Archeological 1B Technical Study for the Newark City Subway Extension and Vehicle Base Facility

Federal Transit Administration
New York, New York
and
New Jersey Transit

Prepared For:
BRW RAIL LINK TEAM
Newark, New Jersey

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April 1996

U.S. Department of Transportation
Federal Transit Administration

NJ TRANSIT

ARCHEOLOGICAL 1B TECHNICAL STUDY

for

NEWARK CITY SUBWAY LINE EXTENSION
AND
VEHICLE BASE FACILITY

by

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1.0 INTRODUCTION

This Archeological 1B Technical Study presents the findings of field testing and additional research undertaken on selected portions of the Vehicle Base Facility (VBF) and Newark City Subway Extension (NCSE) site. The VBF and NCSE study area extends across three Essex County city or township lines--Newark, Belleville, and Bloomfield (Figure 1). This research was undertaken for NJ TRANSIT (NJT) through BRW, Inc. An Archeological 1A Technical Study (Geismar 1995) had identified three areas of potential archeological sensitivity, one a prehistoric issue, the others historic-era concerns (Geismar 1995:46-47; Table 1 and Figure 2).

As planned, the VBF complex will comprise one- to two-story maintenance and storage facilities as well as several small structures, electrical substations, and parking lots. In addition, construction of one to three stations is proposed within the study area, one of them with an associated park-and-ride. These include the joined Heller Parkway-Franklin Avenue Station, a combining and relocation of two existing stations at the current terminus of the Newark City Subway north of Heller Parkway (Option 1 on Figure 3); the proposed optional Grove Street Station, a platform and park-and-ride at the present Bloomfield Township Department of Public Works (DPW) facility on Grove Street north of Bloomfield Avenue, adjacent to the north side of the CONRAIL line (Option 2 on Figure 3); and the proposed optional Belmont Avenue-Franklin Street walk-on station located on either side of Belmont Avenue, just west of Franklin Street (Option 3 on Figure 3).

Of the three archeological issues identified in the Archeological 1A Technical Study, the most critical was a potential adverse affect on the Morris Canal, a defunct, man-made, 19th-century waterway that defines the route of the Newark City Subway. This buried historical feature, that once linked Phillipsburg on the Delaware River with Jersey City on the Hudson River, is listed on the New Jersey State and National Registers of Historic Places.

Another historic-era concern was the proposed Grove Street Station and park-and-ride site. First developed as the Condensite Corporation, it then became the Bakelite Corporation factory where early plastics were produced in an industrial complex built over several decades beginning in 1917. The two remaining structures from this complex that stand on the proposed station site have been found eligible for listing on the National Register of Historic Places during this study (e.g., Drobbin 1995:14-17). These buildings have served as the Bloomfield Township DPW headquarters since 1970, but most of the structures associated with the earlier plastics industry were demolished and replaced by DPW facilities that include garages, gasoline pumps, and storage, recycling and parking lots. The Archeological 1A Technical Study noted that plans for the former industrial complex are available, making

TABLE 1

VBF POTENTIALLY IMPACTED SITES AND FIELD METHOD RECOMMENDED IN ARCHEOLOGICAL 1A TECHNICAL STUDY

Prehistoric Sites

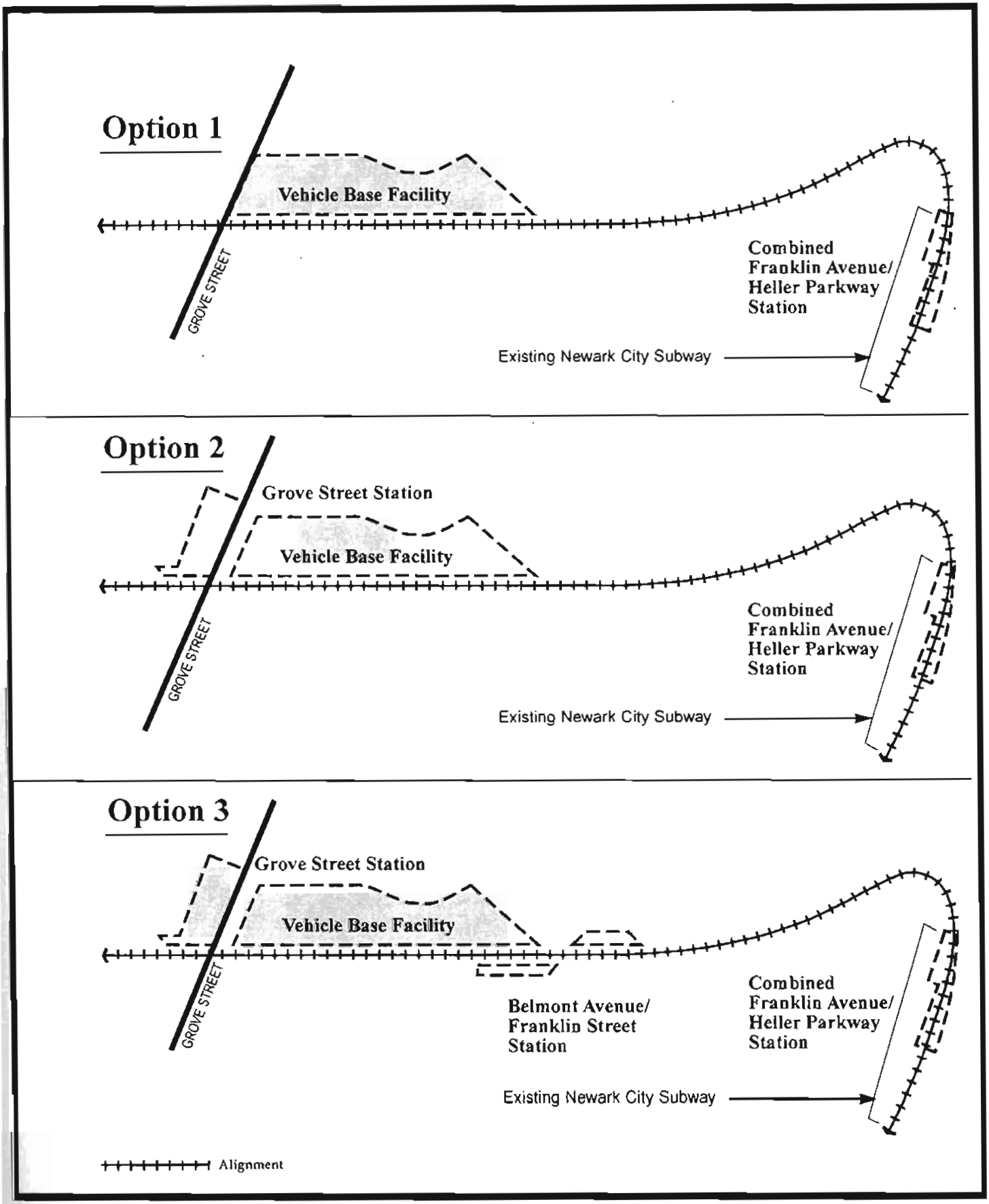
D	Unnamed stream in vicinity of VBF; identified from single-source map data. (B)

Historical Sites

5	Bakelite Corporation Plant (now Bloomfield DPW); parking, gasoline pumps, and recycling and storage lots now located in areas formerly the sites of buildings and tanks related to industrial complex. (R)
10	Morris Canal; State Register 1973, National Register of Historic Places 1974; now route of City Subway. (A/D)

- Letters/numbers correspond to those found in Tables 1 and 2 and Figures 25 and 26 in the Archeological 1A Study (Geismar 1995).

- Recommended field methods
  - (B) = Soil borings
  - (R) = Recordation of buildings according to HABS/HAER specifications
  - (A/D) = Avoidance through design/excavation and documentation if adverse affect is determined and impact is unavoidable



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Vehicle Base Facility (VBF) and Station Site Build Options (schematic)

Figure 3

archeological investigation unnecessary. In addition, the production process of this industry is documented in the literature (for example, see Appendix A). However, it was suggested in the Archeological 1A Technical Study that HABS/HAER documentation recommended by the project's architectural historian should include any evidence of plastics production remaining in these readapted buildings. Potential prehistoric sensitivity within the immediate project area focused on a stream noted on a single published map (Mueller 1906 presented in Geismar 1995:30; see also Figure 10 later in this report). Of concern was the possibility of associated Native American deposits.

The method and sources used in this assessment, a project site description, the findings, and conclusions and recommendations are presented in the following sections.

2.0 METHOD

Research focused on the three archeological issues identified in the Archeological 1A Technical Study: the potential for Native American resources at the VBF site; the effect of proposed construction on the buried Morris Canal; and the viability or necessity of documenting archeological components of the Bakelite industrial complex. The goal was to determine if resources applicable to Criterion D of the National Park Service's guidelines for determining eligibility would be adversely affected by planned construction and to recommend mitigating measures if warranted. Criterion D considers sites that "have yielded, or may be likely to yield, information important in history or prehistory."

Soil borings were a major source of information in this assessment. Selected boring logs from soil borings drilled in two of the potentially sensitive areas by A. Reginatto Consulting Engineers, the project's geotechnical consultants, were made available for this study (Appendices B and C) as was the consultant's soils analysis. In addition, the writer was in attendance for two of the VBF site borings drilled in October 1995, one of them located for geotechncal information (Boring BF-4), the other to address archeological concerns (Boring BF-4A). In November, soil borings were also drilled at the NCSE site north of Heller Parkway. At that time, two additional borings (Borings S-15A, and S-15B) were drilled to accommodate the archeological assessment. The logs from relevant borings and soils data provided information about depth of fill and the condition of the former bed, or prism, of the Morris Canal north of Heller Parkway.

In addition to soil borings, Bloomfield Township records were researched in regard to the development history of the VBF site. Russell K. Layton of the Bloomfield Township Department of Community Development and Inspections, Stephen Coppola in Engineering, and Joseph Pisauro, the Bloomfield Tax Assessor, as well as other township employees, were most helpful in obtaining this information. The collections of the New Jersey Division of the Newark Public Library were researched regarding development of the Newark City Subway, and David Koenig of NJT provided additional information from NJT archives. An unpublished report on the history of the Newark City Subway, written and photo-illustrated by John Catrambone, who kindly made text and photos available, provided valuable information. Historical photos that document preexisting conditions and subway construction were also made available through Mort Farrah and John Wilkens of NJT.

Additional research was undertaken at the offices of Industrial Risk Insurers (IRI, formerly Factory Insurers Association [FIA]) and at the Bloomfield and New York Public Libraries. Further attempts were made to obtain information regarding plastics production at the Bloomfield DPW site. This included library research and contact with the Union Carbide

Corporation, the Smithsonian Institution, the *Independent Press* (a local newspaper with archives that extend back to 1892), and with Cilene Karraker, Leo Baekeland's granddaughter. In addition, several site visits were made when photographs were taken of selected conditions and soil boring activities.

3.0 PROJECT DESCRIPTION

As noted previously, the VBF and NCSE study area is situated partly in Newark, partly in Belleville, and partly in Bloomfield. Until the third quarter of the 19th century, this district was mainly agricultural. When development occurred, it was industrial as well as residential, a condition that persists to this day. Industrial, commercial, and residential buildings in the core study area are mainly one to three stories high with the notable exception of high-rise apartment buildings east and west of the Newark City Subway Franklin Avenue Station and turn-around loop, and a few other high rise apartments in the vicinity.

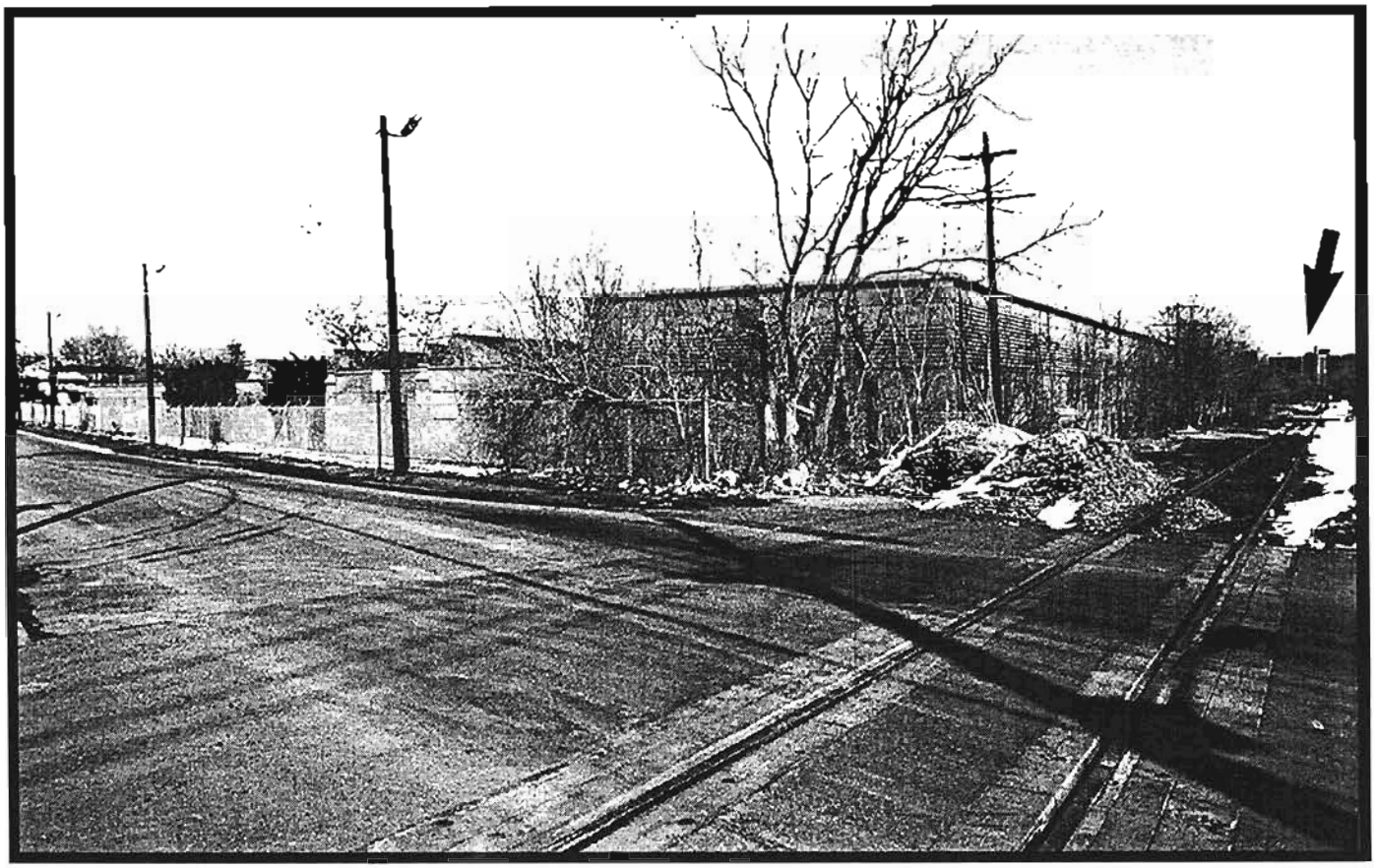
At this writing, the VBF site comprises vacant land and abandoned industrial buildings east of Grove Street and adjacent to the proposed light rail transit alignment (Figures 4 and 5). Most recently a CONRAIL line, the antecedents of this line in the project area extend back to 1876 (see Geismar 1995:27).

