ABANDONED LANDFILL STUDY
IN
KING COUNTY

SEATTLE-KING COUNTY DEPARTMENT OF PUBLIC HEALTH

APRIL 30, 1985

In addition, bottles were found about 1969 when trenches were dug at the site of the Renton City Hall parking lot. The one time existence of a dump at that location was a suggested explanation. However, early historical pictures at the Renton Historical Society's Museum at the Old Renton Fire Station show the presence of a glass and bottle manufacturing operation in the general vicinity. It is possible that the parking lot area may have been the site of that industry's waste.

Another site referenced in some reports is "Bellefield," a third Bellevue site, distinguished from the Factoria and Bellevue Air Field sites. The Bellefield site was located on the area of what is now the parking lot of the Bellefield Office Park located between the Mercer Slough and 112th Southeast in Bellevue. According to the 1974 document, Environmental Management for the Metropolitan Area, Part IV, Solid Waste, this fill accepted rubbish, street sweepings, tires, demolition waste and industrial waste. The King County Solid Waste Management Plan of 1976 reported the Bellefield site had problems with on-site and off-site surface runoff central, leachate and gas venting. It also did not meet the minimum functional standards required for either daily cover or for a clean and sanitary site. The site apparently closed sometime after 1976.

Sites as these have been developed and used to meet community's land use needs. No documented problems have arisen to suggest that they present any existing hazards, but the fact that they, at one time, were landfill sites should be common, not forgotten, consumer knowledge.

EXHIBIT "D"

DRAFT

Draft

ABANDONED LANDFILL STUDY
IN
KING COUNTY

SEATTLE-KING COUNTY DEPARTMENT OF PUBLIC HEALTH

APRIL 30, 1985

ABANDONED LANDFILL STUDY IN KING COUNTY

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This report is the result of many hours of research, field testing, and technical analysis. We wish to extend our appreciation to the following individuals responsible for the final product:

Hayes Evans - Historical Information

Louie Craig - Equipment Loan (Ecology and Environment, Inc.)

Dave Nyblom - File Information (King County Solid Waste Division)

Fred Kaseburg - Legal Counsel (King County Prosecutor's Office)

Bob Jacobs - File Information (King County Parks Department)

Paul Bonin - Laboratory Assistance (Seattle-King County Department of Public Health)

METRO - Water Quality Section

Marcia Townsend - Word Processing (Seattle-King County Department of Public Health)

Greg Bishop
Project Co-Leader

Wayne L. Turnberg
Project Co-Leader

Karen VanDusen
Historical Research

EXECUTIVE SUMMARY

The King County Abandoned Landfill Survey was conducted from October through December 1984 by the Health Department's Environmental Health Division at the request of the King County Council. The twenty sites were selected during a September 17, 1984 meeting between the Seattle-King County Department of Public Health, the Solid Waste Division. (Subsequent to this meeting three additional sites were added to the list.) The primary objective of the survey was to determine if any public health problems existed at the predetermined sites.

The Health Department researched the geographical and historical data on each site with input from various city and county agencies. This information was used by the field staff for guidance in determining where the sampling efforts should be focused.

Due to the limited time and resources available for the study, the staff decided to conduct a primary survey utilizing general sampling parameters. In the event the primary survey revealed any environmental health problems, then funds would be requested for more detailed followup work. The parameters chosen as criteria for the primary survey were:

1. Gas - Methane and non-specific organics/inorganics exclusive of methane;

2. Water - Conductivity, dissolved oxygen, pH, turbidity and temperatures.

The report presents the results of the preliminary survey including the field and historical data for each site. Of the twenty-three sites studied, eleven were found to have no significant environmental health problems. Better leachate or methane control are recommended at four sites. It is further recommended that additional water and/or soil samples be taken and analyzed at eight sites for primary organics and inorganics that may be toxic to humans.

CHAPTER I
INTRODUCTION

- Background Information
- Historical Concerns
- Figure I
- Table I

BACKGROUND INFORMATION

Land use is a major concern for any governmental entity, but particularly for those located in urban areas. In King County the increasing demand for residential, commercial and industrial sites causes both the public and private sectors to look for appropriate, effective and efficient means to use and/or develop remaining vacant land. Reclaiming land through the use of sanitary landfills which are later developed for many different uses has been an acceptable pattern of land use development for years. At least one-hundred-fifty acres of land were so reclaimed in the City of Seattle. However, since the complicated community impacts of New York's "Love Canal," a long forgotten hazardous waste landfill, became known in the 1970's, both public and private citizens have become increasingly sensitive to the legacy of long accepted waste disposal practices. It has become increasingly clear that some sites previously used for landfills are not appropriate for certain types of development due to the potential risk they present for chronic exposure to hazardous materials for users or developers of the site. Other sites have negatively impacted ground and/or surface waters. As a result, several federal, state and local regulations have been passed in an effort to change long accepted patterns of waste disposal and studies have been undertaken or are underway to document existing or abandoned sites which pose either environmental and/or human health hazards.

Against this national background of activity and concern, in September 1984 the King County Council requested the Environmental Health Division of the Seattle-King County Health Department to conduct a preliminary study of the abandoned landfills in King County. In undertaking this study, the Department focused on these questions:

1. Where are the abandoned sanitary landfills in King County?

2. Have abandoned landfills at the currently known sites undergone enough stabilization to allow development to safely occur on site?

3. Is there any evidence to suggest that the abandoned site may contain materials known to be toxic to human health which could impact human health during site development or due to chronic exposure from later use of the site?

4. Is there any evidence to suggest that the site may be negatively impacting the surrounding community via ground/surface water contamination or methane migration?

Both field studies and a search of site specific historical records were conducted in order to answer these questions. In addition, generalized information about waste disposal practices, provided a background perspective regarding the significance of the problem in this County.

HISTORICAL CONCERNS

A preliminary review of abandoned landfills in King County suggests a picture of "probably anything" located "almost anyplace." Garbage was defined by the 1931 Superintendent of the Garbage Division of the Health and Sanitation Department, C.L. Murray, as, "Everything that is wasted from the home, the business house, manufacturing plant...We collect this material without any separation...."

The material collected went to sanitary fills at convenient spots throughout the area. Low lands such as tide lands, marsh or dry ravines were favorite locations. It was not unusual for property owners to lease land to the County for a garbage dump in order to level the property, making it more desirable for development. In addition, the County was plagued by promiscuous dumping on vacant property and dead-end streets.

As noted in a 1970 Public Works document, King County Solid Waste Disposal - For 2020 Vision, Vol. I, "Historically the major objective of solid waste disposal was to get waste out of residential neighborhoods into rural dumping areas at a minimum of cost to the taxpayer. These objectives, shared by both officials and citizens, were conducive neither to operating disposal sites in a sanitary manner nor to preventing environmental pollution. However, 'the out of sight, out of mind' attitude toward solid waste disposal was shared across the nation, and any system which moved solid waste away from citizens' homes was generally deemed an adequate system!

One of the major concerns left from the legacy of solid waste disposal practices in the past are the number of abandoned sites at forgotten locations, long since developed for other uses. Another concern is the traditional practice of mixing commercial/industrial and residential wastes. According to a 1980 Battelle report on the "Identification of Hazardous Waste Disposal Sites and

Management Practices in Region 10," it was not unusual for industries to use regional landfills for waste disposal. This is underscored by a report released by CH_2M Hill in August 1969 entitled, Seattle Area Oil Waste Disposal Facility Study. This report notes that the closing of landfills to oil waste disposal due to water pollution and the cessation of open burning of oil due to air pollution made it difficult to properly and legally dispose of oily wastes from shipyards, industries and service stations. These wastes were noted to contain crude, diesel, lubricating, cutting, cooling, cooking or any other form of mineral or vegetable oil.

Thus the composition of the waste disposal of the several landfills which have been abandoned is of concern from a historical perspective.

Another and well known problem associated with solid waste landfills is the contamination of ground and/or surface waters due to leachate. Closed landfills without leachate interception equipment can contribute to ground water contamination. A draft EIS on the 1982 Comprehensive Solid Waste Management Plan for King County notes that leachate from landfills is the major environmental problem currently caused by solid waste disposal in King County. Unfortunately few, if any of the abandoned sites studied in this report had leachate interception and thus not only current but past landfills as well may be contributing to ground water pollution.

Many of the abandoned landfill sites in King County come as a result of a new strategy in waste disposal. The expanding build-up of residential areas in the 1950's began to crowd out potential future County landfill disposal sites. Old sites were reaching their planned capacities. At the same time the construction of Interstate 5 forced the closure of three large County landfills. Two of these handled 75% of the solid waste in King County. In 1960 the shift from using

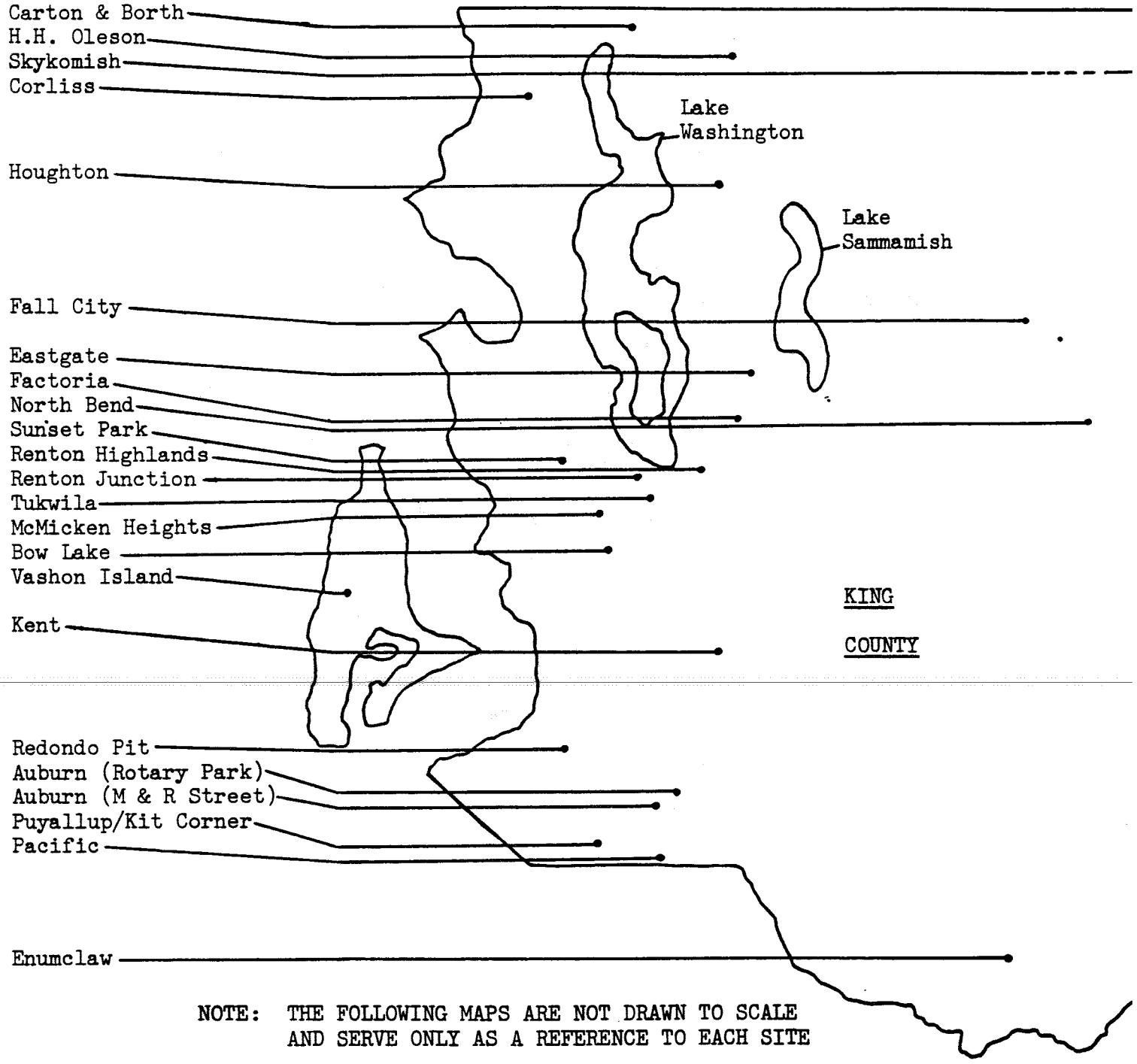
several landfill sites to the use of transfer stations in conjunction with large remote (at that time) disposal sites was adopted. Eventually seven transfer stations eliminated fifteen of the previously used open dumps in the County. What happened to those closed sites and their existing conditions is the concern of this report.

ABANDONED LANDFILL SITES

On September 17, 1984 a meeting was held between representatives of the Seattle-King County Department of Public Health and King County's Solid Waste division to determine the abandoned landfills to be targeted for this study. A list of twenty sites was organized based on the information available at that time. Subsequent to this meeting three additional sites were added to the list. All sites are presented in Table I and Figure 1.

FIGURE 1

KING COUNTY ABANDONED LANDFILL LOCATIONS



NOTE: THE FOLLOWING MAPS ARE NOT DRAWN TO SCALE AND SERVE ONLY AS A REFERENCE TO EACH SITE

TABLE I

KING COUNTY ABANDONED LANDFILL LOCATIONS

Auburn (M & R Street) - Northwest of R Street and 25th Street S.E.

Auburn (Rotary Park) - Northwest of 27th Street S.E. and Alpine St. S.E.

Bow Lake - Northeast of S. 188th St. and Interstate-5

Carton & Borth - Northwest of 71st Ave. N.E. and N.E. 186th Street

Corliss - Northeast of Corliss Ave. N. and N. 163rd Street

Eastgate - Northeast of 156th Ave. S.E. and I-90, north end of Bellevue Airstrip

Enumclaw - Southeast of 284th Ave. S.E. and S.E. 448th Street

Factoria Pit - Northwest of 135th Ave S.E. and S.E. 40th Street

Fall City - Old Dump Rd. at first road bend

H.H. Oleson - Northeast of N.E. 172nd St. and 152 Pl. N.E.

Houghton - Northwest of N.E. 60th St. and 120th Ave. N.E.

Kent - Northeast of Maple St. and Tilden Avenue

McMicken Heights - Between the S. 175th St. dead-end and Interstate-5

North Bend - West of the Middle Fork Road, about 1 mile north of the Y turn from Edgewick Road

Pacific - South of 3rd Ave. S.E. at the White River

Puyallup/Kit Corner - Northeast of S. 360th St. and Interstate-5

Redondo Pit - Southwest of S. Dash Point Road and Pacific Highway South

Renton Highlands - Southwest of N.E. 3rd St. and Jefferson Avenue N.E.

Renton Junction - Between Monster Road and the Green River

Skykomish - North of the Stephen's Pass Highway just east of Skykomish

Sunset Park - Southwest of 18th Ave. S. and S. 136th Street

Tukwila - South of 62nd Ave. S. and S. 151st Street

Vashon Island - West of 130th Ave. S.W. across from the present landfill

CHAPTER II

METHODS AND MATERIALS

METHODS AND MATERIALS

OBJECTIVE

It is the objective of this study to identify obvious and potential problems at the King County abandoned landfills that could adversely impact the public's health and safety.

General test parameters were selected for this preliminary assessment to:

1. Identify sites with problematic methane off-gasing;

2. Identify site areas that may have been used for hazardous waste dumping; and

3. Locate potential or obvious leachate seepage problems.

TEST PARAMETERS

The test parameters selected to identify problematic off-gasing include measurements of methane gas and non-specific trace gases. These are described as follows:

1. Methane Gas - a final by-product of anaerobic organic decomposition, methane is explosive when concentrated in the range of 4% to 18% per volume of atmoshere.

2. Trace Gas - for the purposes of this study, trace gas includes any organic or inorganic gas with an ionization potential of $\leq$ 10.2 eV. Methane, with an ionization potential of 12.98 eV would not be detected. Sites exhibiting trace gas levels greater than ambient air levels are suspect as potential areas of hazardous waste dumping.

The parameters selected to identify surface leachate seepage include pH, temperature, dissolved oxygen, electrolytic conductivity and turbidity. These are described as follows:

1. pH - typical leachate values have been reported to range from 3.7 to 8.5 with a median value of 5.8. Typical surface water values encountered in King County range between 6.5 to 8.5.

2. Temperature - fluctuates seasonally (electrolytic conductivity increases with temperature at a rate of approxiately 2% per degree C).

3. Dissolved Oxygen - dependent upon the physical, chemical, and biological activities in the water. Water quality tends to decrease with low dissolved oxygen values.

4. Electrolytic Conductivity - the ability for a water sample to carry an electric current. It is dependant upon the total concentration of the ionized substances dissolved in the water and temperature. Typical sanitary landfill leachate values have been reported to range from 0.1 to 1.2 milliohm/cm. Surface waters in King County typically exhibit conductivity values between 0.05 to 0.15 milliohm/cm.

5. Turbidity - measurement of suspended solids in a water sample reported in ppm. To approximate NTU's the following is given: ppm x 2.1 = NTU's.

SAMPLING INSTRUMENTATION

Gas measurements were made from one-half inch diameter bore holes sunk three feet into the ground at locations throughout each landfill area. Each hole was capped for a minimum of twenty minutes prior to testing to allow landfill gases to reach a state of equilibrium within the test holes. Methane gas and trace gas levels were monitored using the following instrumentation:

1. Methane Gas - Gas-Pointer Combustible Gas indicator, a product of Bacharach Instrument Company of Pittsburgh, Pennsylvania and Mountain View, California, a division of AMBAC Industries, Inc.

Sample gas was collected from the test hole through a suction tube, processed directly by the meter, and reported as percentage methane per volume of atmosphere.

2. Trace Gas - Model PI 101 Photoionization Analyzer, a product of HNU Systems, Inc. of Newton, Massachusetts.

Sample gas was collected from the test hole through a suction tube designed to draw gas at a flow rate of three-hundred to seven-hundred centimeters per minute past a photoionization sensor. The sample is directly processed by the instrument, recording trace organic and inorganic gases with ionization potentials of less than 10.2eV as parts per million.

Molecules with higher ionization potentials such as those forming the major components of air, would go undetected. Methane, with an ionization potential of 12.98 eV, would not register as part of the trace gases.

Water samples were tested in the field using a Model U-7 Water Quality Checker, a product of Horiba Instruments, Inc. of Irvine, California. The instrument was field calibrated using a standarized solution prior to testing, at a frequency of one per hour of operation. Field water samples were then placed into the unit's water test chamber for direct analysis by the sensor probes and read-out on digital display. The sensor probes were thoroughly rinsed with distilled water before and after each water testing.

HISTORICAL REVIEW METHODS

Since field tests give information about a site at only one point in time, it was appropriate to gain historical information on the twenty-three abandoned disposal sites. This was to provide a broader perspective of what might potentially be the site's characteristics. Specifically data gathering focused on past and present uses of the site in question; any engineering information about the site, including topography and soil studies; information pertaining to waste disposal practices at the site; and any information on known or suspected problems. This effort relied on available secondary data sources. Official records were few. However, files on some of the sites available from the King County Solid Waste Division contained many valuable references as did those from the King County Parks Department for sites subsequently developed for County parks. Anecdotal recollections, historical documents and maps, newspaper clippings, environmental impact statements and specialized studies done for development purposes, or citizen's advisory committee reports formed the bulk of the written report.

CHAPTER III
RESULTS

AUBURN (M & R STREET SITE)

During the time period from the early 1930's through the 1940's King County operated a landfill in the area bordered approximately by 21st and 25th Northeast and M & R Streets in Auburn. The exact closure date is unknown, but since the A.L. Wolfe Addition was platted and built upon by the mid-1950's, it can be assumed that the site closed no later than the early 1950's.

PAST AND PRESENT USE

The area in question was originally operated by King County and later annexed by the City of Auburn. The site was at one time a gravel pit which was subsequently reclaimed by the garbage fill. After the closure, the area was platted as the A.L. Wolfe Addition and is now a large single-family residential area.

SITE/ENGINEERING INFORMATION

Since closure of the landfill and the subsequent housing development there have been numerous settling problems. Particularly along 21st, 22nd and 23rd Streets inadequate compaction and settling prior to on-site development has played havoc with housing stability, water lines, streets and sidewalks. At one point, F.H.A. became involved and required that basements be dug under existing houses to increase stability of the structures.

The area has been described as including some of the old river bottom of the White River and as a relatively shallow fill area.

WASTE DISPOSAL PRACTICES

Generally the landfill is remembered as a place where one could bury and get rid of anything. However, Auburn has been primarily a bedroom community in a rural

setting so that at this time there is no evidence to support anything but residential garbage and rubbish as being deposited on site. The one exception is the apparent existence of a toothbrush factory in the area and the occasional finding of toothbrushes when digging post holes in residential back yards!

The fill was estimated to have been six to eight feet in depth.

SUSPECTED PROBLEMS

With the exception of the long standing land compaction/settling problem in this area, there is no historical information to suggest need for any further investigation.

FIELD RESULTS

On November 26, 1984 four bore holes were tested within the M and R Street site for the presence of methane and non-specific trace gases. Methane was not detected above a trace level from any of the test holes. Trace gas concentrations were low with a range of 0 to +0.3 ppm relative to ambient air levels (Table II).

No surface water was observed on or about the site. Street settling was observed within the vicinity of the former fill.

FIGURE 2

AUBURN ABANDONED LANDFILL: M AND R STREET

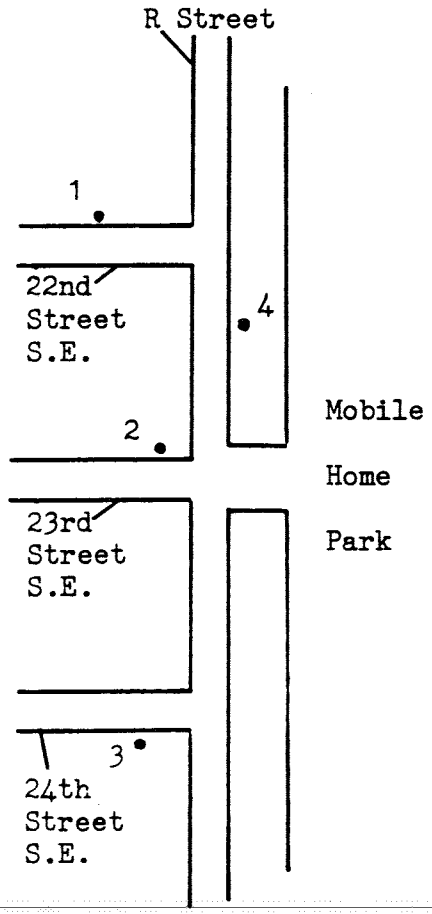


TABLE II

METHANE AND TRACE GAS CONCENTRATIONS
AUBURN ABANDONED LANDFILL: M and R STREETS

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	Trace	0
3	0	.3
4	Trace	0

*Reading represents change from ambient air level

AUBURN (ROTARY PARK SITE)

During the investigation of the main Auburn landfill, the existence of another landfill in the area was discovered. This was on the old Mead property, which is now part of the Auburn Rotary Park.

According to personal accounts this operated for several years until about 1965. In contrast to the main landfill this did not operate as a garbage dump but was primarily used for old cars, rocks, tires and general rubbish. Putrescible waste was not dumped here.

It is estimated that this site may have been thirty feet deep. Upon closure it was covered with one to two feet of top soil.

Since this site took everything except garbage it may be a site of long term concern, if "everything" included crankcase oil, pesticide cans and/or other potentially hazardous waste. However, no files, documents, or personal accounts suggest any problems at the site.

FIELD RESULTS

Twelve test holes were examined for methane and trace gas concentrations at the Rotary Park site on November 5, 1984 (Table III).

Methane gas levels were not observed exceeding trace concentrations throughout the site. Non-specific trace gas levels were observed ranging between 0 to +5.2 ppm relative to ambient air concentrations. Of note, the highest trace gas levels of +2.8, +1.9, and +5.2 ppm were located within the southeast corner of the park.

No waste was observed on or around the former landfill site, though a relatively high perched water table was noted within the southeast park quadrant.

FIGURE 3

AUBURN ABANDONED LANDFILL: ROTARY PARK

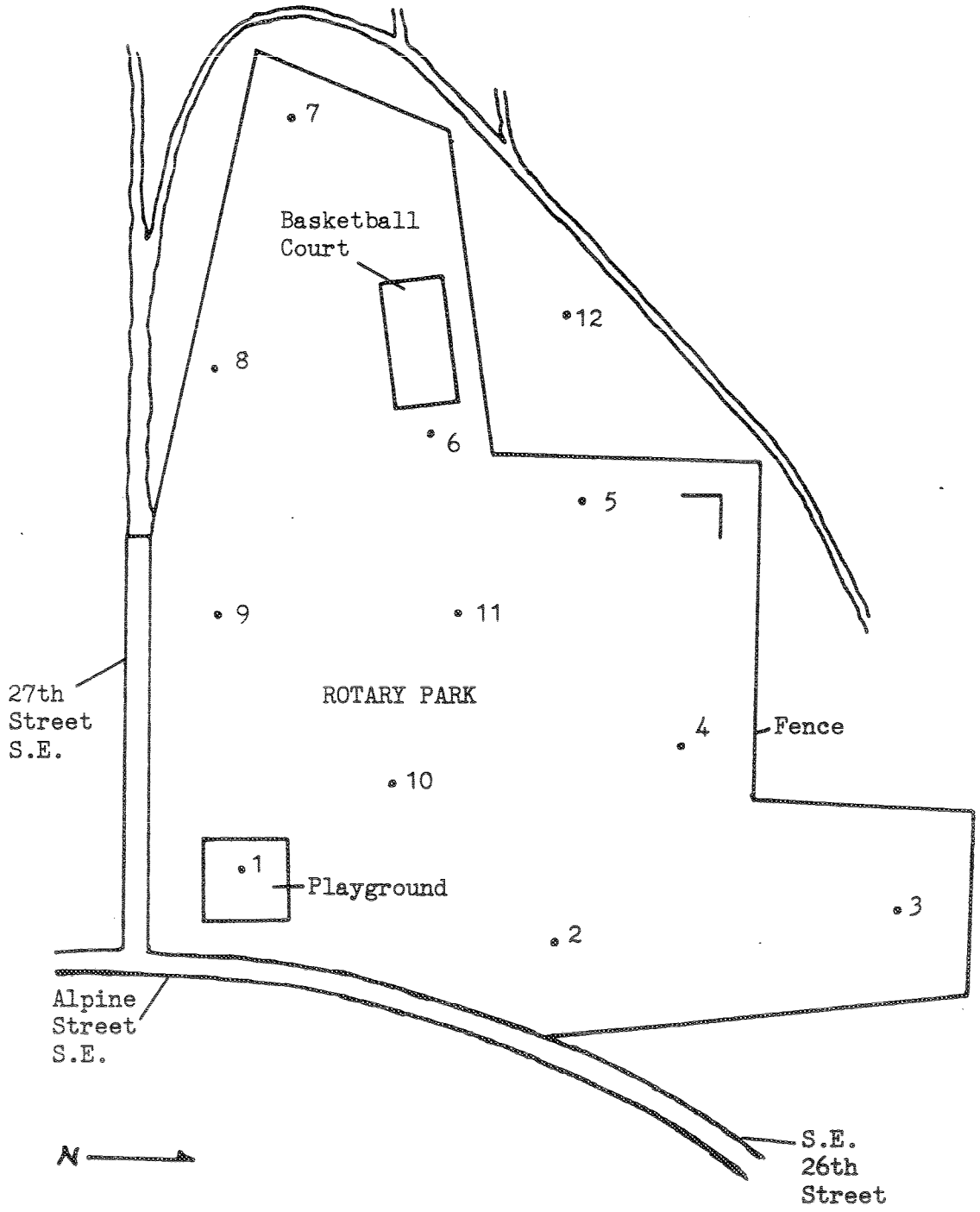


TABLE III

METHANE AND TRACE GAS CONCENTRATIONS
AUBURN ABANDONED LANDFILL: ROTARY PARK

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	2.8
2	0	.5
3	Trace	1.9
4	0	.5
5	Trace	.7
6	Trace	.2
7	Trace	.2
8	Trace	0
9	Trace	.4
10	0	5.2
11	Trace	0
12	0	0

*Reading represents change from ambient air level

BOW LAKE

Located in Section 35T-23N-R4E, the old Bow Lake landfill originally consisted of approximately 14 acres bordered on the west by Military Road and extending from slightly north of South 186th to the Orillia Exit road. It is typically identified as being at 188th and Military, the site of the old access road.

PAST AND PRESENT USE

The landfill was located in a predominantly rural area at the time of its operation. Old maps show a "dump" at the northern portion of the landfill site as early as in 1943. In the late 1950's the construction of Interstate 5 necessitated closure of the site as the freeway ran diagonally through this tract. In 1961 a transfer station was constructed on the site. This station became outdated and was redtagged by the Department of Labor and Industries in 1970. The "new" and existing transfer station was opened for a cost of $1.7 million in the fall of 1978. At that time it was serving an estimated population of 125,000 and transferring at least 60,000 tons of refuse annually to the Cedar Hills landfill site. It remains today the major transfer point for South King County.

SITE/ENGINEERING INFORMATION

There is a distinct slope of the old landfill site to the southeast corner. Early contour maps indicate a two hundred foot difference in elevation between the northwestern portion and the southeastern portion of the site.

Today the transfer site is bordered by freeway and freeway access roads on the west and south and private property on the north and east.

WASTE DISPOSAL PRACTICES

Records indicate that the Bow Lake landfill was the largest landfill in the County during the 1950's when it received 160,000 yd^3 of refuse annually. It served a large geographic area of South King County, running from the Seattle City boundary to Puget Sound, bordering Renton and Kent.

The toe of the fill appears to have moved from northwest to southeast as filling occurred through the years.

Interestingly a small incinerator was installed at the Bow Lake site on an experimental basis in 1955. Unfortunately this proved to be too smokey and incapable of handling the large items of refuse or garbage. In addition, it burned at too low a temperature to ensure complete combustion, so the incinerator was closed.

SUSPECTED PROBLEMS

Comments from private owners, the City of Tukwila and personal observation make it clear that the major problem at this abandoned landfill is uncontrolled leachate. It has apparently been a chronic problem for years.

