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July 1, 2016

Katherine O'Neal, Engineer
Division of Waste Management/Hazardous Waste Section
North Carolina Department of Environmental Quality
217 West Jones Street
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: Work Plan for Membrane Interface Probe Investigation and Confirmation Sampling
Former Parker Hannifin Corporation Facility
12415 Capital Boulevard, Raleigh, North Carolina
Division of Waste Management #NONCD002-591-014

Dear Ms. O'Neal,

AECOM Technical Services of North Carolina, Inc. (AECOM), on behalf of Parker Hannifin (Parker), submits this work plan to outline the procedures for conducting a Membrane Interface Probe (MIP) Investigation at the former Parker site located at 12415 Capital Boulevard, Raleigh, Wake County, North Carolina (the Site). This work plan includes a brief summary of the objectives and methods for implementing the MIP investigation and confirmation soil and groundwater sampling at the Site. The Site location is shown on **Figure 1**.

Site History

The plant was constructed in 1964 for the manufacture and distribution of air control devices. The plant was initially operated by the Scovill Corporation and Schrader Bellows prior to use by Parker beginning in 1986. Parker leased the facility and land from the property owners, the Wake Forest Industrial Development Corporation. Manufacturing activities at the Site were terminated in January 2002. The property was sold to St. Ives 220 LLC on June 2, 2006, and was subsequently acquired by RREF BB NC SICP LLC (Rialto Capital) on June 29, 2012. Currently there is no commercial or industrial activity on the property.

Historically, chlorinated solvents, primarily trichloroethene, were used to remove oil and metal particles from machined parts during manufacturing processes. Two aboveground storage tanks (SWMU 24), one for virgin product and one for used product, were located on the northeast side of the plant. Reportedly, these tanks were taken out of service around 1992, and subsequently removed.

A groundwater remediation system was placed into service at the facility to remove volatile organic compounds (VOCs) and control plume stability. A soil vapor extraction system was also installed to remove VOCs from vadose zone soils.

Site Geology and Hydrogeology

The facility is situated within the eastern-most portion of the Piedmont Physiographic Province of North Carolina. In general, subsurface soils consist of silty clay residuum overlying clayey sand and silt saprolite, which coarsens with depth. The saprolite originates from the underlying gneissic and schistose bedrock and typically contains relict structures and fabric derived from the parent rock from which it was weathered. The saprolite generally grades into partially weathered rock (PWR) with depth. PWR often exhibits the same properties as deeper saprolitic soils, but with higher occurrence of rock and rock fragments. Typically in the Piedmont of North Carolina, the saprolite serves as an unconfined storage aquifer that transmits water downward (generally) to the lower semi-confined PWR unit and fractured confined metacrystalline bedrock aquifer unit[1].

Depth to water ranges from approximately 3 to 5 feet near the creeks to 30 to 45 feet in the upland areas and near groundwater extraction wells. Based on the available data, groundwater flow direction is towards the north-northwest.

MiHPT Investigation

AECOM proposes to use several investigative tools and screening methods to characterize VOCs in source area soils and groundwater. In addition, confirmatory soil and groundwater samples will be collected to correlate with investigative screening tools. The proposed boring locations are shown on **Figure 2**.

MiHPT Investigation

A combined MIP and Hydraulic Profiling Tool (HPT) (MiHPT) unit will be used to provide high-resolution, horizontal and vertical subsurface survey data. The MiHPT tooling will be advanced using direct-push technology (DPT) equipment. Up to 23 borings will be advanced to approximately 40 feet below land surface or probe refusal. The data will be used to evaluate current site conditions, accurately characterize the VOC source area and enable the development of a targeted remediation strategy.

The MIP instrument provides qualitative real-time analyses on levels of soil and groundwater contamination, as well as soil conductivity data which can be used to infer lithologic changes. The MIP screening and lithologic profiling tools should provide valuable information regarding contaminant distribution, and changes in soil permeability which will enable a better understanding of contaminant distribution and migration patterns.

