# REPORT ON SITE REDEVELOPMENT ASSESSMENT FORMER DELPHI INTERIOR & LIGHTING SYSTEMS DIVISION, GENERAL MOTORS CORPORATION TRENTON, NEW JERSEY

by

Haley & Aldrich, Inc. Parsippany, New Jersey

for

General Motors Corporation Pontiac, Michigan

File No. 70613-160 2 October 2008



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General Motors Corporation GM WFG - Remediation Team Pontiac Centerpoint Campus - Central 2000 Centerpoint Parkway Mailcode: 483-520-190 Pontiac, MI 48341-3147

Attention: Ms. Geraldine Barnuevo

Subject:

Site Redevelopment Assessment Former Delphi Interior and Lighting Systems Division General Motors Corporation, Trenton, New Jersey

Ladies and Gentlemen:

Haley and Aldrich, Inc. (Haley & Aldrich) is pleased to present this Site Redevelopment Assessment Report for the above mentioned property. This work was authorized by General Motors Corporation (GM) under Change Order 23 to Project Memo 039.

## **INTRODUCTION**

A preliminary study was conducted to assess the existing subsurface conditions at the GM's Delphi Interior and Lighting System former manufacturing site (Site) in Trenton, New Jersey relative to potential redevelopment from a geotechnical perspective. This assessment does not include environmental or land use considerations. This assessment is limited to evaluation of those conditions which impact general site development and structure foundation construction for potential future development. The assessment is based on available data from previous subsurface investigations and no new investigations were undertaken for this study.

#### **SCOPE OF WORK**

The scope of work included the compilation and evaluation of existing data, a site visit, and preparation of this report containing our findings and recommendations.

Over 900 subsurface investigation logs were reviewed for this study. These subsurface investigation data were compiled from various reports published during the environmental remedial investigation phase at the above mentioned Site, from 1987 through 2008.

The past subsurface investigations were made by several types of equipment and by various methods. The logs include descriptions of the different methods of subgrade penetration and sampling including, hand auguring, direct push sampling (Geoprobe<sup>®</sup>), test pits, soil borings with and without Standard Penetration Test (SPT) sampling, and air rotary drilling for monitoring well installation. Approximately 72 ground water monitoring wells were also installed during the various investigation phases. The subsurface investigation logs generally provide some level of description of the soil constituents; however, the logs containing SPT sampling data are the most useful for the purposes of this study. The following table shows the number of soil borings performed at the Site by year and the number of these soil borings with SPT data.

Year Performed	Number of Soil borings Performed	Number of borings with SPT data
1987	6	0
1990	9	0
1991	13	0
1994	84	38
1996	53	14
1998	108	42
2000	22	0
2002	157	57
2003	114	2
2004	164	0
2005	9	0
2006	11	8
2008	20	0

The explorations referred to in this report are shown on Figure 1, Site Redevelopment Assessment, Exploration Locations.

Our evaluation also included a site visit and a review of historic aerial photographs of the Site. Edward Zamiskie, Bobby Issac and Aaron Farrell of Haley & Aldrich conducted a site visit on 26 August 2008 to better understand the present site conditions and to review aerial photographs. At that time, Mr. John Behrle, a former employee at the Site, was consulted regarding his recollection of the historical development of the Site.

Drawings and aerial photographs reviewed included:

- Original construction plans for plant (various sections), 1936-1944
- Wetlands Survey, Gerald G, DeGroat, L.S., 21 June 2005.
- Aerial photographs from 1940, 1951, 1962, 1965, 1969, 1970, 1974, and 1975.

#### **EVALUATION**

A brief interpretation of the available subsurface investigation data is presented in the following sections. The project site has been divided into eleven (11) areas (Area 1 through Area 11) for the purposes of the environmental remedial investigations, and this report utilizes the same designations. The areas are shown on Figure 1.

Based on published sources, the Site is mapped with unconsolidated materials originating from various depositional processes, overlying the bedrock referred to as the Stockton formation. This formation includes of sandstones, shales, and conglomerates and is found within 10 feet of the ground surface. An eolian deposit (a wind-blown material, predominately silt) occurs in the northwest corner of the property. The unconsolidated materials in the central portion of the Site, and the majority of the Site, are mapped as the Pennsauken Formation. These materials are reportedly of fluvial origin (river or stream deposits). The Pennsauken Formation is described as consisting mainly of sand with some clay and gravel lenses. The "Engineering Soil Survey of New Jersey" (Rutgers 1954) describes this material as predominately silt with minor amounts of intermixed sand and gravel 4 to 8 feet thick, overlying coarser materials and bedrock.

