiently and without any nuisance to the neighboring communities.

We would like to receive a copy of the draft of the EIS when it becomes available and would like to be kept informed as to any developments in consideration of the captioned matter. If there are to be any public hearings in connection with these proceedings, we would like to receive notices of such hearings.

Yours very truly,

Loyal V. Buescher

Loyal V. Buescher, Solicitor
Village of Cuyahoga Heights, Ohio

LVB:deh

REGIONAL PLANNING COMMISSION County of Cuyahoga

Carl S. Bohm, Director 415 The Arcade / Cleveland, Ohio 44114 / 216-861-6805

August 10, 1976

RECEIVED
AUG 12 1976
EPA
OFFICE
ADL

Mr. George R. Alexander, Jr.
Regional Administrator
U.S. Environmental Protection Agency
Midwest Region V
230 S. Dearborn Street
Chicago, Illinois 60604

Re: Cuyahoga Valley Interceptor
Draft EIS

Dear Mr. Alexander

At the August 3, 1976 meeting of the Executive Committee of the Regional Planning Commission action was taken concerning the support of Phase I of the CVI. The Executive Committee unanimously supported the conclusions of the USEPA EIS as stated on Pages 5-12, limited the support at this time only to the Phase I interceptor without anticipation of other phases without further study, and incorporated the staff comments and questions as part of the motion of approval.

The following staff report to the Executive Committee should be discussed and answered in the final EIS document:

Staff Report to the Executive Committee

August 3, 1976

The Regional Planning Commission Executive Committee reviewed a Draft Environmental Assessment of the CVI at the April 27th meeting. A staff report at that time presented staff comments concerning the CVI:

1. Support of CVI Phase one.
2. Pointed out the development of the CVNRA and its goal of conserving open space. The possibility of interceptor extensions through the Park, the provision of sewer service along the valley walls and open lands both east and west have the potential to escalate land costs and shift growth in an undeveloped area.

Mr. George R. Alexander, Jr.
Regional Administrator
U.S. Environmental Protection Agency

August 10, 1976

3. The loss in population in Cuyahoga County experienced between 1970 and 1975 is expected to continue for some time in the future. This is caused by decreased birthrates, increased out migration and decreased in migration. The shift of population away from the central city and urban county may be encouraged by the later CVI phases which will open up raw land for development.
4. The ultimate burden and equity of project costs and its operation of the second and third phases should be carefully examined. Action on the Draft EAS was tabled until receipt of a EIS which would provide fuller documentation of this project.

The Draft EIS prepared by U.S. Environmental Protection Agency in July of this year expands the review of impacts of the sewer installation, specifically in geology, soils, existing stream pollutants, land use, zoning, population projections, secondary effects, natural vegetation and wildlife.

The stated goals of the EIS are:

> "Securing the future integrity and environmental quality of the CVNRA."
> "Diversion of growth into constructive channels,...and avoiding urban sprawl."
> "Reclamation and cleansing of the Cuyahoga River and its tributaries."

The final recommendations of the Draft EIS are that the "Sizing 96 in as proposed by CRSD although there is a marginal case for downsizing to a 90" size which might be more cost effective. Adopt alternatives B and C for Brecksville trunk to avoid erosion of the Chippewa Creek; alt. B for Maple Heights trunk phased construction of Hawthornden trunk to avoid disturbing endangered species.

Conclusions on Page 5-12 state:

> "There is little doubt that CVI Phase I is needed." However, two criteria must be met: 1) "avoidance of unnecessary impacts in the project," and 2) "coordination with other major actions affecting water quality in the Cuyahoga River Corridor."

"Such actions include:

1. Upgrading of Akron Sewer Treatment Plant.
2. Completion of the CVNRA.
3. Preparation and Imp. of 208.
4. Local, County and Areawide Land Use Planning."

The staff strongly supports these conclusions of the U.S. EPA statements.

Mr. George R. Alexander, Jr.
Regional Administrator
U.S. Environmental Protection Agency

August 10, 1976

In addition, the staff provides the following comments concerning the Draft EIS:

A. Page 1-1 of the EIS describes this undeveloped open valley area as a major corridor with a "whole complex of Cleveland Suburbs developed along it." Except for Garfield Heights, this whole area, however, would best be described as an open, vacant, agricultural and park land greenbelt corridor between Cleveland and Akron. Significant development has taken place only on the east and west plateau of the valley. Developed urban corridors in this county area are Rte 6 (Bay Village and Lakewood), Lorain Road (North Olmsted), Pearl and Ridge, Broadway, Mayfied Road and Rte. 2 (Euclid - Lake County). The goal of "diversion of growth and development" into this open channel with 60-70% open land south of Cuyahoga County is misdirected and will cause further urban sprawl at the loss to established communities and despoliation of the open lands around the CVNRA.

B. Pages 2-4 and 2-5 of the Draft EIS amplify the soil problems in the Valley and emphasize the slippage of unstable soils that make up the steep valley walls and 14% of the entire service area. These slopes will be transversed with the trunk lines connecting the developable lands on the plateau and the interceptor along the Valley floor. The Draft EIS also documents the seismic activity in the Cleveland area and that a major seismic risk area lies only 50 miles to the southwest.

From this the staff questions what precautions are being proposed in the construction of the trunk lines as they travel up the steep soils to insure stability, limit to erosion, slippage or faults in the service line? Further, what precautions are proposed to limit tie-ins or development along the steep slopes? The clearing of virgin woods and extreme grading for development would be deleterious to the Valley area in terms of preservation, erosion, pollution, aesthetics, etc.

C. On Pages 2-43 the Draft EIS states that Furnace Run and Slipper Run (both serving Phase II area) are the "least developed areas, rugged with steep stream gradients, no major communities, presently no wastewater treatment discharge and that pollution load from surface runoff and septic tanks is minor. Both are clean water streams of high water quality and meet existing standards."

If these areas are undeveloped, with very minor pollution, and clean water streams, why is an interceptor of some 6 miles proposed into these areas? What will be the secondary impacts of development in these areas on these streams?

Mr. George R. Alexander, Jr.
Regional Administrator
U.S. Environmental Protection Agency

August 10, 1976

D. Pages 5-7 through 5-11 of the Draft EIS discuss the secondary effects of the sewer construction, i.e., increased development. While the latest EAS from CRSD discounts the growth effects, zoning changes, increased costs, etc., as a result of sewer construction, the EIS cites earlier reports from ODNR and CRSD wherein the effects on land use are well documented. The staff further attests to the fact that sewer development has and will continue to permit and direct construction and subdivision activity (which is sometimes unchecked). The lack of sewer and water has the greatest deterent effect on development especially in areas where the land owners pay for such service. On Page 6-1 the EIS states, "For each phase, but particularly Phase II, the community and regional needs for open space and recreation areas must be weighed against the economic benefits (staff questions this) of committing open land for industrial, commercial and residential development."

E. Finally, there is no discussion in either the EAS or EIS of the financial and social impacts of the improvement and its financial burden, who pays? How much? How long? Etc.? From data to date all residents and users in the entire CRSD will be charged an unknown amount for the construction and operation of this expansion being built to service an area nearly equal to the size of the present district. In addition, other areas are being added to the CRDS, notably the Rocky River Valley to the southwest.

The staff questions what the projected unvoted sewer charge will be for the service area resident over time as all improvements are made and at the cost to the entire district?

Therefore, the staff recommends that support be given to Phase I only and incorporate the conclusions of U.S. EPA in terms of sizing, trunk location and land use planning, and that the comments and questions raised by the staff be addressed in the final EIS.

We have appreciated the opportunity to review and provide comments and assistance to your agency's efforts in improving the quality of life for all people and to the people of Cuyahoga County.

Sincerely yours,

Carl S. Bohm (97)

Carl S. Bohm
Director

CSB:rmp:jf

cc: Messrs. Andrew Ungar, Cleve. Reg. Sewer District
William C. Birdsell, Cuyahoga Valley National Park
Thomas Pascarella, Summit Co. Planning Dept.
Michael Duermit, Ohio Conservation Commission

Response

The statement on Page 1-2 is " Another important part of land use and water quality planning is the diversion of growth and development and growth into constructive channels, avoiding urban sprawl, strip development, and other blights."

Futher discussion of steep slope problems is found in Chapter 2.A.2.

Questions as to the desirability of sewering the Phase II and III area, and what action would be desirable, are among the reasons for requiring immediate facilities planning for Phases II and III.

NEFCO

19 North High Street | Akron, Ohio 44308 | Telephone (216) 535 2644

CHAIRMAN DON M. STEPHENS | DIRECTOR BYRON D. STURM

MEMORANDUM

DATE: August 13, 1976

TO: Planning Branch - EIS Preparation Section
USEPA, Region V, Chicago

FROM: R. Charles Larlham Technical Director
Water Quality Planning, NEFCO

SUBJECT: Cuyahoga Valley Interceptor (CVI) EIS
NEFCO Staff Comments

While the NEFCO staff is in general agreement with the EIS, we would like to take this opportunity to make some comments:

(1) Page I-3, It should be noted that NEFCO is the designated A-95 clearinghouse for Summit and Portage Counties. Therefore, projects such as the CVI are concurrently evaluated through the PNRS process of both NEFCO and NOACA. The designation was effective July 1, 1975.

(2) Page 2-7. Flows discussed do not take into account flows from the Portage Lakes area of the Tuscarawas River in the Ohio River Basin. In addition, the assumption that there was no effluent in the mainstem flow in 1933 is ridiculous. Akron has had a sewage treatment plant since the 1920's.

(3) Section 4. We are uncertain whether 90 or 96 inches is supported in this section. It is doubtful whether the cost savings are justifiable against the risk of undersizing in this case. In addition, this staff has serious reservations concerning the applicability and/or usefulness of the NEOWDP.

(4) Although we feel that Phase II may not be ultimately necessary, we are of the opinion that Phase I should be constructed at 96" to allow for the possibility. In addition, we support the recommended changes in alignment of trunks and access area modifications proposed on page 4-1.

As a general statement, we would point out that whether or not Phases II and III of the CVI are constructed, northern Summit and Portage Counties have virtually complete in-ground sewer systems. Therefore, it would require only STP improvements to permit additional development in, for instance, the Macedonia #15 service area. Thus we do not see the CVI as a growth-inducing system. As further reinforcement, we would note that in the Richfield area water unavailability and isolation are likely to discourage growth. Even though a 400,000 gpd STP was constructed, the development for which it was built never really got off the ground.



Cooperation and Coordination in Development Planning Among the
Units of Local Government in Portage, Stark, Summit, and Wayne Counties

Finally, induced growth should not be considered a detriment, if that growth centralizes around a system and thus reduces scattered growth in other unsewered areas. With or without any or all phases of the CVI, we project the same growth for the NEFCO-NOACA area. Without the CVI, we simply expect it to be more scattered, thus encroaching on more outlying productive agricultural land.

RCL:ms

cc: Irwin Odeal, Cleveland Regional Sewer District
Anthony H. K. Ma -- NOACA
Carl Wilhelm -- OEPA
Douglas Hasbrouk -- OEPA-NEDO
John J. Garner -- Summit County Sanitary Engineer
A. K. Boydell -- Portage County Sanitary Engineer

Response

The referenced low flow assumption was made to establish the 58 per cent figure as a minimum , thus showing the substantial role of the effluent component.

SCSE SUMMIT COUNTY SANITARY ENGINEERS

19 NORTH HIGH STREET, AKRON, OHIO 44308 • Phone (216) 379-5660

BOARD OF COMMISSIONERS
Richard E Slusser
Ted E. Cole
Don M. Stephens

John J. Garner, P.E.
Sanitary Engineer

July 30, 1976

U. S. Environmental Protection Agency
Region V
230 South Dearborn
Chicago, Illinois 60604

ATTENTION: Planning Branch
EIS Research Section

Re: Sanitary Improvement No. Q-127
Cuyahoga Valley Interceptor

Dear

Summit County respectfully requests the U.S. Environmental Protection Agency to give full consideration to the extension of the Cuyahoga Valley Interceptor into Northern Summit County as soon as possible. The development of an extensive water pollution control program in Northern Summit County has been dealyed for years because a former director of the Ohio Environmental Protection Agency insisted that the only viable solution to the Northern Summit County problem was the extension of the Cuyahoga Valley Interceptor.

Therefore, we respectfully also request that the first phase of the Cuyahoga Valley Interceptor be designed to take into consideration the future growth and development of Northern Summit County.

Thank you for your consideration of this matter.

Respectfully submitted,

JOHN J. GARNER, P.E.
Summit County Sanitary Engineer

JJG/dmc
cc Cleveland Regional Sewer District
Board of Summit County Commissioners
NEFCO
NOACA
D. Zazo
M. Tondra
File (2)
Mr. Ned Williams, Director, Ohio EPA
Mr. Douglas C. Hasbrouck, N.E. District, Ohio EPA



SUMMIT COUNTY SANITARY ENGINEERING DEPARTMENT CREATED BY ACTION OF THE BOARD OF COUNTY COMMISSIONERS UNDER AUTHORITY OF SECTION 6117 OF THE STATE OF OHIO REVISED CODE BY RESOLUTION NO. 706-67, JUNE 1967.

Response

Consistent with the recommendations of the Summit County Sanitary Engineer, this statement recommends and requires initiation of full facilities planning for Phases II and III.

CLEVELAND REGIONAL SEWER DISTRICT
801 ROCKWELL • CLEVELAND OHIO 44114 • TEL 216 781 6600

ANDREW T. UNGAR
DIRECTOR

August 13, 1976

U.S. Environmental Protection
Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Planning Branch
EIS Preparation Section

Re: Cuyahoga Valley Interceptor
C 390764-010

Gentlemen:

The Cleveland Regional Sewer District has reviewed EPA's Draft Environmental Impact Statement for our Cuyahoga Valley Interceptor Project. In general, we believe that EPA has done a good job of evaluating the Environmental Impacts.

In our judgement, the central issue which must be decided in the final EIS is whether or not it is cost-effective and environmentally sound to provide sufficient capacity in Phase I of the CVI to leave open the option of future extensions. We believe that all of the available data strongly supports a 96" diameter for Phase I of the CVI. While we recognize that there are many specific questions which have been raised concerning future extensions of the CVI (particularly Phase II), unfortunately all of these questions cannot be satisfactorily answered without detailed facilities planning for these phases.

Facilities Planning is a complex and time consuming process involving infiltration/inflow analysis and cost-effectiveness analysis, as well as an analysis of environmental impacts. It must be noted that at this time, alignments for Phase II andIII are merely graphical representations.

Alternate alignment both within and out of the Valley must be thoroughly evaluated. To await the completion of future facilities planning for later phases could increase the cost of Phase I beyond the differential cost of the size increment needed to serve later phases and allow environmental degradation to continue unchecked.

In order to provide clarification of some of the issues discussed in the Draft EIS and to assist EPA in the preparation of the final EIS, we offer the following specific comments:

1. Page 1-2, Section B -- The following changes should be made in the list: Seven Hills - Cleveland Southerly and septic tanks; Independence - delete Cuyahoga County; Oakwood add Cleveland Southerly; Macedonia - add septic tanks; Reminderville - add County Plant; Boston Heights Village - add septic tanks; Stow City - delete small in front of County Plant.

2. Page 1-3 -- Discussion about septic tanks should note that most were installed with off site discharges to either storm sewers or ditches. Few systems were designed to leach into the soil since there is very little good leaching soil in the area.

3. Page 1-4-- It should be noted that at this time alignments for Phases II and III are merely graphical representations. Actual alignments can only be determined through complete Facilities Planning for each of these Phases at such time as they are actually proposed to be constructed.

4. Page 1-5 -- Cuyahoga County Board of Supervisors should be Cuyahoga County Board of Commissioners.

5. Page 1-6, Section D-4 -- This question concerning population was raised by US-EPA in its letter of January 15, 1976, and addressed in detail in our "Reply of the Cleveland Regional Sewer District to Questions posed by the Planning Branch, Region V US-EPA concerning the Cuyahoga Valley Interceptor Project in their letter of January 15, 1976". A copy of our answer to this question is enclosed as Attachment "A". In that answer we note, among other things, that USDC reports a range of 5.9% to 13% in using its population forecasting procedures. It further notes that these procedures usually yield under-estimates. We request that the Attachment "A" discussion be included in total in the final EIS.

6. Page 1-6 -- The ODNR comments of April, 1974, pertain to when the CVI was proposed to be constructed in open cut and included several Cuyahoga River crossings. Since the project has been redesigned in tunnel, the ODNR supports Phase I of the project. (A letter from ODNR indicating the conditions of their support is included on Page 7-11 of the Draft EIS. CRSD will comply fully with the ODNR recommendations.)

