R-009-104.1

4131

APPLICATION FOR FEMP ADVANCED WASTE WATER TREATMENT FACILITY PERMIT TO INSTALL

12/03/92

OEPA/DOE-FN
50
LETTER

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
FAX (614) 644-2329

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4131

George V. Voinovich
Governor

Donald R. Schregardus
Director

December 3, 1992

Re: Fernald
Hamilton County
Application No. 05-5722
Application for FEMP-Advanced Wastewater Treatment Facility
Received August 17, 1992
From A.M. Kinney, Inc.

CERTIFIED MAIL

U.S. Department of Energy
P.O. Box 398704
Cincinnati, Ohio 45239

Gentlemen:

Enclosed is the Ohio EPA Permit to Install which will allow you to install the described source in the manner indicated in the permit. Because this permit contains several conditions and restrictions, I urge you to read it carefully.

As indicated on the permit, you are required to pay a permit fee as provided for by Section 3745.11 of the Ohio Revised Code and any rules established thereunder. The exact amount of this fee is indicated on page 1 of the Permit to Install. This amount must be remitted within fifteen (15) days of the effective date of the Permit to Install. Checks should be made payable to: Treasurer, State of Ohio and sent to: Permits Bookkeeper, Ohio Environmental Protection Agency, 1800 WaterMark Drive, P. O. Box 1049, Columbus, Ohio 43266-0149.

You are hereby notified that this action of the director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code by any person who was a party to this proceeding. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the director's action. A copy of the appeal must be served on the director of the Ohio Environmental Protection Agency and the Environmental Law Division of the Office of the Attorney General within three (3) days of filing with the board. An appeal must be filed with the Environmental Board of Review at the following address:

Environmental Board of Review
236 East Town Street, Room 300
Columbus, Ohio 43266-0557

Printed on recycled paper

You should note that a general condition of your permit states that issuance of the permit does not relieve you of the duty of complying with all applicable federal, state, and local laws, ordinances, and regulations.

If you have any questions, please contact the Ohio EPA district office to which you submitted your application.

Sincerely,

Robert E. Phelps, P.E., Manager
Permit Administration Section
Division of Water Pollution Control

REP/mtk

Enclosure

cc: Southwest District Office
Hamilton County Health Department
A.M. Kinney, Inc.

Ohio Environmental Protection Agency

Permit to Install

Application No. 05-5722

Applicant's Name: U.S. Department of Energy

Permit Fee $750.00

Address: P.O. Box 398704

City: Cincinnati

State: Ohio 45239

Person to Contact: David Brettschneider, Mgr. Operable Unit 5
Telephone: (513) 738-9180

Description of Proposed Source: FEMP-Advanced Wastewater Treatment Facility, Fernald, Hamilton County

Issuance Date: December 3, 1992

Effective Date: December 3, 1992

The above named entity is hereby granted a permit to install for the above described source pursuant to Chapter 3745-31 of the Ohio Administrative Code. Issuance of this permit does not constitute expressed or implied approval or agreement that, if constructed or modified in accordance with the plans included in the application, the above described source of environmental pollutants will operate in compliance with applicable state and federal laws and regulations, and does not constitute expressed or implied assurance that, if constructed or modified in accordance with those plans and specifications, the above described source of pollutants will be granted the necessary operating permits. This permit is granted subject to the following conditions attached hereto.

Ohio Environmental Protection Agency

Donald R Schregardus

Donald R. Schregardus
Director
P. O. Box 1049, 1800 WaterMark Drive
Columbus, Ohio 43266-0149

This permit shall expire if construction has not been initiated by the applicant within eighteen months of the effective date of this permit. By accepting this permit, the applicant acknowledges that this eighteen month period shall not be considered or construed as extending or having any effect whatsoever on any compliance schedule or deadline set forth in any administrative or court order issued to or binding upon the permit applicant, and the applicant shall abide by such compliance schedules or deadlines to avoid the initiation of additional legal action by the Ohio EPA.

The director of the Ohio Environmental Protection Agency, or his authorized representatives, may enter upon the premises of the above named applicant during construction and operation at any reasonable time for the purpose of making inspections, conducting tests, examining records, or reports pertaining to the construction, modification, or installation of the above described source of environmental pollutants.

Issuance of this permit does not relieve you of the duty of complying with all applicable federal, state, and local laws, ordinances, and regulations.

This permit is conditioned upon payment of applicable fees as required by Section 3745.11 of the Ohio Revised Code, and shall be invalid unless the permit fee specified above has been paid in full to the Ohio EPA within fifteen days of issuance of this permit to install.

Any well, well point, pit, or other device installed for the purpose of lowering the ground water level to facilitate construction of this project shall be properly abandoned in accordance with the provisions of Section 3745-9-10 of the Ohio Administrative Code or in accordance with the provisions of this plan or as directed by the director or his representative.

Any person installing any well, well point, pit or other device used for the purpose of removing ground water from an aquifer shall complete and file a Well Log and Drilling Report form with the Ohio Department of Natural Resources, Division of Water, within 30 days of the well completion in accordance with the Ohio Revised Code Section 1521.01 and 1521.05. In addition, any such facility that has a capacity to withdraw waters of the state in an amount greater than 100,000 gallons per day from all sources shall be registered by the owner with the chief of the Division of Water, Ohio Department of Natural Resources, within three months after the facility is completed in accordance with Section 1521.16 of the Ohio Revised Code. For copies of the necessary well log, drilling report, or registration forms, please contact:

Ohio Department of Natural Resources
Fountain Square
Columbus, Ohio 43224-1387
(614) 265-6717

The proposed wastewater disposal system shall be constructed in strict accordance with the plans and application approved by the director of the Ohio Environmental Protection Agency. There shall be no deviation from these plans without the prior express, written approval of the agency. Any deviations from these plans or the above conditions may lead to such sanctions and penalties as provided for under Ohio law. Approval of this plan and issuance of this permit does not constitute an assurance by the Ohio Environmental Protection Agency that the proposed facilities will operate in compliance with all Ohio laws and regulations. Additional facilities shall be installed upon orders of the Ohio Environmental Protection Agency if the proposed sources are inadequate or cannot meet applicable standards.

This permit to install applies only to the wastewater treatment works listed above. The installation of drinking water supplies, air contaminant sources, or solid waste disposal facilities will require the submittal of a separate application to the director.

This permit applies to a wastewater disposal system designed to serve an average daily hydraulic flow of no more than 1,584,000 gallons.

No liquids, sludges, or toxic or hazardous substances other than those set forth in the approved permit shall be accepted for disposal without the prior written approval of the Ohio Environmental Protection Agency.

The appropriate district office of the Ohio Environmental Protection Agency shall be notified in writing as to (a) the construction starting date; (b) the construction completion date; and (c) the date the wastewater disposal system was placed into operation.

A report, which provides a technical appraisal of the operation of the new wastewater treatment system during normal operating conditions, shall be submitted to the appropriate district office of the Ohio Environmental Protection Agency within six months after the new wastewater treatment system is placed into operation.

Ohio Environmental Protection Agency

Permit to Install

Application No. 05-5722

Applicant's Name: U.S. Department of Energy

Permit Fee $750.00

Address: P.O. Box 398704

City: Cincinnati

State: Ohio 45239

Person to Contact: David Brettschneider, Mgr. Operable Unit 5
Telephone: (513) 738-9180

Description of Proposed Source: FEMP-Advanced Wastewater Treatment Facility, Fernald, Hamilton County

Issuance Date: December 3, 1992

Effective Date: December 3, 1992

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Ohio Environmental Protection Agency

Donald R Schregardus

Donald R. Schregardus
Director
P. O. Box 1049, 1800 WaterMark Drive
Columbus, Ohio 43266-0149

RECEIVED
OHIO EPA
AUG 17 1992
SOUTHWEST DISTRICT

4131

OHIO ENVIRONMENTAL PROTECTION AGENCY
Division of Water Pollution Control
Application for Permit to Install or Plan Approval

_X_ Treatment Works (Includes Septic Systems)
  _X_ New Source (1)
  ____ Modification (1) and (2)

___ Pretreatment Only

___ Sludge or Waste Management Plan Approval

___ Other (Sewers, Pump Stations, Fly Ash or Bottom Ash Disposal Site, etc.) (2)

For Office Use Only

Application No. 05-5722
Date Received 8-17-92
PAID
Amount 5015.00 Date 8-17-92
Check# 016399 Date 7-22-92

1. a) Owner *U. S. Department of Energy*
   b) Applicant (per OAC 3745-1-04, See General Instructions).
   Responsible Official *R. E. Tiller* Title *Manager*
   Firm *U. S. Department of Energy* Telephone *(513)738-9180*
   Mailing Address *FEMP‡ P. O. Box 398704, Cincinnati, OH. 45239-8704*
   c) Name of Project/Facility *FEMP - Advanced Wastewater Treatment Facility*
   Location (List street/road address, township and county, or latitude and longitude is possible. Otherwise provide legal description.) *The AWWT facility is located at Bldg. 51 on the FEMP site. The FEMP is located at 7400 Willey Rd. Fernald, OH 45030.*
   d) Receiving Stream or Treatment Works to Receive Wastewaters *Great Miami River (GMR)*
   e) Person to Contract (Person most familiar with the technical aspects of the project.)
   Name *David Brettschneider P.E.* Title *Manager, Operable Unit5*
   f) Operator of facility *Westinghouse Environmental Management Co. of Ohio*

2. a) Reason for project: *Provide advanced wastewater treatment for removing uranium from existing wastestreams prior to discharge to the GMR.*
   b) Is this facility regulated under an effective NPDES permit?

Y	N	Permit #
X		1IO00004-CD ‡‡

   c) Is this application filed in compliance with Ohio EPA Findings and Orders or Consent Order* Y___ N_X_ Date_____
   *If the answer is yes, fill in the effective date of the Finding and Orders.

(1) If the treatment works or modification of treatment works involves the construction of any type of lagoon (non-concrete lined) other than a flow equalization lagoon, the hydrogeologic site investigation report, meeting the requirements given in Detailed Information, Item 13. m, page 5, must be submitted with this application.
(2) For modifications, additions, or replacement of existing works.

‡ Fernald Environmental Management Project (FEMP)
‡‡ An NPDES Permit modification will be required to incorporate the discharge from the AWWT.

Form 4309 (Revised 8/91)

7

3. a) Designed by: *A. M. Kinney, Inc. - Consulting Engineers*
   b) Address: *2900 Vernon Place, Cincinnati, OH 45219*
   c) Inspection Responsibility: *WEMCO*
   d) Address: *P. O. Box 398705, Cincinnati OH 45239-8705*

4. Project Costs: $ *43,000,000* (X estimated ___ bid ___ invoiced)
   (Check one)

5. Estimated schedule
   a) Construction: begin *October 14, 1992* complete *February 23, 1994*
   b) Operation: start *March 1994* compliance *NA*

6. a) This new system has been designed for *1.58* MGD average flow.
   b) This existing system has been modified for additional *N/A* MGD average flow.
   c) This existing system has been modified to comply with effluent limits in Item 7.

