TONAWANDA LANDFILL AND MUDFLATS AREA

TONAWANDA, NEW YORK

GIS-Based Historical Photographic Analysis

By
The US Army Geospatial Center (AGC)
Operations Division
Hydrologic & Environmental Analysis Branch
7701 Telegraph Road
Alexandria, Virginia 22315-3864

July 2009 Final Report
Prepared for :
The US Army Corps of Engineers
Buffalo District, Buffalo, New York

TABLE OF CONTENTS

1 TONAWANDA LANDFILL AND MUDFLATS AREA
TONAWANDA, NEW YORK
GIS-Based Historical Photographic Analysis
2 TABLE OF CONTENTS
3 INTRODUCTION
4 METHODOLOGY
5 PROJECT AREA LOCATION
6 GLOSSARY AND ACRONYMS
7 HISTORICAL SUMMARY
8 TABLE 1 - AERIAL PHOTOGRAPHIC SOURCES
9 TABLE 1 - AERIAL PHOTOGRAPHIC SOURCES (CONTINUED)
10 REFERENCE MAPS
11 1948 USGS TOPOGRAPHIC MAP
12 AREAS OF INVESTIGATION MAP
REMEDIAL INVESTIGATION REPORT
13 INTERPRETATION OF AERIAL PHOTOGRAPHY
14 1927 OVERVIEW
15 1938 OVERVIEW
16 1938 DETAIL VIEW
17 1942 OVERVIEW
18 SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, 1942
19 1951 OVERVIEW
20 TONAWANDA LANDFILL 1951
21 SEWAGE TREATMENT FACILITY AND INCINERATOR, 1951
22 1958 OVERVIEW
23 1960 OVERVIEW
24 SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, 1960
25 SEWAGE TREATMENT FACILITY AND INCINERATOR, 1960
26 1962 OVERVIEW
27 SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, MAY 1962
28 SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, NOVEMBER 1962
29 1964 OVERVIEW
30 1966 OVERVIEW
31 LANDFILL AREA, 1966
32 SEWAGE TREATMENT FACILITY AND INCINERATORS, 1966
33 1972 OVERVIEW
34 LANDFILL AREA, 1972
35 SEWAGE TREATMENT FACILITY AND INCINERATORS, 1972
36 1978 OVERVIEW
37 LANDFILL AREA, 1978
38 MUDFLATS AREA, 1978
39 1980 OVERVIEW
40 LANDFILL AREA, 1980
41 POWER LINE RIGHT-OF-WAY, 1980
42 MUDFLATS AREA, 1980
43 1990 OVERVIEW
44 LANDFILL AND MUDFLATS AREA, 1990
45 1995 OVERVIEW
46 LANDFILL AND MUDFLATS AREA, 1995
47 SELECTED ANAGLYPHS
48 3D VIEW OF LANDFILL AREA, 1938
49 3D VIEW OF LANDFILL AREA, 1942
50 3D VIEWS OF LANDFILL AREA, 1962
HISTORICAL PHOTO COMPARISON OF MAY AND NOVEMBER 1962
51 3D VIEW OF THE LANDFILL AREA, MAY 1972
52 3D VIEW OF LANDFILL AREA, SEPTEMBER 1972
53 3D VIEW OF LANDFILL AND MUDFLATS AREA, APRIL 1978
54 3D VIEW OF LANDFILL AND MUDFLATS AREA, SEPTEMBER 1980
55 3D VIEW OF LANDFILL AND MUDFLATS AREA, MARCH 1990
56 3D VIEW OF LANDFILL AND MUDFLATS AREA, 1995
57 REFERENCES

TONAWANDA LANDFILL AND MUDFLATS AREA

TONAWANDA, NEW YORK

GIS-Based Historical Photographic Analysis

By
The US Army Geospatial Center (AGC)
Operations Division
Hydrologic & Environmental Analysis Branch
7701 Telegraph Road
Alexandria, Virginia 22315-3864

NOTICE

The views, opinions, and conclusions in this report are those of the author and should not be construed as official Department of Army positions or policy unless so designated by other documentation.

Photographic items contained in this report may be restricted for use other than research. It is the responsibility of the party using photographs from this study to contact the U.S. Army Geospatial Center, Operations Division in order to ascertain clearance for use.

INTRODUCTION

This report presents the results of a GIS-based Historical Photographic Analysis of the Tonawanda Landfill and Mudflats Area, located in the Town of Tonawanda, approximately eight (8) miles north of Buffalo, New York.

The Operations Division (Hydrologic and Environmental Analysis Branch) of the U.S. Army Corps of Engineers, Army Geospatial Center (AGC) was tasked to research available historical data records and complete a historical photographic analysis of the of town of Tonawanda Landfill and Mudflats, New York. It is located in the southwestern section of Tonawanda, just north of East Park Drive and about 1.5 miles to the north of the Linde FUSRAP (Formerly Utilized Sites Remedial Action Program) Site. The project area is about 170 acres in size, with a residential area to the north, Interstate 290 to the south, Tonawanda Sewage Treatment Plant on the west, and a CSX-operated railroad line to the east. The Sewage Treatment Plant is not part of this project.

The analysis presented in this report is based upon interpretation of aerial photographic coverage of the project area for the years 1927, 1938, 1942, 1951, 1958, 1960, 1962, 1964, 1966, 1972, 1978, 1980, 1990, 1995, and 2005. Stereo analysis was employed where overlapping photography was available. All coordinates used with the imagery in this report are referenced to the State Plane system, New York West, FIPS Zone 3103 ; Spheroid: GRS 1980; Datum: NAD83, Units: feet. Significant features, derived through photo analysis, are displayed on selected photos in this study. The accompanying GIS, supplied on DVD, includes additional information useful in locating identified features and defining their extent. Some of the identified features can be “benign” as it is not always possible to determine the activity that altered the surface. Future field work and additional ancillary information will further determine the relevance of these features.

This analysis was completed for the US Army Corps of Engineers, Buffalo District, New York.

METHODOLOGY

Photographic analysis of historical aerial photography, both vertical and oblique, was the primary method of identifying man-made and natural occurring features in the Tonawanda Landfill and Mudflats Area.

The analysis in this report is primarily based upon interpretation of black and white and color aerial photography over the project area for the period 1927 to 2005. Stereo viewing was employed where overlapping photographs permitted its use. A list of aerial photography collected by AGC appears in Table 1.

Both single-optical and stereoscopic viewing, at various magnifications, were performed on AGC collection of historical aerial photographs. Visible signatures such as size, scale, shape, shadow, tone, texture, and pattern allow features to be recognized on the aerial photography.

Stereo-paired images viewed through a stereoscopic microscope allows for a three-dimensional view of the terrain.

Over 50 aerial photographs examined.

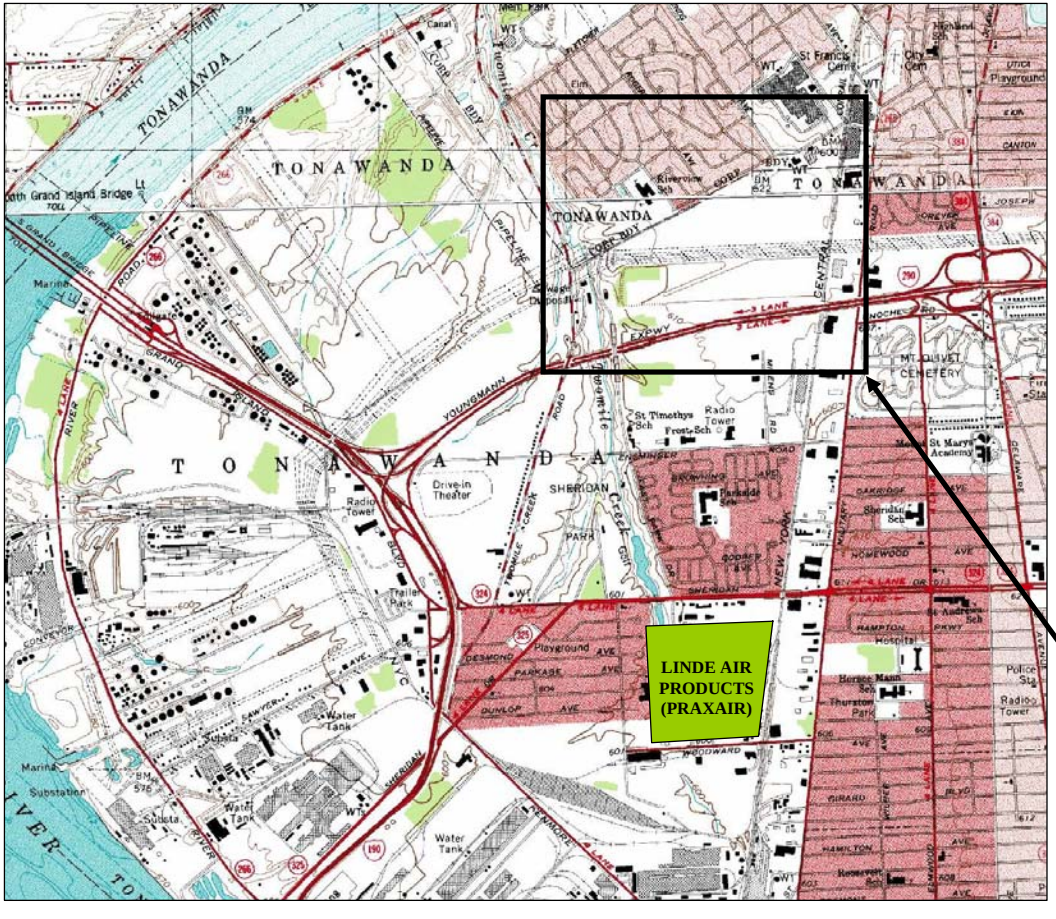
GEOREFERENCED DATA

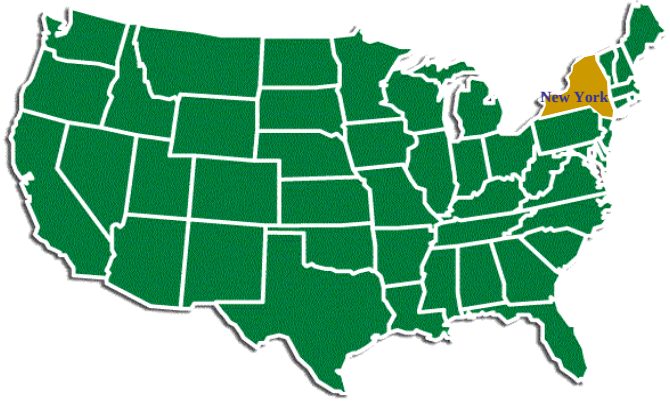
Geodetic Control was applied to the 1927, 1938, 1942, 1951, 1958, 1960, 1962, 1964, 1966, 1972, 1976, 1978, 1980, 1985, 1990, and 1995 aerial photography using 2005 New York State GIS data (http://www.nysgis.state.ny.us/gateway). This georeferenced image file is placed on DVD for quick and easy access. A “world file”, or .tfw file, is associated with each .tif image file. The .tfw file contains the coordinate information of the upper left (x,y) pixel and the pixel size (in meters). This .tfw file must be placed in the same directory as the .tif image file before viewing in any Geographic Information System (GIS) software.

Significant features, derived through photo analysis, are displayed on selected photos in this study. GIS data, supplied on DVD, contains additional information useful in locating identified features and defining their extent. All GIS image and vector data are projected in a State Plane coordinate system, New York West, FIPS Zone 3103 ; Spheroid: GRS 1980; Datum: NAD83, Units: feet.

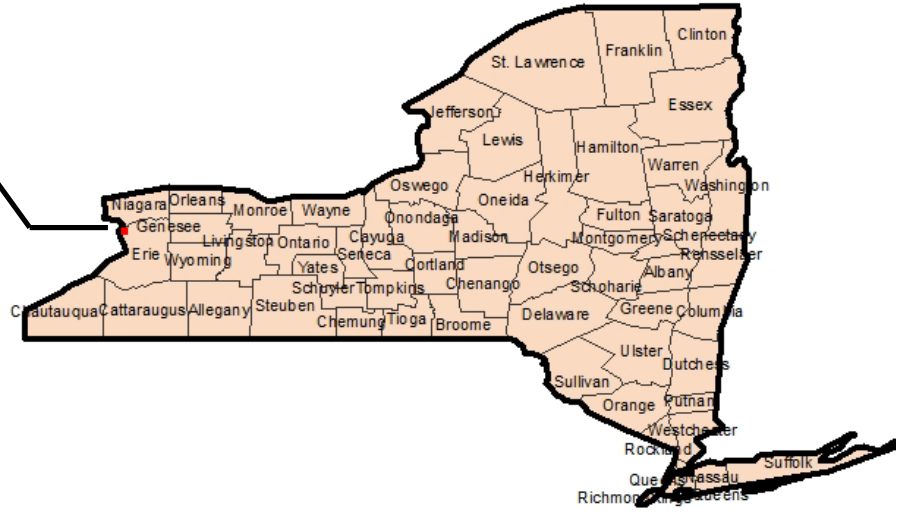
PROJECT AREA LOCATION

GENERAL PROJECT AREA





N



Source: 1980 USGS Maps, **Tonawanda, and Buffalo, NY**, 15 min quads.

GLOSSARY AND ACRONYMS

GLOSSARY

BERM: Man-made ridge or embankment, constructed of natural or man-made materials.

BUILDING/STRUCTUTE: Relatively permanent, usually box-like, roofed, and man-made.

DEBRIS: The scattered remains of anything broken or destroyed.

DEPRESSION: An area sunken below the surrounding surface.

DISTURBED GROUND: Rough ground surface that has been cleared, overturned, dug up, filled and/or changed from the surrounding area.

DITCH: A long narrow trench or furrow dug in the ground, as for drainage or irrigation.

EXCAVATION: A cavity in the earth formed by digging or scooping out material (e.g. to facilitate construction).

GRADED AREA: Area where the ground surface has been shaped, usually leveled to a smooth horizontal or sloping surface.

GROUND SCAR(S): Ground surface, vegetated or not, where marks from a previous activity or feature, or from a subterranean feature are visible. Ground scars can result from many things and therefore vary greatly in appearance (e.g. septic drain fields, archaeological features, buried waste disposal pits, filled trenches, etc)..

INCINERATOR: Incinerators typically consist of a furnace and stack unit used for a variety of disposal activities, including the incineration of medical waste or of an installation's dunnage. These units very in size and may be either freestanding or part of other operation.

LANDFILL: Landfill sites typically are areas formerly used for disposing of both domestic and industrial waste.

MOUNDED MATERIALS: Material that has been placed in piles or mounds.

PIT: Relatively deep, steep sided hole in the ground surface.

POND/LAGOON: A containment area, man-made or naturally occurring, that appears to be used for waste and/or water storage, disposal, or treatment.

TRENCH: An excavation, often elongated and linear, having steep-sided walls.

ACRONYMS

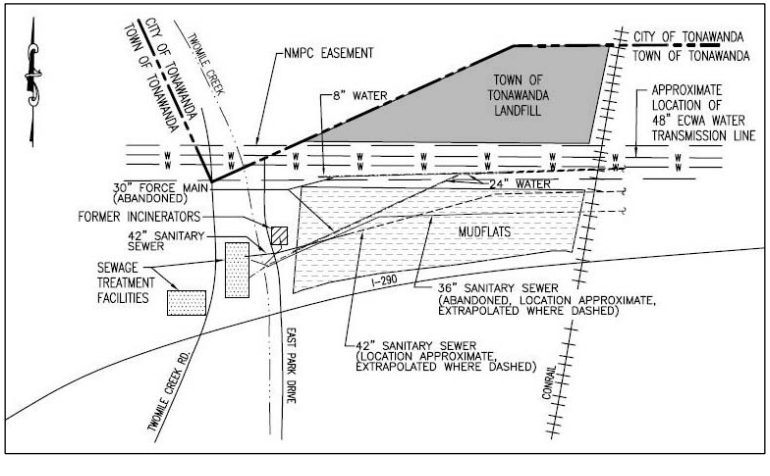
AGC	ARMY GEOSPATIAL CENTER
BLDG	BUILDING
DOQ	DIGITAL ORTHO QUAD
DRG	DIGITAL RASTER GRAPHIC
DVD	DIGITAL VERSATILE DISC OR DIGITAL VIDEO DISC
GIS	GEOGRAPHIC INFORMATION SYSTEM
NAD	NORTH AMERICAN DATUM
NARA	NATIONAL ARCHIVES & RECORDS ADMINISTRATION
UTM	UNIVERSAL TRANSVERSE MERCATOR
WGS	WORLD GEODETIC SYSTEM

HISTORICAL SUMMARY

The landfill was operated as a municipal landfill by the Town of Tonawanda from the mid-1930's through October 1989. In the early 1900's a quarry was located in the western portion of the Landfill property. In the 1920's, the quarry was reportedly abandoned at a depth of 60 feet when water was encountered. Wastes disposed in the Landfill included ash generated by the incinerators (formerly located just west of the Mudflats), construction/demolition debris and yard refuse (leaves, branches, etc.) collected from Town residents. On occasion, the Landfill accepted municipal solid waste and wastewater sludge (formerly incinerated at the incinerators), but only when the incinerators were temporarily inoperable.

The incinerators, operated by the Town of Tonawanda between the 1940's and the early 1980's, were used to burn municipal solid waste and sludge generated at the Town of Tonawanda's Waste Water Treatment Plant. The incinerators were located in the western edge of the Mudflats area (**see Layout**) until they were demolished in 2002. Other than the incinerators, the Mudflats have always been vacant.

Although neither the Landfill nor Mudflats were known to be directly involved with MED activities, the Landfill and Mudflats were designated a FUSRAP Vicinity Property by the DOE (DOE 1992) due to the potential for MED material from the Linde Site having been placed in the Landfill.



Historical Summary Source: Proposed Plan for the Tonawanda Landfill Vicinity Property Site, Tonawanda, New York, U.S. Army Corps of Engineers, Buffalo District, January 2007.

TABLE 1 - AERIAL PHOTOGRAPHIC SOURCES

DATE	APROX. SCALE	SOURCES	TYPE	REMARKS
1927 June	NA	http://www.erie.gov/aerials/1920s/atlases/ book8/html/b8_f27.html	B&W	Medium resolution scanned imagery. No stereo coverage. This data was used to create a 1927 geo-referenced base map.
1938 August	1:20,000	Courtesy of U.S. Army Corps of Engineers, Buffalo District	B&W	This data was used to create a 1938 geo-referenced base map.
1942 April	1:20,000	NARA, Cartographic and Architectural Branch.	B&W	This data was used to create a 1942 geo-referenced base map.
1951 September	1:20,000	NARA, Cartographic and Architectural Branch.	B&W	This data was used to create a 1951 geo-referenced base map.
1958	NA	http://www.historicaerial.com	B&W	Medium resolution scanned imagery, no stereo. Partial coverage.
1959	NA	http://www.historicaerial.com	B&W	Medium resolution scanned imagery. No stereo coverage.
1960 July	1:20,000	NARA, Cartographic and Architectural Branch	B&W	This data was used to create a 1960 geo-referenced base map.
1962 May	1:30,000	NARA, Cartographic and Architectural Branch	B&W	
1962 November	1:40,000	USGS, EROS Data Center	B&W	This data was used to create a 1962 geo-referenced base map.
1964 May	1:50,000	NARA, Cartographic and Architectural Branch	B&W	Poor quality. Small scale photos.
1966 June	NA	http://ublib.buffalo.edu/libraries/asl/maps/aerial/arf-2gg-8-1966-june12.jpg	B&W	Medium resolution scanned imagery. This data was used to create a 1966 geo-referenced base map.

B&W = Black and white NA = Not applicable.
NARA = National Archives & Records Administration, Archives II, College Park, Maryland 20740.
USGS = U.S. Geological Survey.

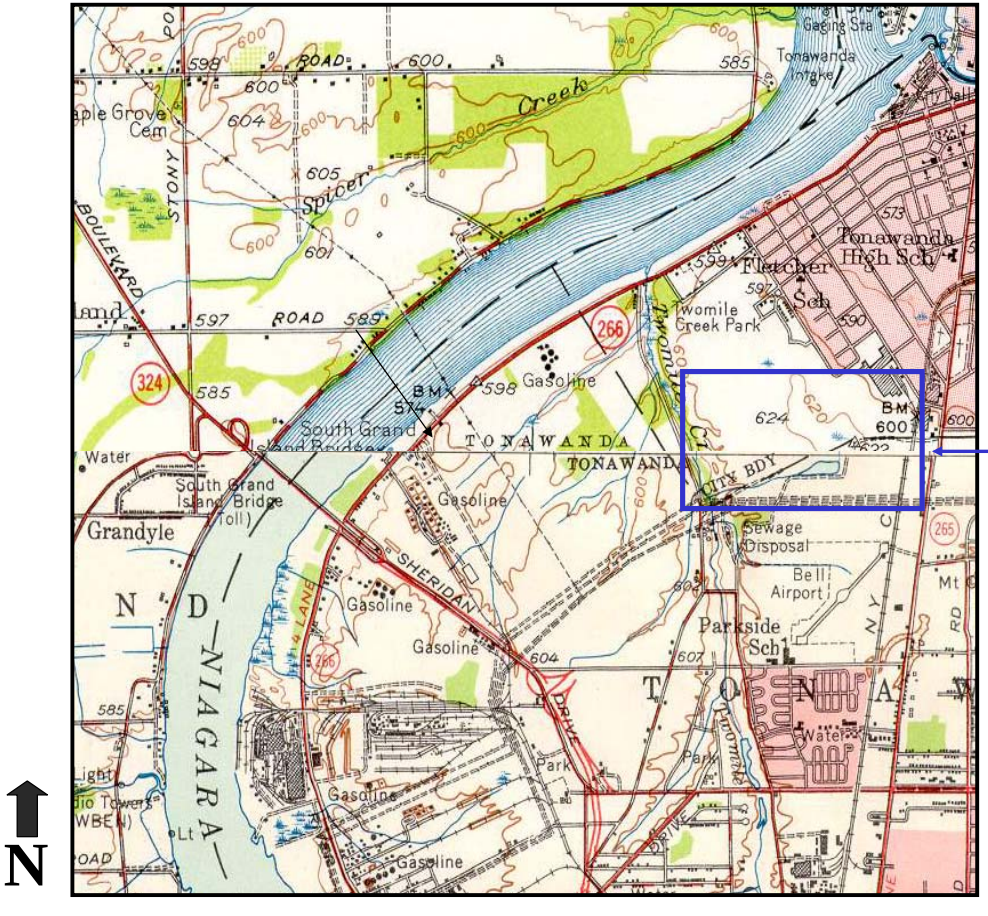
TABLE 1 - AERIAL PHOTOGRAPHIC SOURCES (CONTINUED)

DATE	APROX. SCALE	SOURCES	TYPE	REMARKS
1972 May	1:20,000	USGS, EROS Data Center	B&W	
1972 September	1:20,000	NOAA/NGS, Silver Spring, Maryland	Color	This data was used to create a 1972 geo-referenced base map.
1974 Apr	1:20,000	USGS, EROS Data Center	Color	
1976 May	1:20,000	NOAA/NGS, Silver Spring, Maryland	Color	
1978 Apr	1:20,000	NOAA/NGS, Silver Spring, Maryland	Color	
1978 August	1:20,000	NOAA/NGS, Silver Spring, Maryland	Color	This data was used to create a 1978 geo-referenced base map.
1978 October	1:20,000	USGS, EROS Data Center	B&W	
1980 September	1:20,000	USGS, EROS Data Center	CIR	This data was used to create a 1990 geo-referenced base map.
1985 May	1:40,000	USGS, EROS Data Center	CIR	Low resolution scanned imagery. Poor quality.
1990	1:20,000	Courtesy of U.S. Army Corps of Engineers, Detroit District	CIR	This data was used to create a 1990 geo-referenced base map.
1995 Mar	1:40,000	USGS, EROS Data Center	CIR	This data was used to create a 1995 geo-referenced base map.
2005	1 meter resolution imagery	http://www.nysgis.state.ny.us/gateway/mg/2005/erie	Color	This data was used to create a 'present-day' geo-referenced base map.