The CONRAIL tracks are a major feature within the study area. Looking west along the tracks from Belmont Avenue towards Grove Street, the VBF site appears vacant, particularly when track side trees are in leaf (Figure 6). However, nearer Grove Street the abandoned, one-story, former Potamkin Cadillac Service and Parts building that extends to Grove Street looms large (see Figure 5).

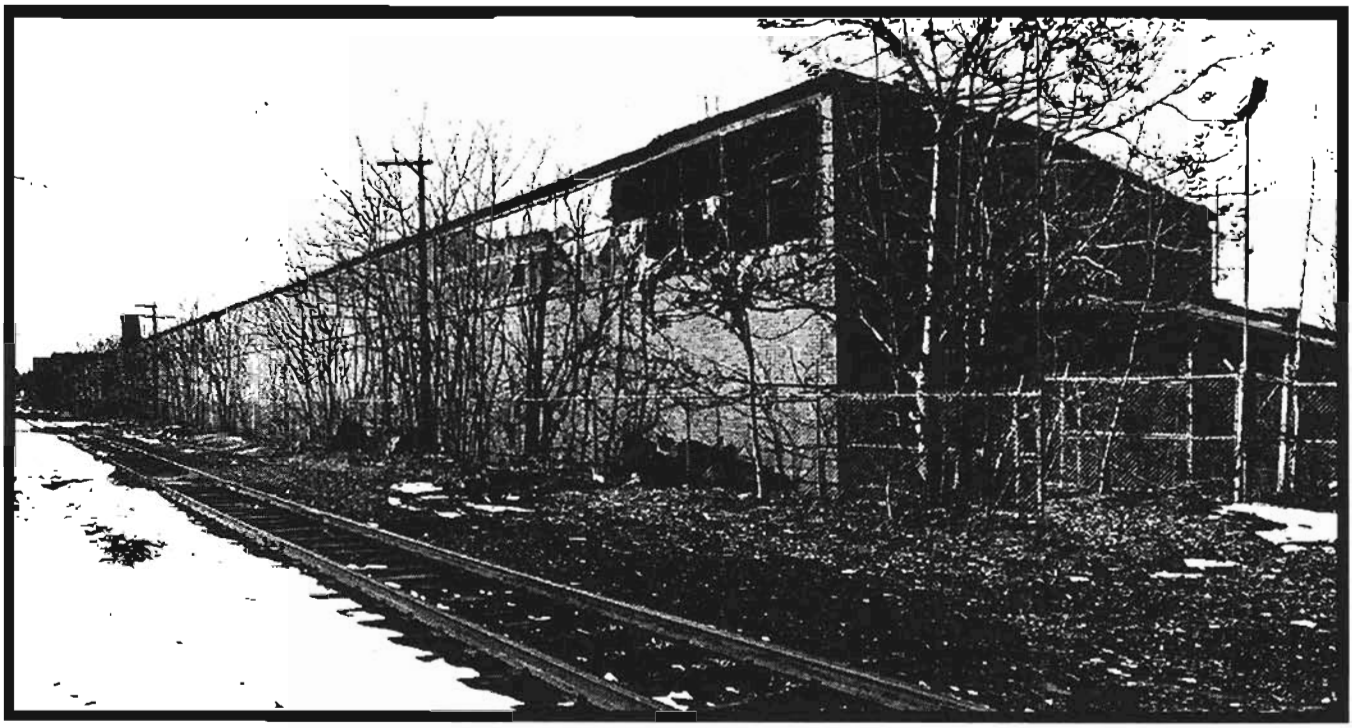
The Bloomfield DPW is situated on the west side of Grove Street, north of the railroad tracks, across from the abandoned Potamkin Cadillac Service and Parts building. The two former industrial buildings on the site are adjacent to the tracks (Figure 7). West and north of the two brick structures joined by an overhead bridge, are the DPW garages, gasoline pumps, and storage, recycling, and parking lots noted in the introduction (Figure 8).

Several blocks to the northeast, north of Heller Parkway and east of Franklin Avenue, the Newark City Subway follows the right-of-way of the former Morris Canal, the major historical/archeological feature remaining within the study area. As noted previously, alteration of the subway's combined terminus and turn-around for the NCSE was identified as a possible area of adverse impact on the buried canal prism.

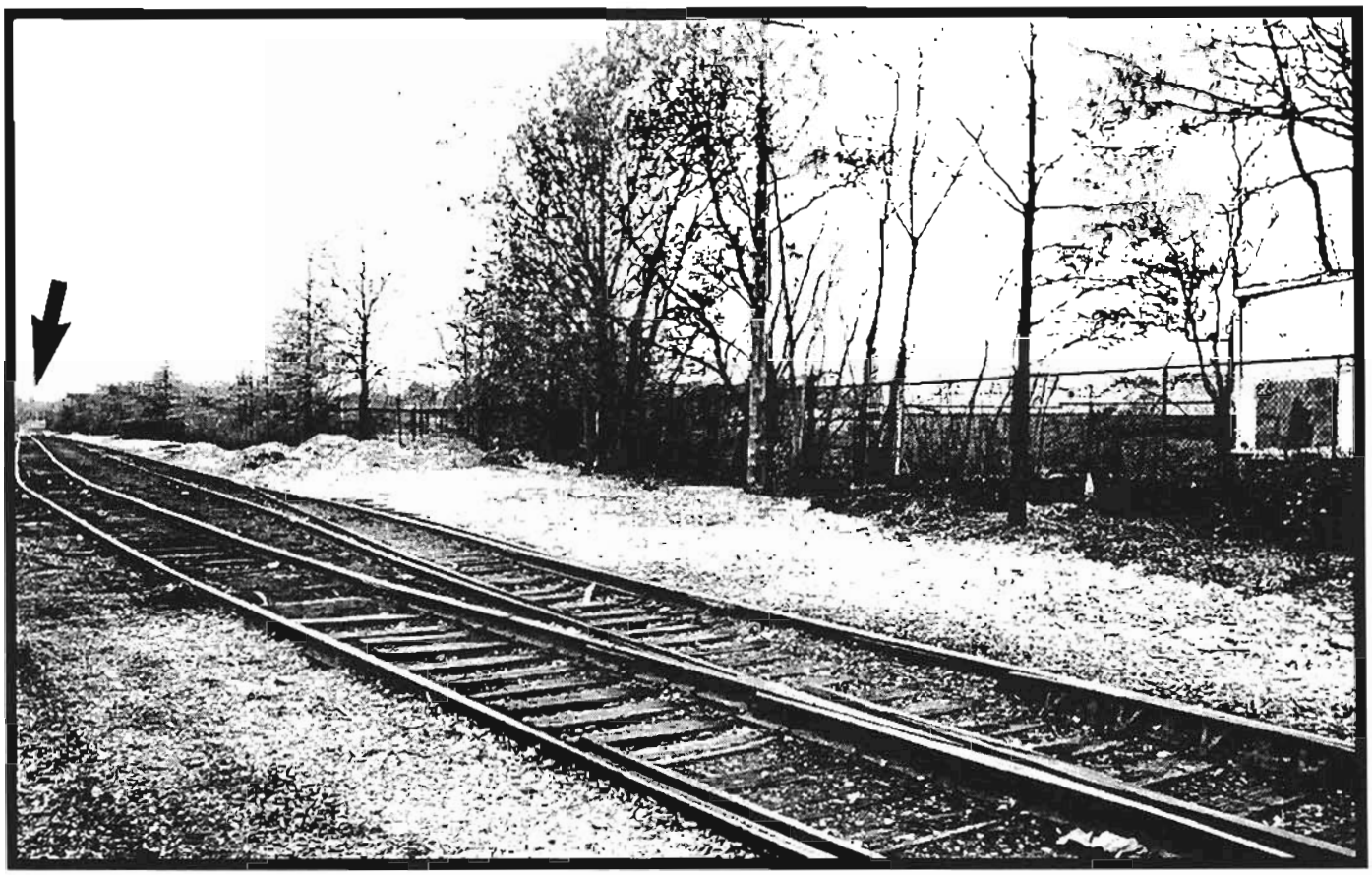
The "subway" tracks are above ground along the canal right-of-way adjacent to Branch Brook Park. The park, which is a State and National Register property located partly within the study area, lies just east of this line (Figure 9).



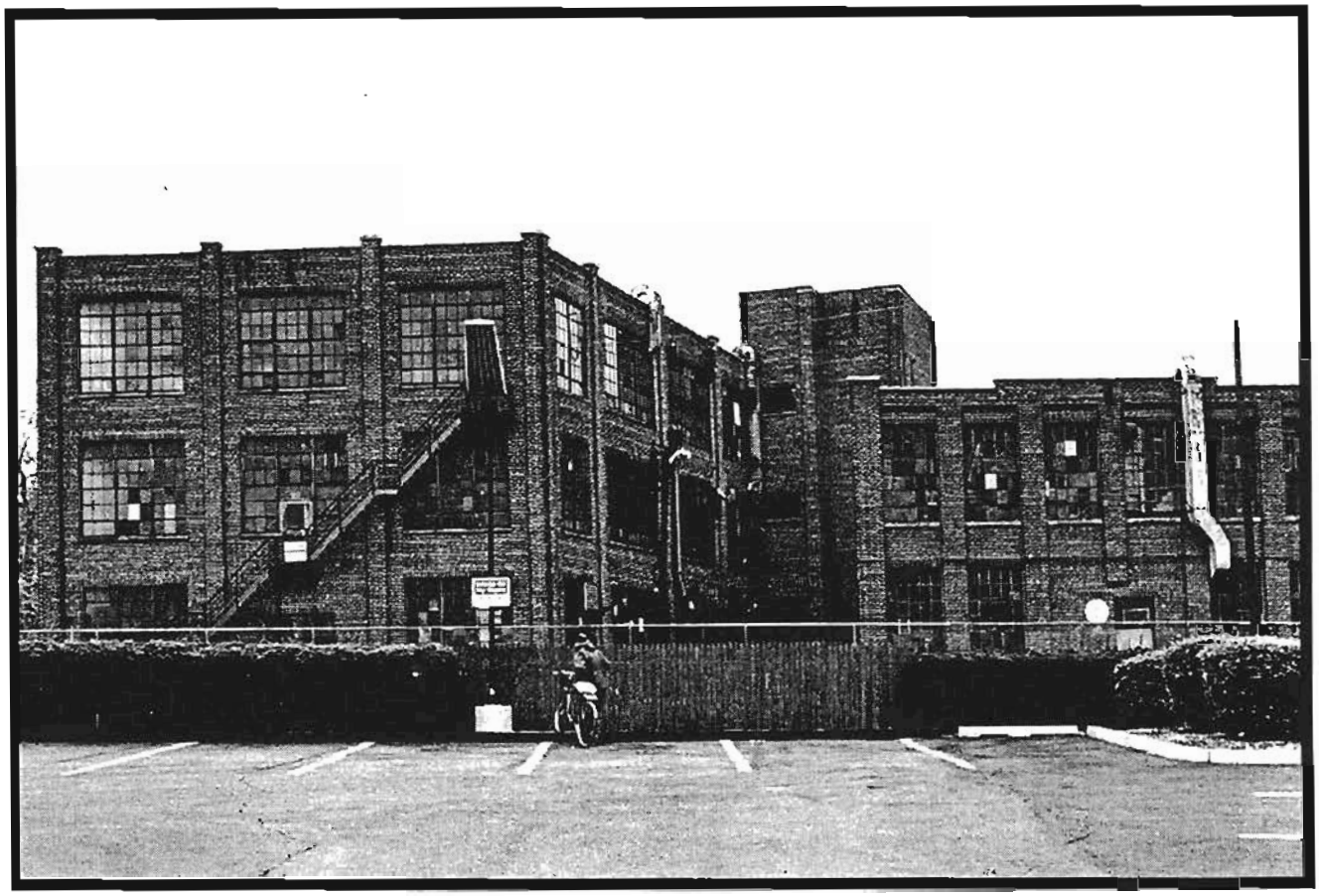
Intersection of former CONRAIL tracks and Grove Street. View is north (left) and east (right). Former Potamkin Cadillac Service and Parts building is in center of the photo, Belmont Avenue can be seen to the far right (arrow). (March 12, 1996)



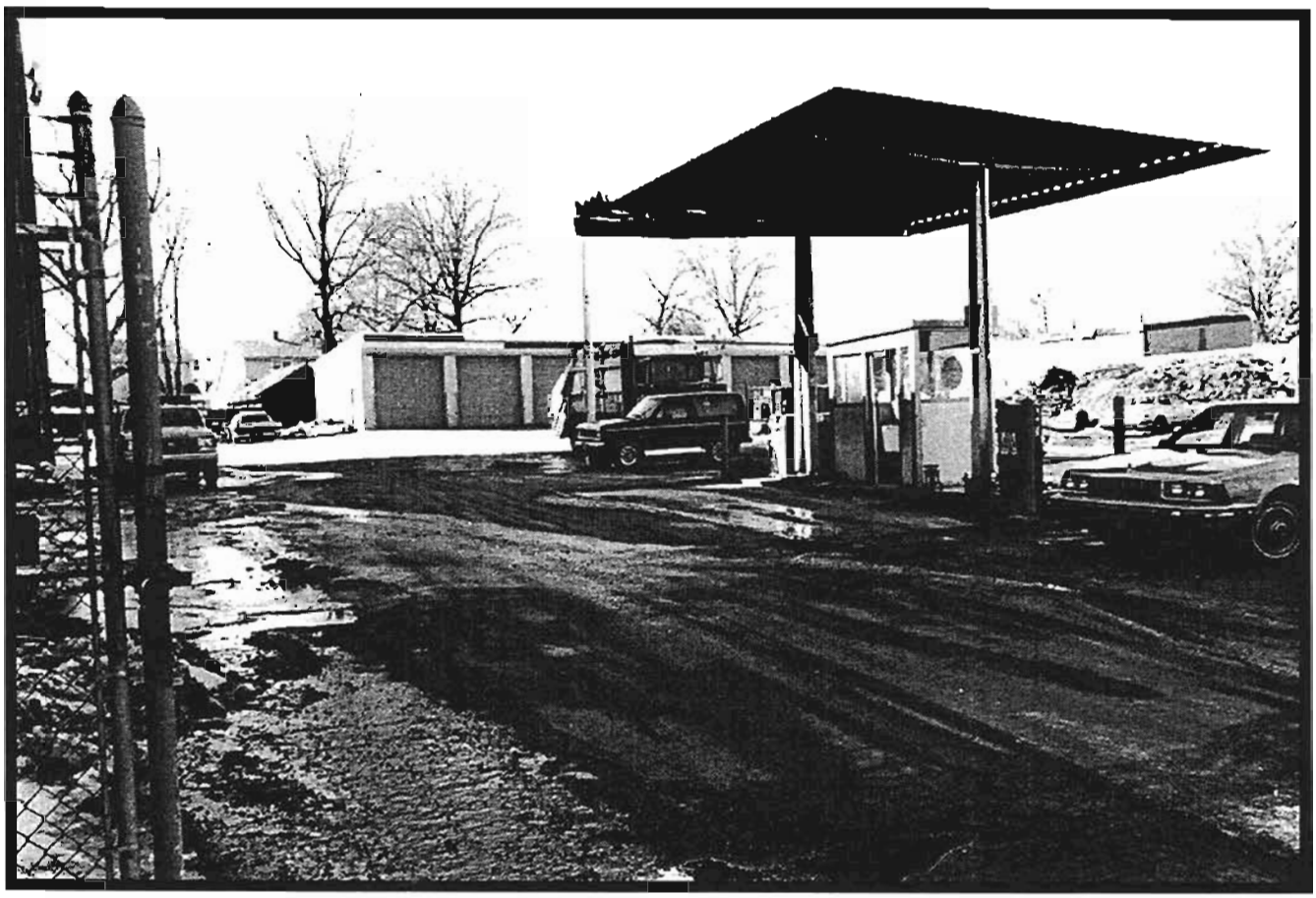
Composite view of abandoned Potamkin Cadillac Service and Parts building, the site of the VBF on north side of former CONRAIL tracks. View is west toward Grove Street. (March 12, 1996)



