

INTERPRETATION OF AERIAL IMAGERY

1969-2016

GRENADA CORPORATION

GRENADA, MISSISSIPPI



PREPARED FOR: US EPA REGION 4

PREPARED BY: BOOZ ALLEN HAMILTON

MAY 17, 2016

Table of Contents

Introduction.....	3
Imagery Documentation.....	5
Image Identification and Acquisition.....	5
Summary and Recommendations for Further Investigation	19

Introduction

This report presents the findings from a historical aerial photographic analysis at the Grenada Corporation located in Grenada, Mississippi (Figures 1 and 2). To perform this analysis, twelve years (1952, 1969, 1979, 1985, 1991, 1996, 1999, 2004, 2006, 2010, 2014, and 2016) were analyzed and reproduced for inclusion in this report. According to historic monitoring reports, the site has been in operation since 1961.

The purpose of conducting this historical aerial image analysis of the geographic area containing the Grenada Corporation (site) is to document areas associated with hazardous waste treatment/storage/disposal.

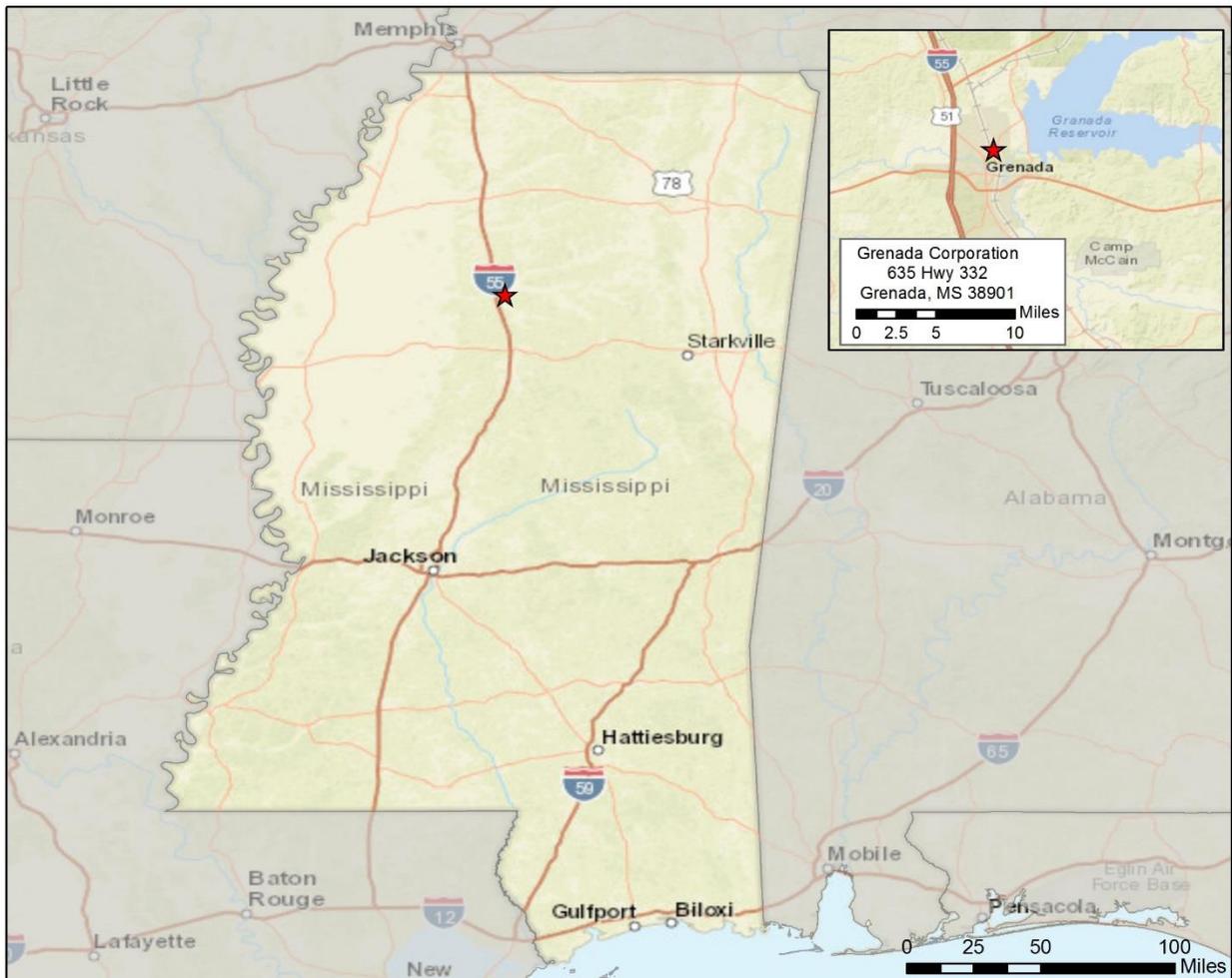


Figure 1. Grenada Corporation (ESRI 2016).