B&W = Black and white CIR = Color infrared NA = Not applicable.
NARA = National Archives & Records Administration, Archives II, College Park, Maryland 20740.
NGS = National Geodetic Survey
NOAA = National Oceanic and Atmospheric Administration
USGS = U.S. Geological Survey.

REFERENCE MAPS

1948 USGS TOPOGRAPHIC MAP

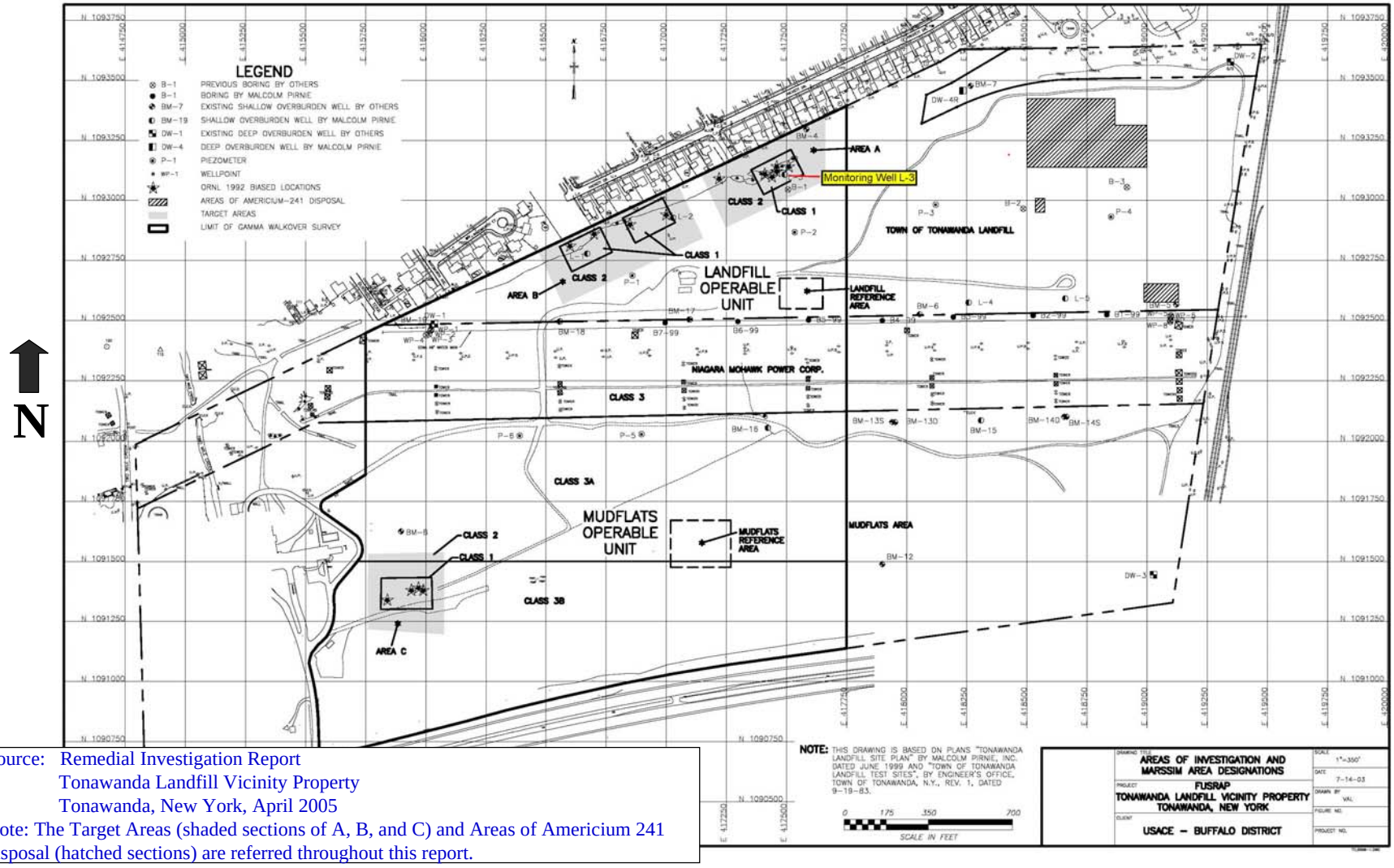


HISTORICAL PHOTOGRAPHIC ANALYSIS:

TONAWANDA LANDFILL & MUDFLATS AREA

Source: 1948 USGS Maps, **Tonawanda, and Buffalo, NY**, 15 min quads.

AREAS OF INVESTIGATION MAP
REMEDIAL INVESTIGATION REPORT



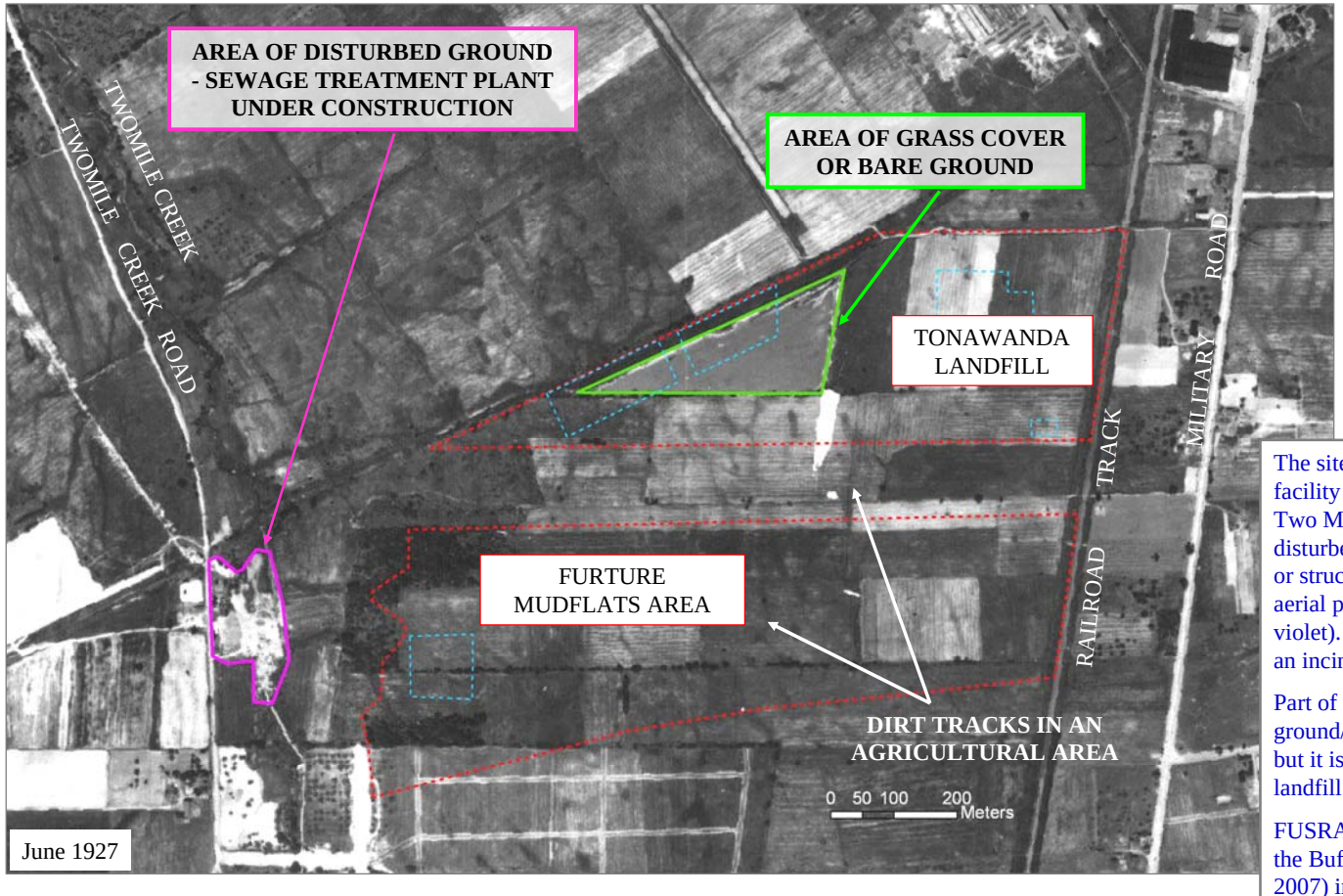
Source: Remedial Investigation Report
Tonawanda Landfill Vicinity Property
Tonawanda, New York, April 2005

Note: The Target Areas (shaded sections of A, B, and C) and Areas of Americium 241 disposal (hatched sections) are referred throughout this report.

INTERPRETATION OF AERIAL PHOTOGRAPHY

1927 OVERVIEW

A 1927 image was the earliest aerial photo obtained for this report. In the general, the 1927 photo depicts the area as an agricultural site.



APPROXIMATE PRESENT-DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT-DAY LANDFILL & MUDFLATS AREAS OF INTEREST

The site for a sewage treatment facility is being developed along Two Mile Creek Road. An area of disturbed ground, lacking buildings or structures, is observed on the aerial photography (shown in violet). There is no evidence yet of an incinerator.

Part of the landfill area is a bare ground/field area (shown in green), but it is not known if it was used as a landfill during this time.

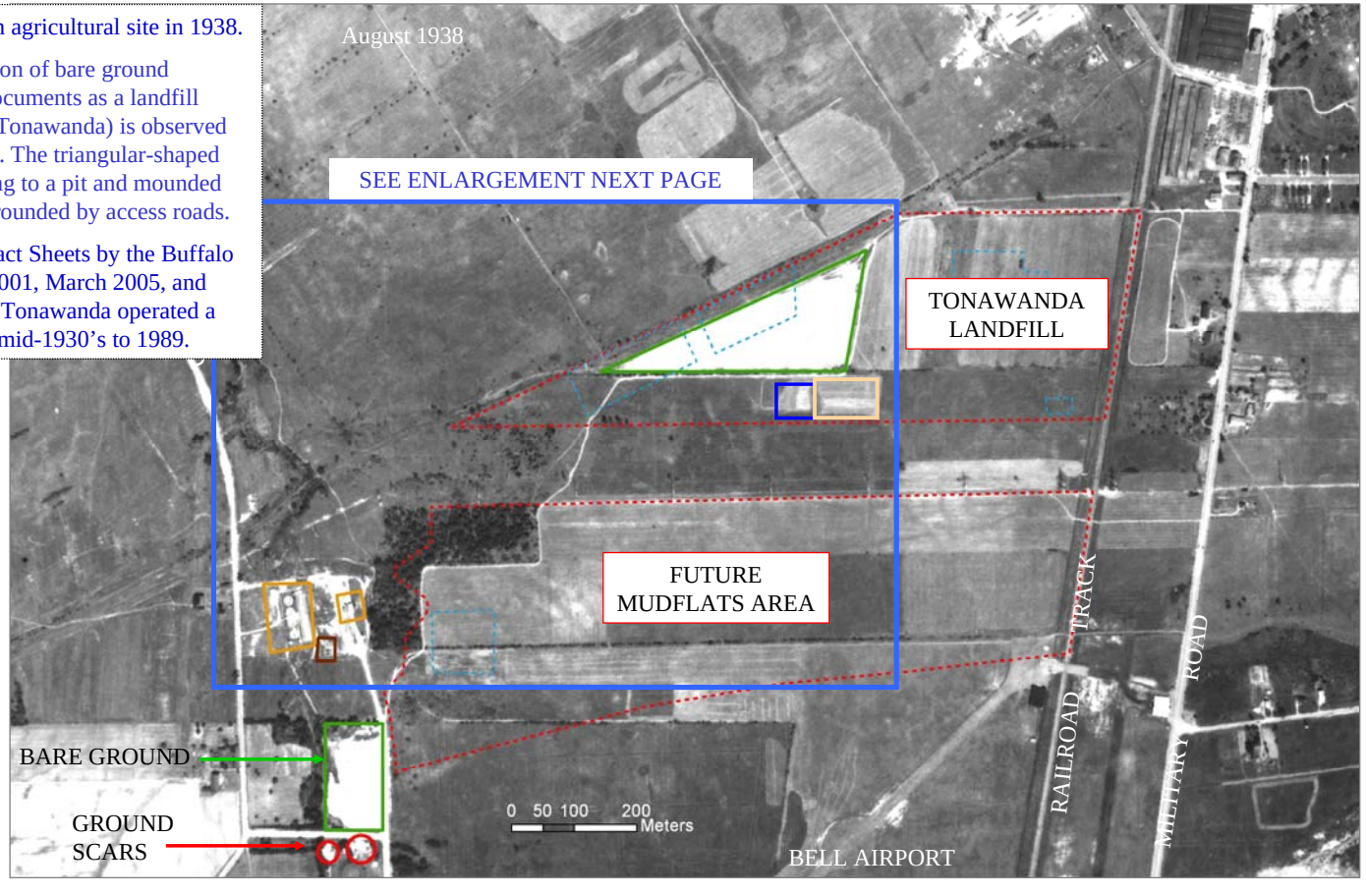
FUSRAP Fact Sheets (produced by the Buffalo District COE in April 2007) indicate that a quarry operated in the western portion of the landfill area from the 1900s to the 1920s. This 1927 photo shows no evidence of such activity.

1938 OVERVIEW

Overall, the area is still an agricultural site in 1938.

A slightly depressed section of bare ground (described in historical documents as a landfill operated by the Town of Tonawanda) is observed on the aerial photography. The triangular-shaped area also shows connecting to a pit and mounded materials. This site is surrounded by access roads.

According to FUSRAP Fact Sheets by the Buffalo District COE (February 2001, March 2005, and April 2007), the Town of Tonawanda operated a landfill here between the mid-1930's to 1989.



APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

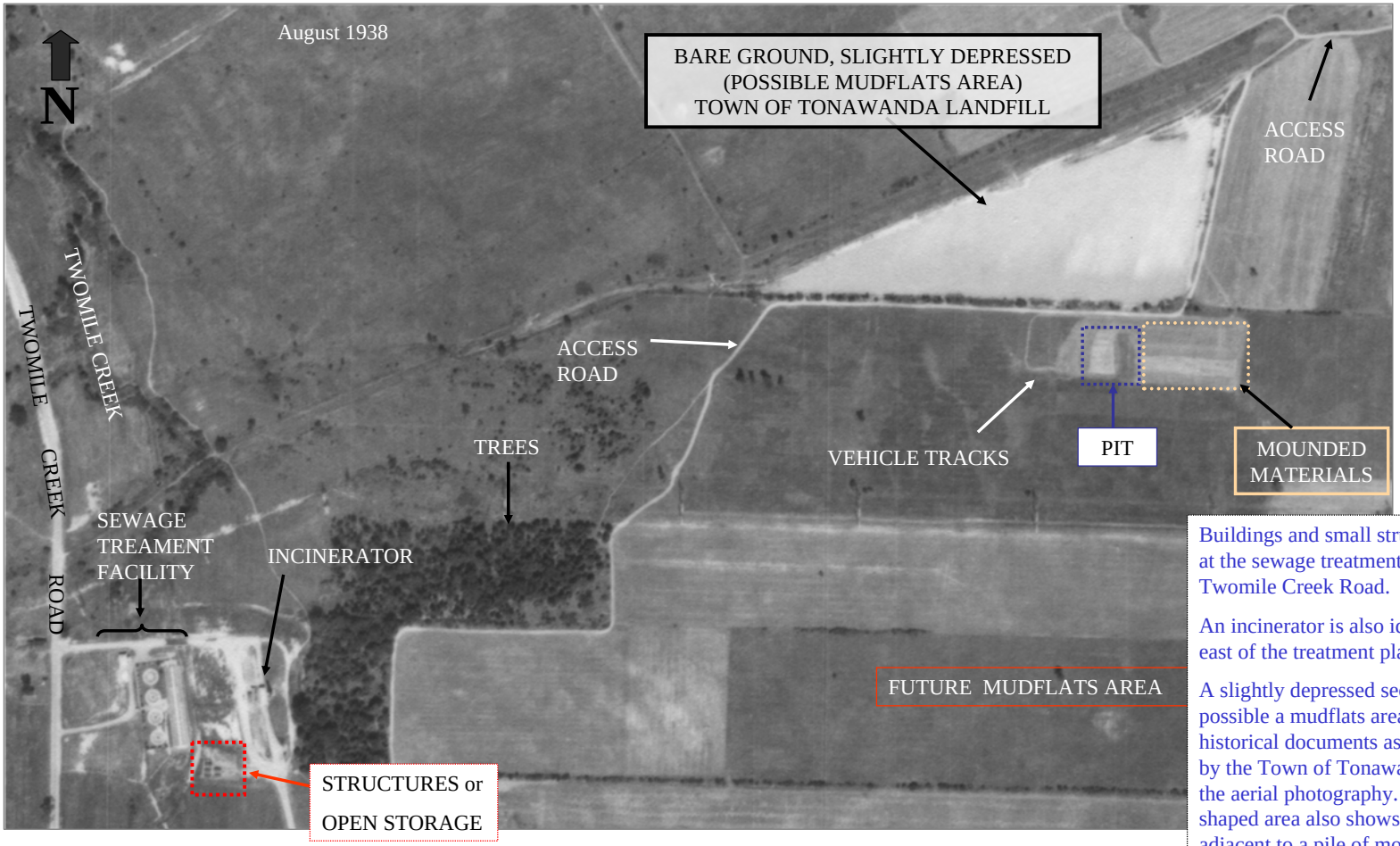
ENLARGEMENT AREA

BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
EXCAVATION

FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM

MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

1938 DETAIL VIEW



PLEASE SEE A 3D VIEW OF 1938
LANDFILL ON PAGE 49

Buildings and small structures are observed at the sewage treatment plant located along Twomile Creek Road.

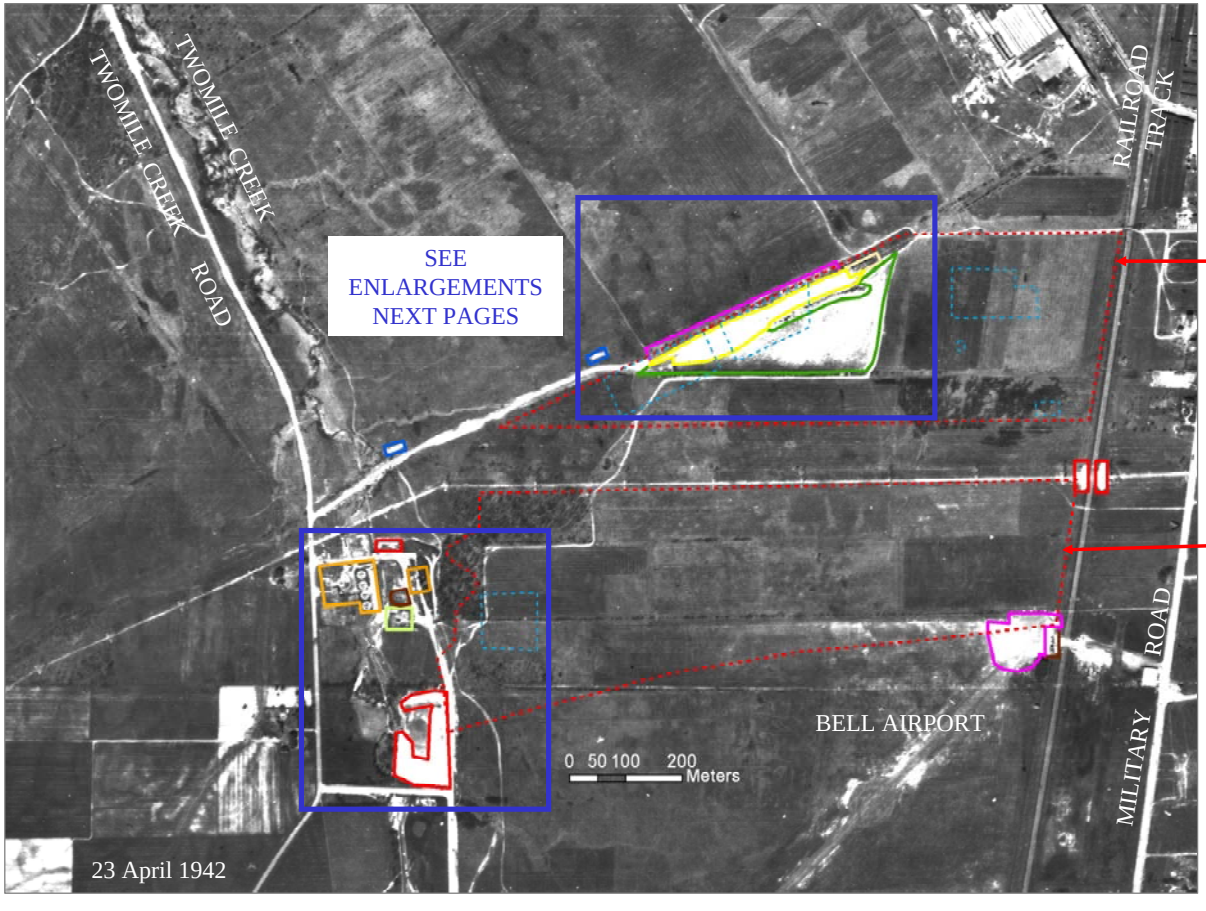
An incinerator is also identified just to the east of the treatment plant.

A slightly depressed section of bare ground, possible a mudflats area (described in historical documents as a landfill operated by the Town of Tonawanda) is observed on the aerial photography. The triangular-shaped area also shows connecting to a pit adjacent to a pile of mounded materials. This site is surrounded by access roads.

In 1938, the future Mudflats Area appears to contain agricultural fields.