View west from Belmont Avenue along former CONRAIL line. Grove Street can be seen on the left (arrow). VBF site is beyond the fence on the right. (1994)



Southern facade of Bloomfield DPW facility buildings from adjacent parking lot of a Roy Rogers restaurant on Boomfield Avenue. These two buildings, erected between 1923 and 1928, were experimental labs in 1938 (see Figure 15). (March 12, 1996)



Garage and gas pumps in yard on north side of Bloomfield DPW facility. Storage and recycling lots are to the right. (March 12, 1996)

Branch Brook Park

Newark City subway tracks at Franklin Avenue Station. Looking north toward turn around loop. Branch Brook Park is on the right (arrow). (February 12, 1994)

4.0 VBF SITE (Native American Considerations)

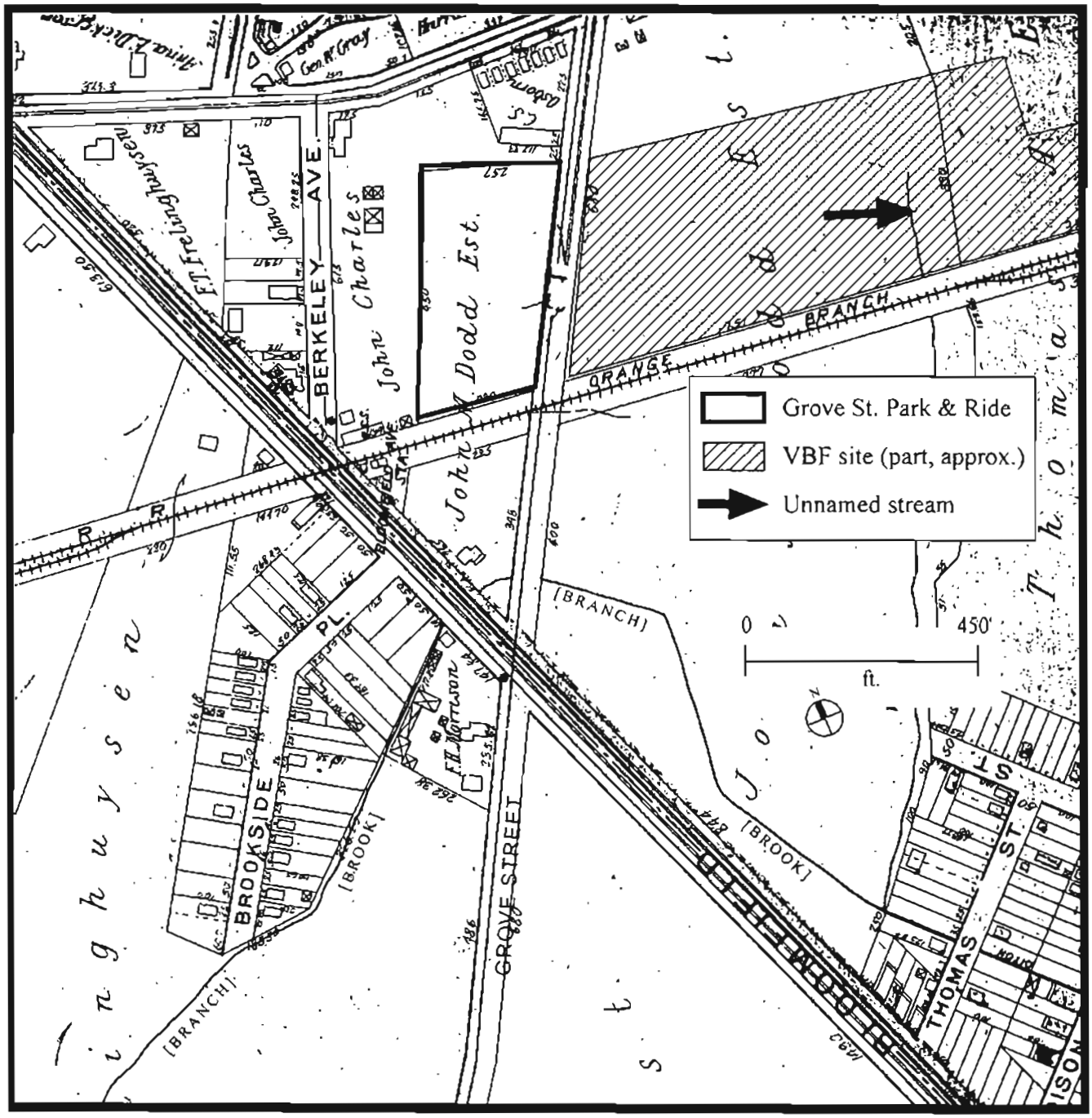
4.1 INTRODUCTION

Research for the Archeological 1A Technical Study determined that the VBF site was situated in an area formerly crossed by streams and brooks that have now been culverted (Geismar 1995:40). Of particular concern was a small waterway situated directly on the VBF site according to a 1906 map, the only published source to show this stream (Figure 10). While a large industrial building has been erected on this site, it is built on slab, and depending on the amount of fill in the area and subsurface conditions beneath the building, the possibility of Native American materials in association with this stream was a consideration. This was particularly so since human occupation in the study area is considered highly feasible (see Geismar 1995:7-9).

Unsuccessful attempts were made to obtain foundation plans for the vacant Potamkin Cadillac Service and Parts building (261 Grove Street) currently situated on the western part of the VBF site, directly over the aforementioned stream. However, the development history of the site was pieced together and, based on this information combined with soils data, it seems there is little if any likelihood of finding intact Native American archeological deposits on the site.

4.2 VBF SITE DEVELOPMENT

Development of the VBF site began in 1915 when the International Arms and Fuse Co. of Maine (IAF Co.) began acquiring the Bloomfield property where they built an arms plant (*Independent Press* 1915). Some land was purchased from Thomas A. Edison and his wife, Mina (Bloomfield Engineering [hereafter BE] 1918:16-392-pt 1). Other lands were bought from heirs of John Mingus Dodd, the historical owner of this part of the study area (Geismar 1995:32). While no plans for IAF Co. buildings were located, a hand written ledger book in the Bloomfield Township archives documents that the Maine company was issued fifteen building permits near Grove Street between January 24 and November 6, 1918 (Bloomfield Ledger Book Misc.). Neither exact locations nor all building dimensions are provided in the ledger, but the permitted structures ranged from at least a 100- by 200-foot, one-story, iron warehouse to a toilet (no dimensions given). A permit was issued on October 9, 1918, for a cinder block paint shop built "according to plans" which were unavailable.



Mueller 1906, detail

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This part of the IAF Co.'s developed property was sold to the General Motors Company in October 1919 (BE 1919:16-392-pt 1 & pt 2). General Motors ultimately occupied two plants on the north side of the railroad tracks, Plant 2 adjacent to the tracks and Plant 1 just north of it; the two buildings were separated by a moving craneway. Plant 2 is the building of concern in this assessment. There was also an associated building south of the tracks and others on Watsessing Avenue to the north (Sanborn 1977).

General Motors renovated and enlarged Plants 1 and 2 over the years. In January 1947, a triangular extension was added to the eastern side of Plant 2 (Inspector of Buildings 1947:9389; FIA 1947:Figure 11); later in that same year, a railroad siding was removed and a closed loading dock appended to the south side of the building (Bloomfield Permit 1947:9389). According to a 1976 fire insurance map, this triangular addition was squared off in 1951 (IRI 1976; Figure 12). This last alteration brought the building to its current length and width of about 790 feet and 288 feet respectively, including the enclosed loading dock.

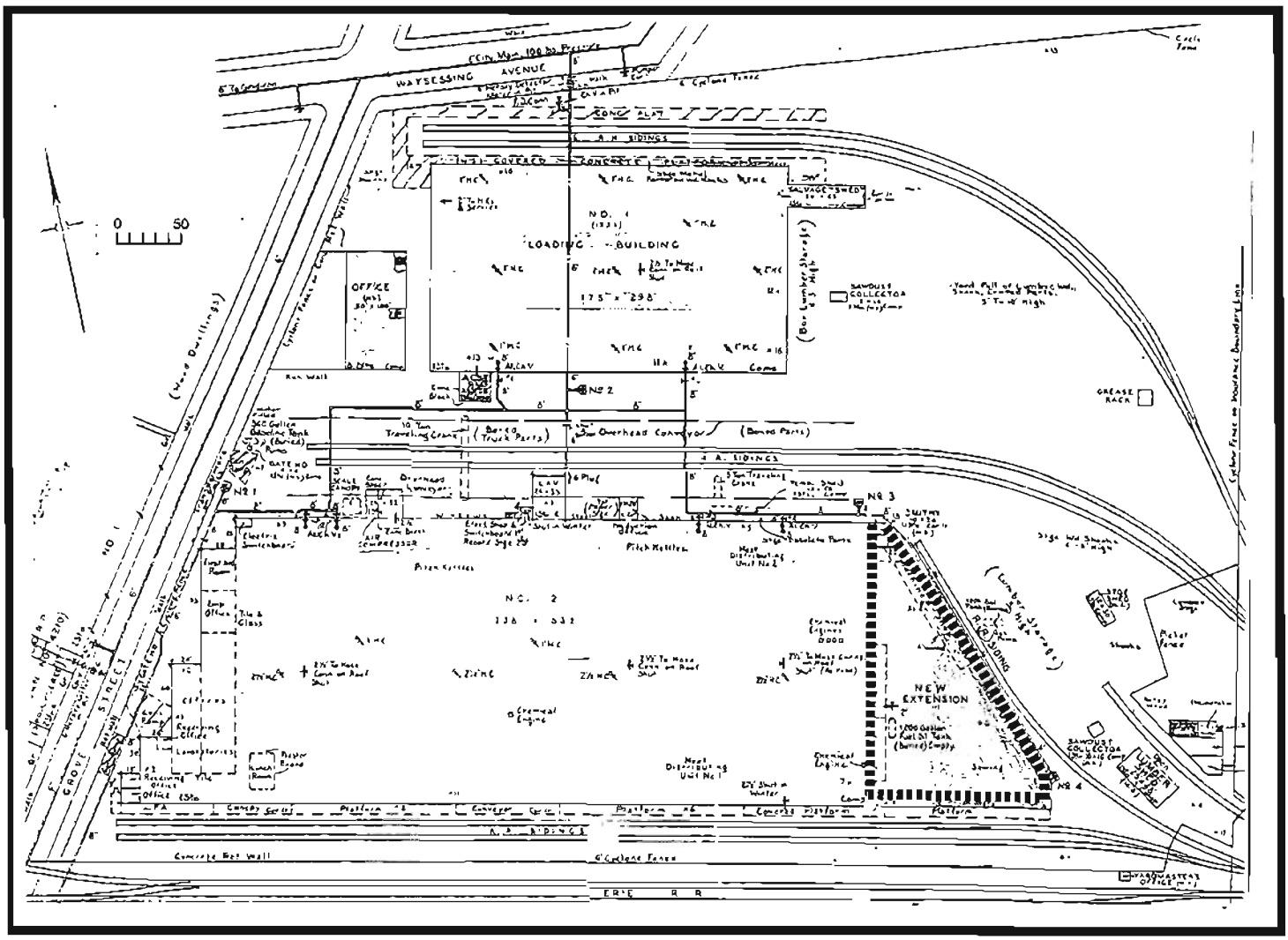
Between 1916 and the 1919 acquisition of the IAF Co. property by General Motors, and subsequent alteration and expansion, a small stream or brook (it is described as a "brook" on a 1949 map) that crossed the property was culverted and rerouted in a 30 inch pipe to serve as a storm sewer. This stream, undoubtedly the one shown on the 1906 Mueller map (see Figure 10), originally meandered mainly just west of the storm sewer that runs under the eastern additions to Plants 1 and 2 of the former General Motors complex. No exact date has been determined for the creation of the storm sewer, but tax maps indicate it was installed between 1929 and 1944 (Tax Maps 1922, 1929, 1934, 1940, 1942, 1944).[1]

Locations of the stream and storm sewer are documented on the aforementioned 1949 map filed in the Bloomfield Engineers office (Figure 13). The stream's former course shown on this map was plotted from coordinates taken in 1916. While the stream or brook is long gone, the location of the storm sewer has not changed according to the most recent tax map (Figure 14). Rerouting this stream and installing the storm sewer undoubtedly disturbed the original ground surface as well as subsurface soils, a situation compounded by construction and subsequent alterations of Plants 1 and 2. For purposes of the archeological assessment, this can only be verified after Plant 2 is razed to construct the VBF.