7. Page 2-4 -- The CRSD has thoroughly reviewed the CVI project from the standpoint of earthquake potential and believes that the design adequately addresses the appropriate degree of seismic risk for the area.

8. Page 2-5 -- The CRSD is well aware of the potential slope stability problems, and the design and proposed method of construction will ensure adequate protection against failure.

9. Page 2-6 -- It should be noted that none of the wetland areas listed are in the Phase I Service area.

10. Page 2-26 -- The credibility of the EIS would be enhanced if the source of the "suggested" BOD and COD values for urban and rural streams were cited.

11. Page 2-49, Section B-1a -- The particulate level at Twinsburg may possibly be explainable by the number of industries in Twinsburg including a major automobile stamping plant.

12. Page 2-57, Section 2c -- The table on occupied family units for the Cuyahoga County portion of the ultimate service area indicates an increase of over 3,700 occupied family units from October, 1970 to October, 1974. The communities in this table represent only part of the ultimate CVI area, and communities such as Garfield Heights and Maple Heights, which are only partially in the CVI service area, have seen most of their new development in the CVI area. Based on this information, the statements about population decline on page 1-6 do not seem reasonable.

13. Page 2-65 -- Note should be made that CRSD complied fully with the recommendations of the archaeological survey and received ". . . acknowledgement of compliance with preservation procedures and formal approval to proceed with the project", from the Ohio Historic Preservation Office.

14. Page 2-65, Section 3b -- The statement from the Northeast Ohio Water Development Plan on industrial water consumption is accurate as far as it goes, but does not present the entire picture. The Northeast Ohio Water Development Plan projects an increase in per capita water consumption of1.75 gpd per year starting with 1969. The CRSD does not project any increase in its EAS for the CVI area water consumption.

    The CRSD is not aware of the degree of sensitivity of the NEOWD Plan per capita water consumption figures to the population projections developed for that plan. Since EPA feels that the NEOWD Plan population projections are no longer valid, the public might, however, raise some questions concerning the use of NEOWD Plan water consumption projections.

The CRSD charges for its sewerage service on the basis of "water billed as sewage" which is obtained from actual water meter readings. On a District-wide basis, the "water billed as sewage" (domestic, commercial and industrial use) has remained fairly constant at approximately 125 gpd per capita.

In developing the per capita flows for the CVI area, CRSD took the actual metered water consumption for each community for the year 1973, subtracted any non-billable flow in terms of water not discharged to the sanitary system, and developed the per capita usage by community.

A review of the information indicates that for communities which are now predominantly residential such as Broadview Heights, Garfield Heights and Oakwood, water consumption is in the range of 65 to 80 gpcd. For communities with significant industrial and commercial development such as Bedford Heights, Independence and Solon, water consumption is in the range of 125 to 150 gpcd.

Because nearly all of the CVI communities have significant undeveloped industrial and commercial areas, CRSD believes that prudent judgment dictates that the use of total CVI service area average per capita water consumption is more appropriate for design of the project than a variable community by community approximation. In light of the fact that CRSD is not predicting an increase in per capita water consumption, as many studies do, and the historical record of a "water billed as sewage" of 125 gpcd, CRSD believes that 105 gpcd is in order, and if anything, on the low side.

15. Page 2-74, Section 3c -- The reference should be to the Northeast not the Northwest Water Development Plan.

16. Page 2-75 to 2-104 -- This section provides an extensive discussion of several sources and methods of population projections. Past discussions among US-EPA, Ohio EPA, local planning agencies, and the CRSD staff and consultant have yielded general agreement that none of these are infallible and none has yet been substantiated as yielding significantly more accurate results. It has also been generally agreed that the accuracy of population forecasts decreases as the geographic area is reduced and the time span from the base year increases. In addition, population projections can best be considered as a range of probable future numbers rather than absolute numbers.

    Based on these limitations the EIS appropriately notes a range of probable population in the CVI Service Area in the year 2020 of 280,000 (as developed by US-EPA) to 333,000 (as developed by CRSD). The proposed 96" diameter sewer will provide for gravity conveyance of the wastewater from approximately 314,000 people,

or slightly more than the mean of the range of probable population in the year 2020. Probable service area population would have to be reduced to approximately 266,000 in 2020 to permit a reduction in sewer size to 90" diameter.

It also has been pointed out by NOACA, that as many as 20,000,000 visitors per year may use the Cuyahoga Valley National Recreation Area. Because of the uncertainty of the population projections and neither EPA nor CRSD have attempted to assign a population equivalent to park users, CRSD believes that reduction in pipe size below 96" in diameter is unrealistic and unsupportable on the basis of probable service population.

17. Page 3-1, Section A -- The text implies that a staged approach to the extension of the CVI may be undesirable. The staging and phasing of major interceptor projects, such as the CVI, is quite cost-effective and consistent with US-EPA's Cost Effectiveness Guidelines.

In the Phase II Service Area, virtually all communities are foregoing any major capital expenditures for improvements to their wastewater treatment facilities. Summit County may proceed with some interim improvements to its Macedonia 15 Wastewater Treatment Plant, but these will be designed with sufficient capacity to serve only until the anticipated completion of Phase II.

In the case of Phase III, service to this areaa has been established as at least 20 years off. Communities in this area are, therefore, proceeding with improvements on that basis.

On this basis, we see virtually no duplication of expenditure in the Phase II area. In the Phase III area, the only duplication results from the incremental cost associated with providing sufficient capacity in the Phase I CVI for future extension to the Tinkers Creek communities.

18. Page 3-1, Section B -- We assume that the reference to " . . . one local planning agency has suggested that service not be extended to the proposed Phase II service area", refers to the Cuyahoga County Regional Planning Commission. CRSD has discussed this matter with the RPC Director and he indicated their strong support for Phase I CVI at the 96" diameter size in order to leave open future options. RPC has, however, expressed reservation about Phase II and raised numerous questions concerning Phase II that should be answered before it is constructed. CRSD believes RPC's questions are valid and will be addressed at such time as Phase II Facilities Planning is performed. CRSD does not feel that all questions concerning later phases must be answered before Phase I can proceed. We believe that RPC concurs with us on this matter. To do so could increase the cost of Phase I beyond the differential cost of the size increment needed to serve later phases and allow environmental degradation to continue unchecked.

19. Page 3-1, Section B -- The reference to CRSD's evaluation of the Summit County Jaite proposal should appropriately note that CRSD is referring to the Valley floor and western side of the Phase II area. The EAS prepared by CRSD indicates a total 2020 estimated population of 8900 people. This number of people would have no effect on the size of Phase I CVI.

20. Page 4-1, Section B -- In general, CRSD can accept the recommendations of US-EPA concerning routing. In the case of the Brecksville trunk, however, the City of Brecksville has advised us that construction was recently initiated on a new allotment which will contain over 600 homes along the original "A" alignment. Protection of this stream valley is no longer a factor, since the subdivision is altering the entire valley. In addition, the Brecksville City Engineer has advised that the Wiese Road alignment compounds a slope stability problem along Wiese Road. The Wiese Road alignment would also preclude the possibility of eliminating the Bradford Lane Pump Station. The "A" alignment appears, therefore, to remain the most cost-effective choice.

    In the case of the Alternate C recommendation, the Royalton Road (Rt. 82) and Brecksville Road (Rt. 21) intersection is the crossing of two major arterial highways. Traffic disruption at this intersection during construction would represent a serious hardship to hundreds of motorists daily. In addition, Royalton Road from Brecksville Road to Chippewa Creek already presents a safety hazard with a steep slope and relatively sharp curve. Construction of the sewer in this area would compound the hazard. On this basis, the Chippewa Creek alignment appears to be more desirable, and CRSD will take all feasible means to minimize the impact to the vegetation along the creek.

21. Page 4-2, Section C-1 -- As noted in number 16 above, a range of population concept appears reasonable and logical. As noted in 16, CRSD believes the range that all agreed upon was from 280,000 to 333,000 with a mean of approximately 313,000.

22. Page 4-2, Section C-2 -- As noted in number 14 above, we do not believe that the 33% reduction in consumption presents a true picture because it refers to industrial consumption only. The Northeast Ohio Water Development Plan projects an increase in per capita water consumption of 1.75 gpd starting from 100 gpd in 1969. The CRSD does not project any increase in its EAS for the CVI area water consumption.

23. Page 4-3, Section 3a -- There appears to be no engineering basis for the assumption of 20% reduction of inflow since combined sewers represent only a very small fraction of the total sanitary sewers in the CVI area. In reality, sewers tend to deteriorate over the years, and past work in the tributary communities has indicated many sources on private property which are difficult and costly to correct. In addition, CRSD is allowing for zero inflow from presently unsewered areas when they are sewered and this is probably an unrealistic assumption. 7-50

It must also be noted that approximately 31 mgd of I/I would have to be removed permanently from the CVI service area to reduce the CVI one size increment to 90" in diameter. Considering that infiltration is relatively insignificant in this case and costly and difficult to reduce, it can be assumed for discussion that the 31 mgd reduction would have to come from the inflow component of the total flow figure. Since 62.9 mgd of the total inflow comes from the future Tinkers Creek Interceptor (Phase III) communities, the downstream leg can be evaluated at the reduced 90" size while the upstream leg remains at 78". Such a revised proposal consisting of 10,000 lineal feet of 90" sewer and 25,000 lineal feet of 78" sewer would result in a net savings of about $400,000, or 2% less than the 96" proposal. It is extremely doubtful if 31 mgd of inflow could be removed for $400,000.

24. Page 4-4, Section 5 -- The CRSD believes that while both population projections and I/I reduction are subject to some uncertainties, reduction in the size of CVI from 96" to 90" in diameter is not cost-effective or supportable.

25. Page 5-2, Section B-a -- All mainline CVI manholes will be at grade and those in the flood plain will have solid, water tight covers. The CRSD has thoroughly evaluated the problem of Hydrogen-Sulfide generation and does not feel that it will be a problem.

26. Page 5-2, Section B-a -- Alternate alignments for Phase II CVI both in and out of the valley will be evaluated at such time as Facilities Planning is performed for Phase II.

27. Page 5-3, Section B-a -- An implication is made that the Cuyahoga Valley National Recreation Area could control the discharge of sewage effluent into streams which flow into the Park. The CRSD is not aware that NPS has such authority. If they do, the reference should be cited in the EIS.

28. Page 5-3, Section B-a -- The reference in the discussion on Penninsula should be to Phase II, not Phase III.

29. Page 5-12, Section D -- CRSD believes, as we noted in our introduction to this letter, that available data supports immediate Construction of Phase I CVI at 96" diameter which provides sufficient capacity for later phases.

The CRSD would be pleased to discuss any of our comments further with EPA at your convenience. We would also like copies of all comments which US-EPA receives on the draft EIS.

Very truly yours,

CLEVELAND REGIONAL SEWER DISTRICT

Andrew T. Ungar

Andrew T. Ungar
Director

ATU/EJO/inc

xc: Ned Williams, Dir. of OEPA
D. C. Hasbrouck, OEPA
J. P. Harris
E. J. Odeal
Gerald Peters, WAPORA

ATTACHMENT A

QUESTION 8 - Recent census data show a population decrease between 1970 and 1973, for a net decrease of 5% in the basic service area. Do these recent trends affect your latest population projections?

ANSWER - The projections used in this study are based on long term trends in the area and are explained in pages 52-61 of the CVI EAS. The base data and various projections were modified to strike a balance between areawide projections and local projections. These projections provide guidelines for making decisions related to planning for a possible future. They are not predictions of a future fact. Estimates of existing population can be developed in various ways. The 1975 current Population Report (U.S. Department of Commerce, USDC) estimates the population for July 1973 using birth-death records for the county level and some smaller areas, net migration estimates based on income tax and local security information, and special allowances for immigrants from abroad and student and military movements, etc.

Yearly estimates and short-term projections are prepared for the Cleveland area by Real Property Inventory of Metropolitan Cleveland (recent RPI copies are included in Appendix "F"). The estimates are made using costs of occupied family units and estimates of persons per dwelling unit based on past trends. Estimates are prepared for October of each year.

The Department of Commerce document shows an analysis of their method versus some special censuses to show the percent differences. Eighty-six (86) special counts were performed to check the administrative records based estimates (USDC). Also, 165 special census counts were made for other purposes and were used to determine the differences. The comparison show a general difference of 5.9% for the 86 special censuses and 13.6% for the 165 special censuses. The procedure loses accuracy as the areas become smaller and as the growth rate increases.

Table I shows the communities covered in part by the CVI service area and an estimation of the portion of each communities population that is within the service area. The table contains the 1970 census data; the 1973 estimate by the USDC (rounded to 100's); the 1980 projection as in the CVI report; the 1973 estimate by the RPI; and the 1980 projection prepared by RPI in 1975. Unfortunately the RPI data does not cover the entire CVI service area so that

TABLE I

SHORT-TERM POPULATION COMPARISONS
(1,000's)

| | 1970 (Census) | | 1973 (USDC) | | 1980 (CVI-EA) | | 1973 (RPI) | | 1980 (RPI) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total (T) | Contrib. (C) | T | C | T | C | T | C | T | C |
| Aurora | 6,549 | 4.3 | 7.5 | 4.9 | 10.0 | 7.2 | | | | |
| Bainbridge | 7,038 | 0.6 | 7.6 | 0.6 | 9.2 | 0.8 | | | | |
| Bedford | 17,552 | 17.6 | 17.6 | 17.6 | 20.5 | 20.5 | 17.4 | 17.4 | 16.7 | 16.7 |
| Bedford Hts. | 13,063 | 11.9 | 13.3 | 12.1 | 19.3 | 17.6 | 16.7 | 15.2 | 22.1 | 20.1 |
| Boston Hts. | 846 | 0.8 | 0.8 | 0.8 | 1.0 | 1.0 | | | | |
| Boston Twp. | 1,504 | 0.6 | 1.5 | 0.6 | 1.8 | 0.7 | | | | |
| Brecksville * | 9,137 | 9.1 | 8.9 | 8.9 | 15.4 | 15.4 | 9.5 | 9.5 | 11.1 | 11.1 |
| Broadview Hts. | 11,463 | 9.1 | 12.0 | 9.5 | 15.6 | 12.4 | 11.9 | 9.4 | 16.4 | 13.0 |
| Garfield Hts.* ** | 41,417 | 13.1 | 39.3 | 12.4 | 47.2 | 14.9 | 40.8 | 12.9 | 39.8 | 12.6 |
| Glenwillow | 526 | 0.5 | 0.5 | 0.5 | 0.8 | 0.8 | 0.6 | 0.6 | 0.7 | 0.7 |
| Hudson Village | 3,933 | 3.9 | 4.7 | 4.7 | 5.0 | 5.0 | | | | |
| Hudson Twp. | 4,462 | 4.5 | 4.6 | 4.6 | 6.5 | 6.5 | | | | |
| Independence * | 7,034 | 7.0 | 6.9 | 6.9 | 7.9 | 7.9 | 7.0 | 7.0 | 6.8 | 6.8 |
| Macedonia * | 6,375 | 6.4 | 6.1 | 6.1 | 8.5 | 8.5 | | | | |
| Maple Heights * | 34,093 | 5.8 | 32.7 | 5.6 | 39.1 | 6.7 | 34.8 | 5.9 | 36.3 | 6.2 |
| Northfield Village | 4,283 | 4.3 | 4.5 | 4.5 | 5.4 | 5.4 | | | | |
| Northfield Center | 4,364 | 4.4 | 4.5 | 4.5 | 6.9 | 6.9 | | | | |
| Oakwood | 3,127 | 3.1 | 3.6 | 3.6 | 4.0 | 4.0 | | | | |
| Peninsula | 692 | 0.5 | 0.7 | 0.5 | 0.8 | 0.6 | | | | |
| Reminderville | 215 | 0.2 | 0.2 | 0.2 | 6.4 | 6.4 | | | | |
| Richfield | 4,943 | 1.7 | 5.0 | 1.7 | 7.5 | 3.0 | | | | |
| Sagamore Hills * | 6,756 | 6.8 | 6.5 | 6.5 | 10.5 | 10.5 | | | | |
| Seven Hills | 12,700 | 1.0 | 13.5 | 1.1 | 17.8 | 1.4 | 13.7 | 1.1 | 16.1 | 1.3 |
| Shalersville | 4,967 | 4.0 | 5.1 | 4.1 | 6.5 | 5.2 | | | | |
| Solon | 11,519 | 8.2 | 11.9 | 8.5 | 15.7 | 11.3 | 12.8 | 9.1 | 15.9 | 11.3 |
| Streetsboro * | 8,038 | 8.0 | 7.9 | 7.9 | 11.1 | 11.1 | | | | |
| Twinsburg City & Twp. | 7,847 | 7.8 | 8.3 | 8.3 | 11.5 | 11.5 | | | | |
| Valley View | 1,422 | 1.4 | 1.5 | 1.5 | 1.7 | 1.7 | 1.4 | 1.4 | 1.5 | 1.5 |
| Walton Hills | 2,508 | 2.5 | 2.8 | 2.8 | 3.2 | 3.2 | 2.5 | 2.5 | 2.6 | 2.6 |
| Total | 238,373 | 149.1 | 240.0 | 151.5 | 316.8 | 208.1 | - | - | - | - |
| RPI Area | 162,434 | 87.2 | 160.9 | 87.4 | 204.2 | 113.8 | 169.1 | 92.0 | 186.0 | 103.9 |
| Non RPI | 75,939 | 61.9 | 79.1 | 64.1 | 112.6 | 94.3 | - | - | - | - |

* Decline estimated by USDC

** Decline estimated by RPI

estimates and short-term projections are not available in many areas. To make comparisions, totals are presented for the total service area, the area included in the RPI data and the non-RPI data.