1942 OVERVIEW

In 1942, the landfill area shows some changes. Along the access road in the north side is a disturbed ground area which is adjacent to a long shallow excavation. Some mounded materials appear between the excavation and the slightly depressed bare ground, possible a mudflats area, on the southern side. Some new roads were observed in the area. According to FUSRAP Fact Sheets by the Buffalo District COE (February 2001, March 2005, and April 2007), the Town of Tonawanda operated a landfill here between the mid-1930's to 1989. The Sewage Treatment Facility and Incinerator are well developed.
The Mudflats Area still appears as agricultural land.
Bell Airport is under construction.
(See following pages for details)



APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

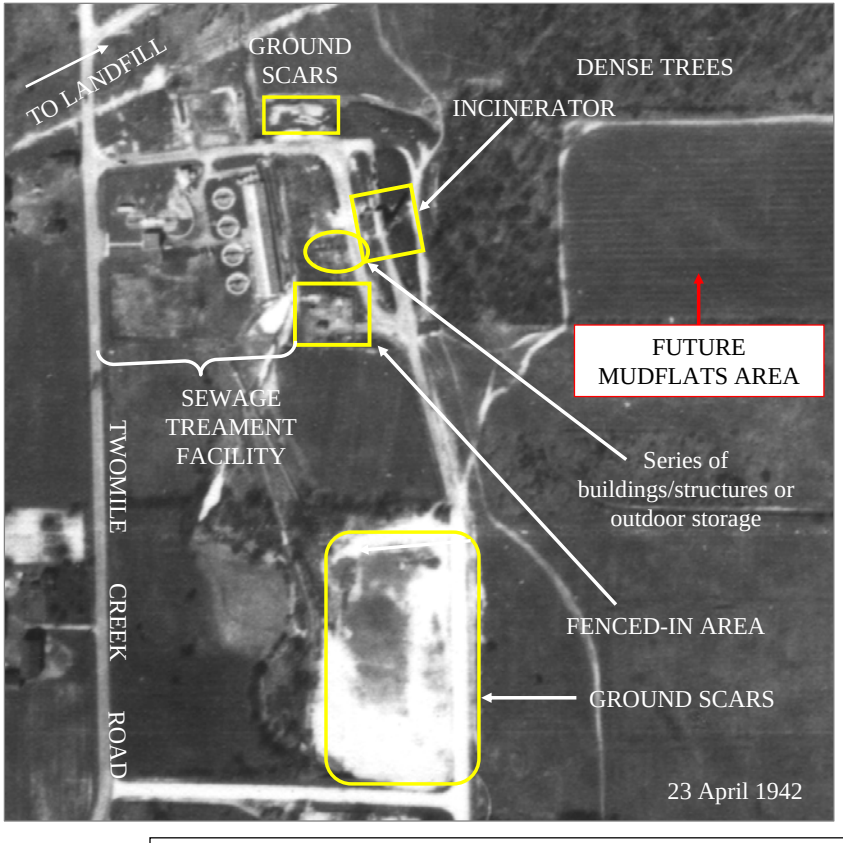
BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
EXCAVATION

FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM

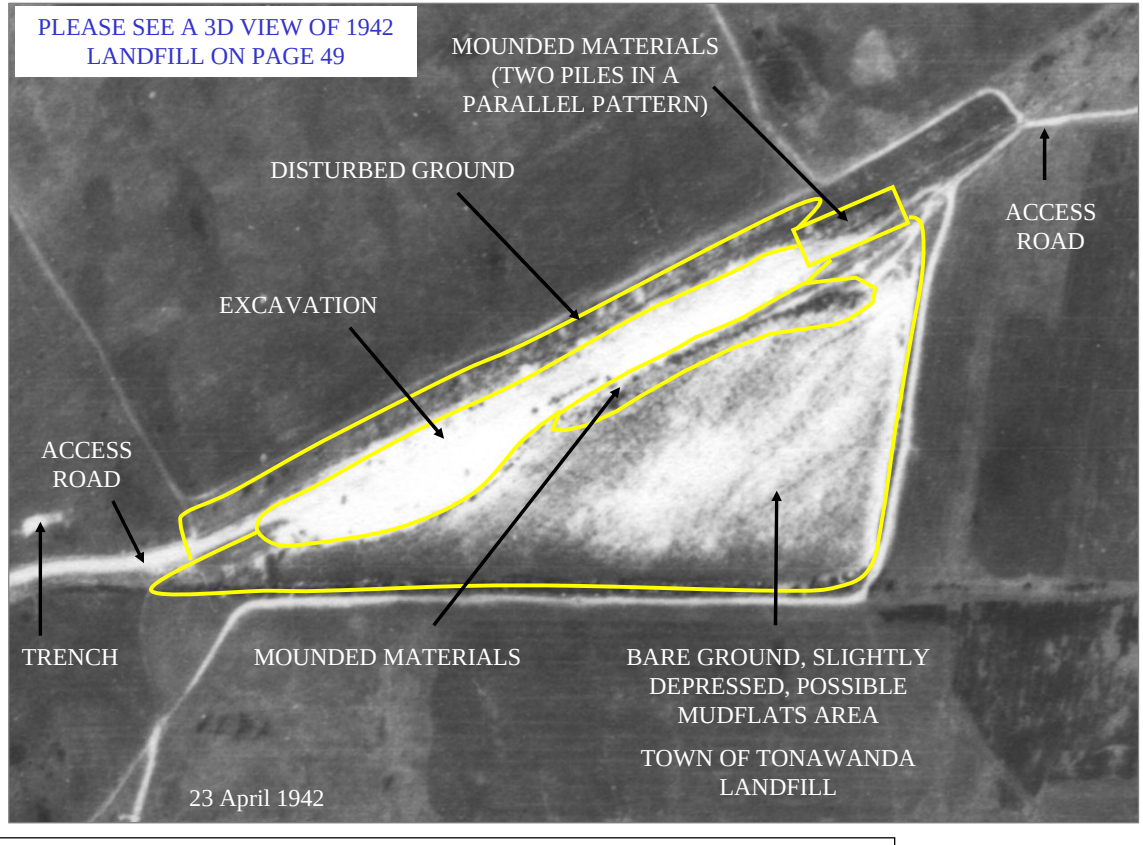
MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, 1942

SEWAGE TREATMENT FACILITY AND INCINERATOR, 1942



LANDFILL AREA , 1942



The Landfill Area contains an elongate disturbed ground, a long and shallow excavation site along the northern side, and a slightly depressed bare ground in the south. This triangular shape area could serve as a mudflats area. According to FUSRAP Fact Sheets by the Buffalo District COE (February 2001, March 2005, and April 2007), the Town of Tonawanda operated a landfill here between the mid-1930's to 1989. The pit and mounded materials adjacent to the southern edge of Tonawanda landfill observed in 1938 aerial photos are not evidence any more. Buildings and small structures are observed in the Sewage Treatment Facility and Incinerator. The Mudflats Area still appears as agricultural land.

N

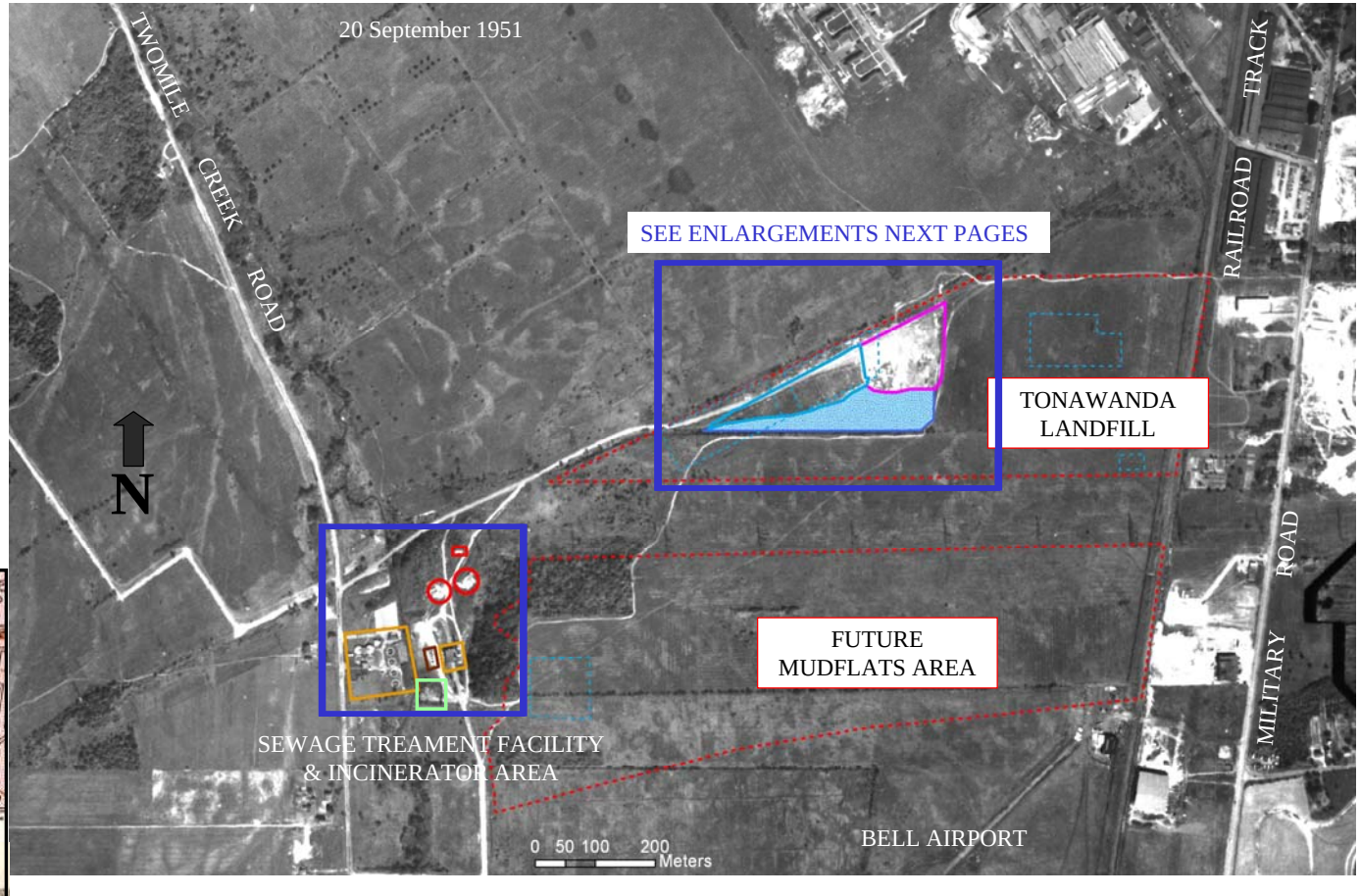
1951 OVERVIEW

In 1951, the landfill area shows significant changes. A pond and an area of disturbed ground are observed for the first time on available aerial photography.

The Sewage Treatment Facility and Incinerator are expanded.

The Mudflats Area still appears as agricultural land.

(See following pages for details)



Source: 1948 USGS Maps, **Tonawanda, and Buffalo, NY**, 15 min quads.

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

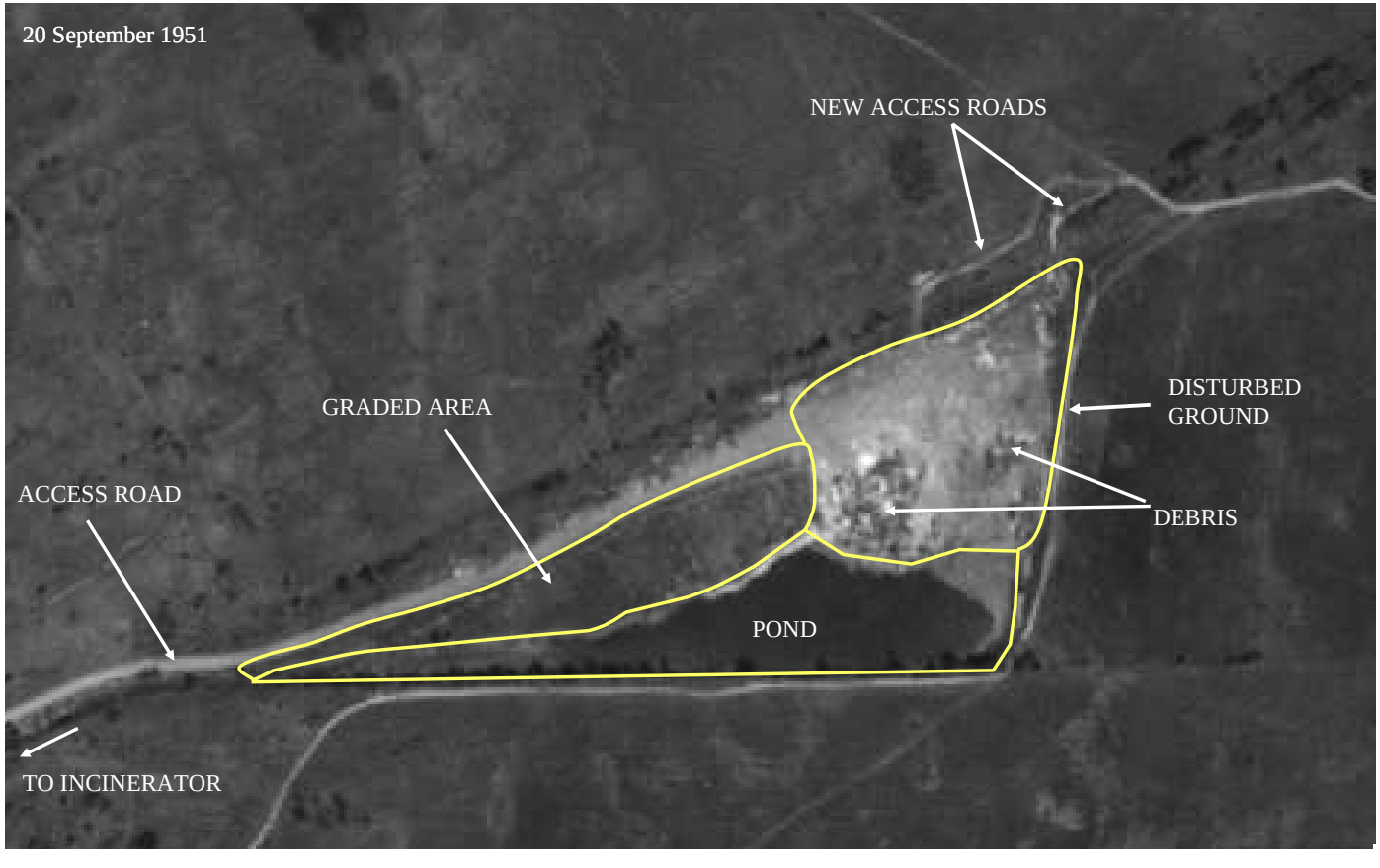
APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

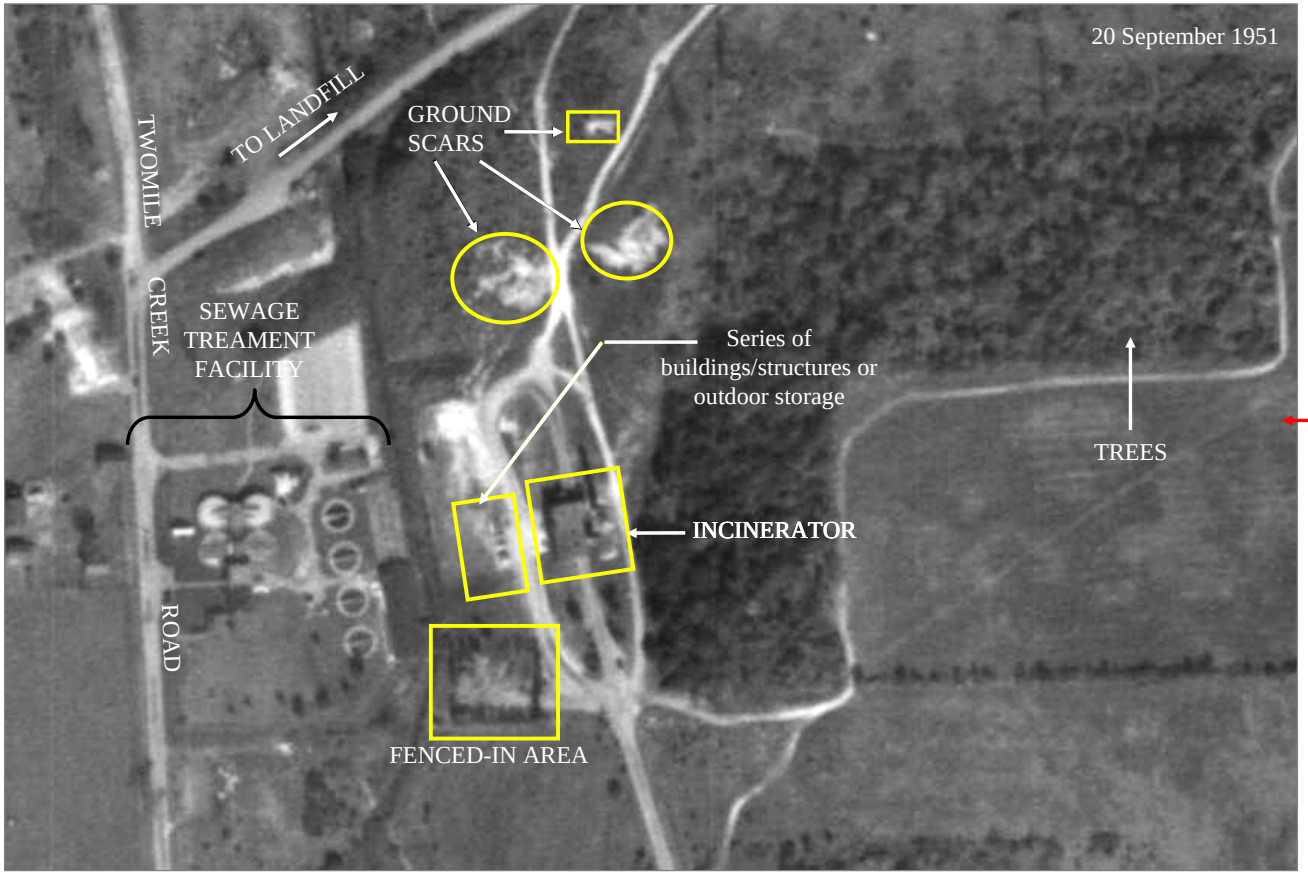
- BUILDINGS/STRUCTURES
- BARE GROUND
- CONSTRUCTION SITE
- EXCAVATION
- FACILITY AREA
- GRADED AREA
- GROUND SCARS
- MOUNDED MATERIALS / BERM
- MUDFLATS AREA
- PITS OR TRENCHES
- POND
- SANITARY SEWER LINE

TONAWANDA LANDFILL 1951

In 1951, the landfill area contained a graded area, a pond, and disturbed ground with scattered debris.

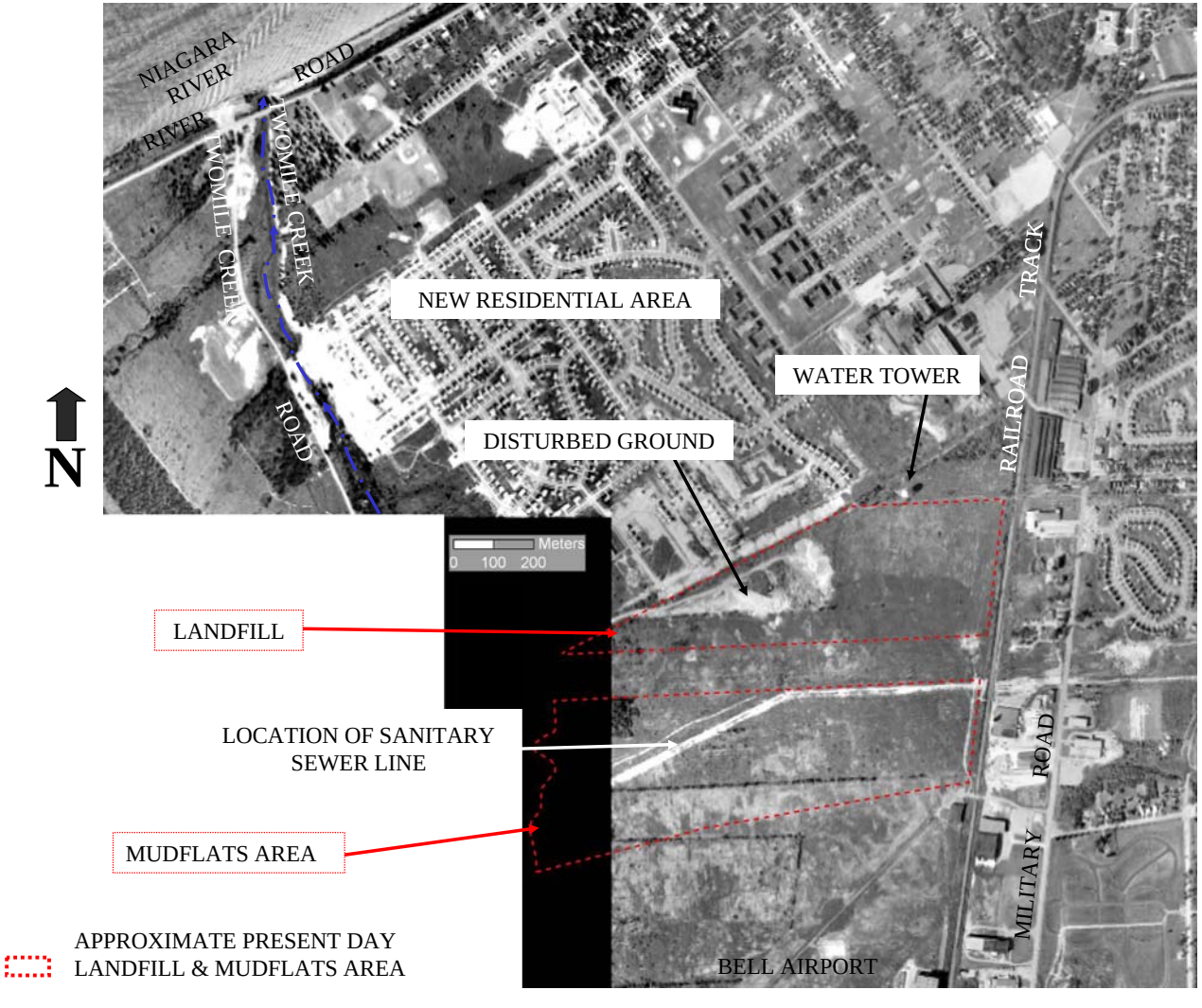


SEWAGE TREATMENT FACILITY AND INCINERATOR, 1951



Scattered ground scars, buildings and small structures, possible outdoor storage are observed in the Incinerator. The Mudflats Area still appears as agricultural land.

1958 OVERVIEW



A medium-resolution scanned image of 1958 was obtained for this report, but no stereo pair was available.

In 1958, a new residential area is observed just north of the landfill. A section of the new residential area, located adjacent to the landfill property, is still under construction.