A secondary concern is what might be in the site. Since the dump operated through the years when there was less effort and no regulation to separate waste types and since it served an area where there were commercial and industrial developments such as Sea-Tac and Boeing, there is the possibility that some potentially hazardous material could be on site. No records have been found to document this supposition. The site is listed on the EPA Region 10 ERRIS list.

FIELD RESULTS

The former Bow Lake Landfill was tested for methane and non-specific trace gas concentrations on October 22, 1984 (Table IV).

Of the seventeen bore holes tested for methane, four were observed within or above the explosive range of methane gas (4% to 18%). Peak methane levels of 30% and 35% were found at the northend of the site.

Trace gas levels ranged between 0 to +0.8 ppm relative to ambient air concentrations. Of note, four of the five positive trace gas readings corresponded to test holes which exhibited the highest levels of methane gas.

Leachate with an oily sheen and characteristic discoloration was observed seeping from the site from the southeast quadrant. Water parameters did not indicate it to be highly concentrated. These data are found in Table V.

Test parameters of a wafer sample retrieved from the transfer station storm drain did not indicate leachate contamination.

FIGURE 4

BOW LAKE ABANDONED LANDFILL

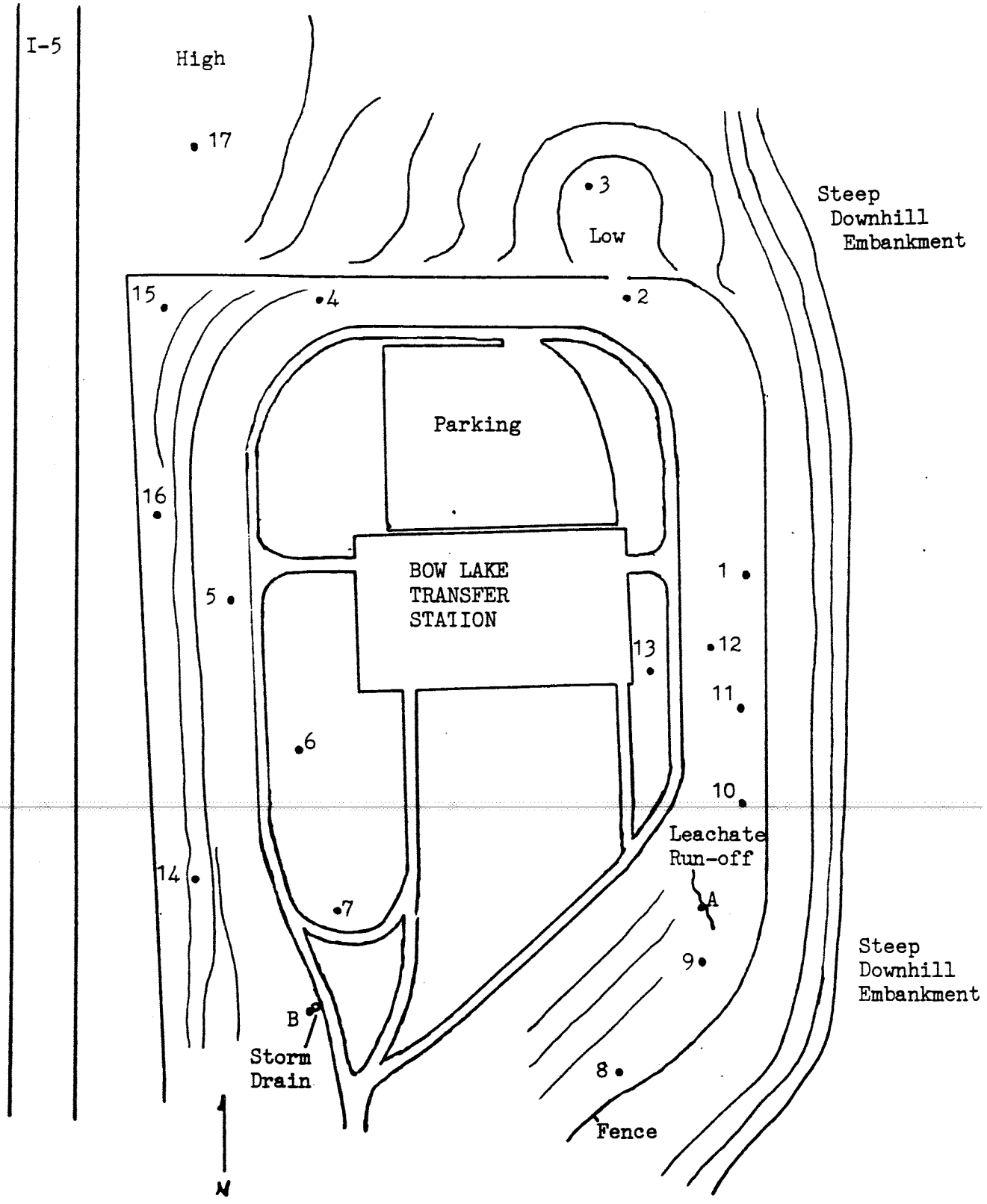


TABLE IV

METHANE AND TRACE GAS CONCENTRATIONS
BOW LAKE ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	0	0
2	35	0.3
3	30	0.7
4	0	0.1
5	0	0
6	5	0.8
7	5	0.7
8	0 (Meter Box)	--
9	0	0
10	0	0
11	0	0
12	0	0
13	2.4	0
14	0	0
15	0	0
16	0	0
17	0	--

*Reading represents change from ambient air level

TABLE V

SURFACE WATER PARAMETERS
BOW LAKE ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	6.6	6.6
Temperature ^{o}C	13.1	15.5
Dissolved Oxygen ppm	1.6	4.2
Electrolytic Conductivity m℧/cm	0.5	0.5
Turbidity ppm	110	2

(1) Flowing leachate stream
(2) Standing water in storm drain

CARTON & BORTH

The Carton and Borth former landfill is situated between 68th Avenue Northeast and 71st Avenue Northeast. The southwesterly quarter of the site is currently occupied by the WesMar Industrial Park. The northwesterly quarter is presently under new building construction.

This site was formally known as the Loveless and Dillon Site. A Seattle Times article dated August 3, 1971 reported that the County Council approved an unclassified use permit for a sanitary landfill by Loveless and Dillon, Inc. This was described as a 12.81 acre landfill on the east side of 68th Avenue Northeast, Kenmore and about three hundred thirty feet north of the Tolt River pipeline.

Since it was a private operation, the County regulated and inspected the site. Health Department officials remember getting complaints about the site regarding stench, which may have been an indication of inadequate cover operations. In addition a stream, which is currently diverted around the perimeter of the property, once ran through the property. The Health Department had responded to complaints regarding the off-colored appearance and odor associated with this stream.

The site was primarily used for rubbish such as wood and stumps, demolition materials, and oil from roads. A minimal amount of garbage was apparently received. It operated for only a short time for the purpose of reclaiming the site for the commercial development that currently exists.

FIELD RESULTS

On October 30, 1984 nine test bore holes were placed in the easterly half of the Carton and Borth site for methane and trace gas monitoring. These data appear

in Table VI. Access for testing of the westerly half of the fill was denied by its current property owners.

Methane gas was observed in low concentrations throughout the site with a peak reading of 5%. All trace gas observations were neutral relative to ambient air concentrations.

One water sample was retrieved from the stream passing around the north to east perimeter of the fill. These data are presented in Table VII. Leachate contamination was not indicated by the test parameters.

FIGURE 5

CARTON & BORTH ABANDONED LANDFILL

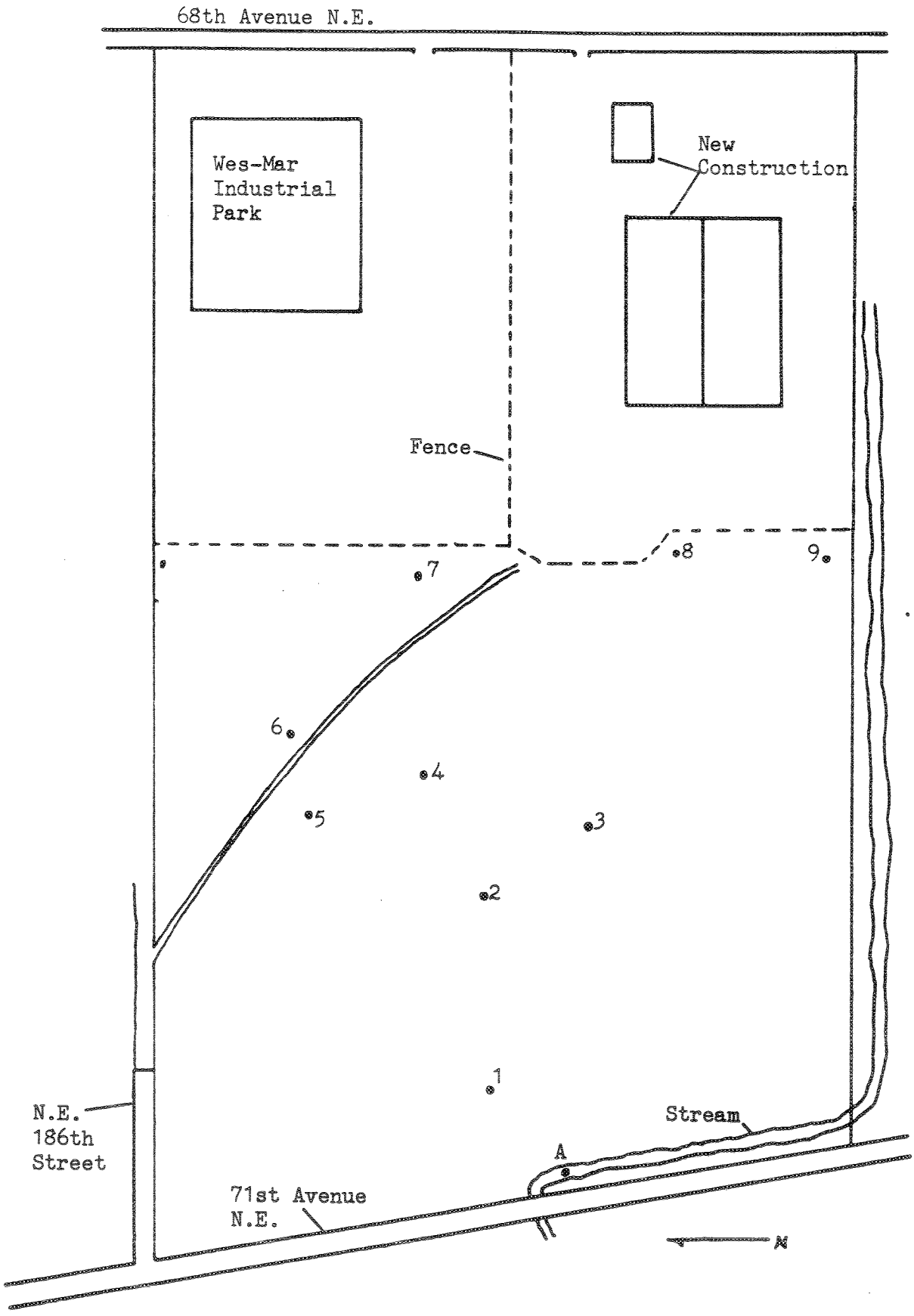


TABLE VI

METHANE AND TRACE GAS CONCENTRATIONS
CARTON & BORTH ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0.1
2	Trace	0
3	Trace	0
4	Trace	0
5	0	0
6	Trace	0
7	5	0
8	1.2	0
9	0	0

*Reading represents change from ambient air level

TABLE VII

SURFACE WATER PARAMETERS
CARTON & BORTH ABANDONED LANDFILL

	Site A (1)
pH	6.1
Temperature ^{o}C	9.7
Dissolved Oxygen ppm	7.8
Electrolytic Conductivity mʊ/cm	0.2
Turbidity ppm	1

(1) Flowing water from creek

CORLISS LANDFILL

The north end of King County was serviced for several years by a landfill located in the vicinity of 1st Avenue Northeast and Corliss Avenue between approximately Northeast 163rd and Northeast 165th. It operated from the 1940's until closed by the construction of Interstate 5 in June 1959. The landfill site today is divided midway by a fence extending east to west. The northerly half is the site of the Northeast Transfer Station. The southerly half is an undeveloped tract.

PAST AND PRESENT USE

Prior to 1940 the site was essentially rural, undeveloped property. Between about 1946 and 1959 King County used the area for a sanitary landfill. Construction of Interstate 5 necessitated excavation of the earliest part of the waste fill on the southeasterly portion of the site. The freeway now runs over that section. The north transfer station was constructed on the more recently used portion of the landfill. The remaining area consists of the undeveloped McCormick Park at Northeast 165th and Corliss, which the King County Parks Department acquired in 1967. This tract is also currently being considered by Metro as a potential site for their North Operating Base.

SITE/ENGINEERING INFORMATION

Data derived from Washington State Department of Transportation and King County explorations reported in a 1984 EIS prepared by Metro describe the site as an area providing surface drainage for Ronald Bog and perimeter areas north of this
In addition. A large peat bog is found adjacent to the landfill site and was mined about the same time the solid waste operation existed. In addition, peat is found under portions of the landfill site.

Soil studies undertaken in 1977 in this area showed that garbage and rubbish extended from a depth of two feet to fourteen feet. Other soil explorations on site note that the maximum fill recorded is thirty seven feet. Motor oil smell was encountered at three feet in one soil boring reported for the site.

The site soils are characterized as fill, peat, loose sand and soft silt deposit, glacial advance sand and glacial till. The ground water is encountered anywhere from four to seven feet in the recorded borings. Groundwater flows generally to the southwest across the site. An early map of the landfill area characterizes the southeastern portion as a "swamp" and shows the toe of the fill adjacent to a creek - possibly Thornton Creek.

WASTE DISPOSAL PRACTICES

The sanitary fill at Northeast 165th and 1st Avenue Northeast handled about 60,000 cubic yards of refuse annually and was the primary north end disposal site. Over 900 cars and trucks were reported to come to the dump on weekends. The nearest County fill after the closure in June 1959 was the site at Houghton.

The earliest portion of the fill at 1st Northeast was lost to the freeway. Included in this portion, in 1947, at the northeastern edge, was an authorized septic tank dump. Plans were underway by 1960 to use part of the remaining landfill site for a transfer station as it exists today.

SUSPECTED PROBLEMS

Since closure of the landfill site, the land has remained undeveloped except for construction of the transfer station.

Concerns about differential settlement, ground water and the natural drainage in the area have made planners cautious regarding development.

In addition, since the site was one of two that handled the majority of the waste produced in King County for several years, it is possible hazardous materials could have been placed on site. The site is mentioned on the EPA ERRIS listing. However, the 1984 Metro Draft Supplemental Environmental Impact Statement for the North Operating Base notes that, "Municipal waste material samples were collected and analyzed from four borings drilled in the filled area. The chemical analyses indicate that the waste material would not likely be considered hazardous or dangerous."

FIELD RESULTS

The Corliss Abandoned Landfill is divided midway by a fence east to west. Testing of the south sector was conducted on October 11, 1984 for methane and non-specific trace gas (Table VIII). Gas sampling of the north sector and all surface water tests were completed on October 12, 1984.

Methane gas was observed at levels within or above the explosive range for methane gas (4% to 18%) from five of twenty test holes located without pattern throughout the site.

Non-specific trace gas was observed near that of ambient air levels with the exception of test hole #11 (0.8 ppm), #14 (3.8 ppm), #18 (9.2 ppm) and #19 (0.8 ppm).

A stream which runs along the site's westerly perimeter was sampled from locations upstream and downstream from the former fill. Test parameters did not indicate any obvious leachate impact upon the stream. These data appear in Table IX.

FIGURE 6

CORLISS ABANDONED LANDFILL

I-5

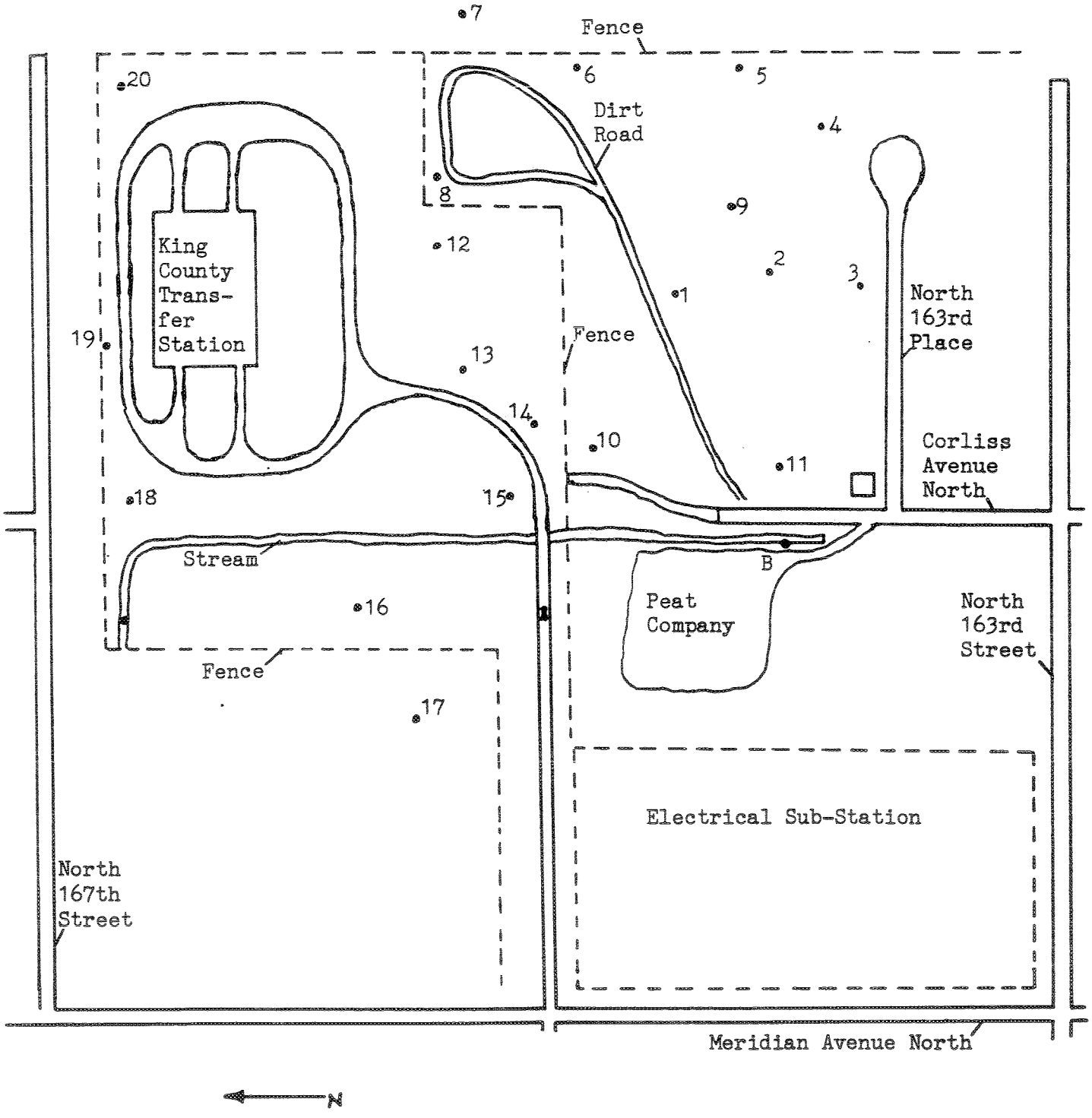


TABLE VIII

METHANE AND TRACE GAS CONCENTRATIONS

CORLISS ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	3.2	0.1
2	Trace	0.2
3	0	0.2
4	0	0.1
5	Trace	0.1
6	30	0.1
7	10	0.2
8	1.2	0.2
9	Trace	0.2
10	0.8	0.2
11	27	0.8
12	Trace	0.1
13	Trace	0
14	42	3.8
15	---	0.1
16	5	0
17	0	0.1
18	3	9.2
19	Trace	0.8
20	Trace	0

* Reading represents change from ambient air level

TABLE IX

SURFACE WATER PARAMETERS
CORLISS ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	6.5	6.6
Temperature ^{o}C	14.9	14.5
Dissolved Oxygen ppm	6.5	6.0
Electrolytic Conductivity m℧/cm	0.1	0.1
Turbidity ppm	4	3

(1) Stream water upstream from landfill
(2) Stream water downstream from landfill

EASTGATE ABANDONED LANDFILL

The north end of the Bellevue Airfield was the site of a former landfill which was closed and covered in 1964. Solid Waste Division files show the landfill operation in this area in 1953 when it was referred to as the Factoria Garbage Dump. It apparently began in about 1951.

Little historical documentation has been found regarding the specific operations of this site. Personal anecdotes reveal that at one time a gravel pit was adjacent to the site.

Very few operational problems were remembered. It was estimated to have been filled to a depth of six to twenty-eight feet. The site was a burn dump and consequently became a problem for the airfield due to smoke reduced visibility.

The general area was purchased by Cabot, Cabat & Forbes and subsequently by Boeing (the current owners) and the Bellevue School District. The site is part of the I-90/Bellevue Business Park.

SUSPECTED PROBLEMS

The site is currently surrounded by controversy. Residents in the Phantom Lake Area north of the old landfill have become concerned about the development of the site and its impact on the lake.

Drainage going through the garbage has caused leachate to be a problem. This has necessitated costly interventions by private owners, including an ongoing methane monitoring program conducted by Boeing. Entranco Engineers recently conducted a study of the landfill leachate to evaluate "whether landfill leachate constitutes significant and dangerous or damaging contamination to Phantom Lake." This was done by assessing priority pollutant data from two sampling stations

located on the I-90 Bellevue Business Park Property. Given the limitations of small sample size, the results included: 1) "Landfill leachate contains certain heavy metal and organic priority pollutants at detectable levels." 2) "Of the organic pollutants measured in the landfill leachate, the insecticide chlordane was the only compound found at concentrations higher than expected." The report cautions that the leachate could have adverse impacts on ground water and that concentrations of the leachate pollutants could vary with higher concentrations possible.

FIELD RESULTS

Nineteen bore holes were tested for methane and non-specific trace gases at the Eastgate Abandoned Landfill on November 20-21, 1984. These data appear in Table X. Methane was observed ranging from 0% to 10% on the site. Only two test holes registered methane in the explosive range (4% to 18%).

Non-specific trace gas levels were low relative to ambient air levels with only one test hole exhibiting a level of +0.6 ppm.

Of note, the Boeing Company, current owners of most of the site property, has installed several off-site methane test wells dug to approximately 30 feet to measure off-site gas migration. It has been their experience to observe dramatic fluctuations in methane levels with changing barometric pressure. High pressure systems have been associated with low methane levels, and low pressure systems with high levels.

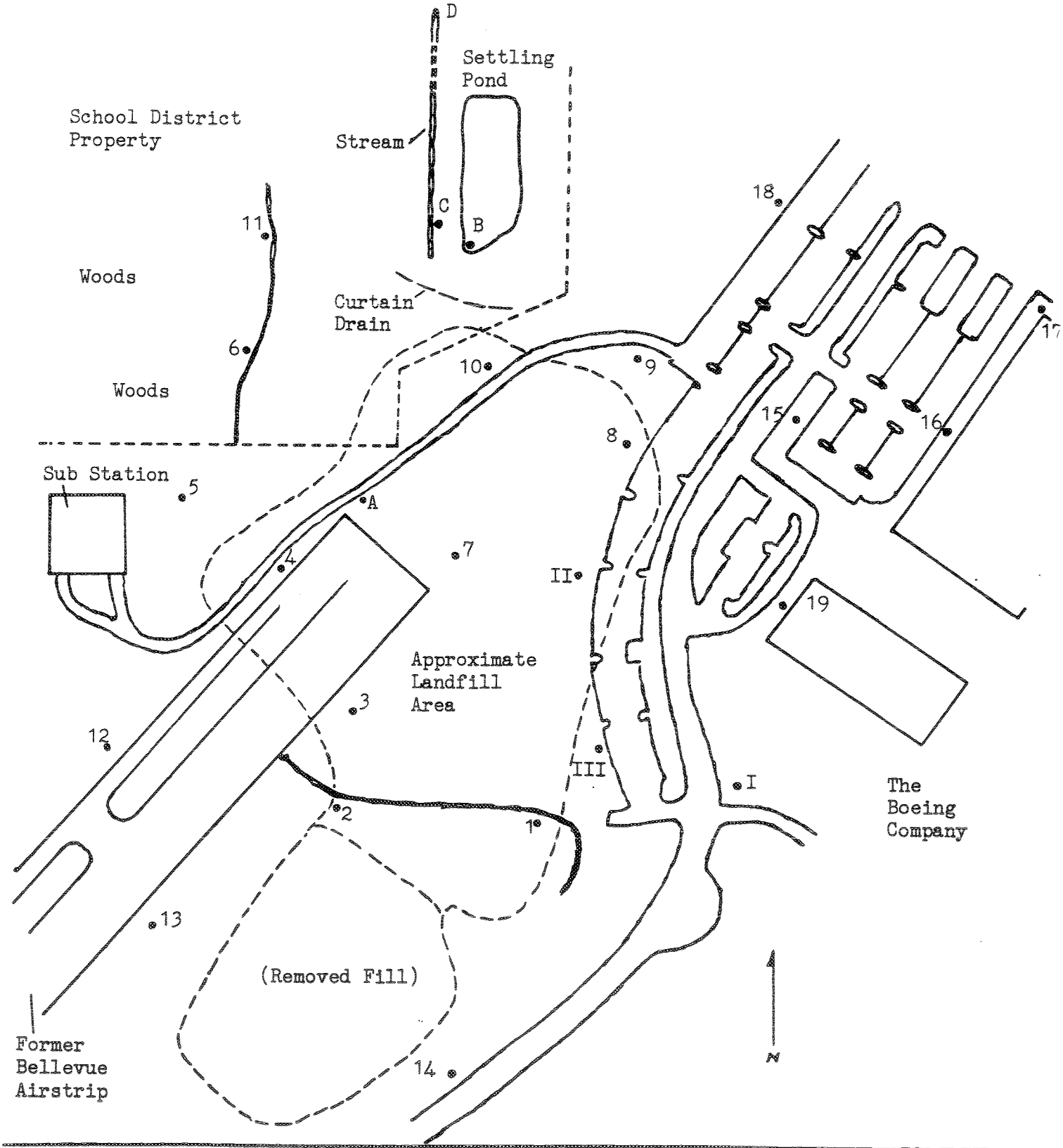
Our observations of this phenomenon appear in Table XI. Two test wells sampled on different days under different barometric conditions yielded dramatically different results. Methane levels were observed fluctuating from trace to 40% from test well A, and 4% to 70% from test well B.

Leachate has historically been a problem with this site. At one time a leachate collection system was installed at the north end of the fill which channeled into a stream and eventually Phantom Lake.

Samples obtained from the settling pond, the leachate recovery stream by the fill and by the lake did not indicate concentrated leachate contamination. Surface water from a run-off stream located directly on the landfill exhibited parameters of good water quality. These data are presented in Table XII.

FIGURE 7

EASTGATE ABANDONED LANDFILL*



*Map dimensions courtesy of the Boeing Company

TABLE X

METHANE AND TRACE GAS CONCENTRATIONS

EASTGATE ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	0.2	0
2	0	0
3	0.2	0
4	10	0.1
5	0.2	0
6	0.2	0
7	Trace	0
8	Trace	0
9	5	0
10	Trace	0.6
11	Trace	0
12	Trace	0
13	Trace	0
14	0	0
15	0	0
16	Water Table	Water Table
17	0.2	0
18	0.2	0
19	0.4	0

* Reading represents change from ambient air level

TABLE XI

METHANE CONCENTRATIONS IN TEST WELLS
EASTGATE ABANDONED LANDFILL

Well	Sampling Date	Methane (%)*
I	11-21-84	Trace
	11-29-84	40
II	11-20-84	4
	11-29-84	70
III	11-29-84	24

* Variations due to barometric pressure differences

TABLE XII

SURFACE WATER PARAMETERS

EASTGATE ABANDONED LANDFILL

	Site A(1)	Site B(2)	Site C(3)	Site D(4)
pH	5.7	5.9	6.2	6.9
Temperature ^{o}C . . .	8.4	9.7	9.4	9.4
Dissolved Oxygen ppm	7.5	7.8	2.4	9.6
Electrolytic Conductivity m$\mho$/cm . . .	.05	.15	.2	.05
Turbidity ppm	2	2	160	1

(1) Drainage ditch on landfill surface
(2) Settling pond
(3) Drainage stream from leachate collection system
(4) Drainage stream from leachate collection system

ENUMCLAW

The current sanitary landfill on Southeast 440th in Enumclaw, operating since 1939, is generally referenced as the "old" landfill. The Sonneson family deeded this area to the City of Enumclaw on January 5, 1939 for the purposes of a garbage dump. However, there was an earlier landfill which was abandoned in 1939 when the Sonneson property became available.

The landfill was located on Roosevelt Avenue to the east of the Farman's Pickle Factory adjacent to the land currently occupied by Pete's Pool at the King County Park. The County leases land to the Enumclaw Golf Course on the site of the old landfill and early maps of the abandoned site show that the fairway parallels the approximate site of the old dump.

Since this dump has been closed nearly fifty years, preliminary data searching revealed no existing records on the site's specific operation.

However, it might be assumed that the old site served the area serviced by the current landfill. This would include the city of Enumclaw as well as some private residents of King County and commercial refuse haulers. The property in the area is primarily residential and Enumclaw itself is a predominantly rural town. It is unlikely that any hazardous material found its way to the landfill unless there could have been wastes from any wood manufacturing existing at that time. The current site is on the EPA ERRIS list, indicating a potential possibility of hazardous waste materials in that site. The earlier site of current concern was closed before the major chemical developments and subsequent waste generation which occurred during and after World War II. Thus, while the existing site may well contain hazardous materials, there is little to suggest the same for the old site.

FIELD RESULTS

On December 8, 1984 nine bore holes were tested at the Enumclaw site for methane gas concentrations. These data appear in Table XIII.