The MIP tool will also be outfitted with the HPT sensor designed to collect data which estimates the intrinsic permeability in the saturated zone. As the probe is advanced at approximately 2 centimeters per second, clean water is injected through a screen on the side of the HPT probe at a low flow rate. The injection pressure, which is monitored and plotted with depth, is indicative of the hydraulic properties of the soil. A relatively low pressure response indicates a large grain size, and the ability to easily transmit water. However, a relative high pressure response indicates a small grain size, which correlates with the inability to transmit water. Boreholes will be abandoned with bentonite chips and/or cement grout after completing the MIP data acquisition. The MIP borings will be surveyed for location and elevation and placed on the Site survey plat.

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[1] Daniel and Paine, 1990. Hydrogeologic Unit Map of The Piedmont and Blue Ridge Provinces of North Carolina, Water Resources Investigations Report 90-4035. Department of the Interior, United States Geological Survey.

Soil and Groundwater Sampling

Up to 10 soil and groundwater samples will be collected to correlate MIP responses with laboratory analyzed VOC data. MIP logs will be used to determine soil and groundwater sample locations and depths. Samples will be collected using DPT equipment.

Soil boreholes will be abandoned with bentonite and/or cement grout after sampling completion. Soil investigation derived waste will be placed in 55-gallon metal drums and temporarily staged at the Site pending characterization and disposal. The borings will be surveyed for location and elevation and placed on the Site survey plat.

Reporting

After completing the MiHPT investigation, AECOM will prepare a brief letter report to summarize the results for submittal to the North Carolina Department of Environmental Quality (NCDEQ). The report will include MiHPT data printouts and graphs with vertical profile logs.

Schedule

The field work for the MiHPT Investigation described in this work plan is currently scheduled to begin on July 18, 2016 unless a response from the NCDEQ is received. Please contact Jim Schenker, Parker Hannifin, at (216) 896-2052, or Bob Wyrick, AECOM, at (919) 461-1440, if you have any comments or questions regarding the scope of work.

Yours sincerely,

Matt Allen, PG
Project Manager

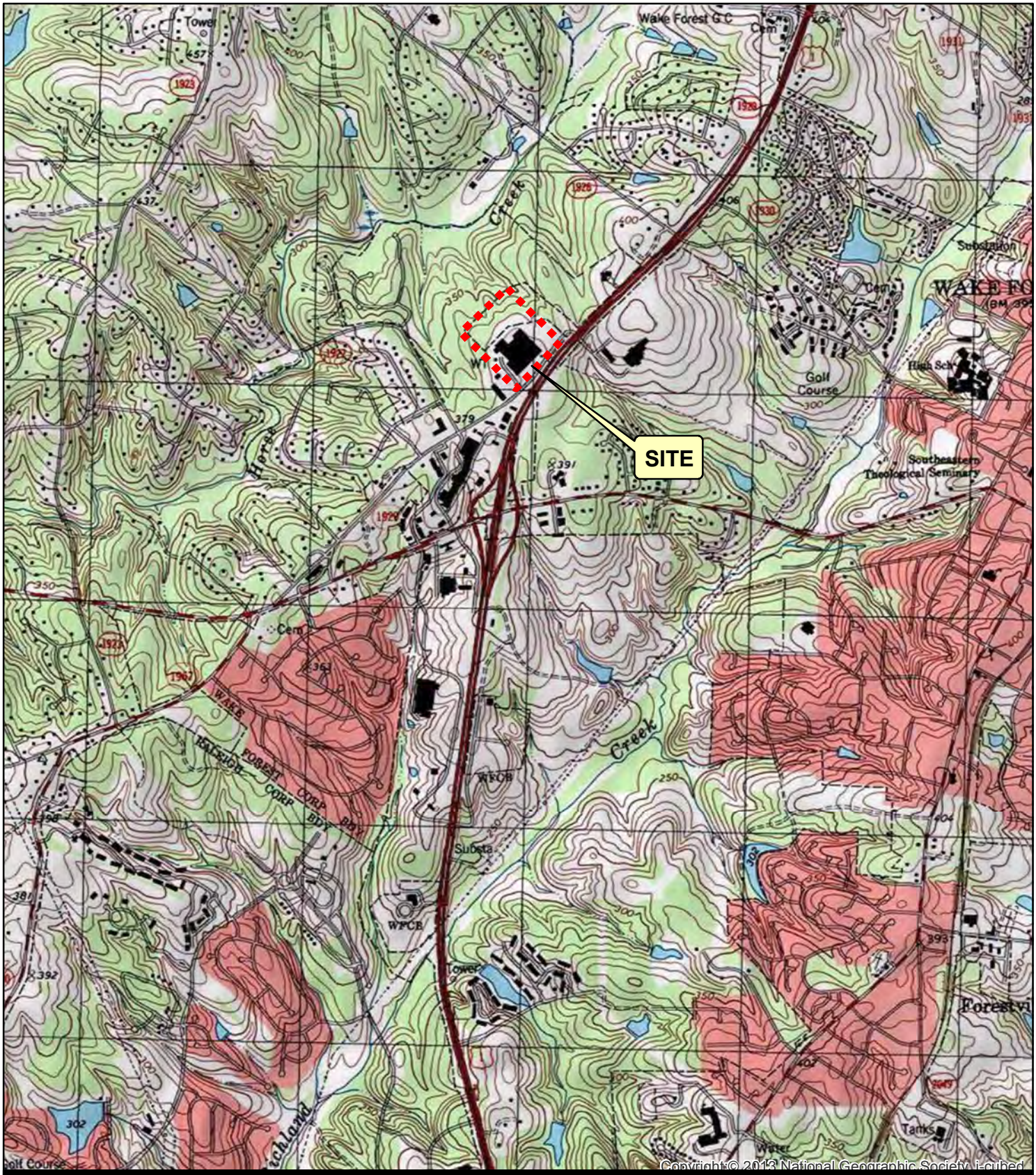
Robert Wyrick, PG
Senior Project Manager