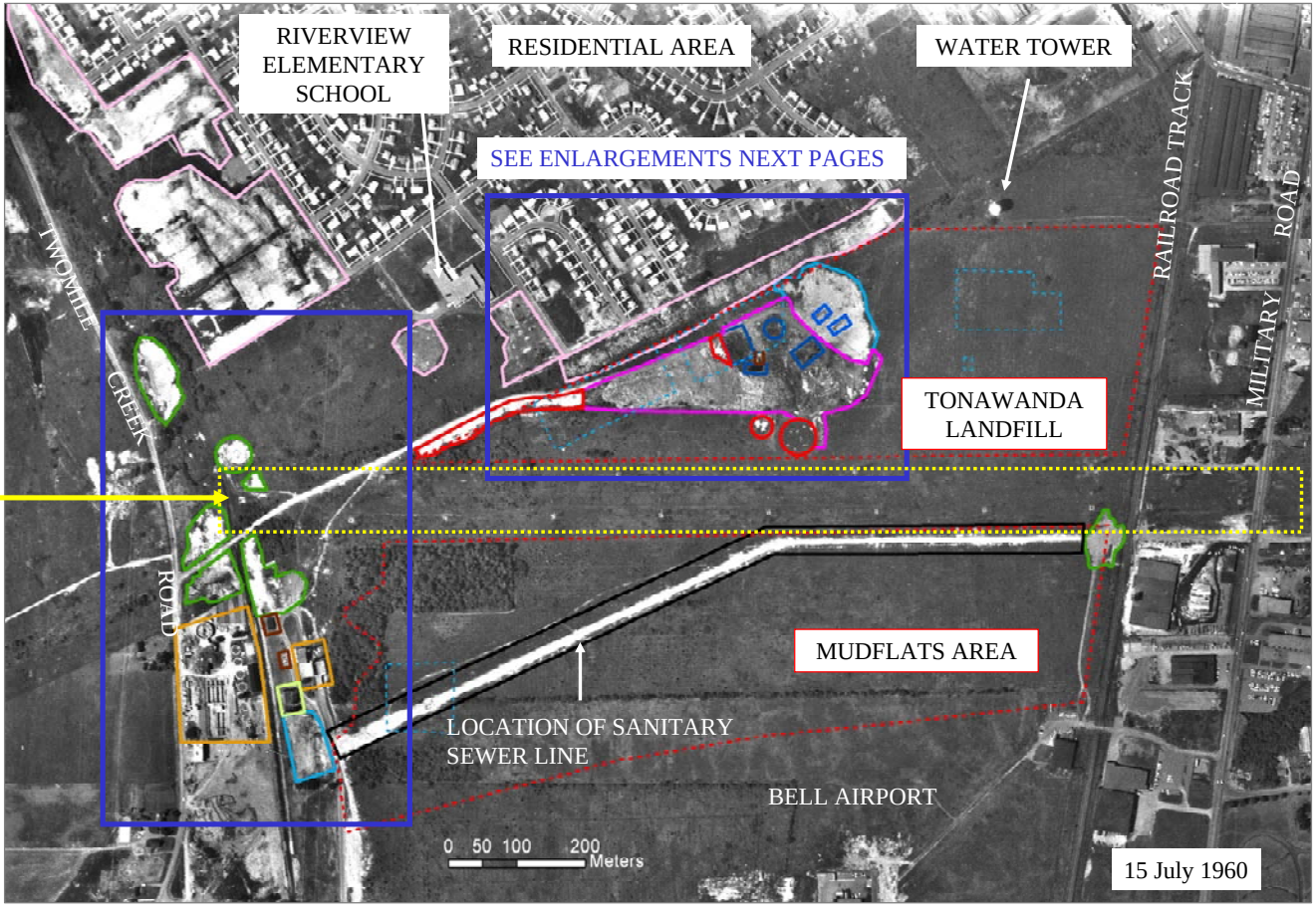
The road leading into the landfill from the east is no longer present. Access to the landfill is available only from the west.

Within the area of the landfill, a previously-observed pond (in 1951) appears filled-in. The active portion of the landfill is identified on the photo as disturbed ground.

A linear ground scar clearly shows the alignment of a sanitary sewer that traverses through the future Mudflats Area.

Both the Sewage Treatment Facility and Incinerator Area lack photographic coverage.

1960 OVERVIEW



POWER LINES

(TWO ROWS OF TOWERS IN NIAGARA MOHAWK POWER, CORP. EASEMENT)

N

In 1960, the Sewage Treatment Facility and Incinerator Area are well developed.

A section of the residential area (lying just adjacent to the landfill) is still under construction.

The landfill area contains disturbed ground, a graded area, pits, trenches, and ground scars.

A linear ground scar (observed for the first time on 1958 aerial photography) shows the alignment of a 42" sanitary sewer line across the future Mud Flats Area.

Towers of a new electric power line are identified within the study area.

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

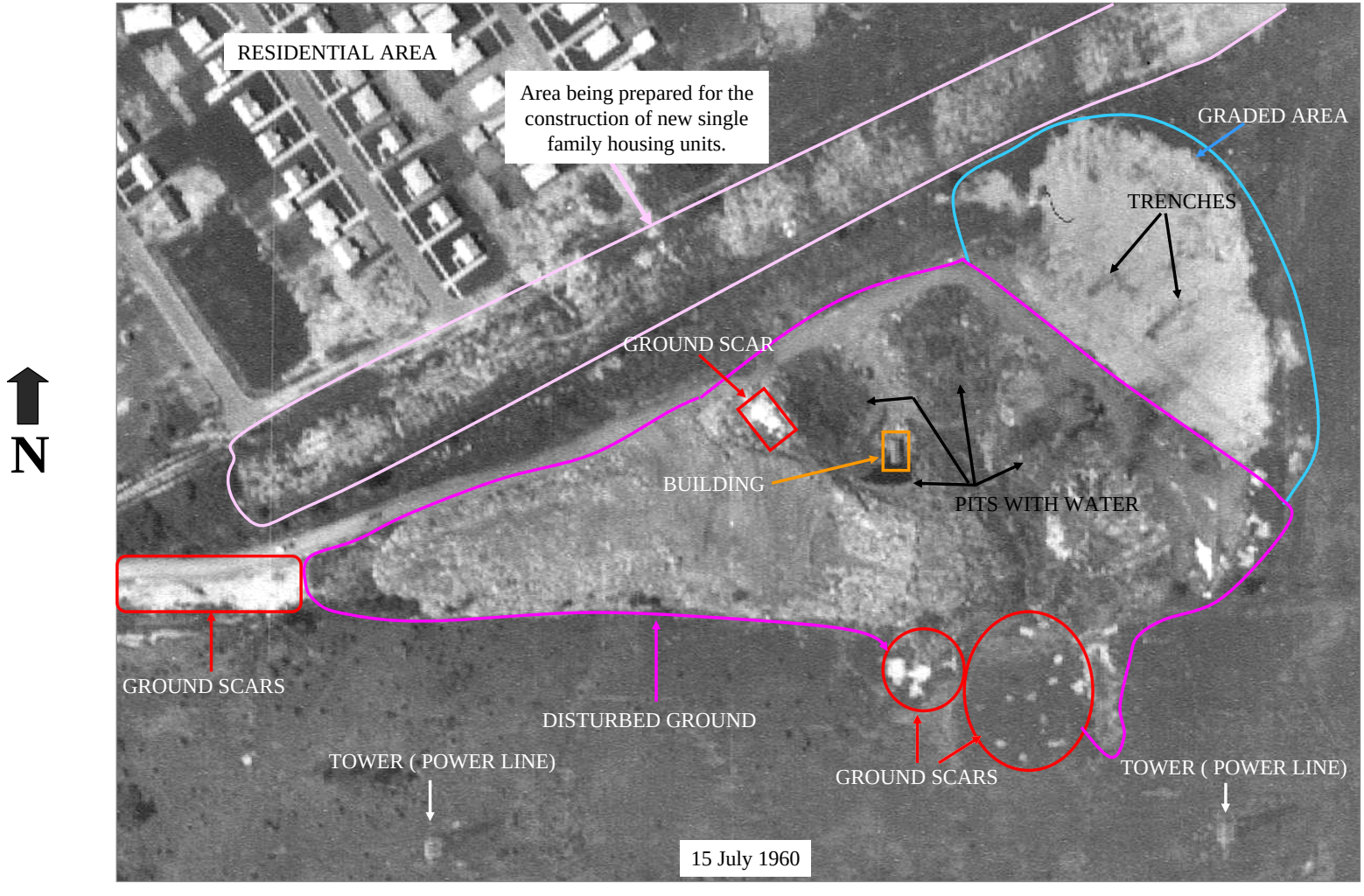
ENLARGEMENT AREA

BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
EXCAVATION

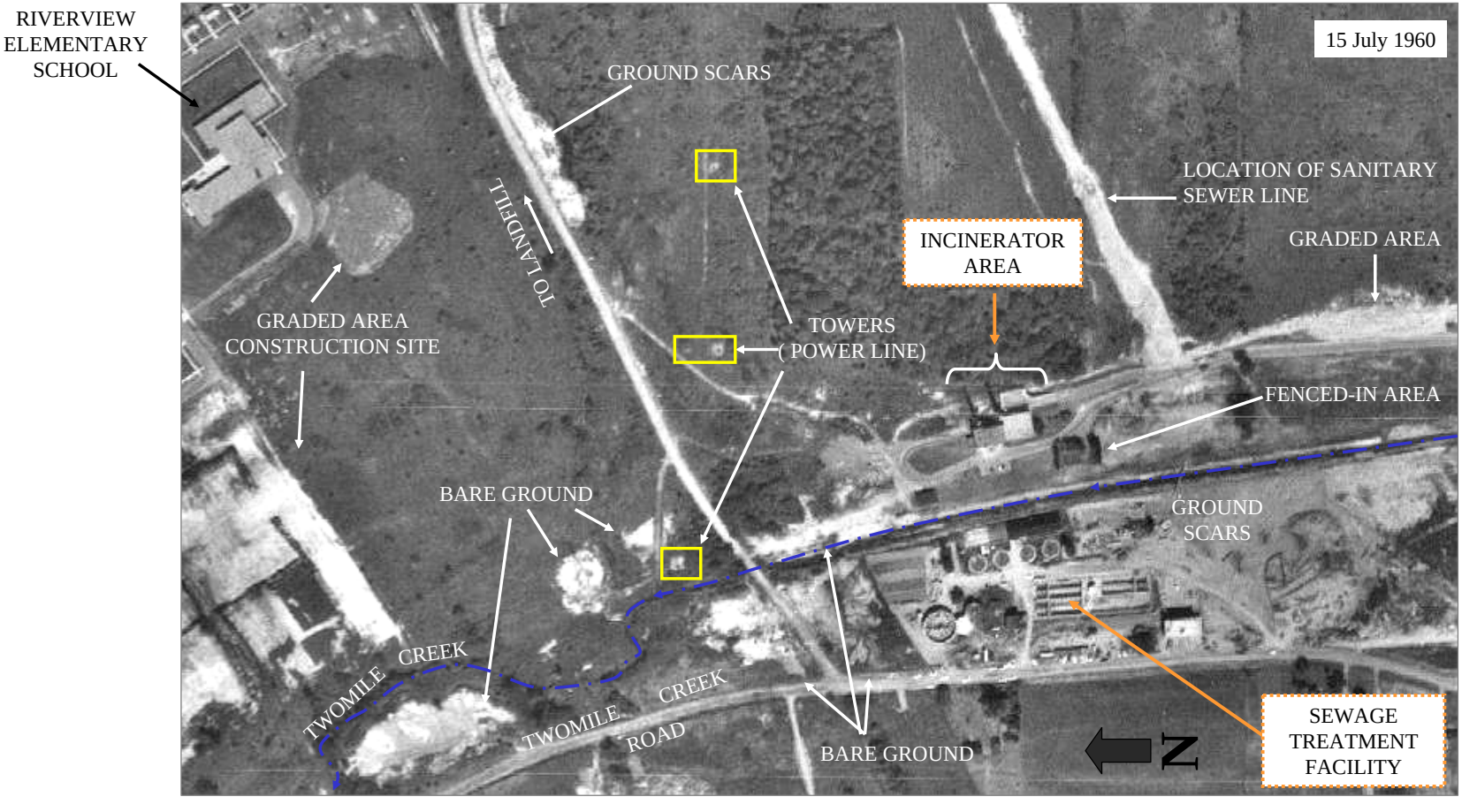
FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM

MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, 1960



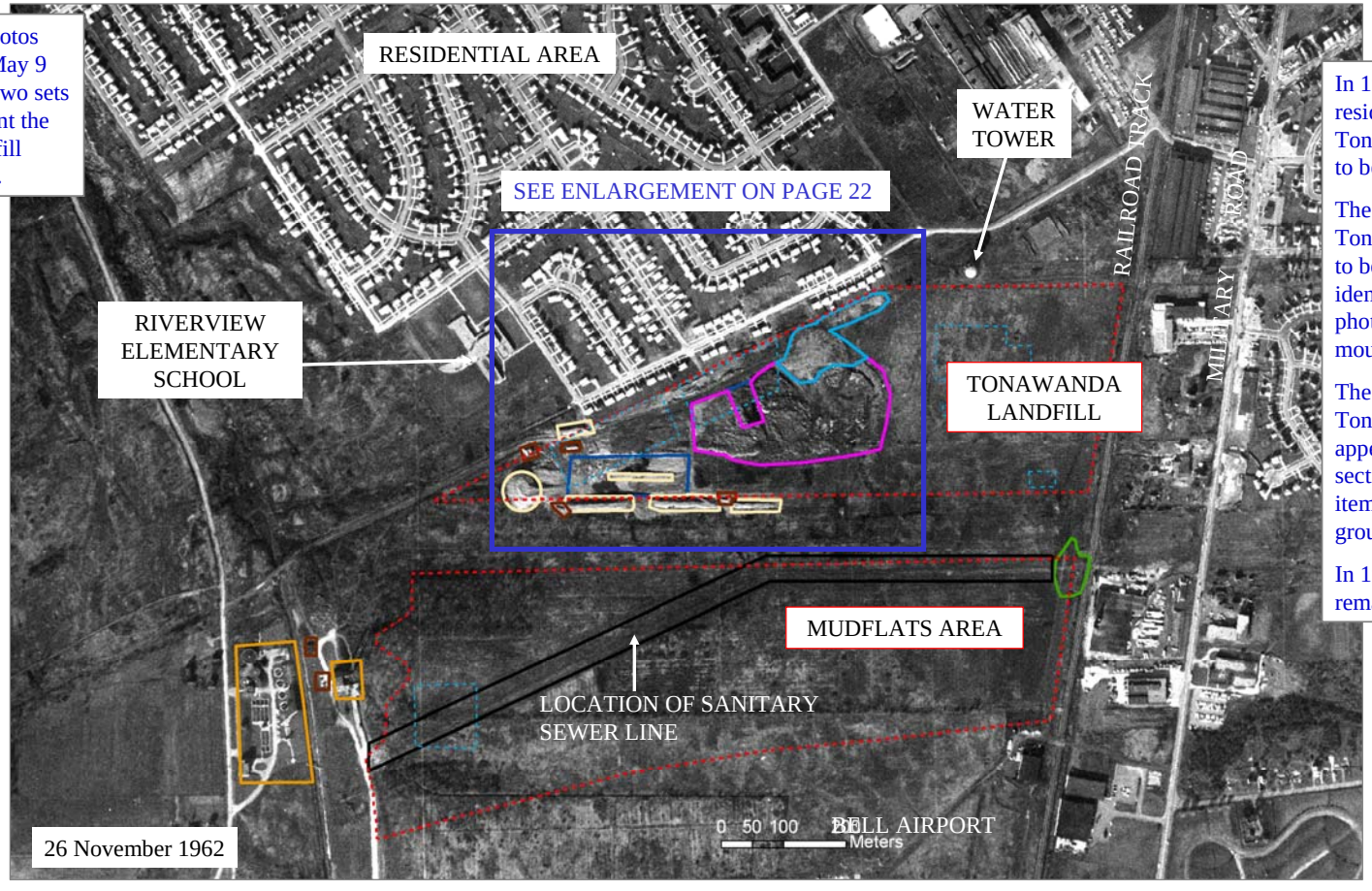
SEWAGE TREATMENT FACILITY AND INCINERATOR, 1960



The Sewage Treatment Facility and Incinerator Area show expansion since the 1950s. Two incinerators are now present on the Incinerator Area property. The road system appears well developed.

1962 OVERVIEW

Note: Two set of aerial photos were collected for 1962: May 9 and November 26. These two sets of photos are used to present the detailed views of the Landfill Area in the next two pages.



In 1962, development of the residential area north of the Tonawanda Landfill Area appears to be complete.

The western section of the Tonawanda Landfill Area appears to be very active. Features identified from the aerial photography include large pits, mounded material, and structures.

The central section of the Tonawanda Landfill Area also appears active. Features in this section of the landfill include such items as: disturbed ground, a pit, ground scars, and piles of debris.

In 1962, the Mudflats Area remains undeveloped.

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

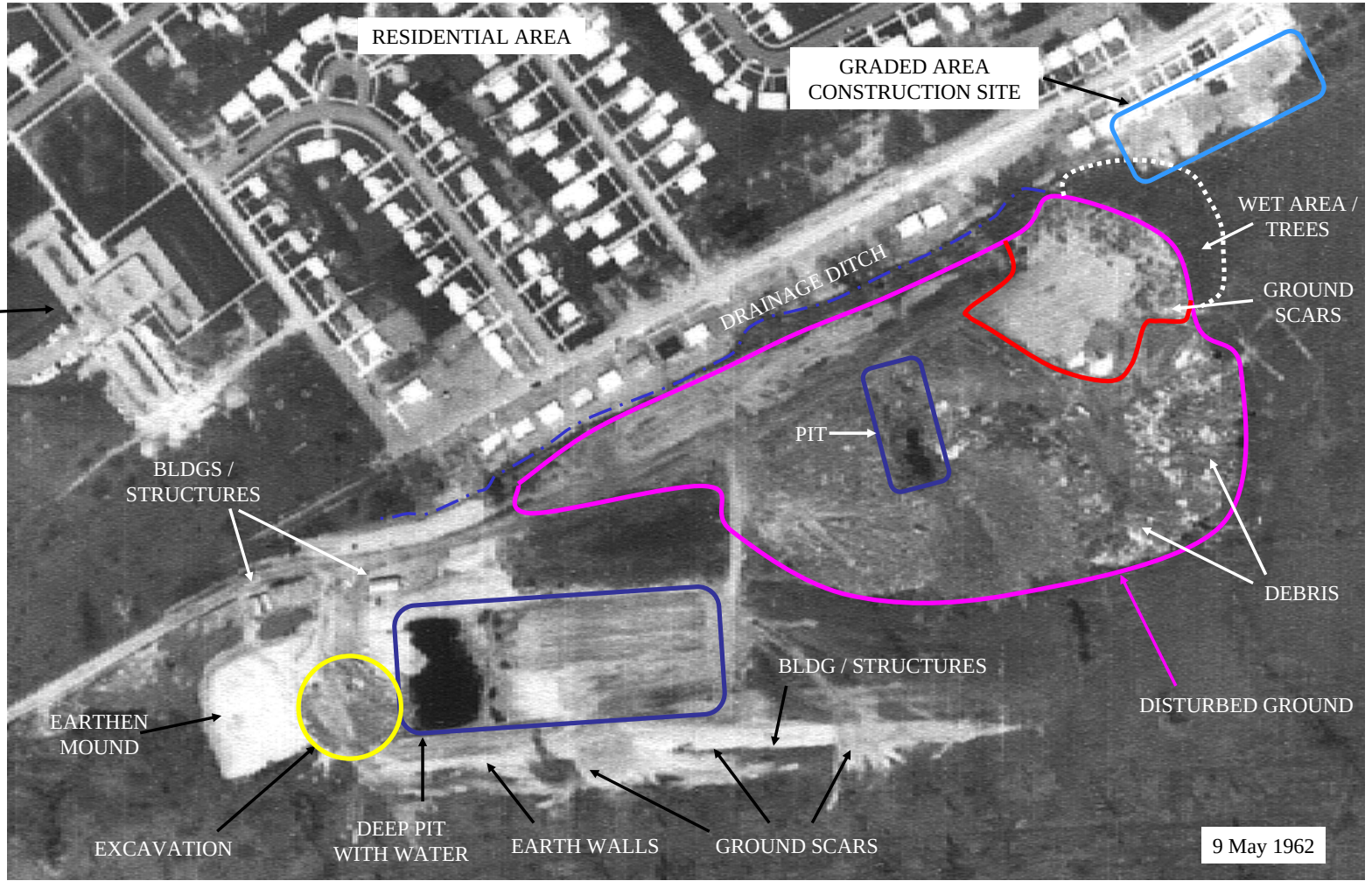
BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
EXCAVATION

FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM

MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

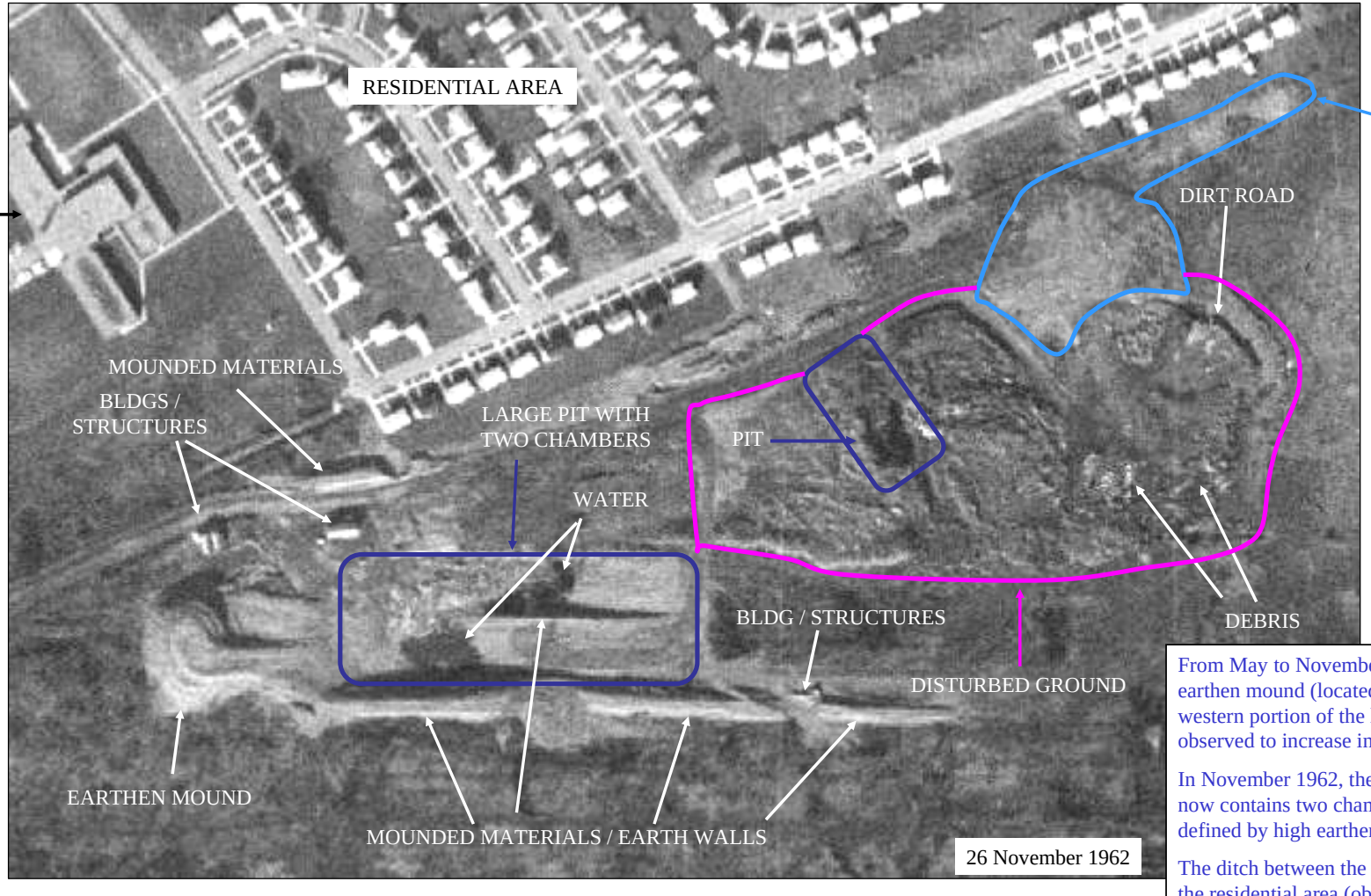
SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, MAY 1962

There are two photo collections for 1962, May 9 and November 26. In this May 9, 1962 photo, on the western side of the landfill, an earthen mound, and a large and deep pit were first observed. The landfill also contained an area of disturbed ground with pit, ground scars, and debris. A drainage ditch is seen between the landfill and the new houses. This ditch appears on May 62 photos only.