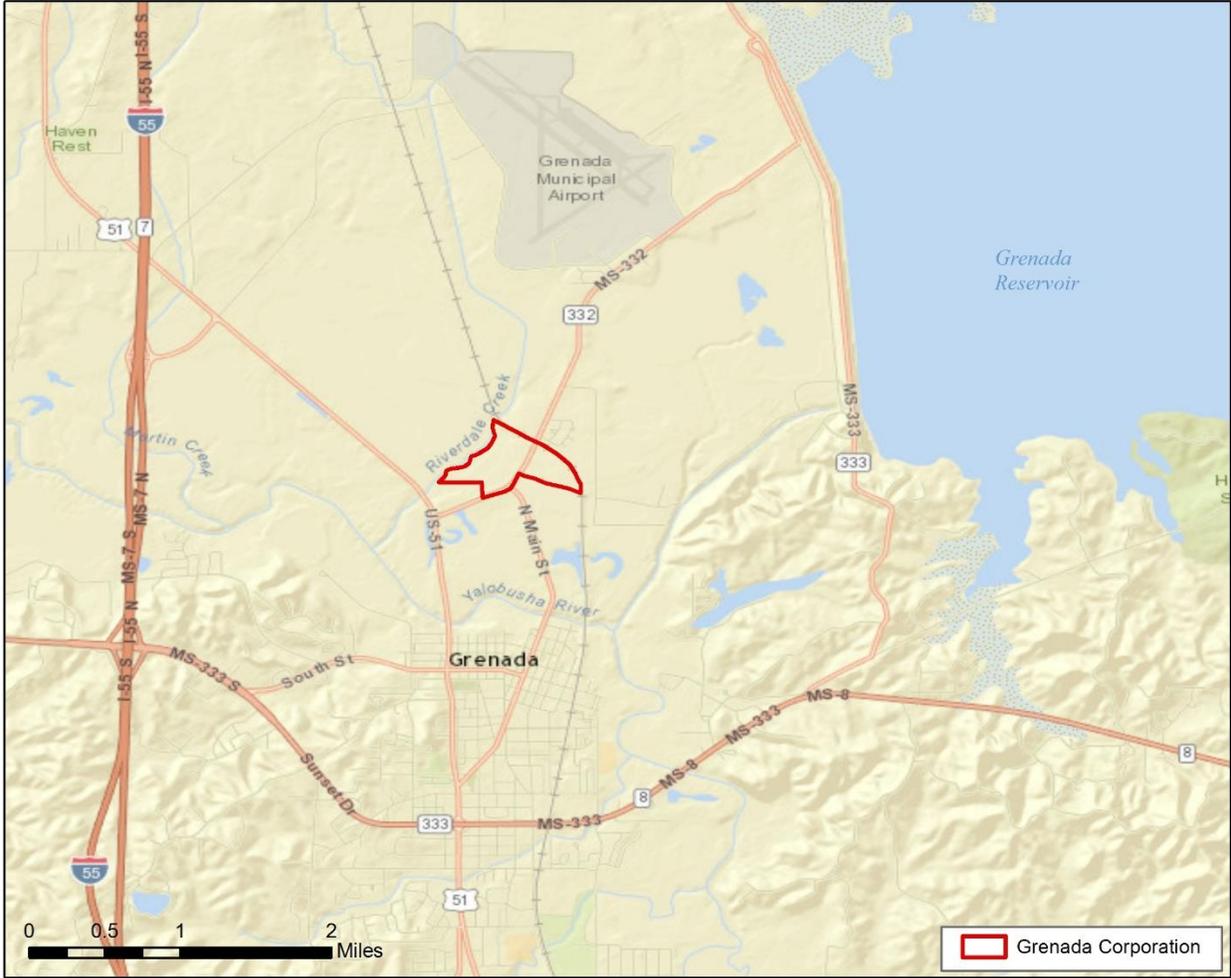


Figure 2. Grenada Corporation Boundary (ESRI 2016).

Imagery Documentation

Image Identification and Acquisition

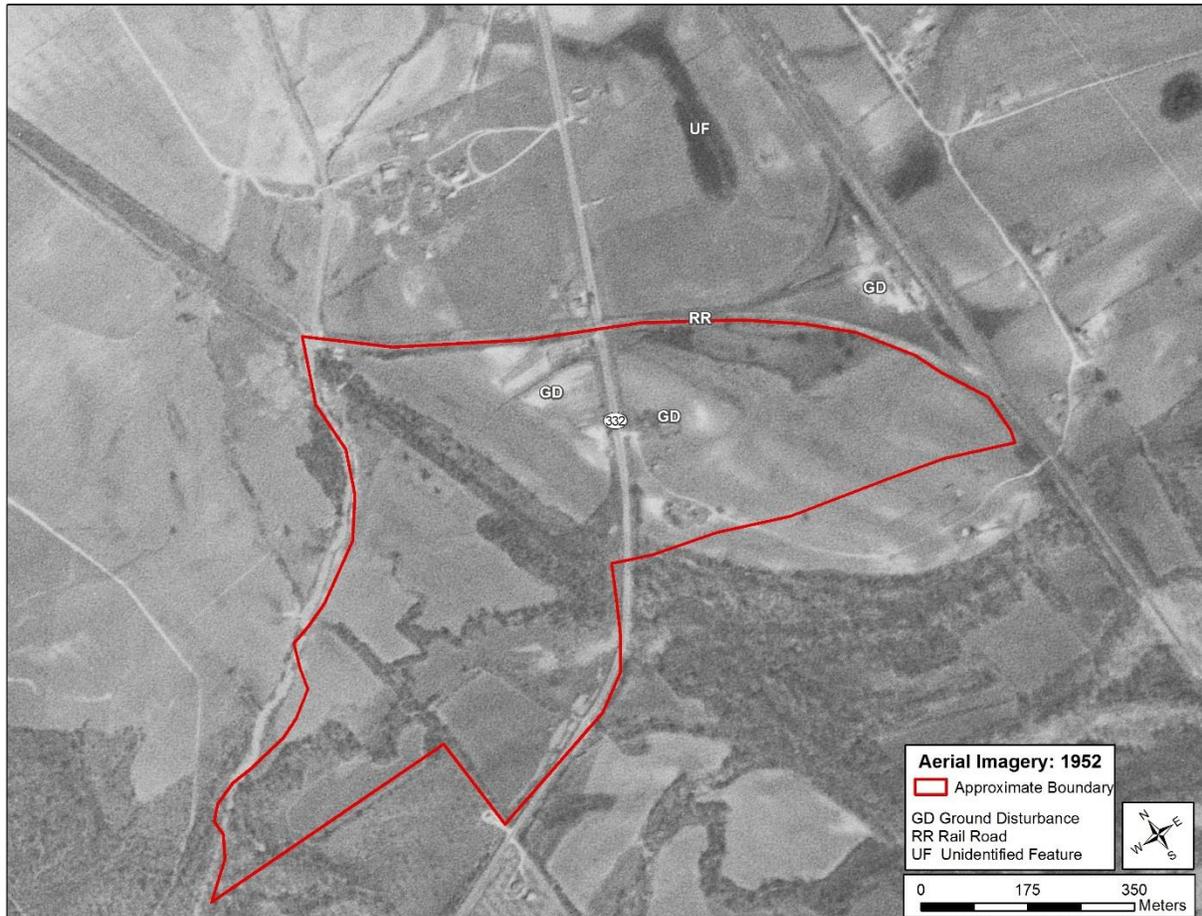
Acquired imagery spans 1952 to 2015 with a photo for at least every two years (except 2006 to 2009), as presented in Table 1.

Table 1. Acquired Imagery

Date	Resolution/Scale	Type	Source
MAR 1952	1:69000	BW	Not Available (geospatial gateway)
SEP 1969	1:125000	BW	Not Available (geospatial gateway)
JAN 1979	1:23000	BW	Not Available (geospatial gateway)
MAR 1980	1:58000	Color Infrared	NHAP
MAR 1985	1:58000	Color Infrared	NHAP
FEB 1996	NA	Color Infrared	NAPP
FEB 1991	NA	BW	NAPP
NOV 1999	1:12,000	Color	NAPP GS-VFOK 5
2004	1:12,000	Color	USDA-FSA-APFO NAIP
2005	1:12,000	Color	USDA-FSA-APFO NAIP
2006	1:12,000	Color	USDA-FSA-APFO NAIP
2009	2 feet	Color Near- Infrared	USACE
2010	1:12,000	Color	USDA-FSA-APFO NAIP
2012	1:12,000	Color	USDA-FSA-APFO NAIP
2014	1:12,000	Color	2014 DigitalGlobe Inc.
2016	1:12,000	Color	Google Earth © 2016