7. Design performance criteria (use attachment if necessary)

Parameter	Units	30 Day Average	7 Day Average	Maximum
Uranium	*mg/l*	*0.020*	*0.020*	*0.020*

8. Facility type: X new ___ modify ___ replace
   a) ___ Pretreatment(*)
   b) X Industrial Direct Discharger(*)
   c) ___ Livestock Management Plan
   d) ___ Public
      ___ Treatment Works(*)
      ___ Sanitary Sewers
      ___ Pump Station
      ___ Land Application of Sludge (Plan Approval Only)
   e) ___ Semi-Public, Private or Commercial(*)
      (*) Part 9d. must be completed

9. Plan Submitted should include (to be attached to the application)
   a) X Detail Plans (4 sets: consult with the appropriate District Office)
      X Construction Drawings
      ___ Specifications
      X Site Plan
      X Vicinity Map
      ___ Schematic diagrams
   b) ___ Data Sheets (as appropriate)
      ___ Sanitary Sewer Data Sheet (sanitary sewers only)
      ___ Pump Station Data Sheet (sanitary sewers only)
      ___ Appendix G (long or short as appropriate)
      ___ Wastewater Treatment Works-General Information (EPA form 8003)
   c) X Special submittals (as appropriate)
      ___ Approval letter from municipality (pretreatment only)
      X NPDES Application (direct discharges) (MODIFICATION †)
      ___ PUCO certification (Facilities Subject to Regulation by the Public Utilities Commission)

† An NPDES permit modification will be required for this new discharge. The modification will be submitted at a later date.

___Soil Analysis
___Groundwater Geologic Evaluation
___Livestock Waste Management Plan
___Certificate of Supervision for installation, and operation of Package Sewage Treatment Plant
_X_Engineering Report
_X_Other: *Copy of test plan results from pilot study.*

d) Operation and Maintenance Costs

Please provide the best possible estimate of the annual operation and maintenance cost of the new or modified facility. For modified facilities the operation and maintenance costs for the entire facility, not for just the modified portions are required. For publicly owned wastewater treatment facilities include the operation and maintenance costs of the sewer system. Provide as much detail as possible. Assume that the facility/system is operating at design flow/loading.

Based on previous correspondence, this information is not required. It can be made available upon request

10. Under OAC 3745-31-04, these signatures shall constitute personal affirmation that all statements or assertions of fact made in the application and attachments thereto are true and complete, comply fully with applicable state requirements, and shall subject the signatory to liability under applicable state laws forbidding false or misleading statements.

* Photostatic copies are not applicable.

** Signature of owner or responsible official of applying company required. (See OAC 3745-31-04).

For Wastewater Treatment Plants

W. W. Adam — 8-10-92
Authorized Signature (of facility)* ** — Date

Title

Address

Signature of Engineer preparing plans.* — Date

Company

Address

11. PTI Application Fees + Plan Approval Fees payable to "Treasurer, State of Ohio" through the appropriate District Office (To accompany each application).

a. Application Fee	$ 15.00	
b. Plan Review Fee (+)	$ 5000.00	(0.002 x Project costs) + $100 (Not to Exceed $5,000.00)
c. Total* (a+b)	$ 5015.00	(Not to Exceed $5,015.00)

* Fee for Sludge Management Plan not to exceed $115.00
* Fee for Waste Management Plan (check with District Office)

12. A permit to install issuance fee will be invoiced upon final issuance of the permit in accordance with the following schedule and due within 15 days of effective date.

Design Flow Discharge (gallons per day)	Fee
Less than 1,000	$ 50
1,001 to 5,000	$100
5,001 to 50,000	$200
50,001 to 100,000	$300
100,001 to 300,000	$525
Over 300,000	$750

PTI Issuance Fees payable to "Treasurer, State of Ohio," through the OEPA Central Office at the following address.

Ohio Environmental Protection Agency
Division of Finance/Permit Bookkeeping
1800 Watermark Drive
P.O. Box 1049
Columbus, Ohio 43266-0149

13. The following detailed information must be submitted on a separate piece of paper and attached to this application. Indicate the "N/A"for non-applicable information.

a) Describe the product or service to be provided by the applicant along with a description of the proposed source/facility (i.e., the number of homes to be serviced, the number of employees, an existing electroplater subject to 40 CFR 413 Sub Part_____ and produces_____).

b) List the name and quantity of all materials and chemicals (solid, liquid, or gaseous) that will be used or produced by the source/facility

c) State the reason for the application. Is this a new installation, modification to an existing source/facility, reconstruction of an existing source/facility, startup of a source/facility that has been permanently shut down for (state number of years), or as built plans for a facility already constructed.

d) Has a previous Ohio EPA PTI or plan review application or plan

13.(Continued)

submission been filed for this source/facility? If so, state the date and type of the application previously submitted.

e) Will the proposed source/facility comply with all existing rules, laws, and regulations of Ohio EPA and U.S. EPA?

f) State the anticipated quality (concentration and loads) of all types of pollutants to be discharged by the facility.

g) State in detail the method for disposal for any wastewater or sludge listed in the question above. A complete description of any control system to be employed should be included.

h) If wastewater is to be discharged to a surface water, state the anticipated concentration (mg/l) and loading (lbs/day) of pollutants in the discharge, and the effect this discharge will have on the surfacewater under critical conditions. List any NPDES permits or indicate if an application has been filed.

i) If wastewater is to be discharged by injection into the groundwater, you must apply for a (UIC) underground injection control permit pursuant to OAC 3745-34. List any UIC permits or indicate if an application has been filed.

j) If wastewater is to be discharged to a sewerage system, what will be the effect on the sewerage system and wastewater treatment system.

k) Describe any monitoring equipment to be installed at the facility.

l) Will the proposed source conform with area-wide waste management plans for wastewater treatment?

m) Hydrogeologic site investigation report required for construction or modification of any type of a lagoon other than a concrete lined lagoon or a flow equalization lagoon which shall contain as a minimum:

1) Well logs and material characteristics.
2) Define the uppermost aquifer.
3) Definition of geology/hydrogeology, and major aquifer(s) for water supply in the area of the proposed facility.
4) Definition of depth to bedrock.
5) Definition of saturated zone ("High Seasonal Water Table", perched zones etc.), includes interconnections and relationships between zones and with surface dischargers (streams, springs and seeps, etc.)
6) Data characterizing soil materials to be utilized in construction. (If applicable.)
7) Note all sources of drinking water, including wells and springs, within 1,000 feet of the limits of waste placement.

For more details contact the district representative.

13 a) **Describe the product or service to be provided by the applicant along with a description of the proposed source/facility (i.e., the number of homes to be serviced, the number of employees, an existing electroplater subject to 40 CFR 413 Sub Part_____ and produces_____).**

The Fernald Environmental Management Project (FEMP) is a government-owned facility. Currently, Westinghouse Environmental Management Company of Ohio (WEMCO) manages the FEMP under prime contract for the United States Department of Energy (DOE).

The FEMP is located near the unincorporated town of Fernald, Ohio, approximately 32 km northwest of Cincinnati, Ohio (Figure 1). FEMP production operations cover approximately 136 acres (Figure 2) in the center of a 1,050 acre site. Several rural communities and commercial operators lie within a 1-5 km radius of the plant.

At the FEMP, various chemical and metallurgical processes were utilized in the past to reduce uranium oxides, uranium fluorides, and recycle materials to uranium ingots and billets. The uranium metal was fabricated to customers requirements. Some of this metal was extruded into tubular form on press facilities located at the RMI Company, Ashtabula, Ohio and were returned to the FEMP for fabrication into fuel cores and target elements. These were used in nuclear reactors at other DOE sites. The FEMP has now ceased production and is now devoted to cleanup and environmental remediation.

The Advanced Wastewater Treatment (AWWT) facility is comprised of two treatment streams; a 400 gpm process wastewater stream and a 700 gpm stormwater/groundwater stream.

The 400 gpm process wastewater stream consists of effluents from existing FEMP treatment facilities requiring uranium removal and wastewater from future remediation projects. Effluent from these facilities are routed to the AWWT for the primary purpose of removing uranium (and other radionuclides that may be removed by the process).

The 700 gpm waste stream is comprised of both stormwater and groundwater. All process area stormwater will be collected in the existing Stormwater Retention Basin (SWRB) and re-routed to the AWWT. This includes stormwater normally discharged to Manhole 175 via the Storm Sewer Lift Station (SSLS) which will be discontinued, and previously uncollected process area stormwater which is proposed to be collected under CERCLA Removal Action #16. During periods when stormwater levels in the SWRB are low, groundwater from from CERCLA Removal Action No. 3 "South Groundwater Contamination Plume Removal Action - Part 2" will be diverted into the AWWT.

The treatment scheme, while separated into two different trains, is the same for both the process area wastestreams and the stormwater/groundwater waste stream. The initial treatment step is coagulation/gravity separation in the clarifiers. The treatment is then a series of multitube filters and carbon filters followed by ion