PLEASE SEE THE 3D VIEWS OF HISTORICAL PHOTO COMPARISON OF MAY AND NOVEMBER 1962 LANDFILL ON PAGE 50

SIGNIFICANT FINDINGS IN THE TONAWANDA LANDFILL, NOVEMBER 1962



From May to November 1962, the earthen mound (located on the western portion of the landfill) is observed to increase in height.

In November 1962, the large pit now contains two chambers defined by high earthen walls.

The ditch between the landfill and the residential area (observed in May 1962) is no longer evident.

PLEASE SEE THE 3D VIEWS OF HISTORICAL PHOTO COMPARISON OF MAY AND NOVEMBER 1962 LANDFILL ON PAGE 50

1964 OVERVIEW

The Mudflats Area is observed for the first time on 1964 aerial photography.

A limited photographic interpretation was made of the 1964 aerial photography due to the small-scale nature of the imagery.

In general, the landfill shows an area of disturbed ground containing pits – some filled with water.

The residential area to the north of the landfill appears as it did in 1962.

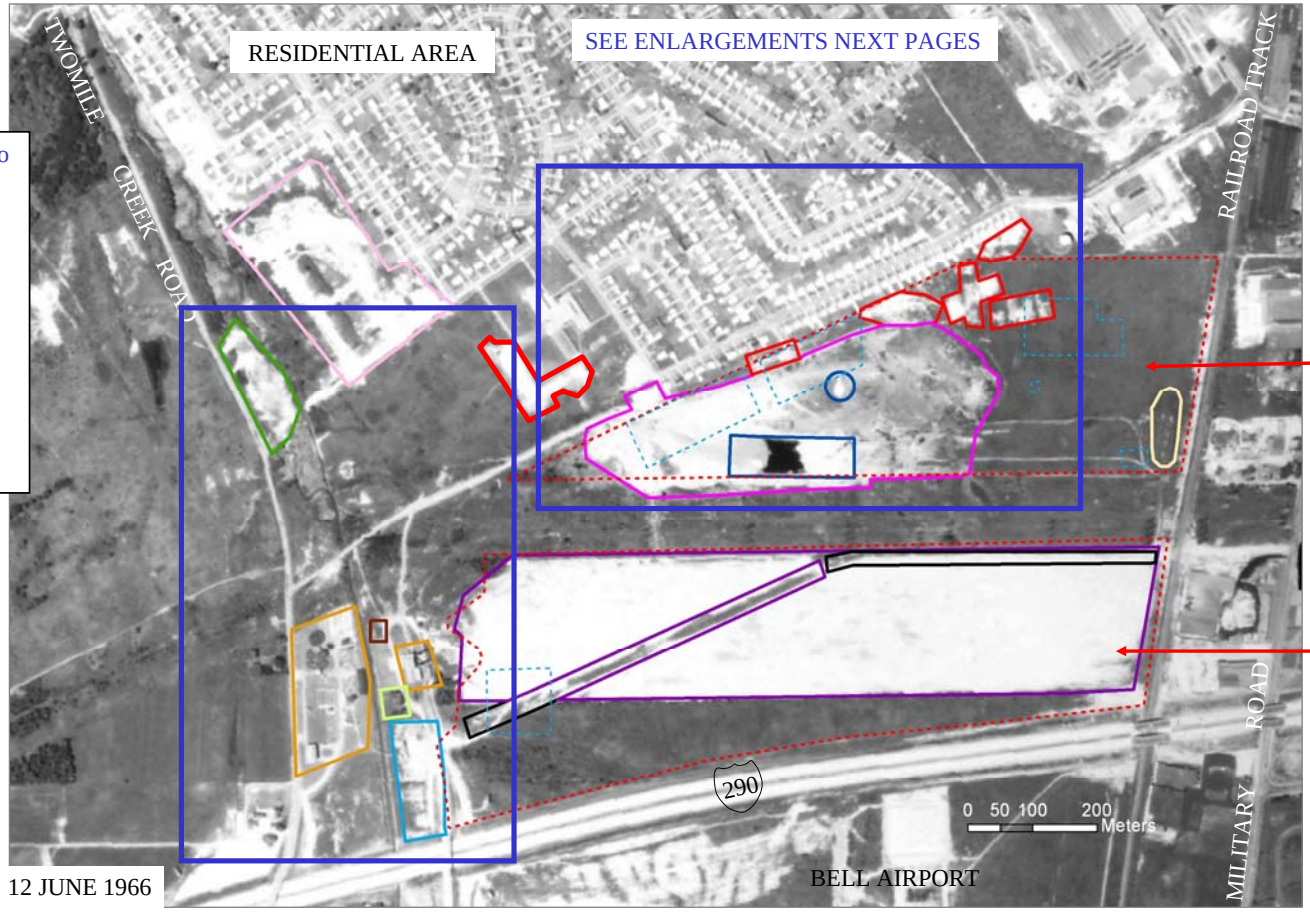
* This feature is a 42-inch diameter sanitary sewer line which was identified for the first time on 1958 aerial photography. Source of information: Remedial Investigation Report, Tonawanda Landfill Vicinity Property, Tonawanda, New York, April 2005, Figure 1-3.

1966 OVERVIEW

The 1966 photo shows changes to the property since what was last observed with 1964 aerial photography.

New excavated areas and dirt roads are observed in the landfill area.

The Mudflats Area is observed clearly on the 1966 aerial photography (with a distinctive light-toned appearance).



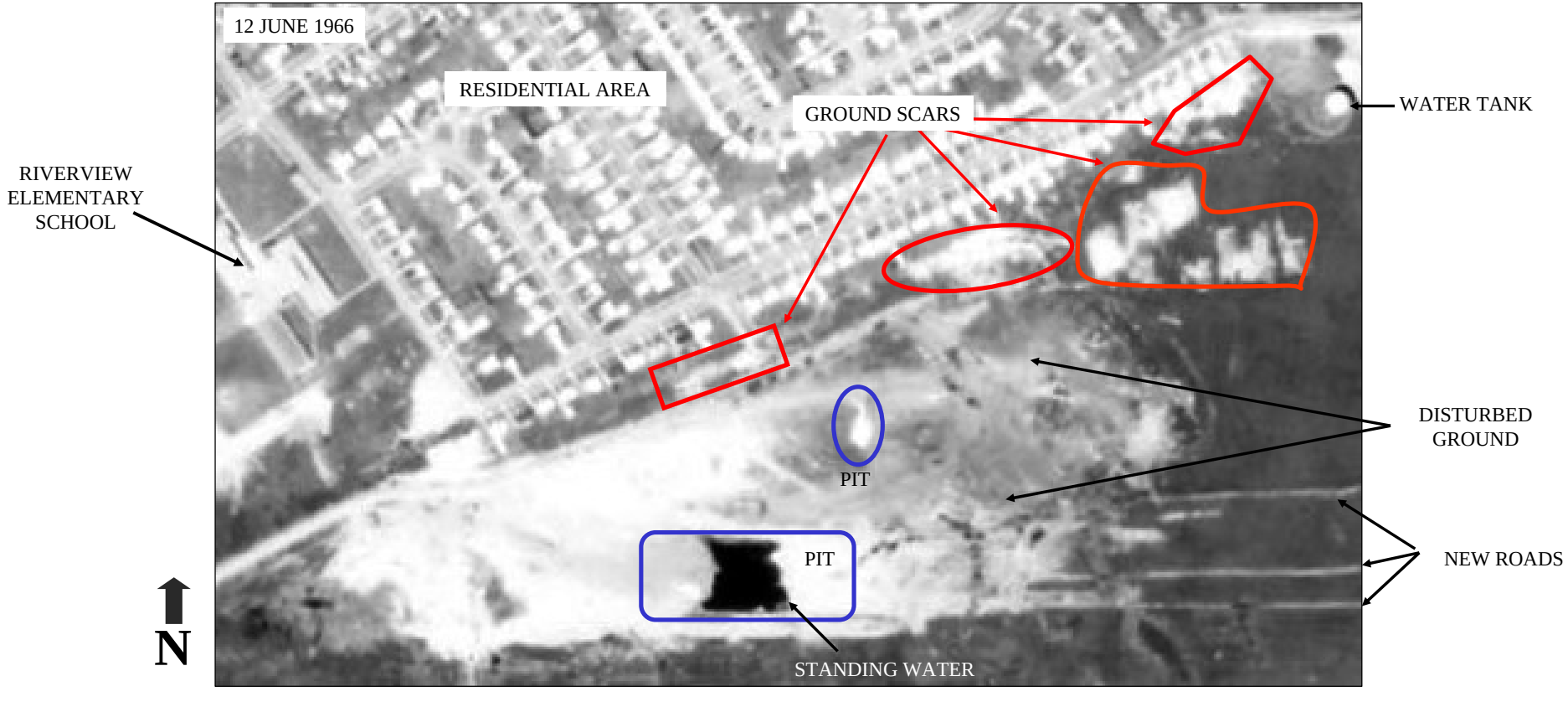
APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

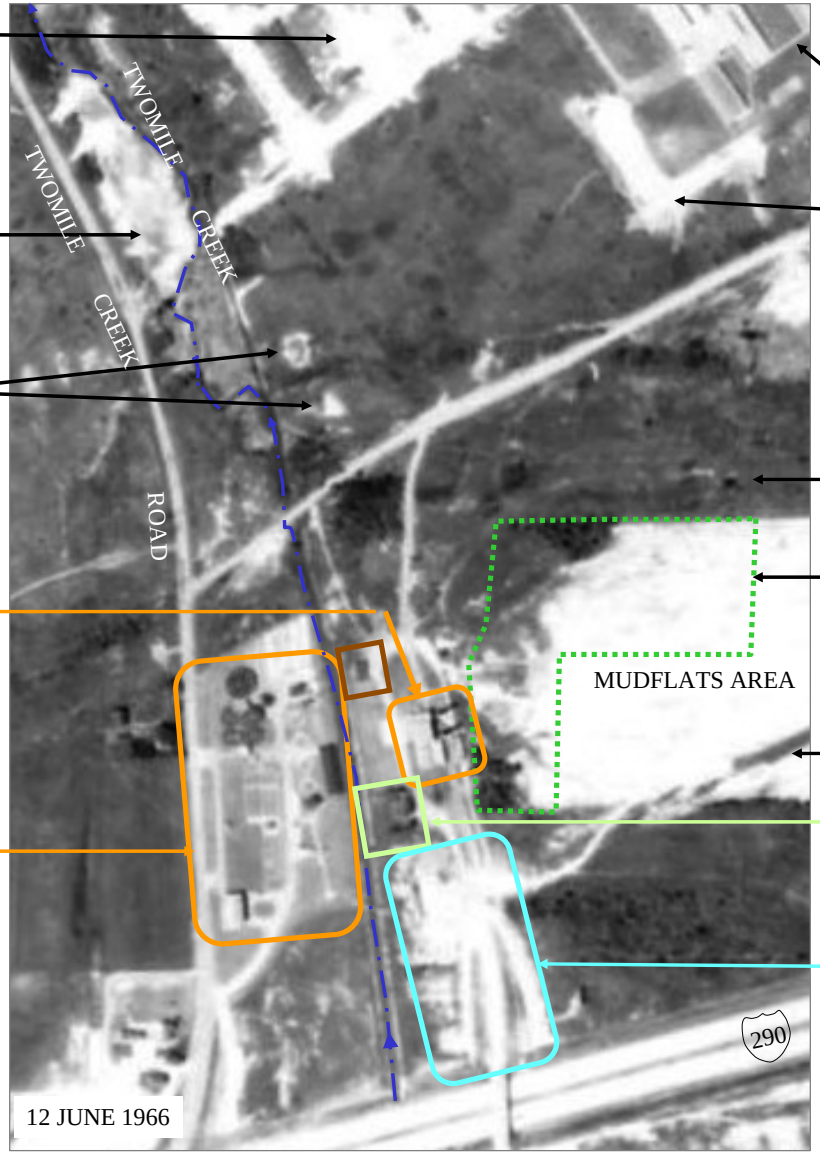
BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
FENCE-IN AREA
FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM
MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

LANDFILL AREA, 1966



In 1966, the landfill remains active. Much of the area appears as disturbed ground. Mounded material which was previously located on the west side of the landfill is now leveled. The large pit, previously observed on both 1962 and 1964 aerial photography, shows standing water inside. Patches of ground scars are observed on landfill property adjacent to the residential area.

SEWAGE TREATMENT FACILITY AND INCINERATORS, 1966



GRADED AREA (CONSTRUCTION OF NEW RESIDENTIAL AREA)

BARE GROUND

TOWERS (POWER LINE)

INCINERATOR AREA

SEWAGE TREATMENT FACILITY

A section of dense vegetation (located east of the incinerators), observed on previous aerial photography, is now cleared.

RIVERVIEW ELEMENTARY SCHOOL

GROUND SCAR

TOWERS (POWER LINE)

LOCATION OF DENSE VEGETATION BEFORE MUDFLATS

MUDFLATS AREA

LOCATION OF SANITARY SEWER LINE

FENCED-IN AREA

GRADED AREA (CONSTRUCTION SITE)

1972 OVERVIEW

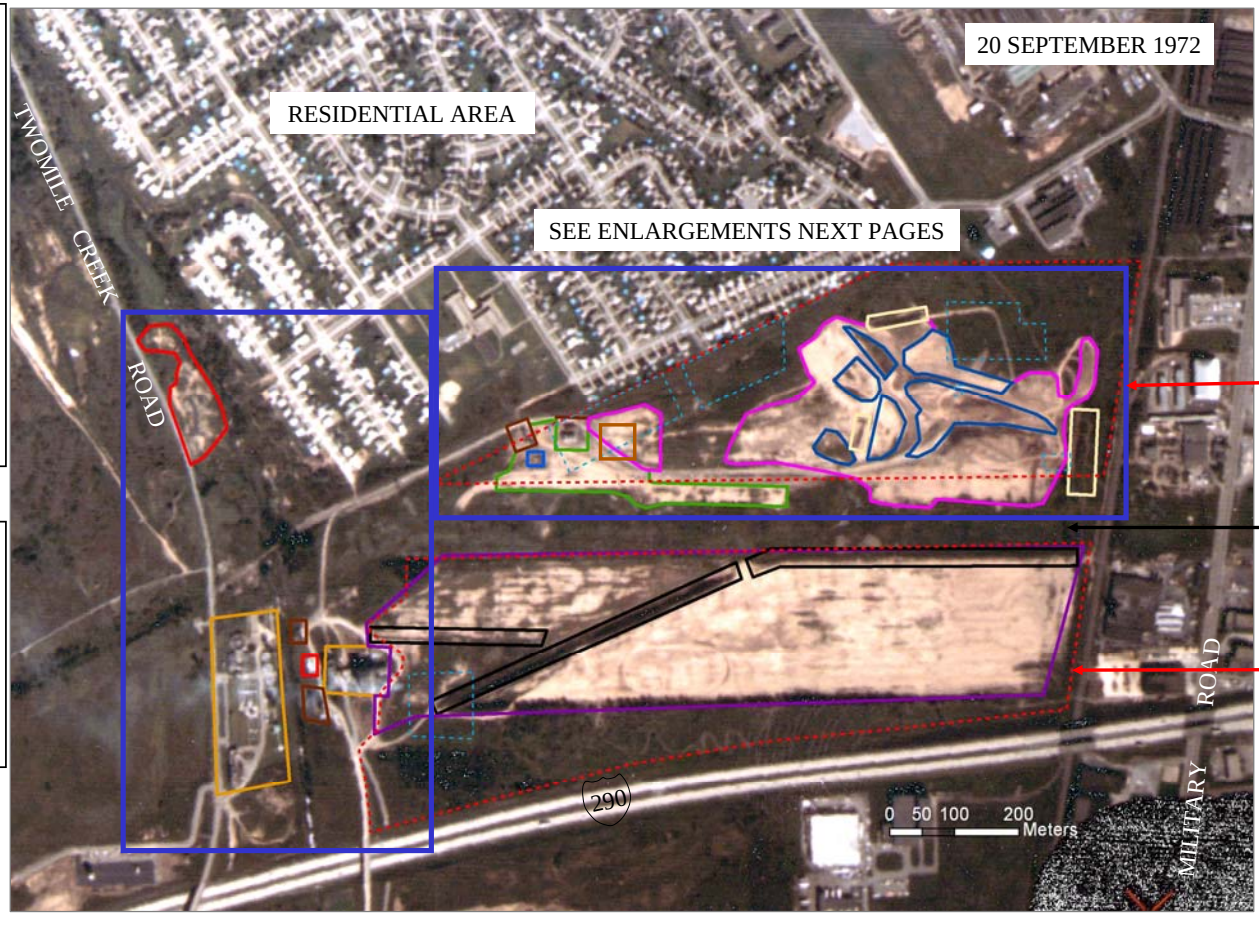
In 1972, increased activity is observed in the Tonawanda Landfill.

The huge pit, previously located on the west side of the landfill, is filled in.

The landfill contains a large amount of disturbed ground, numerous pits and berms, and other small excavated sites.

The Mudflats Area continues to be observed south of the Niagara Mohawk power line right-of-way.

Note: Two set of aerial photos were collected for 1972: May 10 and September 20. These two sets of photos are used to present the detailed views of the Landfill Area in the next page.



APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

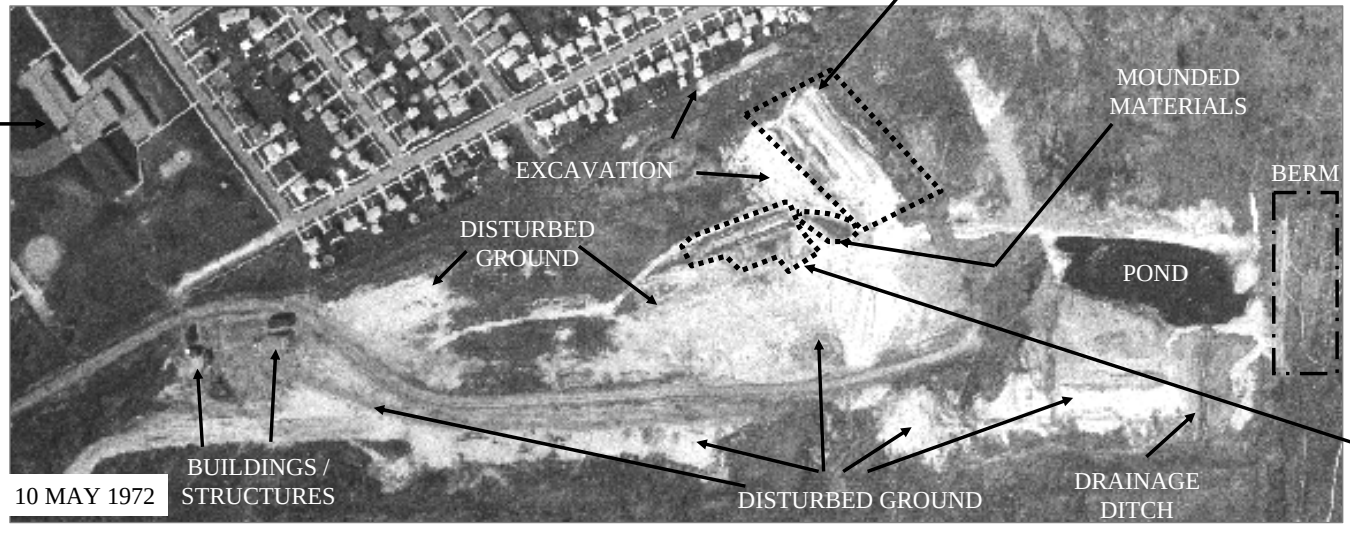
BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
EXCAVATION

FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM

MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

LANDFILL AREA, 1972

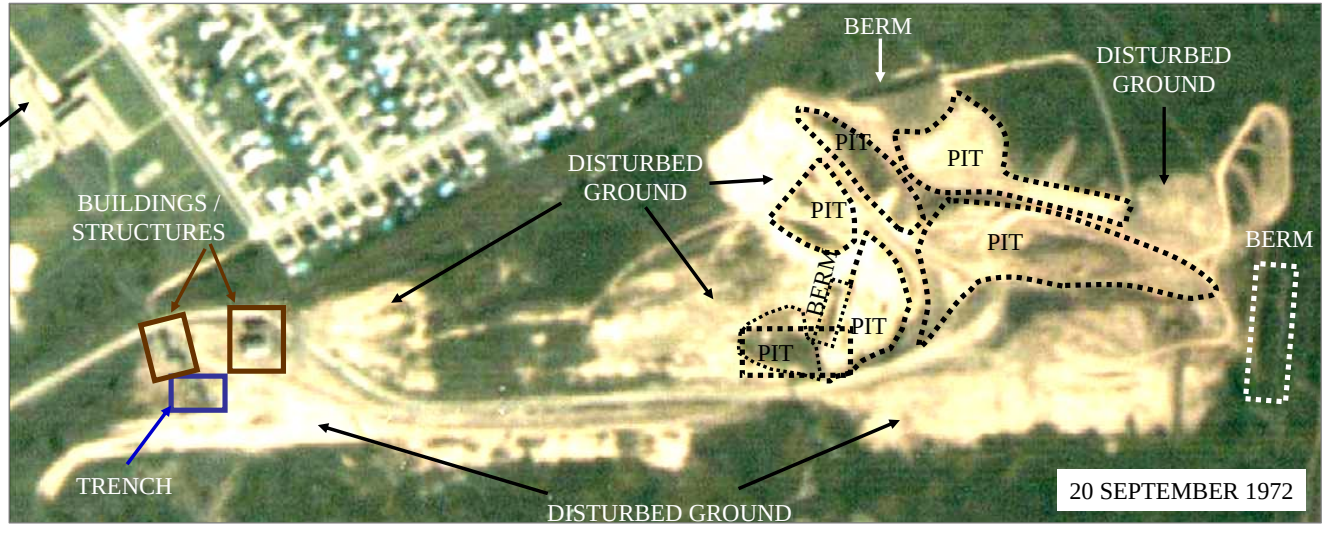
HISTORICAL PHOTO COMPARISON OF MAY AND SEPTEMBER 1972



Two (2) linear trenches filled with dark-toned material.