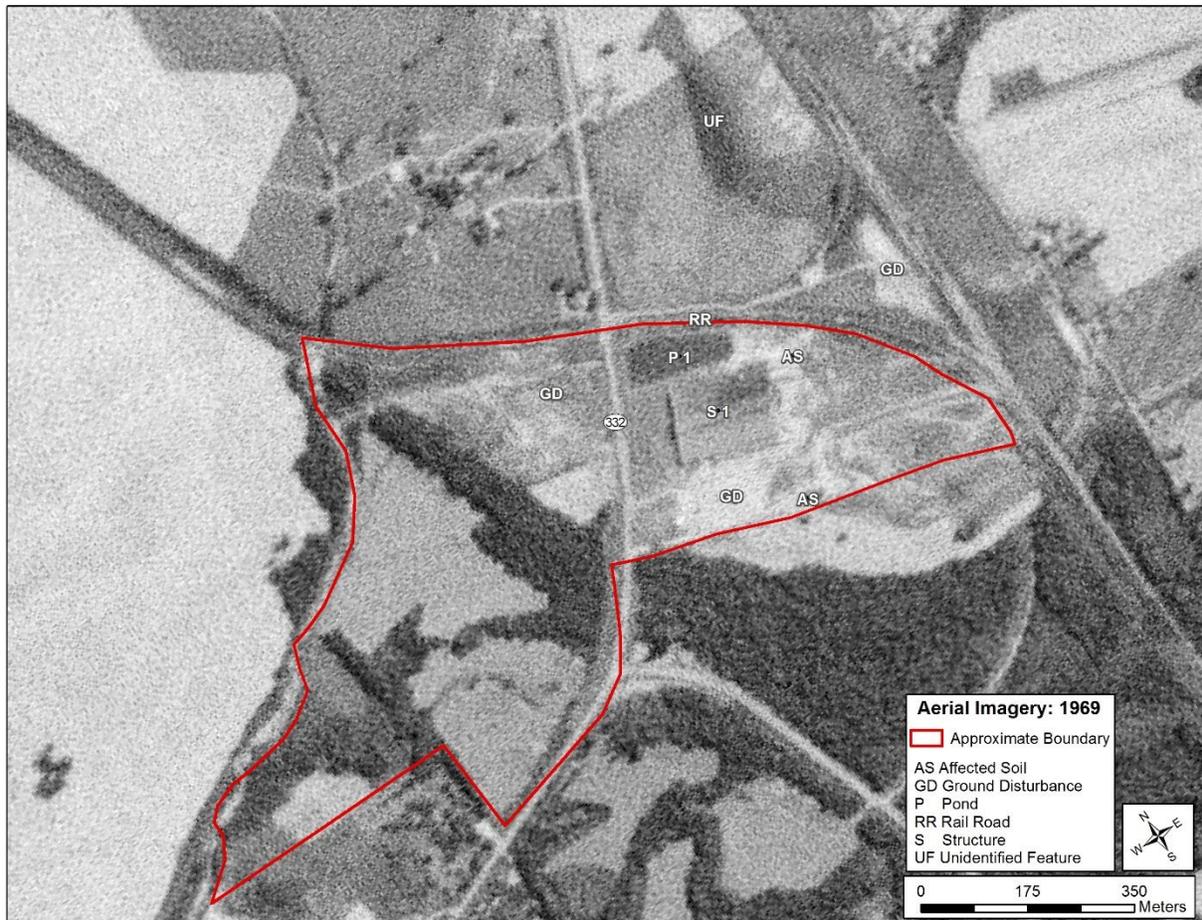
Aerial Imagery Interpretation **Image 1: Year 1952**

- The property is still undeveloped and consists mainly of agricultural land.
- A Railroad and Route 332 visible along the northern border.
- Some Ground Disturbance (GD) is visible to the west of Route 332.
- Some Ground Disturbance is visible to the east of Route 332.
- The residential area, located north of the property boundary, is still undeveloped. A dark form either from a ground disturbance or affected soil, is visible and labeled as an Unidentified Feature (UF).



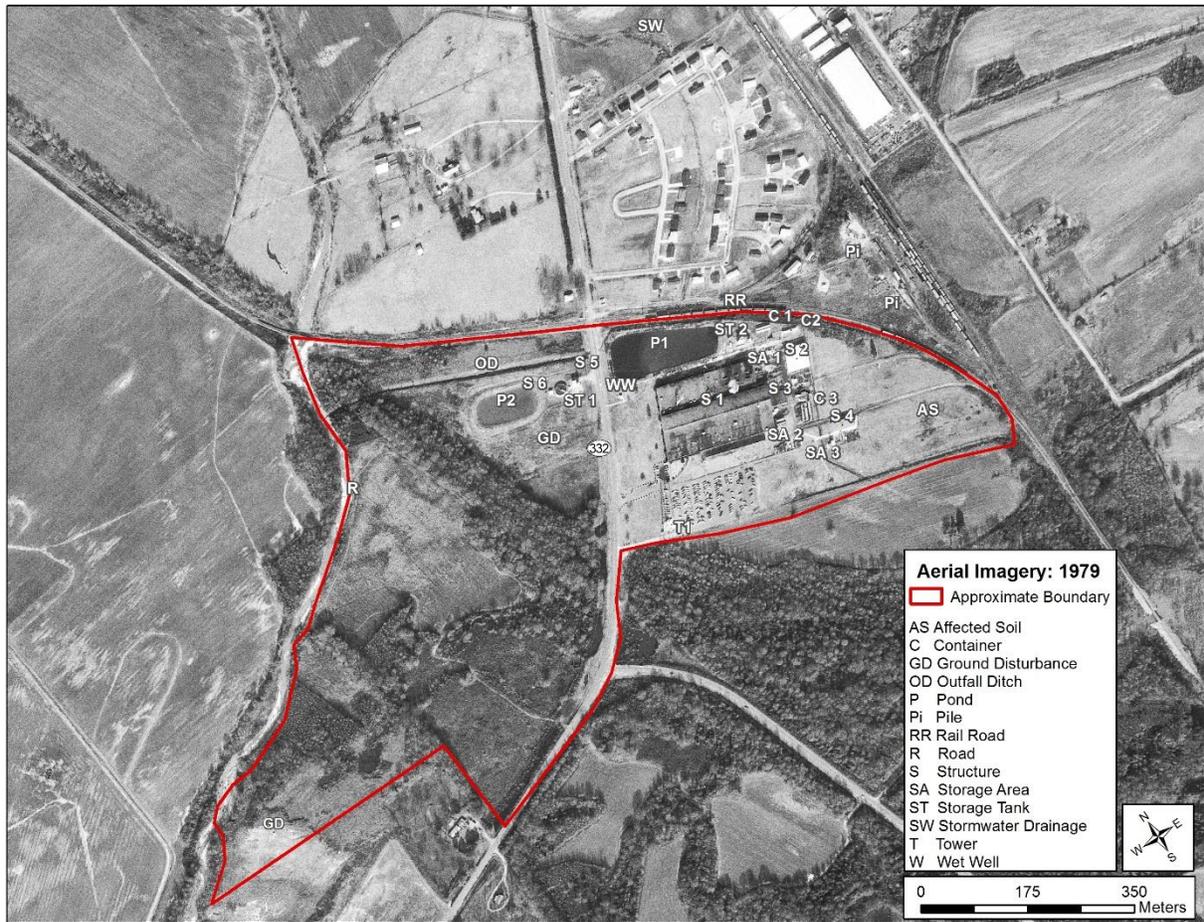
Aerial Imagery Interpretation **Image 2: Year 1969**