Methane gas levels were observed in low concentrations (trace to 0.2%) from test holes located along the east and west perimeter of the fill, indicating its boundaries.

Non-specific trace gas levels were not monitored at this site.

Surface water was not observed on the site. However, a nearby stream was sampled and exhibited parameters of good water quality (Table XIV).

FIGURE 8

ENUMCLAW ABANDONED LANDFILL

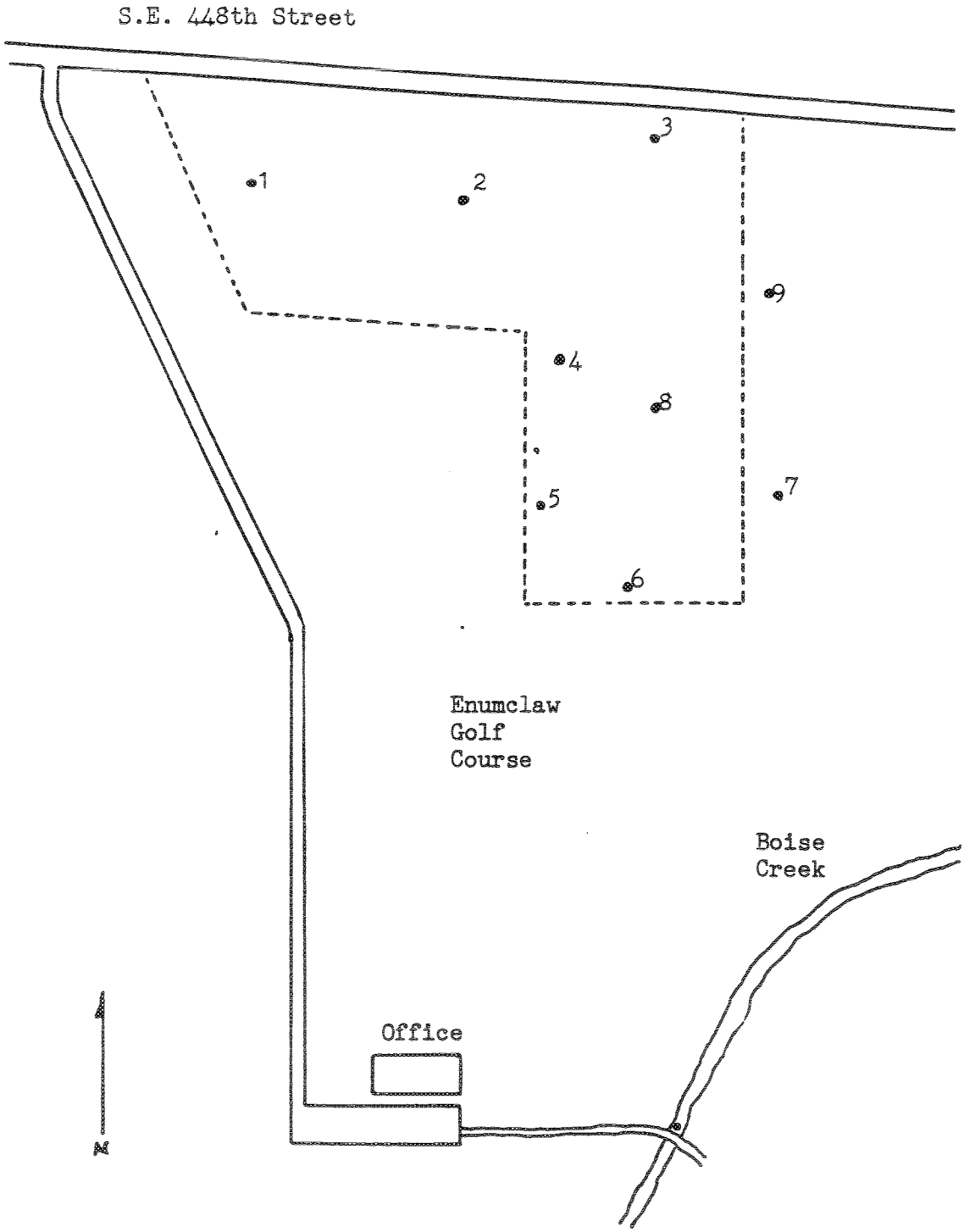


TABLE XIII

METHANE GAS CONCENTRATIONS
ENUMCLAW ABANDONED LANDFILL

Site	Methane (%)
1	0
2	Trace
3	0.2
4	0.2
5	0.2
6	0.2
7	Trace
8	0
9	0

TABLE XIV

SURFACE WATER PARAMETERS
ENUMCLAW ABANDONED LANDFILL

pH	5.8
Temperature ^{o}C	6.5
Dissolved Oxygen ppm	10.2
Electrolytic Conductivity $m\mho/cm$	0.2
Turbidity	42

FACTORIA PIT (SUNSET RAVINE PARK)

South of I-90 on 136th Avenue Southeast is the site of another abandoned landfill in the City of Bellevue. It was closed in about 1951 when operations were moved to the northend of the Bellevue Airfield.

Official information on this site is sketchy. It was apparently the original landfill site in the general area and operated as a burn dump. The site remains undeveloped. It is listed on the EPA ERRIS report.

FIELD RESULTS

On December 1, 1984 eleven bore holes were tested for methane and non-specific trace gases at the Factoria abandoned landfill site. These data appear in Table XV.

Methane was observed ranging from 0% to 0.2% indicating the stability of the site. Trace gas levels were all observed undifferentiated from ambient air levels.

Upstream and downstream water samples obtained from a stream, passing adjacent to the site indicated no change in water quality (Table XVI).

FIGURE 9

FACTORIA ABANDONED LANDFILL

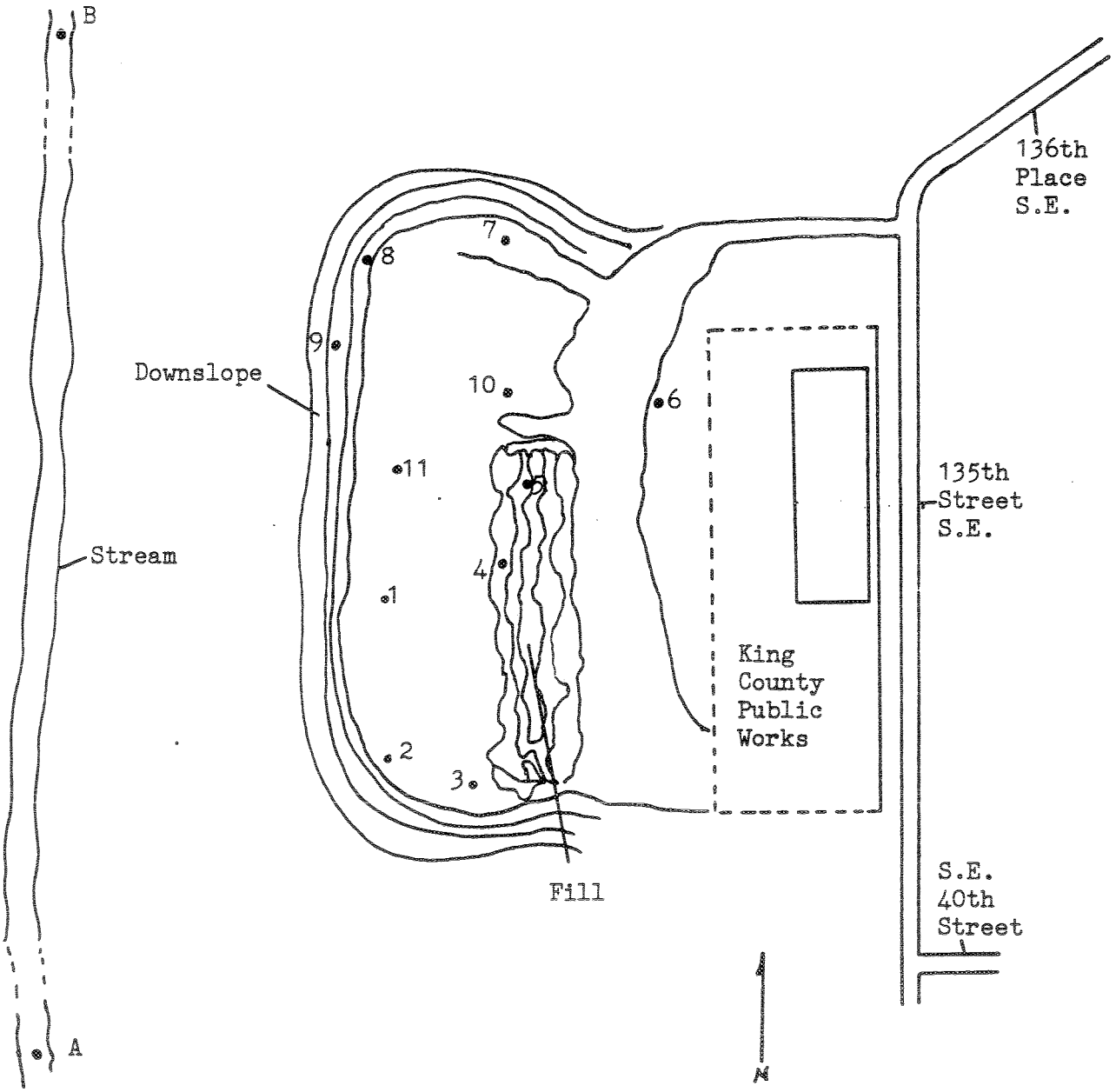


TABLE XV

METHANE AND TRACE GAS CONCENTRATIONS
FACTORIA PIT ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	Trace	0
3	Trace	0
4	0	0
5	Trace	0
6	0.2	0
7	Trace	0
8	Trace	0
9	0.2	0
10	0	0
11	0	0

* Reading represents change from ambient air level

TABLE XVI

SURFACE WATER PARAMETERS
FACTORIA PIT ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	5.9	6.0
Temperature ^{o}C	9.4	9.0
Dissolved Oxygen ppm	9.7	10.1
Electrolytic Conductivity m℧/cm	0.15	0.15
Turbidity ppm	3	9

(1) Upstream from landfill
(2) Downstream from landfill

FALL CITY ABANDONED LANDFILL

Located off the Fall City-Duvall Road is a turn to Southeast 39th Place, the "old Dump Road." Following this road about 0.3 mile beyond two gate posts on the road brings one to the site of a small former landfill. This operated several years and was closed sometime in the early 1960's.

The site was located on Weyerhauser property and privately operated. It was approximately three hundred feet deep and one hundred to one hundred fifty feet in width, located above Rutherford Slough on the top of a steep embankment. Vehicles pulled in and dumped material over the hillside. It was a burn dump.

It was predominantly a community dump and being in a very rural part of King County it is doubtful hazardous materials are on site. The one reasonable exception is the potential presence of pesticides in a rural area. In addition, it is suspected that septic tank pumpers may have dumped on site. However, the practice of burning on site has eliminated any pollutants of this nature as a chronic problem.

When it was closed, Weyerhauser was to clean the area up and close it off. Today there is no visual evidence that a landfill once operated here. It is now overgrown with brush and tall grasses and remains vacant.

FIELD RESULTS

On-site gas testing at the Fall City site was run on October 20, 1984 for methane and non-specific trace gases. These data are presented in Table XVII. Methane was observed in only trace concentrations in each of the five test bore holes.

Trace gas levels were neutral to the ambient air with the exception of a low +0.2 ppm reading of hole #3.

No off-site leaching problems were directly observed. Leachate contamination was not indicated by the test parameters of a slough sample, though an oily sheen was observed on the slough surface (Table XVIII).

Recent illegal dumping of household refuse was observed on the site in small quantities.

FIGURE 10

FALL CITY ABANDONED LANDFILL

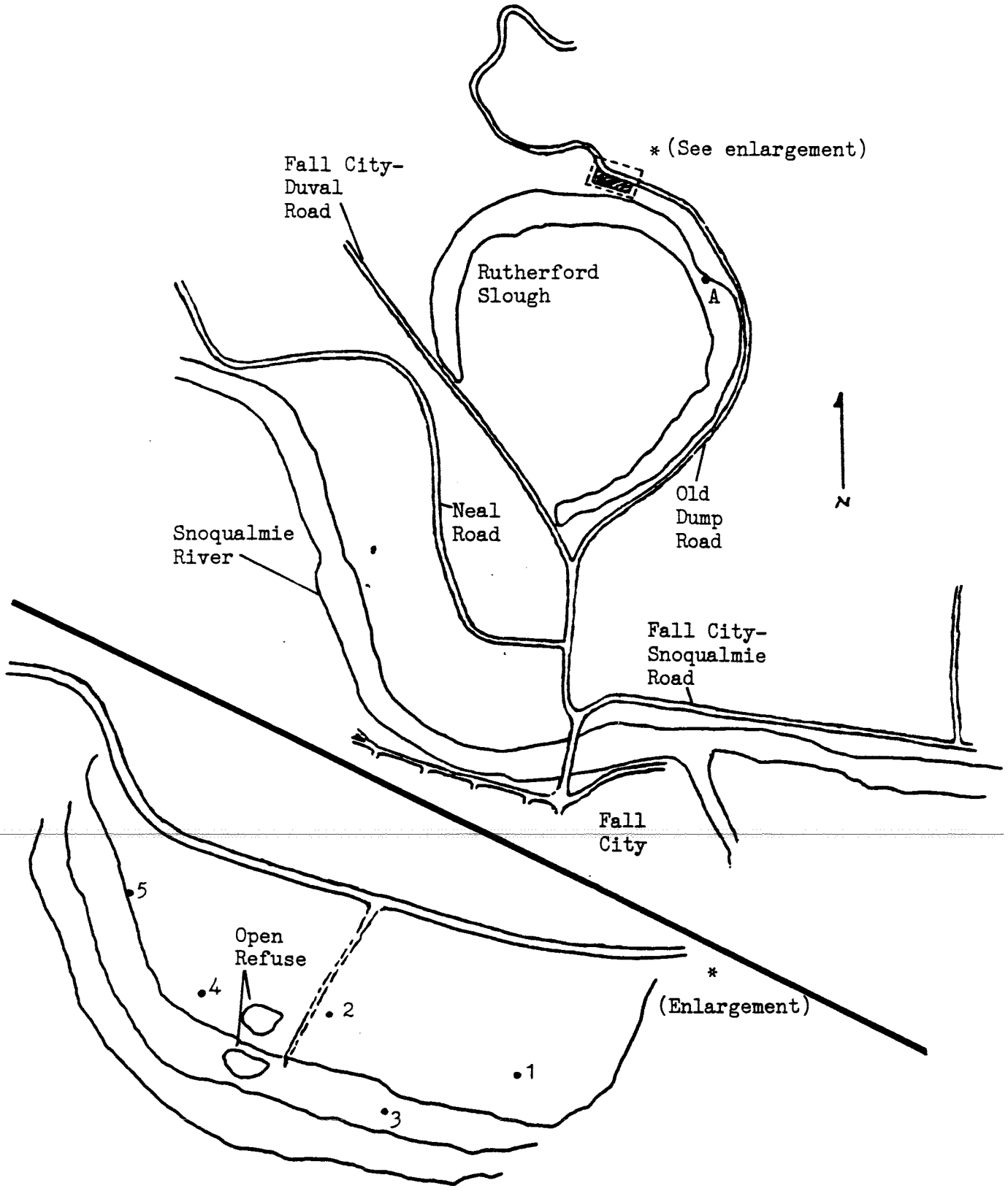


TABLE XVII

METHANE AND TRACE GAS CONCENTRATIONS
FALL CITY ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	Trace	0
3	Trace	0.2
4	Trace	0
5	Trace	0

* Reading represents change from ambient air level

TABLE XVIII

SURFACE WATER PARAMETERS
FALL CITY ABANDONED LANDFILL

pH	6.3
Temperature ^{o}C	7.3
Dissolved Oxygen ppm	8.4
Electrolytic Conductivity m$\mho$/cm	0.1
Turbidity ppm	8

H.H. OLESON

The H.H. Oleson landfill operated from about 1972 until about 1979 as a means of reclaiming an existing abandoned excavation site. It consisted of about 10.8 acres according to the legal description.

PAST AND PRESENT USE

In the early 1970's H.H. Sand and Gravel Company requested the permit to operate a demolition landfill on the site of their former excavation pit. It was primarily a reclamation effort. A time extension for the operation was requested in 1977. At that time the site was described as slightly wooded on the last portion, with the excavation on the west portion currently being filled. Thus the property apparently was filled from east to west.

SITE/ENGINEERING INFORMATION

Maps of the site show that drainage was an anticipated problem. Settling basins were planned along 152nd Avenue Northeast so that drainage swales could have water channeled off property to drains and/or ditch on 152nd Avenue Northeast.

The completed fill was anticipated to change the topography of the site considerably. The final fill slopes gradually to 152nd Northeast (Van Brocklin Road).

WASTE DISPOSAL PRACTICES

According to a S.E.P.A. Application at the time the landfill began, the operation was to follow the standard sanitary fill procedures, alternating layers of sanitary fill and soil. It was estimated that a thirty mile radius around the fill site could be anticipated to contribute waste.

It appears that the fill depth varied from ten to fifteen feet to seventy to seventy five feet in some of the deepest sections.

SUSPECTED PROBLEMS

The type of waste suspected at this site consists of demolition waste. The site is on the EPA ERRIS list.

In addition, it appears that ground and/or surface waters may be subject to leachate.

It was anticipated in the SEPA checklist prepared for this operation that the fill would produce compaction variability, causing some portions of the site to be unsuitable for construction.

FIELD RESULTS

On January 11, 1985 nine bore holes were tested at the former Oleson Landfill for methane and trace gas emissions. These data are presented in Table XIX..

Methane gas levels were not observed above trace levels throughout the site indicating minimal organic decomposition. Trace gas levels were at an equilibrium with ambient air levels.

A water sample was retrieved from a small gravel pit pond located immediately south of the fill. Evidence of leachate contamination was not indicated by the test data (Table XX).

FIGURE 11

OLESON ABANDONED LANDFILL

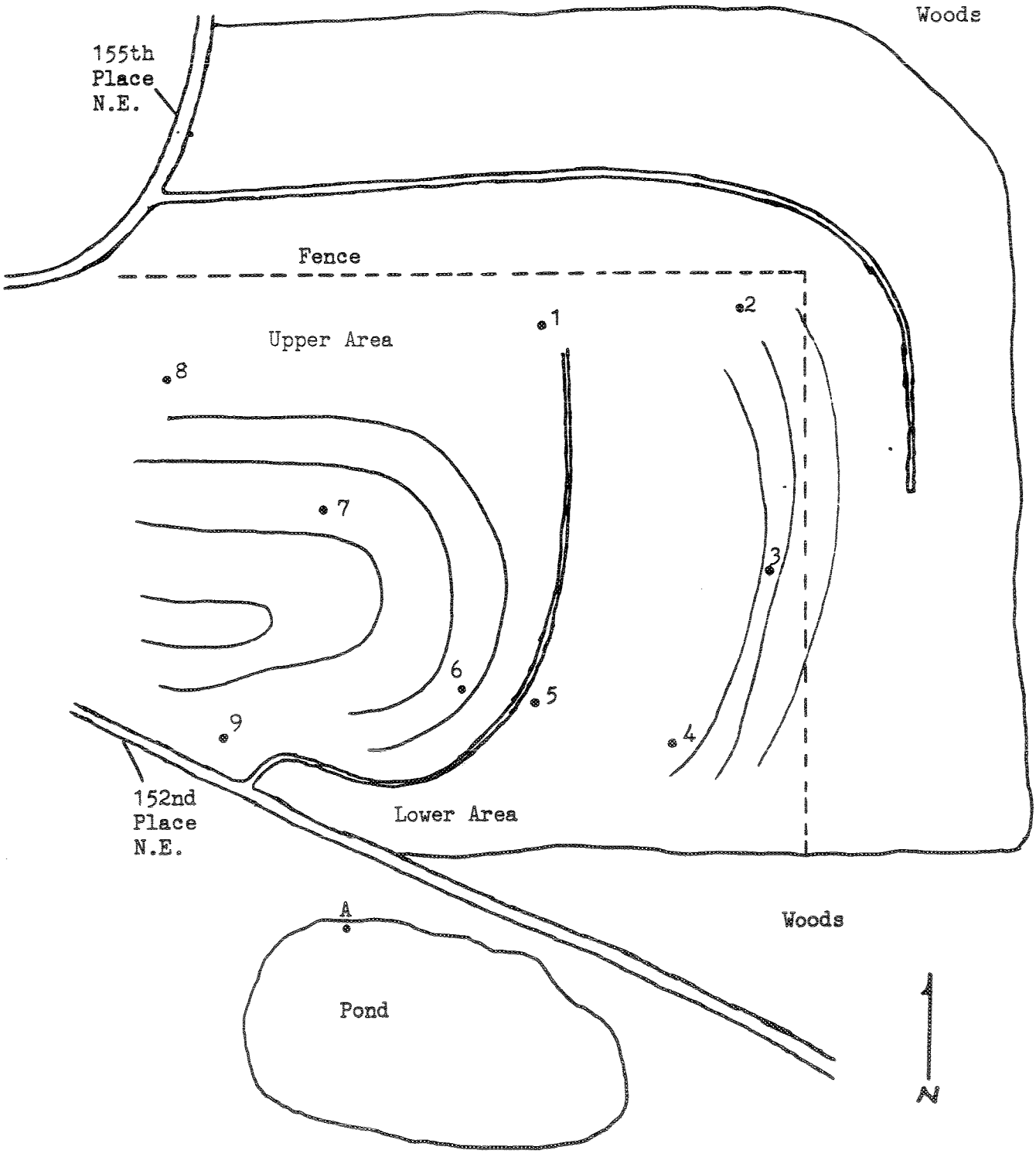


TABLE XIX

METHANE AND TRACE GAS CONCENTRATIONS

OLESON ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)[1,2]
1	0	0
2	Trace	0.1
3	Trace	0.2
4	Trace	0
5	0	0
6	Trace	0
7	Trace	0
8	0	0
9	0	0

(1) Trace gas measurements made using an 11.2 eV HNU probe
(2) Reading represents change from ambient air level

TABLE XX

SURFACE WATER PARMETERS

OLESON ABANDONED LNADFILL

	Site (A) (1)
pH	5.0
Temperature °C	1.8
Dissolved Oxygen (ppm)	13.9
Electrolytic Conductivity mv/cm	0.35
Turbidity (ppm)	34

(1) Gravel pit pond

HOUGHTON

The Houghton Transfer Station located near Bridle Trails State Park is the site of an old abandoned landfill. The landfill operated between approximately Northeast 60th Steet and Northeast 67th bounded by 117th Avenue Northeast and 120th Avenue Northeast. It was used from at least 1945 until closed in 1965.

PAST AND PRESENT USE

As a part of a predominantly rural area, the site was apparently undeveloped until used as a landfill operation beginning in the 1940's. It operated as a landfill until closed in about April 1965. By this time the site was noted to be leveled, harrowed, fertilized and seeded, with a portion of the site adjacent to the current transfer station still being used to dump hot ashes. This transfer station was in operation at the site by 1970 and that operation, plus open space, characterizes the site today.

SITE/ENGINEERING INFORMATION

The site is not perfectly level but is characterized by a gentle slope with the elevations in the general vicinity of the transfer station being greater than those along Northeast 67th. Fill depth varies on site from approximately two feet to over twenty feet. The area around 119th between Northeast 66th and Northeast 67th was characterized as swamp. High water tables and consequent saturated garbage could be anticipated throughout the site.

The final cover consisted of 8,000 cubic yards of top soil brought on site by the Thos. Scalzo Company in 1970. In 1972, due to heavy rains, an additional 2,000 cubic yards of impervious cover material were placed on site and compacted over the area to seal the garbage off from further moisture infiltration. It was replanted with new cover material characterized as having a high transpiration rate.

WASTE DISPOSAL PRACTICES

According to 1963 correspondence, operations at Houghton included garbage dumping, an "old dump area," a salvage operation and an excavation area being used by the State for fill material for highway work.

Burning was practiced in the area of the fill now occupied by the Transfer Station.

After the Corliss/1st Avenue Northeast landfill site was closed in 1959, the refuse was hauled to Houghton for disposal.

The oldest portion of the site, referred to in correspondence as "the old dump area" was east of 119th Northeast and south of Northeast 63rd Street. The site apparently filled from that location northerly toward the area of the existing transfer station.

SUSPECTED PROBLEMS

While Houghton was the receiving site for much King County waste for several years, the characteristics of the waste are not documented. The site is on the EPA ERRIS list.

Problems with impounding water in a low spot in the older section of the landfill have occurred as have leachate problems. Since part of the area has high ground water, it can be anticipated that leachate may be an ongoing problem, as it has been historically.

FIELD RESULTS

On October 8-9, 1984 twenty one bore holes were tested at the Houghton site for methane and non-specific gas. These data are presented in Table XXI.

Methane gas was observed within the explosive concentration range of 4% to 18% in eight of twenty one bore holes tested. Of these, seven were concentrated in the southwest section of the fill.

Trace gas levels ranged between -0.1 to +1.6 ppm relative to ambient air concentrations. Positive trace gas readings generally corresponded with areas of higher methane levels.

Site examination for leachate production, particularly along the west perimeter, were made on October 9, November 8, and December 1, 1984. No leachate or surface water was observed leaving the site.

Water was sampled from a storm run-off stream within the vicinity of the fill's southwest corner on November 8, 1984. Leachate contamination was not indicated. On January 15, 1985 a second water sample was taken from a dug well located along the site's west perimeter. The sample had a strong stagnation off-odor but did not exhibit test parameters indicating heavy leachate contamination. It was noted by the well's owner that the well had a history of containing iron-orange colored water during summer months which would kill grass if used for lawn watering. A third sample was retrieved that day from a swamp located at the west perimeter of the former fill. The influence of leachate was not observed.

FIGURE 12

HOUGHTON ABANDONED LANDFILL

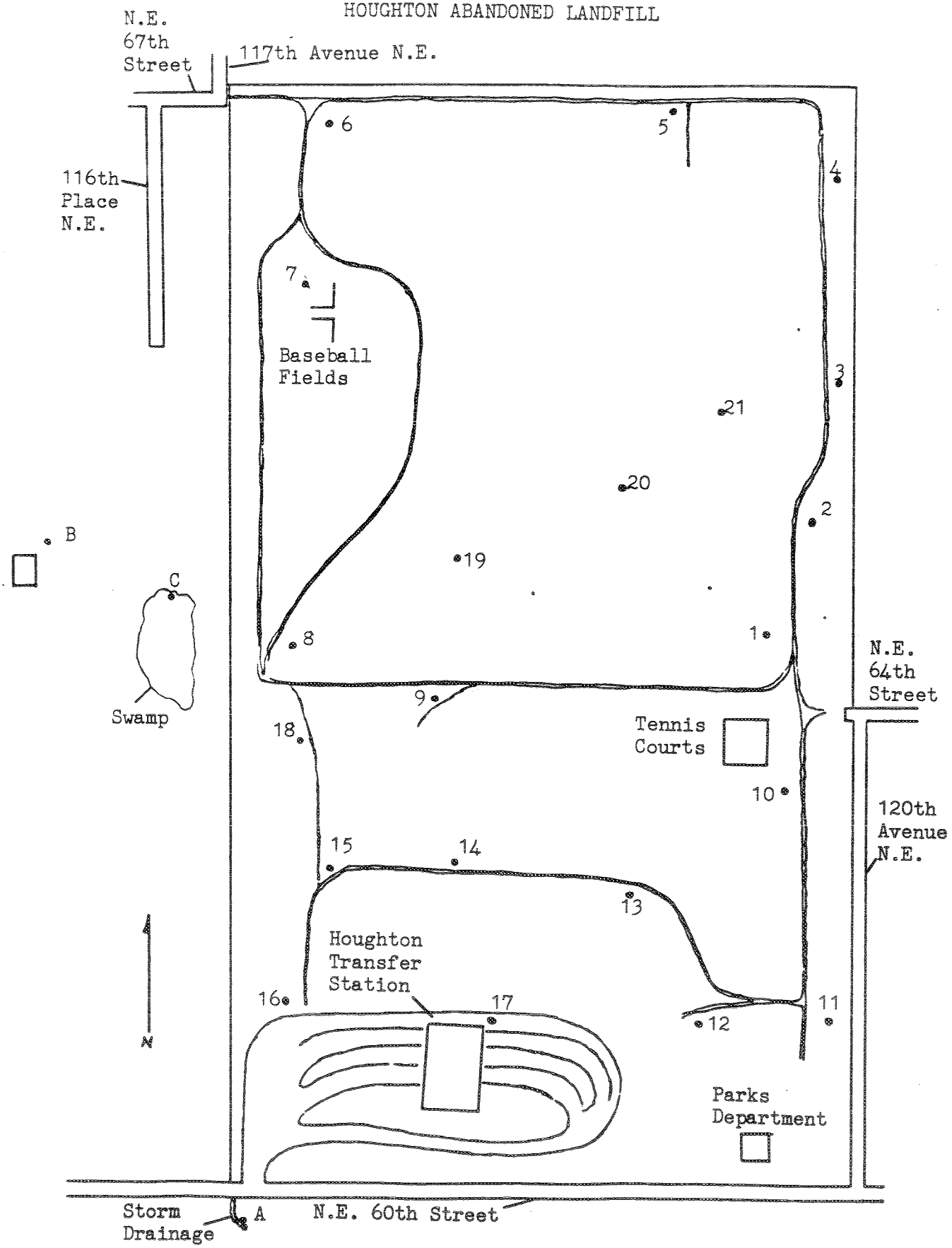


TABLE XXI

METHANE AND TRACE GAS CONCENTRATIONS

HOUGHTON ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	0	0
2	Trace	0
3	0	0
4	Trace	0
5	Trace	0.2
6	11	0.8
7	0.4	-0.1
8	18	1.0
9	11	0.4
10	0	0
11	0	0
12	Trace	0
13	1.2	0.2
14	Trace	0
15	12	1.6
16	≥ 4	0.4
17	12	0.8
18	11	0.2
19	≥ 4	0
20	0.4	0
21	0.7	0

* Reading represents change from ambient air level

TABLE XXII

SURFACE WATER PARAMETERS

HOUGHTON ABANDONED LANDFILL

	Site A (1)	Site B (2)	Site C (3)
pH	6.4	6.4	6.3
Temperature °C	10.8	10.7	4.6
Dissolved Oxygen (ppm)	8.5	1.6	5.6
Electrolytic Conductivity mv/cm	0.4	0.4	0.0
Turbidity (ppm)	55	22	29

(1) Water from an off-site culvert
(2) Dug well 45 feet to static water
(3) Swamp surface water

KENT ABANDONED LANDFILL (MILL CREEK CANYON PARK)

The City of Kent operated a landfill at Woodland Way and Maple Street, this was closed in about 1961 with the opening of the Kent-Highlands operation by the City of Seattle. The former landfill stands today as a vacant clearing abutting the steep slopes of Canyon Park.