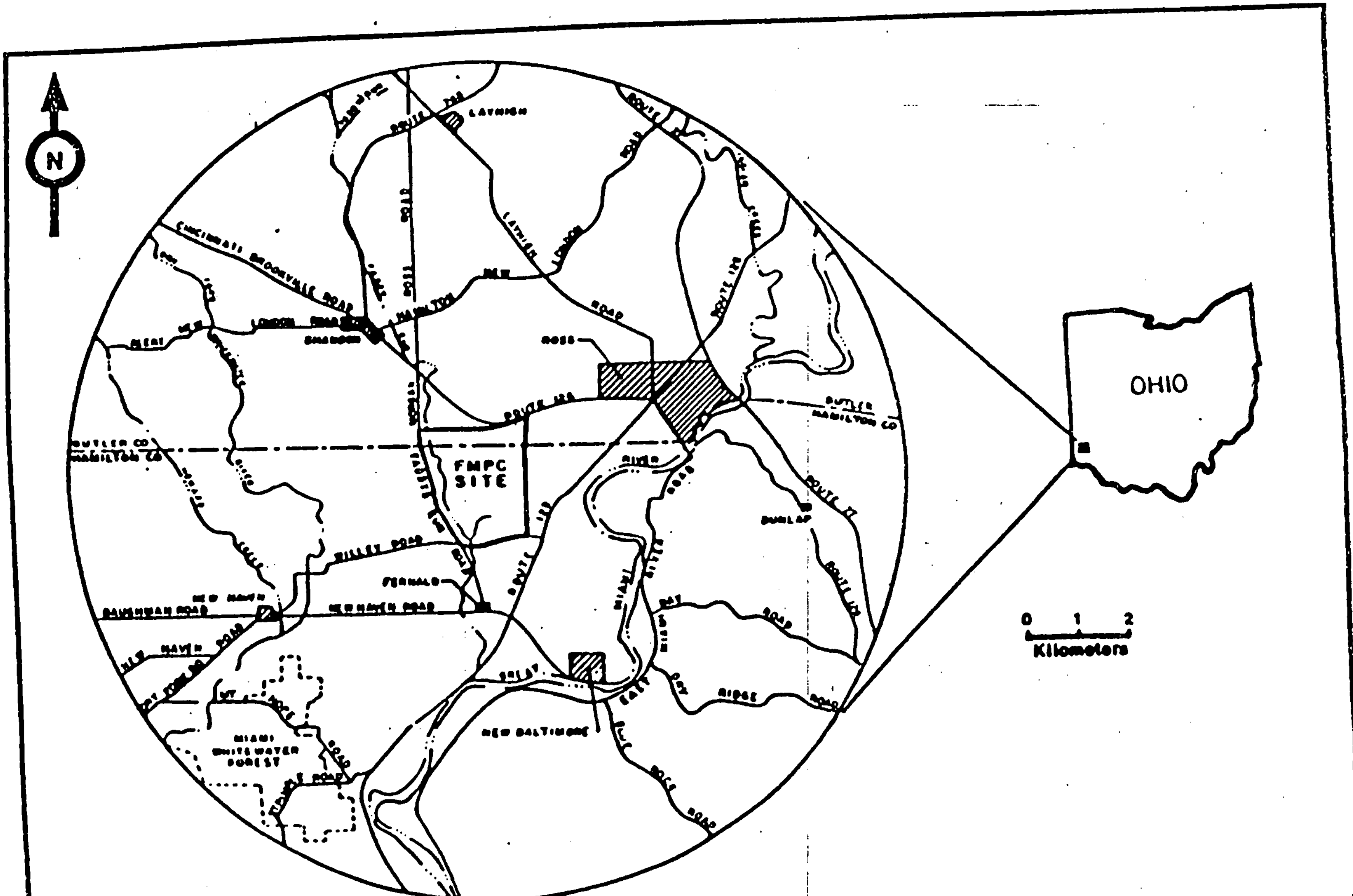
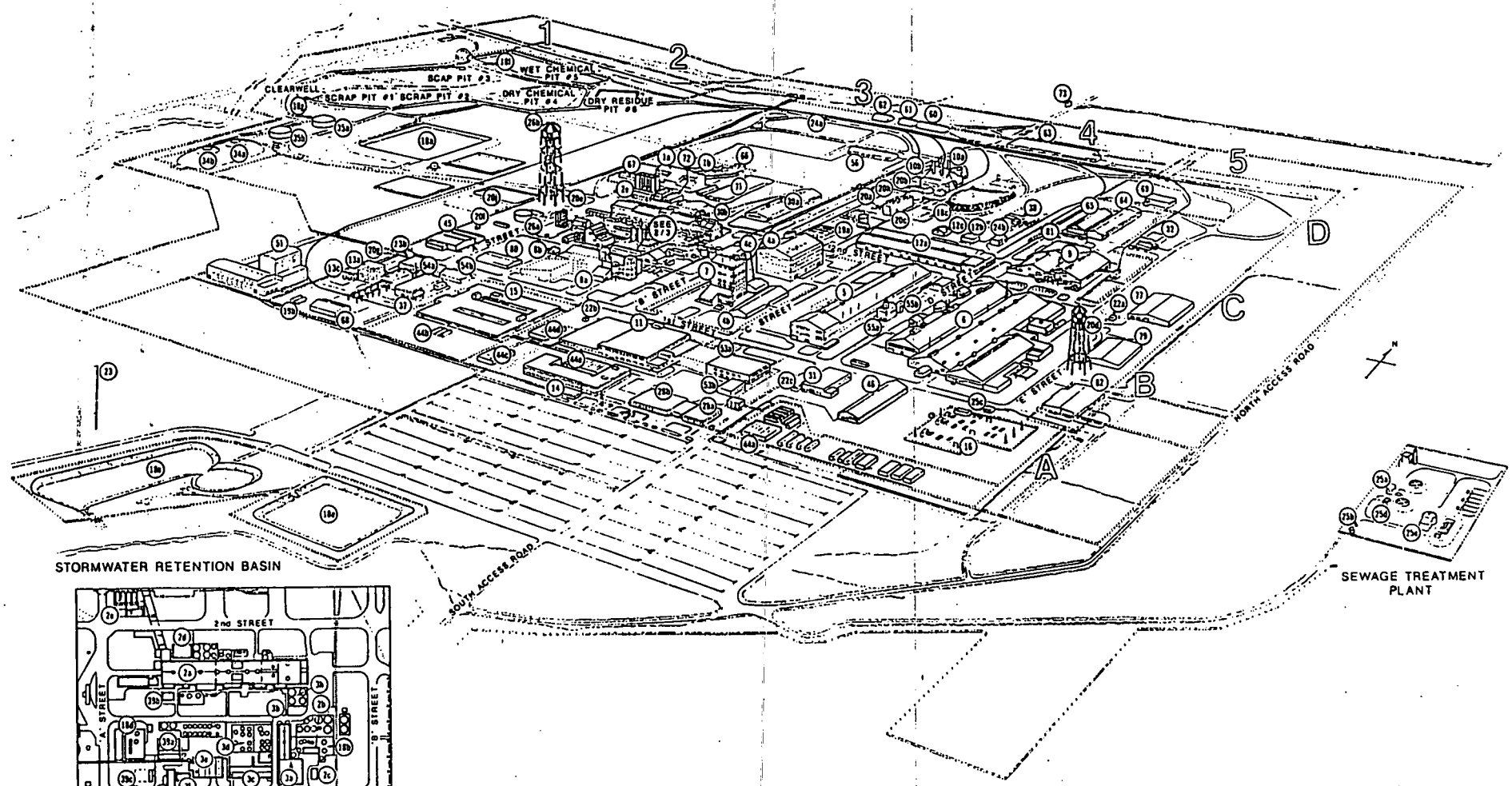
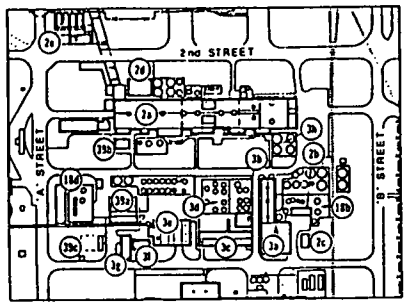


FIGURE 1: *FMPC Area Map*





2/3 DETAIL

See Following Page For Building Identificatio

Figure 2

(1A) BUILDING IDENTIFICATION

4131

Building I.D. No	Grid Coordinates	Title
00	C-3	General
1a	C-3	Preparation Plant
1b	B-3	Plant 1 Storage Building
2a	B-3	Ore Refinery Plant
2b	B-3	Lime Handling Building
2c	B-3	Bulk Lime Handling Building
2d	C-3	Metal Dissolver Building
2e	C-3	NFS Storage and Pump House
3a	B-3	Maintenance Building
3b	B-3	Ozone Building
3c	B-3	Control House
3d	B-3	NAR Towers
3e	B-3	Hot Raffinate Building
3f	B-3	Digestion Fume Recovery
3g	B-3	Refrigeration Building
3h	B-3	Refinery Sump
4a	B-4	Green Salt Plant
4b	B-4	Plant 4 Warehouse
4c	B-4	Plant 4 Maintenance Building
5	B-4	Metals Production Plant
6	B-5	Metals Fabricating Plant
7	B-4	Plant 7
8a	B-3	Recovery Plant
8b	B-3	Maintenance Building
9	C-5	Special Products Plant
10a	D-4	Boiler Plant
10b	D-4	Boiler House Maintenance Building
*1	A-4	Service Building
a	C-4	Maintenance Building (Main)
2b	C-4	Cylinder Storage Building
12c	C-4	Lumber Storage Building
13a	A-3	Pilot Plant Wet Side
13b	A-3	Pilot Plant Maintenance Building
13c	A-3	Sump Pump House
14	A-4	Administration Building
15	A-3	Laboratories
16	A-5	Main Electrical Substation
18a	C-2	Surge Lagoon
18b	B-3	General Sump
18c	C-4	Coal Pile Runoff Basin
18d	B-3	Biodenitrification Towers
18e	*	Storm Water Retention Basin
18f	D-1	Pit 5 Sluice Gate
18g	C-1	Clearwell Pump House
19a	C-4	Metal Tank Farm
19b	A-3	Pilot Plant Ammonia Tank Farm
20a	C-4	Valve/Control Building
20b	D-4	Filter/Chemical Building
20c	C-4	Cooling Towers
20d	B-5	Elevated Storage Tank (Potable H_2O)
20e	B-3	Well House
20f	B-3	Well House
20g	A-3	Well House
20h	D-4	Process Water Storage Tank
20j	B-2	Lime Slurry Pits
22a	B-5	Gas Meter Building
22b	A-3	Sewer Lift Station
22c	A-5	Truck Scale
23	*	Meteorological Tower
24a	D-3	Railroad Scale House
24b	C-4	Railroad Engine Building
24c	*	Chlorination House
25b	*	MH #175
25c	A-5	Sewage Lift Station Building
25d	*	U.V. Disinfection Building
25e	*	Digester Control House
26a	B-3	Pump House - H.P. Fire Protection
26b	B-3	Fire Protection Storage Tank
28a	A-4	Security Building
28b	A-4	Human Resources Building
30a	C-3	Chemical Warehouse
30b	C-3	Drum Storage Warehouse
31	A-5	Engine House - Garage
32	D-5	Magnesium Storage
34a	B-1	K-65 Storage Tank - North
34b	B-1	K-65 Storage Tank - South
35a	C-1	Metal Oxide Storage Tank - North
35b	B-1	Metal Oxide Storage Tank - South
37	A-3	Pilot Plant Annex
38	D-4	Propane Storage
39a	B-3	Incinerator Building
39b	B-3	Warehouse
39c	B-3	Incinerator Bulding Sprinkler Riser House
44a	A-5	Trailer Complex - 6-Plex - East
44b	A-4	Trailer Complex - 3-Plex
44c	A-3	Trailer Complex - 7-Plex - South
44d	A-3	Trailer Complex - 7-Plex - North
44e	A-4	Trailer Complex - 10-Plex
45	A-3	Building 45
46	A-5	Heavy Equipment Garage
51	A-2	~~UF_6 to UF_4 Reduction Facility II~~
53a	A-4	Health, Safety & Production Control Building
53b	A-4	In-Vivo Building
54a	A-3	UF_6 to UF_4 Reduction Facility I
54b	A-3	Warehouse/Weather Shelter
55a	B-4	Slag Recycling Plant
55b	B-4	Slag Recycling Pit/Elevator
56	D-3	CP Storage Warehouse
60	D-3	Quonset Number 1
61	D-3	Quonset Number 2
62	D-3	Quonset Number 3
63	D-4	KC-2 Warehouse
64	D-5	Plant 9 Warehouse
65	D-5	Plant 5 Warehouse
66	C-3	Drum Reconditioning Building
67	C-3	Plant 1 Storage Building
68	A-3	Pilot Plant Warehouse
69	D-5	Decontamination Building
71	C-3	General In-Process Storage Warehouse
72	C-3	Drum Storage Building
73	*	Fire Brigade Training Center Building
77	C-5	Finished Products Warehouse
78	*	New D&D Facility (On Hold)
79	B-5	Plant 6 Warehouse
80	B-3	Plant 8 Warehouse
81	C-5	Plant 9 Warehouse
82	B-5	Receiving & Incoming Materials Inspection Area

* Outside of Perimeter Security Fence

NOTE: Any Unidentified Area is Referred to as 00 General

15

exchange (IX) units. The treatment processes are more fully described in the Engineering Report included as Appendix A to this application.

13 b) List the name and quantity of all materials and chemicals (solid, liquid, or gaseous) that will be used or produced by the source/facility.

Materials used by the AWWT include:

1) "TRU/Clear": "TRU/Clear" is the planned coagulant to be used in the coagulation/separation step. "TRU/Clear" is a potassium ferrate based coagulant (proprietary) and is delivered in powder form.

Estimated use: 400 gpm stream = 576 lb. "TRU/Clear"/day
700 gpm stream = 1008 lb. "TRU/Clear"/day

A liquid alum (28% by weight $Al_2(SO_4)_3$) supply system is being provided as an alternate coagulant to "TRU/Clear" and may be used in either one or both treatment streams. When required, alum is metered at a rate between 0.05 - 0.4 gallons of liquid alum/1000 gallons of wastewater.