- Resolution is low for a detailed interpretation.
- The main warehouse building is now visible (S1).
- Pond 1 (P1) is now visible. It is used as an Equalization Lagoon.
- A Ground Disturbance exists to the west of Route 332. Based on previous inspection reports, this may be an Outfall Ditch.
- Affected soil (AS) and a Ground Disturbance are visible in the southeastern end of main property.
- The UF is still visible in the undeveloped residential area north of the property boundary. Construction of the neighborhood does not appear to have started yet so the cause of the dark area is undetermined.



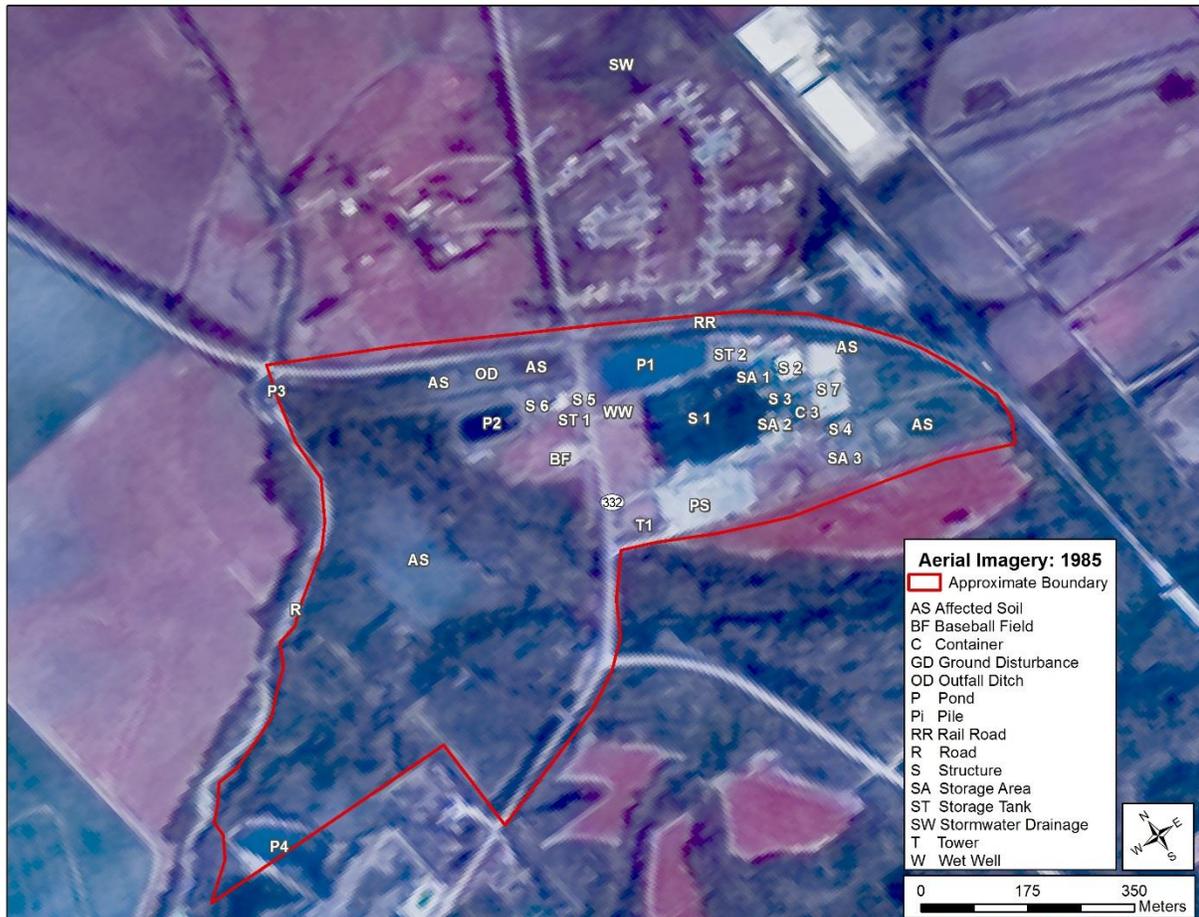
Aerial Imagery Interpretation **Image 3: Year 1979**

- The facility is fully operational with significant construction since 1969. There are several new buildings present, Structures 1-6 (S 1-6) are visible in the northeastern portion of the property.
- Storage Tank 1 (ST 1) is now visible and functions as a part of the Wastewater Treatment Plant.
- Fuel Storage Tank 2 (ST 2) is now visible.
- Tower 1 (T1) is now visible.
- The Outfall Ditch (OD) is present, and referred to as SWMU 7 in previous inspection reports.
- Initial development of residential housing to northeast of facility is present.
- Wet well (WW) is visible in the north and central portion of the property.
- Pond 2 (P2) is now visible. It is referred to as SWMU 4 Sludge Lagoon in historic inspection/monitoring reports.
- Historic equipment/dumping/activity has occurred in the far northeastern corner and outside of the property boundary (Pi).
- Paved surfaces are now present around the entire facility.
- Possible water feature (P3) in very north end of property, connected to the adjacent stream. In some images, this appears outside of the property boundary and in others appears inside the property boundary.
- A roadway is present and leads to P3.
- Potential storage containers (C1-3) are visible in the northeastern portion of the property.
- Potential Storage Areas (SA1-3) exist along eastern side of the facility.
- Possible Affected Soil (AS) exists on the far eastern side of property. The ground is discolored compared to the surrounding area. The discoloration appears to be in several small, dark spots, possibly from stressed vegetation.
- Significant changes have occurred in the residential area north of the property boundary since 1969. The top of the UF that transected the area is now a suspected Stormwater Runoff area (SW) and located directly north of the residential area.