Attachments: Figures

cc: Mr. Jim Schenker (Parker)
file

Figures

Z:\GIS\Projects\P\Parker_Hannifin\Wake_Forest_NC\MXD\Figure_1-1_Site_Location_Topo_2016.mxd



Map Location

Topographic Site Location Map

Former Parker Hannifin Corp. Facility
Wake Forest, North Carolina

N
W E
S

0 2,000 4,000 Feet 1:24,000

March 2016 USGS Topographic Quadrangle Wake Forest (1983) 60489813

Figure 1

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LEGEND

- FORMER PARKER HANNIFIN SITE PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- CREEK WITH FLOW DIRECTION
- FORMER LOCATION OF OVERHEAD POWER LINES
- SWMU 32 — SOLID WASTE MANAGEMENT UNIT
- NEW FENCE
- NEW GROUNDWATER TREATMENT SYSTEM EFFLUENT LINE
- MW-14 — MONITORING WELL COMPLETED IN SAPROLITE OR PWR
- MW-11D — MONITORING WELL COMPLETED IN BEDROCK
- RW-4 — RECOVERY WELL
- POC-2A — POINT OF COMPLIANCE MONITORING WELL COMPLETED IN SAPROLITE OR PWR
- SW9 — SURFACE WATER SAMPLE LOCATION
- SVE-1 — VAPOR EXTRACTION WELL
- 2016 1st SEMI ANNUAL REPORT TCE CONTOUR (ug/L) (DASHED WHERE INFERRED)
- PROPOSED MEMBRANE INTERFACE PROBE LOCATION

NOTES:

1. GROUNDWATER SAMPLES COLLECTED FEBRUARY 16-19, 2016.
2. ALL RESULTS REPORTED IN MICROGRAMS PER LITER (ug/L).
3. DATA FROM DEEP BEDROCK WELLS NOT USED IN MAP INTERPRETATION.

SOURCE: BASE MAP CREATED FROM "BOUNDARY RETRACEMENT" DONE BY MURPHY & SACKS, PROFESSIONAL LAND SURVEYORS, 6308 J. RICHARD DR., RALEIGH, NORTH CAROLINA, DATED OCTOBER 2002. WELL LOCATIONS WERE NOT INCLUDED IN SURVEY, AND ARE APPROXIMATE.