4.3 SUBSURFACE CONDITIONS

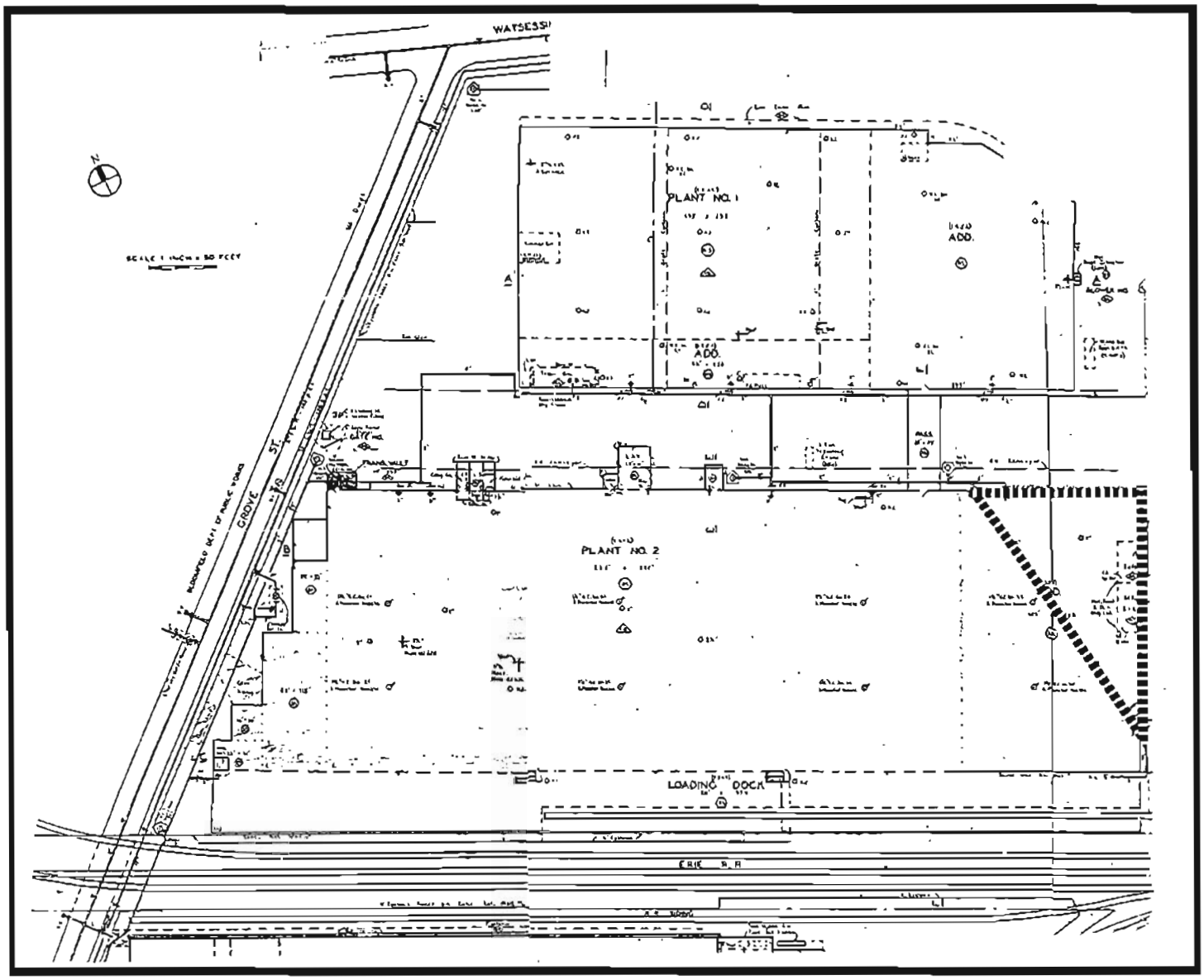
Soil boring data were used by the project's geotechnical consultants to determine subsurface conditions at the VBF site (A. Reginatto 1995). Of particular interest were those borings from the western portion of the site in the general vicinity of the former culverted stream (Borings

[1]Available tax maps show the stream in 1922 and 1929; the 1940 and 1942 maps do not provide stream or sewer information. On the next available map in the Bloomfield Township Engineers office, 1944, a storm sewer is shown and the stream is gone.



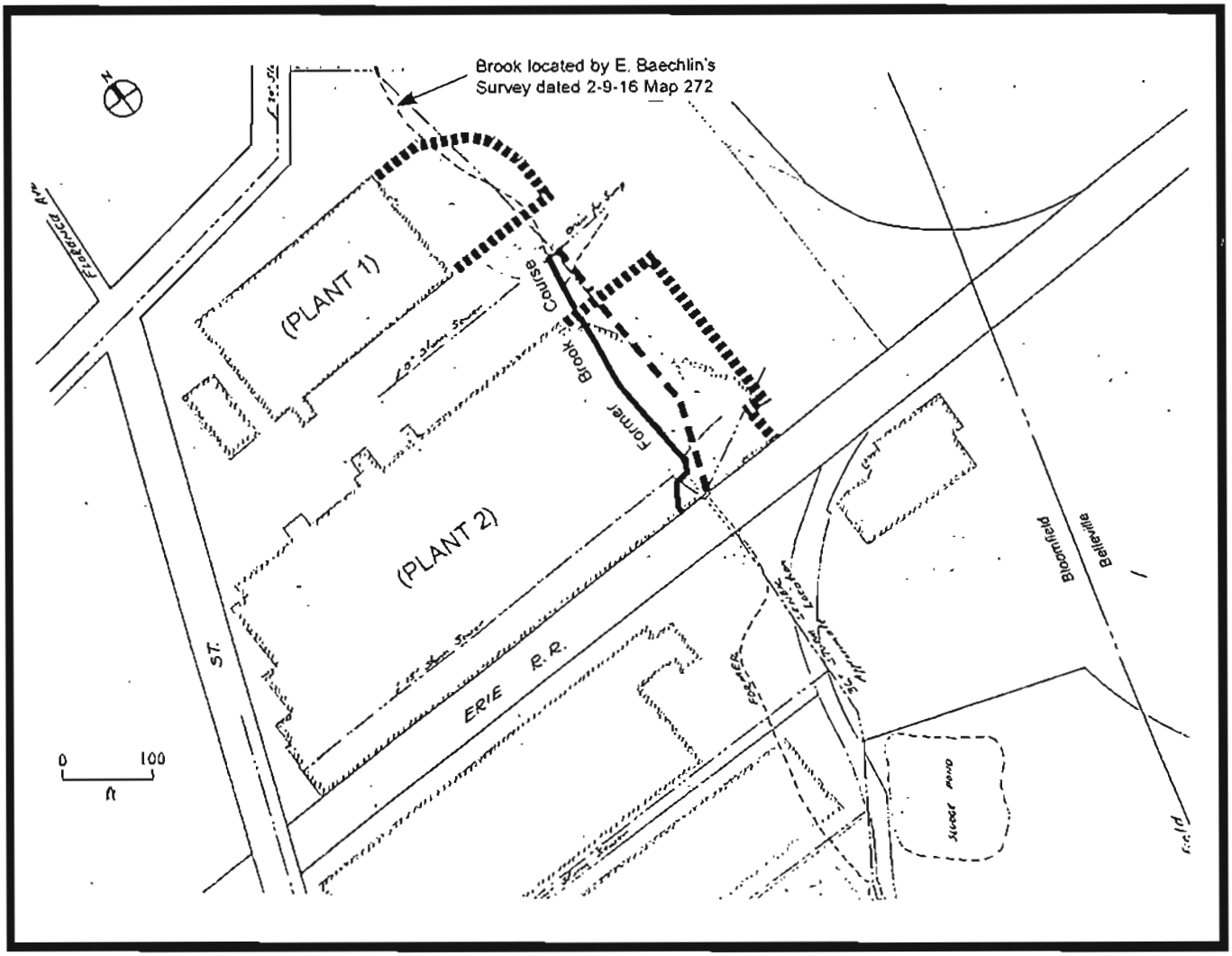
Plants 1 & 2, VBF Site 1947 (FIA 1947)

▮▮▮▮▮▮▮▮▮ Addition



General Motors Parts Division Plants 1 & 2, Bloomfield, N.J. 1976 (IRI 1976)

New addition

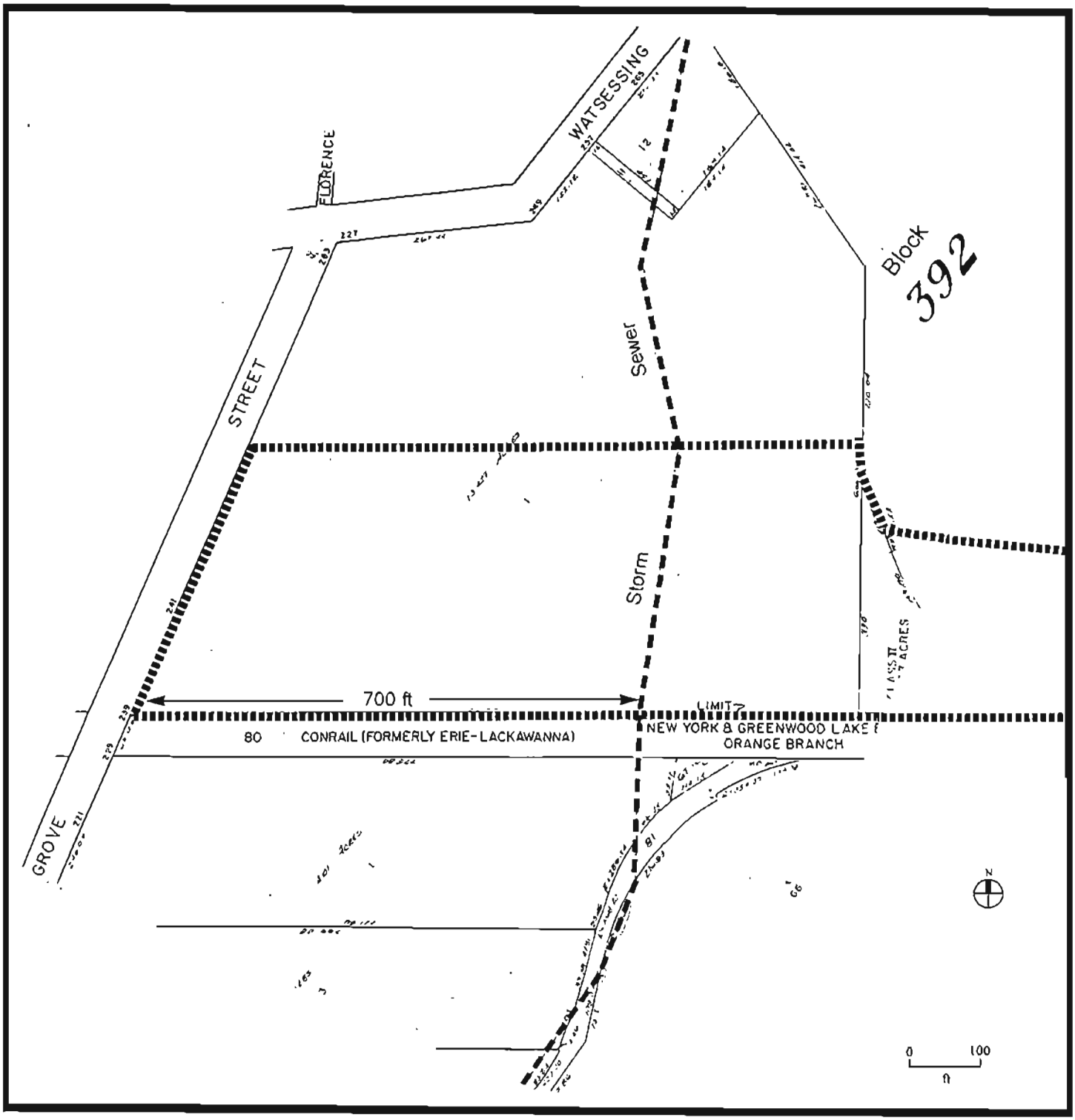


Locations of former brook and current storm sewers on VBF site(Bloomfield Engineers 1949)

Current eastern limit (approx) of existing plants 1 & 2

Former Brook

Storm Sewer



1995 Tax Map-No. 392

VBF Site Approx.

Storm Sewer

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Figure 14

BF-4, BF-4A, BF-5 to BF-8; see Appendix B). Boring BF-4, a geotechnical boring sampled at 5-foot intervals, was archeologically monitored as was Boring BF-4A. This boring was continuously drilled and sampled at 2-foot intervals for archeological purposes.

All these borings documented less than 5 feet of fill overlying a reddish-brown stratum (Boring BF-4A was only drilled to 8 feet, but the others recorded 14 to 18 feet of this stratum). It was noted in the geotechnical report that "the remains of foundations from older, previous structures now demolished" were found in the fill (A. Reginatto 1995:5). While it is possible these were remnants of earlier buildings, perhaps those constructed by the IAF Co. as described above, it is more likely the building debris found in the 2-inch diameter sampling spoon may merely be components of the fill (this possibility was confirmed by Horace Ibarra, the project engineer [Ibarra 1996:personal communication]).

A varved clay underlies the reddish-brown soil, perhaps representing a former ancient lake (this too was confirmed by Mr. Ibarra). Below this varved clay layer is a reddish-brown silt or silty clay overlying sandstone bedrock at 30 feet (A. Reginatto 1995:5-6). Ground water levels noted in observation wells in September 1995, were at depths of 7 to 8 feet, but this measurement is recognized as being variable.

Neither the geotechnical borings nor the boring sampled at 2-foot intervals for archeological purposes identified an original ground surface (an A Horizon) under the fill, a circumstance that would have indicated a buried, undisturbed ground surface. It appears that the sampled area was greatly disturbed before filling.