The contributing population is estimated by assuming the density of a community is constant over the entire area of the community. In reality the outter, less dense areas of the major communities are in the service area while the older more dense areas are not. These areas will likely increase in population more rapidly than the older areas and the assumption of uniform increases has the effect of underestimating the increase in population contributing to the CVI.

An analysis of the table provides the following information:

A. For the total community populations in 1970 and mid-1973.

1. USDC estimates a decline in seven communities for a total of 4500 persons.
2. USDC estimates an increase in total population from 238,400 to 240,000 for a total of 1600 persons or 0.7%.
3. USDC estimates a decline in the RPI area for 162,400 to 160,900 for a total of 1,500 persons or 0.9%.
4. RPI estimates a decline in one community for a total

of 600 persons.

5. RPI estimates an increase in the RPI area from 162,400 to 169,100 for a total of 6700 persons or 4.1%.

B. For the population contributing to the CVI for 1970 - mid-1973.

1. USDC estimates a populated decline in seven communities for a total decline of 1900 persons.
2. USDC estimates an increase in the total contributing area of 149,100 to 151,500 for a total of 2400 persons or 1.6%.
3. USDC estimates an increase in the RPI contributing area of 87,200 to 87,400 for a total of 200 persons or 0.2%.
4. RPI estimates a decline in two communities for a total decrease of 400 persons.
5. RPI estimates an increase in the RPI contributing area population from 87,200 to 92,000 for a total of 4800 persons or 5.5%.

The USDC document gives some indication of the range of population that can be expected using its procedures. The differences reported are 5.9% and 13.6% and are usually underestimates. Table II shows these ranges, the USDC estimates, the RPI estimates, and an interpolation of

the 1980 data for this study to arrive at a 1973 CVI estimate. The report projections were never meant to project 2½ years.

Table II shows that the 1973 estimates are all within the limitations expected by the USDC estimates. The following statements also should be kept in mind in analyzing the 1973 data.

Portions of the I-480 right-of-way have been cleared in the past few years. This highway passes through Garfield Heights and Maple Heights north of the CVI area. About 300 homes were moved during the process in Garfield Heights. Although most of these homes remained in Garfield Heights, the process could have affected the USDC and RPI estimates.

In Maple Heights, recent populations are estimated as approaching 40,000 due to building in the CVI area.

Reminderville has started to build one development which caused the mid-1975 population to increase to 1600 with building in the development such that the 1980 population will go over 6000 persons.

RPI reports that such a significant increase in building occurred between the 1973 and 1974 population estimates that the 1980 projected population for Cuyahoga County increased 37,000 persons, and the CVI service area includes some of the fastest growing portions of the Greater Cleve-

TABLE II

| AREAS | EST. | USDC 5.9% | 13.6% | RPI EST. | CVI STUDY EST. |
|---|---|---|---|---|---|
| Total Community | | | | | |
| Population - 1973 | 240.0 | 254.2 | 272.6 | - | 258.0 |
| Contributing Community | | | | | |
| Population - 1973 | 151.5 | 160.4 | 172.1 | - | 163.9 |
| Total RPI Community | | | | | |
| Population - 1973 | 160.9 | 170.4 | 182.8 | 169.1 | 172.9 |
| Contributing RPI Community | | | | | |
| Population - 1973 | 87.4 | 92.6 | 99.3 | 92.0 | 93.9 |

land area.

With the above analysis it would not be good practice to modify the long-term projections developed in the CVI report because of fluctuations in population over a 2½ year period.

Another question arises as a companion to the stated question which involves the population varieties which would dictate a different size pipe. The following table gives some information on this subject:

| | |
|---|---|
| Projected 2020 Contributing Population | 333,000 |
| 96" Population Capacity | 314,000 |
| 90" Population Capacity | 266,000 |

The reasons for the choice of a 96" interceptor are discussed in the study. The proposed project accepts a small amount of surcharge (less than one foot) if the projected population is realized. A smaller sized pipe would not be appropriate unless the population peaked at about 266,000 persons. Therefore, the size chosen would not have changed for a variation in population between 266,000 and 333,000 persons or 20% less than projected.

Response

Consistent with CRSD's concern facilities planning, including environmental assessments, should begin immediately for Phases II and III.

The difference of opinion concerning validity of P-25 estimates and other local estimates indicates the need that existed for further study. Further discussion of population projections and the economic justification for them is found in Chapter 2.B.4. To all indications the 20 million visitors per year figure is grossly inflated and is discussed in Chapter 5.B.

Most agencies and individuals have supported the suggested Brecksville trunk alternatives. On site observation suggests that the lower portion of the streambed is relatively intact.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Review of Draft EIS--Cuyahoga Valley Interceptor, Cleveland Sewer District

DATE: AUG 25 1976

FROM: Kenneth E. Biglane, Director
Division of Oil and Special Materials Control (WH-548)

TO: Regional Administrator
Region V

Attn: Henry Longest, Chief
EIS Section

The comments from the Office of Water Program Operations concerning the subject document are enclosed. If any of the issues raised in these comments require clarification, please contact John M. Hill, Chief, Environmental Evaluation Branch 202-245-3054.

Project Identification

Location: Cuyahoga and Summit Counties, Ohio

Treatment:
Existing: Thousands of septic tank filter fields and several treatment plants
Proposed: Construction of Phase I Cuyahoga Valley seven mile interceptor sewer running from Brecksville sewage treatment plant to the Cleveland Southerly treatment plant with eleven trunk sewers and lift station. Treatment of the wastewater is undertaken at Cleveland Southerly Plant and discharged to the Cuyahoga River.

Enclosure

AUG 31 AM 11 13
REGI. DIV. - GAB

EPA Form 1320-6 (Rev. 6-72)

Office of Water Program Operations
Comments on
Draft EIS for the
Cuyahoga Valley Interceptor
Cleveland Sewer District

1. We concur on the proposed construction routings on page 4-1 of the EIS and encourage the adoption of the recommended alternatives as described in order to ensure and preserve the integrity of the ecological systems in the area.

2. Secondary and indirect impacts of the project are not fully developed. The discussion of air quality requires further documentation. In order to adequately evaluate the air quality impact of this action, specific ambient air measurements should be made for localized and regional impacts.

3. "Other Federal Activities" in the area was not discussed at all in the statement. A notice in the Federal Register of August 6 page 32944 indicated the existence of a proposed sewer facility project at the Cuyahoga County airport. The interrelationships and impacts of this project should be included in the final EIS on Cuyahoga Interceptor.

4. We view the presence of PCB in the waterbody as a significant issue of concern for its recognized health and ecological hazards on the environment. Therefore, prompt and specific plans should be pursued to control and abate the source of this pollutant in the area.

5. Pursuant to EPA's guidance and goals, documented in "Alternative Waste Management Techniques for BPT, EPA 430/9-75-01-3)" and in November '74 memorandum to Regional Administrators from Mr. Quarles, Deputy Administrator, land application and recycling of wastewater for agricultral purposes are of the most viable waste management techniques and should be considered in projects funded with Federal grants. As indicated in the statement, Cuyahoga River low streamflow during warm months (July, August, September, October) is critical for agriculture; therefore, the potential use of treated effluent for agriculture irrigation during that period should be fully considered, provided the effluent meets the criteria for such use.

Response

Permanent air quality monitoring stations are to be established at Brecksville, Solon, and Bedford. Recent $SO_2$ and $NO_2$ measurements for Peninsula and Twinsburg are contained in Chapter 2, Section B.1.a.

Chapter 5.C.4 contains an expanded discussion of secondary impacts.

The Cuyahoga county airport sewage system is for a relatively small airport handling largely non-scheduled and private aviation. The airport is well outside the proposed service area and there is no indication of any significant interaction between the airport and the proposed project.

One major source of PCBs in the Cuyahoga Basin may be landfill runoff and leachate. The role of low flow reduction in relation to these and other non-point sources is discussed in Chapter 5.C.1 and 5.C.3.

Because of the significant industrial waste component, particularly from metal manufacturing and processing, land application of effluent or sludge from the Cleveland Southerly plant may not be practical. If suitable soils were available in needed amounts, application of effluent or sludge from local plants serving largely residential areas might succeed.

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
230 S. DEARBORN STREET, 32nd FLOOR
CHICAGO, ILLINOIS 60604

(ER-76/719)

September 1, 1976

Mr. George R. Alexander, Jr.
Regional Administrator
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr Alexander:

This responds to your request for Department of the Interior review of the draft environmental statement for Cuyahoga Valley Interceptor, Cleveland Regional Sewer District, Cuyahoga and Summit Counties, Ohio.

General Comments:

We understand that our comments apply only to Phase I of the Cuyahoga Valley Interceptor (CVI) and that we will have an opportunity to review subsequent draft environmental impact statements (EIS) which will cover Phase II and III of the CVI.

The need for Part I and II is somewhat confusing to us as it appears that Part I is actually U.S. Environmental Protection Agency's comments on Part II. The result is a partial duplication of effort and the combined volumes are more difficult to review. We suggest that the information from Part I and II be combined into one volume in the final EIS. Future statements should contain all information necessary for a complete appraisal.

Generally, it appears that Phase I will not be controversial since it will be correcting existing sewer problems and will not result in secondary impacts of stimulating development of undeveloped areas. Furthermore, the draft EIS includes adequate plans to mitigate most damages to the natural environment in the project area. For example, the interceptor will be placed via tunnel construction throughout the valley corridor. Several of the access shafts along the interceptor have been moved to avoid wetland areas. However, we suspect that the tunnel construction may have a draining effect and de-water adjacent wetlands.

Since portions of the Cuyahoga Valley National Recreation Area (NRA) will be affected by the proposed actions, we recommend a section of the final statement deal with the impacts and mitigating measures on that area. We realize the NRA is specifically addressed numerous times in

9/2/76 orig. to Water Div.

the statement; however, a consolidated treatment of the area would be more beneficial. Disturbance of surface features within the Cuyahoga Valley NRA will not be permitted by the National Park Service unless a prior field inspection, inventory and evaluation of the area for significant natural and cultural values has been accomplished and appropriate mitigative measures taken.

SPECIFIC COMMENTS:

Part II ENVIRONMENTAL SETTING

Page 22, Water Quantities:

Project-caused low flow conditions is one of our concerns; however, we believe that it is of lesser adverse impact when compared to the existing, poorly treated sewage entering the Cuyahoga River and its tributaries. Removal of sewage effluents in the project area would return the volume of flow to a somewhat natural condition.

We concur with the statement on Page 26 which indicates that flood damage has increased in the Cuyahoga Valley flood plain ". . . and will continue to increase with expanding development . . . ." We support a code which would prevent development within flood prone areas of the valley, as opposed to constructing flood control structures to protect developments within the flood plain.

Measures to minimize any adverse effects on water quality from abandoned septic tank systems in the project area should be considered.

The documents should include an evaluation of the potential for impacts from exfiltration of sewage where the ground water head is insufficient to maintain infiltration into the sewer system.

Chapter V, Effects of the Proposed Action

Several parts of both the statement and the assessment discuss the effects of proposed actions or alternatives on park sites within the study area. Several parks in the three-county project area were developed or acquired, in part, with monies from the Land and Water Conservation Fund (LWCF). Any of these park lands which are utilized by the proposed project are subject to Section 6(f) of the Land and Water Conservation Fund Act which states, in part, that:

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary, be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

Any actions involving such parks should be coordinated with the Ohio State Liaison Officer for the Land and Water Conservation Fund who is Mr. Robert W. Teater, Director, Department of Natural Resources. A list of those parks in the project area which have received LWCF monies is enclosed. Additional sites presently may be under consideratic for funding; therefore, careful coordination for use of all parks is recommended.

Specific mitigating measures for treatment of construction sites in park areas also should be presented. While this information is briefly discussed in other areas, a complete case for protection of the aesthetics and uses of park lands should be made.

We suggest that more specific information regarding the revegetation program be provided in the final EIS. Names of plant species and combinations of their uses to provide both food and cover for inhabiting wildlife should be included. If requested, the U.S. Fish and Wildlife Service would provide technical assistance to prepare a revegetation plan.

The fourth paragraph on page 144 indicates that more than 100 trees would be removed from a densely forested area. It is not clear if 100 trees is an estimate or only a minimum number.

The value of wetlands regardless of size should not be underestimated in the EIS. We suggest that all affected wetlands be listed in the final EIS and classified as to type and size, and the expected resultant project-caused impact on each identified.

The final EIS should contain more specific information regarding the utilization of non-structural and structural controls to minimize sliding and erosion of soils on hazardous slopes.

Sincerely yours,

Enclosure

Madonna F. McGrath

Madonna F. McGrath
Acting Special Assistant
to the Secretary

Land and Water Conservation Fund Assistance Projects
May 31, 1976

Cuyahoga County

| Project No. | Project Name | Sponsor |
|---|---|---|
| 26 - 00070 | Rocky River Reservation | Cleveland Metro. |
| 26 - 00108 | Cuyahoga River Valley | State |
| 26 - 00166 | Maple Road Park | Maple Heights |
| 26 - 00186 | Grantwood Rec. Park | Solon |
| 26 - 00187 | Glen Burn Avenue Park | Maple Heights |
| 26 - 00188 | Clampher Road Park | Maple Heights |
| 26 - 00251 | Broadview Heights Park Add. | Broadview Heights |
| 26 - 00321 | Wallings Road Park | Broadview Heights |
| 26 - 00341 | Tennis Courts | Garfield Heights |
| 26 - 00390 | Tri-City Community Park | Cities |
| 26 - 00406 | Isaac Nature Preserve | Metro Park |

Portage County

| | | |
|---|---|---|
| 26 - 00234 | Kramer Field | Kent |
| 26 - 00284 | Gayle Creek | State |
| 26 - 00420 | Kent Park | Kent |
| 26 - 00446 | Eagle Creek II | State |
| 26 - 00459 | Sunny Lake Park | Aurora |

Summit County

| | | |
|---|---|---|
| 26 - 00027 | Cuyahoga Valley Park | Akron Metro. |
| 26 - 00050 | Silver Springs Park | Stow |
| 26 - 00061 | Twinsburg City Reg. Park | Twinsburg |
| 26 - 00135 | Seiberling Nature Center | Akron Metro. |
| 26 - 00224 | Beavon Hills Park | Northfield Center Twp. |
| 26 - 00235 | Northwest Comm. Park | Akron |
| 26 - 00338 | Miller Road Park | Fairlawn |
| 26 - 00387 | Crestdale Park | Stow |
| 26 - 00443 | Heather Hills Park | Stow |
| 26 - 00475 | Perkins Woods Park | Akron |

Response

Project impact on the National Recreation Area is discussed in Chapter 5.B, with conclusions and recommendations.

No acquisition or change in land use of Land and Water Conservation Fund projects is contemplated under this proposal, and coordination with Ohio Department of Natural Resources has taken place.

Some discussion of treatment methods and construction within the recreation area is now found in Chapter2.B.3.d and 5.B.

Area wetlands are found almost exclusively in Phases II and III and are discussed in Chapter 2.A.2 and 31B.

