

**Guidance for the Submission and Use of Data
In GIS Compatible Formats Pursuant to
“Technical Requirements for Site Remediation”**

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Introduction

The Site Remediation Program (SRP) of the New Jersey Department of Environmental Protection has proposed regulations for the remediation of contaminated sites entitled “Technical Requirements for Site Remediation” N.J.A.C. 7:26E.

Key aspects of these regulations require the submission and use of Geographic Information System (GIS) and related data. A GIS is a computer mapping system used for the development of geographic data and databases. By Administrative Order, Commissioner Shinn has required that mapped information be submitted to the NJDEP so that the data can be incorporated into the NJDEP’s GIS, and that this information must be consistent with criteria specified in “Mapping and Digital Data Standards” (MDDS) dated April, 1997.

This guidance document is intended to clarify the relationship between the MDDS criteria and practical issues associated with electronic submission of contaminated site remediation information called for in the requirements of N.J.A.C.7:26E. The goals of this guidance are to ensure swift, uncomplicated integration of digital map submissions with the SRP’s existing GIS databases. We can accomplish this task by making use of various common mapping and drafting software packages currently available and generally in use by government and the regulated community. While the regulations require specialized data, the Department seeks to minimize as much as possible departure from standard industry operating practices associated with the developing and reporting information on the investigation and remediation of contaminated sites.

Mapping and Digital Data Standards (MDDS) in Brief

- A. Throughout this guidance, reference is made to MDDS; therefore, it is important for the reader to review and understand thoroughly the elements of this document. Copies and information regarding MDDS can be obtained by calling the Bureau of Geographic Information Analysis (BGIA) at 609/777-0672 or through the DEP Electronic Data Interchange Manual (EDI). Following is a summary of some of the key elements of this document.
 - 1. MDDS references Chapter 218, Laws of the State of New Jersey 1989, that require that geographic data be submitted to the DEP in New Jersey State Plane Coordinates (NJSPC) referenced to North American Datum of 1983 (NAD83) horizontal geodetic datum. NJSPC is the geographic reference system in the horizontal plane defining the spatial relationship of points or features in new Jersey. State Plane Survey feet are the specific units of measurement used by the Department.
 - 2. All base maps regardless of scale must meet the standards defined in the United States National Map Accuracy Standards (NMAS), or the person submitting the data must provide the Department with an explanation of why it is appropriate to deviate from NMAS. However, for large scale maps (larger than 1:2400), post processed or corrected GPS coordinates or an appropriate survey standard is acceptable. Please document the standard used.

Note: These explanations are to be included with information submitted with Metadata requirements for digital map submissions, outlined in section C of this document.

3. Geographic data submitted to NJDEP in digital format is to be consistent with the electronic formats identified in MDDS Table 2. Note: Since digital maps will be processed and stored by DEP staff other than those in the lead remedial program, map, site information and metadata (for detailed explanations regarding metadata, see section C below) must be submitted on their own diskette independent of HAZSITE data or other digitally submitted information. In order to facilitate appropriate distribution of these diskettes through the Department, it is requested that they be individually labeled with the following information.
 - Title – GIS Data
 - Site Name
 - SRP ID#
 - Diskette Contents
 - Maps - CEAs and/or ESAs
 - Site Info file
 - Metadata

Additional detailed information regarding NJDEP GIS standards and practices can be obtained in the hard copy of the “New Jersey GIS Resource Guide –1996” for \$20.00 from DEP Map Sales, PO Box 420, Trenton, 08625-0420; at 609/777-1039. The document is also available on CD ROM in HTML format. Please order Series 2, Volume I, “GIS Tools for Decision Making” (\$30.00 from Map Sales). Note: Additional GIS reference data is also available on 4 NJDEP CD ROMs; see section D of this document for more detail.

Specific spatial mapping and GIS information issues in NJAC 7:26E and SRP operations that this guidance is intended to clarify, include:

A. Guidance for Map Submissions

Section 7:26E-6.3(a)17iii (CEAs) and sections 7:26E-4.7(b)12 (ESAs) require the submission of maps compatible with the DEP’s GIS.