5.0 GROVE STREET STATION SITE (Existing Bloomfield DPW, Former Bakelite Corporation Plant)

5.1 INTRODUCTION

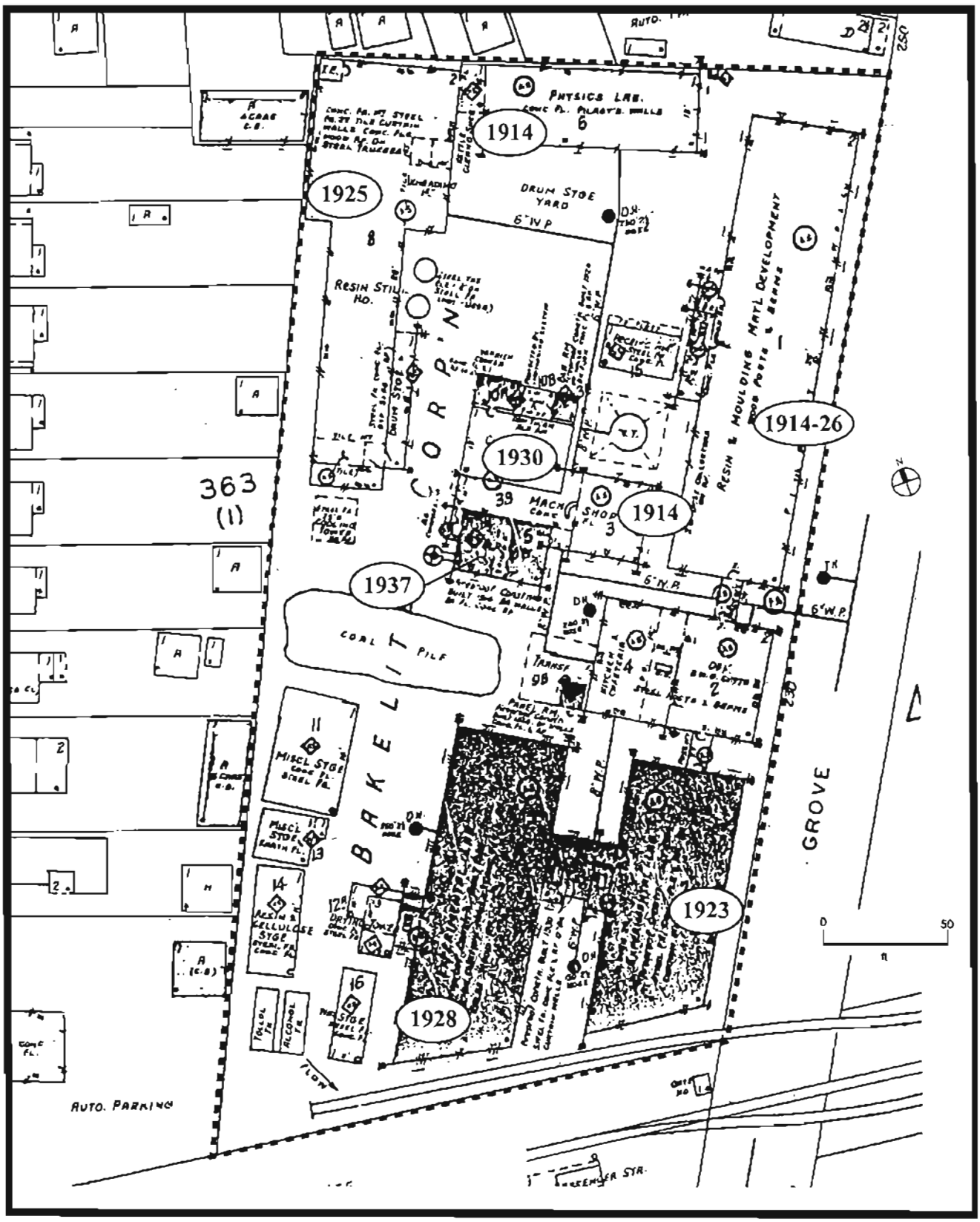
The Archeological 1A Technical Study noted that maps are available that document the industrial complex on the Bloomfield DPW site where plastics used by Thomas Edison were made according to processes perfected by Leo Baekeland (Geismar 1995:33). Production began on the site in 1914, when the Condensite Corporation Plant was opened; by 1922, it had become the Bakelite Corporation Plant.

Maps documenting the industrial complex include a 1938 Sanborn Insurance map that not only shows the buildings, but also the year of their construction in many instances (Figure 15. Also mentioned in the Archeological 1A Technical Study, but not illustrated, was a 1954 fire insurance map presented in Figure 16 (FIA 1954). It was also noted that the processes described in Leo Baekeland's 1907 patent applications for a phenol formaldehyde thermosetting plastic, the condensation method used in its production, and patents affecting its application have remained basically unchanged over the decades (Cook & Slessor 1992 cited in Geismar 1995:33). These patents, which were issued in 1909 (*Official Gazette* 1909:226-227, 262, 277; see Appendix A), expired in 1926 (Lauer 1996:personal communication).[2]

5.2 THE BAKELITE PROCESS

The Bakelite processes for making moulding materials--one thermo-setting, the other thermo-plastic--are described in many books and articles written by and about Leo Henrik Baekeland, their Belgian-born inventor and promoter. A 1940 newspaper article simplifies the distinction between the production of the two Bakelite moulding materials: those that are thermo-setting require compression and heat while thermo-plastic moulding material is produced by injection and cooling (*Independent Press* 1940).

[2]In 1907, Baekeland filed five patent applications, including "heat and pressure" patents on what would become "Bakelite." All five patents were issued on December 7, 1909.



1938 Sanborn, Bakelite Corporation with Building Construction Dates

▬ ▬ ▬ Potential Grove Street Station and Park & Ride

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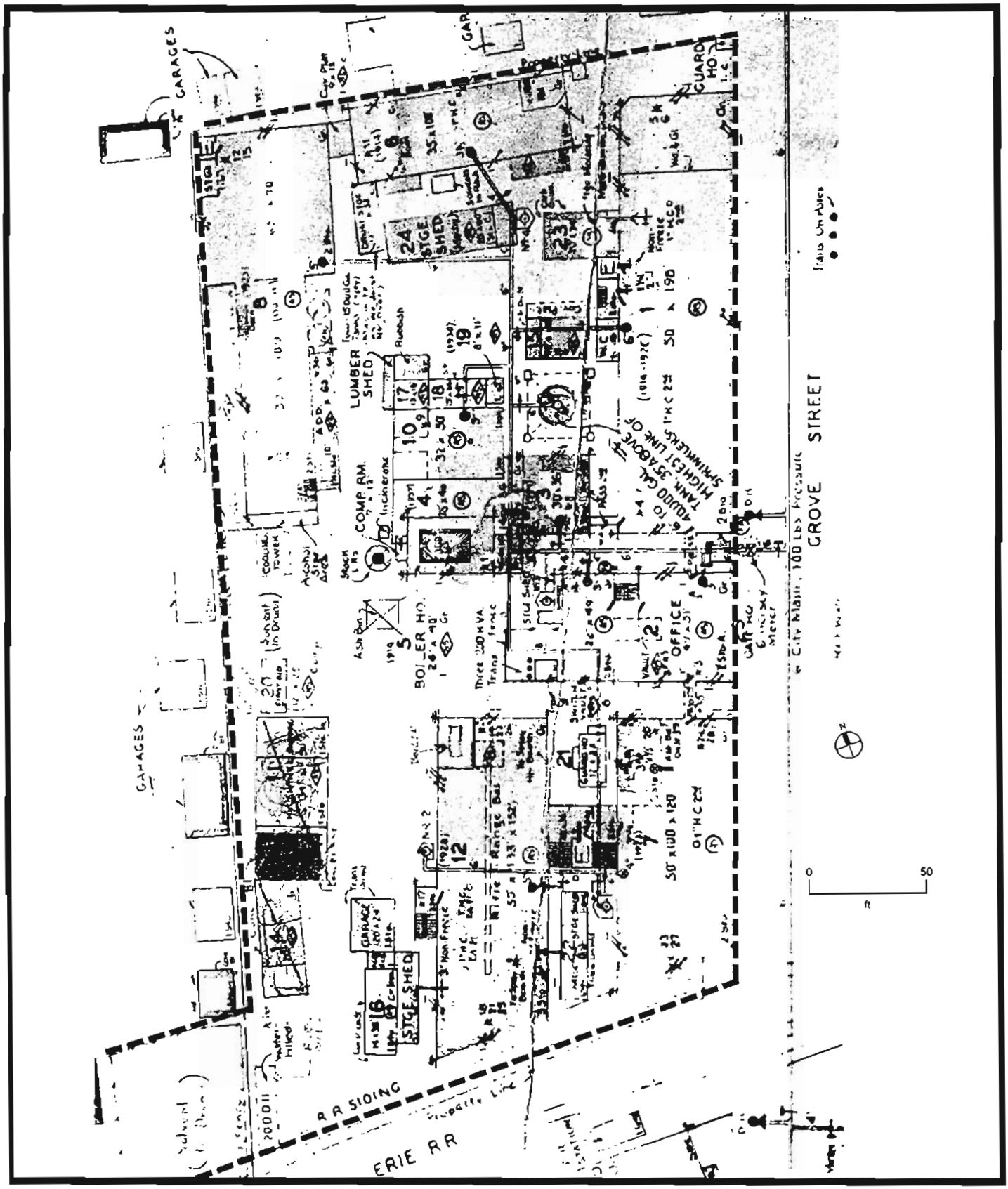
Figure 15



1954 Fire Insurance Map of Former Union Carbide Corp. Grove St. Research Facility in Bloomfield (FIA 1954)

Potential Grove Street Park-and Ride Site

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Figure 16

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Production of thermo-setting Bakelite was based on a reaction between formaldehyde and phenol, controlled by pressure and tempered with ammonia or some other base. This process produced a resin that softened with heating and could be dissolved, but additional heating set it into a permanently hard, strong, insoluble substance resistant to heat and chemicals. This made it suitable for electrical insulation and other industrial uses (Kettering 1946:288-289). In Baekeland's view, its key drawback was its inflexibility, but this was outweighed by its ability to resist heat, friction, dampness, steam, or chemicals (Baekeland 1909:156). An essential component in its manufacture was an apparatus called a "Bakelizer." This was described as

> ...an interior chamber in which air can be pumped so as to bring its pressure to 50 or better [than?] 100 lbs. per square inch. This chamber can be heated externally or internally by means of a steam jacket or steam coils to temperatures as high as 160 degrees C. or higher, so that the heated object during the process of Bakelizing may remain steadily under suitable pressure which will avoid porosity or blistering of the mass (Baekeland 1909:156).

A diagram of Baekeland's "Bakelizer" shows a simple apparatus (Figure 17), but the actual chamber was more impressive. An example from Baekeland's Yonkers, New York, laboratory now in the Smithsonian Museum predates the operation of the Bloomfield plant (Eklund 1996:personal communication; Figure 18), but is undoubtedly similar to those used in the New Jersey facilities.

The plastic produced by Baekeland, first at his Yonkers laboratory, and then at his New Jersey plants in Perth Amboy, Bound Brook, and Bloomfield, was adaptable to a variety of uses from the practical to the frivolous. In addition to industrial applications -- among them, as noted previously, Thomas Edison's phonograph records--personal or household objects were produced that are now collector's items.

Bakelite's versatility is detailed in a 1941 newspaper article that noted:

> It is to be found in every automobile, warship, telephone, radio and power plant; while its chief contributions to science and industry have been in the larger fields of electric generation and use, paints and varnishes, textiles, abrasives, furniture, building, etc., it is also to be found in jewelry, false teeth,[3] artificial limbs and even a skull made of it was fitted to a Toronto electrician who had lost his by a high potential contact (*Independent Press* 1941).

[3]According to Cilene Karraker, Baekeland's octogenarian granddaughter, Baekeland was thrilled with Bakelite false teeth made for him (Karraker 1996:personal communication).

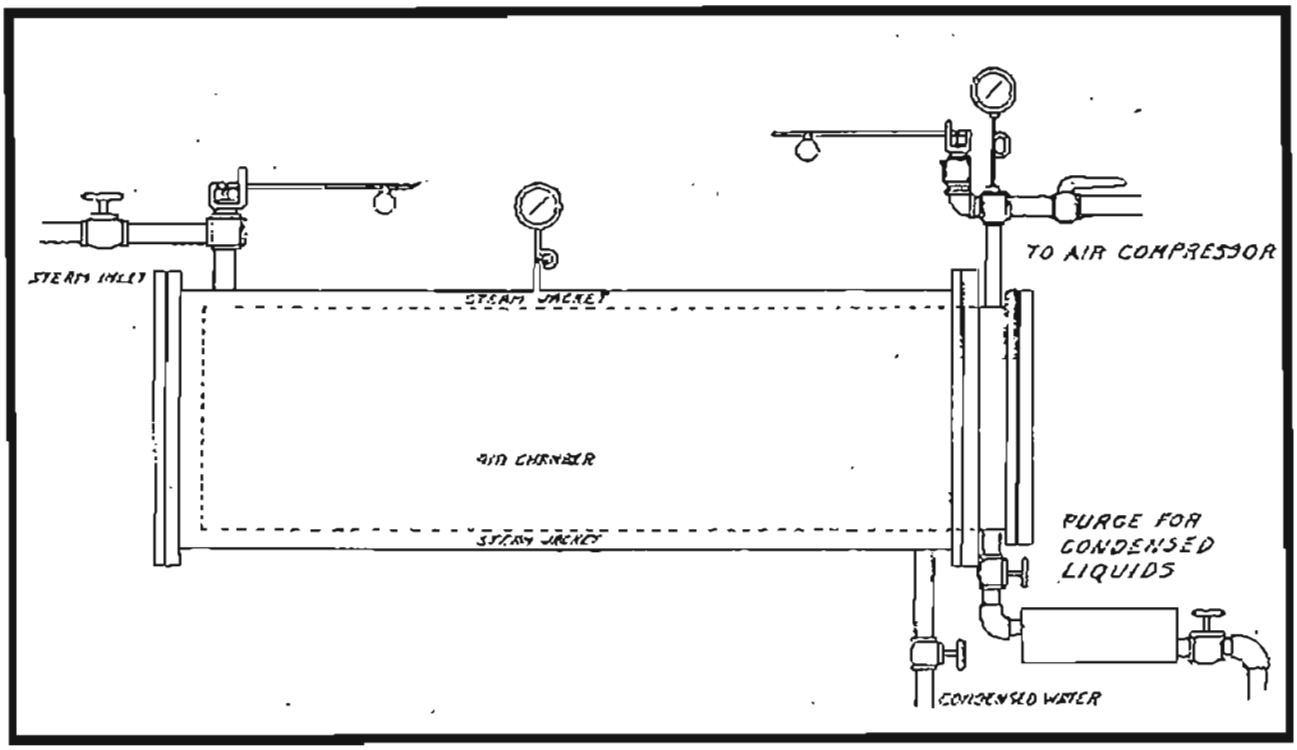
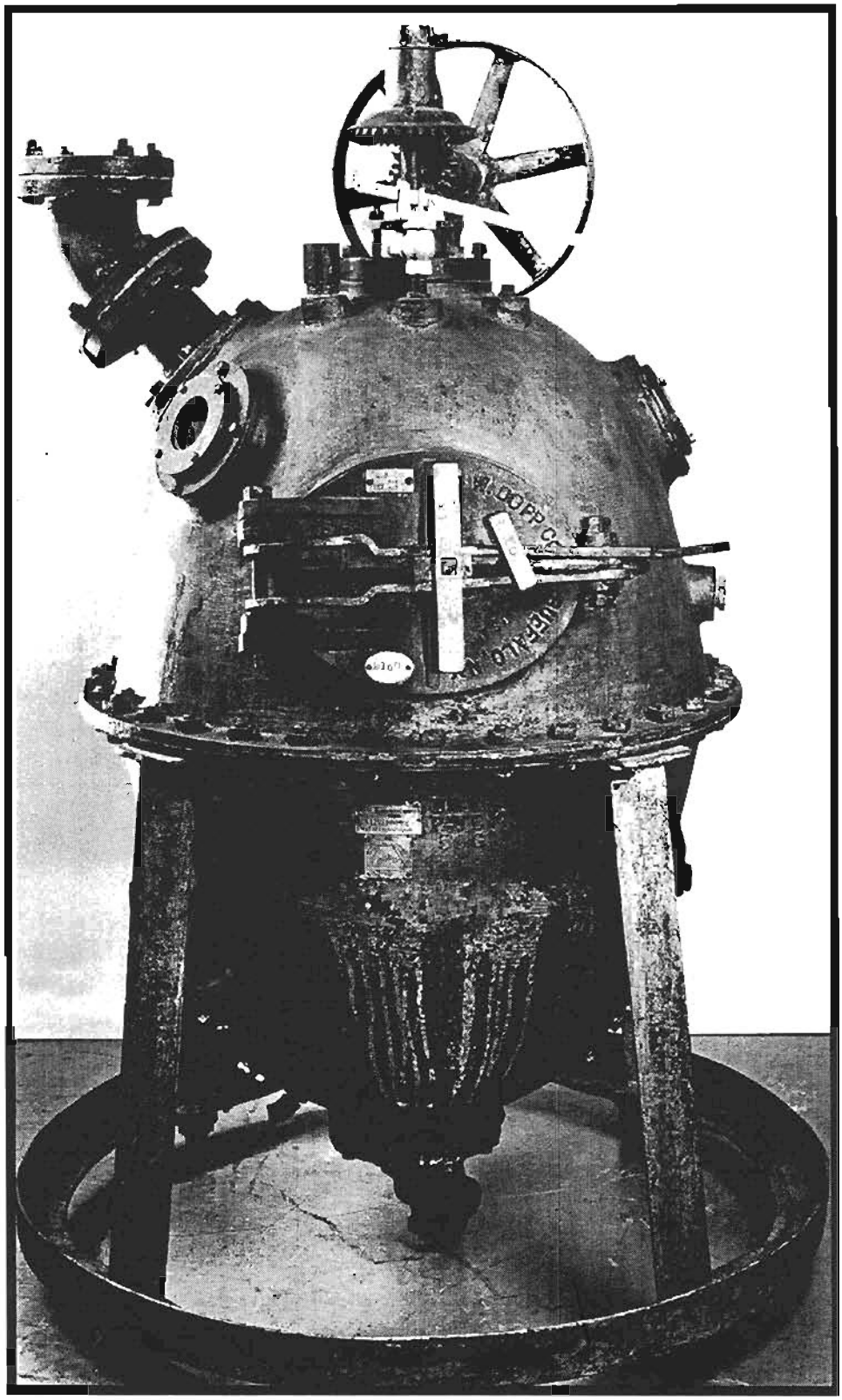