PAST AND PRESENT USE

There is no indication that the site in question had any major use until it was part of the landfill operation. A portion may have been part of a general pit operation earlier. Since its closure it has been left largely in a natural state and serves the community as a passive park.

SITE/ENGINEERING INFORMATION

Discussions with individuals who were in some way affiliated with the landfill operation provided some infomation regarding conditions on site. The fill on site is apparently deep, characterized as being 200 or more feet high. Cover fill was deep, and described as Class A or Class B bank run. Top soil was probably put on top of that, with the last topping being pit run from a cut about 100 feet deep from the area and hence probably similar to the original site conditions. The site is quite rocky at present.

During closure a berm was put around the site to control drainage.

WASTE DISPOSAL PRACTICES

This site served primarily the City of Kent. Excerpts from a 1956 document entitled Community Report of Kent, Washington, characterize the disposal operation as follows:

"The Kent City dump is an uncontrolled dump with 24 to 48 yards of municipal refuse being dumped daily as well as frequent dumping by individuals and a contractor.

"20 of the 32 persons interviewed having individual disposal use the Kent dump, 2 of the total 32 use other dumps, 1 uses a ravine and the remainder use burial, incineration and/or animal or fowl feeding.

"By using the term 'uncontrolled dump' reference is made to the fact that there is no dumping charge, no controlled burning, irregular burial, very loose supervision and little attempt to control scavenging. The height and width of the dump is only limited by the topography of the area. This dump is a public nuisance to nearby residences by reason of odors and smoke. The Kent dump is a definite health hazard both from the potentials of insect and rodent carriers of disease and direct disease contraction by scavengers. If in the future an air pollution problem should arise, such an open burning dump would contribute to air pollution. It is recommended that:

"'A sanitary method of refuse disposal be used and the Kent dump be closed and covered. Incineration and a sanitary landfill are the two accepted methods of sanitary refuse disposal by a community.'"

The type of waste deposited on site can be surmised from the characteristics of the community served. The above report notes that:

"Kent is a growing community in area and population. Its 1955 census of 3,675 in the incorporated limits has been expanded to well over 4,000 by annexations since that time. The population of the immediate area is considerably greater, however, as evidenced by the unusually large business district for a city of this size. The entire Kent School District has a population of over 12,000 persons in residence. A properous community, Kent has an assessed valuation of over four million dollars.

"The City is surrounded by numerous truck farms that contribute in large part to the economy of the community. Several sizable food processing industries provide seasonal employment for the community, as do the farms themselves. Although other industries are moving into the Kent area, the farms and [dependent] processing plants will continue to make an important contribution to the economy and will provide sanitation problems inherent to food industries."

The "other industries" mentioned are of concern as there began to be a shift in the industry type to manufacturing and non-seasonal industries about this time. New establishments working in plastics, steel, and wood are reported. One plant is noted to discharge acid and neutralizer into a local creek and another is reported as handling a product causing dermatitis among employees. Knowing the general

policy of solid waste disposal typical during that time period, it is likely some potentially hazardous materials found their way to the Kent dump. However, most operators of the time remember the waste as being primarily residential waste.

SUSPECTED PROBLEMS

There are no specific records site characteristics documented which indicate any problems since the site was abandoned. With the exception of the possibility that some small amount of industrial waste may have been deposited there, it is unlikely problems should be anticipated.

FIELD RESULTS

On November 2, 1984 nine bore holes wree tested at the former Kent Landfill for methane and non-specific trace gases. Methane gas was observed only at trace levels. Non-specific trace gas tests were neutral relative to ambient air (Table XXII).

Surface water samples were retrieved from a stream at the bottom of Canyon Park at locations upstream and downstream from the fill site. No changes in water parameters were noted. No characteristics of leachate contamination were observed. These data are presented in Table XXIV.

FIGURE 13

KENT ABANDONED LANDFILL

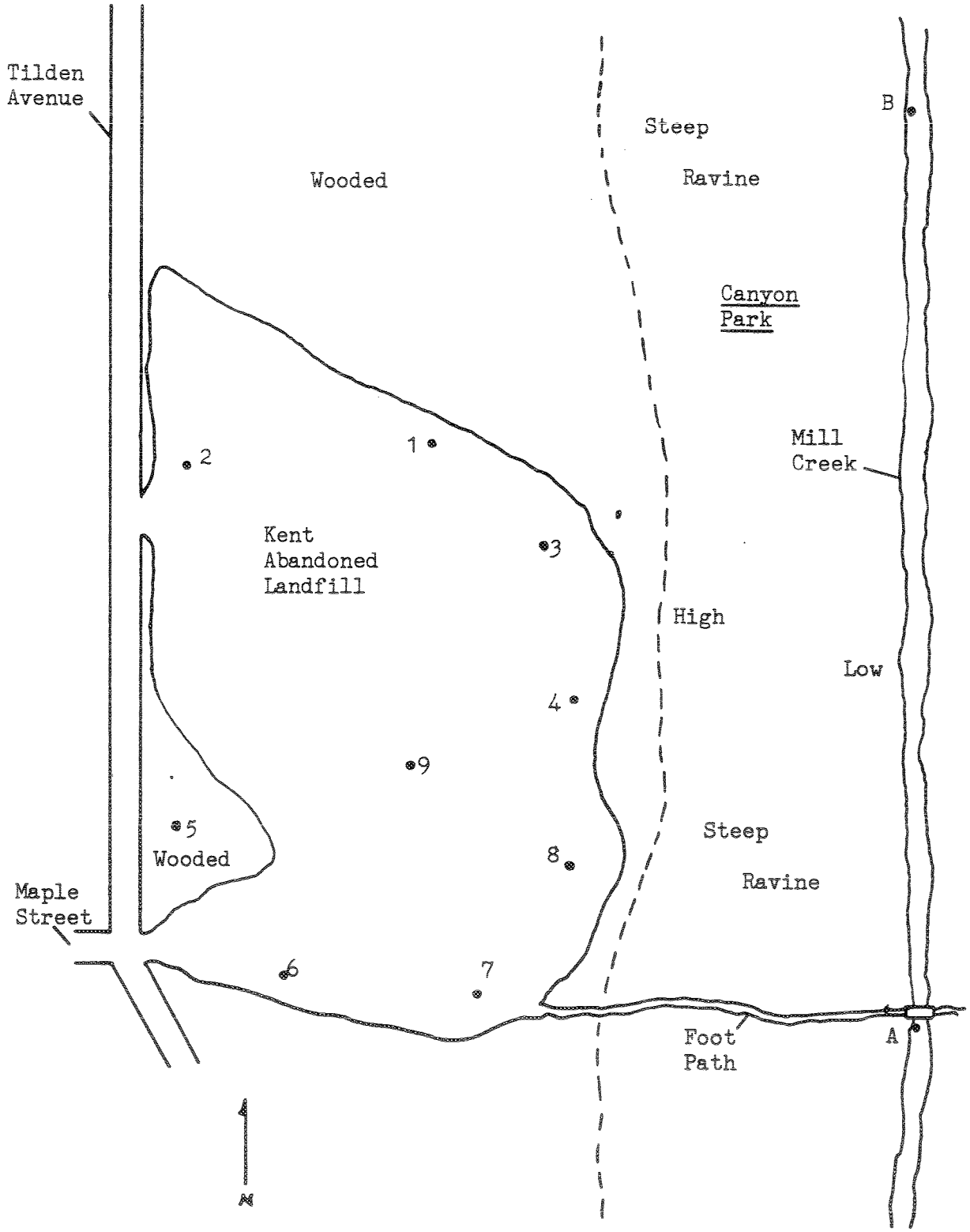


TABLE XXIII

METHANE AND TRACE GAS CONCENTRATIONS
KENT ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	0	0
3	Trace	0
4	0	0
5	0	0
6	---	0
7	Trace	0
8	Trace	0
9	Trace	0

* Reading represents change from ambient air level

TABLE XXIV

SURFACE WATER PARAMETERS
KENT ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	6.2	6.3
Temperature ^{o}C	9.5	9.7
Dissolved Oxygen ppm	9.3	9.4
Electrolytic Conductivity m℧/cm	0.2	0.2
Turbidity ppm	65	66

(1) Stream water upstream from landfill
(2) Stream water downstream from landfill

McMICKEN HEIGHTS

In 1942 a garbage disposal site was located in the South King County area on the hillside southwest of the City of Tukwila. Bordered on the west by 51st Avenue South, and the east by the area currently occupied by Interstate 5 at the location of 53rd Avenue South, the south by South 176th and on the north by South 173rd, the site is a steep ravine where the bordering roads deadend.

No documents regarding this site were located with the exception of the old map showing its location. Long time residents of the area do not recall the dump, referred to as the McMicken Heights garbage disposal site.

The site was probably a small residential site which closed sometime in the 1940's and was entered on 51st Avenue South.

Current land use in the area is residential on all sides, exclusive of the freeway. The disposal site itself remains undeveloped except for a trail system through the area. Some residents recall mention of a "gun club" at one time, so it is possible the site may have been used for target practice sometime after the fill closed and before residential development began. Plat maps indicate the site is approximately 13.95 acres and list it as the Castillo Land Co. property. Unauthorized neighborhood dumping of rubbish is still done at the northern edge of the site.

FIELD RESULTS

Nine bore holes were tested at this site for methane and non-specific trace gas concentrations on November 16, 1984. Results appear in Table XXV. Methane levels were low as measured from the nine test sites, ranging between 0% to 0.2% gas. Trace gas levels never exceeded ambient air concentration.

No surface water was observed directly on-site. Surface water run-off streams were sampled at east and west points of the north canyon and displayed no evidence of leachate pollution (Table XXVI).

FIGURE 14

McMICKEN HEIGHTS ABANDONED LANDFILL

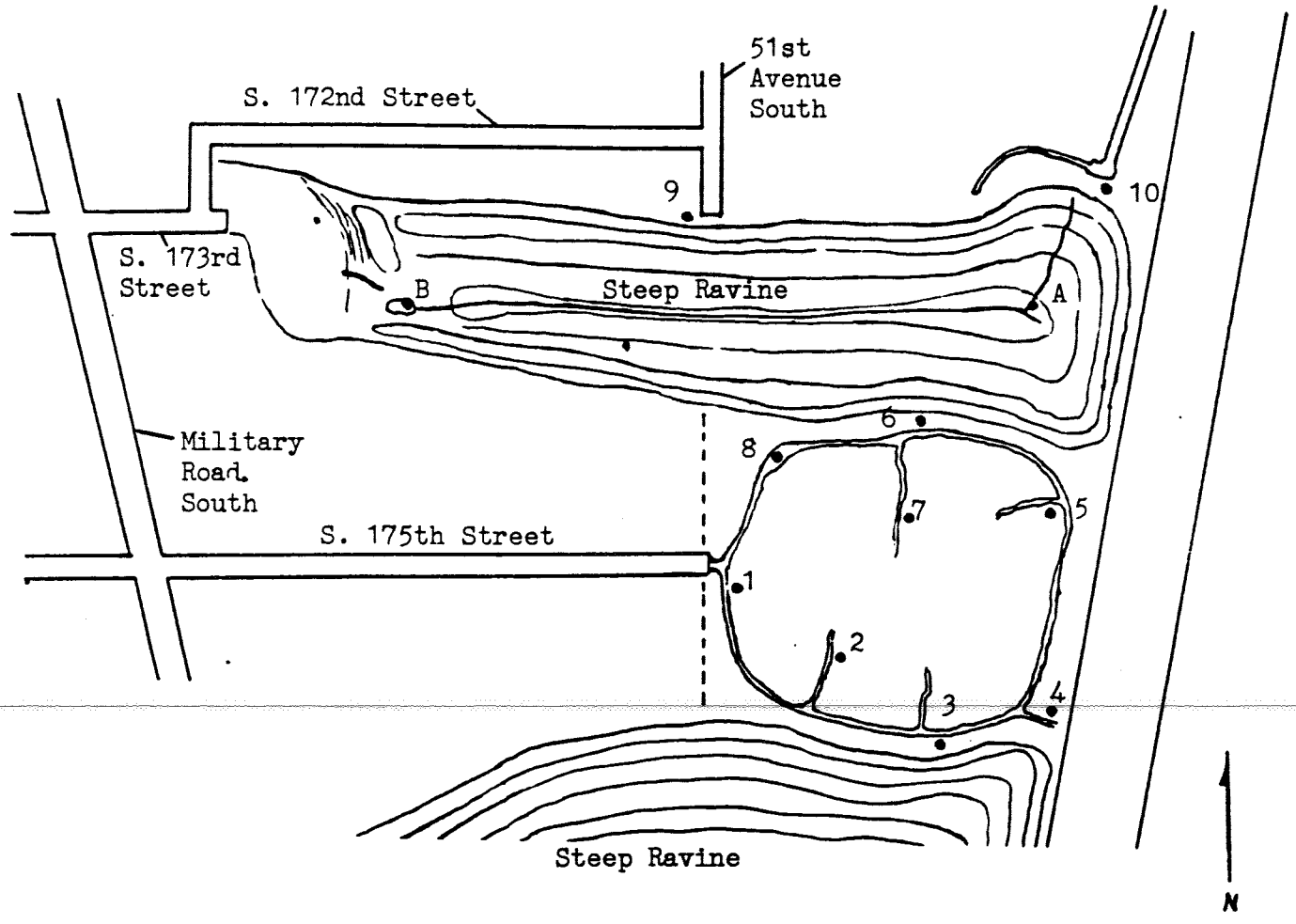


TABLE XXV

METHANE AND TRACE GAS CONCENTRATIONS
McMICKEN HEIGHTS ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	0	0
2	Trace	0
3	0	0
4	Trace	0
5	Trace	0
6	Trace	0
7	Trace	0
8	0.2	0
9	Trace	0
10	Trace	0

* Reading represents change from ambient air level

TABLE XXVI

SURFACE WATER PARAMETERS

McMICKEN HEIGHTS ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	5.6	6.1
Temperature ^{o}C	10.4	10.3
Dissolved Oxygen ppm	10.1	9.9
Electrolytic Conductivity $m\mho/cm$	0.2	0.4
Turbidity ppm	5	2

(1) Flowing water from storm drain run-off
(2) Pooled water from storm drain run-off

NORTH BEND

The North Bend Abandoned Landfill stands today as a small clearing along the west side of the Middle Fork Road, about one mile north of the "Y" turn from Edgewick Road located on the east side of North Bend. There are several well-defined paths extending into the new-growth woods. A gravel pit is across the road and the Snoqualmie River some distance to the north.

This approximately two acre landfill was city operated during the 1950's. The Seattle-King County Health Department baited the area but did not have any other major responsibilities at the site. Being in a small rural area, disposal of any hazardous material there seems unlikely.

FIELD RESULTS

On October 20, 1984 ten bore holes were tested at this site for methane and non-specific trace gas concentrations. These data appear in Table XXVII.

Methane levels were observed ranging between 0% to 0.4% from the ten test bore holes. All non-specific trace gas readings were neutral relative to ambient air concentrations.

No surface water was observed on or about the site.

FIGURE 15

NORTH BEND ABANDONED LANDFILL

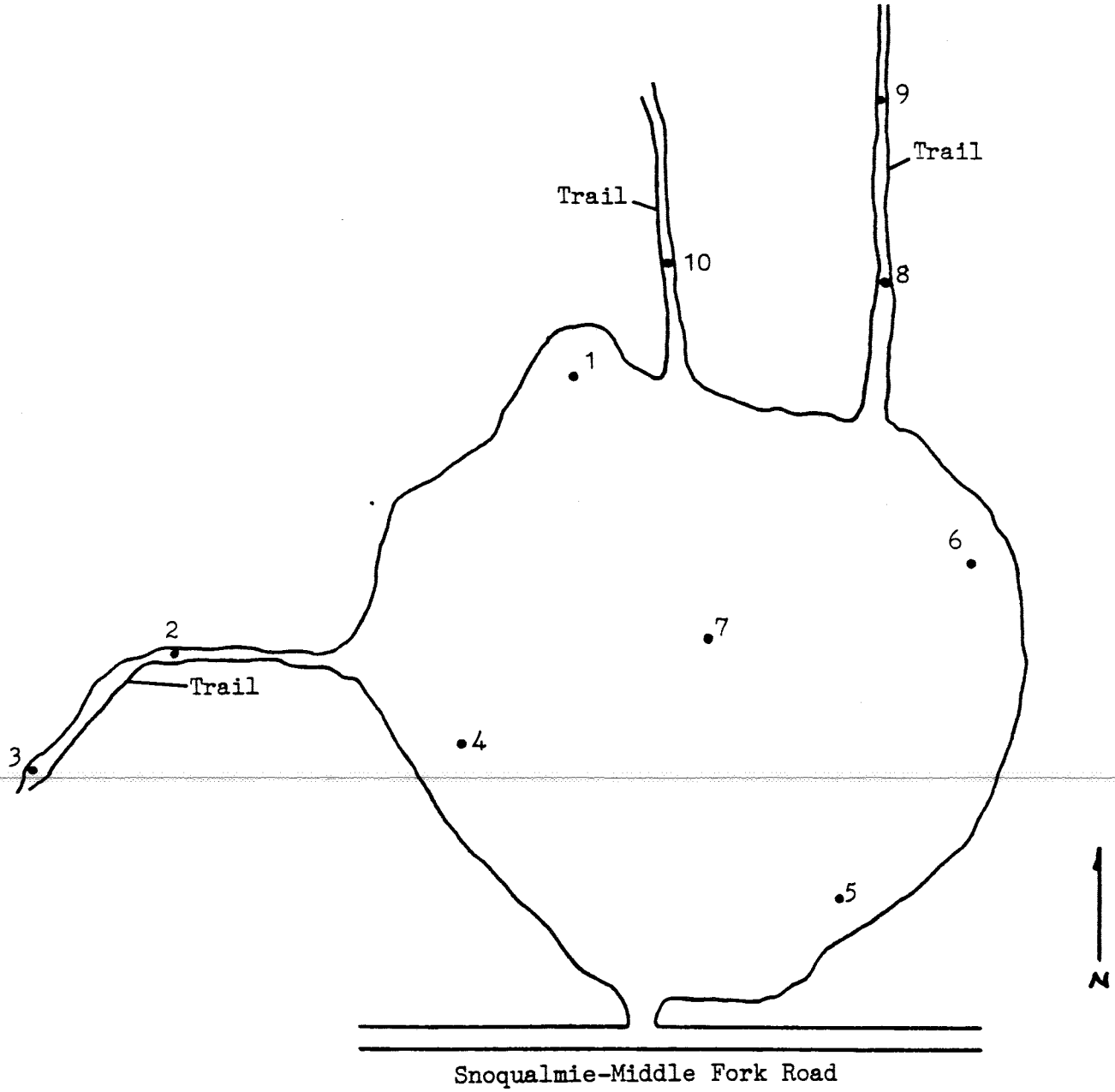


TABLE XXVII

METHANE AND TRACE GAS CONCENTRATIONS
NORTH BEND ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0.1
2	Trace	0
3	Trace	0
4	Trace	0
5	Trace	0
6	Trace	0
7	Trace	0
8	Trace	0
9	Trace	0
10	.4	0

* Reading represents change from ambient air level

PACIFIC CITY

The King County refuse dump in the City of Pacific was located on an approximately seventy two acre site at the location of the present Stuck River Park. Encompassing both sides of the Stuck (White) River the site was large and old. Early maps show "garbage dump" operations as early as 1921 and possibly even in 1914. It was closed about 1961 with refuse being routed to the Puyallup Cutoff landfill.

The legal description of the site is:

E 495 FEET OF W 660 FEET OF NW 1/4 OF SE 1/4 LESS NORTH 200 FEET OF W 100 FEET AND LESS THE PORTION DEEDED TO KING COUNTY 12/14/14, TAX LOT 40 SECTION 36, TOWNSHIP 21 NORTH, RANGE 4 EAST

PAST AND PRESENT USE

There is no information available on the land use prior to the landfill. Since it is located in the traditional farm belt of South King County it can be assumed it was, as it still is predominantly, rural and agricultural. Apparently flooding from the Stuck River was a chronic problem in the early 1900's. Several documents exist showing deeds transferring lands needed for Stuck River improvements. These included concrete bulkheads and rechanneling the river for the benefit of both King and Pierce Counties.

On March 7, 1966 the City of Pacific was granted permission to use about twenty one acres of the abandoned site for park purposes for a period of twenty five years. The City proceeded with site development and discovered not all of the land contemplated for park development had been properly described in the 1966 King County Resolution No. 31548. Thus on August 1, 1969, King County granted the City the permission to use the land originally intended for park purposes. The "new" city park was developed and dedicated in September 1972.

The remaining area adjacent to the landfill is zoned either multi-family or single family residential or industrial property.

SITE/ENGINEERING INFORMATION AND WASTE DISPOSAL PRACTICES

Nothing regarding the use or type of waste disposed was found in the existing records.

Individuals who remember the operation of the landfill recall that it was ten to twelve feet deep. Water was typically encountered, at least at twelve feet and the toe of the fill appeared to border the river. Most of the refuse was burned.

SUSPECTED PROBLEMS

No major problems are anticipated at this site unless, given the rural character of the region, pesticides or their containers may have been dumped here. No records exist to substantiate that. This landfill is mentioned in the EPA ERRIS list.

FIELD RESULTS

On October 23, 1984 fifteen bore holes were tested at the Pacific site for methane and non-specific trace gas concentrations. These data appear in Table XXVIII.

Methane gas levels were observed only at low levels throughout the site with a peak reading of 0.4%.

Non-specific trace gas levels were also non-significant (Range = -0.1 to +0.3 ppm relative to ambient air) with the exception of the 5.6 ppm reading of hole #5. This test was made within the center of a dead patch of grass. Five test holes (a - e) placed within forty feet of hole #5 yielded non-significant levels of methane or trace gases.

A water sample retrieved from the adjacent White River was not indicative of leachate Table XXIX.

FIGURE 16

PACIFIC ABANDONED LANDFILL

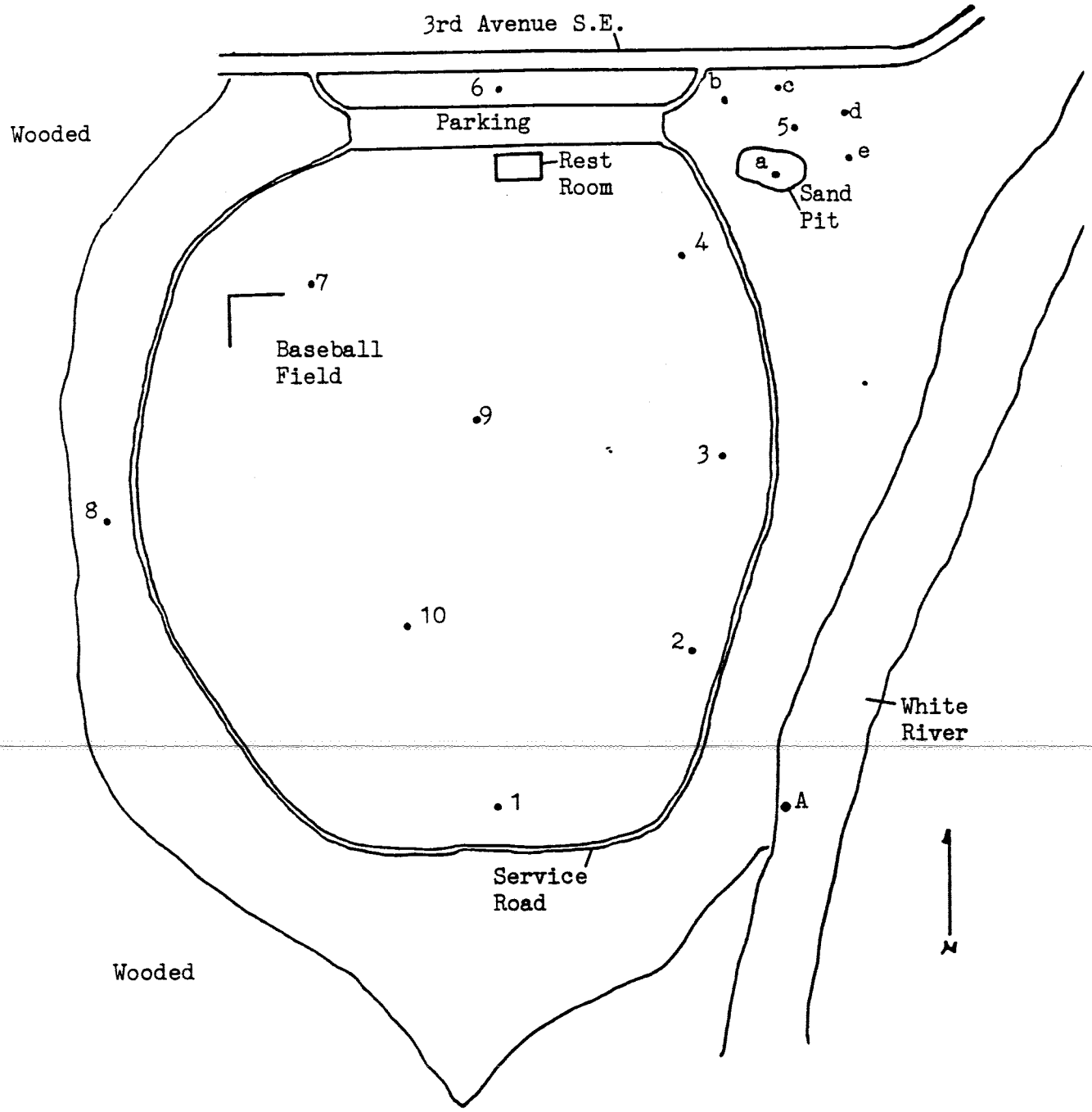


TABLE XXIX

SURFACE WATER PARAMETERS
PACIFIC ABANDONED LANDFILL

	Site A (1)
pH	5.1
Temperature ^{o}C	8.5
Dissolved Oxygen ppm	11.6
Electrolytic Conductivity m$\mho$/cm	0.2
Turbidity ppm	5

(1) White River surface water sample

TABLE XXVIII

METHANE AND TRACE GAS CONCENTRATIONS
PACIFIC ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)[1]
1	Trace	0.1
2	0	0.3
3	0	-0.1
4	0	0
5[2]	0.3	6.2
6	0	0
7	0	0
8	0	---
9	---	0
10	0	-0.1
a	0.4	0
b	Trace	0
c	0.2	0
d	Trace	0.1
e	Trace	0

(1) Reading represents change from ambient air level
(2) Test hole centered an area of dead grass

PUYALLUP/KIT CORNER

King County operated a 30.45 acre sanitary landfill in Section 20, T21N, R4E, immediately east of I-5 and one-quarter mile north of South 360th Street.

PAST AND PRESENT USE

This was apparently tax title property deeded to King County for operation of a "garbage dump." Old maps of the section show a King County dump site here in 1947. The original parcel of land consisted of forty acres, but 9.55 acres were deeded to the State of Washington Department of Highways in 1959, reducing the landfill portion to 30.45 acres. Aerial maps of the area taken in May, 1970 show the landfill as closed.

It is currently vacant land being surplused by the County. Brush and high grass cover the site which is returning to its natural state. Bike trails can be seen on site but the original frontage access road to the site has been closed.

SITE/ENGINEERING INFORMATION AND WASTE DISPOSAL PRACTICES

This was one of the larger King County sites. As the Bow Lake, Renton Junction, and Pacific sites closed, refuse was hauled to this site. It operated until shortly after the opening of the Cedar Hills landfill. It is estimated that thirty to forty feet of refuse fill the site.

Operational maps indicate that the borrow site for cover was located at the south edge of the property. This was also one of the last areas filled. The northern edge of the property was also the site of some of the older fill area, but was expanded and raised with new fill in later stages of operation. The same, ie. raising the fill, appears to have occurred in the central portion of the older fill area.

A paved service road fronted the west side of the site and a dirt service road appears to have run around the northern, eastern and southern edges. A drainage ditch was on the southeastern and southern edges of the fill which appear to be the lower elevations.

SUSPECTED PROBLEMS

Since this site received refuse from a large geographic area and operated for about twenty five years, it seems likely that almost anything could be found here. The site is mentioned on the EPA ERRIS list. The landfill's proximity to the major Tacoma industrial area raises some suspicions regarding the possible unauthorized disposal of hazardous materials at some time during its operation. However, the presence of two nearby landfills in Pierce County at that time probably make this a remote possibility.

The cover fill, apparently put on the site when closed with no provisions made for methane release, make likely a potential for methane build up on site and additional land settlement.

FIELD RESULTS

For the purposes of this study, methane gas was tested from twenty-two test areas located throughout the Puyallup/Kit Corner site on October 27, 1984 which was a day of heavy rainfall. These data appear in Table XXX. Non-specific trace gases were not measured at that time because of that test equipment's sensitivity to excessive moisture.

Methane was observed at levels within or above the explosive range for methane gas (4% to 18%) in ten test holes, located throughout the site with peak levels reaching 68% to 72%. Fissures and areas of dead vegetation were frequently

encountered. Methane gas was measured at 50% directly from the fissure at test site #22. Readings at five test holes were confounded by the high water table.

Trace gases were measured from six bore holes on December 1, 1984. Levels were non-significant, ranging from -0.2 to +0.2 ppm relative to the ambient air levels (Table XXXI).