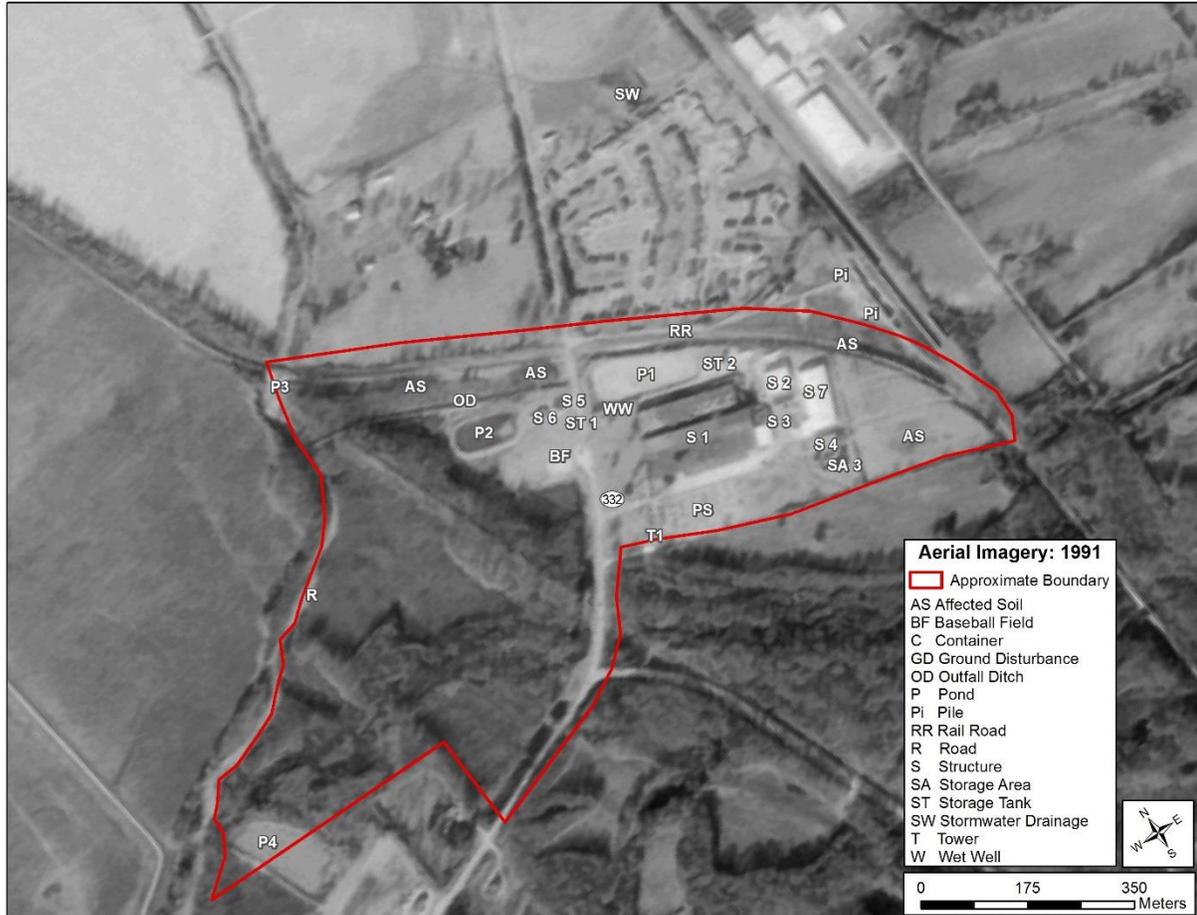
Aerial Imagery Interpretation Image 4: Year 1985

- This year appears to have “Color-Infrared” (CIR) imagery qualities depicting vegetation in red tones and soil in blue, green and white tones.
- Piles are still visible in the northeast corner of property. They do not appear to be permanent and therefore could be some type of gravel or soil storage area. The contents of the “piles” cannot be determined from the aerial photograph.
- Another Pond (P3) is present at the western corner of the property.
- A Baseball Field (BF) is now visible on the west side of Route 332.
- There appears to still be a potential AS to the north of Storage Tank 1 (ST1).
- A new Structure (S7) is present to the east of the main facility (S1).
- Possible Affected Soil (AS) is still present to the east of SA 3.
- Possible AS exists along Outfall Ditch (OD) located north of the property boundary.
- A new Pond (P4) is located in the southwestern corner of the property and appears to extend off the property boundary.
- Darkened ground areas, identified as possible Affected Soil (AS) are located near the Outfall Ditch.
- The residential area north of the property boundary appears to be more developed since 1979. The SW area appears as a dark form to the north.



Aerial Imagery Interpretation Image 5: Year 1991

- Imagery appears black and white with very little to no changes visible since 1985.
- No new construction is visible and features on site appear to be the same as the 1985 image.



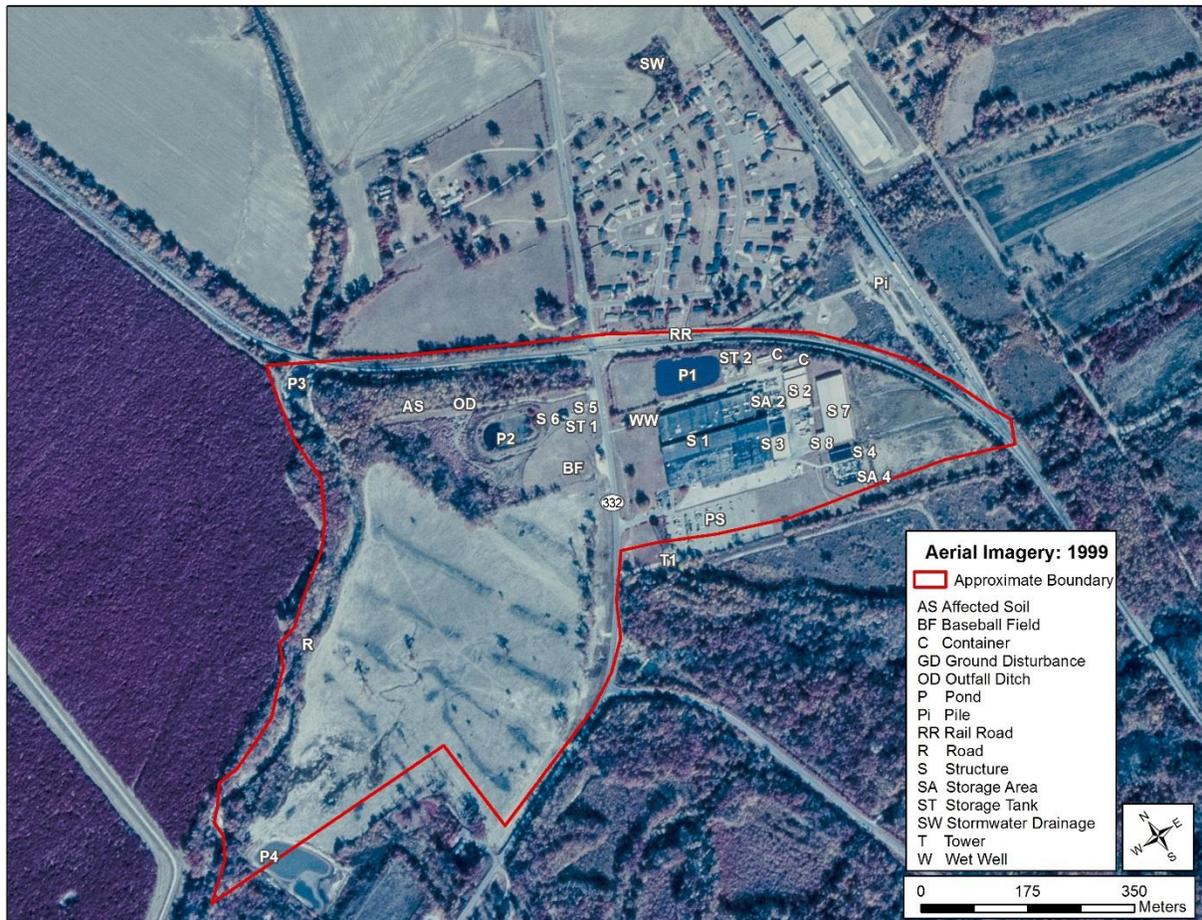
Aerial Imagery Interpretation Image 6: Year 1996