Surficial geologic mapping indicates that in the eastern portion of the property a small surface water feature, Gold Run, flows from north to south in alluvium (stream deposits of recent time). As part of the Site geologic reconnaissance, bedrock was observed in



and adjacent to the stream. These field observations are generally consistent with the geologic map, which presents a narrow band east of Gold Run as saprolite: thoroughly weathered, decomposed bedrock. East of Gold Run, to the eastern property boundary the surficial geologic material is mapped as Pennsauken.

#### AREA 1

This area (approximately 29.6 acres) extends from the northwest corner of the Site to approximately 1300 feet along the west boundary of the property and approximately 1275 feet along the northern boundary along Parkway Avenue, and includes the area formally occupied by the main plant and the bituminous and concrete parking areas adjacent to the Parkway Avenue. The majority of this area is currently covered by the concrete floor slab and foundation of the plant. This slab covers about 20 acres and is approximately 6 to 8 inches thick. There are several depressed areas (pits) in the floor slab ranging from 1 foot to 15 feet deep. Based on the historical construction plans the spread footings for the building are spaced 20 to 60 feet apart depending on the area usage. The footings are embedded 3 to 3.5 feet below the ground surface. The lateral dimensions of these footings vary between 4 to 8 feet. There are abandoned buried stormwater and process sewers running along the eastern edge of the building slab in Area 1, cutting along the western edges of Areas 2 and 3.

Approximately 163 subsurface investigation logs, including monitoring well records, were examined from this area. Almost all of the investigations were conducted in the concrete slab area and most of these were conducted using a Geoprobe<sup>®</sup> sampler.

Thirteen (13) monitoring wells were installed in this area of which seven (7) (MW-41, MW-39, MW-43, MW-44, MW-45, MW-19 and MW-20), have pilot hole boring logs containing SPT data indicating soil density. Most of the borings were advanced from the surface of the concrete slab of the main plant. Based on these data, there is a layer of medium dense to very dense, silt to silty sand material from directly below the concrete slab to the weathered bedrock, at approximately 2 to 15 feet depth. In the southeast corner of Area 1, a loose to medium dense, silt to silty sand layer was found to a depth of 7 to 10 feet, overlying a dense to very dense silty sand layer over the weathered bedrock at 12 to 52 feet depth. The uppermost silt to silty sand layer is likely a fill layer imported to or excavated material reworked at the Site for construction of the main plant building. A variety of non-soil materials was also observed within this layer and occurring sporadically, as recorded in other boring logs, including brick pieces, gravel, crushed stone, cinders, coal and ash-like material, scattered all over the area. A 4-foot thick lens of soft to stiff, lean clay was also recorded at 7 feet depth at MW-45. Bedrock depth varies from 3 feet in the northwest to over 15 feet at the southwest boundary of the area. Based on the history of site construction, we would expect that the initial building construction involved cutting and filling using native soils on site, and that expansions and modifications to the plant may have utilized construction debris and other waste materials that were reworked into required fills.

#### AREA 2

Area 2 (2.5 Acres) lies to the east of Area 1 and included the former 400,000-gallon water storage tank (steel) with a brick enclosure location and the electric transformer location. The area is approximately 300 feet along the north edge and 375 feet along the east edge. Most of the subsurface data is clustered along the north side and southwest corner of the area with limited investigations along the east side.

Borings SB-3-SO-29 through SB-3-SO-33 are located in the cluster of subsurface borings in the southwest corner and have SPT data. These borings indicate a layer of brown, very loose to loose poorly graded sand with silt overlying a stiff silt layer. Boring GSO7, within 30 feet of the SB-3-SO borings, and MW-18, located in the



middle of the west side, indicate a medium stiff to stiff silt layer to approximately 11 to 15 feet depth, overlying dense silty sand over weathered bedrock. Boring GSO7 also indicates presence of weathered bedrock at approximately 15 feet depth.