During examination of the site for leachate problems a metal drainage conduit was found along the west side of the site's access road which drained into a surface water collection stream. A discoloration characteristic of leachate was noted on the drainage conduit. Test parameters of the stream water under the conduit on October 27 did not indicate a leachate problem at that time, though a slightly acidic pH (5.3) was noted.

Water was also sampled from an east perimeter stream. Leachate contamination was not indicated at that location. Surface water data are presented in Table XXXII.

FIGURE 17

PUYALLUP/KIT CORNER ABANDONED LANDFILL

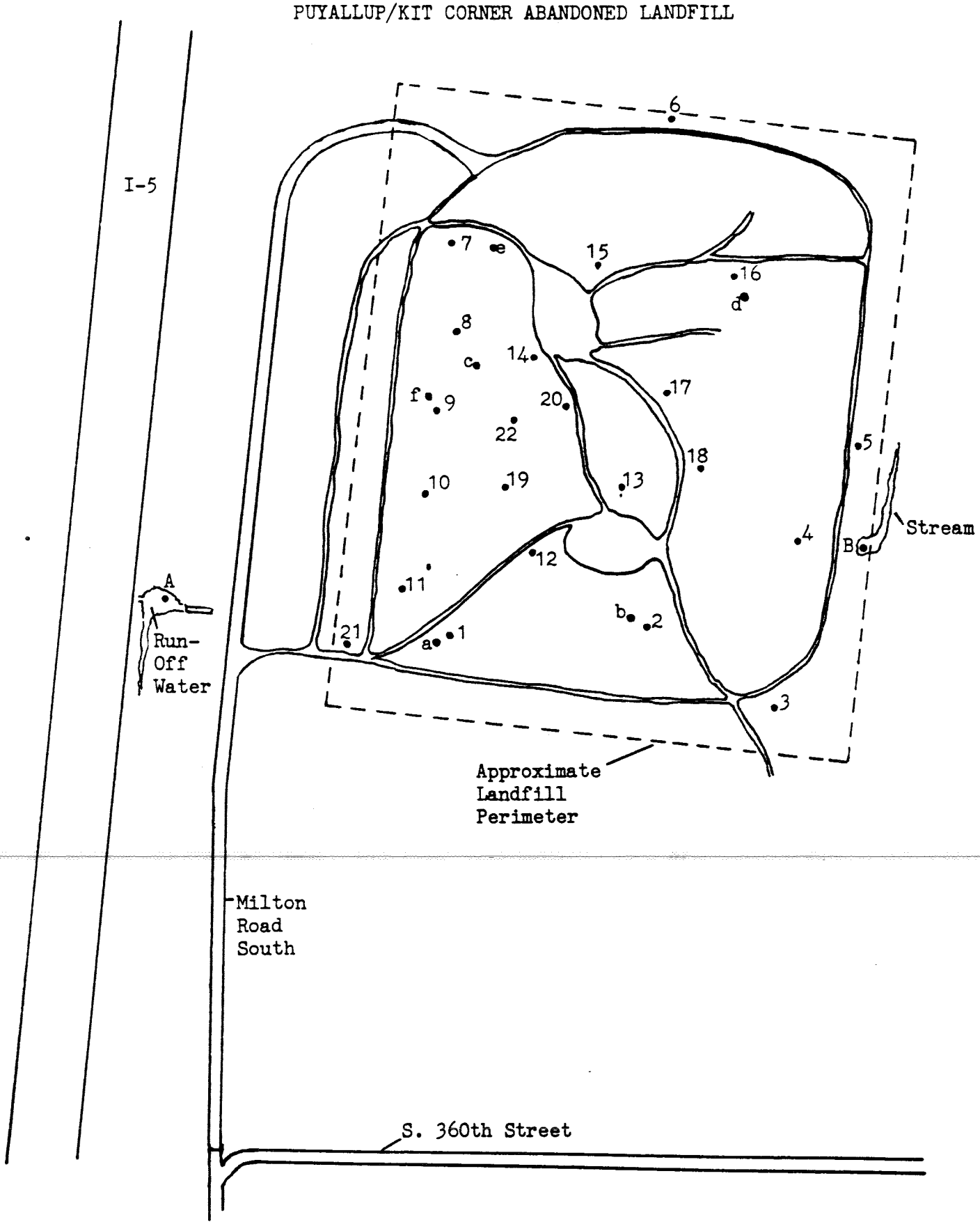


TABLE XXX

METHANE GAS CONCENTRATIONS

PUYALLUP/KIT CORNER ABANDONED LANDFILL

Site	Methane (%)
1	0.8
2	60
3	Trace
4	72
5	25
6	Trace
7	Water Table
8	Water Table
9	70
10	18
11	Water Table
12	Water Table
13	5
14	12
15	68
16	Water Table
17	Trace
18	5
19	3
20	47
21	Trace
22	50

TABLE XXXI

TRACE GAS CONCENTRATIONS
PUYALLUP/KIT CORNER ABANDONED LANDFILL

Site	Trace Gas (ppm)*
a	-0.2
b	0
c	0
d	0.2
e	-0.2
f	0

*Reading represents change from ambient air level

TABLE XXXII

SURFACE WATER PARAMETERS
PUYALLUP/KIT CORNER ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	5.3	6.0
Temperature ^{o}C	8.9	8.2
Dissolved Oxygen ppm	10.2	9.5
Electrolytic Conductivity m$\mho$/cm	0.1	0.1
Turbidity ppm	12	175

(1) Run-off stream surface water
(2) Stream surface water, east perimeter

REDONDO PIT

The Redondo Pit referred to a large gravel pit located at the intersection of the Pacific Highway South and South Dash Point Road a few blocks north of Federal Way High School. It was a nineteen acre site.

The Redondo Pit was operated by the King County Department of Public Works as a gravel pit for several years. During the 1940's the Port of Seattle, the United States Navy, and the County used the site as an oil dump. Bilge oil, crankcase oil, and road oil were dumped there. It was common to burn the oil off until residents and/or regulations curtailed the practice. In 1969, when the gravel pit was exhausted, the land was transferred to the King County Parks for use as a community park site. Final plans for the park were made in 1973 and the current Sacajawea Park was completed.

King County Park Department officials report running into bunker oil during development. They excavated what they could find, using earth fill from the Federal Way School District's Sacajawea Junior High School site. Today the area is a three level athletic/recreational facility with track and football/soccer activities on the lower level, baseball and tennis on the middle, and general playground/picnic area on the upper section.

FIELD RESULTS

This site was tested on November 7, 1984. Methane gas levels were not observed above 0.6% from the twenty bore holes tested. Trace gases were noted with peak readings above ambient air levels of +1.0 ppm in the lower section, +8/8 ppm in the center, and +1.2 ppm in the upper section. A ground water table was observed in test holes located on the lower section (Table XXXIII).

On-site structures (restrooms) exhibited no indication of problematic ground settling due to the fill.

No surface water was observed on or about the fill area. However, water samples were obtained from run-off sewer drains located on the lower tier (site A) and the upper tire (site B). These data are presented in Table XXXIV. Parameters of leachate contamination were not observed in the water samples.

FIGURE 18

REDONDO PIT ABANDONED LANDFILL

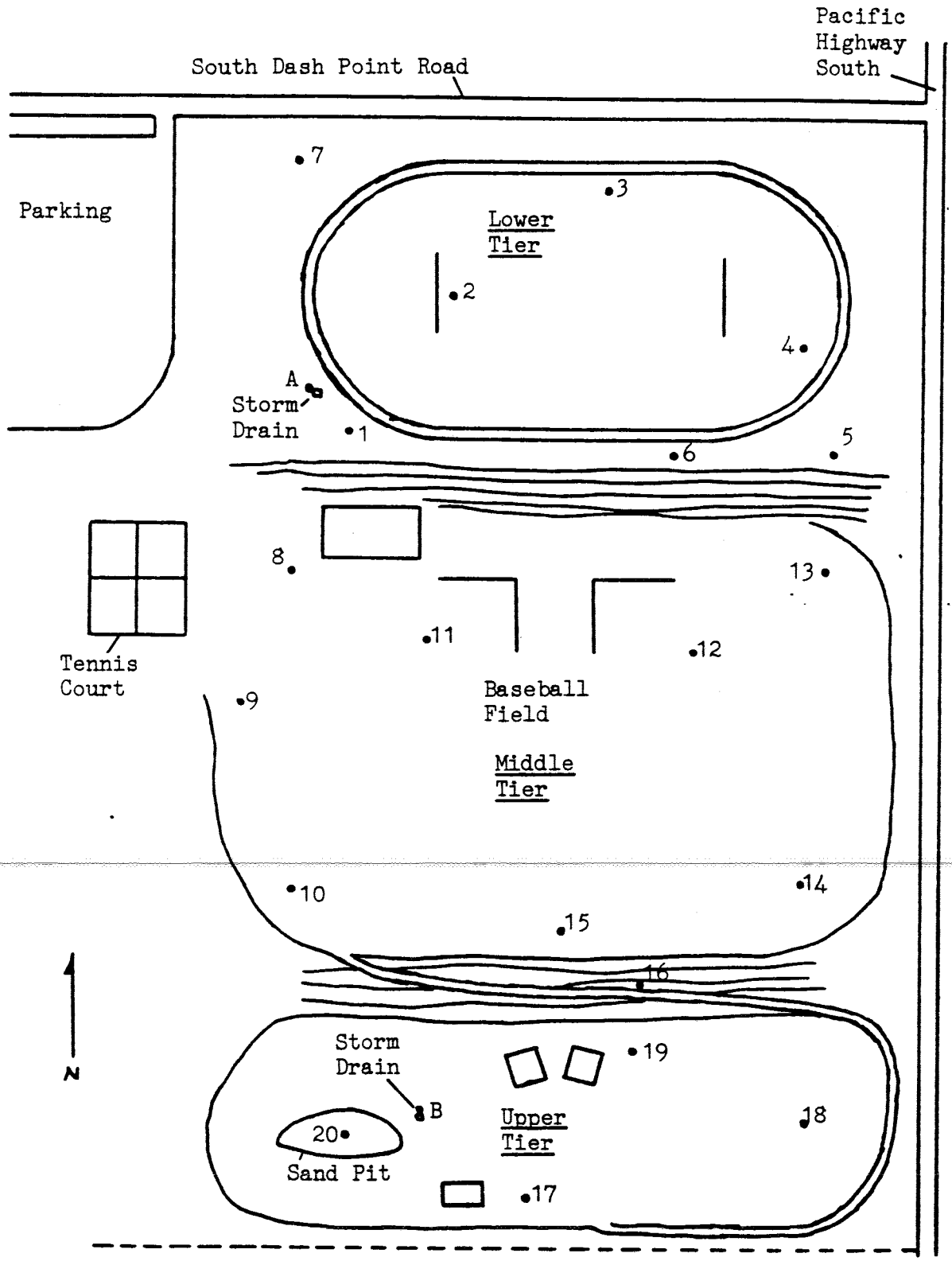


TABLE XXXIII

METHANE AND TRACE GAS CONCENTRATIONS
REDONDO PIT ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	0	1.0
2	0	0.8
3	0	0
4	0	0
5	0	1.0
6	Water Table	Water Table
7	0	0
8	0	0
9	.0.6	0.8
10	Trace	---
11	0	0
12	0	0
13	Trace	0
14	0	0.4
15	Trace	8.8
16	Trace	---
17	Trace	1.2
18	Trace	1.0
19	Trace	0.8
20	Trace	0.2

* Reading represents change from ambient air level

TABLE XXXIV

SURFACE WATER PARAMETERS
REDONDO PIT ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	5.9	6.0
Temperature ^{o}C	8.8	9.7
Dissolved Oxygen ppm	8.4	3.5
Electrolytic Conductivity m$\mho$/cm	0.1	0.05
Turbidity ppm	13	8

(1) Storm-drain water
(2) Storm-drain water

RENTON HIGHLANDS

The Renton Highlands abandoned landfill was on about 11.2 acres. On the south side of Northeast 3rd Street slightly east of Mt. Olivet Cemetery, and west of the Southeast District Office of the Seattle-King County Health Department.

PAST AND PRESENT USE

Operating since the 1940's, correspondence dated June 7, 1951, described the site as follows:

> "The area of approximately 12 acres, privately owned, lies directly south of the Renton Highland Housing Project and just east of the Renton City limits, a former gravel pit with plenty of cover material. It is 1 1/2 miles from the Renton City Hall, a minimum trucking distance.
>
> "This site appears to be a good one for dumping, is in need of fill to round out a broken area and has a probable expectancy period of 10 to 20 years. It has about the best possible soil condition, good proximity to collection area, but also good visual and wind isolation from thickly settled parts of the city."

Unfortunately, perhaps, in the thirty years since this correspondence the site did not stay "isolated." The Renton Highlands has seen substantial growth in the ensuing years. The dump site was closed by the late 1960's. Today the land is still undeveloped private property.

In addition, it appears that another site operated slightly north of that location. Correspondence dated January 31, 1949 from D.L. Evans, County Road Engineer to the County Commissioners, notes the following:

> "The attached application from the City of Renton to purchase Lots 1, 2, 3, 8, 9 and 10, Section 7, Rainier Acres, to be used for garbage disposal site.... This location is a portion of an old gravel pit which has been worked out and is of no further value to the County for this purpose...."

This area, just west of Renton Vocational Institute is currently used by the Housing Authority for residential dwellings.

SITE/ENGINEERING INFORMATION AND WASTE DISPOSAL PRACTICES

According to the 1951 correspondence noted earlier, "The soil type in this area is Everett gravelly sandy loam, a very deep deposit of gravel, very well drained with little if any possibility of horizontal seepage."

The site was a large, major fill in the area which is remembered as receiving "everything." Fires were common with smoke drifting into the neighborhood adjacent to the site.

It is thought that a portion of Northeast 4th and/or the housing project in that general area may actually be on some of the older fill.

In 1951 it was noted that major material being dumped was ash from the housing project which "has no fumes, smoke, or odor."

SUSPECTED PROBLEMS

Although no records regarding waste disposal are available the existence of several industries, including Boeing and Paccar, in Renton during the life span of this fill raise the question of possible hazardous materials disposal. The site is mentioned in the EPA ERRIS list.

FIELD RESULTS

On November 14, 1984 eight bore holes were tested for methane and non-specific gas at this site along the north side of Northeast 3rd Street. Three bore holes were tested on January 25, 1985 for only methane gas along the south side of Northeast 3rd Street. Methane gas was not observed above trace levels from any of the test holes. Trace gas levels were all observed at equilibrium with ambient air conditions.

A water sample was retrieved from the Mt. Olivet Creek on January 25, 1985. Signs of leachate contamination were not indicated.

FIGURE 19

RENTON HIGHLANDS ABANDONED LANDFILL

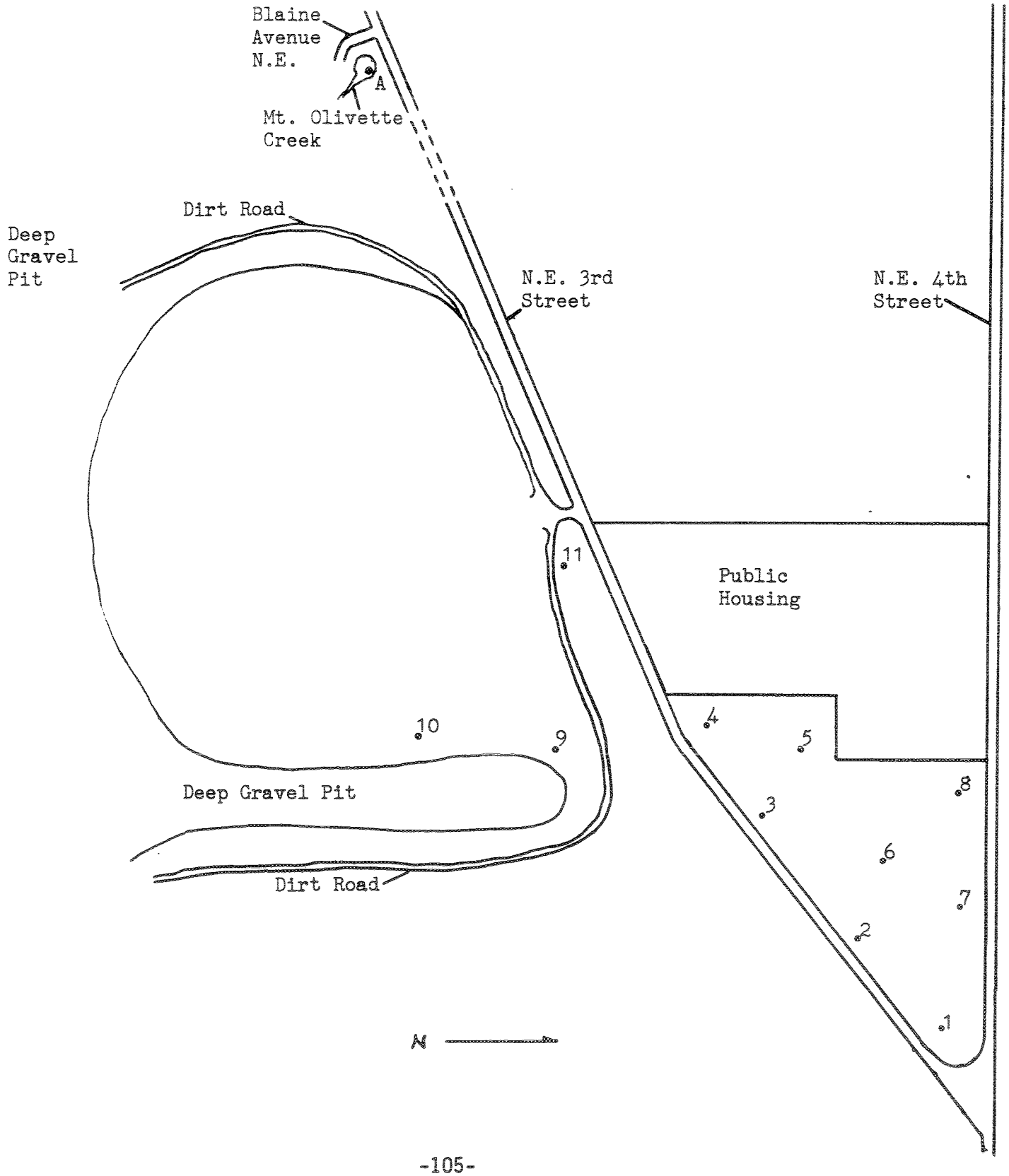


TABLE XXXV

METHANE AND TRACE GAS CONCENTRATIONS

RENTON HIGHLANDS ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm) (1)
1	Trace	0
2	0	0
3	Trace	0
4	0	0
5	0	0
6	Trace	0
7	0	0
8	0	0
9	0	---
10	0	---
11	0	---

(1) Reading represents change from ambient air level

TABLE XXXVI

SURFACE WATER PARAMETERS

RENTON HIGHLANDS ABANDONED LANDFILL

	Site (A)
pH	6.7
Temperature °C	8.3
Dissolved Oxygen (ppm)	9.8
Electrolytic Conductivity mʊ/cm	0.2
Turbidity (ppm)	4

RENTON JUNCTION (MONSTER ROAD)

King County operated a refuse disposal site at the Renton Junction near Longacres from approximately 1946 to about 1961. It operated on land leased from the Northern Pacific Railway Company described as:

> "Those portions of Lots 31 and 32 of Interurban Addition to Seattle, according to the recorded plat thereof, lying northeasterly of a line parallel with and distant 36 feet northeasterly, measured at right angles, from the center line of the most northeasterly main track as now constructed across said lots; together with the southwesterly one-half of the original channel of the White River which attached thereto when the channel of said river was relocated and constructed along the southwesterly side of the Railway Company's tracks."

Additional land was obtained from Mr. Fred Nelson of Renton for the operation described as: "that portion of government Lot 6, Section 24, Township 23N, Range 4EWM, lying between the westerly right of way line of the Steel Hill County road No. 24-23-4-1 and the centerline of the old channel of the Green River."

PAST AND PRESENT USE

As noted by the legal description, part of this property was once the old river channel which became part of the Northern Pacific Railway right of way and private rural property. After its operation as a sanitary landfill the land was surplused and in 1979 purchased for commercial use. The site is currently used by a decorative rock company and is used for storage of crushed rock and gravel associated with that operation.

Across the Green River lies Fort Dent Park, southwest of the site is the Riverview Nursery and to the east is the Metro Secondary Sewage Treatment Plant.

SITE/ENGINEERING INFORMATION AND WASTE DISPOSAL PRACTICES

No specific geological or hydrological information was found regarding the site other than it was part of the old river channel. It may be surmised that the

base soil is clay, sand and gravel overlain by fill forty to fifty feet deep and topped off with a relatively impermeable layer and topsoil.

Once the landfill operation started there are records showing numerous complaints regarding the site. Nuisance conditions prevailed in the warm weather. Fire and smoke were reported night and day. Inadequate fill dirt for the cover of the operation was noted, as were problems of dumping sewage and oils on site. The County had a contract for the maintenance of this dump with a private concern in effect until December 31, 1957. This contract called for bulldozing and compaction twice weekly with the top side being covered with eighteen inches of dirt. It also required that the garbage be deposited in lifts or layers not to exceed twelve feet in depth after initial compaction. There was no earth available on the site and all cover material had to be brought in by trucks. The only earth available within hauling distance had been of a hardpan type with a heavy clay concentration.

The site was used not only by the County, but according to copies of agreements, also by the City of Renton to dispose of a portion of their garbage and refuse.

The seriousness of the fires at the south end of the dump operations in 1950 prompted correspondence between the King County Fire Marshal and the Health and Sanitation Department, who ran the landfill, to confine burning to the north area of the landfill.

The landfill was closed effective December 27, 1957 with directions for refuse to be taken instead to either the Bow Lake Fill at South 188th and Military or the landfill at South 352nd Street about one-half mile east of the Puyallup cut off highway, both still in operation at that time.

However, the Health Department was requested to continue filling operations as plans to discontinue the fill were described as leaving the fill in an unusable

condition. The fill was reopened, using County equipment to conduct operations, which continued for about two years.

SUSPECTED PROBLEMS

Due to the proximity of the old landfill site to the Green River, it is conceivable that leachate may reach the river.

The site is recorded on the EPA ERRIS list. The site's proximity to several industries in South King County make it possible that some potentially hazardous materials, including oil, were dumped at the site during its years of operation.

FIELD RESULTS

The Renton Junction Abandoned Landfill was tested for methane and trace gas emissions on January 10, 1985. These data are presented in Table XXXVI. Methane gas levels were observed ranging between 17% and 33% from test holes located at the northerly half of the former fill. Lower levels of methane gas (3% to 5%) were observed within the southerly section.

Trace gas levels were observed ranging between -4.8 ppm to 0 ppm relative to the ambient air.

A surface water sample was retrieved along the shoreline of the Green River immediately adjacent to the former landfill. Leachate contamination was not indicated (Table XXXVII).

FIGURE 20

RENTON JUNCTION ABANDONED LANDFILL

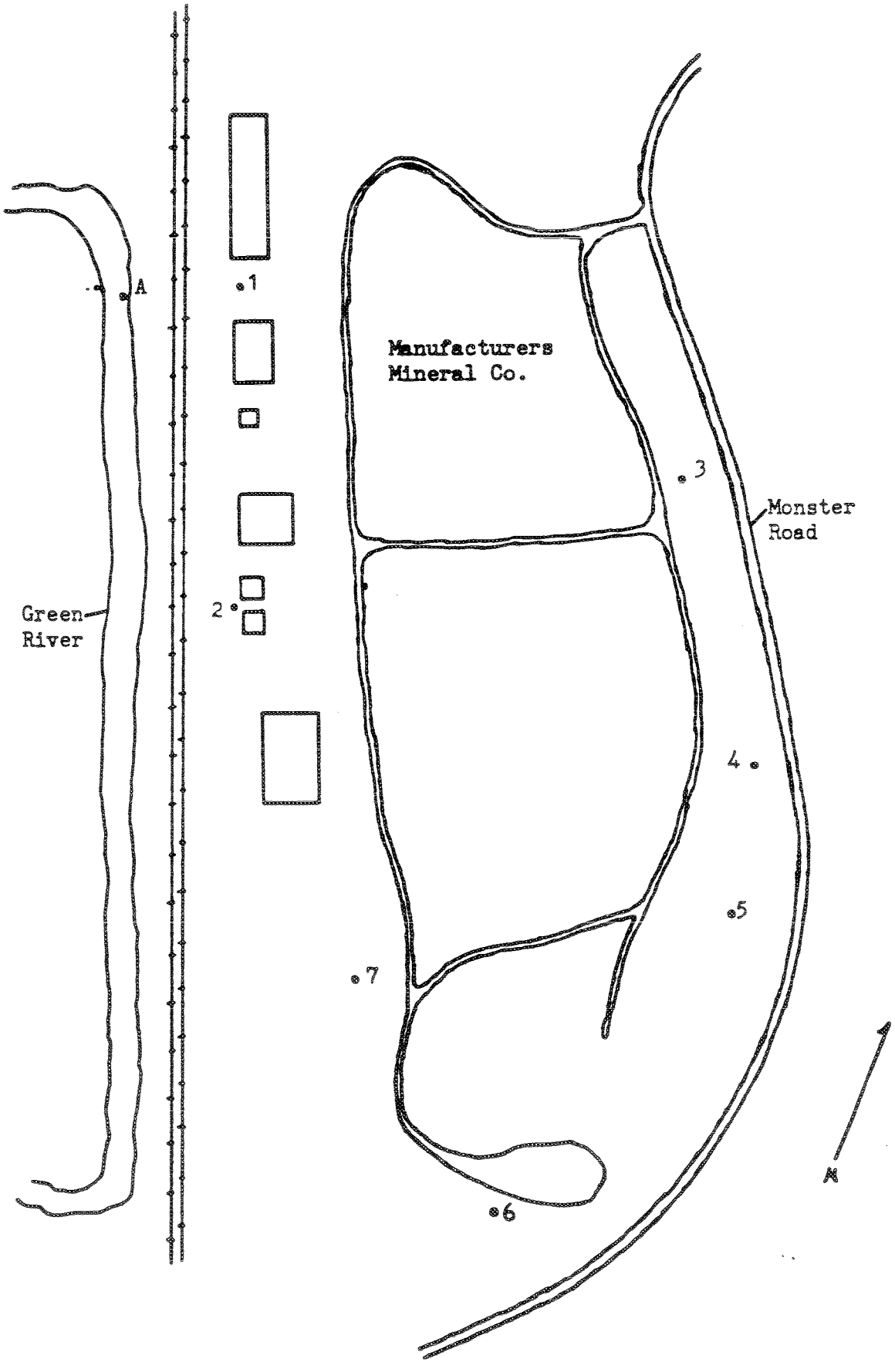


TABLE XXXVII

METHANE AND TRACE GAS CONCENTRATIONS

RENTON JUNCTION ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)
1	33	-2.7
2	30	-4.6
3	17	-4.8
4	4	0
5	3	0
6	3	0
7	5	0

(1) Trace gas measurements made with 11.2 eV HNU probe
(2) Reading represents change from ambient air level

TABLE XXXVIII

SURFACE WATER PARAMETERS

RENTON JUNCTION ABANDONED LANDFILL

	Site (A) (1)
pH	5.6
Temperature °C	5.2
Dissolved Oxygen (ppm)	9.8
Electrolytic Conductivity mu/cm	0.2
Turbidity (ppm)	1

(1) Green River surface water

SKYKOMISH

The town of Skykomish operated a landfill outside the corporated limits of the town between the old Cascade Highway, south of the Railroad right of way east of town from about 1946 until 1979. The parcel of land is described in Sec 25, T 26 N, R11EWM, as Gov't Lot 6 lying E of the W line of # 1/2 of SW 1/4 of Sw 1/4 produced N across Gov't Lot 6 and South of Great Northern Rwy Co. right of way and northerly of the County road, westerly of line in boundary line agreement, King Co. recording #7812070786 EXCEPT portions deeded to King County under record #4627707 and #7503170254.

In 1979 this was transferred to the County for a county operated drop box station.

The waste disposal practices, site conditions and problems of the landfill were discussed in depth in a report entitled "Solid Waste Disposal Alternatives for the Skykomish Area - a Feasibility Study" prepared by the King County Solid Waste Division in May 1978. This assisted in the decision to develop the current transfer station found on site. Excerpts from that report follow.

SITE/ENGINEERING INFORMATION

"Geology data for the Skykomish area is scarce. Soil studies done by the U.S.D.A. - Soil Conservation Service in King County do not cover Skykomish.

"During the winter of 1976-77, the King County Department of Public Works took some soil boring samples in connection with a project to renovate the Old Cascade Highway around Skykomish. The current landfill is located a few hundred feet north of the Old Cascade Highway and one mile east of the Town's business district.

"The samples taken in the general area of the landfill went no deeper than six-plus feet. The soils were composed of sand and gravels with cobbles up to 8 inches in diameter.

"The gravel pit excavations made in former years which now comprise the landfill site, show similar material at all exposed depths (up to 15 feet deep)."

WASTE DISPOSAL PRACTICES

"The town of Skykomish [now] operates an open burning (landfill). This has been the solid waste disposal practice in the Skykomish area for as far back as long-time residents can remember. The property which the Town now uses as a landfill was originally purchased from the Northwestern Improvement Company in 1946. At that time, the Town's landfilling practice consisted of digging a trench with dimensions of about 30' x 100' x 12'. The garbage would be dumped in the trench and burned once or twice a week. Once or twice a year the Town would obtain a backhoe and/or bulldozer and compact the waste in the trench and cover it with about three feet of soil. When one trench was full, they would dig another and repeat the process.

"The Town's current practice is quite similar. They now use an area method of fill rather than digging trenches. The burning of the solid waste is done within the proscriptions of PSAPCA's Resolution No. 353 in that rubber tires, waste oil, asphalt roofing or flooring materials, dead animals or demolition material are not burned. The burned residue is compacted in an area left from a gravel excavation operation. The compacted waste is still covered only at infrequent intervals."

SUSPECTED PROBLEMS

"...Assuming that the problems of inadequate cover material could be solved, the present landfill site would still have a leachate problem...At the Skykomish landfill, leachate is produced when rain or melting snow percolates through the buried waste.

"...The Skykomish landfill is located within 100 yards of the South Fork of the Skykomish River. Thus the possibility of water pollution from leachate exists.