- This year appears to have Color-Infrared (CIR) qualities.
- A large pond (P4) is visible in the southwest portion of the property and may extend off site.
- There is a reflective difference between Pond 1 and 2 which could be due to the water constituents, water level, or material containing water. CIR imagery reflects a variation in colors based on the components that make up a given surface body of water, building material, etc.
- A new Structure 8 (S8) is visible adjacent and to the southwest of S7.
- SW, located north of the residential area, appears to be very prominent. CIR imagery depicts areas with dense vegetation in tones of dark green, The SW area appears to be much darker than the surrounding area.



Aerial Imagery Interpretation Image 7: Year 1999

- This imagery contains Color-Infrared (CIR) qualities.
- Mass deforestation occurred in the southwest portion of property since 1991.
- P2 appears to have a very little water compared to previous years.
- Discolored vegetation is still present along Outfall Ditch (CIR imagery shows healthy vegetation as varying shades of red).
- It is possible that some distressed vegetation is present along the Outfall Ditch due to the variation in colors of the vegetation surrounding the ditch. Often shades of pink indicate unhealthy vegetation or low chlorophyll levels in the vegetation present (see “Recommendations and Areas for Further Investigation” section for a description on CIR imagery).
- Containers are still present in the northeast side of main facility (S1).
- There are little to no changes visible in the residential area north of the property boundary.
- The storage area(s), Pi, to the northeast of the property boundary appear to have prominent access roads, changes in piles and storage practices. One pile is now visible, compared to two piles in previous years.



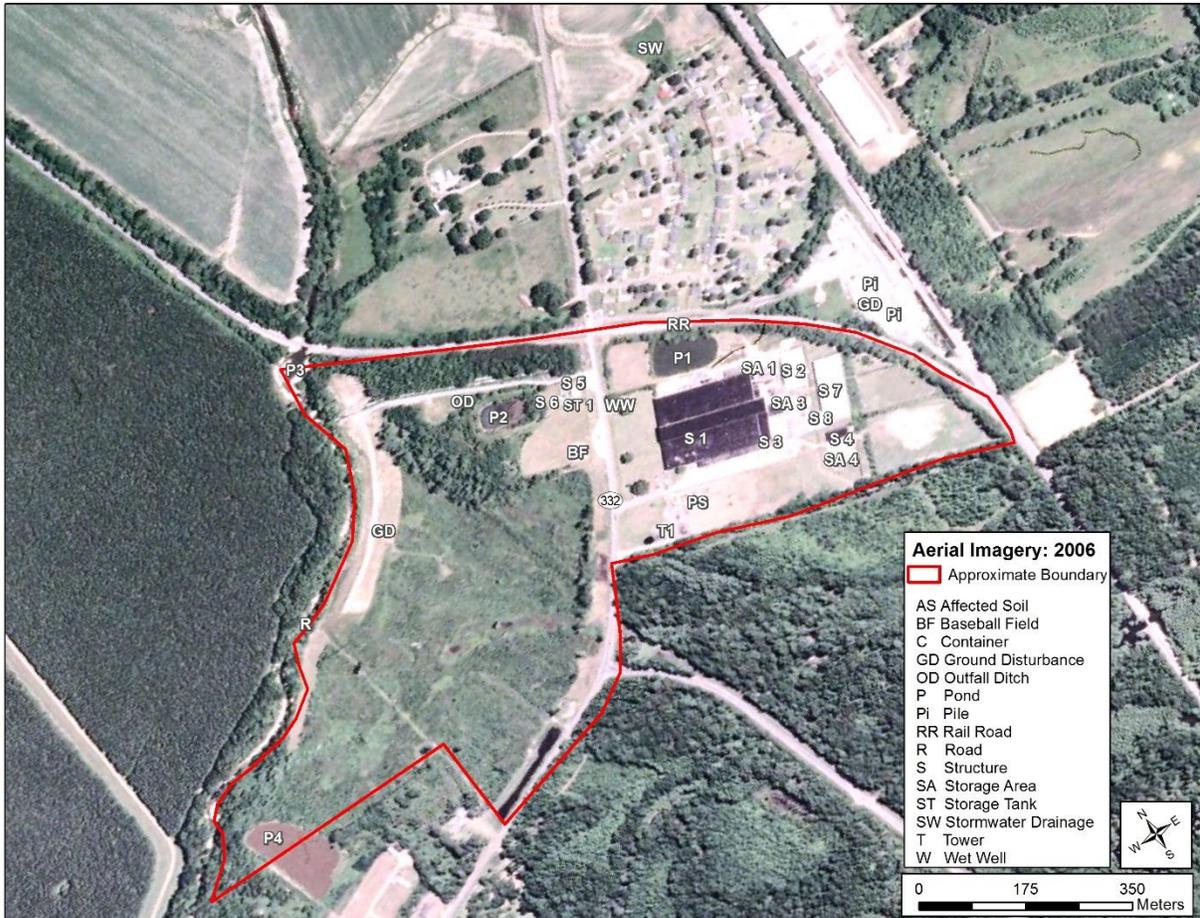
Interpretation Image 8: Year 2004

- There is an increase in the soil disturbance outside of the northeastern side of the property boundary labeled Pi (pile).
- Piles are visible along the outer northeastern property line.
- A Ground Disturbance is visible along the western edge of the property leading to P3. It could be the development of an access road.
- Storage Tank 2 appears to have been removed (refer to Image 7: Year 1999 to see the location of Tank 2 labeled “ST 2”).
- Vegetation in the SW area is very dense.
- The storage areas labeled Pi now have two, more defined piles of a material stored to the northeast of the facility’s property boundary. A larger ground disturbance is also visible in the area surrounding the Pis.