2) Caustic (NaOH): "Tru/Clear" is required to be mixed with water with a pH of 11.5. Therefore, a caustic supply system is necessary to prepare the water to a pH of 11.5 A 25-ton delivery of a 50% NaOH solution is received at the FEMP and diluted to 12,500 gallon; 20% NaOH solution used to raise the pH. In addition NaOH is used in the eluate treatment system.

Estimated use (pH adjustment):

400 gpm stream = 1393 lbs. NaOH/day
700 gpm stream = 2439 lbs. NaOH/day

Estimated use (eluate treatment):

400 gpm stream = 383 lbs. NaOH/day
700 gpm stream = 575 lbs. NaOH/day

3) Sulfuric acid: H_2SO_4 (93%) is used as the eluant for regenerating the ion exchange resin and for pH adjustment to bring the wastewater down to a pH of approximately 8.0 prior to treatment in the ion exchange system.

Estimated use (pH adjustment):

400 gpm stream = 1708 lbs. H_2SO_4/day
700 gpm stream = 2988 lbs. H_2SO_4/day

Estimated use (IX resin regeneration):

400 gpm stream = 470 lbs. H_2SO_4/day
700 gpm stream = 704 lbs. H_2SO_4/day

4) Activated Carbon: Activated carbon is used in the carbon filters immediately proceeding the ion exchange units to protect the ion exchange resin from potential organic constituents in the wastewater.

5) Ion Exchange Resin: "DOWEX 21K" is an ion specific resin used in the ion exchange system for removing uranium.

Materials produced by the AWWT facility include:

1) Sodium sulfate (Na_2SO_4): Barren sodium sulfate is produced according to the following reaction between sulfuric acid and sodium hydroxide in the pH adjustment step and the eluate treatment step:

$$H_2SO_4 + 2NaOH \text{ ----------> } Na_2SO_4 + 2H_2O$$

Approximately 8,502 lbs. of Na_2SO_4 are produced and discharged to the Great Miami River on a daily basis.

2) Waste slurries: These slurries are the result of:

* Clarifier underflow
* Multitube filter backwash
* Thickener underflow from eluate treatment

These slurries are collected in a slurry surge tank and pumped to Plant 8 for processing. Approximately 25,500 (17.7 gpm) gallons of slurries, containing an average of about 5.8 lbs. of uranium, will be pumped to Plant 8 on a daily basis.

3) Treated wastewater: Approximately 1,082 gpm of treated wastewater will be discharged to the Great Miami River on a daily basis. The effluent will consist of approximately 0.20 lbs. of uranium/day @ 15 ug/l.

13 c) State the reason for the application. Is this a new installation, modification to an existing source/facility, reconstruction of an existing source/facility, startup of a source/facility that has been permanently shut down for (state number of years), or as built plans for a facility already constructed.

This is a new wastewater treatment facility required pursuant to DOE Order 5400.5 for the protection of the public and the environment.

13 d) Has a previous Ohio EPA PTI or plan review application or plan submission been filed for this source/facility? If so, state the date and type of the application previously submitted.

A previous PTI application for the AWWT has not been filed.

13 e) Will the proposed source/facility comply with all existing rules, laws,and regulations of Ohio EPA and U.S. EPA?

The AWWT facility will comply with all existing rules and regulations. The AWWT facility is a polishing facility for process waste streams and will provide additional treatment for stormwater which currently receives only primary settling. The AWWT will also provide treatment for a portion of the groundwater from CERCLA Removal Action #3 which; per agreement with U.S. EPA and Ohio EPA, is to be discharged untreated.

13 f) State the anticipated quality (concentration and loads) of all types of pollutants to be discharged by the facility.

As stated, the AWWT receives two types of wastestreams: 1) previously treated process wastewater and 2) stormwater/groundwater. The contaminant of concern for both streams is uranium. When both of these streams eventually combine after their respective treatment the combined effluent discharged to the Great Miami River will contain approximately 15 ug/l. Based on 1,082 gpm discharge, this equates to approximately 0.20 lbs. uranium/day. The effluent will also contain approximately 650 mg/l Na_2SO_4 as a result of the reaction between NaOH and H_2SO_4 in the eluant treatment step. Waste slurries discharged from the AWWT amount to approximately 17.7 gpm. These waste slurries are processed through the Plant 8 filter system. Filtrate is eventually discharged back through the AWWT treatment system while filter cake will be drummed and handled as a low level radioactive waste. Approximately 5.8 lbs/day of uranium will be discharged to Plant 8 in these waste slurries.

While there is the potential for additional removal of other pollutants, such as metals in the clarification step and any potential VOC's at the carbon filters, no attempt has been made to quantify these removals as the design basis is specifically for uranium. The effluent quality from the AWWT for contaminants other than uranium is assumed to be at least equal to, and potentially better than, the existing combined discharge.

13 g) State in detail the method for disposal for any wastewater or sludge listed in the question above. A complete description of any control system to be employed should be included.

Wastewater will be discharged in accordance with the FEMP NPDES permit; 1I000004*CD (Application No. OH0009580). All generated slurries will be processed through the existing Plant 8 filter system. Filtrate will be discharged to the General Sump and will repeat the treatment cycle. Filter cake will be drummed and handled as a low level radioactive waste.

The heart of the controls and instrumentation for the AWWT facility will be a distributed control system (DCS) located in the control room in Building 51. The starting and stopping of motors and opening and closing of valves will be handled by the DCS through automatic control or manual operator control via keyboard-available software switches.

13 h) If wastewater is to be discharged to a surface water, state the anticipated concentration (mg/l) and loading (lbs/day) of pollutants in the discharge, and the effect this discharge will have on the surface water under critical conditions. List any NPDES permits or indicate if an application has been filed.

As stated, the AWWT is a polishing system for process related wastewater and provides treatment for uranium for previously untreated stormwater and groundwater. Therefore, the AWWT will mitigate the effect of a discharge under critical conditions relative to the existing procedure of allowing individually treated wastestreams to combine and discharge without additional uranium removal. Approximately 15 ug/l (0.2 lbs./day) of uranium will be in the AWWT effluent.

Existing wastewater discharges are covered under the FEMP NPDES permit 1IO00004*CD. An NPDES permit modification to the current FEMP permit is necessary to incorporate the necessary monitoring. This modification will be submitted at a later date.

13 i) If wastewater is to be discharged by injection into the groundwater, you must apply for a (UIC) underground injection control permit pursuant to OAC 3745-34. List any UIC permits or indicate if an application has been filed.

Wastewater will not be discharged to the groundwater.

13 j) If wastewater is to be discharged to a sewerage system, what will be the effect on the sewerage system and wastewater treatment system.

Wastewater will not be discharged to a sewerage system; rather, it will be discharged directly to the Great Miami River.

13 k) Describe any monitoring equipment to be installed at the facility.

The monitoring equipment consists of flow measurement devices, tank level measurement devices, pressure measurement devices, temperature measuring devices, liquid analysis devices, gas analysis devices, and weighing systems. Treated wastewater will be discharged to a 24-inch diameter force main being installed under CERCLA Removal Action #3. Effluent sampling capability will be provided.

13 l) Will the proposed source conform with area-wide waste management plans for wastewater treatment?

Yes. The AWWT facility will be compatible with the "Comprehensive Water Quality Report for the Lower Mainstream of the Great Miami River (River Mile 92.5 - 0.9) Montgomery, Warren, Butler and Hamilton Counties, Ohio" (Rev. 1984).

13 m) Hydrogeologic site investigation report required for construction or modification of any type of a lagoon other than a concrete lined lagoon or a flow equalization lagoon which shall contain as a minimum:

2) Define the uppermost aquifer.
3) Definition of geology/hydrogeology, and major aquifer(s) for water supply in the area of the proposed facility.
4) Definition of depth to bedrock.
5) Definition of saturated zone ("High Seasonal Water Table", perched zones etc.), includes interconnections and relationships between zones and with surface dischargers (streams, springs and seeps, etc.)
6) Data characterizing soil materials to be utilized in construction. (If applicable.)
7) Note all sources of drinking water, including wells and springs, within 1,000 feet of the limits of waste placement.

This project does not involve a lagoon of any type.

REPORT ON DETAIL PLANS
FOR UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
ADVANCED WASTEWATER TREATMENT FACILITY
HAMILTON COUNTY

A Permit to Install application and detail plans for this project were received by the Southwest District Office of Ohio EPA on August 17, 1992. The plans were prepared by A. M. Kinney, Inc. The plans are for a new treatment system dubbed the Advanced Wastewater Treatment (AWWT) Facility and is being proposed for the further treatment of wastewaters generated by Fernald Environmental Management Project (FEMP). Waters to be treated by the AWWT include the following sources:

* Stormwater collected in the Stormwater Retention Basins (SWPBs)
* Groundwater from the South Plume
* Effluent from the sewage treatment plant (STP)
* Effluent from the Biodenitrification Treatment System
* Filtrates and other wastewaters from the General Sump

The AWWT facility is to consist of the following treatment steps:

* pH adjustment
* Coagulation
* Clarification
* Filtration
* Adsorption
* Ion exchange

The treatment system will be separated into two parts: Phase I - which will treat up to 700 gpm of stormwater and/or groundwater; and Phase II - which will treat up to 400 gpm of Biodenitrification Treatment System effluent, general sump wastewaters and sewage treatment plant effluent. All of these waste streams will be pumped to the AWWT system.

The intent of the AWWT Facility is to remove radionuclides from FEMP's discharges to the Great Miami River and it is expected that there will be concomitant removals of other residual pollutants from the tributary sources. Effluent from the AWWT is directed to FEMP's main discharge line at manhole 176B.

Solids generated from the AWWT Facility ultimately accumulate in the general sump area in Building 8. Solids will be drummed for storage and disposal in the same manner as are other solids currently generated by operations in Plant 8.

A report titled, "Wastewater Treatment Improvements - Plantwide (WTIP), Process Description" prepared by A. M. Kinney, Inc., was submitted with the PTI application. We find the report to be very concise and clear in explaining the proposed AWWT Facility and accompanied apertures and have attached it as part of this report.

We find the plans to be acceptable and recommend them for approval.

Matt Walbridge
Permits Group
Division of Water Pollution Control

Richard Shoemaker, P.E.
Permits Group Leader
Division of Water Pollution Control

klj

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

W. O. 02902-35
May 29, 1992

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE (WTIP) PROCESS DESCRIPTION

The specifications and drawings included in Spec. 02902-3501 and Spec. 02902-3502 include two subproject tasks as follows:

Task 2 - Process Area Storm Water Runoff Control Improvements include work at the Storm Water Retention Basin (SWRB) to provide instrumentation in Building 51 control room for indication and control of storm water levels in the three SWRB chambers. Task 2 includes work in the process area for the piping of spills to the General Sump from Manhole 34 or the SWRB, without interrupting discharge from the General Sump to the 12-inch wastewater force main.

Task 3 - Advance Wastewater Treatment (AWWT) Facility includes equipment to remove radionuclides, primarily uranium, from wastewater, storm water, and groundwater discharged to the Great Miami River. The treatment steps are TRU/Clear coagulation, gravity separation (clarifiers), filtration (multitube backwashing filters), carbon filters, and ion exchange (IX), with resin regeneration and eluate treatment. Two parallel treatment trains are included: Phase 1 treating 700 GPM storm water or groundwater, and Phase II treating 400 GPM wastewater from the Biodenitrification Effluent Treatment System (BDN-ETS), General Sump, and Sewage Treatment Plant (STP). The AWWT facility is to be located at Building 51.