## AREA 3

Area 3 (about 3 acres) lies to the south of Area 2 and is approximately 300 feet by 450 feet in area. This area had been used as the facility's steam plant and storage of solid fuel (coal) and then liquid fuel (No. 4 and No. 6 fuel oils) in above-ground storage tanks. The storage tanks were on the floor of a pit. The pit is approximately 200 feet by 100 feet in area and 10 feet deep near the southern end of Area 3, and was used as a secondary containment area for a 30,000-gallon and 500,000-gallon above ground No. 6 fuel tanks. This recessed area is lined with 3-inch crushed stone aggregate. The slab of the former steam plant remains. This area has a reasonable distribution of past exploration locations, however borings with SPT data are confined to the western half of the area.

A study of the available data, especially boring B-24, B-25, SB-3-SO-27 and MAO-C-B3 (at edge of Area 3 and Area 4) indicates a loose to medium dense sand layer with occasional fill material like ash and cinders to a depth of 2 to 13 feet, underlain by a layer of stiff silt and dense sand at some locations to depth of approximately 17 feet. Weathered bedrock is found at a depth of approximately 16 to 17 feet.

### AREA 4

Area 4 (about 0.7 acres) lies to the south of Area 3. This area was the facility's hazardous waste temporary storage area. The waste was stored in drums on a concrete slab. This slab still exists. This small area has numerous soil borings with SPT data. Based on the available data, this area has a fill layer to a depth of 8.5 to 10 feet with a medium dense to very dense sandy silt to silty sand, underlain with medium dense sandy silt to silty sand layer. Weathered bedrock was found at approximately 10 to 12 feet depth.

#### AREAS 5, 6 and 7

Areas 5, 6 and 7 (about 11 acres combined) are located on the southwest corner of the Site. These areas were formally used for paved parking lots, miscellaneous support buildings and a sludge drying bed area (designated No. 5). Only 8 subsurface investigation logs include SPT data across these areas. At the northern side of Areas 5 and 6, based on borings MW-19 and MW-20, there is a 15 to 25 foot thick layer of loose to medium dense silt overlaying a dense silty sand layer over the weathered bedrock, which is found at a depth of approximately 20 to 25 feet. Near the middle of the west side of Area 6, at borings MW-46 and MW-47, bedrock was found at shallow depths, approximately 4 to 9 feet below grade. Based on borings MW-48 and MW-49, a silt to silty sand layer above weathered bedrock, approximately 15 feet deep, is present through the middle of this combined area; however, the soil consistency varied from medium stiff/medium dense to very stiff/dense. A stiff to very stiff, clay to silty clay layer was found at boring B7-2 overlaying weathered bedrock at an approximate depth of 20 feet. At MW-22, a dense to very dense silty sand layer extended to a depth of 12 feet, overlaying a loose gravely sand and silt layer over weathered bedrock at 15 feet depth. The presence of slag and cinders near the surface has been reported in boring B7-7, B7-2 and MW-22.

As described herein, there is a significant amount of variation in the subsurface conditions in this area, perhaps resulting from various phases of grading and filling related to past construction activity. There also exists a significant gap in subsurface density/consistency data across these areas.



## AREA 8

Area 8 (about 3.9 acres) is located in the middle of the south of the Site and was formerly occupied by the wastewater treatment facilities which have been removed. The ground slopes to the southeastern end of the area. The wastewater treatment area included eight 150,000 gallon neutralization tanks and two 1,000,000 gallon sludge settling tanks which have been demolished and backfilled, but the broken-up concrete bases and walls remain.

A study of the representative available boring logs with SPT data in this area (MW-11, B8-5, MW-7, B8-1, SB-8-SO-12 and B10-3) indicates a medium stiff to very stiff, clay and silt layer in the mid section of the area. Some fill materials were also described in the boring logs from 6 to 20 feet. This layer was underlain by weathered bedrock.

Boring B8-9 on the west end indicates a silty sand to sandy silt layer overlying the weathered bedrock. It appears that fill was used to expand the level portion of the Site to the south along the drainage swale adjacent to the railroad. This has created a deep swale with steeply-sloping sides.