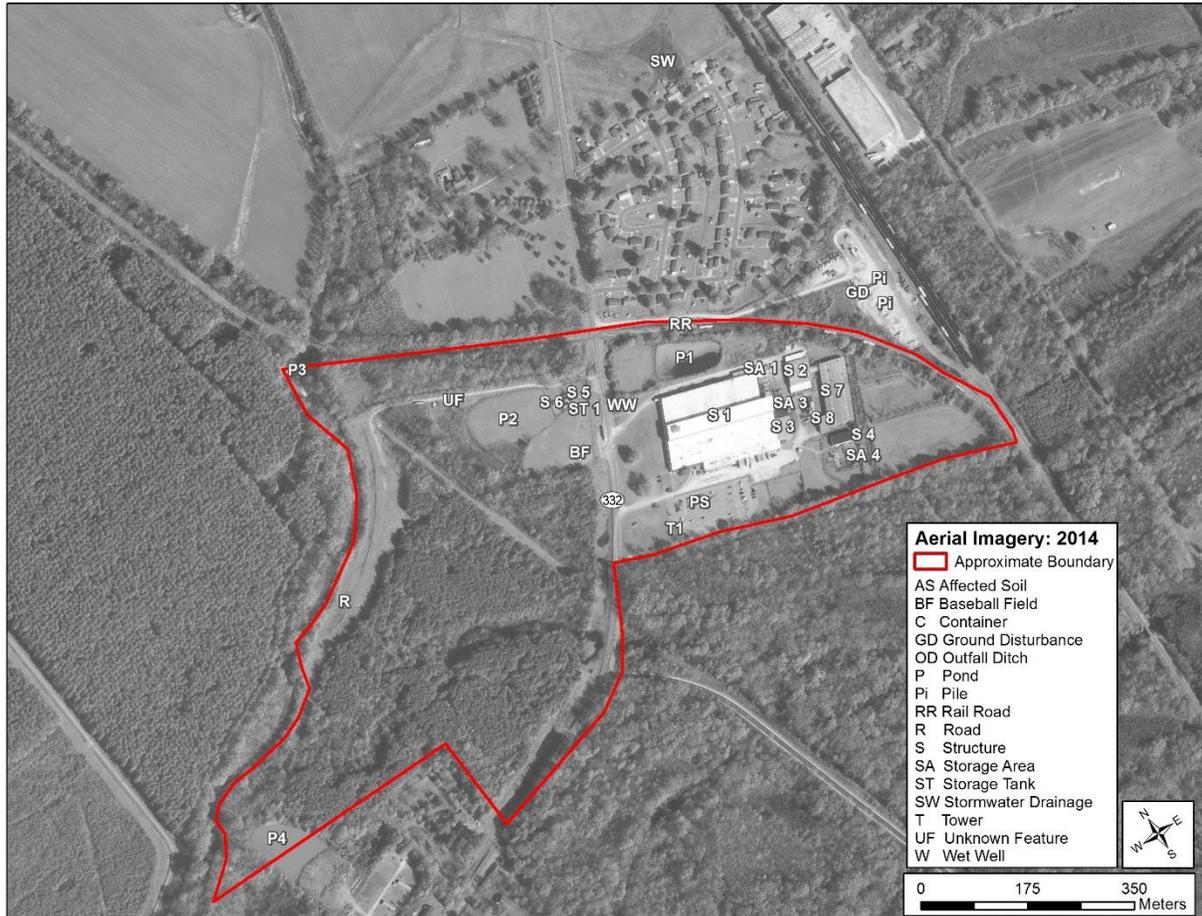
Interpretation Image 9: Year 2006

- No changes are observed in the facility or surrounding property since 2004.



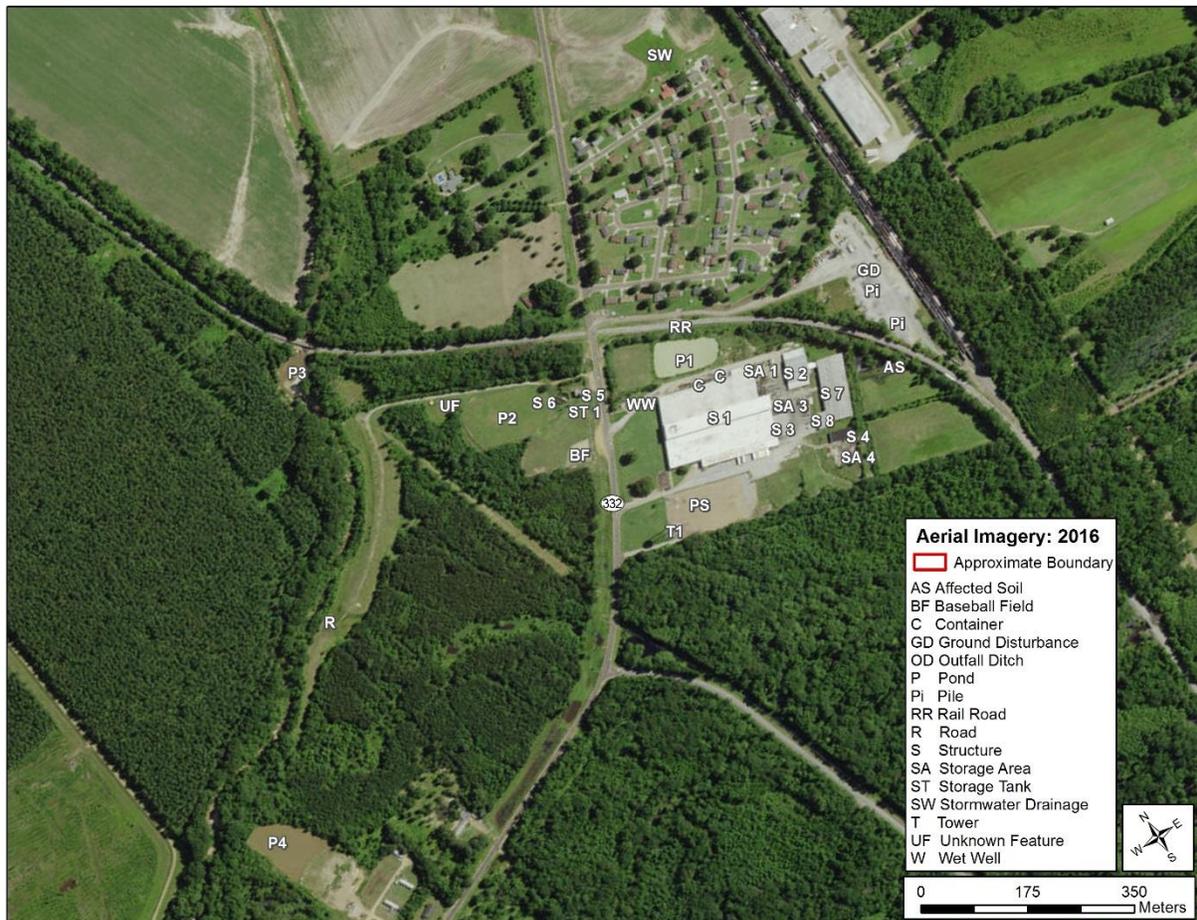
Interpretation Image 11: Year 2014

- Unidentified Features (UF) are still visible along the northern edge of the former location of P2.
- No other changes are observed since 2010.