The following description of the two tasks refer to the Piping and Instrumentation Diagrams (P&IDs) and Process Flow Diagram (PFD) Sheet No. P-18.

TASK 2 - PROCESS AREA STORM WATER RUN OFF CENTRAL IMPROVEMENTS

The Task 2 work shown on P&ID Sheet No. P-12 includes the following:

- Level indicators for the three SWRB chambers, with readout in the Building 51 control room.
- Motors on the two Hydrogate inlet half gates to the east and west SWRB chambers, with controls in the Building 51 control room, and power from the SWRB Valve House (provided by the South Plume subproject).
- Motors on the three Waterman sluice gates to the wet well of the SWRB transfer pump station, with controls in the Building 51 control room and power from the SWRB Valve House.
- Controls in the Building 51 control room, for the two new SWRB transfer pumps provided by the South Plume subproject.

The Task 2 work shown on P&ID Sheet No. P-13 includes the following:

- New 6-inch FRP electric heat traced, insulated, aluminum jacketed piping from discharge of Storm Sewer Lift Station (SSLS) pumps to three tanks in the General Sump.
- Connection from existing 6 inch SWRB force main to the new 6 inch line to the General Sump.
- This will provide for recovery of spills from Manhole 34 or SWRB without interrupting discharge from the General Sump to the 12-inch wastewater force main.

TASK 3 - AWWT FACILITY

The AWWT process is shown diagrammatically on PFD Sheet No. P-18. Parts of the facility will be described in following sequence, with reference to the listed P&IDs:

- Storm Water/Groundwater Influent (Phase I) - P&ID Sheet No. P-12.
- Wastewater Influent (Phase II) - P&ID Sheet Nos. P-13 and P-14.
- Liquid Alum System - P&ID Sheet No. P-19.
- TRU/Clear Supply - P&ID Sheet Nos. P-20, P-21, and P-22.
- Caustic Supply - P&ID Sheet Nos. P-24 and P-27.
- Acid Supply - P&ID Sheet Nos. P-25, and P-27.
- 400 GPM Wastewater Pretreatment (Phase II) - P&ID Sheet Nos. P-27, P-28, and P-30.
- Ion Exchange System (Spec. 02902-3501) - P&ID Sheet Nos. P-31, P-40, and P-41.
- Ion Exchange System Tie Points and Vent Scrubber - P&ID Sheet No. P-32.
- Eluate Treatment and Waste Slurry Pumping to Plant 8 - P&ID Sheet Nos. P-33, P-34 and P-35.
- 700 GPM Ground/Storm Water Pretreatment (Phase I) - P&ID Sheet Nos. P-36, P-37, and P-39.
- AWWT Discharge - P&ID Sheet No. P-44.
- Centralized Sampling System - P&ID Sheet No. P-45.
- Steam and Condensate - P&ID Sheet No. P-46.
- Compressed air - P&ID Sheet No. P-47.
- Treated Water and Cooling Water - P&ID Sheet No. P-48.

Storm Water/Groundwater Influent (Phase I). The Task 3 work shown on P&ID Sheet No. P-12 includes extension to Building 51 control room of SWRB Valve House controls for selection of storm water or South Plume groundwater to be pumped to the 700 GPM treatment train of the Building 51 AWWT. In a year of average rainfall (41 inches), 700 GPM of storm water would be pumped 182 days; the other 183 days, 700 GPM of South Plume groundwater would be pumped from the SWRB Transfer Pump Station to the 700 GPM treatment train of the Building 51 AWWT. The Task 3 work includes underground 10-inch high density polyethylene (HDPE) piping from the South Plume subproject tie point TP56 to the AWWT, and underground 24-inch HDPE piping from the AWWT to the South Plume subproject tie point TP73.

Wastewater Influent (Phase II). The Task 3 work shown on P&ID Sheet No. P-13 includes the new 8 inch electric heat traced, insulated, aluminum jacketed piping to Building 51 from underground tie point TP65 in the existing 12-inch wastewater force main near the existing electrically operated valves (EOVs) at intersection of 1st Street and "B" Street. The 12-inch force main collects wastewater from the BDN-ETS (average 76 GPM, peak 132 GPM), General Sump (average 52 GPM, peak 368 GPM) and STP (Average 122 GPM, peak 257 GPM). Thus the wastewater flow in the 8 inch piping to Building 51 totals 250 GPM average and 757 GPM peak. The Task 3 work shown on P&ID Sheet No. P-14 includes the new underground piping to the new STP lift station from underground tie point TP67 in the STP discharge piping to Manhole 175. The new lift station will be a wet well with two submersed slide rail coupling centrifugal pumps (one stand by). The pump discharge flow will be controlled according to the level of water in the wet well. The pump discharge is carried by aboveground 6 inch electric heat traced, insulated, aluminum jacketed piping to underground tie point TP68 in the 12-inch wastewater force main near Manhole 175. Locked post indicator valves (PIVs) will be installed for the present mode of operation to continue until the AWWT is completed.

Liquid Alum System Provisions are included to use alum as an alternative coagulant. As shown on P&ID Sheet No. P-19, liquid alum, 28 weight percent $Al_2(SO_4)_3$, will be pumped out of the truck tank into the 7500 gallon Alloy 20 storage tank in Building 51. One 25 ton delivery occupies 4280 gallons. Three metering pumps (one swing) transfer alum to the two mix tanks shown on P&ID Sheet No. P-21, at the rate of 0.05 to 0.4 gallon of liquid alum per 1000 gallons of water being treated. The alum storage tank and metering pumps are in an 8000 gallon containment which adjoins the acid feed tank containment in Building 51. A spill recovery and a duplex filter recovery pump is provided for the alum and acid containments.

TRU/Clear Supply. As shown on P&ID Sheet No. P-20, TRU/Clear coagulant will be delivered by truckload at the north truck door of the north wing of Building 51. A hydraulic dock lift will be installed, so the truck may be unloaded using a manual pallet truck. The TRU/Clear powder will be received in 55-gallon clamp top steel drums with an inner envelope to protect the powder from humidity. As the TRU/Clear (active ingredient potassium ferrate) is a Class 2 oxidizer, special construction is provided for its storage room. The storage room in the north wing of Building 51 will have capacity for 120 drums of TRU/Clear. The storage room also serves as the air lock for the adjoining low humidity room in which the drums are opened. Dry air is supplied to the two rooms to maintain less than 30% R. H. in the drum opening room. Drums are unloaded by a vacuum wand. Air from the dust control hood is drawn through the Dust Scrubber (P&ID Sheet No. P-22). Three to six drums would be emptied each day.

As shown on P&ID Sheet No. P-21, TRU/Clear powder from the vacuum receivers will be dropped into two weigh tanks which supply the two weigh feeders. Each weigh feeder supplies a mix tank where TRU/Clear is mixed with pH 11.5 water at the rate of 0.6 to 1.0 pound of TRU/Clear per 1000 gallons of water. One mix tank treats wastewater from the 400 GPM treatment train. The other treats ground/storm water from the 700 GPM treatment train. The TRU/Clear mixtures are pumped to the clarifiers.

As shown on P&ID Sheet No. P-22, 3000 CFM of TRU/Clear dust control exhaust air is scrubbed in a venturi scrubber using recirculated high pH water. Scrub water blowdown is dropped to the two mix tanks. Exhaust air from the venturi scrubber passes through a second scrubber using bubble cap trays washed with treated water to remove any high pH mist from the air. The scrubbed air then passes through a demister and reheater to the exhaust fan and exhaust stack through the high bay roof of Building 51.

Caustic Supply. One of the existing 20,000 gallon carbon steel ammonia tanks east of Building 51 will be used for storage of 20% NaOH. The existing tank truck unloading apron and storage tank containment will be used for unloading and storage of caustic. As shown on P&ID Sheet No. P-24, 50% NaOH will be pumped from the tank truck to an in-line mixer in which the 50% NaOH is blended with treated water and 20% NaOH recirculating through a heat exchanger to provide cooling during summer months. The resulting 20% NaOH flows to the storage tank. During cold winter weather, the caustic will be recirculated through the heat exchanger to keep the storage tank temperature above the - 13F freezing point of 20% NaOH. The 20% NaOH is pumped from storage to the feed tank shown on P&ID Sheet No. P-27. The feed tank and pumps are located beside the heat exchanger inside Building 51, and distribute 20% NaOH to the users. One 25 ton delivery of 50% NaOH would be unloaded every 5 to 6 days, and diluted to 12,500 gallons of 20% NaOH. 80 percent of the caustic will be used for pH adjustment required by TRU/Clear, and 20 percent for IX eluate treatment.

Acid Supply. New tank truck unloading, acid storage, and containment facilities will be provided east of Building 51, and separate from the caustic facilities. As shown on P&ID Sheet No. P-25, sulfuric acid (50 to 100% H_2SO_4) will be pumped out of the truck tank into the electric heat traced, insulated, stainless steel jacketed Alloy 20 storage tank. Spill recovery pumps and a duplex filter are provided for spill sump and acid storage tank containment. Acid is pumped from storage to the acid feed tank inside Building 51, and to the Ion Exchange System tie point in the west wing of Building 51. As shown on P&ID Sheet No. P-27, strong acid is pumped from the feed tank to the users other than the Ion Exchange System. One 25 ton delivery of 50% H_2SO_4 (4280 gallons) would be unloaded every 4 to 5 days.

400 GPM Wastewater Pretreatment (Phase II). As shown on P&ID Sheet No. P-27, wastewater (250 GPM average, 757 GPM peak) flows to the first Equalization Tank where caustic is added for pH 11.5. Other streams, such as sump pump discharges, are delivered separately to the first Equalization Tank in the dilute caustic containment south of Building 51.

The sump pump discharges are principally the rain water falling on the east and south containments, the east acid storage tank containment, and the roof over the acid and alum tank truck unloading containment. In a year of average rainfall (41 inches), the rain water collected would average 3500 gallons per day (2.5 GPM). Five inches of rain would total 156,000 gallons, equaling 108 GPM for 24 hours. The sump pump discharges also include washdowns from all containments, inside and outside of Building 51.

Also received separately by the first Equalization Tank is the barren sodium sulfate solution from the IX eluate treatment system (3.4 GPM average, 40 GPM peak). This will contain up to 4.3 percent Na_2SO_4 depending on the concentration of sulfuric acid in the strongest eluant used for IX resin regeneration.

Wastewater having pH 11.5 is pumped from the first 75,000 gallon Equalization Tank to the adjacent 75,000 gallon pH Holding Tank. The wastewater levels in the two tanks are managed so as to accommodate the first shift peak in flow of STP effluent. From the pH Holding Tank, 400 GPM is pumped to the TRU/Clear mix tank inside Building 51.

As shown on P&ID Sheet No. P-28, 400 GPM from the TRU/Clear mix tank flows to the clarifier, containing 0.6 to 1.0 pound of TRU/Clear per 1000 gallons of wastewater. The clarifier underflow is drawn through one of the screens protecting the pumps from objects dropped into the open top clarifier. The clarifier underflow pump will discharge to the nearby slurry surge tank, shown on P&ID Sheet No. P-35. The clarifier overflow is pumped through a multi tube filter inside Building 51. Part of the filtrate is saved for backwashing the filter, automatically, one tube at a time. The backwash slurry (1200 GPD) will flow to the slurry surge tank. The clarifier underflow and filter backwash slurry are expected to contain about 2.2 pounds of uranium daily.