1. All maps submitted regardless of digital format must be in NAD83 and in New Jersey State Plane Coordinates.
2. The CEA or ESA must be distinctively identified apart from other objects that may appear with the maps.
3. CEAs and ESAs must be mapped as polygons. It is necessary that the object be prepared and submitted as a closed polygon.

4. If submitted in a digital format that organizes data into separate layers, the polygon must be placed in its own separate layer.
5. Special reference for CAD submissions:

As noted above the polygon identifying the CEA or ESA must be organized into its own layer. Additionally, it is necessary to include in the CAD file in other layers, building footprints and other notable surface features that will aid in orienting the CEA when comparing it to GIS photo base maps.

Note: The DEP encourages the submission of the entire CAD file drawing for the facility, modified as noted above in dwg or dxf.

B. Associated Information Files

As noted previously, electronic compatibility is defined by the acceptable formats noted in MDDS. Since there is a range of formats compatible with GIS, the potential exists for considerable variability and confusion in the development of a standard data base supporting a single centralized map and database. Accordingly the DEP requests, in addition to the digital map submission, an ASCII line delimited file labeled and ordered as outlined below. This information should be included on the diskette with the map.

1. Support information for CEAs
 - a. "Site Name" as listed in the latest version of the "Known Contaminated Sites in New Jersey" (KCSNJ).
 - b. "CSL ID #" as listed in the latest version of the KCSNJ.
 - c. "Lead Program ID #" as listed in the latest version of the KCSNJ.
 - d. "Lead Program" Letter abbreviation of the remedial program overseeing the remedial action.
 - e. "Street Address" as listed in the latest version of the KCSNJ.
 - f. "Municipality" as listed in the latest version of the KCSNJ.
 - g. "County" as listed in the latest version of the KCSNJ.
 - h. "Start Date" Note the date that the CEA unit is to go into effect, ex: Jan 01, 1997.
 - i. "Duration" The length of time that the CEA is expected to last; # of years, # of months.
 - j. "Contaminants" List all contaminants exceeding water quality standards for which the CEA was approved.
 - k. "CEA Depth" The maximum vertical extent in feet that the CEA has been approved for.

2. Support information for ESAs (Note that an ESA does not require listing of any contaminants)
 - a. “Site Name” as listed in the latest version of the “Known Contaminated Sites in New Jersey” (KCSNJ).
 - b. “CSL ID #” as listed in the latest version of the KCSNJ.
 - c. “Lead Program ID #” as listed in the latest version of the KCSNJ.
 - d. “Lead Program” Letter abbreviation of the remedial program overseeing the remedial action.
 - e. “Street Address” as listed in the latest version of the KCSNJ.
 - f. “Municipality” as listed in the latest version of the KCSNJ.
 - g. “County” as listed in the latest version of the KCSNJ.

3. Hard Copy Backup

Until the methods for digital map data submission have come into general use, where all procedures and protocols are understood and routine, the DEP will continue to require submission of 1(one) hard copy backup for comparison with the digitally submitted data. The elements of this information include support data and hard copy maps as outlined below.

Support data for both CEAs and ESAs

- a. “Case Name” as listed in the latest version of the KCSNJ.
- b. The CSL ID number and lead program ID Number.
- c. Address of the facility, where the unit is located. A mailing address is not acceptable if it is different from the facility’s street address.
- d. The Municipality and County.
- e. The DEP organization that had the lead during the remedial process leading to the establishment of the unit.
- f. Any engineering controls associated with an institutional control such as a cap, fence, etc.
- g. Other kinds of institutional or engineering controls that have been or will be approved or have been requested for the facility.

— If reporting on CEAs, include:
- h. The CEA Depth, the vertical extent in feet that the CEA extends to.

- i. Identification by chemical name of all contaminants exceeding water quality standards. Include the highest concentration being left behind for each of the above referenced contaminants.
 - j. Note the date that the unit is to go into effect and its expected duration in years and months.
 - If reporting on ESAs include:
 - k. Identification by name of the class or type of environmentally sensitive area being mapped.
4. Maps - minimum 8.5" x 11"
- a. Submit a clean legible copy of that section of the USGS Quad or Orthophoto quad map where the facility is located. The map should include enough of the surrounding community and road system so the site can be easily identified from air photography. Identify on the map the facility location (point or cross).
- Note: Topoquads and Orthophoto quad and quarterquad maps can be obtained from DEP Map sales at \$5.00 for each paper copy.
- b. Submit a clean legible copy of a road map that identifies, by name, local roads around the facility (e.g.: Hagstrom County maps).
 - c. Submit a scaled property map that includes (as built) major surface features such as facility buildings, roads, parking lots, etc. Include on this map the location and areal extent of the CEA or ESA to be mapped. All bordering edges of the unit should be clearly distinguishable from other lines appearing on the facility as built map (the unit area can be lightly shaded). Include the north arrow, and scaled reference in feet or meters.