Problems of slope instability are discussed in Chapter 2.A.2 and in CRSD's letter of August 13, 1976.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION V
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

OFFICE OF
THE REGIONAL DIRECTOR

July 30, 1976

Mr. George R. Alexander, Jr.
Regional Administrator
U. S. Environmental Protection
Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Alexander:

Re: DEIS - Cuyahoga Valley Interceptor (Ph. 1)
Cuyahoga and Summit Counties, Ohio

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely,

Robert A. Ford

Robert A. Ford, Regional
Environmental Officer
Region V

cc: Charles Custard, OEA
Warren Muir, CEQ

RECEIVED
AUG 5 1976
EPA REGION 5
OFFICE OF REGIONAL
ADMINISTRATOR

5731 Caranor Drive
Kent, Ohio 44240
August 25, 1976

U.S. Environmental Protection Agency Region V
230 S. Dearborn St.
Chicago, Ill. 60604

Attention: Planning Branch - EIS Preparation Section

I appreciate this opportunity to comment on the Draft EIS for the Cuyahoga Valley Interceptor and regret the lateness of these comments due to illness in my family.

I commend USEPA Region V insistence on preparation of a Draft EIS for the Cuyahoga Valley Interceptor, also for appreciation of the significance of its impact on the Cuyahoga Valley National Recreation Area (CVNRA). Many people worked hard for the establishment of the CVNRA and protection of this park is important, including protection of land and water resources in this area. I also appreciate the recognition of protecting archeological and historic sites. EPA emphasis on coordination with 208 planning, areawide land use planning, CVNRA, and Akron STP is important. Comments on specific pages follow:

P. 1-5: "Local agencies and citizens groups have raised few or no objections to the project yet." This sentence does not discriminate between the separate phases of the project. Phase I is widely accepted as a means to upgrade water quality by eliminating a number of old STP's and adding service to areas now using individual sewage systems. There has been much concern in Summit and Portage counties about phases II and III, with their impact on development of the area, the CVNRA, groundwater supply, and the hydrology and water quality of the river and streams. Patterns of growth and development have shifted substantially in northeast Ohio since this project was proposed. With the current energy situation, movement of jobs to the south and southwest U.S., northeastern Ohio is now losing population slowly. I would like to recommend that phases II and III be postponed indefinitely. I defer to those who have studied the CVNRA more closely for recommendations on handling the sewage from the CVNRA, where peak flows may vary from normal patterns. I would like to suggest that public funds be saved by sizing various parts of the project for phase I only.

P. 1-6: Sizing and cost effectiveness: The population in the phase I service area must be checked for more recent figures than 1973 and the size of the project must be revised in line with current figures and projections. The money saved can be used for upgrading more STP's in the area and adding advanced treatment.

P. 2-39: Solon, Twinsburg, Aurora, Hudson, Tinkers Creek: Water quality data shows the need for attention but 201 facilities plans are being made right now for these areas and phase III would be a costly duplication of effort. The advantage of several plants would be increased flexibility for changing development patterns in this area (difficult to predict at present).

P. 2-49: Air quality: I hope that USEPA will insist that all the important air quality measurements be made between Akron and Cleveland, if this has not already been done, because of the impact on the CVNRA.

P. 2-74: As is stated here, a major source of pollution is urban, suburban and rural runoff. I hope that approval of CVI phase I will not diminish EPA efforts to deal with nonpoint sources in this area.

P. 2-75 ff: Demography and economics: No mention was made of Northern Ohio Urban Systems, a private and valuable source of up-to-date population and economic data for this area. With current fertility rates at 1.9 for the U.S., not expected to recover to more than 2.1, why is Series "C" used (p. 2-95)? The extensive discussion of projections in EPA Draft EIS is summarized on page 2-102. However I do not find a recommendation to revise the size of the proposed interceptor to meet these lower pro-

jections or any updated figures (p. 4-4 conclusion is vague). The new July-August 1976 projections (p. 4-2) should be evaluated.

P. 3-1: Alternatives: Neither in EPA nor CRSD statements was any mention of the alternative of water conservation (for both domestic and industrial users) as a means of reducing per capita water use, thus reducing the capital and operating expenditures for water supply and waste treatment, plus conservation of our scarce energy resources. We could learn much from this approach which would be useful during the next dry cycle.

P. 4-3: The "abnormally high inflow figures" (p. 5-11) mean that corrective measures should be undertaken on a definite schedule, not wait until 2020 to do anything. It is also important to take steps to reduce infiltration in current systems, and to monitor very carefully all new construction for tight connections.

P. 5-5: Alternates for some trunk sewers: I appreciate EPA evaluation of alternates and hope that the final route will be laid out by on-site inspection and consultation with geologists because of the impact on steep slopes with unstable soils, conservation of the limited supply of prime forest, and lower cost. I commend the attention to preservation of historic and archeological sites.

P. 5-7: "The trunks have been sized for ultimate development." I object to the projections on which this is based and to the philosophy of promoting development rather than the goal of PL 92-500--to clean up the nation's waters. I just received a copy of the 8-21-76 Cleveland Plain Dealer article by Raymond Kadukis. Without commenting on other aspects of this article, I believe that USEPA Region V would do well to approve a project based on realistic figures and point out publicly that the local funds saved could be spent on upgrading local sewer lines and other necesssry expenses.

I also would like to express my deepest concern for the impact of the proposed interceptor on the cost of acquiring land for the CVNRA. If sewers are extended to an area, the price of the land will go up and the limited funds appropriated by Congress for park land acquisition will buy less. This could be avoided by timing certain parts of the project so that sewer service will not be available until park land acquisition is completed in that area. I would also like to point out that the northern boundary of the CVNRA is Rockside Road and that all manholes to Rockside Road should be at grade level and sealed within the park boundaries.

P. 7-1: Public participation: There seem to have been very few public meetings; therefore this opportunity to comment onthe dfaft EIS is very much appreciated.

I would like to commend the extensive efforts made in the preparation of the Cleveland Regional Sewer District Environmental Assessment and particularly the following points:

P. 1-10: Recognition of the importance of control of erosion and soil loss during construction.

P. 152: Recommendation for use of local construction labor where possible. Training programs to upgrade skills would be important; also retraining and upgrading current STP operators would be important; their skills are needed.

P. D-1: Detailed archeological survey and recommendations for protection of specific sites.

P. 160: Construction management specifications are important and adequate supervision is essential. The use of sediment traps is very important to protect the streams, Ohio Canal, and Cuyahoga River. Careful supervision is critical in laying of sewer lines for tight joints and minimizing infiltration.

Good maps and extensive bibliography.

I also commend the OEPA for high priority rating for funding (p. 4).

Comments on other aspects of CRSD Environmental Assessment:

P. 3: "Since water supply source for the area is primarily from Lake Erie, the removal of the wastewater will reduce stream flow to near the natural condition." There is confusion on this page regarding the word 'area.' This sentence is true only for CVI phase I, not II and III. 'Area' in line 2, p. 3, refers to Kent, not even in the CVI study area. Groundwater is a major source of water supply in this whole Cuyahoga watershed (including Kent city water, all from wells). Groundwater depletion would be a serious problem for domestic, industrial, and agricultural users. Reductions in low flow (p. 22) of 82% for Tinker's Creek and 74% for Brandywine Creek are unacceptable because of the need for aquifer recharge, damage to wetlands, and increased concentration of toxic pollutants such as PCB's (see EPA EIS, p. 5-4).

P. 34: Greater Cleveland water supply system: I question the suggested extension of the Cleveland water supply system into Portage County, both because of aging facilities in Cleveland and several alternatives available to supply the Streetsboro area from nearby sources. In northern Summit County plans are being made for Summit County to buy water from the City of Akron and to sell it to those wanting this service.

P. 52-53: Use of 1960-70 population figures leads to erroneous conclusions with regard to both feasibility of phases II and III and sizes of tunnels and trunk lines for phase I. According to p. 125, a 66" tunnel size will take care of peak flows with high population projections to the year 2020 for phase I. Therefore I suggest building a 72" tunnel for ample margin rather than 96" and save a significant amount of money. As is pointed out, it may be cost effective to have all tunnels the same diameter.

In conclusion, I concur with EPA conclusions on p. 5-12 that the CVI phase I is needed for removal of septic tank effluent, industrial discharges, and transfer to a plant with a consistently high level of treatment. Several important questions remain unanswered:

Will EPA require that these "poorly treated industrial discharges" be pretreated according to PL 92-500, before connections are made to the interceptor?

Will EPA promote reuse and recycling according to PL 92-500, and provide technical assistance for this purpose?

Will EPA consider the alternative of water conservation?

Will EPA consider a demonstration land sewage treatment project for Portage County instead of phase III? (or other innovative methods)

Will EPA require that all dischargers (including septic tank owners) connect to the sewer lines within a reasonable time after they are available?

Will EPA require action on infiltration/inflow problems?

Will EPA monitor carefully the impact on CVNRA?

Will the Cleveland Southerly plant (when completed), recipient of all these effluents, meet the requirements of the U.S.- Canada Agreementon Water Quality of 1972?

There is extensive evaluation of CRSD population proections in EPA Draft EIS, with questions raised about the impacts of phases II and III, but no mention of any modifications of size of proposed interceptors and lines. What are your recommendations on size? on status of phases II and III?

Thank you for your attention.



Sincerely yours,

Edith Chase

Mrs. Edith Chase

Response

Cost-effectiveness of sizing is discussed in Chapter 4.C; questions of possible economic growth were considered in Chapter 2.B.4 and 5.C.4. This statement proposes immediate initiation of facilities planning for Phases II and III to ensure consideration of the need (if any) for these later projects. Such planning would of course include consideration of multi-plant alternatives, such as those suggested in this comment.

Air quality measurements will soon be undertaken at Brecksville, Solon, and Bedford (see Chapter 2.A.1.a and 5.C.4).

Any possible approval of CVI Phase I will not effect EPA's commitment to non-point source reduction through the Section 208 and other planning programs.

A complete SSES will be undertaken as a condition of a possible grant, to determine cost-effective inflow reductions, point by point, throughout the CVI service area.

A more detailed discussion of trunk sewer points of instability is found in Chapter 2.A.2.

As described in Chapters 2.B.2.d amd 5.B, the construction of CVI Phase I should have little or no effect on land acquisition costs for the National Recreation Area. All manholes within the park area will be at grade and covered.

Because of the highly impermeable nature of most CVI area soils, low flow reduction should have little effect on aquifer recharge (See Chapter 5.C.1 and 5.C.3).

Water supply considerations are discussed in Chapter 2.B.3.b and 2.B.4.c.

Some of the Phase II and III multi-plant configurations discussed in Chapter 3.B might allow land application should sufficient suitable soils be found.

Residents of the new service area will be subject to Ohio law requiring tiein to available sewer service within 90 days.

National Wildlife Federation

1412 16TH ST., N.W., WASHINGTON, D.C. 20036

Phone: 202—797-6800

August 27, 1976

Mr. Alfred E. Krause
Environmental Impact Statement
Preparation Branch
Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, Illinois 60604

Re: Cuyahoga Valley Interceptor (Draft Environmental Impact Statement)

Dear Mr. Krause:

I transmit comments from Ms. Sallie Rhodes of our Conservation Division on Phase I of the captioned project.

As you can see from the four-page enclosure, we have serious concerns about the secondary impacts of this prospective funding. We are particularly worried about the impacts on wetlands, and about the inducement this interceptor may provide for ill-advised, uneconomic, and ecologically damaging development in the floodplain area. Finally, we note the possibility of causing development pressures and/or land value increases in the area proposed for acquisition by the National Park Service as the Cuyahoga Valley National Recreation Area. None of these secondary impacts are adequately dealt with in the impact statement. All have a great bearing on how the interceptor should be routed; and indeed, whether it should be built.

We are also concerned that, unless the nutrient problem is solved by concurrent upgrading of the Akron plant, all the good works that this $36 million expenditure will generate will not, in the final analysis, make the receiving waters in the Cuyahoga Valley either fishable or swimmable.

We trust that diligent effort will be made to solicit the advice of the U.S. Fish and Wildlife Service personnel and to enlist the interest of the Flood Insurance Administration as the planning for this project moves ahead. It is important that the Flood Insurance Administration begin, and quickly, to move the affected flood hazard communities into Phase II of the Flood Insurance Program, by giving those communities flood-

rate mapping priority. In that way, effective floodplain development constraints will, through the imposition of high insurance rates and mandatory flood-proofing or elevation requirements, be discouraged.

Finally, in order to control the location and extent of secondary growth we would encourage your Regional Office to give careful consideration to:

1) addressing the infiltration/inflow problems in the existing system now, rather than later, so as to prevent over-capacity from being built into the new system;

2) cutting down the size of the interceptor (which is very substantial, especially in Phase I); and

3) using sewer restrictions as conditions of the grant, i.e., to prevent tie-ins from new development in ecologically sensitive areas (wetlands, floodplain). There is ample precedent for the latter approach, and EPA Program Guidance Memorandum #50, coupled with EPA's Wetland Protection Policy, lends endorsement to it.

Thank you for this chance to give you our thoughts.

Very truly yours,

Bob Golten

Robert J. Golten
Counsel

National Wildlife Federation

1412 16TH ST., N.W., WASHINGTON, D.C. 20036 Phone: 202—797-6800

August 27, 1976

George R. Alexander, Jr.
Regional Administrator
United States Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, Illinois 60604

RE: Cuyahoga Valley Interceptor Proposal by Cleveland Regional Sewer District

Dear Mr. Alexander:

We have received the draft EIS and Environmental Assessment for the Cuyahoga Valley Interceptor. The area is rich in floodplains, wetlands, and recreational areas. We believe the final EIS should offer a more comprehensive evaluation of secondary effects of these resources. We hope you will consider the following observations.

1. The divergence of the sewage from the tributaries will certainly contribute to a low flow problem during some years. The impact of this problem on the water quality of the stream as well as possible solutions should be addressed in the final EIS.

2. The proposed three phase project seeks to decrease BOD, suspended solids and toxic element levels which will in turn contribute to higher water quality. However, the remaining problem of high nutrient levels and the possibility of algal blooms are not presented in the draft EIS. No provisions for coordinated upgrading of the Akron-Botzum Treatment Plant are evident. Quantification of the nutrient levels and the integration of new plans for the Akron plant should be discussed in the final EIS.

3. The EPA on page 2-4 points out that minor seismic risk occurs in Cuyahoga Valley and no mention of this problem is made in the Environmental Assessment. The possible impact of seismic activity should be explored in the final EIS.

4. The construction of trunk sewers is complicated since the proposed trunks cross mature tree stands, slide hazard areas and erosion hazard areas. We support Alternative B and C on the Brecksville Trunk and Alternative B on the Maple Heights Trunks. In addition the impact on sensitive areas of Phases II and III should be considered in the early stages of planning. Routes in the already developed highlands should be considered to avoid construction on steep slopes and in the floodplain.

5. There appears to be confusion over the population estimates for the Cuyahoga River Valley. It is hoped that any controversy over the projections will be cleared up in the final EIS. In addition, the secondary impacts of development due to the construction of the interceptor need more analysis.

6. The two miles of the main interceptor which will be tunnelled through the Cuyahoga National Recreation Area will certainly reduce the impact of the project. The Recreation Area is in the floodplain and we are concerned that the interceptor will increase the possibility of commercial and residential development in the area before the land is acquired by the Federal Government. The secondary impacts of the project on the cost and schedules of the Recreation Area need to be more thoroughly examined.

7. The draft EIS discussed potential floodplain development only in general terms. Page 2-75 of the EIS states creation of the Cuyahoga Valley National Recreation Area will eliminate possible development of a "large portion of the Cuyahoga Valley main floodplain." This statement should be supplemented by a table indication how much floodplain will remain developable in order to assess the potential for floodplain development.

   The Environmental Assessment states on page 25 that there are "existing floodplain regulations within some of the communities"(our emphasis). The final EIS should summarize these regulations by community. Also, for communities with flood hazard areas and no ordinances protecting them from development, we ask EPA to consider initiating steps under P.G. Memo #50 and requiring as a grant condition adoption of adequate floodplain regulations.

8. The draft EIS fails to discuss secondary impacts on wetlands. Our concern is heightened by the assessment which indicates that developers have in the past filled and built on wetlands as indicated on page 70. The final EIS should discuss what (if any) local or state regulations serve to protect wetlands from development.

   If wetlands are not adequately protected from filling and development, what does EPA intend to do to insure compliance with EPA Wetlands Policy (38 Fed. Reg. 10834) which calls upon your agency to protect wetlands from damaging misuses? (See also Program Guidance Memo #50.) We commend your attention to the use of sewer tie in restrictions to protect wetlands from development. For example, we refer you to the use of just such a restriction asrecently employed by EPA Region VIII for a project in Oahe, S.D. (Project No. C460243, June 9, 1976). The final EIS should discuss the measures deemed necessary to protect wetlands from development.