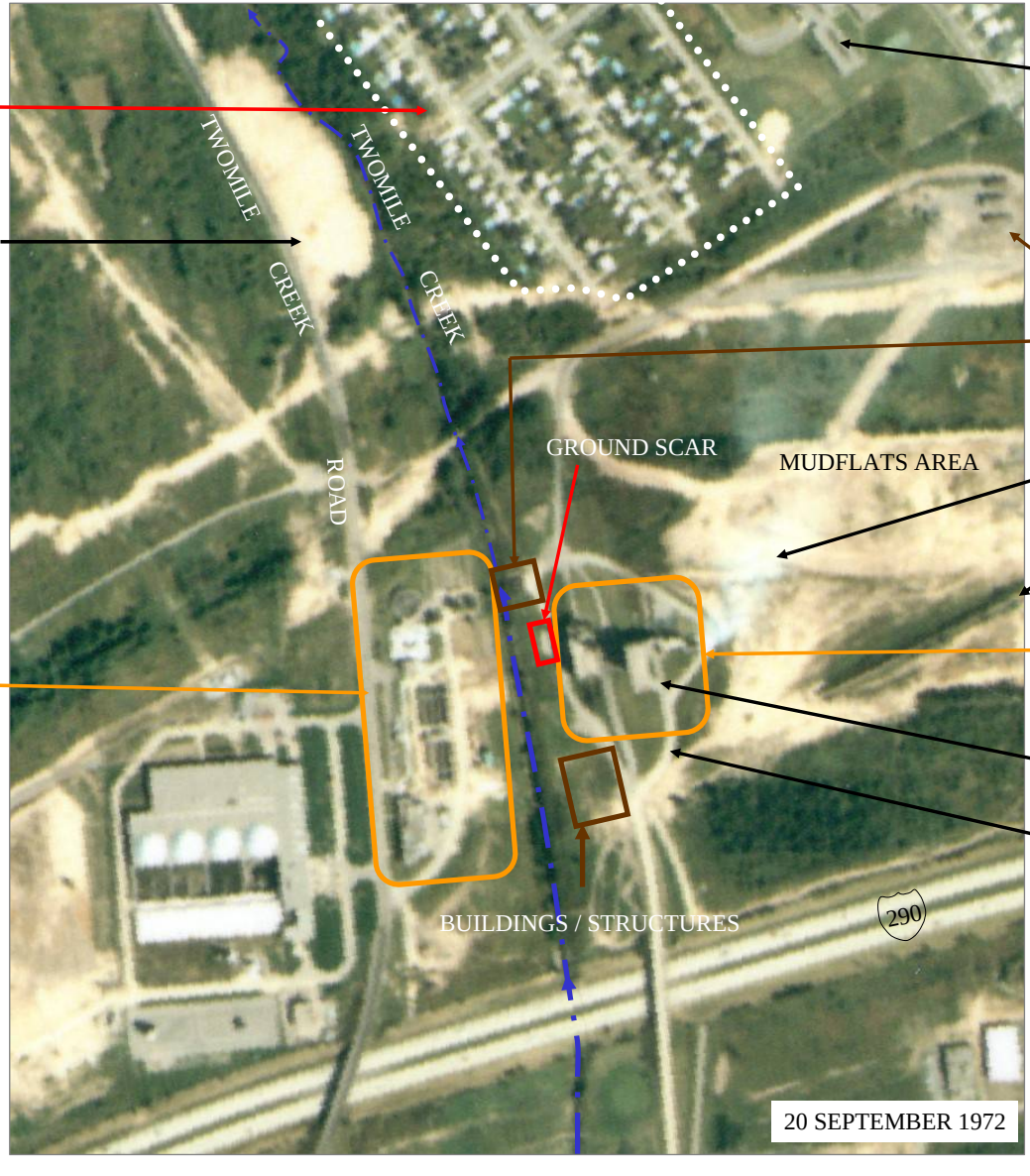
Two (2) linear trenches and one (1) smaller 'Z-shaped' trench.

In May 1972, the landfill contains a pond and numerous excavation sites and trenches. By September, the pond was filled. The landfill was a large disturbed ground with many pits and berms.



PLEASE SEE THE 3D VIEWS OF HISTORICAL PHOTO COMPARISON OF MAY AND SEPTEMBER 1972 LANDFILL ON PAGE 51 AND 52

SEWAGE TREATMENT FACILITY AND INCINERATORS, 1972



NEW RESIDENTIAL AREA

BARE GROUND

RIVERVIEW ELEMENTARY SCHOOL

BUILDINGS / STRUCTURES

PLUME OF SMOKE

LOCATION OF SANITARY SEWER LINE

INCINERATORS

SEWAGE TREATMENT FACILITY

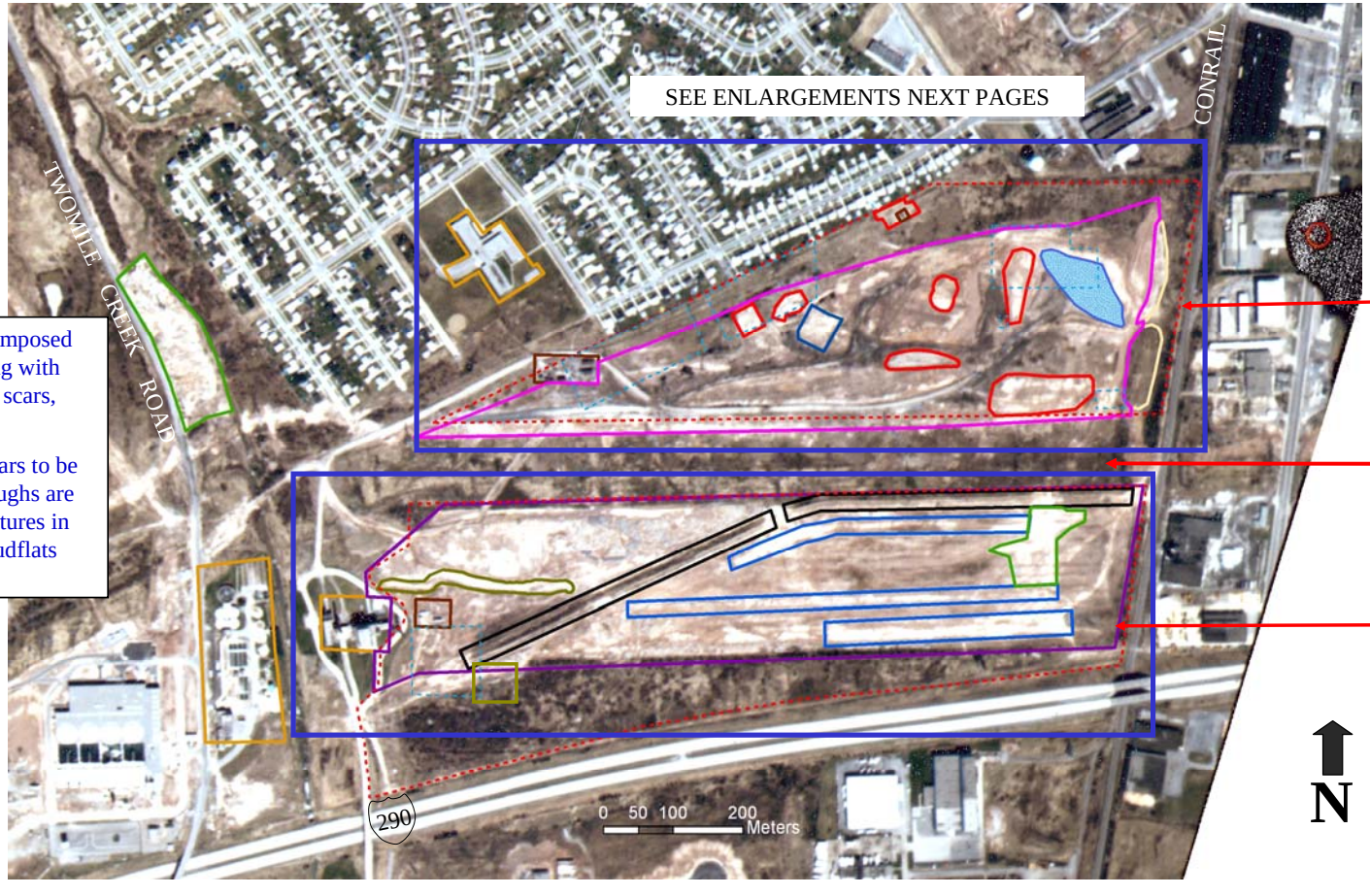
NEW INCINERATOR BUILDING

NEW ROAD

1978 OVERVIEW

In 1978 the landfill is composed of disturbed ground along with excavation sites, ground scars, and two ponds.

The Mudflats Area appears to be drained. Trench and troughs are identified as residual features in the somewhat vacant Mudflats Area.



TONAWANDA LANDFILL

NIAGARA MOHAWK POWER LINE RIGHT-OF-WAY

MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

- BUILDINGS/STRUCTURES
- BARE GROUND
- CONSTRUCTION SITE
- DRAINAGE DITCH
- FACILITY AREA
- GRADED AREA
- GROUND SCARS
- MOUNDED MATERIALS / BERM
- MUDFLATS AREA
- PITS OR TRENCHES
- POND
- SANITARY SEWER LINE

LANDFILL AREA, 1978

23 APR 1978

RIVERVIEW ELEMENTARY SCHOOL

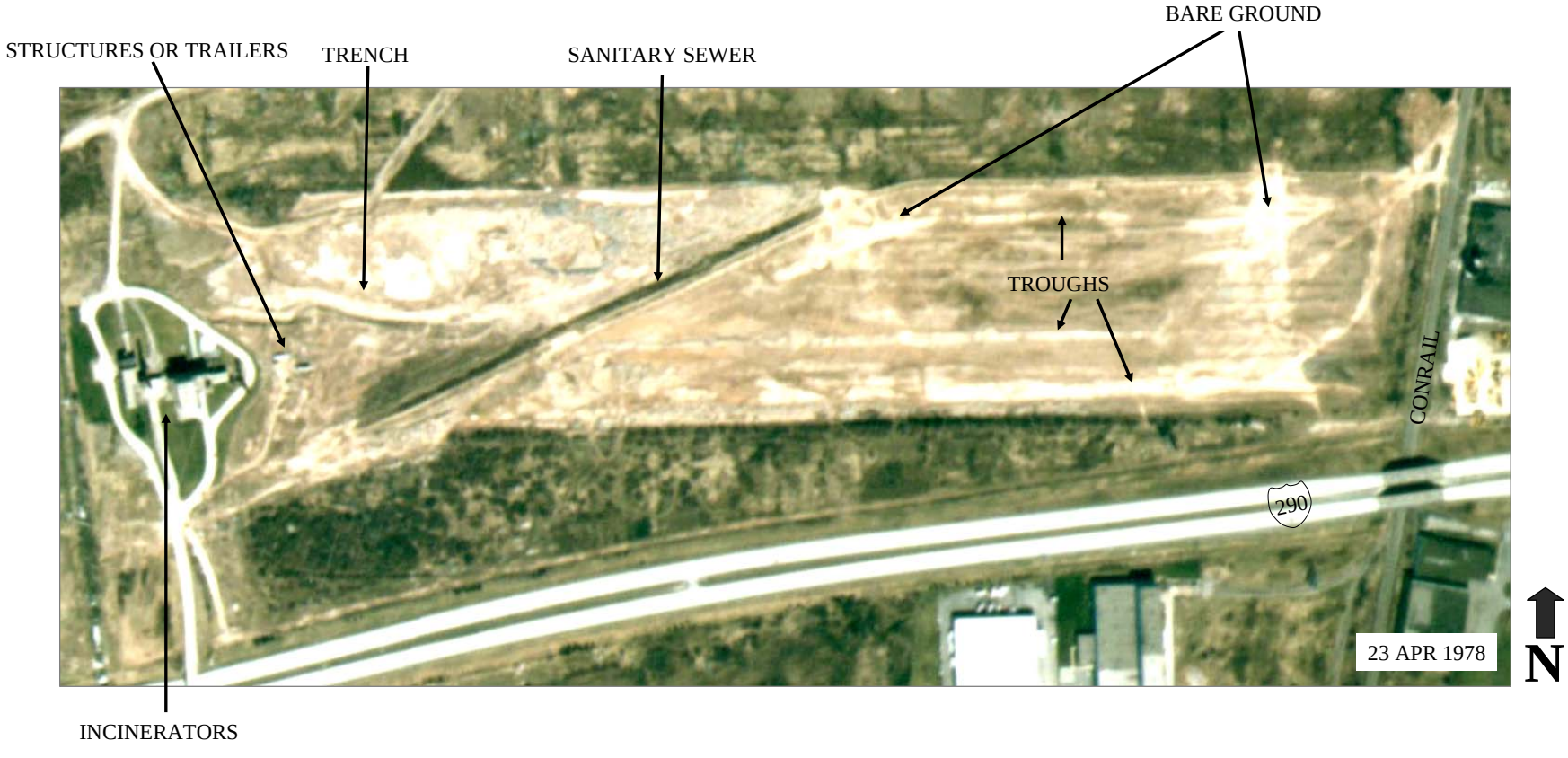
BUILDINGS / STRUCTURES

BERM / MOUNDED MATERIALS

In 1978 the Tonawanda Landfill is a large area of disturbed ground.
The landfill also contains excavation sites, scattered ground scars, and two ponds.

PLEASE SEE A 3D VIEW OF 1978 PHOTO ON PAGE 53

MUDFLATS AREA, 1978



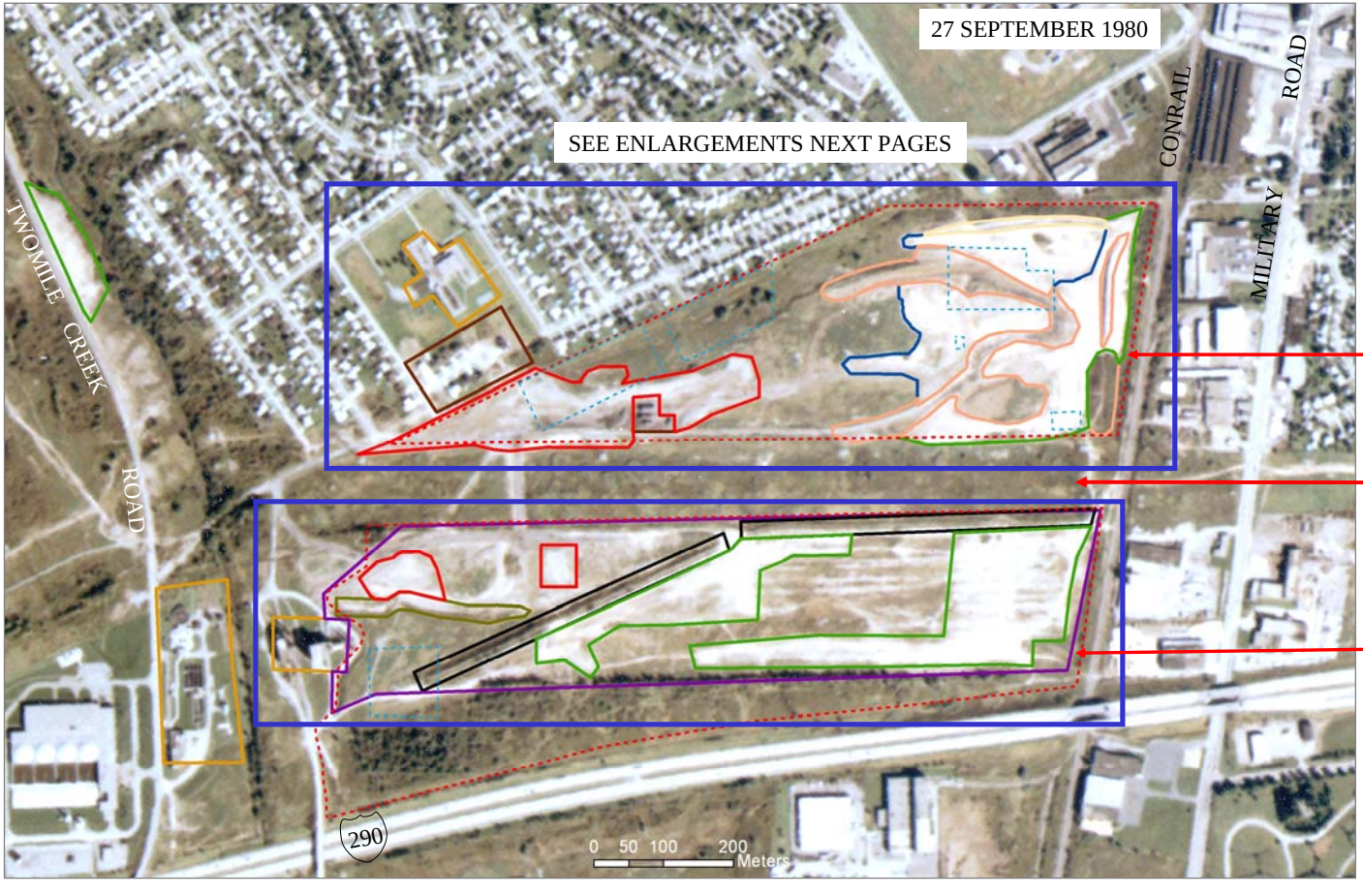
In 1978 the Mudflats Area appears to be drained. Trench and troughs occur along the bottom.

PLEASE SEE A 3D VIEW OF 1978 PHOTO ON PAGE 53

1980 OVERVIEW

In 1980, the Tonawanda Landfill contains shallow pits, a trench, a berm, and an area of ground scars.

Both the landfill and mudflats area appear to be less active (showing signs of revegetation).



APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

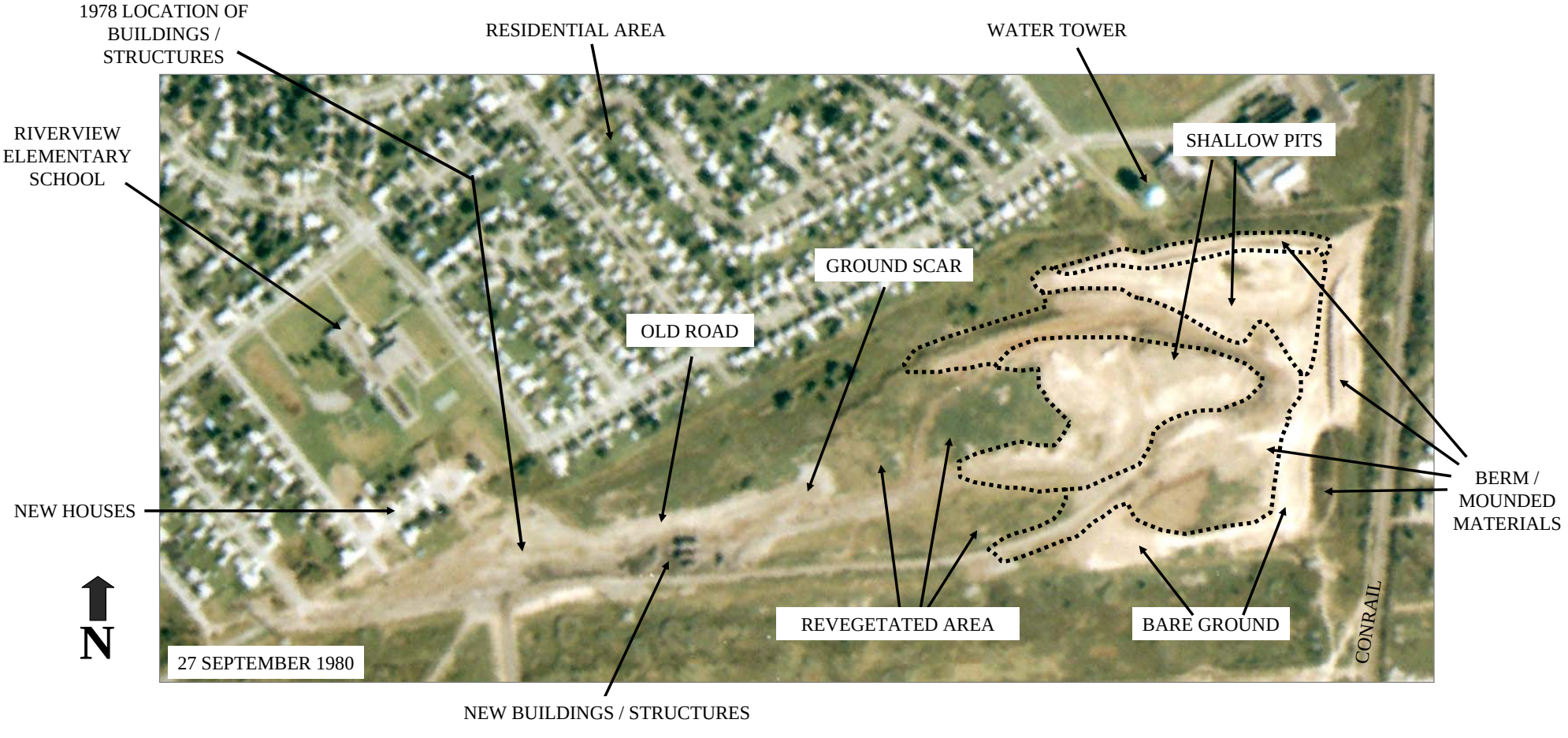
ENLARGEMENT AREA

BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
DRAINAGE DITCH

FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM

MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

LANDFILL AREA, 1980



Portions of the landfill appear to be covered with patches of new vegetation.

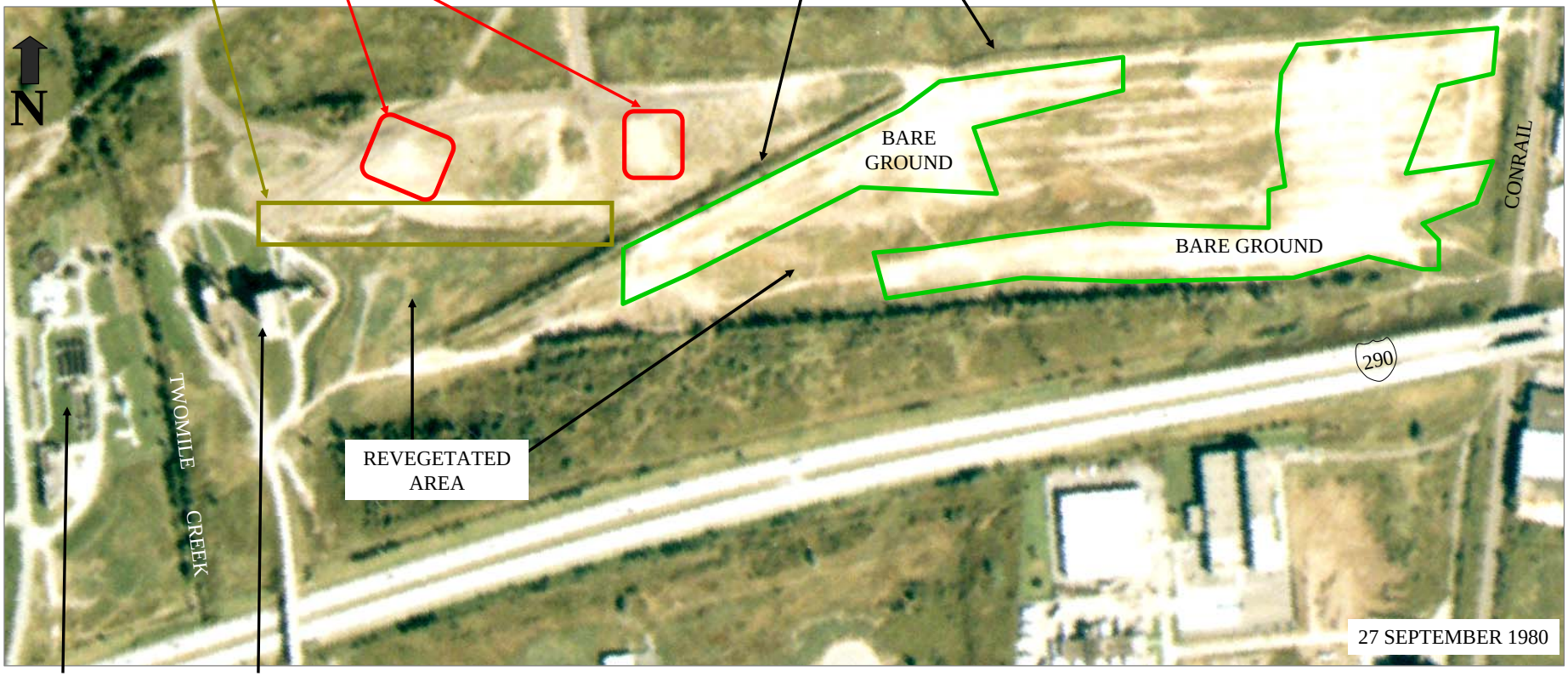
PLEASE SEE A 3D VIEW OF 1980 PHOTO ON PAGE 54

POWER LINE RIGHT-OF-WAY, 1980

In 1980, the power line right-of-way lying between the Tonawanda Landfill and the Mudflats Area contains scattered mounded materials.