C. Metadata Requirements for Digital Map Submissions

Metadata is information/data about the map submissions and is necessary to evaluate mapped data accuracy and acceptability. Since the mapped data required for submission under the Technical rules is relatively simple, it is important to keep the metadata structures supporting them simple. This information will be critical for the DEP to ensure rapid accurate installation of the maps and data on the Department's electronic data management system.

Following are the points of information that must be completed with map submissions.

1. Identification Information

- Description - An explanation of what is intended to be represented by the map data submissions.
- Abstract - A brief summary identifying the different data sets being submitted and the source of information that is their basis.

- Purpose/Brief description - A summary of the purpose of the data submissions.
- Supplemental information - Any other descriptive information about the data that may be important.
- Currentness Reference - The time period that the data submissions are based upon.

2. Data Quality Information

- Attribute Accuracy - An assessment and explanation of the spatial accuracy of the mapped data submissions.
- Quantitative Attribute Accuracy Assessment - What was done to identify and evaluate the accuracy of the mapped feature locations.
- Completeness Report - Information about omissions, selection criteria, generalizations, definitions used, and other activities used to derive the data sets. Include difficulties, problems and questions in establishing feature locations.
- Lineage - Information about the process (GPS, survey, manual digitizing, scanning) used to generate the lines, points and polygons. Include the methods and technologies employed as well as sources of data used to construct data sets.
- Source Scale Denominator - The denominator of the representative fraction on a map, i.e., the scale referenced in meters. For example on 1:24000 scale map, the source scale denominator is 24000, where 1" on the map = 24000 inches on the ground.
- Type of Source Media - The medium of the source of the data sets, (for example, paper, mylar, acetate, microfiche, CD-ROM, online, tape, transparency).
- Source Currentness Reference - How recent is the source of information that the source data is based upon.
- Process Date - The date when the mapped data submissions were completed.

3. Spatial Data Organization

- Direct Spatial Reference Method - The system of objects used to represent space in the data set. Vector (point, line, polygon) or Raster.

4. Spatial Reference

- Grid Coordinate System - A plane-rectangular coordinate system based on, and adjusted to, a map projection so that geographic positions can be readily transformed to and from plane coordinates, (for example NJ State Plane Feet).
- Horizontal Datum Name - Identification given to the reference system used for defining the coordinates of points. (Should always be NAD 83).

5. Attribute Information

- Attribute Label - The name of the attribute along with any description necessary to clarify or explain the data set.

6. Metadata Reference Information

- Metadata Date - The date that the metadata were created or updated.
- Metadata Contact - The party and agency responsible for metadata information.

7. Citation Information

- Originator - The name of an organization or individual that developed the data set
- Title - The name by which the data set is known
- Author's Notes - Special notes that the author may have for this data set.

8. Contact Information

- Contact Person(s) Primary - The person, and the affiliation of the person, associated with the data set.
- Contact Organization - The name of the organization affiliated with the contact person.
- Contact Address - Address of the contact person and organization.
- Contact Voice Telephone - The telephone number of the contact persons and organizations.

The metadata attributes may be submitted as a text file on the diskette containing the map and supporting data. Also contact Lenora Ross with the Bureau of Geographic Information Analysis at 609/984-2243 for a copy of the DEP's metadata documentation diskette. Note that the text file associated with the diskette is more comprehensive than the list included above. Only those points identified here need be completed.

D. Using the NJDEP's GIS Resources as a Source of Information

The following are citations from N.J.A.C. 7:26E. where reference is made for the use of NJDEP GIS resource information.