"Visual inspection of the Skykomish River near the landfill reveals no obvious leachate outfall.

"The lack of obvious leachate problems does not however make the Skykomish landfill a conforming site. Leachate is being produced, although it's simply not traceable at present...."

The closure of the site and the development of the drop box station eliminated most of these problems.

FIELD RESULTS

On November 3, 1984 thirteen bore holes were tested for methane and non-specific trace gases at the Skykomish site. These data are presented in Table XXXVIII.

Throughout the site, only low levels of methane gas were observed with a peak reading of 0.8%. Trace gas levels were all neutral relative to the ambient air concentrations with a range of -0.1 to +0.1 ppm.

Heavy intermittent fainfall and a four inch snow cover created surface water pooling on the site which confounded three test hole results.

Surface waters were tested from a pool at the northern base of the fill and from a storm water run-off stream at the southern entrance (Table XXXIX). Leachate contamination was not indicated by the test parameters, although weather conditions may have masked such a problem.

FIGURE 21

SKYKOMISH ABANDONED LANDFILL

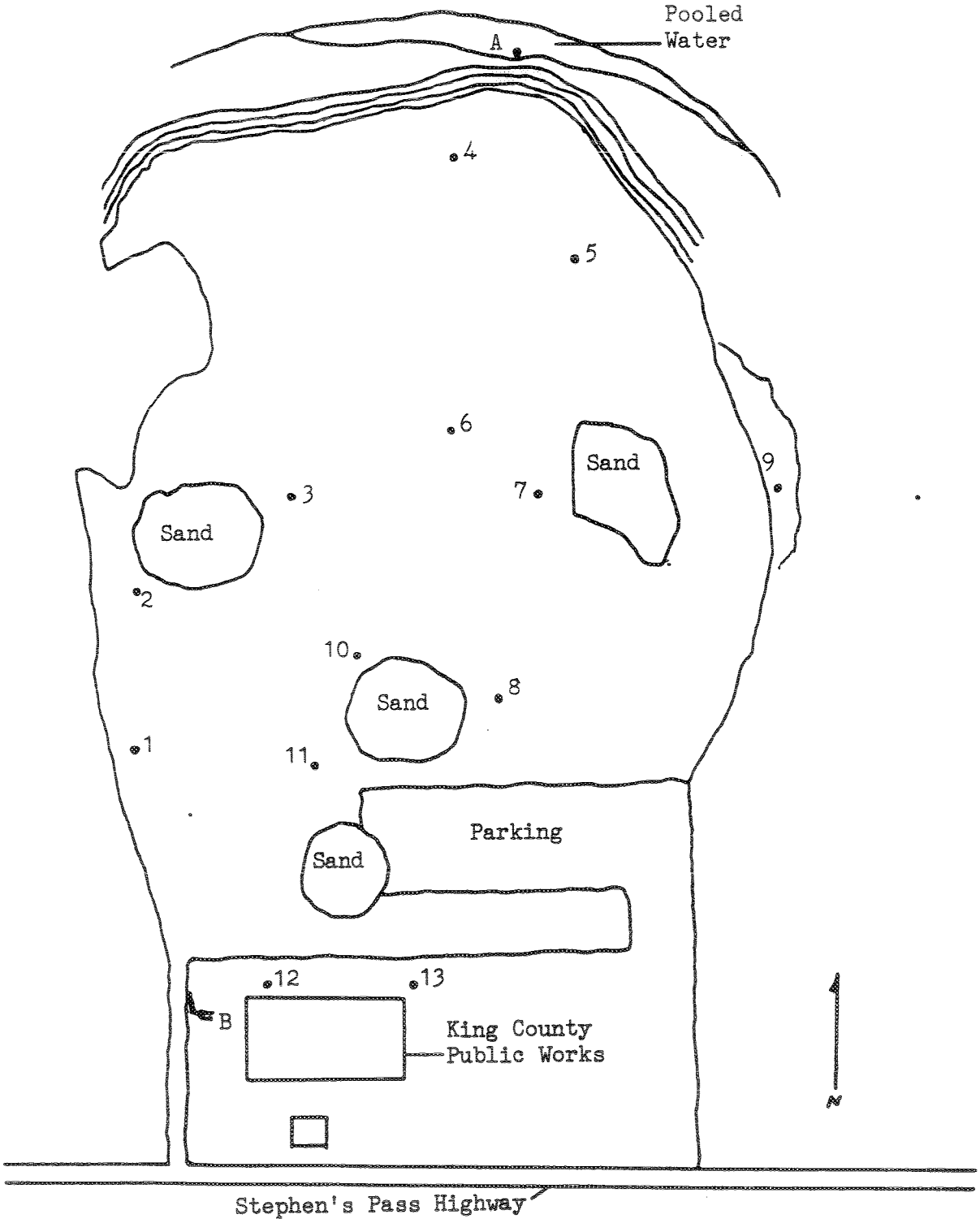


TABLE XXXIX

METHANE AND TRACE GAS CONCENTRATIONS
SKYKOMISH ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	0	0
2	Water Table	Water Table
3	0.8	-0.1
4	0.4	0
5	Trace	0
6	0.4	0
7	Water Table	Water Table
8	Trace	0
9	0	0.1
10	Trace	0.1
11	Trace	0.1
12	0	0
13	Water Table	Water Table

* Reading represents change from ambient air level

TABLE XL

SURFACE WATER PARAMETERS
SKYKOMISH ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	6.6	7.1
Temperature . . . . . ^{o}C	5.1	4.6
Dissolved . . . . . Oxygen ppm	8.1	10.9
Electrolytic . . . . . Conductivity m℧/cm	0.4	0.4
Turbidity . . . . . ppm	13	17

(1) Standing pooled water at north base of landfill
(2) Flowing run-off stream

SUNSET PARK

The southeast corner of Sunset Park at South 140th and 18th Avenue South is the general location of an abandoned oil dump site.

PAST AND PRESENT USE

King County Park and the Sunset Shops of the Public Works Department have facilities on the east edge of the Sunset Park. Directly south of these facilities is the site of the old oil dump. It apparently operated from about 1936 to 1941 or 1942. The Navy and possibly the Port of Seattle are remembered as using the dump facility. The site was two to three acres in size and the dump from ten to twelve feet in depth. Only liquid waste was deposited here and at least 98% of that was oil waste.

A number of precautions have been taken at the site since closure of the site. These have included fencing, storm drainage, and the installation of a skimmer and baffle on the drainage inlet into Tub Lake. Oil problems remain however as the oil bubbles up in Tub Lake. There is a high water table in the area and an oily sheen can at times be seen on high water adjacent to Tub Lake.

SITE/ENGINEERING INFORMATION AND POTENTIAL PROBLEMS

There is some information indicating that this site was originally a gravel pit. A 1980 report detailing the plans for the "North Sea Tac Park" prepared by Jongigan, Gerrard and McNeal, Inc. describes the general geological and hydrological conditions surrounding this area. In that report they note that South Park is part of the Miller Creek Drainage Basin, with Miller Creek itself not being a distinctive stream at this time, but rather characterized as narrow channelizations or shallow murky areas.

That report further notes that there are particular problems at this site including,

> "pollution and debris caused by garbage dumped into the stream channel and fertilizers from playfields...a serious on-site source of pollution is found adjacent to Tub Lake...at present the oil leaches through the soil into the surrounding area. The light oil slick intermittently visible in Tub Lake has been attributed to the abandoned dump."

Soils in the area are poorly drained. As noted in the 1980 study of the area, the soils are derived from glacial deposits with the most common parts being Alderwoods, Everetts, and Indianola.

> "The remainder of the soils at North Sea-Tac Park were formed in glacial depressions or clayey alluvium and are very poorly drained. Derived from vegetation in varying degrees of decomposition, the soils are acidic with a high organic content. Orcas and Seattle Muck (Or and Sk) are characterized by thick layers of peat. Organic soils are inappropriate for construction because of high compressibility. Because the water table is at or near the surfaces of these soils, they are unsuitable for development of any kind."

SUSPECTED PROBLEMS

In essence the site remains of concern due to the oil deposits. Even after forty years, the effects of the oil dump are still visible.

FIELD RESULTS

Sunset Park is geographically divided into two distinct elevations with the northerly two-thirds at a higher elevation than the southerly one-third. These areas are used for recreational/athletic activities. At the south perimeter of hte park encroaches the marsh/swamp lands of Tub Lake. Access to Tub Lake is restricted by fences and "warning/danger" signs.

The Phase I field evaluation of the former landfill at Sunset Park was conducted on October 18, 1984. Sixteen bore holes were examined for methane and non-specific trace gas levels (Table XL). Methane was observed at low concentrations (trace to 0.4%) from all test holes located within the northerly

two-thirds of the park. Higher levels within the explosive range for methane gas were observed from four to six bore holes located within the southerly third of the site.

Non-specific trace gas levels were all non-significant with the exception of a 2.8 ppm level relative to ambient air concentrations at bore hole #2.

Surface water was sampled from a roadside stream at the southeastern corner of the fill and from the marsh water of Tub Lake. These data are presented in Table XLI. The test parameters did not indicate leachate contamination.

FIGURE 22

SUNSET PARK ABANDONED LANDFILL

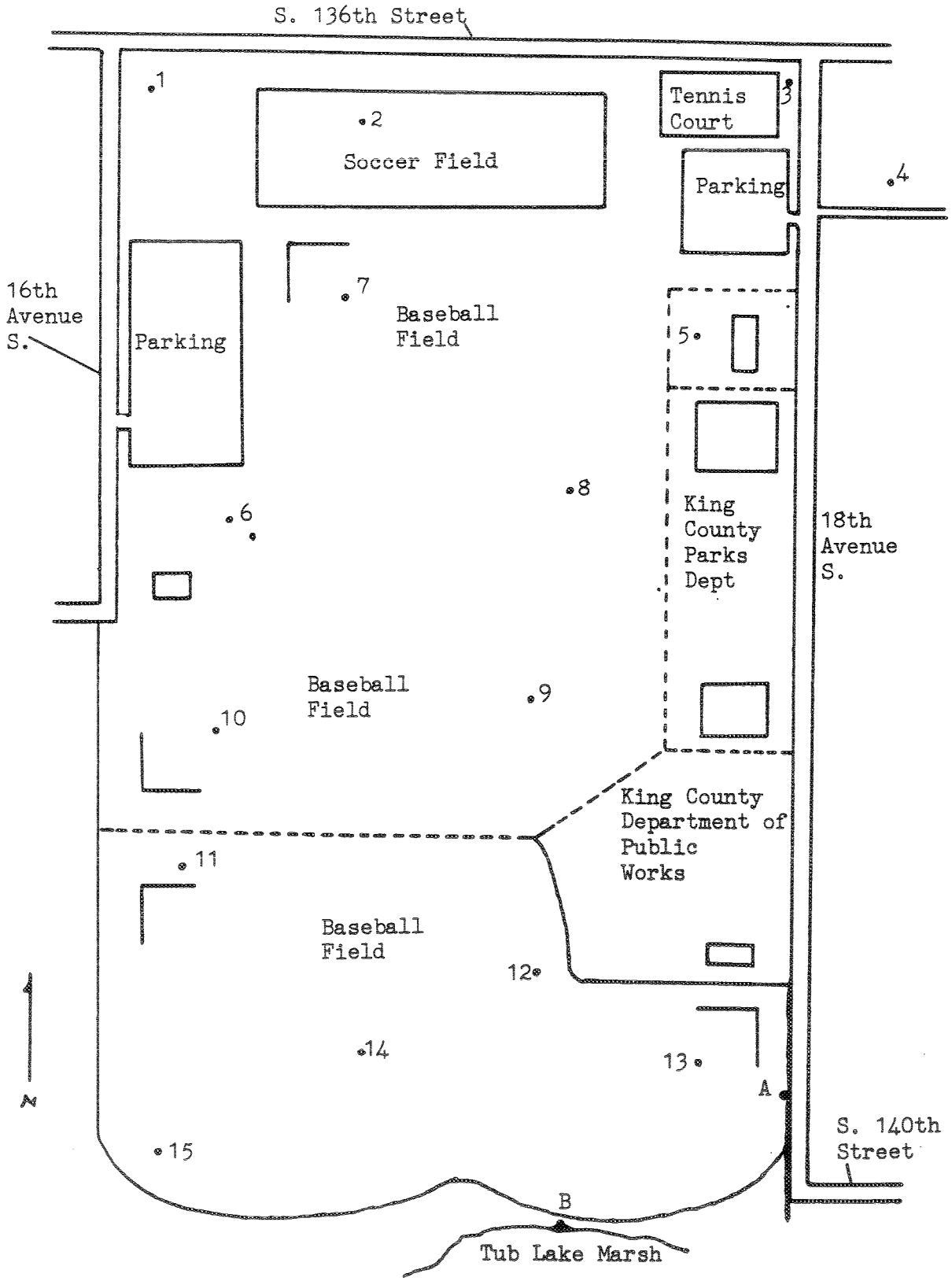


TABLE XLI

METHANE AND TRACE GAS CONCENTRATIONS

SUNSET PARK ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	Trace	2.8
3	0.2	0.1
4	Trace	0
5	0.4	0
6	Trace	0
7	Trace	0
8	Trace	0
9	Trace	0
10	Trace	0
11	Trace	0
12	12	0
13	14	0
14	15	-0.1
15	10	0
16	1.2	0

* Reading represents change from ambient air level

TABLE XLII

SURFACE WATER PARAMETERS
SUNSET PARK ABANDONED LANDFILL

	Site A (1)	Site B (2)
pH	6.1	6.2
Temperature ^{o}C	9.8	14
Dissolved Oxygen ppm	3.9	10.1
Electrolytic Conductivity m℧/cm	0.3	0.5
Turbidity ppm	7	4

(1) Flowing water from road ditch
(2) Stagnant water from swamp

TUKWILA

An old abandoned landfill exists at the end of 62nd Avenue South at the turn of South 153rd in Tukwila.

The site is located in the middle of a residential area but at the time of its operation, there was very little housing on the hill. Tukwila was an agricultural region and the landfill is remembered as a disposal site for household trash and garbage. Broken bottles and waste from the dairy which operated in the valley prior to the 1960's were also deposited there. It is thought that the site was discontinued in the mid-1940's. No documents on the site have been found.

FIELD RESULTS

This former landfill was tested for methane and trace-gas levels on October 29, 1984. Because of its small size, only three bore holes were placed for testing. Methane gas was observed only at trace levels indicating the stability of the site. Trace gas levels wer not observed above ambient air levels (Table XLII).

One water sample was retrieved from the swamp adjacent to the former fill. Water stagnation was indicated by a low dissolved oxygen level (1.2 ppm) and a relatively high electrolytic conductivity reading (0.5 milliohm/em). These data appear in Table XLIII. Leachate contamination was not indicated.

FIGURE 23

TUKWILA ABANDONED LANDFILL

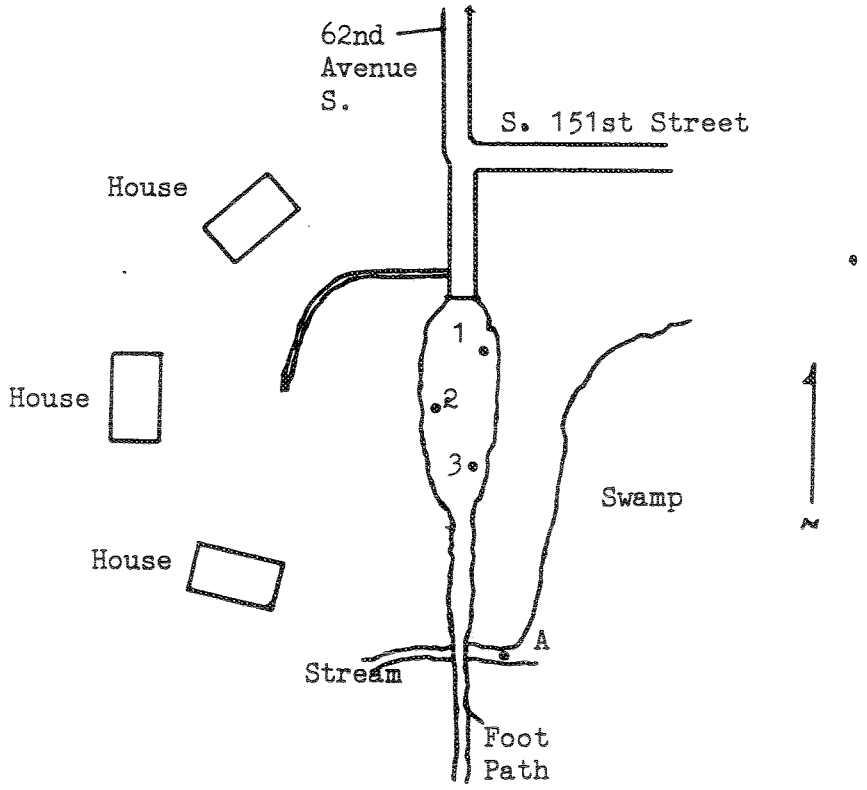


TABLE XLIII

METHANE AND TRACE GAS CONCENTRATIONS

TUKWILA ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	Trace	0
3	Trace	0

* Reading represents change from ambient air level

TABLE XLIV

SURFACE WATER PARAMETERS

TUKWILA ABANDONED LANDFILL

	Site A (1)
pH	6.0
Temperature ^{o}C	7.6
Dissolved Oxygen ppm	1.2
Electrolytic Conductivity m-℧/cm	0.5
Turbidity ppm	17

(1) Marsh/swamp water

VASHON ISLAND

Across the road from the existing Vashon Island disposal site is the location of the original Island garbage dump.

No documents regarding the original site were located. It is believed that this site closed over forty years ago. It is remembered primarily as a site where residents dumped waste "off the bank." Age and location make it an unlikely problem area.

FIELD RESULTS

This site was tested on November 17, 1984 for methane and trace gases. These data are presented in Table XLIV. Methane levels ranged from betwen 0% to trace in the nine bore holes tested indicating the age and stability of the site. Trace gas levels did not differ from the ambient air concentratons. No surface water was evident on or around the site. Of note, the wooded downhill slopes were littered with old bottles and decomposed household refuse.

FIGURE 24

VASHON ISLAND ABANDONED LANDFILL

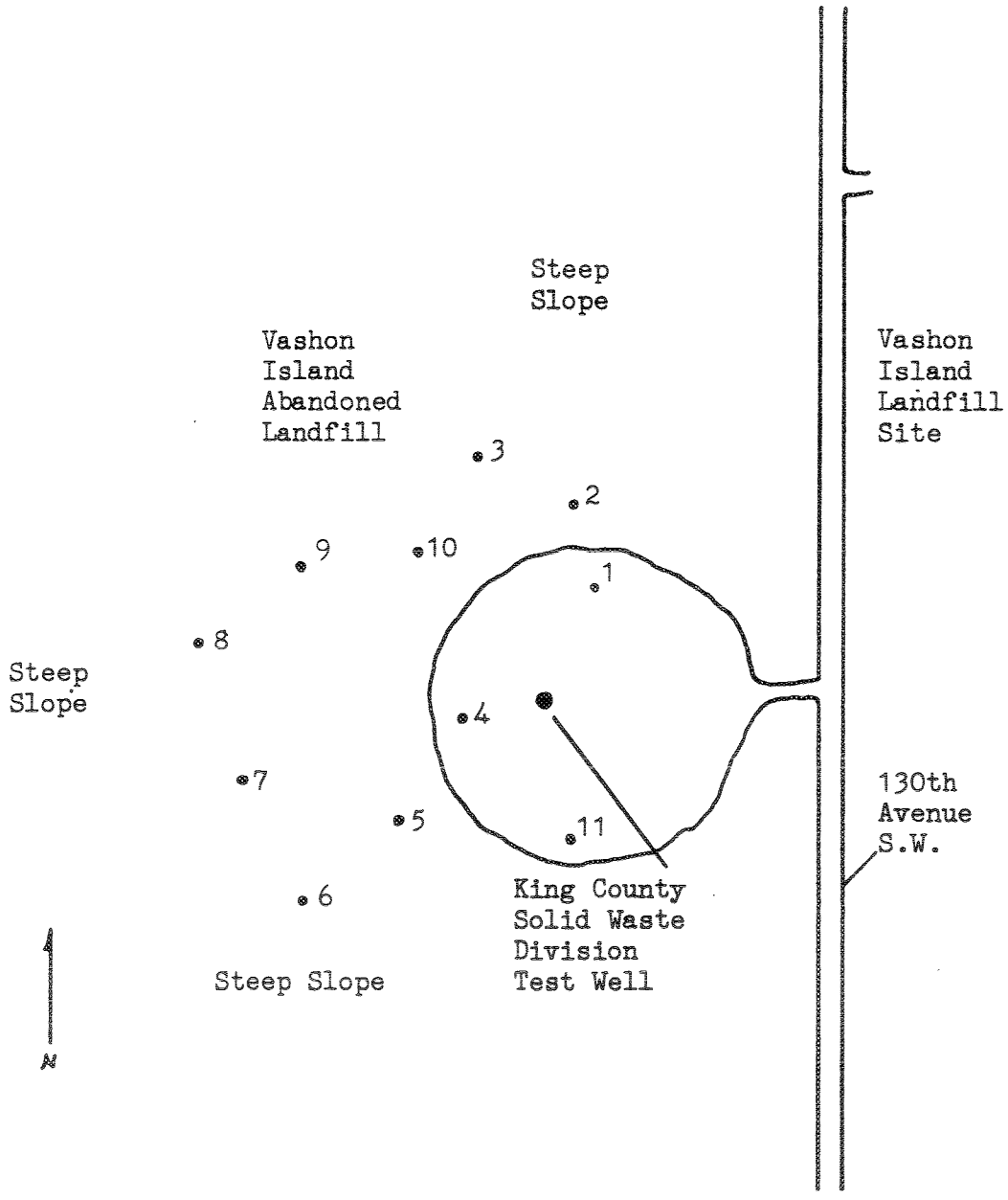


TABLE XLV

METHANE AND TRACE GAS CONCENTRATIONS
VASHON ISLAND ABANDONED LANDFILL

Site	Methane (%)	Trace Gas (ppm)*
1	Trace	0
2	0	0
3	Trace	0
4	Trace	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	Trace	0
11	0	0

* Reading represents change from ambient air level

OTHER SITES

While the preliminary study presented in the previous sections focused on known abandoned sites identified for the Environmental Health Division, during the course of the study the existence of other abandoned sites came to light. One of these, Rotary Park in Auburn, discussed in the previous sections, had operated until the mid-1960's. However, there were no records readily available for the Auburn site. This was also true for the other newly identified sites. Their existence became known either by the passing mention of a private citizen or by seeing a reference made to a site buried in a report which focused on another site or issue. They are mentioned here to demonstrate that this study does focus on the generally known and accepted disposal sites in King County. But there indeed may be others that are lost in time and in the memories of those who lived and worked throughout the County in earlier years.

Some of the sites identified during the course of researching historical references were additional and unsuspected dump sites in Renton. During the 1930's and 1940's a garbage site was in operation in the area of the old Renton Coal Mining Company. It was in the canyon area on the east side of Interstate 405, currently seen as a blackberry-covered hill below Cedar Avenue South, slightly north of South 8th Street. All materials were dumped here and burning was common.

Another site from the 1940's and 1950's is remembered along the Cedar River industrial waterway near where it makes its entrance to Lake Washington, situated between the Boeing Renton Plant and the Renton Airport. The Cedar River tract and river park area are at that location today. Fires were common at this site which reportedly received "all kinds of stuff."

In addition, bottles were found about 1969 when trenches were dug at the site of the Renton City Hall parking lot. The one time existence of a dump at that location was a suggested explanation. However, early historical pictures at the Renton Historical Society's Museum at the Old Renton Fire Station show the presence of a glass and bottle manufacturing operation in the general vicinity. It is possible that the parking lot area may have been the site of that industry's waste.

Another site referenced in some reports is "Bellefield," a third Bellevue site, distinguished from the Factoria and Bellevue Air Field sites. The Bellefield site was located on the area of what is now the parking lot of the Bellefield Office Park located between the Mercer Slough and 112th Southeast in Bellevue. According to the 1974 document, Environmental Management for the Metropolitan Area, Part IV, Solid Waste, this fill accepted rubbish, street sweepings, tires, demolition waste and industrial waste. The King County Solid Waste Management Plan of 1976 reported the Bellefield site had problems with on-site and off-site surface runoff central, leachate and gas venting. It also did not meet the minimum functional standards required for either daily cover or for a clean and sanitary site. The site apparently closed sometime after 1976.

Sites as these have been developed and used to meet community's land use needs. No documented problems have arisen to suggest that they present any existing hazards, but the fact that they, at one time, were landfill sites should be common, not forgotten, consumer knowledge.

CHAPTER IV
CONCLUSIONS AND RECOMMENDATIONS

PREFACE

The Conclusions and Recommendations that follow represent the opinion of the Seattle-King County Department of Public Health. Statements are based on the field and historic data presented earlier in this study.

The Seattle-King County Department of Public Health will submit a budget proposal to the King County Budget Office for a follow-up study of the eight abandoned landfill sites recommended for soil and/or water sampling. This project, if funded, will be conducted by the Health Department in 1986.

AUBURN ABANDONED LANDFILL (M & R STREET SITE)

This site revealed only slight readings of methane and non-specific organic/inorganic off-gasing. No surface water was available for sampling. Settling of streets, sidewalks and building foundations was readily apparent at the site. No significant environmental health problems were observed at the site and no further study is recommended.

AUBURN ABANDONED LANDFILL (ROTARY PARK)

This site exhibited elevated off-gasing of non-specific organic/inorganic gases concentrated in the eastern half of the site. Methane off-gasing was only noted at trace levels. No surface water was readily available for sampling.

It is recommended that soil and water samples be taken and analyzed for primary organics and inorganics that may be toxic to humans.

BOW LAKE ABANDONED LANDFILL

This site exhibited pockets of off-gasing of both methane and non-specific organics/inorganics. The elevated gas levels are consistent with the general type and volume of waste taken at the former landfill. Leachate was observed draining down and off the southeast portion of the property.

It is recommended:

1. The above noted leachate be intercepted and managed in an environmentally sound manner within the confines of the County transfer station property so as to prevent air, soil, and/or water contamination.

2. No further building construction take place on the property until the site has been stabilized.

3. That soil and water samples be taken and analyzed for primary organics and inorganics that may be toxic to humans.

CARTON & BORTH ABANDONED LANDFILL

This site demonstrated virtually no evidence of non-specific organic/-inorganic off-gasing and slight evidence of methane generation within the center of the site.

It is recommended:

- That methane monitoring be periodically conducted in proximity to the commercial structures adjacent to and west of the former landfill to insure that methane migration is not occurring in the building substructures.

CORLISS LANDFILL (McCORMICK PARK)

This site exhibited off-gasing of both methane and non-specific organics/inorganics. Explosive or greater levels of methane were found clustered through the central portions of the former fill. Water samples taken both up and downstream of the site in Thornton Creek revealed no evidence of leachate.

It is recommended:

1. No building construction take place on the property until the site has been stabilized.

2. Gas flaring or similar technology be utilized to reduce high concentrations of trapped methane within the fill.

3. Soil and water samples be taken and analyzed for priority organics and inorganics that may be toxic to humans.

EASTGATE ABANDONED LANDFILL

This site includes the old Bellevue Airfield and a small portion of Bellevue School District property. Little evidence of non-specific organic/inorganic off-gasing was observed. Methane gas was detected both on the former landfill and migrating to the east/northeast of the landfill. Leachate has been historically observed leaving the site via a surface ditch and draining into Phantom Lake.

It is recommended:

1. Gas flaring or similar technology be utilized to reduce high concentrations of trapped methane within the fill.

2. No further building construction take place until the landfill site has been stabilized.

3. Boeing continue methane migration monitoring, including specific checks of buildings in the path of potential migration.

4. The above noted leachate be intercepted and managed in an environmentally sound manner within the confines of the property so as to prevent air, soil, and/or water contamination.

ENUMCLAW ABANDONED LANDFILL

This site exhibited trace levels of methane off-gasing. The down gradient surface stream did not reveal evidence of leachate. Given the field data and the age of the former landfill, no environmental health problems are evidenced and no further study is warranted.

FACTORIA PIT (SUNSET RAVINE PARK)

This site demonstrated little evidence to suggest an environmental health risk. Since surface water revealed no evidence of leachate, and off-gasing was insignificant, no further study is warranted.

FALL CITY ABANDONED LANDFILL

This site revealed no evidence of methane off-gasing and one slightly elevated non-specific organic/inorganic reading. The water sample did not reveal high conductivity but the water had an oily appearance.

No significant environmental health problems were observed at the site and no further study is warranted.

H.H. OLESON

Methane and trace gas levels were observed at low levels throughout the site. The off-site water sample tested did not indicate a leachate contamination problem.

Given the depth of the fill and its relatively recent deposit, further ground settling may be expected. It is therefore recommended that no building construction take place over the fill until the property has settled.

HOUGHTON ABANDONED LANDFILL

This site exhibited elevated levels of methane off-gasing particularly in the southwest section and only low levels of non-specific organic/inorganic gases were observed. Obvious signs of leachate were not observed during site inspections. However, leachate problems have historically been encountered.

It is recommended:

1. No additional building construction take place on the landfill until it has stabilized.

2. Soil and water samples be taken and analyzed for priority organics and inorganics that may be toxic to humans.

3. Gas flaring or similar technology be utilized to reduce high concentrations of trapped methane within the fill.

KENT ABANDONED LANDFILL (MILL CREEK CANYON PARK)

This site revealed no evidence of non-specific organic/inorganic off-gasing and very little evidence of methane off-gasing. The lack of significant environmental health problems at the site make further study unnecessary.

McMICKEN HEIGHTS ABANDONED LANDFILL

This site revealed no evidence of non-specific organic/inorganic off-gasing and very little evidence of methane off-gasing. No significant environmental health problems were observed at the site and it is recommended that no further study be done.

NORTH BEND ABANDONED LANDFILL

This site demonstrated very little evidence to suggest an environmental health risk. Only one methane and one non-specific organic/inorganic reading were even slightly positive. No further study seems warranted.