9. Much of the Cuyahoga Valley through which the interceptor will pass is either wetlands or floodplain and these areas are extremely important for wildlife. We are concerned that the secondary impacts of future development on the flora and fauna were not considered to any extent in the draft EIS beyond inventories being taken. A number of endangered species frequent this area and a study of the impact of habitat encroachment on their population levels needs to be undertaken.

   We are particularily concerned with the spotted salamander (Ambystoma maculatum). It is commendable that the trunk sewer is planned alongside Sagamore Road to minimize the impact on these animals. However, the questions of how much additional space will be opened up and whether the hazard to these migrating salamanders will be significantly increased have not been discussed in the draft EIS.

10. On page 5-12 the EPA states that one of the criteria for improvement in the Cuyahoga River Valley should be "coordination with other major actions affecting water quality in the Cuyahoga River corridor from Akron to Cleveland." There is a need at this early planning stage for coordination with the upgrading of the Akron-Botzum and the Southerly Sewage Treatment Plants as well as with the various land use planning agencies. The final EIS would be more responsive if this planning, including all three phases, was initiated now.

In conclusion, we support the conclusions which the EPA made on pages 5-12 and 5-13 of the draft EIS, and we trust that the concerns which have been expressed in this letter will be addressed in the final EIS.

Sincerely,

Sallie Rhodes

SALLIE RHODES
Research Correspondent

Response

A. Cover letter

Upgrading of the Akron STP has the highest Ohio State priority rating of any project. Together the CVI and Akron projects may well allow secondary contact recreation on the river between Akron and Cleveland. Comments of the U.S. Fish and Wildlife Service are included below.

The minor cost differences of various sizings will allow the project to proceed relatively unchanged, provided proper sizing and planning is undertaken now for later phases. There are few or no sensistive wetlands in the Phase I area (See 2. A. 2).

B. Comments

Low flow reduction concerns are now discussed and quantified in Chapters 5.B.1 and 5.B.3.. Construction of Phase I of the CVI and Akron STP improvements should be completed within a year of each other.

Seismic risk concerns are discussed in Chapter 2.A.2. Highland routes for portions of Phase II are discussed in Chapter 3.B.

Final population projections and economic crosschecks on them are now found in Chapter II.B.4 and 5.C.4.

Secondary growth and impact on the CVNRA has been expanded and is included in Chapter V.B.

Floodplain regulations are summarized in Chapter 5.C.3. Study of wetland impacts will be a part of required facilities planning for Phases II and III.

No broadening of the corridor the Sagamore Road salamanders must cross will occur, according to CRSD.

Initiation of facilities planning will be a condition of the Step 2 grant. Among those tiems required will be a definite schedule.

ILLINOIS Wildlife FEDERATION

13005 S. WESTERN AVE., BLUE ISLAND, ILLINOIS 60406

P. O. BOX 116 PHONE 312-388-3995

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OFFICE OF REGIONAL ADMINISTRATOR

August 23, 1976

George R. Alexander, Jr.
Regional Administrator, Planning Branch
United States Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, Illinois 60604

RE: Cuyahoga Valley Interceptor Proposal by Cleveland Regional Sewer District

Dear Mr. Alexander:

This statement prepared by Frank B. Goetschel, President, Illinois Wildlife Federation and a member of the National Wildlife Federation. My statement is non-technical and non-scientific because the drafts submitted are non-technical and non-scientific. My interests are to see an upgrading of the waters in the Great Lakes Basin and to preserve our natural non-replaceable resources. This statement has been sent to all concerned, hoping they will concur or respond with additional pertinent information relative to this EIS.

Having completed a study of the draft Nos. I, II, and III as prepared by the C.R.S.D., each phase must stand on its own merit, realizing Phase I must be sized to take the load of future Phases II and III. A few general statements are necessary before my EIS statement.

1. The pollution problems of the Cuyahoga River and its tributary streams are not a new problem for Ohio and its effect on Lake Erie.

2. The prime pollution problem to be solved with this proposal is not the rivers and tributaries in this valley, but Lake Erie.



PUBLISHERS OF ILLINOIS Wildlife

NATIONAL WILDLIFE FEDERATION AFFILIATE

1. Point source problems documented in the EIS are older than the study is able to document. This proposal would never have had to be conceived if through the years proper steps would have been taken to bring suit against violators.

2. The federal funds made available for such programs are limited and collected from all of the citizens of the United States. It does seem questionable as to whether the citizens of the U.S. should bail this area out of a dilemma that was known to exist, yet not taking any remedial action through the years. It is like the U. S. government paying a federal court-ordered fine for the violator.

3. It is necessary for the C.R.S.D. to face the questions of:

   a. future financing for operating and maintenance and the service charge to the user or user community.

   b. pretreatment of all manufacturing effluents before discharge into the Cuyahoga Valley Interceptor (CVI).

4. A plan to limit the growth of this area is necessary, with a land use policy allowing no new suburban construction and no new manufacturing complexes that will contribute large volumes of effluent to CVI.

5. There is no documented information in the EIS which gives positive proof that the environs in each area had any great input, and that they know what the tax rate will be to retire the debt and to pay the operating costs plus maintenance.

Realizing that a problem exists, and that funding is available if approved, I make the following statements directed toward this EIS:

1. With 98,400 feet of interceptors and the main trunk, which is 35,000 feet, making 133,400 feet or 25 miles of construction with an average estimated width of 25 feet or more 3,335,000 square feet or roughly 100 acres of disrupted land.

2. Within this 25 miles of CVI corridor it is evident that some irreplaceable resources exist. It is evident that this corridor is mainly in some flood area - wet land area - stream beds - park areas - prime wildlife habitat with desirable wildlife reproduction areas.

3. The protection of all wildlife is of main concern. The spotted salamander colony will be distressed and could cause a complete loss of the species.

4. The lowering of the stream and associated tributaries is of major concern, and with the loss of acre feet of water it is evident that a loss of water area will reduce the fish life population. Lowering of the water level will drain some of the normally flooded wet

lands, causing a loss of these areas if they are allowed to dry up for any extended time, thus the loss of the plant and animal life which will reduce the wildlife food chain produced in wet lands.

5. The services of the National Fish and Wildlife Service should be enlisted to prepare a documented study of the areas in question.

6. Construction of 25 miles of interceptors and trunk sewers will naturally penetrate some shallow ground water aquifiers and will present construction problems along with the problems of dewatering these aquifiers when infiltration takes place into the interceptor or sewer trunk. This water will need treatment and must be added to the total hydraulic load on the receiving plant.

7. Due to the projected time schedule it is evident that the pollution of the streams and rivers will increase, and due to the sewage sludge banks already in these streams it is evident that recovery of these streams is questionable; the possibility of having anything to save in this long period of time is also questioned.

8. It is evident from the report that some natural treatment is taking place in the streams due to dilution and increases in D.O. This natural treatment must be considered when considering the CVI in place of remote plants.

9. The EIS does not address itself definitely to secondary impact. Some of these secondary impacts are well documented from other large metropolitan sewage treatment systems (covered under Secondary Impacts).

10. The effect of the present effluent on Lake Erie is well documented in other studies of the Cuyahoga through the years. The Great Lakes Basin is of concern to all boundary states and the provinces of Canada. Efforts to correct the Cuyahoga pollution problems should have been instituted years ago.

11. The degree of treatment to be instituted must meet the requirements of a less than 1 to 1 dilution factor. The treatment process must be a part of this EIS to document what effluent quality can be expected with respect to D.O., B.O.D.s, nutrient removal, total suspended solids, etc.

12. With the proposal presented it cannot be expected that 100% of the load will be removed from the streams in question and final effluent to Lake Erie will still have some polluting effect.

Conclusions:

It is evident that there will be loss of irreplaceable resources.

There will be damage to fish and wildlife through associated habitat and food supply damage.

Future operating costs are of major importance to assure proper maintenance and updating of treatment facilities as will be required.

Handling of storm water and natural infiltration will be a problem.

Park areas will be disfigured and scarred.

Low flow problems will create drainage of flood plains and natural wet lands.

Secondary Impacts:

The study does address itself to some secondary impacts; however, some are important.

1. The CVI corridors will need constant care for many years to replace vegetation controlling erosion and correction of backfill problems.

2. All tunnel access structures must be as high as possible -- waterproofed with secured inspection holes -- to prevent these structures from becoming future flood relief structures. All tunnel access structures must be protected with adequate fencing to prevent any vandalism and possible opening for overflow reasons.

3. The secondary impact on Lake Erie after construction of CVI and treatment by the Southerly Treatment Plant (STD) must be evaluated.

   The proposal to collect sewage is well documented but the degree of treatment is not. With the population studies of the CVI corridor and the estimated M.G.D. tables, the hydraulic load to the C.R.S.D. is not tremendous. But the addition of this load to C.R.S.D. must be considered as to the treatment process and the percent reduction that will be expected.

   If this plant will arbitrarily service 1,000,000 people at 90% efficiency, pollution to Lake Erie will be equal to a population of 10,000 people with no treatment.

   With no drawings showing new process to be added to the C.R.S.D. plant, it will be assumed that all known control will be added with maximum control on B.O.D. removal, increased D.O., disinfection, total suspend solids, and nutrient removal.

   Processing special industrial wastes will require C.O.D. monitoring and special equipment to separate the pollutants in certain industrial wastes.

   The expansion of the plant must be studied for land available in the immediate area.

4. The pumping station to lift the CVI collected waste water to the treatment plant is of major importance because it can be assumed that a flood overflow structure will be necessary. It can be assumed that they will be used in emergency and these emergencies will present themselves. With no storm water retention for future treatment it is evident that pollution will exist at this time in the receiving stream.

5. The information on the treatment facilities, land available for future expansion is not available in the EIS. The updating of the present plant must provide all of the known technology for treatment. Of major importance is the ability to treat industrial wastes from the inventory of present effluents and their particular characteristics. Of prime importance is a study to determine how many times the plant has been on bypass because of untreatable wastes and storm overflow.

6. The cost study ratio of small plants versus one large plant should not be a determining factor in this proposal for many reasons:

   a. Each area in question has an obligation to discharge a suitable effluent to the receiving stream.

   b. Is land available at the treatment plant to expand, to provide new tertiary treatment and for retention of storm flow?

   c. Is the present metropolitan system free of storm flow?

   d. Land in remote areas in the CVI system appears to be available.

   e. Treatment of 100% residential sewage can produce sludge of somewhat high quality without excessive amounts of heavy metals, which could be used for land reclamation. Mixing with discharges from the manufacturing and processing plants can cause problems with the disposal of sludge because of heavy metals.

   f. Properly operated small plants located on the streams in question can be considered an asset to water levels in the streams.

   g. Special treatment can be used where necessary in place of special treatment to 100% of the flow at one plant.

   h. Small plants treating refinery wastes or volatile discharges must be required where necessary.

In conclusion:

The total MGD of the collection system is not monumental if sectionalized. If handled in remote plants operated by the C.R.S.D. employees, a local

employment factor is evident that is beneficial. Monitoring of small plants is not as complex as one large plant. Elimination of the CVI construction costs and future maintenance and operating costs is a major factor for establishing future tax structures. The EIS does indicate certain environmental short term items, and also lists the long term items, but it does not address itself directly to the real problem of pollution to Lake Erie from all sources.

There is not a documented statement that the 208 Committee has had time to study this proposal. Time should be allowed for this Committee to function and to bring forth a representative study by the environs of the area in question.

It is questionable as to whether future polluted discharges into the streams and tributaries in question will be prohibited by local governing bodies, as no master plan has been proposed for land use and the protection of flood plains and wet lands.

The problems of the Cuyahoga are as old as the first settlements. A crash program for immediate approval is not necessary today. All of the pros and cons must be studied.

The benefit cost ratio is of utmost importance and an over-constructed system is a waste of our natural resources. It is important that steps be taken to improve water quality in the Cuyahoga Valley immediately, with the main thrust of getting a better effluent into the Cuyahoga River and discharge into Lake Erie. In as many areas as possible, sewage lagoons should be provided by the county or C.R.S.D. to intercept septic tank discharges and as many other discharges as it is feasible to intercept. If the C.R.S.D. has legal control over the area, immediate steps should be made to correct the individual problems.

In the alternatives listed my study indicates this priority:

D - a multiple plant system
B - dual interceptor to small plants
F - alternate trunks
C - CVI - new regional plant
A - CVI Phase I
E - no action.

I would like to make one final suggestion without documentation at this time because of lack of engineering data. My suggestion is that a study by the Army Corps of Engineers be instituted immediately to close the mouth of the Cuyahoga River, reverse the river to a southerly flow into a sanitary canal, then into one of the tributaries flowing south in Ohio after treatment.

Sincerely,

Frank B. Goetschel

Frank B. Goetschel, President
Illinois Wildlife Federation

FG/lj

Response

Had action been taken on all existing pollution problems in the United States there would not be so many of them today. The people and governments of the Cleveland area are no more culpable than those of hundreds of other cities. Indeed those agencies preceding CRSD were almost pioneers in the introduction of secondary treatment in the 1930's.

Chapter 5.C.4 and Chapter 5 generally contain a discussion of secondary growth and induced development. Apparently water supply is a dominant limiting factor of greater significance than availability of sanitary sewers. Financial impact of construction on local municipalities is partially discussed in Chapter 5.C.4.

The calculations of land disrupted by construction ignore tunneling of the interceptor mainstem and trunk lines within the National Recreation Area. Wetlands within the Phase I service area are minimal (See 5.A.2). The Sagamore Road Salmander colony is of a species endangered only within Cuyahoga County and relatively common within the State of Ohio.

Low flow reduction impact is now discussed in greater length in Chapters 5.C.1 and 5.C.3. Lowering of water levels in the Cuyahoga River mainstem will be minimal. Comments resulting from coordination with the Fish and Wildlife Service are included below.

Considerations of tributary water quality with a multi-plants or partially multi-plant alternative for Phase II and III is included in Chapter III.B. Water quality projections for the proposed project are in Chapter 5.C.1 and 5.C.3.

All access areas within the Recreation Area will be sealed and normal revegetation should conceal them after one year. CVI service area sewage received at the southerly STP will receive tertiary treatment, Phosphorus removal, nitrification and disinfection.

Possible Phase II and III alternative discussed in Chapter 3 may produce a sludge of quality high enough to allow land application.. Expansion and upgrading of the Southerly STP is now underway and ample land exists for future needs.

The reversal of the Cuyahoga River suggested in this comment may divert enough water from Lake Erie to violate agreements of the International Joint Commission.

WOJC/K

# CITIZENS FOR LAND AND WATER USE

*Water Is Not Free To Modern Man*

*Dilution Is No Longer The Solution To Pollution*

*"Water is Life"*

August 3, 1976

Citizens for Land and Water Use, Cleveland Metropolitan Area' reaction to Region V, U.S. EPA Environmental Impact Statement for Phase I of the Cuyahoga Valley Interceptor Sewer.

A need for Phase I of the CVI was recognized prior to 1959.

In 1966, the late Walter E. Gerdel, Cleveland Commissioner of Pollution Control, interviewed the late Mrs. Edmund F. Smircina and me, to enlist the aid of Citizens for Land and Water Use.

We were to encourage the suburbs that had developed without restraint, installing hundreds of septic tanks in an area unsuited for filter fields, to join Cleveland's Cuyahoga Valley Interceptor Sewer.

Most of these septic tanks are still polluting, plus numerous package sewage treatment plants that are nothing but costly jokes for pollution control.

For these reasons it seems unconscionable to allow this polluting of the Cuyahoga River to go on another day.

The Citizens who helped to make the money available for the clean-up want the clean-up as of yesterday.

The installation of Phase I of the CVI is overdue. It was needed before the word'ecology' became a household word. The CVI was needed during the 'Environmental Fad' that caused agencies like the EPA to be formed. It is needed now, even though 'Ecology' is in fourth or fifth place of popular concern.

Why should an Environmentalist have to beat an Agency over the head for the implementation of the projects the Agency was formed to facilitate?

Install Phase I of the CVI now! No contingencies, please,

Non-Profit Mrs. James H. Angel, 2084 Elbur Ave., Cleveland Ohio 44107 216/221-1859

Citizens for Land and Water Use, Cleveland Metropolitan Area' reaction to Region V, U.S. EPA Environmental Impact Statement for Phase I of the Cuyahoga Valley Interceptor Sewer.

continued--

that are enumerated in the conclusions of your Environmental Impact Statement. It seems as if Region V is attempting to make the CVI incidental to the conclusions on page twelve of chapter five.