As shown on P&ID Sheet No. P-30, the multi tube filtrate flows through the carbon filters, inside Building 51, to the pH8 adjustment module in the neutral containment south of Building 51. The pH adjustment module includes an in-line mixer, a tank, and two pumps, one being a standby for the other. The pH of the water is monitored as it is pumped from the tank. If the pH is not acceptable, flow is stopped. The tank has enough free board for the upstream flow to continue without interruption for 10 minutes while the pH is corrected by Building 51 control room attendants. Strong sulfuric acid is metered into the mixer to lower the pH from 11.5 to 8. 400 GPM of pH8 wastewater is pumped through the Ion Exchange System shown on P&ID Sheet No. P-31.

Ion Exchange System. The design, fabrication, assembly, and installation of the Ion Exchange System is provided under separate Specification No. 02902-3501, including equipment interconnecting piping, manual valves, automated valves, instrumentation, control panel, pump motor control, access stairs and walkways, and electric heat tracing and insulation of outdoor piping, tanks, and pumps. The Ion Exchange System includes a resin removal and replacement unit, capable of removing spent resin, draining it, and loading it into clamp top drums. This unit will be capable of hydraulically placing fresh resin in the IX vessels, and will also be capable of removing spent carbon from, and loading fresh carbon into, the carbon bed vessels.

Separate IX modules are provided for the 400 GPM wastewater and the 700 GPM ground/storm water. Spec. No. 02902-3501 allows other IX configurations different from the following shown on P&ID Sheet Nos. P-31, P-40 and P-41. Nine IX resin vessels, six regeneration work tanks, and four regeneration pumps are included. The IX resin vessels are in the west wing of Building 51, and the regeneration work tanks and pumps are in the dilute acid containment south of the west wing.

Three IX resin vessels, three regeneration tanks, and two pumps (one standby) are for 400 GPM wastewater, the others are for 700 GPM storm water/groundwater. 400 GPM of pH8 wastewater will flow through two IX resin vessels, in lead/lag series, to the discharge pH adjustment module shown on P&ID Sheet No. P-44. The third IX resin vessel is available for regeneration.

700 GPM of pH8 storm water/groundwater will be split into 350 GPM streams, each flowing through two IX resin vessels, in lead/lag series, to the discharge pH adjustment module shown on P&ID Sheet No. P-44. The other two IX resin vessels are available for regeneration.

Two of the IX resin vessels will be regenerated each week. Less than 15 pounds uranium will be removed from each vessel. Regeneration of one vessel requires three shifts. The regeneration procedure is initiated manually and is automatically controlled. Eluants are made up by adding strong sulfuric acid to eluate saved from previous regeneration steps. The strongest acid elution is followed by washing with treated water. Each step requires recirculation of eluant through the IX resin vessel being regenerated. Between steps, compressed air is used to drain the IX resin vessel. The eluate having the highest concentration of uranium is pumped to one of the two receivers shown on P&ID Sheet No. P-33. The other eluates are saved in the work tanks for regeneration of the next IX resin vessel. The eluate from regeneration of the 400 GPM IX resin vessels is expected to contain an average of 1.5 pounds uranium daily. The eluate from regeneration of the 700 GPM IX resin vessels is expected to contain an average of 1.4 pounds of uranium daily.

<u>The Exchange System Tie Points and Vent Scrubber.</u> The piping tie points between the AWWT-Ion Exchange System and the other parts of the facility are shown on P&ID Sheet No. P-32. Air vented frofm the IX resin vessels, regeneration work tanks , and eluate receivers (217 CFM peak) discharges through the vent scrubbing module located in the neutral containment South of Building 51. The air first passes up the packed tower, down which pH 11.5 water is circulated. The air then passes up the bubble cap tray tower, down which treated water flows. Water from the bubble cap tray tower flows through a liquid seal to the base chamber of the packed tower. The exhaust air blower discharges up the vertical stack. Spent pH 11.5 scrubwater from the packed tower (2 GPM peak) discharges into the trench drain to the South Sump.

<u>Eluate Treatment and Waste Slurry Pumping to Plant 8</u>. As shown on P&ID Sheet No. P-33 IX eluate is pumped from one of the receivers in the dilute acid containment south of Building 51 to the eluate treatment system inside Building 51. At the rate of 40 GPM, eluate flows first through the in-line mixer, where 20% NaOH is added, then through the heat exchanger, and the heated mixture flows to the first precipitator, from which slurry overflows to the second precipitator. From the second precipitator, slurry is pumped through a second in-line mixer, to the thickener shown on P&ID Sheet No. P-34. Dilute caustic is added in the two precipitators and in the second in-line mixer.

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
W. O. 02902-35
May 29, 1992

As shown on P&ID Sheet No. P-34, 40 GPM of pH 7 slurry flows to the inclined plate thickener. Thickener underflow (50 GPD average, 0.5 GPM peak) is pumped to the slurry surge tank. The thickener underflow is expected to contain an average of 2.9 pounds of uranium daily. Thickener overflow is pumped to the recycle tank in the neutral containment south of Building 51. Barren sodium sulfate solution at pH7 is pumped (at 3.4 GPM average) from the recycle tank to the first Equalization Tank of the 400 GPM wastewater treatment train.

As shown on P&ID Sheet No. P-35, waste slurry collected in the slurry surge tank is pumped to Plant 8. The waste slurry will have pH 11.5, and is expected to contain an average of 8 pounds of uranium daily.

700 GPM Ground/StormWater Pretreatment (Phase I). From the SWRB Transfer Pump Station, 700 GPM flows to the pH 11.5 adjustment module shown on P&ID Sheet No. P-36. The 700 GPM pH 11.5 adjustment module also separately receives the backwash slurry from the discharge multi tube filter (P&ID Sheet No. P-44).

The 700 GPM ground/storm water is pumped to the TRU/Clear mix tank inside Building 51, to produce 700 GPM pH 11.5 ground/storm water containing 0.6 to 1.0 pound of TRU/Clear per 1000 gallons. As shown on P&ID Sheet No. P-37, half of this stream flows to each of the two 85,000 gallon clarifiers, next to the 700 GPM pH 11.5 adjustment module, in the dilute caustic containment south of Building 51. The clarifier overflow is pumped through the multi tube filter inside Building 51. Backwash slurry from this filter (2250 GPD) and the clarifier underflow are pumped to the waste slurry surge tank, carrying an average of 2.9 pounds of uranium daily.

The multi tube filtrate flows through the carbon filters in the west wing of Building 51 and to the pH8 adjustment module in the neutral containment south of Building 51. As shown on P&ID Sheet No. P-39, the 700 GPM pH8 storm water/groundwater is pumped through the IX resin vessels.

AWWT Discharge Water. As shown on P&ID Sheet No. P-44, 400 GPM wastewater IX effluent flows directly to the pH adjustment tank in the neutral containment south of Building 51. 700 GPM ground/storm water IX effluent flows to the in-line mixer, where 20% NaOH is added to raise the pH to 8. Two mixing/recycle pumps (one swing) circulate 2000 GPM through the tank for thorough mixing of the water. The combined effluents (1100 GPM) are pumped through the multi tube filter, inside Building 51, to the AWWT discharge tie point TP-73, in the underground 24 inch HDPE piping of the South Plume subproject (P&ID Sheet No. P-12). The backwash slurry from the multi tube filter flows to the first tank of the 700 GPM pH 11.5 adjustment module.

Centralized Sampling System. As shown on P&ID Sheet No. P-45, separate 1/2 inch Teflon tubing to the central sampling station is provided from each of 11 sample points in the containments south of Building 51, each of 11 sample points in the IX System, and each of 6 other sample points inside Building 51. The three 3/4 inch Alloy 20 uranium analyzer sample lines from the IX System also extend to the central sampling station, and are extended to the nearby Control Room, where the uranium analyzer is located, with a return line back to the central sampling station sink. The central sampling station is located along the wall (Grid Line C-7/D-7) above the trench drain from the carbon filter area of the west wing inside Building 51. The central sampling station sink empties into the trench drain which in turn empties into the South Sump.

Steam and Condensate. As shown on P&ID Sheet P-46, steam is received from the existing 6 inch 150 psig steam supply main on the pipe rack outside the northeast corner of Building 51. Full pressure steam is supplied to the eluate heater which operates one to three shifts each week. The condensate from the eluate heater discharges to the flash tank, where 25 psig is maintained. Full pressure steam is also supplied to the pressure reducing station PCV-651 which supplies 25 psig steam to the steam hose stations, the caustic heater, and the scrubber exhaust reheater. 25 psig steam is also supplied by the flash tank. Excess 25 psig steam is vented from the flash tank to the atmosphere. Condensate from the flash tank, and condensate from the 25 psig steam traps discharge to the condensate receiver, and is pumped into the existing condensate return main on the pipe rack outside the northeast corner of Building 51.

Compressed air. As shown on P&ID Sheet No. P-47, breathable compressed air is supplied from the existing breathing air supply (SA) inside Building 51. Breathing air is supplied to respirator hose stations in the TRU/Clear drum opening room and on the three levels above, in the high bays of the north wing of Building 51.

Plant air for the east unloading and acid storage area is supplied from the existing plant air supply main on the pipe rack outside the northeast corner of Building 51. Plant air is supplied to 3 hose stations, to caustic unloading, to acid unloading, to alum unloading, and four air-driven spill and acid transfer pumps.

Plant air for purging the TRU/Clear weigh tanks, for the air-driven spill pump inside Building 51, for the vacuum receivers, for the IX System, and for compressed air hose stations inside Building 51 and in the south containments is supplied from the existing plant air filter inside Building 51.

Treated Water and Cooling Water. As shown on P&ID Sheet No. P-48, cooling water is supplied from the existing cooling water supply main in Building 51, to the caustic heat exchanger, for removing heat of dilution during unloading of caustic, received at 50% NaOH and stored at 20% NaOH. Cooling water from the heat exchanger is discharged to the existing cooling water return main in Building 51.

Treated water is supplied from the existing treated water (TW) supply main in Building 51, to hose station inside Building 51, and to the treated water tank in the neutral containment south of Building 51. Two treated water pumps (one swing) supply treated water to the caustic dilution mixer (160 GPM peak), to the IX System (200 GPM peak), to the scrubbers, and to treated water hose stations in the east acid unloading and storage containments, and in the containments south of Building 51.

APPENDIX A

ENGINEERING REPORT

for

ADVANCED WASTEWATER TREATMENT FACILITY

Prepared by:

F. L. JOHNSTON

WESTINGHOUSE ENVIRONMENTAL MANAGEMENT COMPANY OF OHIO

and

A. M. KINNEY, INC.

CONSULTING ENGINEERS

PERMIT TO INSTALL APPLICATION - ENGINEERING REPORT FOR ADVANCED WASTEWATER TREATMENT FACILITY - FEMP

A. SUMMARY

The Advanced Wastewater Treatment Facility (AWWT) will provide advanced technology for uranium removal from designated wastestreams. The facilities proposed in this application will consist of two parallel treatment streams. One stream (Phase I) will address treatment of 700 gpm of stormwater runoff from the Storm Water Retention Basin (SWRB) and the Storm Sewer Lift Station (SSLS). (**NOTE:** The SSLS discharge; permitted outfall 1I000004604, will be discontinued thus allowing all collected stormwater from the process area to receive treatment in the AWWT facility.) When the level of stormwater in the SWRB is below a certain level the AWWT facility has the capability of receiving uranium contaminated groundwater. CERCLA Removal Action No. 3 "South Groundwater Contamination Plume Removal Action" provides for the pumping of groundwater back to the FEMP site for either direct discharge to the Great Miami River or for treatment through the AWWT when capacity is available. The second stream (Phase II) will address 400 gpm of process wastewater flow and future remediation wastewaters. A future stream (Phase III) will address additional flows originating from the remediation of groundwater. The combined capacity of the three phases of the AWWT may ultimately approach 7000 gpm. This Permit to Install Application is for Phases I and II only.