### AREA 9

Area 9 (about 10.9 acres) lies in the central and eastern portion of the Site, spanning an area of 550 by 900 feet and was formerly used as an employee parking lot. The area slopes to the east and varies over 10 feet in elevation from the highest in the northwest corner to the lowest in the southeast corner. As indicated by representative boring logs HSO23, HSO6, HSO2, B10-4, HSO10, MW-51, B8-1 and MW-27 from this area, the weathered bedrock slopes from west to east and is generally overlain with soft to very stiff sandy silt to silty sand. MW-27, in the southeastern corner of the area, shows a stiff to hard clay layer above the weathered bedrock. Fill materials like cinders, slag, concrete, glass, metal, rubber, off-spec. car parts and lumber was also observed in the soil near the surface in many of the explorations. Some explorations have encountered large volumes of these waste materials.

#### AREA 10

Area 10 (about 6.4 acres) is located east of Area 9 and west of the Gold Run (a manaltered surface stream). This area was formerly used for sludge beds (designated Nos. 1 through 4). The beds, according to our information, were dg into fill that had been placed to level off the Site in this area, filling the area adjacent to and west of Gold Run.

Boring logs MW-1, B10-8, SB-10-SO-3, B10-7, SB-10-SO-7, MW-4, SB-10-SO-10, B10-5 and B10-3 were used to study the subsurface conditions in this area. Weathered bedrock was encountered within 10 to 15 feet of the ground surface in most of the borings.

The overburden soil was mostly sandy silt to silty sand and clayey silt to silty clay, overlying the weathered bedrock. Many borings encountered sludge material in the soil. Ash, cinders, glass, metal, rubber, wood, concrete and asphalt was also observed in most of the borings.

Up to approximately 10 feet of fill was observed along the Gold Run in this area during our site visit. It appears that fill was used to expand, by leveling, the useable portion of the Site or to form berms for the containment of the sludge. Pronounced ridges of fill are present running parallel to Gold Run, which is at a lower natural elevation. However, the exact limits and thickness of the fill is not clear from the data available. Visual observation of the surface indicated presence of glass, metal, concrete, bricks, plastic, carpet etc. in the area.



## AREA 11

Area 11 (about 11.6 acres) includes and lies to the east of Gold Run. A man-made pond (retention basin) created by a low concrete dam exists at the north end of this area. We understand that this pond served as a source of fire fighting water. Other than the dam this area has not been developed since ownership by General Motors. In 2003, General Motors sold a small section (approximately 4 acres) for construction of the Credit Union of New Jersey building. This area has only a few locations with sufficient data for soil density/consistency, mostly concentrated near MW-21 to MW-35 and at boring HSO22. The subsurface material consists of loose to dense sandy silt and silty sand to a depth of 8 to 10 feet, overlying the weathered bedrock, the top of which slopes from north to south.

## FINDINGS AND RECOMMENDATIONS

In general the subsurface conditions, from a geotechnical perspective, are suitable for redevelopment. The Site conditions are characterized by varying depths of fill over weathered shale/siltstone/sandstone bedrock. The fill appears to be reworked residual soils mixed with small amounts of non-soil fill material such as brick, concrete, cinders, ash, etc. This fill presumably was used to level the Site to facilitate the plant construction, including the ancillary operations, buildings, and extensive parking areas. No significant amount of putrescible waste was identified based on the available subsurface records. The fill materials will require special attention, including further investigation and treatment during construction. The degree of the special treatment will depend upon the proposed site construction. Based on the existing data, our findings and recommendations are presented below.

#### **Site Development**

- 1. Construction of light to moderately heavy structures, including residential and lowrise commercial buildings, can be accommodated in most areas of the Site if proper investigation and treatment of the subsurface conditions are made.
- 2. Spread footings can be used to support building column and wall loads and slabs-on-grade floors can be constructed on undistributed natural soils or improved fill materials. To use spread footings, the fill at the Site, which varies widely over the Site, but could be as much as 8 to 10 feet thick, would need to be excavated and recompacted in controlled lifts in areas to receive structural loads. During this process, deleterious materials (such as wood, oversized debris, organics, etc.) would be segregated and removed for disposal. The improvement of the Site fill using deep dynamic compaction methods and rapid impact methods may also be considered. These methods are generally appropriate if the fill and shallow underlying material do not contain materials that hinder the transfer of the applied energy. These materials include organic soils, soft clays, and some waste materials such as tires, plastic, carpet, textiles and wood, if found in large quantities.
- 3. Alternative (intermediate) foundation types that bypass the fill materials but do not represent traditional deep foundation types (such as piles) can be used to transfer structural loads to competent undisturbed natural materials, such as dense/stiff silt and sand mixes, weathered rock, and bedrock. These foundation types include rammed aggregate columns (RAC) and vibroconcrete columns.
- 4. There is the potential to reuse the existing floor slab and building foundation in the main plant area (Area 1). Based on the visible portions of the existing concrete, it appears to be in sound condition and there are no signs of distress such as structural cracking or settlement except in areas that may have been impacted by site remediation activities. Concrete quality and strength can be verified by coring and testing. The subgrade conditions directly below the concrete can be evaluated by shallow test borings or borings. Pending verification, it is expected that the existing foundations and slab could be incorporated into new construction of low to moderate-rise commercial or industrial structures. However, reuse of existing foundations and slabs is often difficult because of modifications required to