Too many people are dead who should have had the opportunity to realize the installation of Phase I of the CVI. These people were dedicated to the welfare of future taxpayers.

It makes economic sense to build sufficient capacity into Phase I to handle Phase II and Phase III. Not to do so is to create problems for the future.

People want solutions, and no planner approaches a problem with a solution. In fact a good plan usually calls for another plan.

We wring our hands in anguish at the word 'plan'. To adapt a saying, 'hell is paved with plans'. And that is where too much of our pollution control money is going-----to hell.

Mrs. James H. Angel, Chairman
Citizens for Land and Water Use
2084 Elbur Ave.
Cleveland, Ohio
44107

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# CITIZENS FOR LAND AND WATER USE

*Water*
*Is Not Free*
*To Modern Man*

*"Water is Life"*

*Dilution*
*Is No Longer The*
*Solution To*
*Pollution*

August 30, 1976

Mr. George R. Alexander, Jr., Director
Planning Branch, EIS Preparation Section
U.S. EPA Region V
230 South Dearborn
Chicago, Illinois 60604

Dear Mr. Alexander:

Thank you for sending us a copy of the Illinois Wildlife Federation's statement to Region V, on Phase I of the Cuyahoga Valley Interceptor in the Cleveland Metropolitan Area, Ohio.

As polluted as our area is alleged to be, we have not ever contemplated 'thumbing our nose' at Nature by reversing the flow of the Cuyahoga River.

There is no question that a locally financed job is the most economical. As early as 1966, we volunteered time and effort for the implementation of the CVI at the local level. But the suburbs so hated Cleveland that this was an impossibility. (How do you deal with mass human intolerance?)

We consider ourselves very fortunate that the Cleveland Regional Sewer District has been legally established.

We are dedicated to doing everything in our power to help Cleveland Regional Sewer District do a good job. OUR OBJECTIVE IS CLEAN WATER. If need be, we will run strong interference, to keep 'outsiders' from hampering the implementation of Phase-I of the CVI.

Frank B. Goetschel, President of the Illinois Wildlife Federation, took a cheap shot when he said, "----the citizens of the United States are bailing the Cleveland area out of a dilema that was known to exist, yet not taking any remedial action through the years.

Federal funding should be tripled for the Cleveland area, in compensation for the slander that has been broadcasted worldwide, that Lake Erie is dead----and that you can't drown in Lake Erie because you can walk on the pollution.

continued---

Non-Profit Mrs. James H. Angel 2084 Elbur Ave. Cleveland, Ohio 44107 216/221-1859

Mr. George R. Alexander, Jr.
Cuyahoga Valley Interceptor
August 30, 1976

The truth is, that Cleveland's Easterly and Southerly STPs, serving 85% of the Cleveland area, had secondary treatment as early as 1938, far ahead of most municipalities in the United States.

Mr. Alexander, you have our permission to call in the services of the National Fish and Wildlife Service, relative to Phase I of the CVI, as suggested by the Illinois Wildlife Federation, AFTER both agencies assume some responsibility to the people in the United States and Ohio by forcing the Ohio Wildlife Division to allow the fish to spawn during the main Spring spawning season, March 15th through May 15th.

The commercial taking of fish in the corridors to the spawning beds in Lake Erie before the fish spawn, is fish genocide.

If the Illinois Wildlife Federation and the National Fish and Wildlife Service do not have the authority to help in this long-festering wildlife problem, of considerable magnitude, then we question their authority to hinder the speedy installation of the CVI. (Fish flyer enclosed)

The Illinois Wildlife Federation's concern for the spotted salamander colony seems to draw attention away from the matter at hand; namely the installation of the CVI. I have never seen a spotted salamander. (Is it related to the "red herring"?)

When a plumber is called in to repair a broken pipe, it is prudent not to beat him over the head with a wrench while he is working. It raises the cost of the job, to say the least.

Our objective is to get all of the sewage to the sewage treatment plant to be properly treated, with a minimum impact on the environment. The Cleveland Regional Sewer District has promised to do this.

Thus far, Region V seems, to me, to be almost as cussed about the CVI as the Cleveland suburbs were.

Drop that wrench! Men want to work.

Yours very truly,

J. Angel

Mrs. James H. Angel, Chairman

# CITIZENS FOR LAND AND WATER USE

*Water*
*Is Not Free*
*To Modern Man*

*Dilution*
*Is No Longer The*
*Solution To*
*Pollution*

*"Water is Life"*

**World's fish catch could be tripled**

WASHINGTON — (UPI) — The world's catch of fish, now 69.5 million tons a year, could be nearly tripled, "If mankind is intelligent enough to cooperate and use the best available management techniques," Norman J. Wilimovsky of the University of British Columbia told the North American Wildlife Conference.

Cleveland Press 3-26-1976

**Man's management of fish cannot compare with Nature's uninterrupted plan for abundance.**

In Nature's plan, the roe-laden female fish swim to their spawning beds. When the eggs are laid, the male fish fertilize them. The average roe-laden female walleye or pickerel can lay more than five hundred-thousand eggs. About five male fish are required to fertilize this many eggs.

Believing this natural phenomena, it is reasonable that a ban on commercial fishing during the Spring spawning season, March 15th to May 15th, can increase Lake Erie fish to an abundance for all the people.

Twelve pounds of grain fed to cattle equals one pound of meat. The fish feed on what Nature provides. Yet the price of quality fish is higher than porterhouse steak.

Commercial fishermen make a living on a natural resource that they JUST TAKE from Lake Erie. Commercial fishing is the only industry that stops the production of a product by taking as many fish as they can before the fish spawn.

High food prices prompt us to demand protection for the reproduction of the people's natural resource.

The Ohio Wildlife Division has the legal authority to allow the fish to spawn during the Spring spawning season. It is blasphemous for the Wildlife Division to require a fishing license while deliberately creating a scarcity of fish.

Mrs. James H. Angel, Chairman

Non-Profit Mrs. James H. Angel 2084 Elbur Ave. Cleveland, Ohio 44107 216/221-1859

# APPENDIX A

## STREAM BIOLOGY

In this section, we have included a more detailed description of the stream biology. First is a discussion of the classification of zones as used in the description of reaches of the stream. The second section of the Appendix describes the use of the Biotic Index[34] and the third section is the detail biology of each station.

### CLASSIFICATION OF ZONES

A. The Clean Water Zone or Relatively Unpolluted

1. General Features

   a. DO high
   b. BOD low
   c. Turbidity low
   d. Organic content low
   e. Bacterial count low
   f. Numbers of species high
   g. Numbers of organisms of each species moderate or low
   h. Bottom free of sludge deposits

2. Characteristic fauna includes wide variety of forms such as:

   a. Caddis fly larvae (Trichoptera)
   b. Mayfly larvae (Ephemeroptera)
   c. Stonefly larvae (Plecoptera)
   d. Damselfly larvae (Zygoptera)
   e. Beetles (Coleoptera)
   f. Clams (Pelecypoda)
   g. Fish such as:
      Minnows, Notropid type
      Darters (Etheostomidae)
      Millers thumbs (Cottidae)
      Many sunfishes and basses (Centrarchidae)
      Sauger, yellow perch, etc. (Percidae)

3. The Biotic Index of this zone generally would be above 15. However, in low nutrient water, the Biotic Index may be very low.

B. Zone of Recent Pollution or Polluted

1. General Features

   a. DO variable, 2 ppm to saturation
   b. BOD high
   c. Turbidity high
   d. Organic content high

e. Bacterial count variable to high
f. Number of species declining from clean water zone
g. Number of organisms per species tends to increase
h. Other: Slime appearing on bottom

2. Characteristic fauna

a. Midge larvae (Chironomidae or Tendipedidae) becoming more abundant
b. Back swimmers (Corixidae) and water boatmen (Notonectidae) often present
c. Sludgeworms (Tubificidae) common
d. Dragonflies (Anisoptera) often present
e. Fish Types
Fathead minnows (*Pimephales promelas*)
White sucker (*Catostomus commersonnii*)
Bowfin (*Amia calva*)
Carp (*Cyprinus carpio*)

3. The Biotic Index of this zone would range between 2 and 7.

C. Septic Zone or Grossly Polluted

1. General Features

a. DO little or none during warm weather
b. BOD high but decreasing
c. Turbidity high, dark, odoriferous
d. Organic content high but decreasing
e. Bacterial count high
f. Number of species very few
g. Number of organisms: may be extremely high or none at all
h. Others: Slime blanket and sludge deposits usually present, oily appearance on surface, rising gas bubbles

2. Characteristic fauna

a. Mosquito larvae
b. Rat-tailed maggots
c. Sludgeworms (Tubificidae)
d. Air breathing snails (*Physa*)
e. Fish types: None

3. The Biotic Index of this zone would be less than 2.

D. Zone of Recovery (may be subdivided, often abnormally productive) or Moderate to Excessive Enrichment

1. General Features

a. DO 2 ppm to saturation
b. BOD dropping
c. Turbidity dropping, less color and odor

d. Organic content dropping
e. Bacterial count dropping
f. Numbers of species increasing
g. Numbers of organisms per species decreasing (with the increase in competition)
h. Other: less slime and sludge

2. Characteristic fauna

a. Midge larvae (Chironomidae)
b. Black fly larvae (Similium)
c. Giant water bugs (Belostoma)
d. Clams (Unio)
e. Fish types
Green sunfish (Lepomus cyanellus)
Common sucker (Catostomus commersonnii)
Flathead catfish (Pilodictis olivaris)
Stoneroller minnow (Campostoma anomalum)
Buffalo (Megastomatobus cyprinella)

3. The Biotic Index of this zone would range between 5 and 1[illegible]

E. Clean Water (Downstream)

1. General Features: similar to upstream clean water except that it is now a larger stream.

2. Characteristic fauna: similar to upstream clean water fauna except that species include those indigenous to larger stream.

3. The Biotic Index of this zone would be similar to the Clean Water or Relatively Unpolluted zone and generally would be greater than 15.

## RELATIONSHIP OF BIOTIC INDEX TO WATER QUALITY STUDIES

Aquatic Life communities have long been used as indicators of water quality. The repeated occurrence of certain benthic species in similar habitats of a given watershed have provided the biologist and the engineer with an important device for the assay of water quality, particularly as a monitor for various criteria, such as DO and organic waste loads, and under certain conditions, toxic substances. Biological surveys of streams, rivers, and lakes do not require frequent periodic sampling. One intensive investigation by a competent observer or team using methods that properly sample all of the niches of a determined sampling area is sufficient to biologically classify the water quality.

The streams of the Cuyahoga River Tributary Study area represent a wide variety of aquatic habitats. Some reaches of these streams are slow flowing, some rapid, some deep, others shallow. Excellent to poor reaeration and varying light penetration occur in most of the streams. Varying turbidity between watersheds or within a watershed has a [illegible]ed effect on comparison of t[illegible]

data. All of the watersheds of this study area have at least one comparatively long reach in which reaeration is excellent through falls, cascades, and riffles. DO in these reaches is invariably, and misleadingly high when compared to the organic load and other oxygen depleting factors.

Quantitative reporting of stream biology can be a difficult problem and its validity is often questioned. If the data are to be compared between stations on a stream, sampling techniques should be such to eliminate the variables caused by the variations in physical habitat. These variations affect not only the make-up of the aquatic community species, but their populations. Although the physical and chemical properties of a given series of stations appear to be equally comparable, a strict total species - total individuals biology may not necessarily support the chemical analysis. Conversely, neither does this kind of data give proof of a degraded condition. Collecting techniques for coarse and irregular substrates of rubble and rough bedrock, although often highly populated, leave room for significant error in retrieving and collecting all of the individuals within a given sample area.

In considering the several problems of collecting, compiling data, and reporting, the technique was chosen of reporting a quantitative value based on the number of macro-invertebrate species collected at the various stations. This procedure is adapted from Beck[34] and is in use by the Miami Conservancy District in southwestern Ohio. The organisms are first listed in categories of varying degrees of tolerance to organic pollution. First, a group, identified as Class I is compiled as intolerant of any or very low quantities of organic wastes. The latter being reflected as the natural addition of plant and animal detritus plus possibly, highly diluted unnatural additions. The cumulative effect could not be above the natural range for unspoiled streams in the area. It should be pointed out that there is a good deal of variation in the rates of eutrophication on the watersheds of a large area or region such as the present study. The second group of organisms, Class II, is made up of those that are tolerant of moderate pollution levels. This group is numerous in total species but becomes more restricted as the pollution load increases. The last group, Class III, includes those organisms that survive, or in the case of some, thrive in grossly polluted conditions. The first and third groups contain fewer kinds than Class II.

The significance of Class I organisms is increased by applying a factor of two to the number of Class I species. All data are representative of the number of kinds. The number of individuals is not computed as a part of this biotic index. Class III organisms are recorded but are not included in computing the index as the goal is to arrive at a value of quality above the grossly polluted condition. If such a value is not derived then a biotic index of zero is reported and gross pollution is assumed unless accompanied by an explanation that satisfactorily shows why the quality is otherwise.

The formula for computing a biotic index based on the above considerations is then:

$$2\ (\text{n of Class I}) + \text{n of Class II} = \text{BI (Biotic Index)}$$

The raw data for each sampling station was gathered by collecting and recording the macro-invertebrates attached to or living on the bottom of the stream at the sampling point. The area of search is the width of the stream

for a length of approximately fifty feet. Collecting techniques varied with the conditions at the station. Hand picking, seining, dredging, and screening provide a range of collecting techniques suitable to reveal the variety of organisms, but not all of these give valid quantitative data.

The index is used as a statement of biological quality at a sampling point and as a basis of comparison of biological conditions in a stream from upstream sampling points to the lower terminus of the stream. If the geography, geology, and hydrology of several streams of an area are similar, comparisons of these streams can be made with validity.

## DETAILED BIOLOGICAL DESCRIPTION BY SAMPLING STATIONS

Following is a detailed biological description of the major streams within the study area.

### Tinkers Creek No. 1

Biology: BI=1*

Algae
- *Oscillatoria*
- *Spirogyra*
- *Cladophora*
- *Stigeoclonium*

Animals
- Annelida, Tubificidae, sludgeworm
- Mollusca, Gastropoda, *Physa*, snail
- Arthropoda, Tendipedidae, midge

*In the gorge immediately upstream of the Wood Creek entry near this station, a brief survey period yielded a BI of 4. Reaeration in the gorge is high and there is visible improvement in water quality over Station 2. The Wood Creek discharge of Bedford effluent is severely damaging to the water quality below that entry.

### Tinkers Creek No. 2

Biology: BI=2

Algae
- *Oscillatoria*

Animals
- Annelida, Tubificidae, sludgeworm
- Arthropoda, Cladocera, daphnids
  - Hemiptera, Corixidae, water boatman
  - Diptera, Tendipedidae, midge

Tinkers Creek No. 3

Biology: BI=2

Animals
Annelida, Tubificidae, sludgeworm
Mollusca, Gastropoda, *Physa*, snail
Arthropoda, Decapoda, crayfish
Diptera
Tendipedidae, midge

Fish
*Esox vermiculatus*, red-fin pickerel

Tinkers Creek No. 4

Biology: BI=12*

Algae
*Oscillatoria*
*Nitzschia*
*Stigeoclonium*
*Cladophora*
*Spirogyra*

Higher Plants
*Acoris calamus*, sweetflag
Sagittaria, arrowhead

Animals
Annelida, Hirudinea, leech
Arthropoda, Decapoda, crayfish
Ephemeroptera, Heptageniidae, mayfly
Ephemeroptera, Baetidae, mayfly
Odonata, Zygoptera, Calopterygidae, damselfly
Hemiptera, Corixidae, water boatman
Hemiptera, Gerridae, water strider
Coleoptera, Gyrinidae, whirligig beetle
Diptera, Tendipedidae, midge
Trichoptera, Leptoceridae, caddis fly
Amphibia, *Rana clamitans*, green frog (tadpoles)

*No riffles at this station. Current relatively swift with gradient of approximately 10'/mile. BI good for this physical conformation.

Numerous mayfly naiads and caddis fly larvae are valid criteria for good water quality at this station, particularly considering the absence of riffles combined with the relatively deep stream. A swampy area comprised of a former stream bed supports a rich biota. The swamp is the probable origin of the tadpoles found in Tinkers Creek at this station. No fish were found.