PLEASE SEE A 3D VIEW OF 1980 PHOTO ON PAGE 54

MUDFLATS AREA, 1980



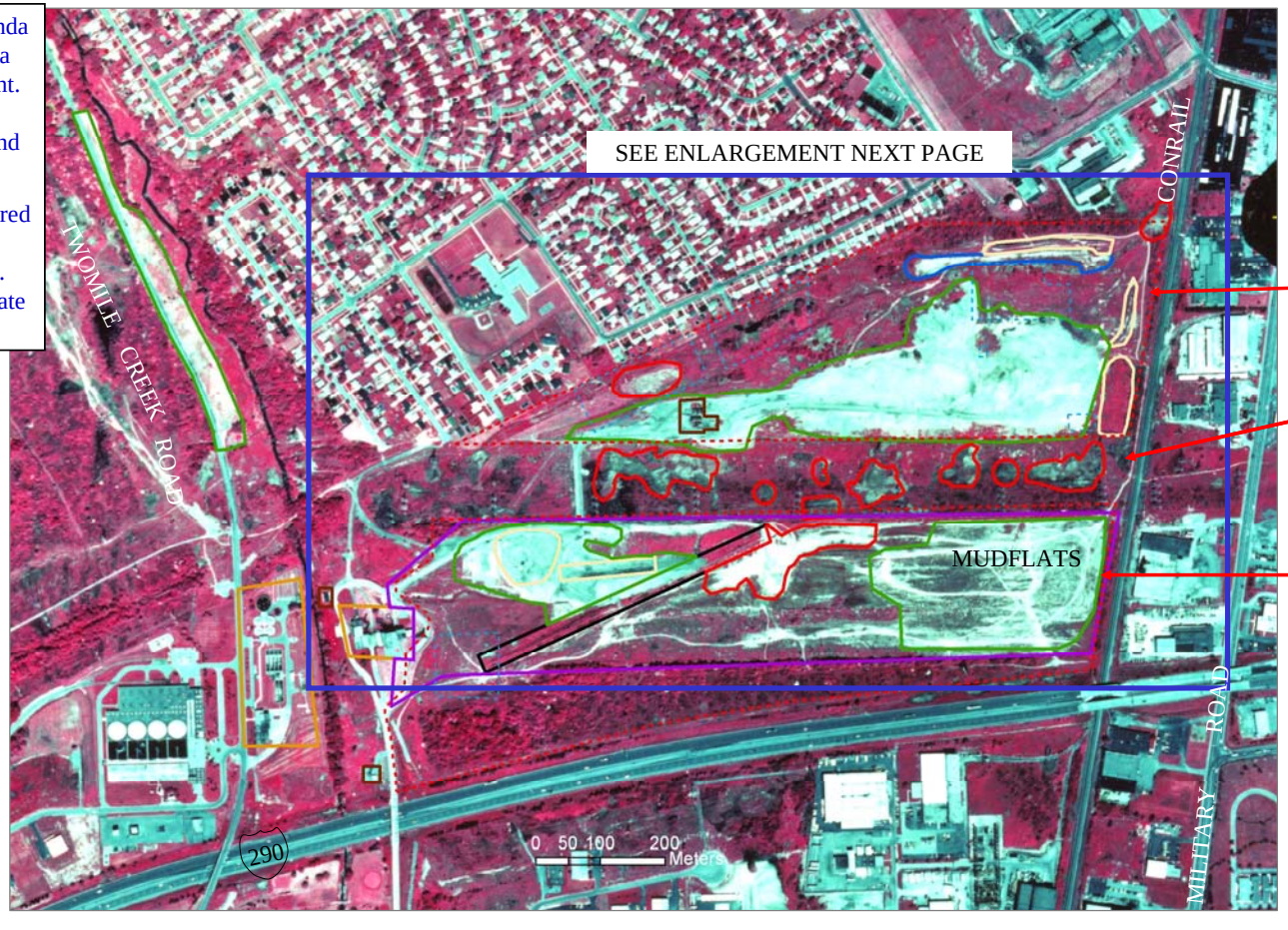
In 1980, a portion of the mudflats is covered by vegetation

PLEASE SEE A 3D VIEW OF 1980 PHOTO ON PAGE 54

1990 OVERVIEW

In 1990, both the Tonawanda Landfill and Mudflats Area show signs of abandonment. These two sites contain a large amount of bare ground (fill soil).

Note: This is a color infrared photograph. Red color indicates dense vegetation. White and light blue indicate bare ground.



TONAWANDA LANDFILL

NIAGARA MOHAWK POWER LINE RIGHT-OF-WAY

MUDFLATS AREA

N

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

BUILDINGS

BARE GROUND

GROUND SCARS

MOUNDED MATERIALS / BERM

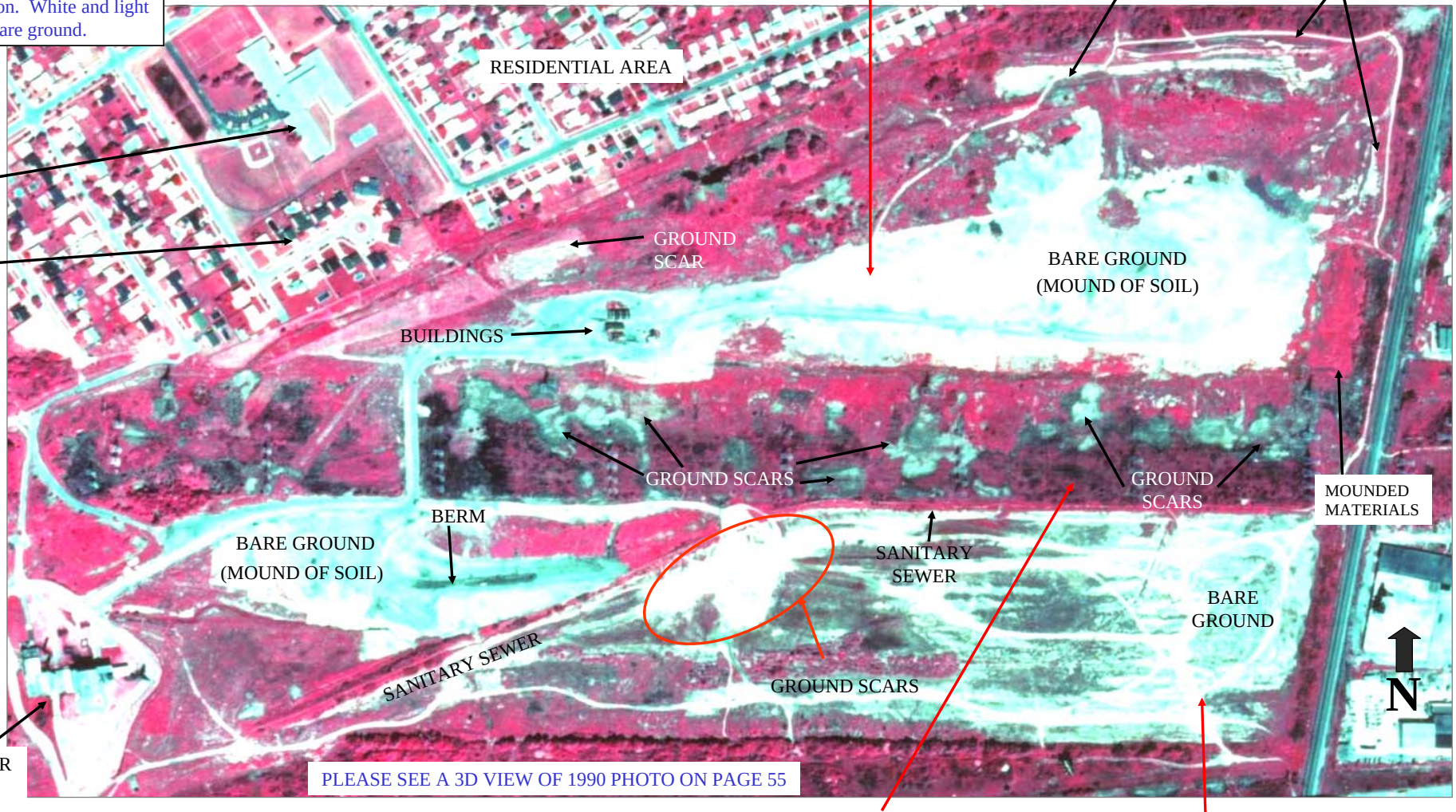
MUDFLATS

STRUCTURES / FACILITY

PLEASE SEE A 3D VIEW OF 1990 PHOTO ON PAGE 55

LANDFILL AND MUDFLATS AREA, 1990

Note: This is a color infrared photograph. Red color indicates dense vegetation. White and light blue indicate bare ground.



PLEASE SEE A 3D VIEW OF 1990 PHOTO ON PAGE 55

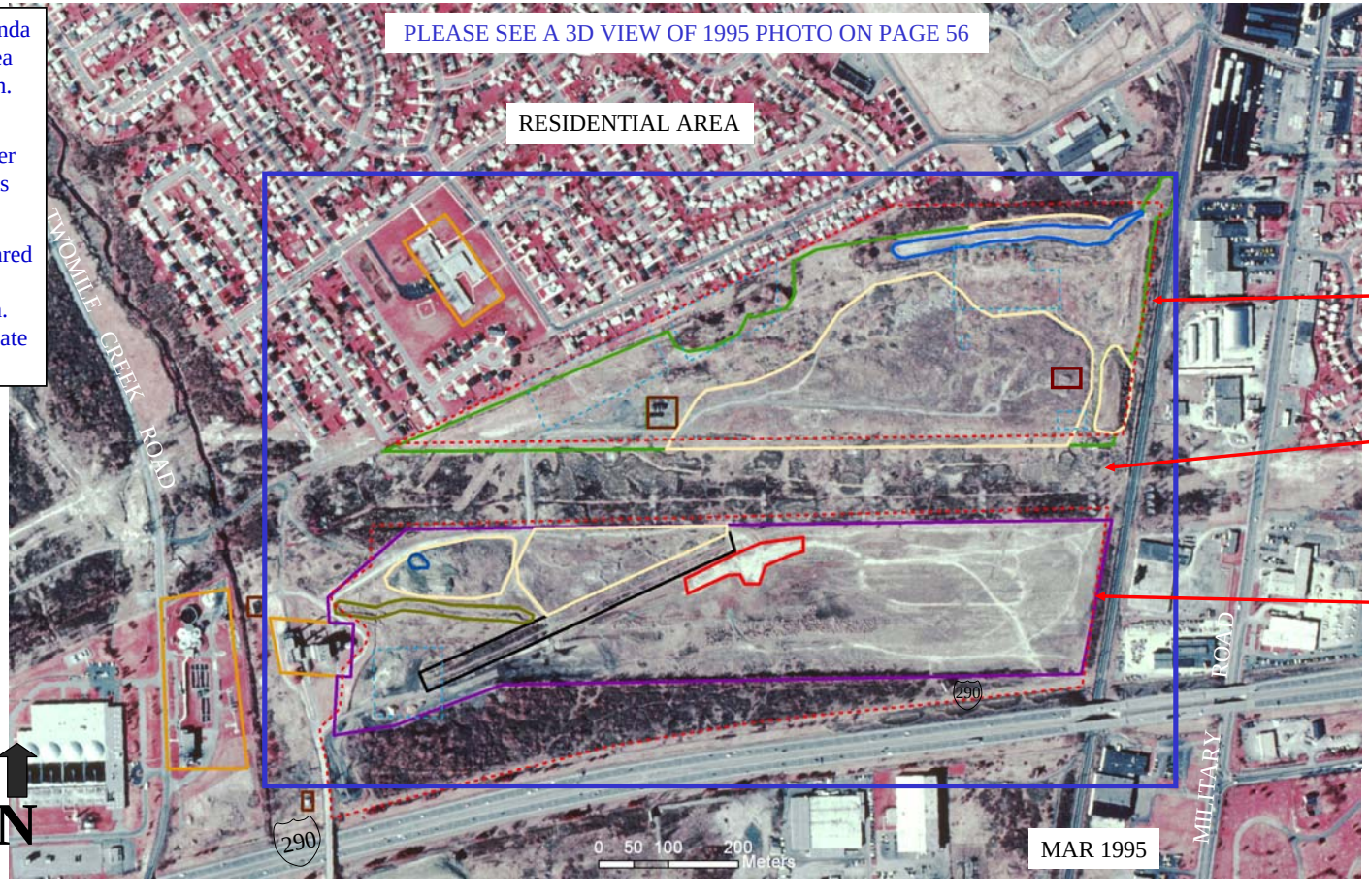
1995 OVERVIEW

In 1995, both the Tonawanda Landfill and Mudflats Area show signs of revegetation.

The mottle light pink indicates sparse grass cover in the landfill and mudflats area.

Note: This is a color infrared photograph. Red color indicates dense vegetation. White and light blue indicate bare ground.

PLEASE SEE A 3D VIEW OF 1995 PHOTO ON PAGE 56



APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREA

APPROXIMATE PRESENT DAY LANDFILL & MUDFLATS AREAS OF INTEREST

ENLARGEMENT AREA

BUILDINGS/STRUCTURES
BARE GROUND
CONSTRUCTION SITE
DRAINAGE DITCH
FACILITY AREA
GRADED AREA
GROUND SCARS
MOUNDED MATERIALS / BERM
MUDFLATS AREA
PITS OR TRENCHES
POND
SANITARY SEWER LINE

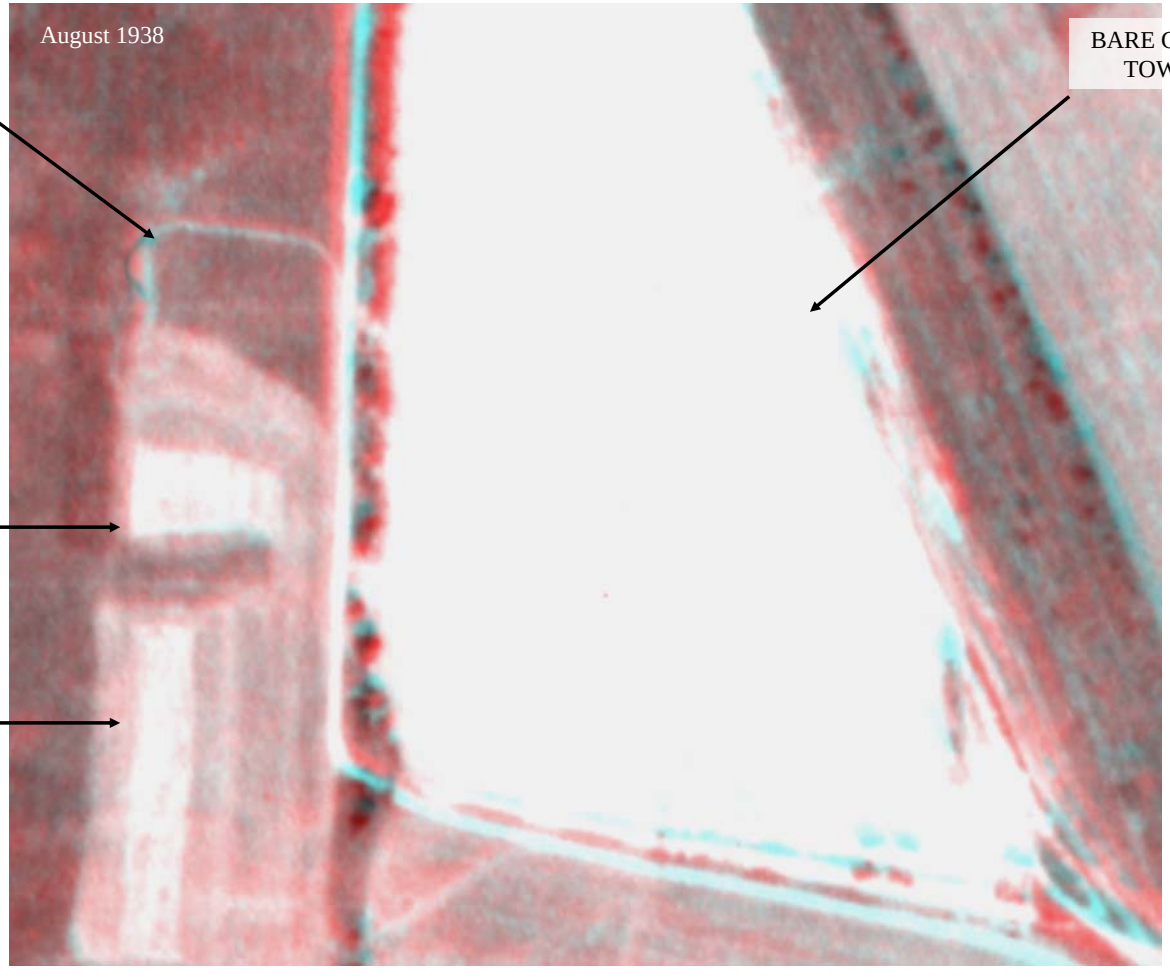
LANDFILL AND MUDFLATS AREA, 1995

Note: This is a color infrared photograph. Red color indicates dense vegetation. White and light blue indicate bare ground. Mottle light pink indicates sparse grass cover on the bare soil.

PLEASE SEE A 3D VIEW OF 1995 PHOTO ON PAGE 56

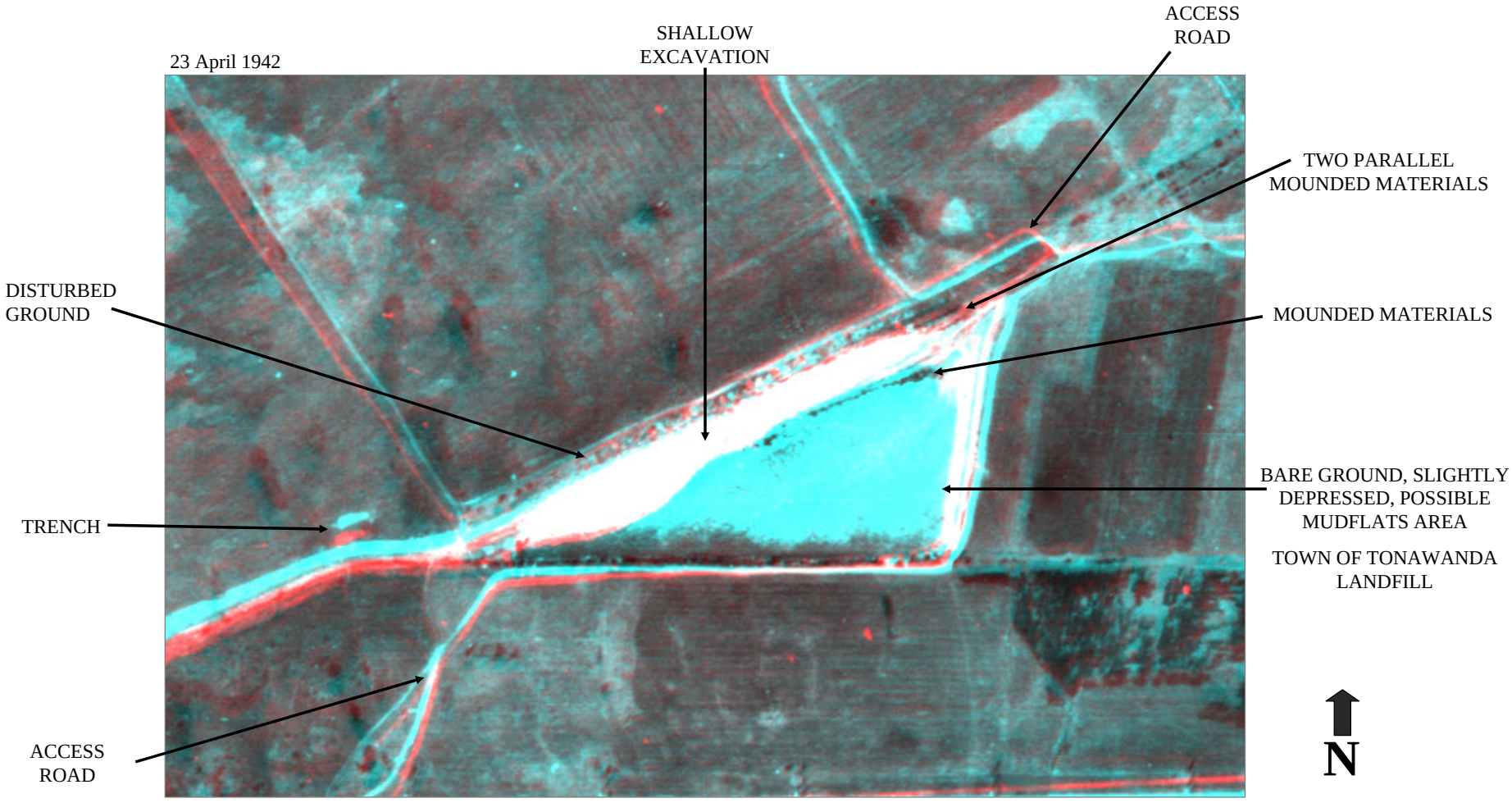
SELECTED ANAGLYPHS

3D VIEW OF LANDFILL AREA, 1938



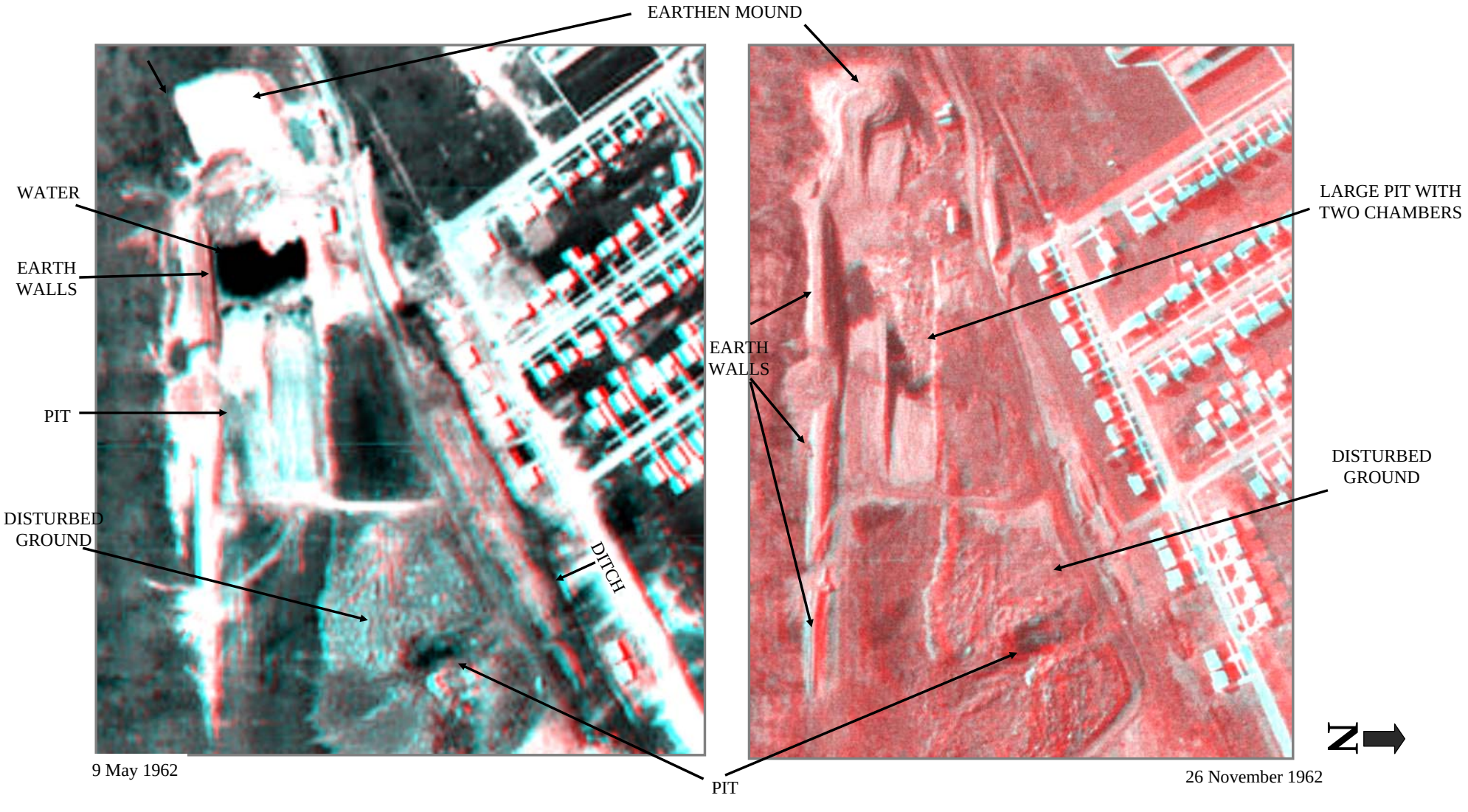
In order to make the 1938 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position. North is to the right.