Diagram showing general principle of a Bakelizer (*Bakelite molded* 1924:31)

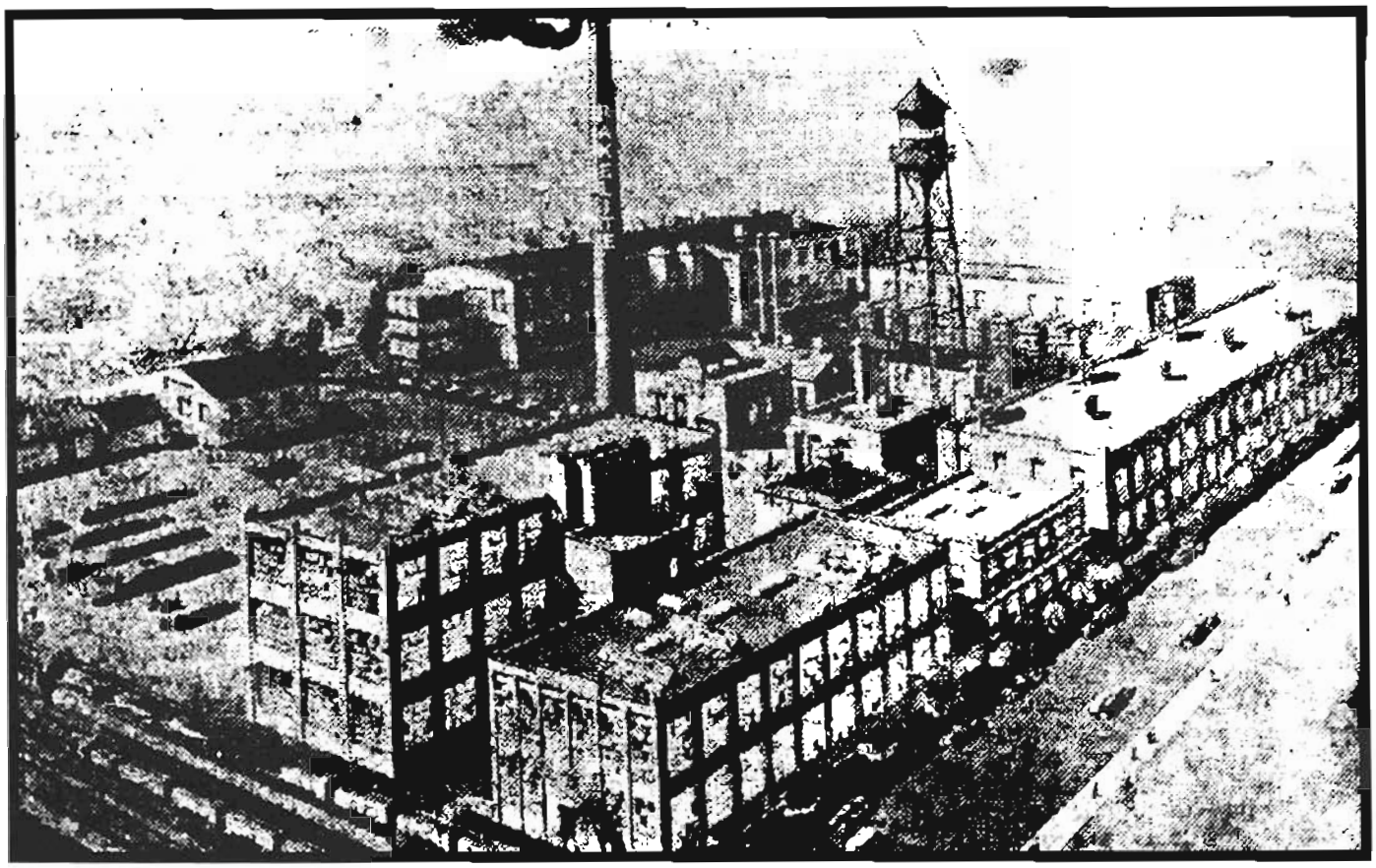


Bakelizer apparatus from Baekeland's Yonkers laboratory now in Smithsonian collection (courtesy Smithsonian Institution)

5.3 THE BLOOMFIELD BAKELITE CORPORATION PLANT

The Bloomfield Bakelite Corporation Plant at 230 Grove Street is documented on insurance maps, as noted above. While no detailed photo was located, a "wash drawing" featured in a 1940 newspaper article shows the industrial complex in that year (*Independent Press* 1940; Figure 19).[4] The facility had been acquired by the Union Carbide and Carbon Corporation (later Union Carbide) in 1939, and 300 employees were soon engaged in research and development rather than production (*Independent Press* 1940). The two-acre site with ten buildings was sold to the Schering Pharmaceutical Company for use as a chemical research facility in 1958 (*Independent Press* 1958); seven years later, in 1965, Schering donated the property and buildings to Bloomfield College to serve as its science facility (*Independent Press* 1965). At the time of the tansfer, the complex included thirty-five laboratories, a cafeteria-library building, a glassware wash room, and an infirmary (*Independent Press* 1965). In 1967, financial difficulties caused the college to swap the Grove Street property for other town lands. According to tax records, it had become the Bloomfield DPW facility by 1970 (*The Herald-News* 1975; Pisauro 1996:personal communication).

[4]Miss Lucy Sant Ambrogio, the Bloomfield Museum's volunteer curator, kindly made a copy of this rendering available as well as copies of several *Independent Press* articles.



"Wash drawing" of Bakelite Plant in Bloomfield, N.J. 1940 (*Independent Press* 1940). Grove Street is on the right, the Erie railroad tracks, now CONRAIL, can be seen in the lower left corner.

6.0 HELLER PARKWAY-FRANKLIN AVENUE STATION (Morris Canal)

6.1 INTRODUCTION

The effect of proposed construction on the buried Morris Canal was a major focus of the archeological 1B field investigation. The canal's dimensions, its 1924 abandonment, and its subsequent development history were considerations in this assessment.

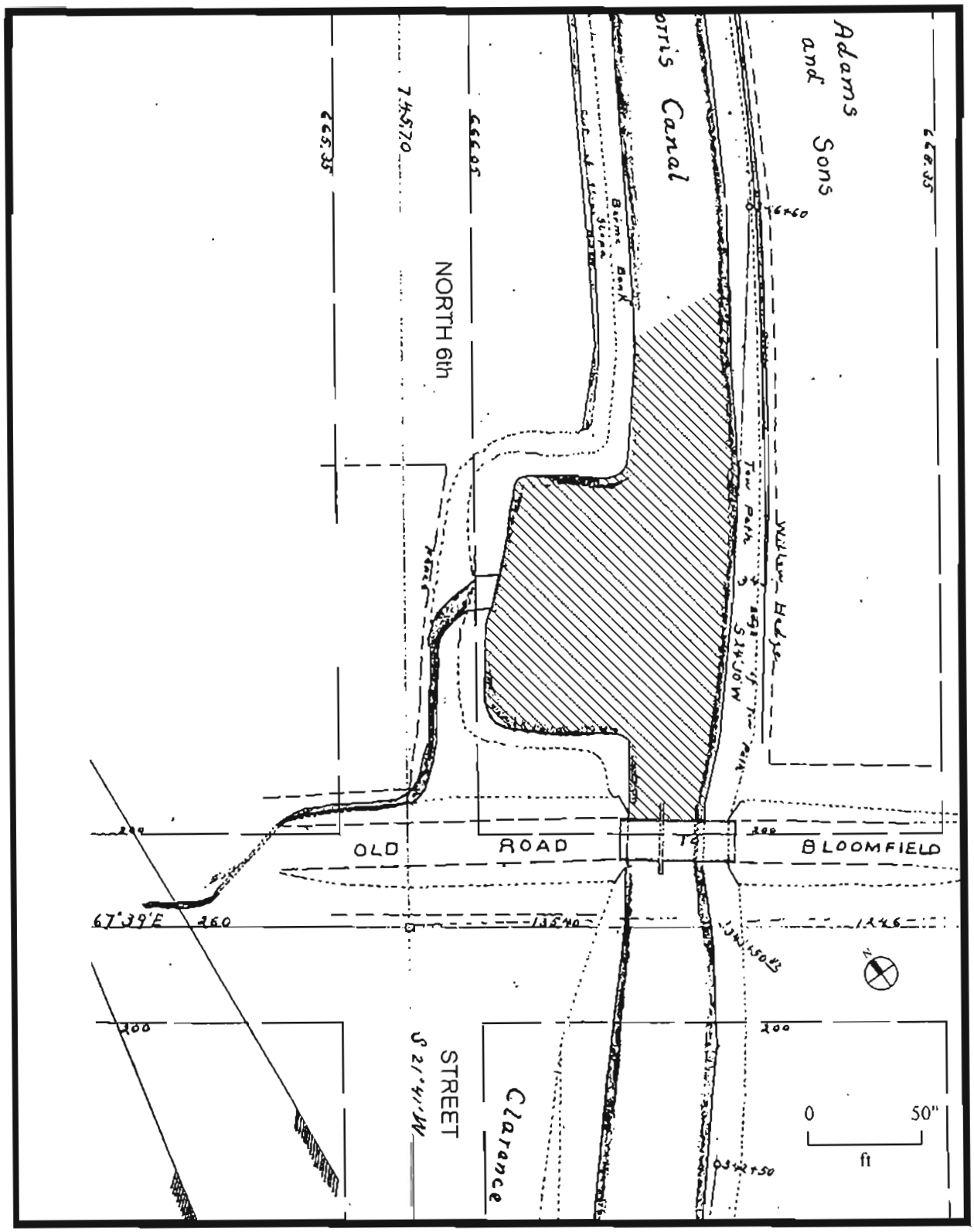
To determine the effect, an evaluation was required of the condition of the buried canal prism. Soil borings drilled north of the existing Newark City Subway turn-around, where new track will be installed, were archeologically monitored and continuously sampled as an initial step in the evaluation (Figure 20). These soil borings (Borings S-15A, and S-15B), sampled to between 8 and 10 feet below the asphalt surface, revealed a clean reddish sand that ultimately extended to shallow bedrock documented elsewhere at 14 to 16 feet below grade (see Soil Boring Logs, Appendix C this report and Subsurface Conditions below). No clay, silt, or organics were found to suggest the bottom of the canal's prism had been located. The sterile red sand found throughout the archeological and geotechnical samples appears to be a clean fill that replaced any former canal deposits. For example, the same condition was noted in geotechnical borings taken nearby along the former canal route (Borings S-13, S-14, and S-15; see Appendix C).

6.2 CONSTRUCTION OF THE MORRIS CANAL

The Morris Canal was constructed in increments beginning on the western end in 1825 (Kalata 1983: 93, 122). It ran "northerly from Phillipsburg to Lake Hopatcong (then called 'Great Pond'), then east to Paterson where it turned south to Bloomfield" and on to Newark, reaching downtown in 1831 (Hamm 1985:1-2). Regular service began the following year.

Originally 32 feet wide at the top, 20 feet wide at the bottom, and 4 feet deep (Kalata 1983:279, 373), in 1845 the canal was enlarged to accommodate larger boats and make it more economically viable. It was ultimately expanded to a surface width of 42 feet, a bottom width of 25 feet, and a depth of 5 feet (Kalata 1983:372-373). An exception to this standard was found just north of Heller Parkway (formerly Old Bloomfield Road) in Bloomfield where a wider basin was located that extended about 125 feet north of Heller Parkway (Figure 21). At that point it again conformed to the 42-foot by 25-foot by 5-foot channel.

Soil boring (S-15A or S-15B) being drilled north of Franklin Avenue loop on November 10, 1995. View is looking west.



Morris Canal Survey 1892, detail north of Heller Parkway

Morris Canal Basin

Newark City Subway Extension and Vehicle Base Facility Environmental Assessment

U.S. Department of Transportation Federal Transit Administration

NJ TRANSIT

Prepared By
BRW Rail Link Team

Figure 21

In addition to the desire for increased capacity, an impetus to the 1845 alteration was the collapse of some of the canal's earthen banks. This had widened the waterway but partially filled its prism. When the canal was expanded, rip-rap or stonework was often introduced to stabilize the banks (Kalata 1983:373). Despite these alterations, the canal finally became unprofitable and obsolete. Seepage and an inadequate water supply became increasingly annoying problems, although seepage was less in 1918-1919 than earlier because of decreased canal traffic (Vermeulle 1929:72-73).

As described in 1912, the first 10 miles of the canal's eastern portion were "in very bad condition and unlovely to look upon." The banks were "low and slimy" and "refuse of all kinds" poured into it and flowed "upon the muddy waters" (Morris Canal Investigation Committee 1912:51). Beyond the cities, however, the abandoned canal often retained its bucolic aspect as evidenced by a photo taken just south of the study area, probably in the 1920s or early 1930s (see Figure 27 later in this report).