Tinkers Creek No. 5

Biology: BI=10*

Algae
- Oscillatoria
- Diatoms
- Spirogyra
- Hydrodictyon

Higher Plants
- Anacharis canadensis, waterweed
- Lemna, duckweed
- Wolffia, water meal

Animals
- Annelida, Tubificidae, sludgeworms
  - Hirudinea, leech
- Mollusca, Gastropoda, Physa, snail
  - Gastropoda, Helisoma, snail
  - Pelecypoda, Sphaeridae, fingernail clam
- Arthropoda, Ephemeroptera, Heptageniidae, mayfly
  - Odonata, Libellulidae, dragonfly
  - Hemiptera, Corixidae, water boatman
  - Hemiptera, Gerridae, water strider

Fish
- Lepomis macrochirus, bluegill sunfish
- Lepomis gibbosus, pumpkinseed sunfish
- Esox vermiculatus, red-fin pickerel
- Ictalurus sp., bullhead

*Slow moving, relatively deep reach. BI good for this situation.

Tinkers Creek No. 6

Biology: BI=23

Algae
- Oscillatoria
- Spirogyra
- Desmids

Higher Plants
- Typha latifolia, cattail
- Sparganium, Burreed
- Potenderia cordata, Pickerelweed
- Sagittaria, Arrowhead
- Anacharis canadensis, waterweed
- Lemna, duckweed

Animals
- Bryozoa, Plumatella
- Annelida, Hirudinea, leech
- Mollusca, Gastropoda, Physa, snail
  - Gastropoda, Gyraulus, snail
  - Gastropoda, Lymnaeidae, snail
- Arthropoda
  - Cladocera, daphnids
  - Copepoda, cyclops
  - Amphipoda, Gammarus, scuds
  - Odonata, Zygoptera, Lestes, damselfly
  - Odonata, Aeschnidae, Anax, dragonfly
  - Odonata, Libellulidae, dragonfly
  - Hemiptera, Belastomatidae, Belastoma, water bug
  - Hemiptera, Notonectidae, backswimmer
  - Hemiptera, Corixidae, water boatman

Tinkers Creek No. 6 (Cont'd.)

Arthropoda
- Hemiptera, Gerridae, water strider
- Coleoptera, Hydrophillidae, water scavenger beetle
- Diptera, Tendipedidae, midge
- Diptera, Culicidae, mosquito

Fish
- *Lepomis gibbosus*, pumpkinseed sunfish
- *Esox vermiculatus*, red-fin pickerel
- *Notropis cornutus*, common shiner

Tinkers Creek No. 7 (Pond Brook)

Biology: BI = 6

Algae
- None

Higher Plants
- *Petandra virginica*, arrow-arum
- *Sagittaria sp.*, arrowhead
- *Potenderia cordata*, pickerelweed
- *Polygomun sp.*, smartweed
- *Nuphar advena*, pond lily

Animals
- Annelida, Tubificidae, sludgeworm
- Arthropoda
  - Copepoda, *Diaptomus*
  - Megaloptera, *Sialis*, alderlfy
  - Ephemeroptera, Heptageniidae, mayfly
  - Odonata, Zygoptera, Lestidae, damselfly
  - Odonata, Anisoptera, Libellulidae, dragonfly
  - Hemiptera, Belastomatidae, *Belastoma*, giant water bug
  - Hemiptera, Corixidae, water boatman
  - Hemiptera, Gerridae, *Gerris*, water strider
  - Coleoptera, Gyrinidae, Dineutes, whirligig beetle
  - Coleoptera, Hydrophilidae, Hydrophilus, water scavenger beetle
  - Diptera, Tendipedidae, midge

This station is located on Ohio Route 82 and south of Aurora Pond. Pond Brook is the outlet of Aurora Pond and the drainage for a large area of very low gradient land around this former bog pond. Bog conditions occur throughout the area, however, agriculture, land drainage, and effluents have modified the quality of the area considerably. The stream water is brown and highly organic, and although the bed substrate is clay and/or sandy gravel, an organic silt usually is evident as an overlay. No riffles occur near the sampling point. The stream flow is from three to ten feet wide and one to two feet deep. Rooted aquatic vegetation encroaches on the flow section from the banks. Silt is deposited around the submerged stems. The aquatic life here reflects a pH higher than is usually found in a more typical acid bog area where pH is usually below 6.

The biotic index of 6 is considered evidence of good water quality for water from a bog-like source.

Brandywine No. 1

Biology: BI=0

Algae
Oscillatoria
Anabaena

Animals
Annelida, Tubificidae, sludgeworms
Arthropoda, Syrphidae, hover fly (maggot)
Tendipedidae, Tendipes, midge

This station is located immediately below the entry of effluent from the aerated lagoon of the Jaite Paper Mill of the Owens Illinois Company. The water is always highly turbid and odoriferous. The odor varies from a moderate STP type to a strong paper mill type. The creek color is brown although the oxidation pond effluent and its ditch bank is dark gray. The organisms are all pollution tolerant; however, they occur only in the shallow, virtually dead water zones near the stream bank. Bottom samples from mid-channel contained no organisms.

Above the paper mill effluent the stream is in a condition of a recovery zone. It has entered the flood plain of the Cuyahoga from a rocky, high gradient wooded gorge. The drop is about 300 feet from station two (2) at Akron-Cleveland Road to station one (1) including the Brandywine Cascade of about forty feet. Water quality improves due to oxygenation and some tributary dilution in this reach. Prior to and during the study period several silting problems occurred due to more or less prolonged periods of construction of Interstate 271 paralleling and crossing the stream above the falls, and straightening of the stream course and slope seeding at the Brandywine Ski Area above the Jaite Paper Mill. Equipment operation in the stream and on its banks, as well as runoff, contributed quantities of silt, soil, and gravels much of which were deposited in the channel on the Cuyahoga flood plain.

In the reach passing through the ski area, the biology shows some improvement over station two upstream. Midge and caddis larvae, two snail species, and a few unidentified minnows were collected or seen. Cladophora is common. Although to be expected, crayfish could not be found. None of the forms were abundant.

Briefly, the stream shows qualities of advanced recovery in the reach just above the sampling station (1), but it is grossly damaged at that station by effluent from the mill lagoon and changing character of the stream channel providing less natural reaeration.

Brandywine No. 2

Biology: BI=0

Algae
Oscillatoria
Cladophora

Brandywine No. 2 (Cont'd.)

Animals
Annelida, Tubificidae, sludgeworm

Above this station, the stream has passed through a long reach of relatively low gradient with little aeration. At this station, it is entering the gorge cut in the valley wall that drops the stream over three hundred feet in the next three miles. Immediately above this station, highway construction has repeatedly damaged the stream channel and contributed a silt load several times during and before the study period. Macedonia No. 15 discharges an effluent of 1 mgd just above this station. The stream discharge is made up largely of effluent from wastewater treatment plants at this point. The water quality above the Macedonia No. 15 effluent is a recovery zone, nutrient enriched, supporting large populations of green alga, higher aquatic plants, isopods, crayfish, and a few minnows. The water quality at station two (2) is polluted; generally, it has a brownish gray color, and a noticeable effluent odor.

Brandywine No. 3

Biology: BI=3

Fungi
Sphaerotilus

Algae
Oscillatoria
Diatoms

Higher Plants
Elodea
Myriphyllum

Animals
Mollusca, Gastropoda, Physa, snail
Arthopoda, Cladocera, daphnid
Hemiptera
Corrixidae, water boatman

Under normal flow conditions, about one-half of the discharge at this point is effluent from the Hudson Wastewater Treatment Plant on Hines Hill Road. No clean water animal forms were collected. The stream here is on a low gradient with two low riffles in a hundred and fifty yard reach above and below the station. Water color is usually gray brown but occasional blooms of blue-green algae produce a blue-green color in the long deep pools. This reach is in a zone of recent pollution.

Brandywine No. 4

Biology: BI=7

Algae
Oscillatoria
Cladophora
Spirogyra

Higher Plants
Anacharis canadensis, waterweed

Brandywine No. 4 (Cont'd.)

Animals
Arthropoda
Isopoda, Ascellus, aquatic sow bug
Odonata, Zygoptera, damselfly
Odonata, Anisoptera, aeschnid dragonfly
Hemiptera, Gerridae, water strider
Coleoptera, Dytiscidae, predaceous diving beetle
Diptera, Tendipedidae, Tendipes, midge

Throughout the early part of the study period, the above biology was noted on several occasions. The principle quality problem obvious during the same period was occasional silting, with a thin layer remaining on the substrate and submerged plants.

The stream here is in a recovery zone. However, the water quality is frequently within the parameters of clean water. Pollution problems here are occasional slugs from upstream residential developments. All of the organisms found at station four (4) are moderate to heavy pollution tolerant.

On July 30, the sampler reported a gray water color, sewage odor, and zero DO for this station. A follow-up check on July 31 showed improved color, odor and DO of 11.4 mg/l. However, no aquatic animals could be found. Examination of several upstream points yielded the location of potential problem sources in the development called Connecticut Estates. The DO of outfalls into two Brandywine headwater streams were below 3 mg/l. One is an aerator type tank, yielding a small flow at that time of 11°C. water with a DO of 2.5 mg/l. The other is a small package plant with an effluent of 21°C. and DO of 2.8 mg/l at the time of the survey. The fenced area prevented close study, but the probable source of the previous day low DO and odor-color observation may have been effluent from the package plant. Minnows were present on July 31 in the brook downstream of the effluent. The DO was 4.2 mg/l. This reach is in the zone of recovery.

Sagamore Creek No. 1

Biology: BI=6

Algae
Cladophora
Diatoms

Higher Plants
None

Animals
Arthropoda
Decapoda, crayfish (exuvea only)*
Ephemeroptera, Stenonema, mayfly
Hemiptera, Gerris, water strider
Diptera, Simuliidae, black fly
Tendipedidae, midges
Trichoptera, Hydropsychidae, caddis fly

*The molted exoskeleton is evidence of the presence of crayfish.

Sagamore Creek No. 1 (Cont'd.)

Fish
Pimephales notatus, blunt-nose minnow
Notropis cornutus, common shiner

This station is located at Sagamore and Canal Roads where the creek enters the Cuyahoga River flood plain. The water quality is improved over the number two (2) station upstream in spite of the addition of effluent from Hawthornden State Hospital. The gradient is relatively steep, falling 230 feet in the nearly two miles below station two (2). The stream bed is rocky, much of it being unstable sand and gravel mixed with rubble.

Aeration is high with saturated DO in most sections of this reach. During the period of this study, much of the flow at this downstream station was made up of effluent from the upstream WT Plants.

Sagamore Creek No. 2

Biology: BI=6

Algae
Oscillatoria
Diatoms, Nitzschia, Navicula
Hydrodictyon
Cladophora
Spirogyra

Higher Plants
None

Animals
Platyhelminthes, planarian
Annelida, Hirudinea, leech
Mollusca, Physa, snail
Sphaeridae, finger-nail clam
Arthropoda, Isopoda, Ascellus, a uatic sow bug
Diptera, Simuliidae, black fly
Diptera, Tendipedidae, Tendipes, midge

Fish
Notropis cornutus, common shiner

Sagamore Creek in this reach is in a zone of recovery from the rich effluent out of the Northfield Treatment Plant. Cladophora and blue-green alga are abundant. Midge larvae, Ascellus, and Physa snails are numerous as is typical of organically rich water. The other forms are present in moderate numbers.

The absence of sludgeworms may indicate an excess of metal ions, although neither were they found at sampling station three (3) on Sagamore Creek. Crayfish also appear to be absent from this section of the watershed.

The streams that make up the headwaters of Sagamore Creek are all intermittent, except the branch which carries the effluent of the Northfield Plant. This stream has a continuous flow often made up almost entirely of the effluent.

Sagamore Creek No. 3

Biology: BI=5

Algae
Hydrodictyon
Spirogyra

Higher Plants
None

Animals
Mollusca, Physa, snail
Arthropoda, Ascellus, aquatic sow bug
Hemiptera, Gerris, water strider
Diptera, Simuliidae, black fly
Diptera, Tendipedidae, midge
Trichoptera, caddis fly

Amphibia, Rana clamitans, green frog (tadpoles)

This branch of Sagamore Creek is the outlet of Willow Lake, a small impoundment of what was formerly a smaller natural body of water, partly upland swamp. Throughout most of the sample period there was a low stable flow over the substrate of gravel and rubble with riffle situations predominant. The organisms in the samples were represented by very low numbers, Ascellus being most generally distributed in the riffles. A small pool below the highway culvert at the station contained filamentous algae and tadpoles of the green frog. The latter may have been transported from the upstream lake during higher flow periods.

This branch of Sagamore Creek is, in general, unpolluted.

Chippewa Creek No. 1

Biology: BI=6

Algae
Diatoms
Oscillatoria
Cladophora

Animals
Annelida, Tubificidae, sludgeworms
Arthropoda, Copepoda, Cyclops
Decapoda, Orchinectes - crayfish
Hemiptera, Gerridae, Gerris, water strider
Diptera, Simuliidae, blackfly
Diptera, Tendipedidae, Tendipes, midge
Diptera, Culicidae, mosquito
Trichoptera, Hydropsychidae, caddis fly

Fish
Notropis cornutus, common shiner
Pimephales notatus, blunt-nose minnow

Chippewa Creek No. 1 (Cont'd.)

This station includes collections and observations from the Riverview Road bridge upstream to include the ford of the Brecksville Metropolitan Park parkway. The substrate is an alluvium of sand, silty soil, broken shale, and sandstone rubble. The stream has emerged from the gorge condition with its accompanying high aeration into its own short flood plain and blends into the Cuyahoga flood plain. The very poor water quality of the Harris Road station has improved considerably due to the excellent reoxygenation occurring in the gorge. Most of the tributary streams between these two stations, Stations 1 and 7, contribute water that is in excellent condition to help recover quality in the main stream carrying a moderate organic pollution load. Storm discharge and periodic slugs of wastes from upstream produce temporary conditions of biologically limiting quality on small streams draining the urban area. Oily stains and discolored sediments were found in tributary streams which also lacked crayfish and mayflies in habitats where they were to be expected.

At station one (1) none of the organisms were found in an abundance indicating high levels of nutrient. The above normal frequency of freshets and more severe runoffs during the study period with resulting disturbance of the substrate each requiring a period of time for re-establishment of the biotic community is undoubtedly a factor affecting the quantitative and qualitative observations. Toxic substances in addition to organics may also play a role here in limiting the biotic index.

The fish were collected here in June. A subsequent check in October yielded fewer invertebrates and no fish in this reach of the stream. The only evidence of crayfish during the early summer period were some exoskeleton fragments and a pincer left after racoon predation.

Water quality here is moderately polluted with a classification of partial recovery.

Chippewa Creek No. 2

This station is located at Harris Road and situated on Chippewa Creek in the reach that is most damaged at the present time.

The valley here is wider and somewhat deeper than the upstream station (3). Although mostly wooded, the immediate stream course is more exposed to direct sunlight and diurnal heating is more evident here than at the upstream station. The substrate is shale and alluvium exposed as the stream works against the banks. Erosion is more evident in this stretch than in most other sections of the stream. The gradient is steep enough that in spite of high BOD, the field DO readings are high, usually at or near saturation. The biology yields a more realistic evaluation.

Biology: BI=4

| Algae | Higher Plants |
|---|---|
| Flagellates | None |
| Oscillatoria | |
| Stigeclonium | |
| Hydrodictyon | |

Chippewa Creek Station No. 2 (Cont'd.)

Animals
Mollusca, Gastropoda, *Physa*, snail
Arthropoda, Cladocera, daphnids
Hemiptera, Corixidae, water boatman
Diptera, Tendipedidae, *Tendipes* sp., midge
Culicidae - mosquito

Fish
*Campostome anomalum* - stone roller
*Lepomis gibbosus* - pumpkinseed sunfish

The first biological study at this station coincided with a fish kill that was observed for several hundred yards below the entry of the flow from the sanitary landfill. The only species found in the stream at this time were the pumpkinseed and stone roller, the later numerous. In the vicinity of the entry the stream flows over bedrock and beds of shale chips and fine gravel, suitable habitat for several minnow species and darters that were present several years ago (1951-1952). Distressed and dead stone rollers were found from the entry of the landfill leachate downstream for a distance of about one and one-half miles. The greatest number were noted at the Harris Road sampling station. Over one hundred dead fish were counted. In addition, one hundred to one hundred fifty stone rollers were observed in creeks and small runs entering the main stream at this station. The water in these tributaries was not deep enough most places to cover the fish and under ordinary circumstances they would not remain in such a shallow stretch. Water quality in the main stream was of such condition that the three to five inch minnows appeared to be repelled by it to the extent that several living fish were observed forcefully swimming and beating themselves out of the water and onto the shore margin or rocks.

Two hours later another check at the sampling station revealed additional dead fish. The water throughout this period was orange-brown in color, turbid, and flecked with foam. Silt and organic matter deposits formed in all but the riffle and rapid sections of the stream.