7:26E-3.11(a)2 Site investigation - ecological evaluation

7:26E-4.2(b)4i,ii,iv,vi Remedial Investigation Workplan

7:26E-4.4(h)3v(1) Conducting a well search

7:26E-4.6(a)2,3 (b)2ii Remedial investigation of landfills and historic fill material

Note: Currently, there is no data available in NJDEP's GIS relating to historic fill.

Information currently is accessible through a 4 Volume CD set available for purchase from NJDEP Map Sales at 609/777-1039. Additional information regarding use and content of these CDs can be obtained by contacting the Bureau of Geographic Information Analysis help desk at 609/777-0672 or NJDEP Map Sales at 609/777-1038 and requesting the pamphlet entitled "NJDEP GIS CD-ROMs."

In the event that review of the DEP data sets (CDs) indicates the presence of an environmentally sensitive area on or adjacent to the property being investigated, or if there is a discharge pathway from the facility leading to an environmentally sensitive area, the respondent does not need to copy and resubmit this information in digital format to DEP to reflect these conditions. All that is required as part of the report is a note that an area was identified using DEP information and what the DEP GIS designation for the area is. Map submissions are required if new previously unidentified areas are identified or if DEP GIS information is significantly in error. This could include DEP information that indicates that a site impacts an environmentally sensitive area when it does not, as well as indicating a site does not impact an area when it does.

E. The Determination of Coordinates for Inclusion on the HAZSITE Database.

1. More detailed information regarding the application of the HAZSITE Database can be obtained by reviewing NJDEP's Electronic Data Interchange (EDI) manual. Discussed below are strategies for determining the coordinates required for inclusion in the HAZSITE Database.
2. Establishment of the coordinate framework for reporting site specific sampling locations. Concern has been expressed regarding the requirement to survey each sampling point during each field sampling event. Specifically, there is concern regarding the cost of hiring a licensed surveyor or the development and/or implementation of GPS capability every time a sampling event occurs at a contaminated site. Several options for reducing the expenses for determining these coordinates that are acceptable to the DEP are presented below.

a. Establishment of control point coordinates

(i) Standard Surveying Techniques

Using traditional survey equipment and techniques during initial sampling activities, it will be necessary establish one(1) surveyed control point for the site and for reference in future sampling events. The control point should be located as close to the center of the property and areas of investigation as feasible. To facilitate registering the point on the site plan, it is recommended that the control point be located on or adjacent to existing surface construction features already reflected on existing architectural or CAD drawings. The control point must represent, within 1.5 meters, the actual location on the facility property.

(ii) Global Positioning System (GPS)

Another method for establishing a control point for grid system development is GPS. As with traditional survey techniques, it is necessary to establish one control point for the site and for reference in future sampling events. The control point should be located as close to the center of the property and areas of investigation as feasible. To facilitate registering the point on the site plan, it is recommended that the control point be located on or adjacent to existing surface construction features already reflected on existing architectural or

CAD drawings. The control point must represent, within 3 meters, the actual location on the facility property.

The GPS receiver employed should be designed for GIS data collection or precise surveying. Critical receiver collection parameters must be set by the receiver operator to ensure the collected control point positions are of acceptable quality and meet DEP requirements. These parameters include position (or fix) collection mode, PDOP mask, satellite elevation mask, signal to noise ratio (SNR) mask, and number of sample fixes collected per point.

- (a) The position collection mode should be 3D (4 or more GPS satellites used to determine position) or over-determined 3D (5 or more satellites). And the GPS unit should be a code based, 6 channel receiver at a minimum.
- (b) Satellite geometry conditions should be such that PDOP is less than or equal to 6 during GPS collection. The receiver's PDOP mask should be set to 6.
- (c) The receiver's elevation mask should be set to 15 degrees.
- (d) The receiver's signal to noise ratio mask should be set to six (6).
- (e) The minimum number of sample fixes required will depend on the quality of the receiver employed. Regardless of receiver used, a minimum number of fixes must be collected so that when differentially corrected (either post processed or in real time), the final averaged position is accurate to within 3 meters 2drms (with a 95% level of confidence).
- (f) Additional, more detailed information regarding GPS use and techniques is in section 7.0 GLOBAL POSITIONING SYSTEM of "Mapping and Digital Data Standards."

b. Establishment of a facility grid coordinate system

The coordinates established using survey or GPS techniques become the control point, and are included on the facility map to establish a baseline to determine coordinates for past and future sampling activities.