The principle driver necessitating the AWWT facility is U. S. DOE Order 5400.5 "Radiation Protection of the Public and the Environment". The overall goal of the order is to provide an ample amount of protection to both the public and the environment. The anticipated removals of uranium will bring the FEMP into compliance with this order.

B. DESCRIPTION OF THE WASTE GENERATION PROCESS

In July 1989, the FEMP ceased operating as a large scale integrated production facility supplying uranium metal used in the fabrication of fuel cores and target elements for nuclear reactors operated by the United States Department of Energy (DOE). The principal product from FEMP Operations was uranium metal in various physical forms. Although some derby metal (elemental uranium) was shipped directly to other DOE facilities, most of the production stream metal was cast into ingots and billets. The billets were shipped directly to other DOE user sites. The ingots were center drilled and surface-machined for offsite extrusion into tubes. Some extrusions were returned to the FEMP, where tube blanks underwent heat treating and fabricating into target element cores for use in DOE reactors at other locations. Other extruded material was further processed into fuel billets, at an offsite forge operation, for direct shipment to another DOE site. Both fuel cores and target elements were used in government reactors for the generation of electricity and the production of plutonium.

Current activities at the FEMP are devoted to cleanup and environmental remediation.

C. DESCRIPTION OF EXISTING WASTEWATER TREATMENT FACILITIES

C-1. Process Wastewaters

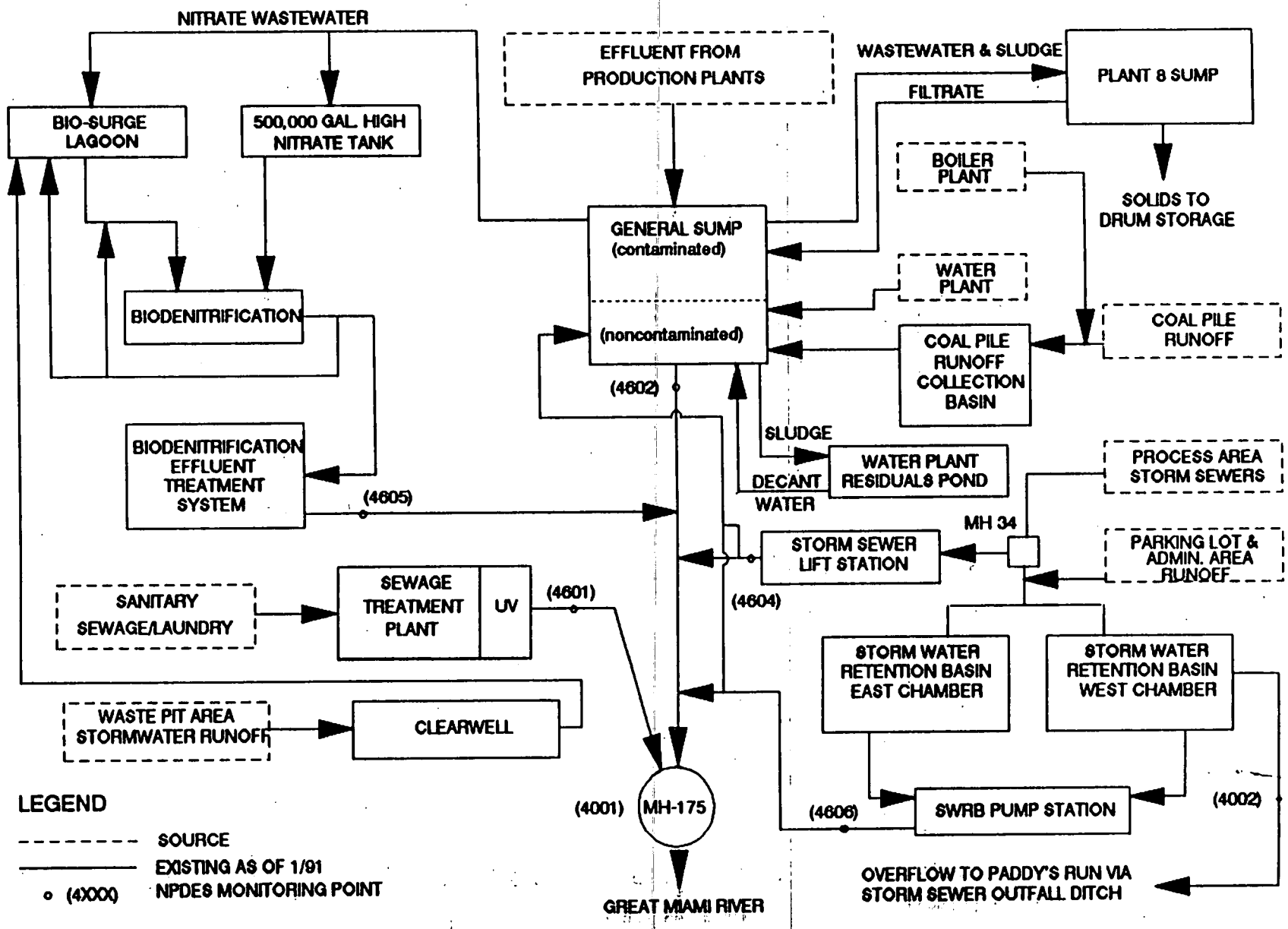
All uranium contaminated process wastewaters are initially treated at their source. The individual plants involved in the manufacturing or forming of uranium metal have the capability of collecting process wastewater and treating them to control the discharge of uranium to the FEMP wastewater treatment system (Figure 3). The plant sumps are systems of drains, trenches, pits, and tanks with associated piping, process and control equipment which collect, hold, treat, and release to the General Sump the industrial wastewater from the various chemical and metallurgical processes inherent to each plant. These sumps provide a means to chemically treat, filter, decant and sample wastewater streams prior to discharge to the General Sump. This allowed the plants to recover uranium residues for recycle, or discard, thus limiting the amount of uranium in the wastewater discharged to the General Sump. This also allowed the individual plants to neutralize wastewater effluents to an acceptable pH range before discharge to the General Sump. Standard Operating Procedures require the wastewaters discharged to the General Sump to meet certain specifications for uranium content and pH.

The General Sump is a tank farm which is principly a transfer facility but also has the capability to provide treatment consisting of neutralization, precipitation, and decant for large quantities of industrial wastewater. This facility is divided into a "uranium - contaminated side" and a "non-uranium - contaminated side". Uranium contaminated wastewaters are received and segregated based on the source of the wastewater. Segregation is primarily based on uranium content however, other pollutants may be considered, again, based on the source of the wastewater and the pollutants of concern. Uranium bearing wastewaters are routed to Plant 8. Treatment for uranium, heavy metals, and fluorides at Plant 8 consists of precipitation with lime, sedimentation, and filtration. Filtrate after treatment at Plant 8 is returned to the General Sump for sampling and eventual transfer to the Biodenitrification (BDN) Facility.

The BDN facility consists of the BDN Surge Lagoon (BSL), a High Nitrate Storage Tank (HNT), four BDN Towers, followed by the BDN Effluent Treatment System (NPDES outfall *4605). This facility accepts nitrate bearing wastewaters; collected stormwater runoff from the waste pit area including stormwater runoff currently collected in the Clear Well and from the future Waste Pit Area Runoff Control Project installed under CERCLA Removal Action #2; and effluent from the uranium-contaminated General Sump. During production combining the flows from the HNT and BSL provided the ability to dose the BDN Towers in such a way as to equalize the flows and nitrate concentration. The BDN Effluent Treatment System was installed specifically to treat the effluent from the BDN towers.

Each of the four BDN Towers is a fluidized bed of anthracite coal on which bacteria is attached. This bacteria is utilized to remove nitrates from wastewater by converting nitrate to gaseous nitrogen. The effluent from these towers contain a high concentration of BOD due primarily to excess methanol

FIGURE 3 - EXISTING WASTEWATER FLOW DIAGRAM - FEMP



feed. Methanol is used as the carbon source in the biological conversion of nitrate to nitrogen.

A treatment system, installed as CERCLA Removal Action #1 - "Perched Groundwater Under FEMP Buildings", is the Volatile Organic Chemical (VOC) treatment facility. This facility is constructed inside of Plant 8 for the purpose of treating perched groundwater contaminated with VOC's. Cartridge filters precede canisters of activated carbon which are used to adsorb VOC's. Effluent from this system is discharged to the Plant 8 Sump wastewater treatment system. It is planned to discontinue the use of this system when the AWWT facility is operational.

Wastewaters not contaminated with uranium undergo as necessary; aeration, precipitation with lime, and pH adjustment and are then discharged to MH-175 (NPDES outfall *4001) via NPDES outfall *4602). These types of wastewaters emanate from the Boiler Plant, Coal Pile Runoff Facility, decant from the Lime Sludge Ponds, and the future Electrodialysis Reversal water treatment system.

C-2. Sanitary Wastewaters

The Sewage Treatment Plant (STP) receives wastewater from the sanitary sewer system including wastewater from various drains, toilets, sinks, showers, etc. The STP also receives wastewater from the laundry facility which is a source of uranium contamination.

The sanitary sewer system consists of a network of underground pipes and manholes which transports collected sanitary wastewater. This network drains by gravity to the sewer paralleling First Street and ultimately to Manhole 101 and the Sanitary Lift Station. This lift station feeds the FEMP Sewage Treatment Plant.

The Sewage Treatment Plant consists of a headworks facility (comminution, bar screen, grit chamber), two primary clarifiers, two trickling filters, two final clarifiers, and an ultraviolet disinfection facility. Sludge generated is anaerobically digested then dried, drummed, and stored as a low-level radioactive waste. Sewage Treatment Plant effluent is discharged to MH-175 via NPDES outfall *4601.

C-3. Process Area Stormwater

Storm water runoff from the process area is collected in the storm sewer system and flows to Manhole 34 where it may be diverted to the Storm Sewer Lift Station (SSLS) (NPDES outfall *4604) or to the Stormwater Retention Basin (SWRB) (NPDES outfall *4606).

The Storm Sewer System consists of a network of underground piping. Runoff drains by gravity to an interceptor paralleling B Street and thence to Manhole 34 located just west of the Services Building (Building 11).