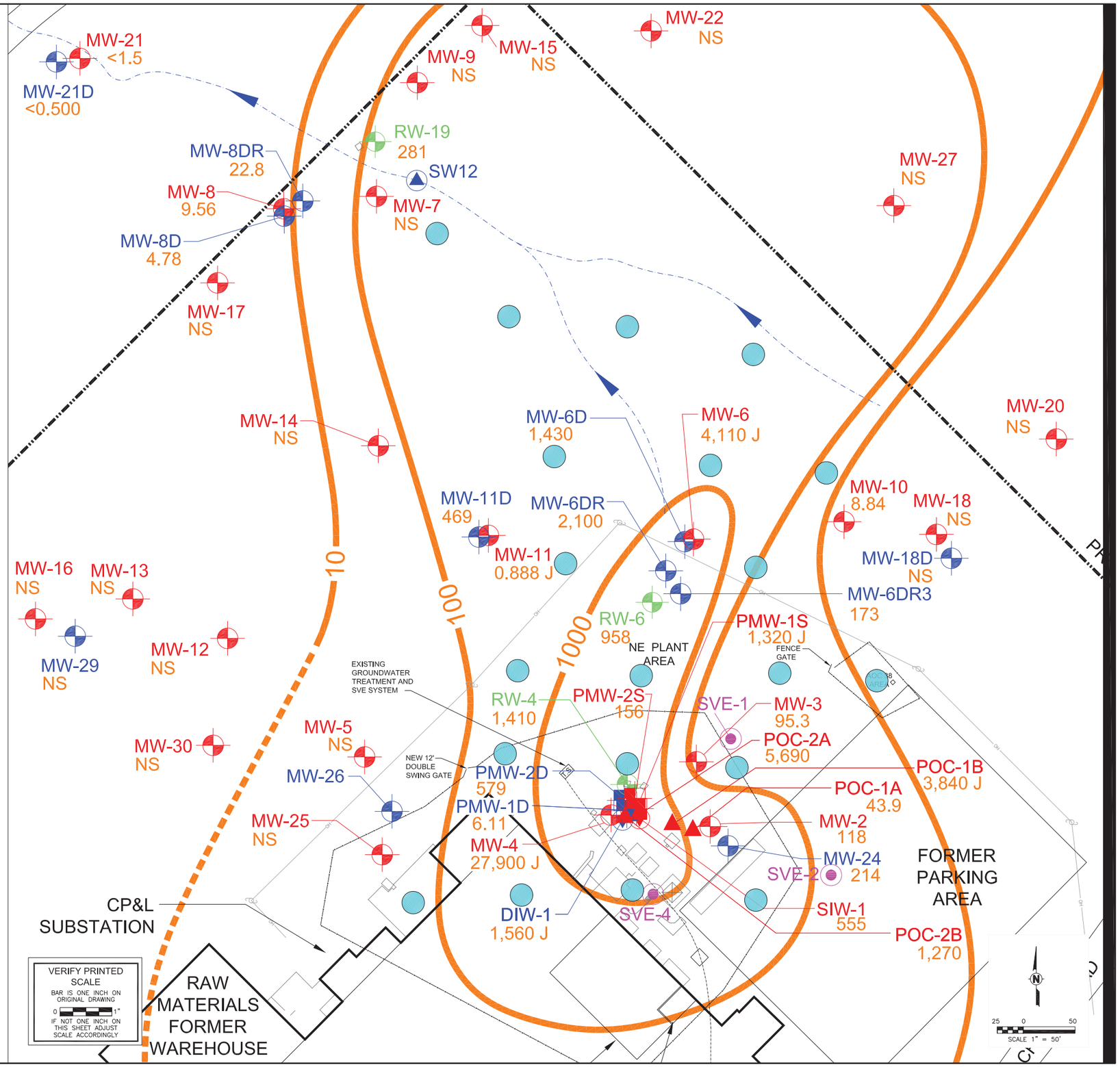

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Figure: 2

PROPOSED MEMBRANE INTERFACE PROBE LOCATION MAP (TCE ISOCONCENTRATION - FEBRUARY 2016)

Proposal for Membrane Interface Probe Investigation
Former Parker Hannifin Corporation Facility
Wake Forest, North Carolina
Project No.: 60489831 Date: 05/20/2016

ANSI D 22" x 34"
Approved:
Checked:
Designer:
Project Management Initials:
Last saved by: PIRESS(2016-06-23) Last Plotted: 2016-06-23
Filename: Z:\CAD\PROJECTS\P\PARKER_HANNIFIN\WAKE_FOREST_NC\2016 PROPOSED MIP\DWG\FIGURE 1_TCE ISOCON MAP-INJECTION AREA_1ST-2016_PROPOSED-MIP.DWG