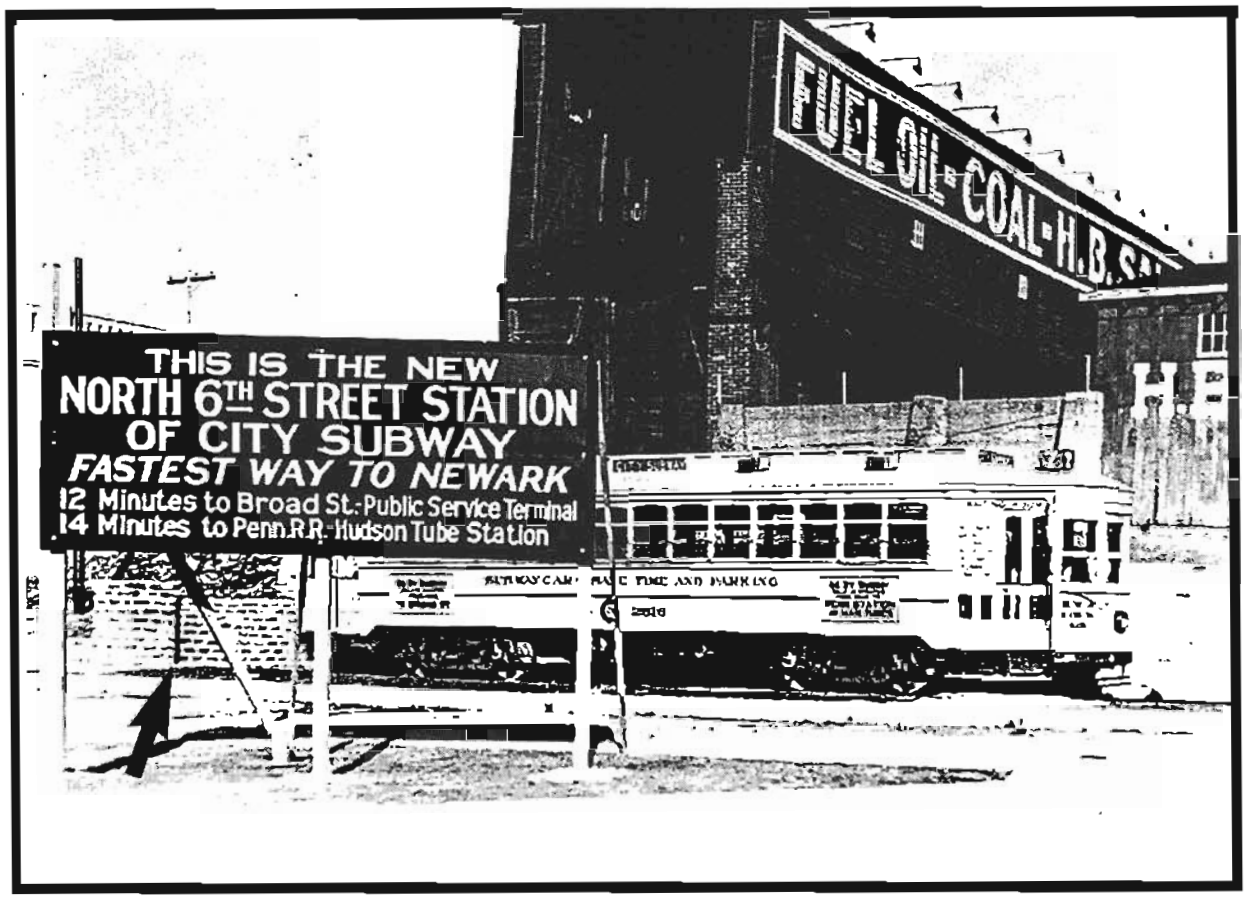
6.3 NEWARK CITY SUBWAY

In 1922, the canal and its parent company, the Morris Canal and Banking Company, passed to the State of New Jersey, with total abandonment "clearly in sight" (Hamm 1985:3). The City of Newark obtained title to its portion of the abandoned canal in 1927 (Anon n.d.), paving the way for it to become the route of the new City Railway, now the Newark City Subway. Horse-drawn street car lines had provided Newark's first public transportation beginning in 1859 (Catrambone 1980[5]; see Figure 22 for a horse-drawn trolley on the Newark-Bloomfield line). The new City Railway was to be a combination of the long-established trolley system and an adaptation of New York City's Eighth Avenue subway line (Anon. n.d.).

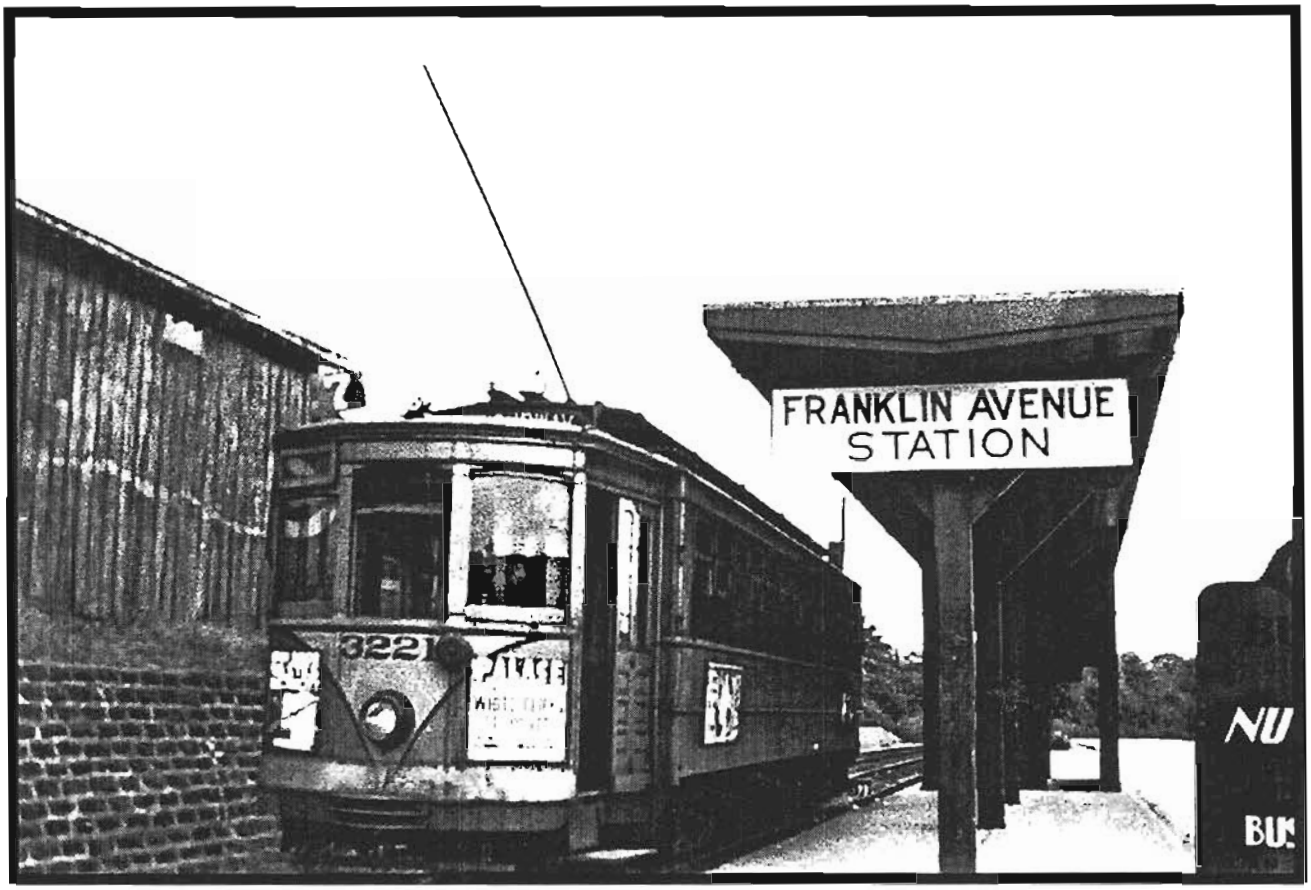
Ground breaking for the new subway took place in 1929 (Catrambone 1980). Construction in downtown Newark entailed excavation and widening of the canal bed and a cut-and-cover construction. Once past Orange Street, the line ran north above ground, connecting with previously established trolley routes. At this time, a new route, the No. 7 line, was created. It ran entirely along the former canal, initially ending at Heller Parkway and later, in 1940, terminating at the North 6th Street Station just to the north (Figure 23), now the Franklin Avenue Station (Figures 24 and 25 show this station in 1944 and 1954). A stone wall located just north of the station (Figure 26) has been mistaken for a remnant of the former canal, but is instead part of a wall constructed in 1940 (see Figures 23 and 24). In 1953, a turn-around loop was created at the end of Route No. 7 to accommodate new trolley cars that could only be operated from one end (Catrambone 1980).

[5] See Catrambone 1980 for a detailed account of the history and development of the Newark City Subway.

Newark-Bloomfield horse-drawn trolley c. 1880. (Courtesy NJ Division, Newark Public Library)



New North 6th Street Station on December 9, 1940 with Car 2616 serving as a waiting room. Note H.B. Salmon Co. Building also seen on Figures 26 and 27 (courtesy of John Catrambone). Note new stone wall (arrow).



New loading platform at Franklin Avenue Station September 9, 1944 (courtesy of John Catrambone).

New Franklin Avenue Station October 2, 1954 after turning loop had been completed (courtesy of John Catrambone).

View north above present Newark City Subway terminus. Erie Railroad trestle is in the background. Stone wall on left is also seen in Figures 21 and 22. (November 15, 1995)

6.4 NEWARK CITY SUBWAY IN THE STUDY AREA

Photos taken just before and during construction of Route No. 7 near the study area document the canal and its conversion to an above-ground subway line (Figures 27 and 28). One source notes that "In adapting the course of the Morris Canal it has been necessary to widen and to deepen the original excavation" (Anon. 1932). While this may refer mainly to the mile-long underground section in downtown Newark, it appears that the 4-mile-long above-ground portion also required elimination of the abandoned canal prism. This is suggested by the clean red sand to bedrock found in the soil borings, a deposit that created a stable foundation for the newly-established line (see Subsurface Conditions).

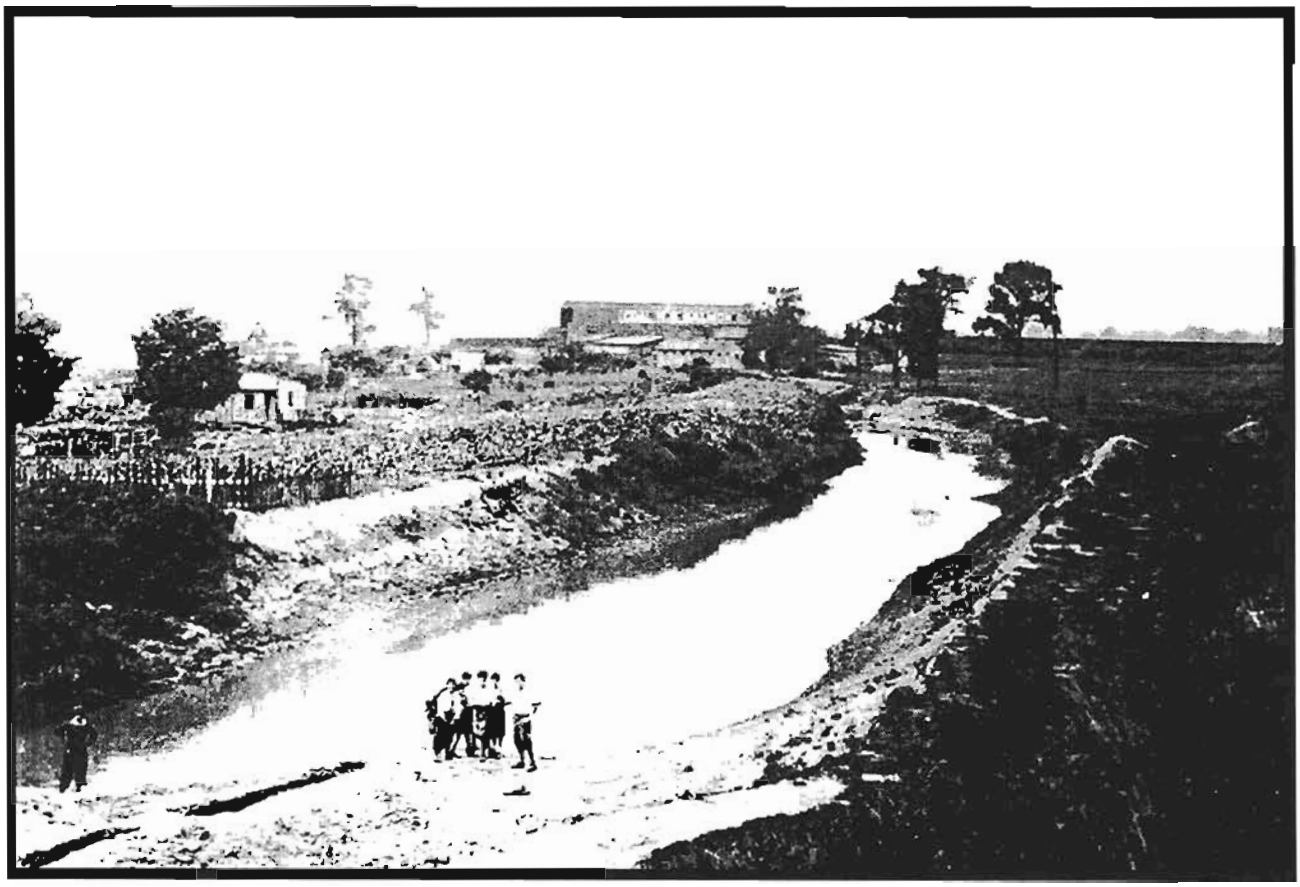
6.5 SUBSURFACE CONDITIONS

Soil boring data from this part of the site documented approximately 3 feet of fill on the west side of the Newark City Subway tracks in Borings S-13, S-14 and S-15. A similar sequence was found in the borings drilled for archeological purposes north of the subway turn-around, Borings S-15A and S-15.B (A. Reginatto 1995:11; see Soil Borings Appendix C this report). As was the case with the VBF borings, borings drilled for geotechnical purposes were sampled at 5-foot intervals while those drilled for archeological purposes were continuously sampled at 2-foot intervals and were monitored by the writer.