3D VIEW OF LANDFILL AREA, 1942



3D VIEWS OF LANDFILL AREA, 1962

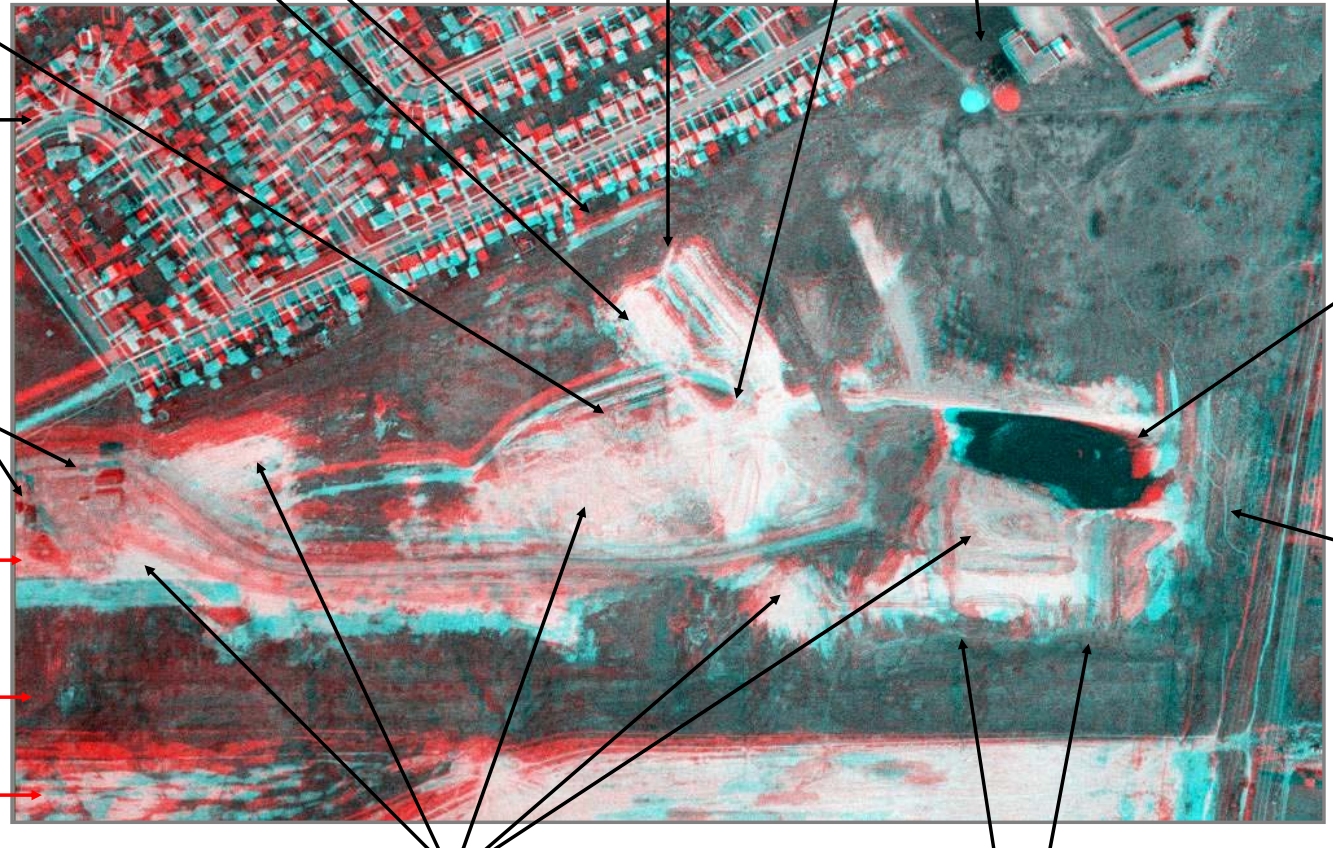
HISTORICAL PHOTO COMPARISON OF MAY AND NOVEMBER 1962



In order to make the 1962 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position. North is to the right.

3D VIEW OF THE LANDFILL AREA, MAY 1972

In May 1972, the landfill was a large disturbed ground containing a pond and some trenches.



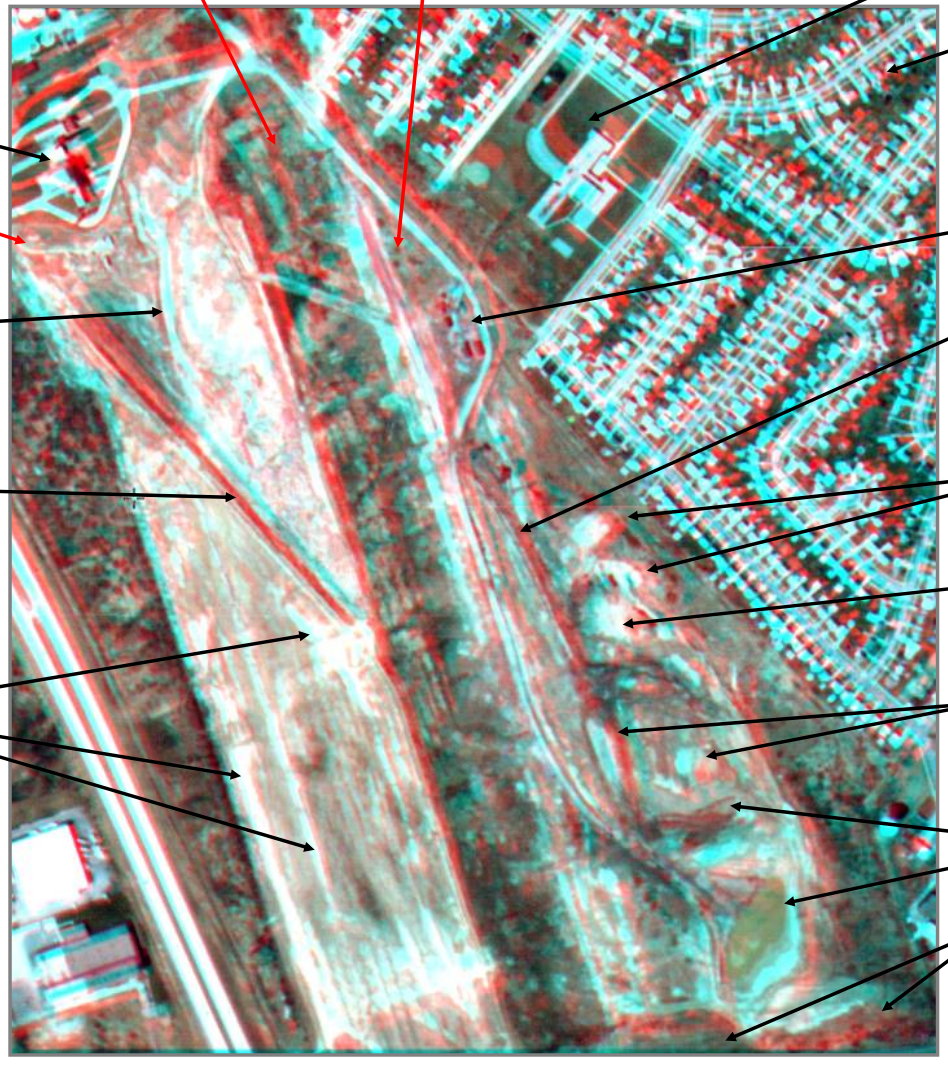
3D VIEW OF LANDFILL AREA, SEPTEMBER 1972

By September 1972, the pond was filled. The landfill was a large disturbed ground with many pits and berms.

In order to make the 1972 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position. North is to the right.

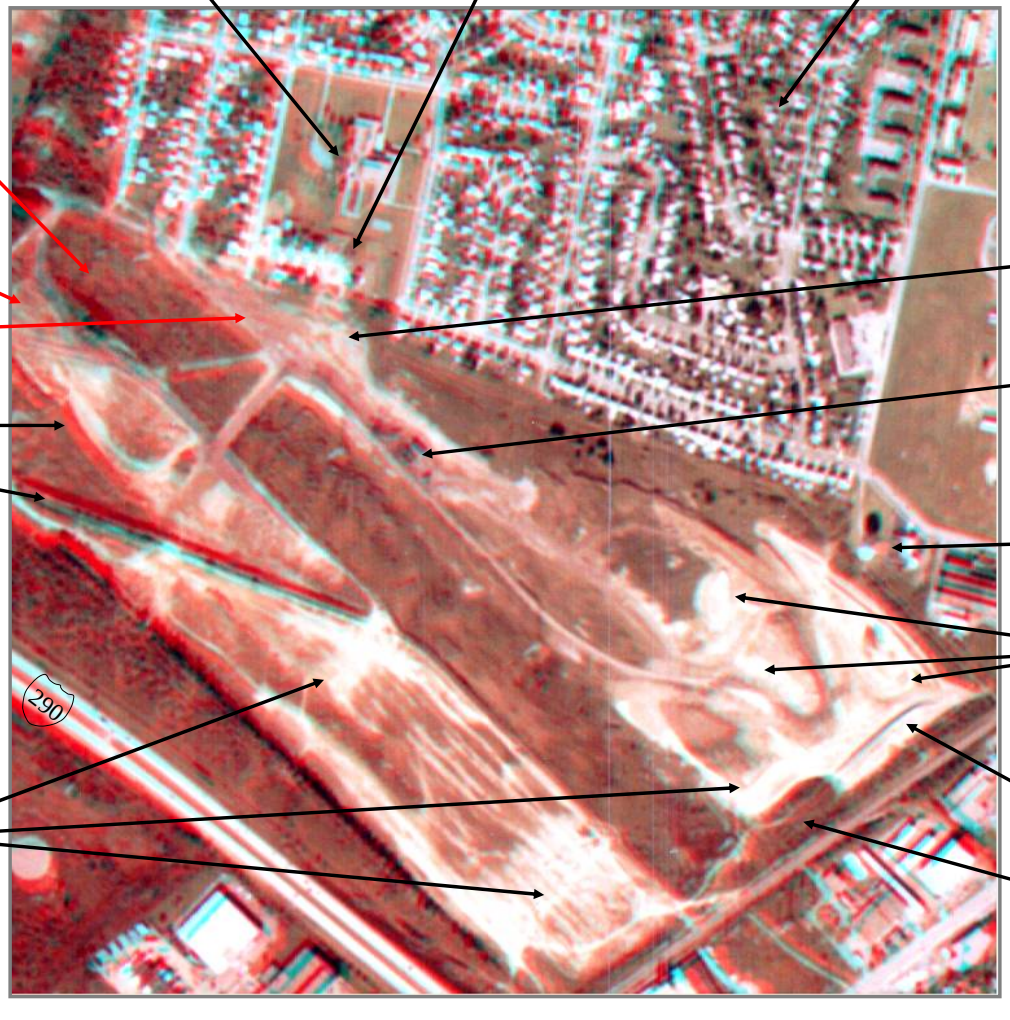
3D VIEW OF LANDFILL AND MUDFLATS AREA, APRIL 1978

In order to make the 1978 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position.



In 1978 the Tonawanda Landfill is a large area of disturbed ground. The landfill also contains scattered ground scars, a pit, and two ponds. The Mudflats Area appears to be drained. Trench and troughs occur along the bottom.

3D VIEW OF LANDFILL AND MUDFLATS AREA, SEPTEMBER 1980



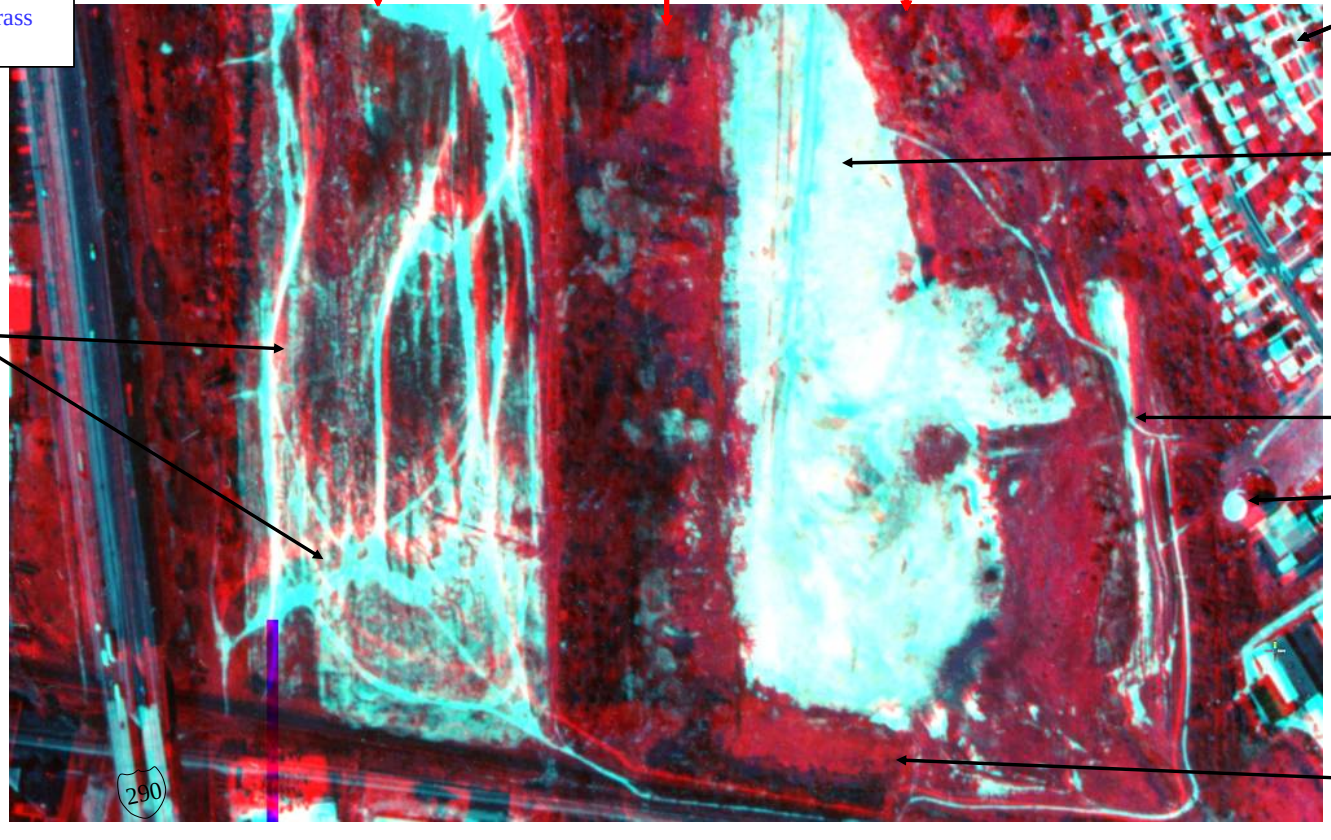
In 1980, the Tonawanda Landfill contains shallow pits, a trench, a berm, and an area of ground scars.

Both the landfill and mudflats area appear to be less active (showing signs of revegetation).

In order to make the 1980 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position. North is to the right.

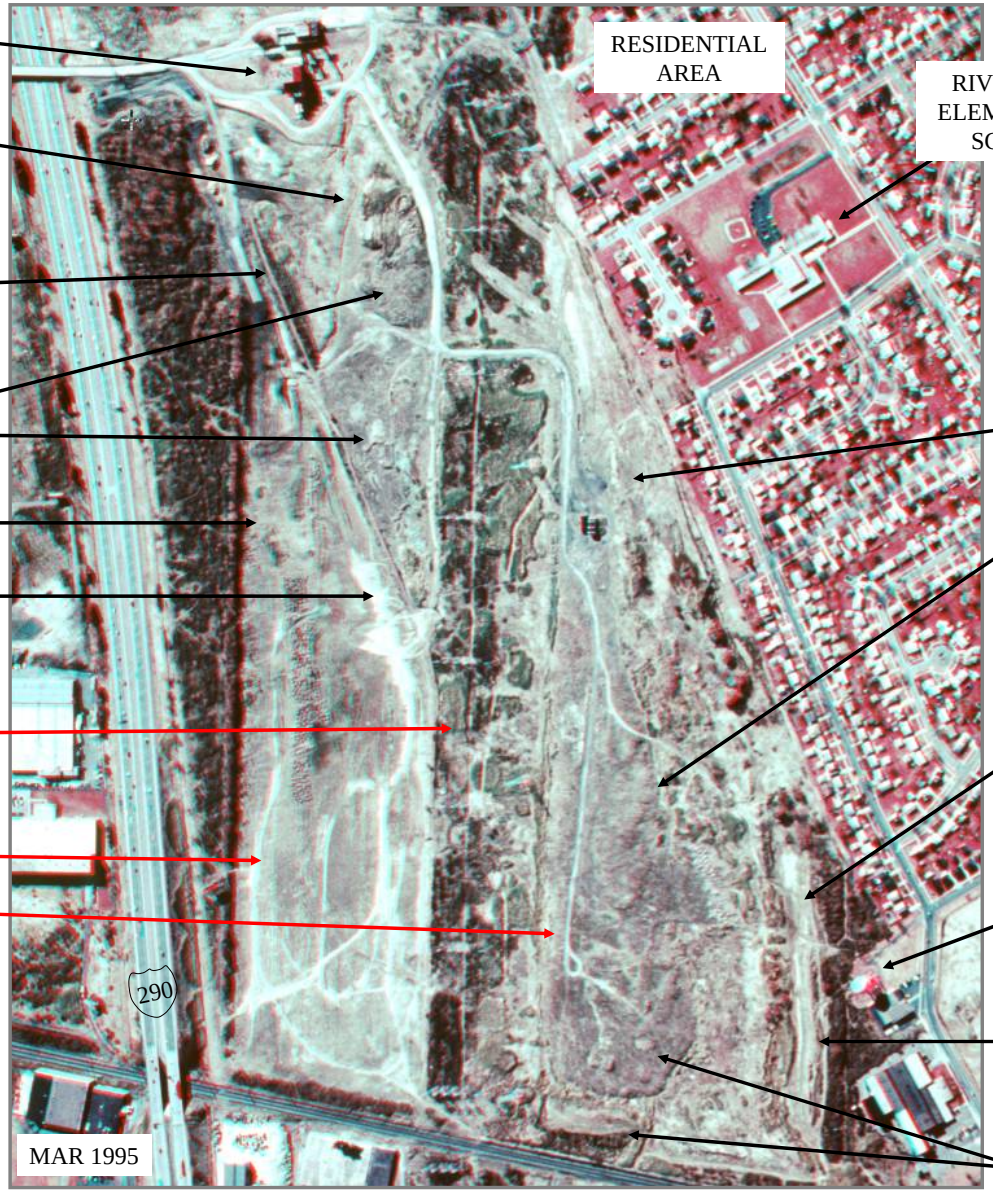
3D VIEW OF LANDFILL AND MUDFLATS AREA, MARCH 1990

Note: This is a color infrared photograph. Red color indicates dense vegetation. White and light blue indicate bare ground. Mottle light pink indicates sparse grass cover on the bare soil.



In order to make the 1990 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position. North is to the right.

3D VIEW OF LANDFILL AND MUDFLATS AREA, 1995



Note: This is a color infrared photograph. Red color indicates dense vegetation. White and light blue indicate bare ground. Mottle light pink indicates sparse grass cover on the bare soil.

In order to make the 1995 anaglyph, the direction of the photos are required to be oriented to their stereo viewing position. North is to the right.

N

REFERENCES

National Archives and Records Administration (NARA), Cartographic and Still Pictures Branches, College Park, MD.

National Oceanic and Atmospheric Administration (NOAA), National Geodetic Survey (NGS), Silver Spring, MD.

U.S. Army Corps of Engineers, Buffalo District, 2001. *FAQs for the Tonawanda Landfill and Mudflats from Previous Meetings. July*.

U.S. Army Corps of Engineers, Buffalo District, 2002. *FUSRAP Fact Sheet, FUSRAP-Related Material in the Town of Tonawanda Landfill and Mudflats Area, Tonawanda, New York*, February.

U.S. Army Corps of Engineers, Buffalo District, 2005. *FUSRAP Fact Sheet, Tonawanda Site. Tonawanda, New York*, March.

U.S. Army Corps of Engineers, Buffalo District, 2007. *FUSRAP, The Tonawanda Landfill and Mudflats Vicinity Property Fact Sheet for the Proposed Plan, Tonawanda, New York*, April.

U.S. Army Corps of Engineers, Buffalo District, 2007. *Proposed Plan for the Tonawanda Landfill and Mudflats Vicinity Property, Tonawanda, New York.* April.

U.S. Army Corps of Engineers, Buffalo District, 2007. *Public Meeting on the Tonawanda Landfill Vicinity Property Proposed Plan Presentation, Tonawanda, New York.* April.

U.S. Army Corps of Engineers, Buffalo District, 2005. *Remedial Investigation Report, Tonawanda Landfill Vicinity Property, Tonawanda, New York.* April.

U.S. Army Corps of Engineers, Detroit District

U.S. Geological Survey, 1948 Edition Buffalo, NY, 15 min quad; Polyconic projection. 1927 North American datum 10,000 foot grid based on NY coordinate system, west zone

U.S. Geological Survey, 1948 Edition Tonawanda, NY, 15 min quad; Polyconic projection. 1927 North American datum 10,000 foot grid based on NY coordinate system, west zone.

Edition Tonawanda West, NY, 7.5 min quad; 1927 North American datum 10,000 foot grid based on NY coordinate system, west zone.

US Geological Survey, EROS Data Center, Sioux Falls, SD.

US Geological Survey, Reston, VA,22092.

WEBSITES:

Erie County website:
http://www.erie.gov/aerials/1920s/atlases/ book8/html/b8_f27.html

NETR (Nationwide Environmental Title Research), LLC.
HistoricAerials.com : http://www.historicaerial.com

New York State GIS website:
http://www.nysgis.state.ny.us/gateway/mg/2005/erie

University at Buffalo - The State University of New York web site:
http://ublib.buffalo.edu/libraries/asl/maps/aerial/arf-2gg-8-1966-june12.jpg1980

U.S. Geological Survey website: http://terraserver-usa.com