PACIFIC ABANDONED LANDFILL (PARK SITE)

This site revealed low level readings of methane and non-specific organic/inorganic off-gasing. The water sample from the adjacent White River did not indicate the presence of leachate. No significant environmental health problems were observed at the site and no further study is warranted.

PUYALLUP/KIT CORNER ABANDONED LANDFILL

This site demonstrated consistently elevated levels of methane off-gasing. Although both surface water samples failed to detect leachate parameters. A stained half round corrugated pipe was observed draining from the landfill area into the freeway storm drain.

It is recommended that:

1. No building construction take place until the site has been stabilized.

2. Gas flaring or similar technology be utilized to reduce high concentrations of trapped methane within the fill.

3. Soil and surface/ground water samples be taken and analyzed for priority organics and inorganics that may be toxic to humans.

REDONDO PIT (SACAJAWEA COUNTY PARK)

This site exhibited elevated off-gasing of non-specific organic/inorganic gases, with the peak level observed in the middle terraced portion of the park. No corresponding significant levels of methane gas were noted at the site. This finding is consistent with the understanding that the site was utilized as a waste oil disposal site by the Navy and the Port of Seattle during and before World War II. No leachate was detected in the storm waste water system utilized by the park.

It is recommended that:

- Soil samples be taken and analyzed for priority organics and inorganics that may be toxic to humans.

RENTON HIGHLANDS ABANDONED LANDFILL

This site revealed no evidence of non-specific organic/inorganic off-gasing and only occasional traces of methane off-gasing. Mt. Olivet Creek was sampled and revealed no evidence of leachate. No significant environmental health problems were observed at the site and recommend that no further study is warranted.

RENTON JUNCTION ABANDONED LANDFILL

This site demonstrated relatively high levels of methane off-gasing with five of the seven test holes being within or above the explosive range. No evidence of non-specific organic/inorganic gases were observed exceeding background levels.

It is recommended:

1. That all existing building construction be properly vented and periodically monitored to insure that methane is not accumulating in any substructures.

2. That no further building construction take place over the former landfill site until it has been stabilized.

SKYKOMISH ABANDONED LANDFILL

This site revealed little evidence of methane or non-specific organic/inorganic off-gasing. No significant environmental health problems were observed at the site and no further study is warranted.

SUNSET PARK ABANDONED LANDFILL

This site exhibited active off-gasing of methane in the far southern portion of the park immediately adjacent to the Tub Lake property owned by the Port of Seattle. The non-specific organic/inorganic gases were at background levels in all but three samples and hence were not significant. The surface water sample at the border of the park and the lake property exhibited as slightly elevated specific conductivity.

It is recommended that:

1. No building construction take place at the southern portion of the park property until the site has been stabilized.

2. Water and soil sampling be conducted on Port of Seattle property (Tub Lake) and analyzed for priority organics and inorganics that may be toxic to humans.

TUKWILA ABANDONED LANDFILL

This site revealed no evidence of non-specific organic/inorganic off-gasing and very little evidence of methane off-gasing. Water sample parameters raise questions regarding the quality of on-site water and it is recommended:

- That surface water samples be taken and analyzed for priority organics and inorganics that may be toxic to humans.

VASHON ISLAND ABANDONED LANDFILL

This site exhibited no significant evidence of methane or non-specific organic/inorganic off-gasing. The monitoring well of King County Solid Waste division located on the former landfill was most recently sampled on September 12, 1984. The results indicate elevated conductivity but no corresponding high levels of heavy metals. No significant environmental health problems exist at the site and it is recommended that no further study is warranted.

GLOSSARY AND REFERENCES

GLOSSARY

1. Building Construction: Refers to a dwelling or habitable structure.

2. Stabilized: Refers to the cessation or appropriate control of methane and trace gas generation.

REFERENCES

Several individuals and secondary data sources proved helpful. Apologies are extended to any who are inadvertently missing from the following list:

1. Bishop, Larry, Soil Testing on McCormick Site, Soils and Materials Testing Lab, Redmond, Washington, April 5, 1977.

2. The Camran Corporation, A Study of Solid Waste Disposal for Seattle and King County, September 1969.

3. CH_2M Hill, Inc., "Cycle 3 Presentation Decision Document," Solid Waste Management Study, RIBCO, April 1, 1974.

4. CH_2M Hill, Inc., Environmental Management for the Metropolitan Area, Part IV. Solid Waste, Seattle, Washington, December 1974.

5. CH_2M Hill, Inc., Seattle Area Oil Waste Disposal Facility Study, City of Seattle, Port of Seattle, Municipality of Metropolitan Seattle (METRO), King County, Washington Water Pollution Control Commission, August 1969.

6. Cheremisinoff, P. and Gigliello, K., Leachate from Hazardous Waste Sites, Technomic Publishing Company, Inc., Lancaster, Pennsylvania, 1983.

7. Entranco Engineers, I-90 Bellevue Business Park: Water Quality Impact Analysis: Priority Pollutant Amendment, May 1984.

8. Environmental Protection Agency, Region 10, Emergency and Remedial Response Information System (ERRIS), Records by State, County and Site Name, Report: 100, March 12, 1984.

9. Felton, Samuel, Phantom Lake Water and Sediment Samples of January 1981 and April 1981, University of Washington Fisheries Center, April 20, 1981.

10. Gowrylow, Mike, "Battle Over Phantom Lake's Silt," Journal American, Page 1, January 14, 1983.

11. Haggard, Joel E., King County Solid Waste Disposal - For 2020 Vision, Volume I, (Prepared for King County Department of Public Works, Solid Waste Division), February 1970.

12. Hanford, C.H., Seattle and Environs, 1852-1924, Volume 1, Chicago and Seattle: Pioneer Historical Publishing Company, 1924.

13. Highline Times, At Sunset Park, County has Until June to Remedy Oil Seepage, May 9, 1973.

14. Jongejan, Gerrard, North Sea-Tac Park: A Joint Planning Effort by the Part of Seattle and King County, McNeal, Inc., January 1980.

15. King County Department of Public Works, Transfer Stations Replace Limited Maintenance Dumps, Pages 91-94, April 1963.

16. King County Department of Public Works, Solid Waste Division, Abandoned Landfill Site Files: Bow Lake, Eastgate, Enumclaw, H.H. Oleson, Houghton, Miscellaneous, Pacific City, Puyallup, Renton Junction, Skykomish.

17. King County Department of Public Works, Solid Waste Division, Final Environmental Impact Statement, Northshore Transfer Station, April 1979.

18. King County Department of Public Works, Solid Waste Division, Solid Waste Disposal Alternatives for the Skykomish Area, Town of Skykomish, May 1978.

19. King County Department of Public Works, Solid Waste Division, "Skykomish to Get Mini Transfer Station," Waste Watcher, Volume 1, No. 2, January 1979.

20. Horton, Dennis and Assoc., Inc., Playground Drainage and Grading Sunset Park, Specifications/Contract Documents, King County Parks Department, Seattle, Washington, July 1965.

21. Municipal News, Freeway Grabs Two County Garbage Fills, Page 33, March 7, 1959.

22. Municipal News, Garbage Dumps Give Way to Transfer Sites, Page 120, November 12, 1960.

23. Municipal News, Huge Ravine Proposed for Garbage Fill, April 28, 1956.

24. Municipal News, Improvements in County Garbage Transfer Program, September 23, 1963.

25. Municipal News, League Endorses County Garbage Disposal, Page 81, June 25, 1960.

26. Municipal News, League Recommends Survey of Garbage Problems, Page 107, July 25, 1959.

27. Municipality of Metropolitan Seattle (METRO), Draft Supplemental Environmental Impact Statement, North Operating Base, July 1984.

28. Nordmark, John L, Garbage Dump in Renton, King County Planning Commission Correspondence to John E. VanAmburgh, Department of Public Health, June 7, 1951.

29. H.H. Oleson, Inc., SEPA Environmental Checklist, King County Solid Waste Division, H.H. Oleson Landfill File, 1977.

30. Phelps, Myra L., Seattle Engineering Department: A Narrative History 1875-1975, Seattle Public Works Department.

31. Puget Sound Conference of Governments, Solid Waste Management Board, Comprehensive Solid Waste Management Plan for King County, Draft Environmental Impact Statement, November 30, 1982.

32. Puget Sound Governmental Conference, Animal Program Report (1969-1970), Solid Waste Management Plannins, HUD Project No: WASH P-1604, 1969 Program Application - Component "3D," March 1970.

33. Rand, M.C., Greenberg, A.E., Toras, M.J., Editors, Standard Methods for the Examination of Water and Wastewater, 14th Edition, American Public Health Association, 1976.

34. Seattle-King County Department of Public Health, King County Comprehensive Solid Waste Management Plan and Minimum Functional Standards for Solid Waste Handling, Draft Environmental Impact Statement, 1976.

35. Seattle-King County Department of Public Health, Public Health in Seattle and King County, Annual Report, 1948.

36. Seattle Municipal News, Public Works Board Garbage Report, Page 55, April 3, 1943.

37. The Seattle Times, City Park Replaces Dump, (E5), Sunday, September 10, 1972.

38. The Seattle Times, Gravel-Mining Permit Back for Rehearing, April 9, 1972.

39. Shannon and Wilson, Inc., Subsurface Investigation Proposed Rendondo Park, King County, Washington, (for Lloyd Thorson, Landscape Architect), December 18, 1970.

40. University of Washington and State College of Washington, Graduate Sanitarians, Community Report of Kent, Washington, August 1956.

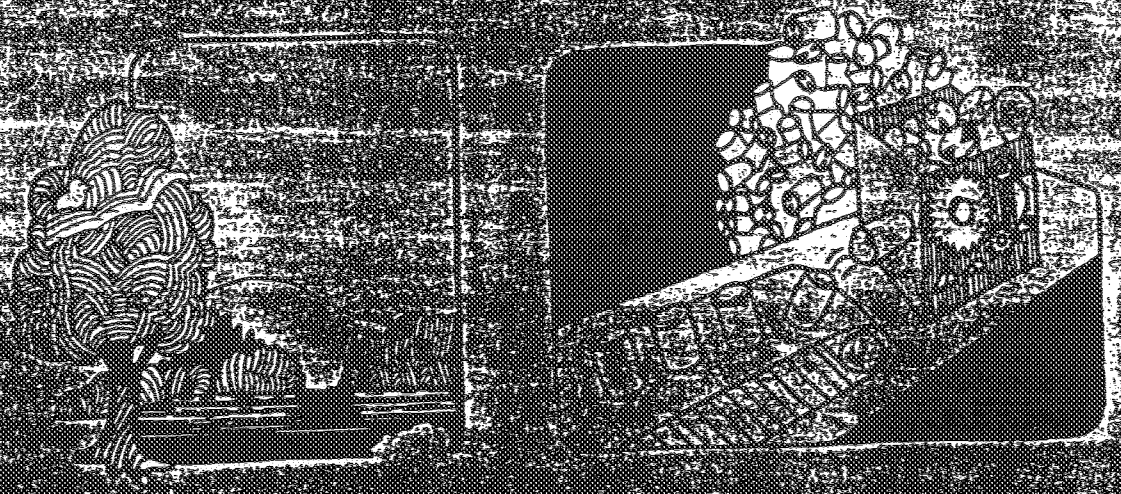
Personal Discussions With:

Lauren Anderson, City of Bellevue
Maxine Anderson, City of Tukwila
Leonard Chapman, City of Auburn
Hayes Evans, Seattle-King County Department of Public Health and King County Public Works (Retired)
Robert Howell, Tacoma-Pierce County Health Department
Robert Hughes, City of Kent
Bob Jacobs, King County Parks Department
Jack Lange, City of Auburn (Retired)
Don Mosley, City of Enumclaw
Municipality of Metropolitan Seattle (METRO), Water Quality Section
Ron Nelson, City of Renton
Pat Nevins, City of Auburn
Pat O'Flagherty, JRB Associates
Leon Owen, King County Public Works
Doug Pierce, Tacoma-Pierce County Health Department
Norm Regan, City of Enumclaw
Byron Sneva, City of Tukwila
John Throap, Auburn private citizen
Ernie Tonda, Renton Historical Society
A.K. VanDusen, King County Public Works (Retired)
Don Wickstrom, City of Kent
Paul Wolfe, Auburn private citizen

EXHIBIT "E"

177
R 4[illegible]

Environmental Management for the Metropolitan Area



Part IV

Status Report

December 1974

E-1

CONTENTS

E-2

CONTENTS
(Continued)

E-3

CONTENTS
(Continued)

FIGURES

E-5

PRIVATE SECTOR

Private industry is currently involved in all aspects of solid waste handling in King County. It is difficult to evaluate the activities of this sector on the same basis as the governmental sector because private companies are involved in only the operations management of the system, whereas government is involved in both administrative and operations management.

The major private waste disposal companies in King County include Marine Disposal Company, which operates a transfer station in the Seattle industrial area and a landfill on the Tulalip Indian Reservation; the Palmer Coking Coal Company, which operates a demolition landfill in the Newcastle area; the Bellefield Company, which operates a demolition fill in the Mercer Slough; Chempro in Seattle, which handles numerous special and hazardous wastes; and Western Processing in Kent, which also handles special and hazardous wastes.

The services of the private sector and those of the governmental entities generally complement each other. The notable exception concerns transfer stations and disposal sites operated by the Marine Disposal Company, which competes with the City of Seattle and King County. In Seattle this competition is for nonresidential wastes alone, while in King County, competition is for both residential and nonresidential waste disposal.

Seattle and King County have the responsibility to ensure that adequate solid waste disposal is available for their respective jurisdictions. These responsibilities have resulted in construction of transfer stations and establishment of landfills by both jurisdictions as the most economical method of meeting the needs of waste management. These transfer stations and landfills were designed in the mid-1960's to handle waste loads that could be anticipated for approximately the next 20 years.

Subsequent to the design and construction of some of the King County transfer stations, Marine Disposal Company established a private transfer station on the Seattle waterfront. The private transfer station creates two problems for the governmental entities. The first relates to the responsibility for providing waste disposal service to the public and the commitment in physical facilities that has already been made to carry out that responsibility. The second problem relates to the effects of competition on the economics of facility operation. These problems are discussed below.

The governmental agencies are at a clear disadvantage in the current situation from a standpoint of responsibility. They have the responsibility to ensure adequate solid waste management, regardless of who operates the system and are not empowered to delegate it to any private operator of public facilities. In the current system, the responsibility has been assumed by constructing public facilities to handle the waste quantities. The commitment to build these facilities was made in May 1965. The facilities were designed to handle the waste flow from Seattle in any given year and now require this flow to pay for the investment previously made. It is fortunate that the City of Seattle controls the residential waste stream within its boundaries; the city may move to control the

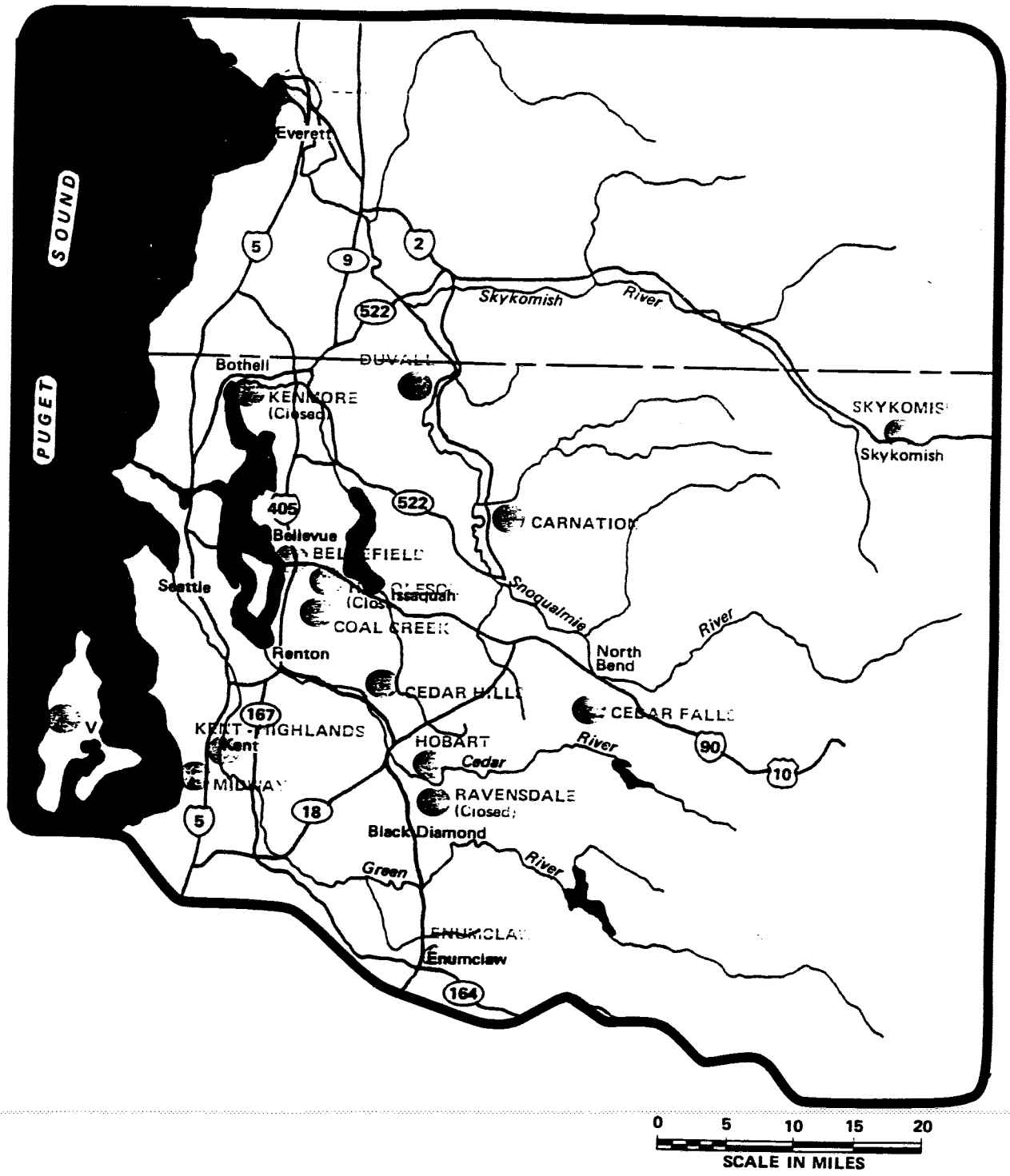


FIGURE 26

DISPOSAL SITE LOCATIONS

E-7

Five private landfills operate in the county–in addition to the Tulalip site–taking in some 13 percent of disposed wastes (see table 24). They operate under varying permits. Typically, those in unincorporated areas require a "conditional use" permit from the County Planning Department, and a grading permit from the Building Department. To secure these permits, it is necessary to submit operational plans, descriptions of wastes to be disposed, and the number of vehicles that will be using the site. Conflicts of responsibility result because permit violation inspections are conducted by three departments–Building, Public Works (Solid Waste Division), and Health. The result is inadequate enforcement.

Table 24. **Private Solid Waste Disposal Sites**

	1972 Tonnage Handled[1]	Hours & Days of Operation	Remaining Capacity[2]
Bellefield	64,800	8 a.m. to 5 p.m. Daily	1 year
Coal Creek	17,500	7 a.m. to 7 p.m. Daily	3 years
H. H. Oleson	14,400	Currently closed	None
Kenmore	55,800	Currently closed	Unknown
Ravensdale	260	Currently closed	Unknown
Tulalip	270,000	5 days/week (Monday-Friday)	15 years
Total	**422,760**		

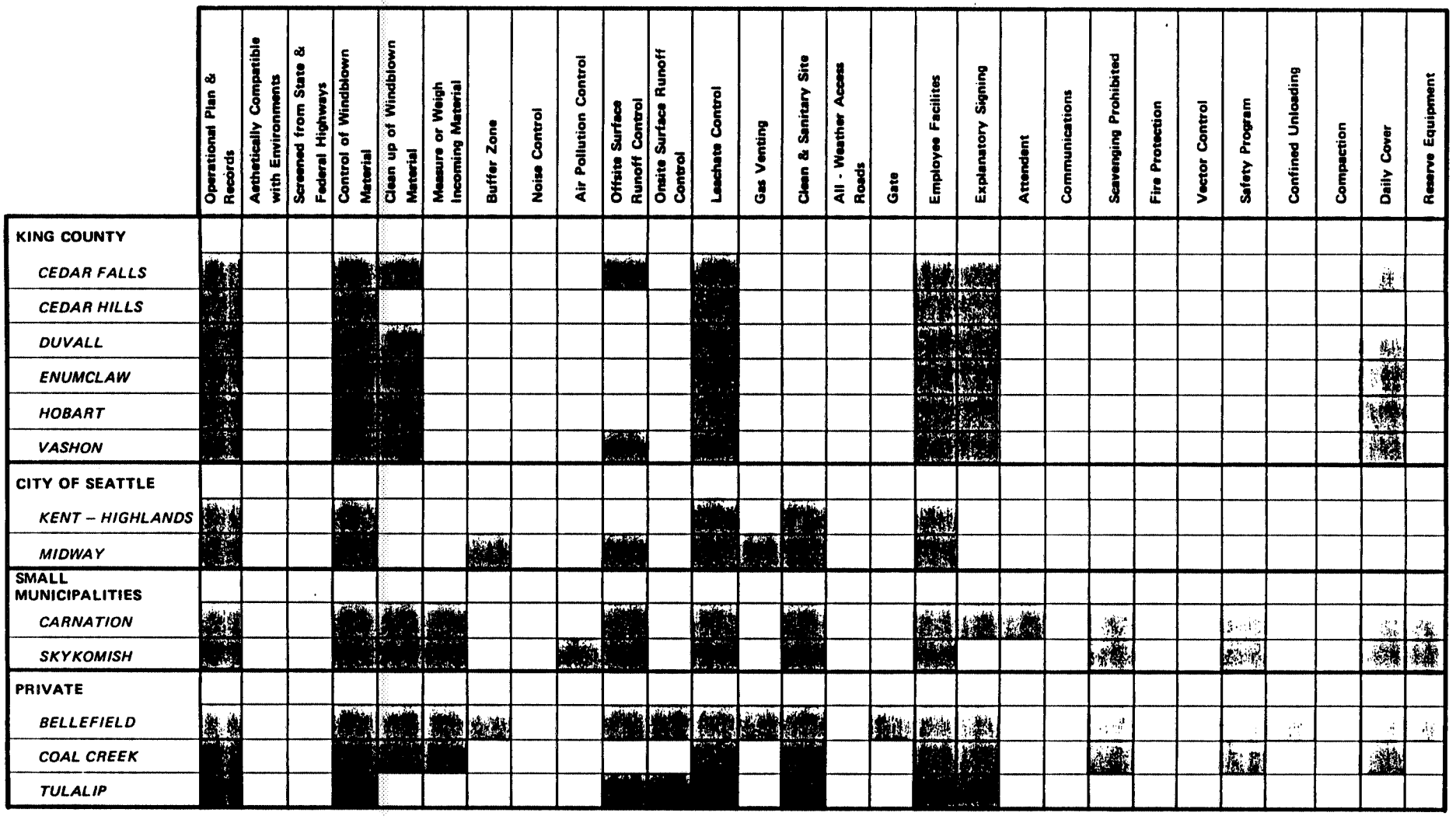
1 Estimates from interviews and monitoring programs. See appendix B.
2 Beyond 1973. At current levels of waste input in areas presently approved for filling.

Effects of Standards

An evaluation of sites by the county *Minimum Functional Standards* identified major inadequacies at all sites, including lack of operational plans and records, leachate control, and adequate employee facilities. In addition, the *Minimum Functional Standard* requirement for daily cover is met at only the four large landfills. A minor inadequacy seen at all sites was lack of control over windblown material. Only three landfills had adequate signs designating the site name, hours of operation, and types of waste accepted. Also, most of the landfills failed to meet standards for cleanup of windblown material, offsite surface runoff control, and maintenance of a clean and sanitary site. A complete evaluation of each site is shown in table 25.

E-8

Table 25. **Compliance with King County Minimum Functional Standards**



Disposal costs are also higher than necessary due to an unavoidable duplication of costs and service with the county's three major disposal systems. For example, the remote rural sites in King County's Solid Waste Division are expensive to operate and would be costly to upgrade for compliance with *Minimum Functional Standards.* Rural transfer stations located in these areas, as discussed earlier in this chapter, would provide greater convenience. In general, unit costs of land disposal are reduced with larger operations, as can be seen by comparing smaller, rural landfill unit costs to Cedar Hills landfill unit costs on table 26.

Site Capacities

When considering the future of the existing disposal system, the single most important factor is the life remaining in landfills. It is important to know in advance when sites will be exhausted so that new sites or methods of disposal can be found without a disruption of service. Using estimates provided by operating agencies or conservative calculations, the closing dates for disposal sites were projected. They are shown in table 28.

The existing major landfill system appears to have adequate capacity until the year 1991 in the worst case. This estimate is based on the following assumptions:

- Constant per capita waste generation.
- No construction of new sites (except for demolition wastes).
- Starting in 1975, all wastes will be disposed within the county.

The projection is based on reasonable estimates of remaining site capacities and routing of waste flows within the system. If the capacity of any site has been substantially overestimated, the entire system's life might be significantly shorter. This possibility is another reason for the immediate development of operational plans that include measurements of remaining capacities at all the landfills. A special facet of this problem is that the two existing private demolition waste sites will be closed by 1976, and Midway, which also accepts demolition wastes, is scheduled to close in mid-1976.

General Considerations

The equipment used in landfills receives hard usage, but has an operating life about the same as that used in the construction industry. The two landfills in Kent each have a compactor, dozer, scraper, and two water trucks. The county's landfill at Cedar Hills has twice as many pieces of equipment. Small landfills typically operate with a single dozer or front-end loader. Seattle and King County report an average operating life of 9 to 10 thousand hours (4 to 5 years) for dozers, compactors, and front-end loaders at their sites.

E-10

Table 28. **Estimated Life of Landfills Serving King County**

	Estimated Closing Date [1]
King County	
Cedar Falls	38% capacity remaining after 2000
Cedar Hills	Early 1991
Duvall	Late 1978
Enumclaw	Early 1985
Hobart	Early 1983
Vashon	50% capacity remaining after 2000
City of Seattle	
Kent-Highlands	Late 1980
Midway	Mid-1976
Small Municipalities	
Carnation	47% capacity remaining after 2000
Skykomish	Early 1985
Private	
Bellefield	Late 1974
Coal Creek	Late 1976
Tulalip	Late 1988[2]

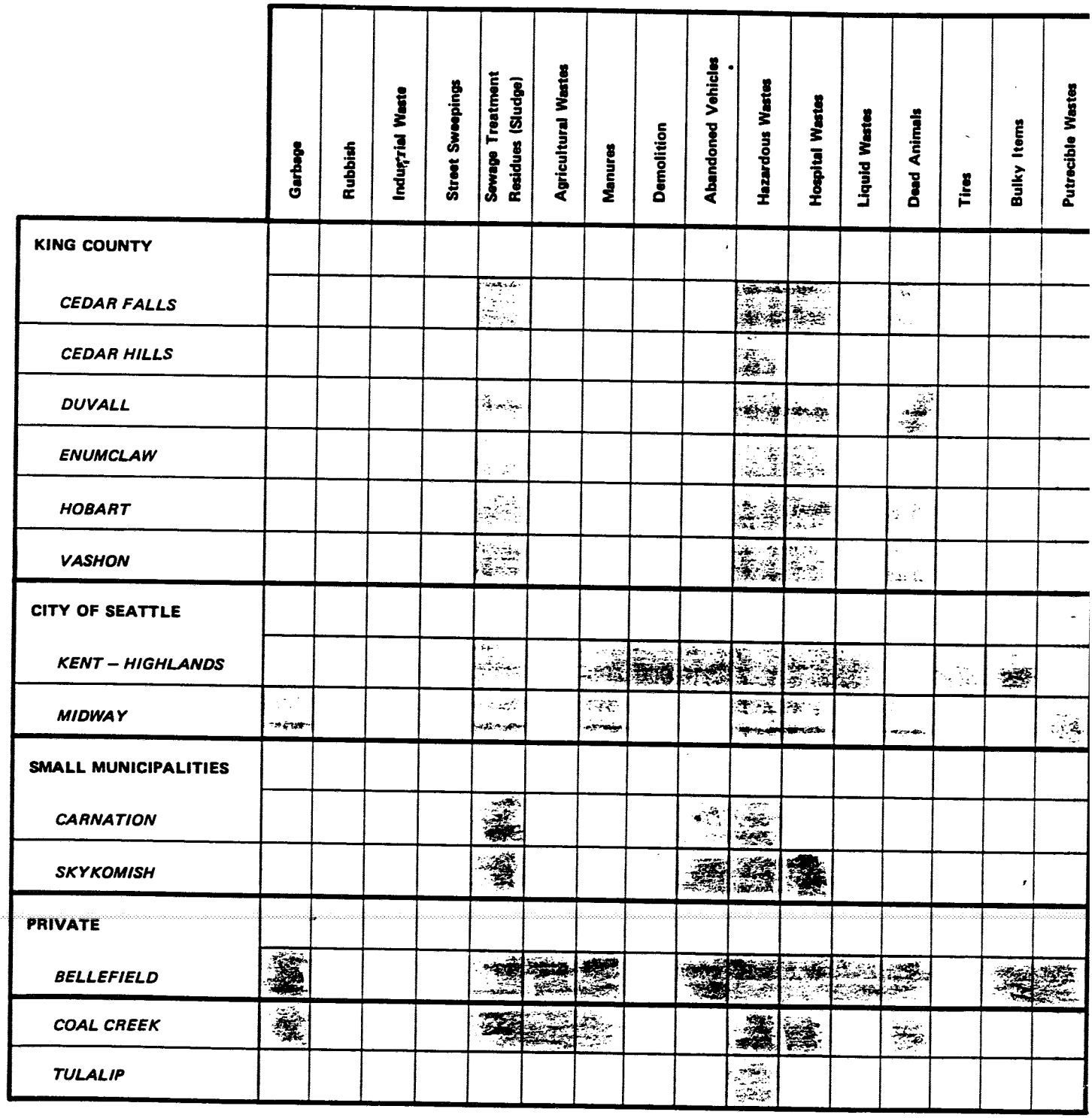
1 Assuming current waste disposal practices continue.
2 This assumes that operations continue at present levels.