Upon generation of New Jersey State Plane coordinates for the control point, it is necessary to register (locate) that point on the facility map. Note that registering of the control point is aided by being able to identify the point on the facility map where the survey or GPS sighting was taken. Accordingly, it is helpful to capture the point in the field as near as possible to an object identifiable both on the facility plan as well as on the ground.

For example, one way the create a grid could include use of a hard copy architectural plan of the facility or CAD drawing. Establish a 2 dimensional, 1 foot square x-y grid system using the control point coordinates as a basis for determining additional grid based coordinate points. When preparing the grid,

precisely identify true north on the map to ensure that future coordinates developed using this method are accurate. Grid dimensions must be established in NAD83 and in New Jersey State Plane feet, since it very difficult to establish a grid system using latitude and longitude coordinates. The Department's primary concern when developing coordinates for the HAZSITES Database is that spatial distribution of the coordinates is consistent. Note that it is not necessary to generate a 1'x 1' grid over the entire site plan, but only around those points and areas where the sampling activities are occurring.

Once a grid with x and y coordinates has been established, the coordinate information correlating to the locations of sampling points and well placement can be used to complete the HAZSITES Database requirement for position information.

c. Locating a control point using orthophotography

Another method for determining point coordinates involves the use of aerial orthophotography. Statewide 1995 digital imagery will be available on a county by county basis in the Universal Transverse Mercator (UTM), coordinate system, in NAD83 at a cost of approximately \$150.00 to \$300.00 per county. The product available will be 1 meter, resolution, JPEG, color infrared digital orthophoto quarterquads. The imagery is expected to be available for sale from the USGS, Earth Science Information Center at 1-800-USA-MAPS in the fall of 1997.

This imagery, when available, can be used to develop coordinates as the base map for identification of sampling points. Built into the imagery is the UTM coordinate system that will allow for the establishment of facility field coordinates. Since the orthophoto coordinates are in UTM the respondent must convert the point to NAD83 and New Jersey State Plane feet before submission of the digital record to the DEP in the HAZSITE Database. Additional guidance regarding suggested methodologies for this conversion will be provided in subsequent editions of this guidance.

Listing of NJDEP GIS and Site Remediation Information Resources

- A. "Mapping and Digital Data Standards" can be obtained by calling the Bureau of Geographic Information Analysis at 609/777-0672.
- B. "New Jersey GIS Resource Guide -1996-" for \$20.00, or on CD-ROM, Series 2, Volume 1, "GIS Tools for Decision Making" for \$30.00 from DEP Map Sales, PO Box 420, Trenton, 08625-0420; 609/777-1039.
- C. Metadata Documentation Diskette. Contact Lenora Ross with BGIA at 609/984-2243 for a copy of the DEP's metadata documentation diskette.
- D. "NJDEP GIS CD-ROMs" Information regarding use and content of the NJDEP GIS CDs can be obtained by requesting the pamphlet from BGIA at 609/777-0672 or DEP Map Sales.

- E. NJDEP GIS 4 Volume CD set at \$30.00 per volume is available for purchase from NJDEP Map Sales at 609/777-1039.
- F. The Electronic Data Interchange (EDI) Manual can be obtained by writing to Ralph Pasceri at NJDEP, OIRM, PO Box 428, Trenton, NJ, 08625-0420.
- G. The HAZSITE Database can be obtained by reviewing NJDEP's Electronic Data Interchange (EDI) Manual or by contacting Barbara Yuill at 609/633-1380. 
- H. United States Geological Survey, (USGS), Earth Science Information Center, 1-800-UAS-MAPS.

Modifications to this Guidance

The DEP recognizes that all issues of concern regarding the submission of GIS compatible digital data may require further explanation or clarification. Any questions and recommendations for additions or modifications to this document can be addressed to John Defina, Bureau of Planning and Systems, PO Box 413, Trenton, NJ, 08625-0420, 609/633-0537, or through Email at JDEFINA@DEP.STATE.NJ.US. Revisions to this document will be posted on the SRP website at <http://www.state.nj.us/dep/srp> and in the NJDEP EDI Manual.