accommodate the new structure, and may not be cost-effective. In addition, there are numerous pits within the slab that would need to be backfilled with compacted soil or crushed stone. If the slab and foundation concrete is demolished and removed (wholly or partially) and chemical analysis does not indicate otherwise, it is expected that the recycled concrete can be a good source of construction material for site redevelopment, including using it in a RAC or deep dynamic compaction construction.

- 5. Site infrastructure such as roadways and parking will require typical site preparation efforts such as clearing, stripping and grubbing, and proof rolling; but, in general, most of the Site areas appear stable and will not require special treatment. Underground utility construction can be accomplished with typical trenching equipment.
- 6. There are miscellaneous buried abandoned concrete structures and sewers on the Site, and redevelopment of these areas could be limited unless these structures are removed or investigated, and stabilized in place.
- 7. Because of the fine-grained nature of the much of the soil and the fill material above relatively shallow bedrock, site recharge of collected surface water to meet stormwater management requirements will be challenging.
- 8. There are wetlands on the Site along Gold Run and the swale adjacent to the railroad along the southern edge of the Site. There will be restrictions to redevelopment because of these and GM should consult a wetlands consultant to evaluate the potential impacts.
- 9. The low dam in Area 11 should be assessed for safety and regulatory compliance (as applicable) before it is incorporated or modified by any redevelopment construction.

## **Further Study**

To determine specific recommendations for site development, including generating potential premium cost data, additional subsurface information is required:

- 1. The findings and conclusions of this report can be enhanced by performing a limited site exploration program. The program would include test pits to further examine the nature and the extent of the fill materials on the Site. The pits will have a significant advantage over the previous borings and probes, allowing the direct observation of the composition of the fill, and in particular any deleterious materials present. The pits would also help define the limits of fills on site at the edges of the property. The information will help define the extent of site preparation and special treatment, resulting in premium construction costs that would be expected. We recommend that a program including 10 days of pits using a crawler-mounted hydraulic excavator capable of digging up to 20 feet would be appropriate.
- 2. Prior to providing specific recommendations for development concepts the following needs to be considered:
  - a. Several areas in the Site do not have sufficient soil consistency data to determine the competency of the subsurface, especially considering that the Site has a significant amount of fill deposited to varying depths and of varying nature. Therefore additional subsurface explorations will be required.
  - b. The presence of soft silt and loose sand layers which are observed sporadically over the whole Site will have to be closely examined and detailed geotechnical laboratory tests may have to be conducted to determine the nature of such soils and potential impact on development.



- c. The nature of fill material will have to be closely examined in order to determine any possibility of degradation or decomposition over time that may result in ground subsidence, structure settlements, or gas generation.
- d. If specific structures are proposed, a specific focused subsurface exploration program should be conducted to supplement the existing geotechnical data and comply with state and local building codes.

Considering that the property was used as automotive manufacturing facility since 1938 to 1998, there are associated environmental concerns which, as we understand is being evaluated for further remedial processes.

We appreciate the opportunity to provide engineering services on this project. Please do not hesitate to call if you have any questions or comments.

Sincerely yours, HALEY & ALDRICH, INC.