The City of Seattle employs 13 people at its landfills. Twenty-nine are employed by King County. Nine are employed by Marine Disposal Company at the Tulalip site. Usually only one equipment operator works at the smaller county and private sites, often intermittently.

While access at the large public sites is limited to larger vehicles, the most significant restrictions apply to waste types. Table 29 lists wastes accepted for disposal at the various landfills. The consideration is whether or not a particular waste can be handled and disposed of safely. Industrial, hazardous, and liquid wastes pose the greatest problems. A special site that had been handling these wastes near Pasco was closed at the end of 1974. Special wastes are discussed in more detail below.

E.11

Table 29. **Solid Wastes Accepted for Disposal**

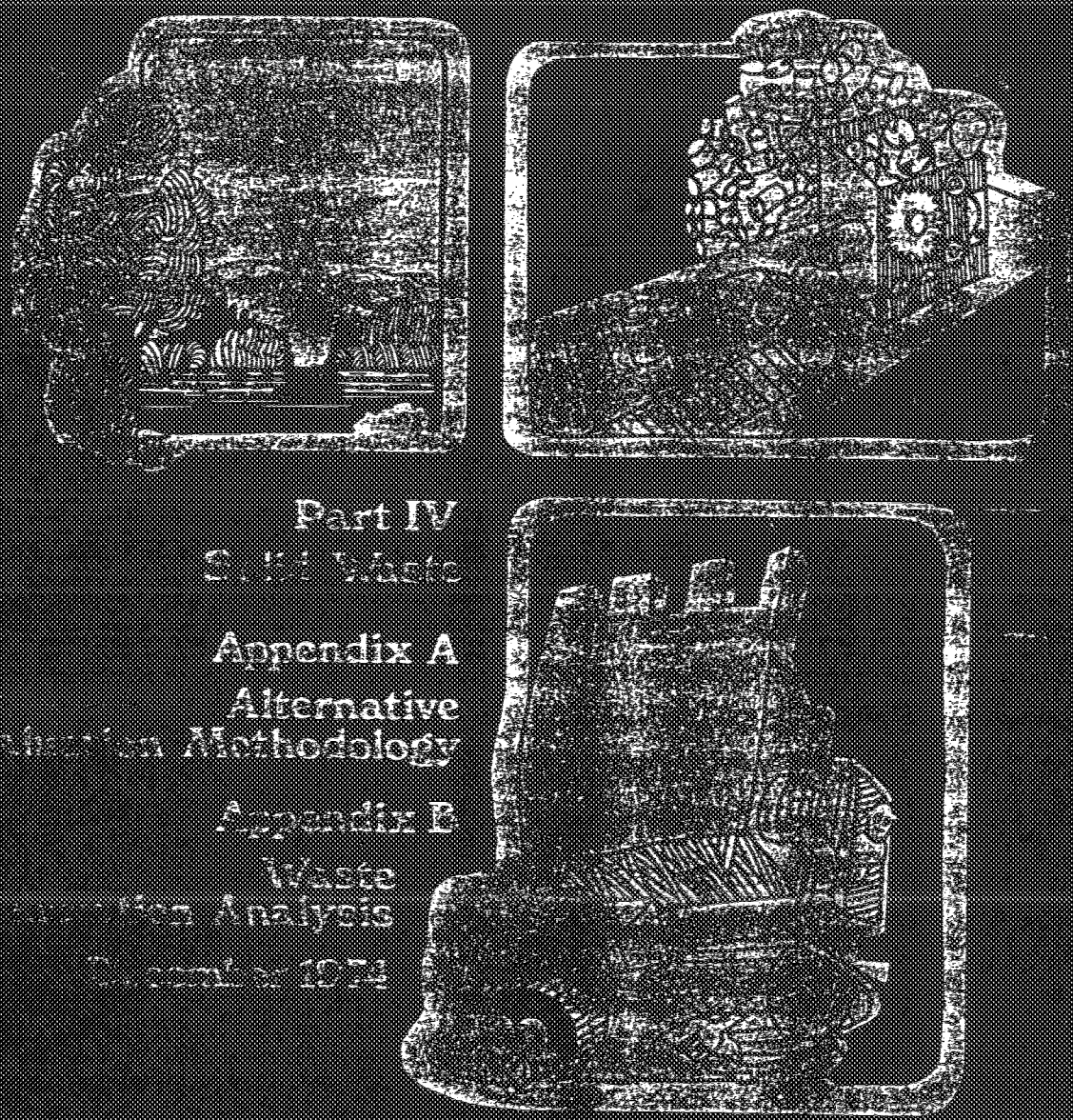


ACCEPTED

NOT ACCEPTED

E-12

Environmental Management for the Metropolitan Area



Part IV
Solid Waste

Appendix A
Alternative
Generation Methodology

Appendix B
Waste
Composition Analysis

December 1974

DISPOSAL APPROACH

To verify the quantities of solid wastes estimated through the generation approach procedures, the amount actually entering the final disposal sites was monitored. To accomplish this, the quantities entering the 15 disposal sites in King County in 1972 were determined by combining information from four separate sources. The City of Seattle records provided an actual tonnage entering the City of Seattle landfills at Midway and Kent-Highlands.

The quantities entering demolition sites--Bellefield, H. H. Oleson, and Kenmore--were estimated from an analysis of the generation of demolition and construction wastes in the county and the percentage of these wastes entering these three sites along with rough estimates of waste throughput from site operators.

Estimates for King County disposal sites, other than Cedar Hills, were obtained from 1972 estimates of the total tonnage handled at these sites by the King County Solid Waste Division. Quantities for the remaining small city and private sites were estimated by the King County Solid Waste Division.

Finally, special monitoring programs were undertaken between 25 June and 7 July 1973 at both the Massachusetts Street Barge Transfer Station and the King County Cedar Hills landfill to ascertain waste quantities handled at each of these facilities. From 25 June to 7 July, portable scales at the Cedar Hills site weighed incoming vehicles. This included all long-haul transport trucks and private refuse collection trucks serving Issaquah, North Bend, Black Diamond, and Maple Valley. Also

weighed were occasional loads of road construction waste from several highway construction jobs operating in the area. Other wastes that regularly entered Cedar Hills were also monitored; included were special wastes discussed in chapter 5 of the *Solid Waste* management report. Figure B-1 shows the weekly fluctuation of waste entering Cedar Hills landfill from the six King County transfer stations during the monitoring period. Extrapolating the 2-week data from the Cedar Hills monitoring gives a total of 258,000 tons per year entering from the transfer stations, with an additional 11,000 tons per year from the other sources.

During the same period of time, a monitoring operation was also underway at the Massachusetts Street Barge Transfer Station. Although this facility has a certified scale and weighs each load that enters, the historical records of these weights were not available to the study team. For this reason, the weights were recorded by study team employees during the 2-week monitoring period. This information yielded daily quantities entering the barge from Seattle, Mercer Island, and the east side of Lake Washington. The total daily quantities entering the facility during the monitoring period are plotted on figure B-2. A reduction in waste throughput occurred on Independence Day during the second week of monitoring. For this reason, the first week alone was used for projections of annual tonnages. This indicated that approximately 243,000 tons enter the facility annually.

These quantities for both the Cedar Hills landfill and the Massachusetts Street Barge Transfer Station, together with estimates of tonnages entering the other landfills in King County, are represented in table B-4. The total waste quantity

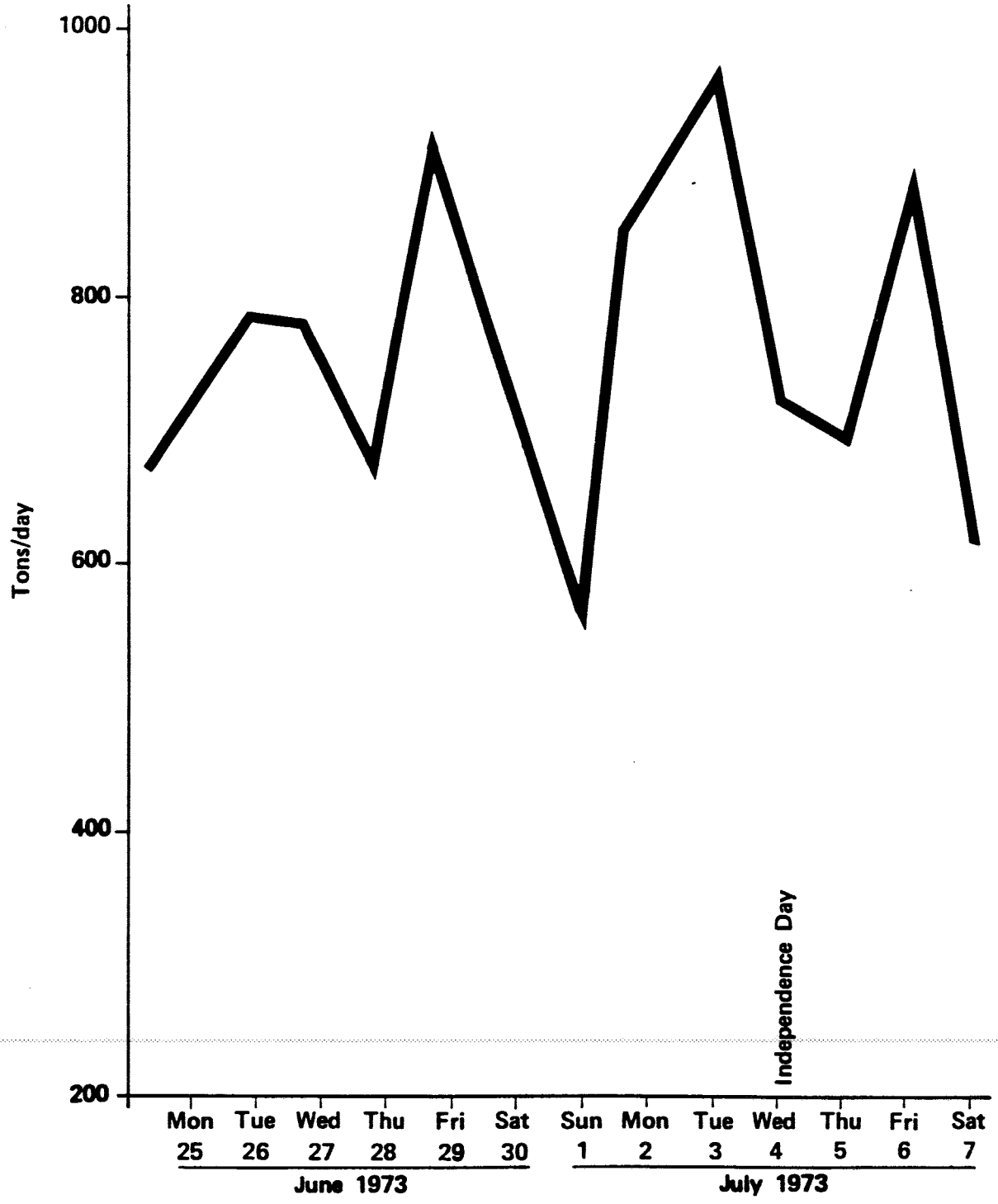


FIGURE B - 1

KING COUNTY TRANSFER STATION WASTE LOADING MONITORED AT CEDAR HILLS SANITARY LANDFILL

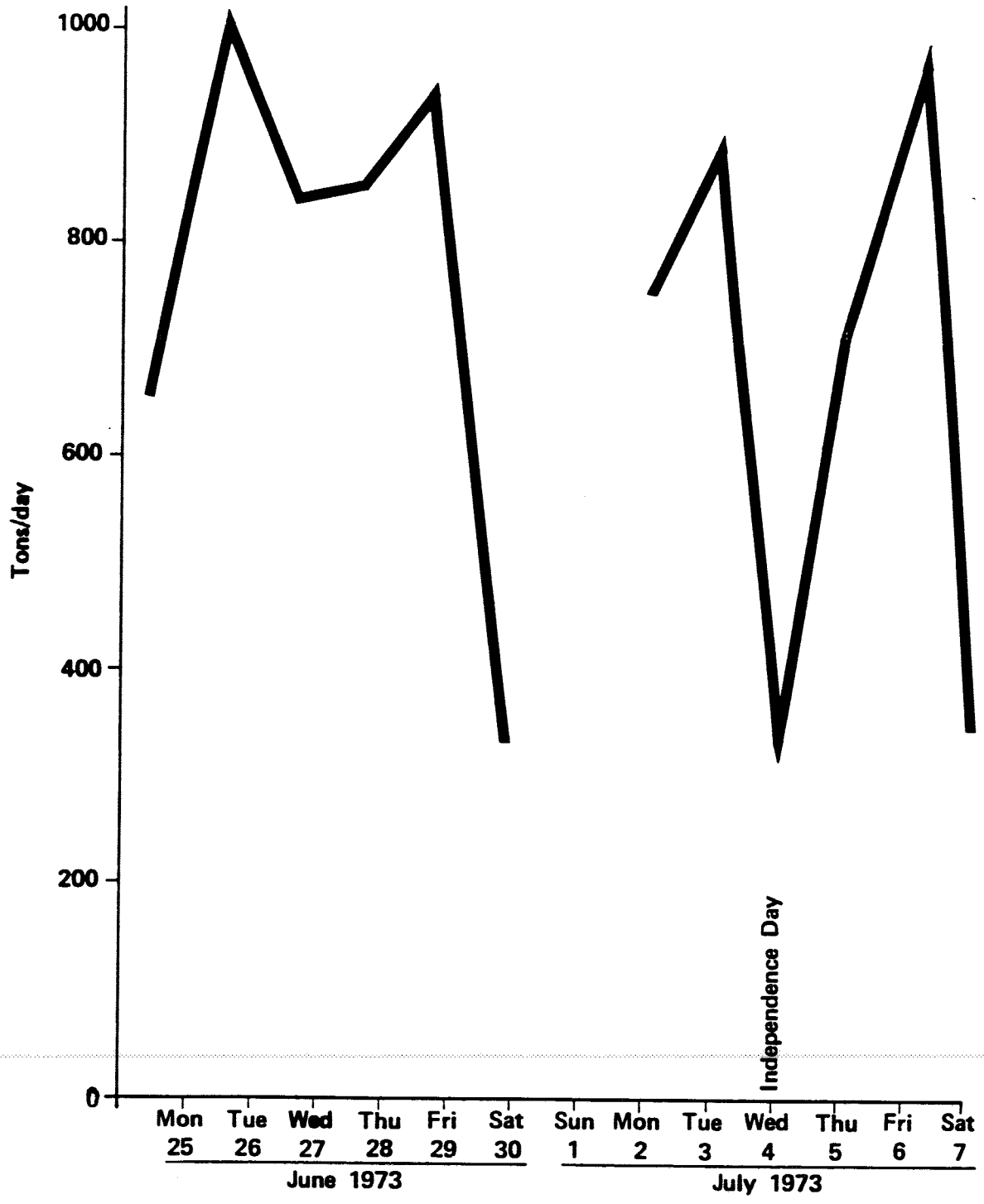


FIGURE B-2

MASSACHUSETTS STREET BARGE
TRANSFER STATION WASTE LOADING

Table B-4

ESTIMATED SOLID WASTE QUANTITIES
ENTERING SITES IN KING COUNTY
(1972-1973 Estimates)

Disposal Site	Controlling Agency	Annual Tonnage
Bellefield	Private	64,800
Carnation	City of Carnation	500
Cedar Falls	King County	3,900
Cedar Hills[1]	King County	269,500
Coal Creek	Private	17,500
Duvall	King County	12,800
Enumclaw	King County	8,300
H. H. Oleson	Private (now closed)	14,400
Hobart	King County	13,700
Kenmore	Private (now closed)	55,800
Massachusetts Street Barge[2]	Private	243,300
Ravensdale	Private (now closed)	300
Seattle Landfills[2] (Midway and Kent-Highlands)	City of Seattle	418,100
Skykomish	City of Skykomish	300
Vashon	King County	6,600
TOTAL TONNAGE		1,129,800

1 From actual monitoring of disposal at these sites.
2 From 1972 City of Seattle Solid Waste Utility records.

entering landfills in 1972 is 1.13 million tons per year using these estimates.

ADJUSTMENTS OF WASTE QUANTITIES

The previous discussion shows 1.26 million tons estimated to travel from the generation sources to the final disposal sites, and 1.13 million tons estimated to actually enter these sites. Since both numbers are estimates, the actual tonnage disposed in 1972 probably lies somewhere between these estimates.

Assuming this to be the case, the magnitude of the adjustment must be determined. Both King County and Marine Disposal Company report that annual quantities handled somewhat exceed those projected from survey data in this study. King County indicates that 270,000 tons are handled annually through the transfer stations and an additional 30,000 to 80,000 tons of wastes enter the site from other sources. The discrepancy between these data and information gathered during the monitoring period is due in part to some inaccuracy of the scales used during the monitoring period and the short duration of the sampling period, which would not allow sufficient time to detect seasonal fluctuations. Adjusting for these differences, the total quantity of waste handled at Cedar Hills in 1972 is estimated at 309,000 tons.

Previous estimates of the Massachusetts Street Barge Transfer Station waste throughput have been 300,000 tons per year. Since the monitoring data could not account for seasonal fluctuations, a similar adjustment for these factors as applied to the data for Cedar Hills places the estimate of waste for this facility at 270,000 tons annually.

Having adjusted the waste throughput for Cedar Hills and the Massachusetts Street Barge Transfer Station quantities, the adjustment of the other small sites remained. Since no easily identifiable guidelines exist for such an adjustment, the total of 1.2 million tons was selected as a total disposal figure and the quantities at the small King County landfills were adjusted upward to absorb the waste difference. The selection of 1.2 million tons was based on a consideration of the mean between the 1.26 million tons generated combined with the 1.13 million tons of estimated disposal and tempered with the lack of seasonal fluctuation data in the 1.13 million figure. The resulting disposal tonnages are shown in table B-5.

It should be noted that an accurate knowledge of waste generated and disposed is necessary for good solid waste management planning. This information aids in the activities of budgeting, priority establishment, and enforcement. Upon implementation of this plan and the resultant installation of scales at all facilities, better recordkeeping will be available to establish a reliable set of base data for system decisionmaking.

Table B-5

ASSUMED SOLID WASTE QUANTITIES
ENTERING LANDFILL SITES IN KING COUNTY
(1972-1973 Estimates)

Disposal Site	Controlling Agency	Annual Tonnage
Bellefield	Private	64,800
Carnation	City of Carnation	500
Cedar Falls	King County	4,300
Cedar Hills	King County	309,000
Coal Creek	Private	17,500
Duvall	King County	13,900
Enumclaw	King County	9,000
H.H. Oleson	Private (now closed)	14,400
Hobart	King County	14,900
Kenmore	Private (now closed)	55,800
Massachusetts Street Barge	Private	270,000
Ravensdale	Private (now closed)	300
Seattle Landfills (Midway and Kent-highlands)	City of Seattle	418,100
Skykomish	City of Skykomish	300
Vashon	King County	7,200
TOTAL TONNAGE		1,200,000

Table 36. **Transfer/Transport and Disposal Impacts — Existing System**

	SHORT-TERM	LONG-TERM	
ADVERSE IMPACT RATINGS	△	▲	SLIGHT - MINOR IMPACT
	○	●	MODERATE - NOTICEABLE IMPACT
	□	■	SEVERE - MAJOR IMPACT
			NONE - NO IMPACT

ELEMENT	CAUSE	IMPACT	MITIGATION	DISPOSAL SITES: KC: CEDAR FALLS	KC: CEDAR HILLS	KC: DUVALL	KC: ENUMCLAW	KC: HOBART	KC: VASHON	SEA: KENT-HIGHLANDS	SEA: MIDWAY	SM: CARNATION	SM: SKYKOMISH	P: BELLEFIELD	P: COAL CREEK	P: TULALIP	TRANSFER/TRANSPORT: KC: ALGONA	KC: BOW LAKE	KC: FACTORIA	KC: FIRST AVE. N. E.	KC: HOUGHTON	KC: RENTON	SEA: NORTH	SEA: SOUTH	P: MASS. ST. BARGE
NATURAL SYSTEMS																									
I FLORA	Landfill - Clearing & grubbing of land	Destruction of native trees, shrubs, & ground cover	Initiate landscaping program	◭	▣	▲	◭	◭	▲	▣		◭	◭	▣	◭	▣									
	Landfill on or near bodies of water	Destruction of aquatic plant life	Avoid sites involving bodies of water											◉		▣									
	Construction of transfer stations	Destruction of native trees, shrubs, & ground cover	Initiate landscaping program														▲	▲	◉	▲	▲		▲	▲	
II FAUNA																									
A. WILDLIFE Land Animals	Landfill - Clearing & grubbing of land	Destruction of wildlife habitat	Restore natural vegetation	◭	▣	◭	◭	◭	▲	◭		◭	◭	◭	◭	▣									
	Construction of transfer stations	Destruction of wildlife habitat	Restore natural vegetation														▲	▲	▲	▲					
B. WILDLIFE Aquatic	Landfill on or near bodies of water	Potential hazards & loss of habitat	Avoid sites involving bodies of water											▲		▣									
	Leachate generated from solid wastes	Potential hazards to aquatic life	Collect & treat leachate		▲					▲						◉									
C. PEST POPULATION	Exposed garbage for long periods of time	Propagation of rodents, flies, & other vectors	Cover garbage as soon as possible and maintain sanitary conditions	▲	▲	▲	▲	▲	▲	▲		▲	◉			▲									
		Attraction of birds	Cover garbage as soon as possible & maintain sanitary conditions					▲	○	○						◉		▲				▲	▲	▲	
D. MICRO-FAUNA	Landfill operation	Destruction of soil habitat	Avoid operation & restore proper soil conditions	◭	◭	◭	◭	◭	◭	◭		◭	◭	◭	◭	◭									
	Construction of transfer station	Destruction of soil habitat	Avoid construction & restore proper soil conditions														▲	▲	▲	▲	▲	▲	▲	▲	
III WATER																									
A. SURFACE WATER DIVERSION	Site grading	Alteration of natural drainage patterns & increased runoff	Avoid construction	▲	◉	▲	▲	▲	◉	▣	▲	▲	▲	▲	▲	▲	◉	▲	▲	▲	▲				
B. GROUND-WATER MOVEMENT	Landfill - creation of man-made aquifer	Temporary storage of atypical ground-water susceptable to pollutants	Increase waste compaction & collect & treat leachate	▲	◉	◉	◉	◉	◉	▲	◉	◉	▲	▲	▲	▲									
C. GROUND & SURFACE WATER QUALITY	Surface water runoff from site	Degradation of adjacent surface & groundwater	Collect & treat runoff					▲	▲				▲	▲	◉	▲	▲	▲	▲	▲	▲			▲	
	Production of leachate from solid waste	Degradation of adjacent surface & groundwater	Collect & treat leachate	▲	◉	▲	▲	◉	▲	◉	▲	▲	▲	▲	▲	▣									
	Production of gases from solid waste	Degradation of adjacent surface & groundwater	Gas control & venting												▲										
	Operation on or near bodies of water	Potential floating debris	Cover transport vehicle & use floating boom cables										△		▲									◉	
IV ATMO-SPHERE	Landfill operation	Dust	Sprinkling measures	▲	◉	◉	▲	▲	◉	△	△	▲	▲	△	△	◉									
	Landfill - burning or spontaneous combustion	Particulate & gas degradation of air quality	Fire prevention & protection measures	△	△	△	△	△	△	△	△	△	□	△	△	△									

NOTE KC = King County, SEA = City of Seattle, SM = Small Municipality, P = Private

E-22

Table 36. Continued

	SHORT-TERM	LONG-TERM	
ADVERSE IMPACT RATINGS	△	▲	SLIGHT - MINOR IMPACT
	○	●	MODERATE - NOTICEABLE IMPACT
	□	■	SEVERE - MAJOR IMPACT
			NONE - NO IMPACT

ELEMENT	CAUSE	IMPACT	MITIGATION
IV ATMOSPHERE	Operation of transfer/transport system	Particulate & gas emissions	Sprinkling measures & vehicle emission controls
	Waste decomposition	Odor & gases	Proper cover and gas control measures
V GEOLOGY & SOILS	Site grading & landfill operation	Potential soil erosion & slope instability	Protect soil and excavate properly
COMMUNITY VALUES			
I VISUAL	Landfill operation	Change in character of area and general unsightliness of operation	Phased landscaping and proper operation
	Transfer/Transport Operation	Change in character of area and general unsightliness of operation	Modify operation and establish perimeter buffer
II ODOR	Landfill operation	Localized odor distribution	Maintain perimeter buffer
	Transfer operation	Localized odor distribution	Maintain perimeter buffer
III NOISE	Landfill operation	Disruptive sounds from equipment	Maintain perimeter buffer
	Landfill location	Disruptive traffic patterns to and from site	Route traffic via major arterials
	Transfer operation	Disruptive noise extending beyond site boundary	Provide adequate perimeter buffer or muffling structure
	Transfer/Transport Operation	Disruptive traffic patterns to and from site	Route traffic via major arterials
IV HEALTH	Solid waste leachates	Potential water contamination and associated health problems	Collect and treat leachates
	Surface water runoff from site	Potential surface water contamination and associated health problems	Collect and treat runoff
	Standing water and exposed solid wastes	Breeding ground for vectors and potential transmission of disease	Proper site drainage, cover, and maintenance of sanitary conditions
	Solid waste handling methods	Transmission of disease via direct handling of waste by personnel	Prevent waste handling or salvage by personnel
V SAFETY	Landfill operation	Production of flammable gas	Proper gas venting and control
	Inadequate supervision at transfer and disposal facilities	Potential danger to facility users	Properly man and police facility
	Landfill and transfer station site layout and operating practice	Potential for user and employee injury	Proper design and safety precautions
	Lack of proper barriers at site boundary to prevent access	Potential vandal damage to facilities and liability for injury	Provide adequate fencing or other methods to protect facilities

DISPOSAL SITES: KC — CEDAR FALLS, CEDAR HILLS, DUVALL, ENUMCLAW, HOBART, VASHON; SEA — KENT-HIGHLANDS, MIDWAY, CARNATION; SM — SKYKOMISH; P — BELLEFIELD, COAL CREEK, TULALIP

TRANSFER/TRANSPORT: KC — ALGONA, BOW LAKE, FACTORIA, FIRST AVE. N. E., HOUGHTON, RENTON; SEA — NORTH, SOUTH; P — MASS. ST. BARGE

NOTE: KC = King county, SEA = City of Seattle, SM = Small Municipality,

E-23

Table 36. Continued

	SHORT-TERM	LONG-TERM	
ADVERSE IMPACT RATINGS	△	▲	SLIGHT - MODERATE IMPACT
	○	●	MODERATE - NOTICEABLE IMPACT
	□	■	SEVERE - MAJOR IMPACT
			NONE - NO IMPACT

ELEMENT	CAUSE	IMPACT	MITIGATION	DISPOSAL SITES: KC: CEDAR FALLS	KC: CEDAR HILLS	KC: DUVALL	KC: ENUMCLAW	KC: HOBART	KC: VASHON	SEA: KENT-HIGHLANDS	SEA: MIDWAY	SM: CARNATION	SM: SKYKOMISH	P: BELLEFIELD	P: COAL CREEK	P: TULALIP	TRANSFER/TRANSPORT: KC: ALGONA	KC: BOW LAKE	KC: FACTORIA	KC: FIRST AVE. N. E.	KC: HOUGHTON	KC: RENTON	SEA: NORTH	SEA: SOUTH	P: MASS. ST. BARGE
VI CUSTOMER SERVICE	Landfill & transfer station location	Level of user convenience	Relocate or add facilities to serve area optimally	▲	◉	▲		▲	▲	○	△			△	△	◉	▲			▲				
	Transfer station design	High use day creates vehicular queuing problem	Expand facility														◉	◉	◉	◉	◉	◉	◉	◉	▲
VII RESOURCE DEPLETION	Current disposal and transfer station practice	Non-recovery system results in increased depletion of non-renewable resources	Practice a high level of recycling	■	■	■	■	■	■	□	□	■	■	□	□	■	■	■	■	■	■	■	◉	◉	◉
	Disposal and transfer/transfer operation power consumption	Loss of non-renewable resources	Alter methods of operation	◉	▲	◉	◉	◉	◉	△	△	◉	◉	○	○	▲	◉	◉	◉	◉	◉	◉	◉	◉	▲
VIII LAND USE	Landfill location	Use of large amounts of land that might be utilized for other purposes	Practice disposal methods that require less land	▲	◉	▲		▲	▲	◉		▲	▲	▲		◉									
	Transfer station location	Use of land that might be utilized for other purposes	Relocate station														▲		▲		▲				
	Location of disposal and transfer/transfer operation	Operation incompatible with adjacent land use	Relocate operation					◉			△									◉			▲		
IX UTILITIES																									
A. SEWERS - STORM & SANITARY	Landfill & transfer station facility operation	Increased demand upon utility	Expand utility to handle increased load							△	△								▲	▲			▲	▲	▲
B. WATER	Landfill & transfer station facility operation	Increased demand upon utility	Expand utility to handle increased load							△	△						▲	▲	▲	▲	▲	▲	▲	▲	▲
C. TELEPHONE	Landfill & transfer station facility operation	Increased demand upon utility	Expand utility to handle increased load	▲	▲	▲	▲	▲	▲	△	△			▲	▲		▲	▲	▲	▲	▲	▲	▲	▲	▲
X ECONOMICS																									
A. PROPERTY VALUES	Landfill and transfer/transport operation	Loss in surrounding land value	Upgrade or relocate operation								△									◉	▲		▲		
B. USER CHARGES	Cost level of current disposal & transfer/transport operation	Diversion of individual user's financial resources	Modification of disposal & transfer/transport operation	▲	▲	▲	▲	▲	▲	△	△	▲	▲	△	△		▲	▲	▲	▲	▲	▲	▲	▲	▲

NOTE: KC = King County, SEA = City of Seattle, SM = Small Municipality, P = Private

E-24