Interpretation Image 12: Year 2016

- A new area with potentially Affected Soil (AS) is visible in the northeastern area of the property (darker soil area).
- A potential waste storage area is located between S1 and P1 along the main building (S1). Storage Containers (C) are visible along the northern side of the main building.
- Potential waste storage areas are present between S1 and S3 (labeled C).
- A potential waste storage area is present near S6.
- The Unidentified Feature (UF) is still visible to the west of the historic location of P2, but some “equipment” or “debris” appears to have been removed since 2014.
- The SW area located to the far north of the residential area has not changed and still appears to be dense with vegetation.
- The Pi areas and GD to the northeast of the facility’s property boundary appear to be larger possibly due to heavy use.



Summary and Recommendations for Further Investigation

The Grenada manufacturing facility was constructed by Lyon in 1961 and sold to Rockwell International, Inc. (Rockwell) in 1966. Rockwell operated a wheel cover manufacturing facility at the Site from 1966 to 1985. The plant and property were then sold to Textron Automotive Company (Textron). Meritor, a subsidiary of Rockwell, retained environmental liability for the property in 1997. Grenada Manufacturing, LLC acquired the property in 1999 from Textron and continued to operate as a wheel cover plant until 2008. The property was then sold to ICE, who is now the current “permittee”.

Potential environmental areas of concern are present onsite as well as offsite. The residential area, located outside of the facility property boundary and to the north, saw significant development from 1969 to 1991. Prior to any construction or development activities, a dark form was visible and transected the area. It is unclear what could have caused this, but it is a potential area of investigation. From 1979 to present day the most northern portion of the dark form remains visible. The Stormwater Runoff (SW) area appears to be a collection area for stormwater drainage associated with the adjacent residential area. Based on aerial photographs alone, any speculation as to the cause of the “dark area” is inconclusive without further investigation of the soil, surface water, and/or groundwater.

Storage areas appear to be adjacent to the northeast property boundary. Starting in 1952, this area appears to be a ground disturbance. From 1952 to 2016, this area grows, visible storage piles (Pi) are present, the size of the ground disturbance (GD) fluctuates, and access roads become visible. Impact the norther residential area is not confirmed from the aerial photographs.

Additionally, imagery from three years is represented with qualities of “Color-Infrared” Imagery (CIR). This imagery shows coloration of vegetation, soil, water, etc. differently than photographic imagery. Areas represented in pink tones are recommended for further investigation and CIR alone is inconclusive. Color representations in the imagery can include, but are not limited to the following:

- Dark red – Dense vegetation usually appears red.
- Light red and pink – Vegetation contains less chlorophyll. Another possibility for this color can be due to stressed vegetation, poor health, or the end of a growing season.
- White, tan, light blue/greens – These often represent soils. Darker shades of blue and green can be soil with high moisture content. Clays and sands can appear as a dark tan. Concrete and gravel are usually white or light blue.
- Dark blue – Generally, water will appear in dark shades of blue. Shallow bodies of water or streams will appear the shade of the materials they contain. For example; a stream with a gravel bed will appear tan. A stream with a sand bed could appear white or tan.

1952 – Imagery shows post construction condition of the property, but the imagery is of poor quality. There is little evidence of activity on or offsite. One area for potential investigation could be the dark area labeled “Unidentified Feature” (UF) to the north of the

property boundary. Based on the aerial image alone, it is difficult to determine the cause of the discoloration. Often, features like this are labeled as a “ground disturbance” if it is clear there was some sort of vegetation cleared, or, an “affected soil” if a release appears to have occurred. The images are not clear enough for a determination. This feature is visible until construction of the residential area is underway in 1979.

1969 – The imagery shows the beginning stages of development both within the facility property boundary and adjacent property to the north.

1979 – The facility is fully operational. At this time, it was owned and operated by Rockwell.

- There appears to be a storage area located northeast of the facility property boundary and railroad track (Pi).
- Affected Soil (AS) is also identified in the eastern portion of the property where vegetation appears to have been removed and “discoloration” is visible. It is unclear what the cause of the discoloration is, but it appears in the image as small dark spots.
- Construction to the north of property boundary has progressed. The dark area is only visible north of the new homes built since 1969.

1980 – There is no photo available for this year due to poor image quality.

1985 – The imagery has some CIR qualities and indicates vegetation in tones of red and pink, as well as, areas with tones of dark blue, green and white.

- A baseball field is identified in the north and central area of the property (white) with adjacent land in tones of pink. This can be attributed to the time of year (March), poor or stressed vegetation, or low chlorophyll content.
- Additional “pink” areas can be seen near the wet well (WW) and Storage Area 3 (SA3).
- Construction in the residential area north of the property boundary appears to be nearly completed. The SW area is visible due to the dark green and blue tones. Due to the CIR qualities to this image, the colors can be attributed to a higher concentration of chlorophyll in this area.

1991 – There are no visible changes from 1985 to 1991.

1996 – This imagery is the second of three aerials with CIR qualities.

- The imagery is from February, which could contribute to the tones of pink surrounding the facility.
- White, likely indicating paved surfaces, is very visible along with Pond 1 and 2 in vibrant blue.
- The reflective quality of P1 and P2 appear differently in the imagery. This could be attributed to a difference in the water constituents, amount of water in the ponds, or the material lining each pond.
- Similar to 1985, the SW area, north of the residential area, has a very defined dark shape relative to the surrounding soil. CIR qualities in the image depict thick vegetation in dark green and blue tones.

1999 – The third of three aerials with CIR qualities shows vegetation with pink tones, both inside and outside of the property boundaries.

- Located to the south of the facility area and adjacent to Storage Area 4 (SA 4) and surrounding Ponds 1 and 2 (P 1 & 2) appear pink.
- Another possible explanation for the pink coloration of the vegetation surrounding the Outfall Ditch could be the time of year, this imagery is from November and not an active growing season.
- There are also signs that a large area of vegetation was removed in the southern portion of the property. Land appears smooth and light blue green.
- The storage piles (Pi) to the northeast of the facility boundary have reduced in quantity from 2 piles to 1 pile.

2004 – Since 1999, significant changes are visible outside of the property boundary to the northeast.

- Piles (possibly for storage or disposal) are visible.
- A large Ground Disturbance is visible along the western border of the property.
- Storage Tank 2 was removed (according to historic monitoring reports).

2006 – There are no visible changes since 2004.

2010 – Significant changes occurred within the property boundary since 2006.

- Pond 2 (P2) appears to be filled in.
- A large ground disturbance is visible south of the former location of P2.

2014 – No significant changes occurred between 2010 and 2014.

2016 – This imagery is collected from Google Images and depicts data from mid-2015 to 2016 in one image.

- Changes from 2014 to 2015/2016 mainly include additional potential Waste Storage Containers and an Unidentified Feature still present near the former location of P2.
- There is also Affected Soil along the northeastern property boundary.
- The SW area to the north of the residential area is still visible with a clear shape and thicker vegetation than surrounding soil.