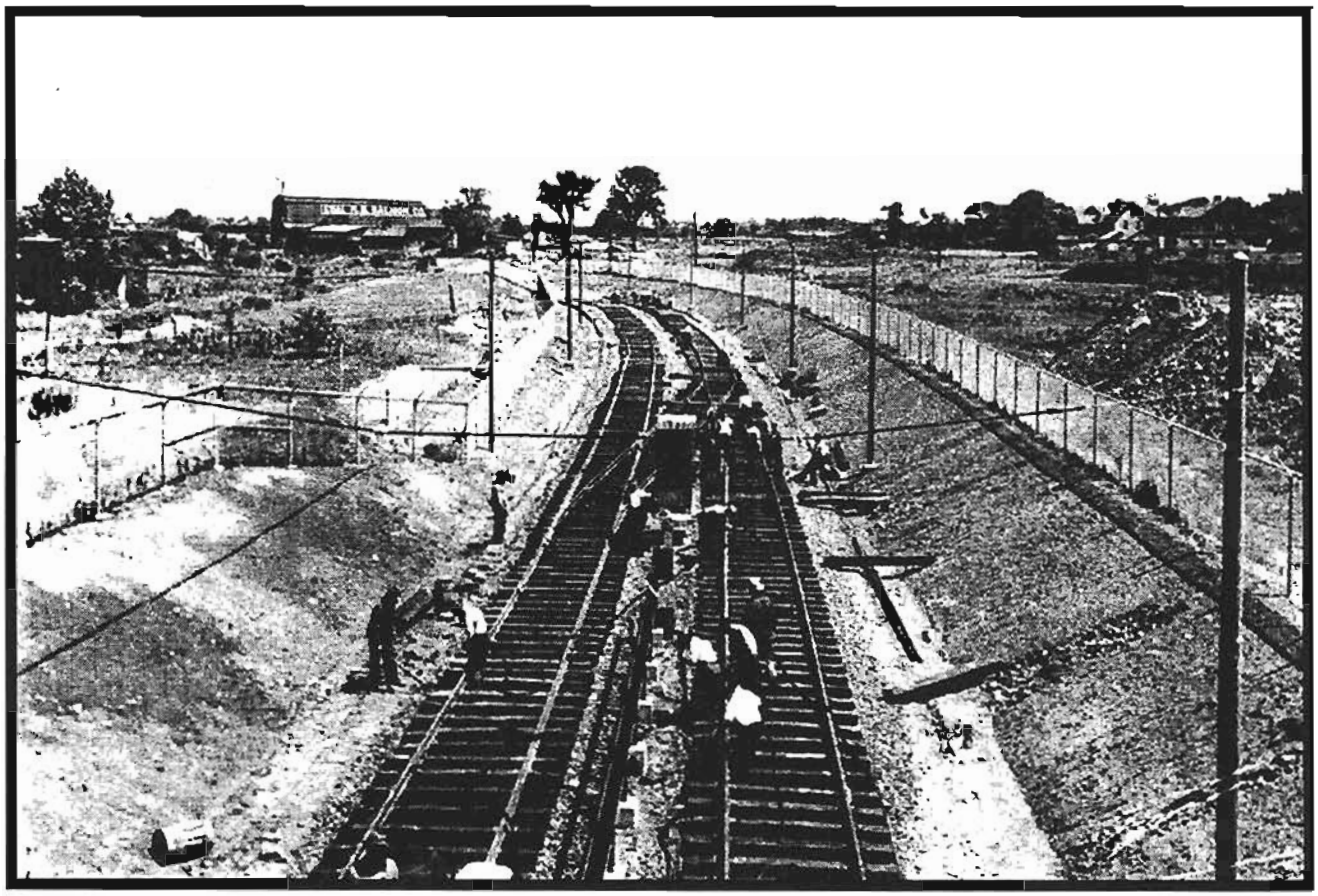
The soils analysis for this part of the site indicated the 3-foot, heterogenous, man-made fill layer found on the west side of the tracks was followed by a stone ballast (A. Reginatto 1995:11). A 10 to 12-foot layer of red brown silt with sand and gravel was found below the ballast. Some layers within this level contained more sand than others (described as "strata" but not necessarily natural stratification [Ibarra 1996:personal communication]), and the lower part of this level was found to contain some cobbles and boulders. Beneath this, sandstone bedrock was reached at depths of 14 to 16 feet below the surface (A. Reginatto 1995:11).

A somewhat different situation was found in the archeological borings located beyond the tracks and within the confines of the former canal route according to historical maps and photographs. Although the fill material and depth were similar, there was no stone ballast. This is not surprising since stone ballast would be associated with the railroad tracks, and no tracks were placed on this northern part of the site.

Of greatest importance is the fact that there is no evidence of a filled canal documented in any of the borings. It is noted in the geotechnical analysis that "fill may be thicker where the old canal bed has been filled" (A. Reginatto 1995:11). However, the fact that the depth of fill is the same throughout the tested area, even where the canal was located according to maps and photographs, gives rise to the theory that the canal bed was entirely removed when the subway line was constructed in this area. As noted above, this theory is supported by the referenced literature.



Morris Canal looking north from the vicinity of Heller Parkway prior to subway construction. Note the H.B. Salmon Co. building in background, on west side of canal (courtesy NJT).



City railway under construction in 1934. View is looking north from Heller Parkway with H.B. Salmon building again shown on the west side of the former canal (courtesy of NJT).

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

Soil borings and additional documentary research have indicated that Native American resources at the VBF site and the Morris Canal at the NCSE site do not appear to be archeological concerns. These were two areas of potential sensitivity identified in the Archeological 1A Technical Study where subsurface testing occurred. The proposed optional Grove Street Station site, formerly the Bakelite plant, was also considered in the assessment. Additional documentation done for this study supports the conclusion that archeological investigation is not necessary at this location.

While the possibility of impacting Native American resources in association with a former stream or brook now located under an existing building was considered a minor concern, an adverse effect on the buried prism of the State and National Register-listed canal feature was a more sensitive issue.

Soil boring data combined with additional documentary research suggest that the canal has been eliminated in this part of the study area. Furthermore, the stream on the VBF site was rerouted and culverted between 1929 and 1944. These activities would have caused subsurface disturbance. The assumed disturbance is also suggested by soil borings. It appears, then, that implementation of the proposed light rail transit system at the VBF and NCSE site will not impact archeological resources.

7.2 RECOMMENDATIONS

Based on the information amassed for this analysis, it is recommended that the findings regarding disturbance at the VBF site in the vicinity of the former stream be verified through testing or monitoring when the abandoned Potamkin Cadillac Service and Parts building (former Plant 2 of the General Motors Chevrolet industrial complex) is demolished. It is also recommended that the findings regarding past destruction of the Morris Canal prism be verified through a test excavation where subsurface disturbance will occur within the confines of the former canal bed. As noted in the Archeological 1A Technical Study, it is also recommended that HABS/HAER documentation of the two remaining former Bakelite Corporation Plant structures, now the Bloomfield DPW facility, include photo-documentation of any evidence of plastics production that may still be found. It is also recommended that final construction plans be reviewed by an archaeologist to ensure there will be no adverse impact on presently unidentified archeological resources.

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_____ , 1909. Patent No. 942,700. Condensation Product of Phenol and Formaldehyde and Method of Making the Same. Leo H. Baekeland, Yonkers, N.Y. Filed Dec 4, 1907. Serial No. 405,021. *U. S. Patent Office*, December 7, 1909:226-227.

_____ , 1909. Patent No. 942,808. Abrasive Composition and Method of Making Same. Leo H. Baekeland, Yonkers, N.Y. Filed Oct. 26, 1907. Serial No. 399,382. *U.S. Patent Office*, December 7, 1907:262.

_____ , 1909. Patent No. 942,809. Condensation Product and Method of Making Same. Leo H. Baekeland, Yonkers, N.Y. Original application filed Oct. 15, 1907. Renewed Sept. 17, 1909. Serial No. 397,560. *U. S. Patent Office*, December 7, 1907:277.

_____ , 1909. Patent No. 942,852. Indurated Product and Method Preparing Same. Leo H. Baekeland, Yonkers, N.Y. Original application filed July 13, 1907. Serial No. 383,684. Divided and this application filed April 18, 1908. Serial No. 427,874. *U. S. Patent Office*, December 7, 1907:277.

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APPENDIX A

BAKELITE PATENTS (5)

Filed 1907, Issued 1909

Patent No. 942,808

Abrasive Composition and Method of Making Same. Filed 10/26/1907. *Official Gazette, U. S. Patent Office* 1909:-262

942,808. ABRASIVE COMPOSITION AND METHOD OF MAKING SAME. LEO H. BAEKELAND, Yonkers, N. Y. Filed Oct. 26, 1907. Serial No. 399,382.

1. The method of making an abrasive composition which consists in incorporating an abrasive material with a phenolic body and formaldehyde and transforming the same into an insoluble condensation product.

2. The method of making an abrasive composition which consists in incorporating an abrasive material with a phenolic body and formaldehyde and transforming the same into an insoluble condensation product by application of heat.

3. The method of making an abrasive composition which consists in incorporating an abrasive material with a phenolic body and formaldehyde and transforming the same into an insoluble condensation product by application of heat and pressure.

4. An abrasive or polishing composition containing an abrading or polishing agent, and an insoluble condensation product of a phenolic body and formaldehyde.

Patent No. 942,809

Condensation Product and Method of Making Same. Filed 10/15/1907. *Official Gazette, U. S. Patent Office* 1909:-262

942,809. CONDENSATION PRODUCT AND METHOD OF MAKING SAME. LEO H. BAEKELAND, Yonkers, N. Y. Filed Oct. 15, 1907, Serial No. 397,560. Renewed Sept. 17, 1909. Serial No. 518,283.

1. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used.

2. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, and separating water from the resulting product.

3. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, separating water from the resulting product, and then hardening the same.

4. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, separating water from the resulting product, and then hardening the same by application of heat and pressure.

5. The method which consists in reacting on a phenolic body with formaldehyde in presence of a base serving as a condensing agent, the proportion of base in the product being less than one-fifth of the equimolecular proportion of the phenolic body used, compounding the resulting body with a suitable material and then hardening the composition.

[Claims 6 to 8 not printed in the Gazette.]

Patent No. 942,852

Indurated Product and Method of Preparing Same. Filed 7/13/1907; refiled 4/18/1908. *Official Gazette, U. S. Patent Office* 1909:-277

942,852. INDURATED PRODUCT AND METHOD OF PREPARING SAME. LEO H. BAEKELAND, Yonkers, N. Y. Original application filed July 13, 1907, Serial No. 383,654. Divided and this application filed Apr. 18, 1908. Serial No. 427,874.

1. The method of indurating fibrous or cellular materials which consists in mixing formaldehyde and a phenolic body in proportions to yield an insoluble and infusible reaction product, separating water from the mixture, applying the resulting substantially water-free product to the fibrous or cellular material, and hardening the composition.

2. The method of indurating fibrous or cellular materials which consists in mixing formaldehyde and a phenolic body in proportions to yield an insoluble and infusible reaction product, separating water from the mixture, applying the resulting substantially water-free product to the fibrous or cellular material, and hardening the composition by simultaneous application of heat and pressure.

3. The method of indurating wood which consists in mixing formaldehyde and a phenolic body in proportion to yield an insoluble and infusible reaction product, separating water from the mixture, applying the resulting substantially water-free product to the wood and hardening the composition.

4. The method of indurating wood which consists in mixing formaldehyde and a phenolic body in proportion to yield an insoluble and infusible reaction product, separating water from the mixture, applying the resulting substantially water-free product to the wood and hardening the composition by simultaneous application of heat and pressure.

5. As a new composition of matter wood cell tissue impregnated with an infusible and insoluble condensation product of phenol and formaldehyde.

[Claim 6 not printed in the Gazette.]

Patent No. 942,699

Method of Making Insoluble Products of Phenol and Formaldehyde. Filed 7/13/1907. *Official Gazette, U. S. Patent Office* 1909:226

942,699. METHOD OF MAKING INSOLUBLE PRODUCTS OF PHENOL AND FORMALDEHYDE. LEO H. BAEKELAND, Yonkers, N. Y. Filed July 13, 1907. Serial No. 383,684.

1. The method of producing a hard, compact, insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting upon a phenolic body with formaldehyde, and then converting the product into a hard, insoluble and infusible body by the combined action of heat and pressure.

2. The method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, producing thereby a reaction product capable of transformation by heat into an insoluble and infusible body, forming the article from said reaction product, and rendering the article hard, insoluble and infusible by application of heat and pressure.

3. The method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, producing thereby a reaction product capable of transformation by heat into an insoluble and infusible body, separating water from the resulting product, forming the article from said reaction product, and rendering the article hard, insoluble and infusible by application of heat and pressure.

4. The method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, producing thereby a reaction product capable of transformation by heat into an insoluble and infusible body, forming the article from said reaction product compounded with a filling material, and rendering the article hard, insoluble and infusible by application of heat and pressure.

5. In a method of making articles containing an insoluble and infusible condensation product of phenols and formaldehyde, the step which consists in causing the water to separate from the mixture of a phenolic body and an aqueous solution of formaldehyde by adding to said mixture a metallic salt soluble in water and adapted to cause such separation.

Patent No. 942,700

Condensation Product of Phenol and Formaldehyde and Method of Making the Same. Filed 12/4/1907. *Official Gazette, U. S. Patent Office* 1909:226-227

942,700. CONDENSATION PRODUCT OF PHENOL AND FORMALDEHYDE AND METHOD OF MAKING THE SAME. LEO H. BAEKELAND, Yonkers, N. Y. Filed Dec. 4, 1907. Serial No. 405,021.

1. A condensation product resulting from the reaction of a phenolic body and formaldehyde, said condensation product being solid at all temperatures, hard when cold, soft and elastic when heated but infusible, and insoluble in alcohol, glycerin, formaldehyde or mixtures of these, but swelling in phenol and acetone without complete solution therein.

2. The method of making a condensation product of a phenolic body and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, and arresting the reaction when the initial condensation product has been transformed into a mass which is solid at all temperatures and hard when cold, soft and elastic when heated but infusible, insoluble in alcohol, glycerin and formaldehyde or mixtures of these, and which swells in phenol and acetone without complete solution therein.

3. The method of making a condensation product of a phenolic body and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, separating water from the initial condensation product, and arresting the reaction, when the initial condensation product has been transformed into a mass which is solid at all temperatures and hard when cold, soft and elastic when heated but infusible, insoluble in alcohol, glycerin and formaldehyde or mixtures of these, and which swells in phenol and acetone without complete solution therein.

4. The method of making a shaped condensation product of a phenolic body and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, arresting the reaction when the product has become infusible and insoluble but is yet capable of softening under the influence of heat, and shaping and hardening said product.

5. The method of making a shaped condensation product of a phenolic body and formaldehyde, which consists in reacting on a phenolic body with formaldehyde, arresting the reaction when the product has become infusible and insoluble but is yet capable of softening under the influence of heat, shaping said product and hardening the same by adequate application of heat.

[Claims 6 and 7 not printed in the Gazette.]