Edward M. Zamiskie, Jr., P.E. Vice President

Jeffrey L. Duncan, P.E. Project Manager

Enclosures:

Figure 1 - Site Redevelopment Assessment, Exploration Locations

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## REFERENCES

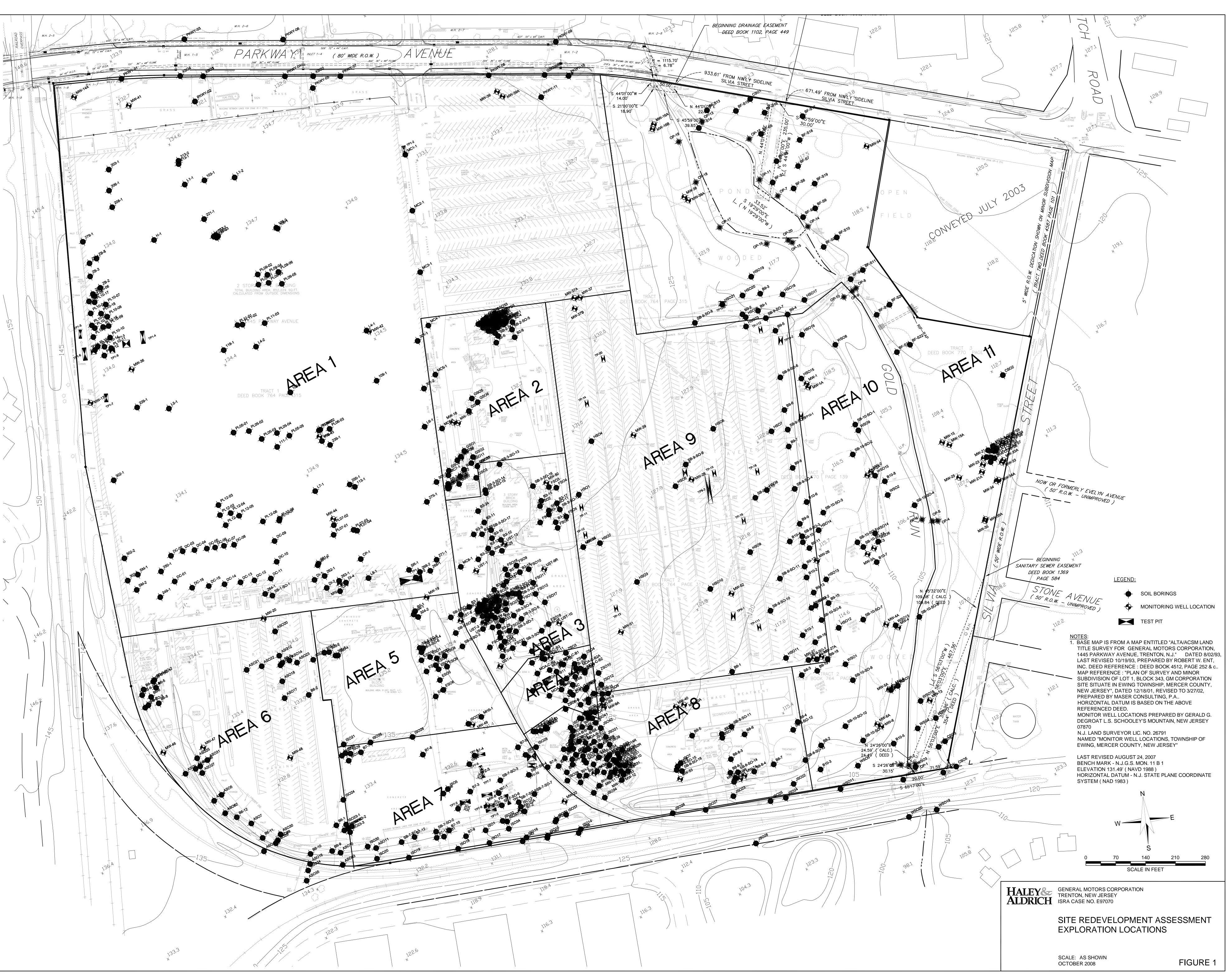
- Site Investigation Report, Former Delphi Interior and Lighting Systems Division. General Motors Corporation, Trenton, New Jersey. ISRA Case No. 97070. December 2006
- 2. Remedial Investigation Report/ Groundwater Investigation Workplan. Former Delphi Interior and Lighting Systems Division, General Motors Corporation. Trenton, New Jersey. ISRA Case No. 97070. July 2008
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