Subsequent restudies of Chippewa Creek at this station show an absence of fish, mollusks, and several of the insect nymphs and larvae that would be expected under natural conditions here. The feeder streams entering at this station contain caddis, mayfly, and beetle larvae which were formerly present in the main stream.

At present the substrate of the station is overlayed by a silty black sludge from a film to 0.5 feet in depth. Sludgeworms are present but not numerous. "Bloodworm" (*Tendipes*), midge larvae, and mosquito larvae are present. No macroscopic life form is abundant.

The COD and BOD remain high and field DO readings have been within one or two ppm of saturation at water temperature of 8° - 9°C. during the fall of 1969.

Chippewa Creek is grossly polluted in this reach. In spite of sufficient DO, fish and most tolerant forms do not survive here.

Chippewa Creek Station No. 3

Biology: BI=7

Algae
- Diatoms
- *Oscillatoria*
- *Stigeoclonium*
- *Cladophora*
- *Phytoconis*
- *Spirogyra*

Higher Plants
- None

Animals
- Annelida, Tubificidae, sludgeworm
- Arthropoda, Cladocera, daphnid
  - Decapoda, crayfish
  - Ephemeroptera, Heptageniidae, mayfly
  - Hemiptera, Corixidae, water boatman
  - Hemiptera, Gerridae, *Gerris*, water strider
  - Diptera, Tendipedidae, midge
  - Diptera, Syrphidae, hover fly
  - Trichoptera, Hydropsychidae, caddis fly

Fish
- *Etheostoma nigrum*, johnny darter
- *Notropis cornutus*, common shiner

Amphibia
- *Plethodon cinereus*, red-black salamander

The steep sided gully that the stream has cut in the reach adjacent to this station is wooded and very much shaded. Small seeps or springs are common. The geology is clay underlayed by soft shales and broken sandstone slabs. The cut varies from forty to fifty feet below the till surface of the area.

The stream gradient is sufficient to maintain near saturation DO concentrations at the present pollution loads.

The heavy runoffs or freshets on an unstable substrate seem to be a reasonable factor in the low quantities of several of the algae present here. At no time was there an abundant growth. The submerged portion of sandstone supported an extensive thin layer of the several attached forms listed above. *Spirogyra* was noted in the quiet pools between marginal rocks Diatoms became abundant in narrow zones bordering the main current. The absence of higher plants at this station is not significant.

The animal population reflects the pollution load specifically by an abundance of the midge fly larvae as contrasted to the other insect forms that are present but in very low numbers. The midge larvae are equipped to succeed well whereas the mayflies and caddis cannot, due either to competition or the pollution load present, or both.

Chippewa Creek Station No. 3 (Cont'd.)

Sludgeworms were present in the silty substrate, but not in large numbers. No sludge deposits were found or expected here.

The fish were surprisingly few in number. One darter and two of the shiners were taken or seen in the vicinity of the station. The nature of the stream is such that many should have been present. The scarcity of darters could be associated with the apparent complete absence of one important group of animals, the mollusks. Snails should have been present and formerly were further downstream. Snails are a significant part of this darters diet. This may indicate intermittent heavy loads of pollution.

Yellow Creek No. 1 (Bath Road)

Biology: BI=12

Algae
- Cladophora
- Diatoms

Higher Plants
- None

Animals
- Bryozoa, Plumatella, moss animal
- Platyhelminthes, planarian
- Mollusca, Ancylidae, Ferrissia, limpet
- Arthropoda, Decapoda, Orchinectes, crayfish
  - Ephemeroptera, Stenonema, mayfly
  - Hemiptera, Gerridae, Gerris, water strider
  - Coleoptera, Psephenidae, Psephenis, water penny
  - Diptera, Simuliidae, Simulium, blackfly
  - Diptera, Tendipedidae, Calospectra, midge
  - Trichoptera, Hydropsychidae, caddis fly

Fish
- Etheostoma nigrum, johnny darter
- Lepomis gibbosus, pumpkinseed sunfish
- Campostoma anomalum, stoneroller
- Notropis cornutus, common shiner

Yellow Creek at Bath Road flows over a substrate of shales and rubble partly overlaid by sandy and silty gravels. Aeration is good. Water quality of little to moderate pollution is attested to by the variety of organisms present with the inclusion of clean water restricted forms such as Psephenis, a beetle larva that seems to be quite sensitive to organic pollution in this region. It is indigenous to riffles. Yellow Creek in this reach is a clean water zone.

Furnace Run No. 1

Biology: BI=16

Algae
- Oscillatoria
- Diatoms
- Cladophora
- Spirogyra
- Hydrodictyon

Furnace Run No. 1 (Cont'd.)

Animals
- Bryozoa, *Plumatella*
- Mollusca, Gastropoda, *Physa*, snail
- Arthropoda, Decapoda, crayfish
  - Megaloptera, fish fly
  - Ephemeroptera, *Stenonema*, mayfly
  - Odonata, Zygoptera, Agrionidae, damselfly
  - Hemiptera, Gerridae, *Gerris*, water strider
  - Coleoptera, Psephenidae, water penny
  - Diptera, Simuliidae, black fly
  - Diptera, Tendipedidae, midge
  - Diptera, Culicidae, mosquito
  - Trichoptera, Hydropsychidae, caddis fly

Fish
- *Etheostoma nigrum*, johnny darter
- *Notropis cornutus*, common shiner
- *Pimephales notatus*, blunt-nose minnow

The diverse species found at this station reflect a very good water quality. BOD is very low. Much of the watershed is protected by forest cover and within Furnace Run Reservation of the Akron Metropolitan Park. From the standpoint of pollution, it is one of the least spoiled streams in the study area.

Furnace Run No. 2

Biology: BI=14

Algae
- Diatoms
- *Cladophora*
- *Spirogyra*

Animals
- Mollusca, Gastropoda, *Helisoma*, snail
- Arthropoda, Decapoda, crayfish
  - Plecoptera, stonefly
  - Ephemeroptera, Baetidae, mayfly
  - Odonata, Zygoptera, Agrionidae, damselfly
  - Hemiptera, Gerridae, water strider
  - Coleoptera, Gyrinidae, whirligig beetle
  - Diptera, Simuliidae, blackfly
  - Diptera, Tendipedidae, midge
  - Trichoptera, Hydropsychidae, caddis fly
  - Trichoptera, Helicopsychidae, caddis fly

Fish
- *Pimephales notatus*, blunt-nose minnow

Furnace Run No. 2 (Cont'd.)

This station is located at Brush Road within the Furnace Run Reservation. The water quality is good as indicated by the diverse organisms, especially stoneflies and this particular damselfly. The biotic index though somewhat lower than sampling point 1 is probably freer of unnatural waste pollutants. The BOD of 2.6 average is slightly higher than Station 1, but probably has a natural source in the lower gradient upstream area. It still falls within the range of a clean stream.

Mud Brook No. 1

Biology: BI=16

Algae
- Diatoms
- *Oscillatoria*
- *Cladophora*
- *Stigeoclonium*

Higher Plants
- *Anacharis canadensis*, waterweed

Animals
- Platyhelminthes, planarian
- Annelida, Tubificidae, sludgeworm
- Mollusca, Gastropoda, *Physa*, snail
- Mollusca, Gastropoda, *Helisoma*, snail
- Mollusca, Sphaeriidae, fingernail clam
- Arthropoda, Amphipoda, *Gammarus*, scud
  - Decapoda, crayfish
  - Ephemeroptera, Baetidae, mayfly
  - Odonata, Zygoptera, damselfly
  - Hemiptera, Gerridae, water strider
  - Hemiptera, Corixidae, water boatman
  - Coleoptera, Psephenidae, water penny
  - Diptera, Simuliidae, black fly
  - Diptera, Tendipedidae, midge

Fish
- *Etheostoma nigrum*, johnny darter
- *Notropis cornutus*, common shiner

The substrate at the sampling point located at Akron-Peninsula Road is sand with some bars of gravel and rock rubble. Between the road and Mud Brook confluence with the Cuyahoga River, the banks and stream bed are littered with rubbish of mixed materials. At some points, the bank is obviously used for solid waste disposal.

The stream water quality is markedly improved here from the upstream sampling point at Seasons Road. The gradient dropping into the Cuyahoga Valley combined with an excellent storage period in Wyoga Lake removes much of the BOD.

Biotic index of 16 is improved over 1967 when it equaled 10. Two of the additional animals are in group I and are difficult to miss in collection. The improvement is certainly due in part to the installation of the Mud Brook interceptor.

Mud Brook No. 2

Biology: BI=3

Algae
- Oscillatoria
- Stigeoclonium
- Cladophora

Sphaerotilus, sewage bacteria

Higher Plants
- Anacharis canadensis, waterweed
- Potamogeton crispus, pondweed

Animals
- Annelida, Tubificidae, sludgeworms
- Mollusca, Gastropoda, Physa, snail
- Mollusca, Gastropoda, Helisoma, snail
- Arthropoda, Tendipedidae, Tendipes, midge

This station is below the confluence of Mud Brook and Powers Brook. Upstream, Mud Brook drains a swampy area. Powers Brook is badly polluted by the overloaded Hudson Township Plant No. 6. On all sampling and examination occasions at this station, the odor was strong and the DO was low. The color was often brown affected excessively during the study period by excavation in connection with the extension of Trexel Road northwest from its intersection with Barlow Road and the abandoned NYC railroad right-of-way. Removal of large quantities of clay and peat in this construction area has periodically caused the discharged water to be a dark, coffee brown color.

The biology at Seasons Road (Station 2) reflects the very poor quality water present from this station downstream to its entry into Wyoga Lake.

The enrichment of Wyoga Lake is a source of concern considering its use as a swimming facility by the residents of the development building up around the lake. A symptom of the problem is reflected in the occurrence, during the summer months, of algae blooms intense enough to temporarily color swimmers skin and hair a greenish hue. Swimsuits were also discolored. Ohio Department of Health reportedly maintained surveillance of water quality during the summer at this lake.

Fish Creek

Biology: BI=5

Algae
- Cladophora
- Diatoms, Navicula
- Oscillatoria

Higher Plants
- None

Animals
- Mollusca, Gastropoda, Physa, snail
- Amnicola, snail
- Arthropoda, Isopoda, Ascellus, aquatic sow bug
  - Decapoda, crayfish
  - Tendipedidae, midge

Fish Creek (Cont'd.)

Fish
Notropis cornutus - common shiner

The limited list of organisms found here coupled with the abundance of a few indicates an early recovery zone with abundant nutrients. Cladophora, at times, is plentiful enough to virtually choke the stream.

Sand Run No. 1

Biology: BI=0*

Algae
Cladophora

Animals
Annelida, Tubificidae, sludgeworms
Diptera, Tendipedidae, Tendipes, midge
Diptera, Calospectra, midge

*See probable explanation in paragraph below.

The sample location is at Riverview Road. The substrate is sand, gravel, and rubble mixed with a gray silt. The same gray silt is a continuous suspended component of the stream and appears to be its greatest pollution problem. The BOD was low for the test period. The stream has always been turbid with a gray suspension during the present study period and throughout a tributary study done in 1967. It is reasonable to assume that the silt interferes with the respiratory surfaces of the organisms that should otherwise be found here. Populations of all species are low numbering two or three individuals per square yard.

Slipper Run No. 1

Biology: BI=6

Algae
Diatoms

Higher Plants
None

Animals
Arthropoda, Plecoptera, Acroneuria, stonefly
Ephemeroptera, Stenonema, mayfly
Coleoptera, Psephenidae, water penny

Slipper Run flows through a wooded watershed, the lower part in a deep ravine. The stream is at present in good condition with an interesting community of only a few animals (insects). This is one of the few streams in the area that contain stoneflies, a form generally associated with unpolluted water. The lack of algae is in part due to the fact that little direct sunlight gets to the bottom of the steep sided and heavily wooded ravine. The condition is almost similar to a cave

Spring Run

Biology: BI=7

| Algae | Higher Plants |
| --- | --- |
| Cladophora | None |

Animals
Arthropoda, Ephemeroptera, Stenonema, mayfly
Diptera, Simuliidae, black fly
Trichoptera, Hydropsychidae, caddis fly
Trichoptera, Helicopsychidae, caddis fly

Fish
Rhinichthys atratulus, short-nosed dace
Notropis cornutus, common shiner

Spring Run is basically a clean stream. It has a continuous flow of good quality ground water for the most part flowing through a shaded ravine. Recent grading and excavation work in the reach immediately above the sampling point by the Boston Mills Ski Area has choked the stream with silt, soil, and gravel as it enters and flows across the flood plain. All of the above listed organisms occurred during this study in low numbers. The Cladophora filaments are covered with silt. The animals are represented by one or two specimens each found after intensive search. In the ravine itself, the water is cool and clear. The sparsity of organisms is to be expected in that environment. Reseeding and the eventual protection of the lower part of the watershed, followed by natural flushing of the clogging sediments should permit Spring Run to return to a more normal condition.

## Appendix B

### METHODOLOGY FOR DERIVING SUBURBAN EMPLOYMENT

Employment by place-of-work is preferred to employment by place-of-residence for the kind of analysis undertaken in this paper. All employment data given is place of work. Since it was not available for the suburban jurisdictions it was obtained for 1960 and 1970 by subtracting city employment by place-of-work. The latter is available; the former is not. It was calculated by converting census of population data or place-of-residence for the two SMSA's, cities and years into the desired place-of-work, as follows.

The Censuses present data entitled Place of Work during the Census Week by Selected Characteristics for SMSA's. They can be aggregated into the form of Table B-1. The Not Reported number in the SMSA column was distributed to the SMSA and the outside SMSA rows proportionately. The SMSA addition was then distributed to the city and the suburbs proportionately. The new (higher) SMSA number (SMSA row and SMSA column) was then multiplied by the higher (now that the Not Reported had been added) numbers for the City and Suburbs rows in the SMSA column. The new (even higher) numbers for the City and Suburbs rows in the SMSA column. The new (even higher) numbers for the City row and SMSA column were transferred directly to Table 2-51, where they were subtracted from the SMSA employment figures to yield the desired suburbs employment data.

Table B-1. Number of Employees by Place of Work. Residents of the Akron and Cleveland SMSA's for 1970 and 1960.

| Place of Residence | Akron 1970 | | | Akron 1960 | | |
|---|---|---|---|---|---|---|
| Place of Work | SMSA | City | Suburbs | SMSA | City | Suburbs |
| All Places | 245941 | 99037 | 146904 | 184225 | 106912 | 77313 |
| SMSA | 193749 | 84552 | 109197 | 165746 | 99607 | 66139 |
| (plus not reported) | (204800) | | | (169923) | | |
| [plus OBES adjustment] | [245000] | | | [198000] | | |
| City | 105785 | 65910 | 39875 | 125245 | 89521 | 35724 |
| (plus not reported) | (111819) | | | (128401) | | |
| [plus OBES adjustment | [111232] | | | [48383] | | |
| Outside SMSA | 38921 | 9043 | 29878 | 13951 | 4185 | 9766 |
| (plus not reported | x | | | x | | |
| [plus OBES adjustment] | x | | | x | | |
| Not Reported | 13271 | 5442 | 7829 | 4528 | 3120 | 1408 |

| Place of Residence | Cleveland 1970 | | | Cleveland 1960 | | |
|---|---|---|---|---|---|---|
| Place of Work | SMSA | City | Suburbs | SMSA | City | Suburbs |
| All Places | 797902 | 276653 | 521249 | 681847 | 330719 | 351128 |
| SMSA | 719208 | 243668 | 475540 | 645613 | 312840 | 332773 |
| (plus not reported) | (770790) | | | (669990) | | |
| [plus OBES adjustment] | [855000] | | | [700000] | | |
| City | 389650 | 183816 | 205834 | 463322 | 288723 | 174599 |
| (plus not reported) | (417596) | | | (480816) | | |
| [plus OBES adjustment] | [463219] | | | [502353] | | |
| Suburbs | 329558 | 59852 | 269706 | 182291 | 24117 | 158714 |
| (plus not reported) | (353194) | | | (189174) | | |
| [plus OBES admustment] | [391781] | | | [197647] | | |
| Outside SMSA | 25298 | 3444 | 21854 | 11426 | 2780 | 8646 |
| (plus not reported) | x | | | x | | |
| [plus OBES adjustment] | x | | | x | | |
| Not Reported | 53396 | 29541 | 23855 | 24808 | 15099 | 9709 |

x - not needed.
Sources: (1) Table 190
(40) Table 131

# APPENDIX C
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