A 60-inch diameter storm sewer runs south from MH-34 to the Stormwater Retention Basin. A 15-inch concrete dam is currently located in the invert of this line. Stormwater is contained in the line by this dam which under normal

operation diverts storm water to the SSLS wet well when the SSLS pumps are activated. With the SSLS pumps activated, stormwater is discharged directly to MH-175. During a storm event, the SSLS pumps are deactivated which allows the stormwater to overflow the dam allowing all stormwater to flow to the SWRB. There is also the ability, upon detection of a spill entering the storm sewer system, to actuate a diversion valve located upstream of the SSLS discharge which routes the contaminated stormwater back to the General Sump for disposition. There are five strategically located continuous pH monitors in the storm sewer system. High and low pH is alarmed. These pH alarms provide the indication of contamination in the stormwater. (**NOTE:** A valve control system to better control the flow of stormwater to the basins and for controlling spill material which may enter the storm sewer system was recently issued a Ohio Permit to Install No. 05-5127. This will also accommodate the planned discontinuation of the SSLS discharge to MH-175)

The SWRB is divided into two chambers; the first of which was placed in operation in November 1986 and the second was placed into operation in December 1988. These chambers allow the settling of solids to occur, prior to discharge to the Great Miami River. The SWRB also has a permitted overflow, NPDES outfall *4002, when a storm event occurs such that the basin capacity is exceeded.

C-4. Groundwater

By the time the new Advanced Wastewater Treatment Facility is on line, groundwater, from near the leading edge of an off property plume of uranium contaminated groundwater, will be pumped back to the FEMP site to control the migration of this contamination. This work is being completed under CERCLA Removal Action No. 3 "South Groundwater Contamination Plume Removal Action" - Part 2. Part 3 of this same removal action will provide for the installation of an interim Advanced Wastewater Treatment System (IAWWT) consisting of two treatment units treating: 1) effluent from the Stormwater Retention Basin and 2) effluent from the BDN Effluent Treatment System prior to discharge through NPDES outfall *4605. This IAWWT will operate in the interim period until the Advanced Wastewater Treatment System is operational.

D. DESCRIPTION OF THE PROPOSED FACILITIES

The proposed facilities encompass two distinct tasks:

Process Area Stormwater Runoff Control Improvements. These improvements include work at the SWRB to provide automation of control gates and instrumentation in the AWWT control room (Building 51) for indication and control of stormwater to and from the SWRB chambers. This task also includes work in the process area for the piping of spills to the General Sump from Manhole 34 or the SWRB, without interrupting discharge from the General Sump to the 12-inch force main discharging to MH-175. More specifically, this work involves:

* Level indicators for the SWRB basins, with readout in the Building 51 control room.

* Motors on the two Hydrogate inlet half gates to the east and west SWRB chambers, with controls in the Building 51 control room. Power to the gates will come from the SWRB Valve House provided under the South Plume Removal Action #3 subproject.

* Motors on the three Waterman sluice gates to the wet well of the SWRB transfer pump station, with controls in the Building 51 control room and power from the SWRB Valve House.

* Controls in the Building 51 control room, for the two new SWRB transfer pumps provided by the South Plume subproject.

* A new 6-inch FRP electric heat traced, insulated, aluminum jacketed piping from the discharge of the Storm Sewer Lift Station (SSLS) pumps to the three tanks at the General Sump; Tanks 8, 9, and 14.

* Connection from the existing 6-inch SWRB force main to the new 6-inch line to the General Sump.

* Locked valve on the SWRB discharge to General Sump.

* Locked valve and emergency discharge line from the SWRB to the outfall force main for use only in an emergency to prevent a SWRB overflow at *4002.

* Discontinuation of the SSLS discharge to MH-175.

This work is shown on Plan Sheets P&ID P-12 and P-13 included in Appendix C.

The Advanced Wastewater Treatment Facility (AWWT). This facility will include equipment to remove radionuclides from FEMP wastewaters prior to discharge to the Great Miami River. The treatment steps are "TRU/Clear" coagulation (liquid alum as a backup system), clarification, filtration using multi-tube backwashing filters, carbon filters, and ion exchange with resin regeneration capability including eluate treatment.

The AWWT is separated into two parallel treatment streams: Phase I is a 700 gpm stream for treating stormwater/groundwater and Phase II is a 400 gpm stream for treating process wastewater and future remediation wastestreams. While these treatment streams are separate, the treatment scheme is identical for both streams. The AWWT facility is to be located at existing Building 51.

The AWWT facility is being bid under two separate contracts. The Ion Exchange system is being bid separately under Contract Specification 02902-3501 while the remaining equipment and site work is bid under Contract Specification 02902-3502. The Ion Exchange system contract was advertised for bid on March 27, 1992. The system is shown on P&ID P-31, 40, and 41 (Contract Drawings 02902-3501) while tie points into the AWWT facility are shown on P&ID P-32 (Contract Drawings 02902-3502). The contract advertised for the Ion Exchange system allows for alternative configurations.

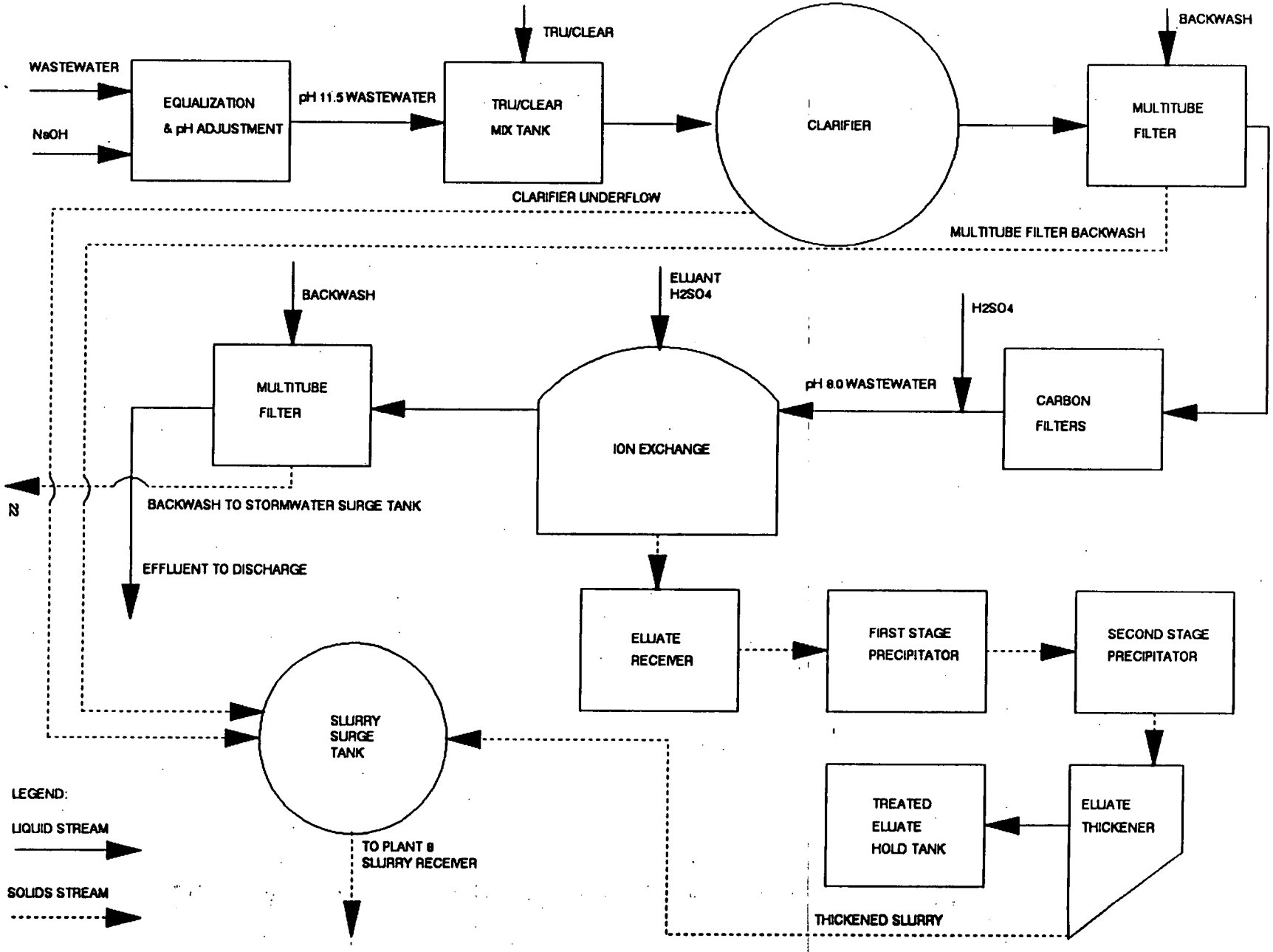
The AWWT scope of work is described below with reference to the applicable Piping and Instrumentation Diagrams (P&ID's).

* Stormwater/Groundwater influent (P&ID P-12)
* Wastewater influent (P&ID P-13 and P-14)
* Liquid alum system (P&ID P-19)
* "TRU/Clear" supply system (P&ID P-20, P-21, and P-22)
* Caustic supply system (P&ID P-24 and P-27)
* Acid supply system (P&ID P-25 and P-27)
* 400 GPM Wastewater pretreatment (P&ID P-27, P-28, and P-30)
* Ion Exchange system (Contract Specification 02902-3501 P&ID P-31, P-40, and P-41)
* Ion Exchange system tie points and vent scrubber (P&ID P-32)
* Eluate treatment and waste slurry pumping to Plant 8 (P&ID P-33, P-34, and P-35)
* 700 GPM Stormwater/Groundwater pretreatment (P&ID P-36, P-37, and P-39)
* AWWT discharge (P&ID P-44)
* Centralized sampling system (P&ID P-45)
* Steam and condensate (P&ID P-46)
* Compressed air (P&ID P-47)
* Treated water and cooling water (P&ID P-48)

D-1 Treatment Process Description

As stated, the AWWT system is two parallel treatment streams for handling 400 gpm (0.576 MGD) process wastewater and 700 gpm (1.008 MGD) stormwater/groundwater. Figure 4 shows a generic process flow diagram depicting the basic process flow of the process wastewater and stormwater/groundwater streams.

FIGURE 4 - AWWT PROCESS FLOW DIAGRAM



D-1.1 400 GPM Process Wastewater System

D-1.1.1 Influent Basis

Sewage Treatment Plant (STP) effluent	0.1750 MGD
General Sump effluent	0.0750 MGD
BDN Effluent Treatment System effluent	0.1100 MGD
Perched groundwater	0.0250 MGD
Groundwater/SWRB/future remediation streams	0.1710 MGD
Treated Water Hose Stations	0.0046 MGD
Scrubbers	0.0043 MGD
700 gpm IX Elution	0.0035 MGD
400 gpm IX Elution	0.0024 MGD
Caustic Dilution	0.0017 MGD
AWWT stormwater	0.0035 MGD
	0.576 MGD

Influent uranium = 2.4 lbs. uranium/day. This is based on 1990 and 1991 effluent data.

Process wastewater first enters the equalization tank (51-X155-TNK) where a 20% NaOH solution is added for pH adjustment to 11.5 (necessary for the "TRU/Clear" coagulant) and is then pumped to the pH hold tank (51-X156-TNK) to insure the proper pH is obtained. pH 11.5 wastewater is sent to the Mix Tank (51-X116-TNK) where "TRU/Clear" is added to obtain a wastewater mixture containing 0.6 to 1.0 lbs "TRU/Clear"/1000 gallons wastewater. This Mix Tank then discharges to the 85,000 gallon wastewater clarifier (51-X161-CLS) where solids separation by gravity occurs. Clarifier effluent is directed to the clarifier overflow tank (51-X162-TNK) which then discharges through a multi-tube filter (51-X170-FLT) followed by carbon filters (51-X200A-FLT, 51-X200B-FLT, and 51X-200C-FLT). These series of filters will remove any organic contamination that may be in the wastewater. Effluent from the carbon filters is mixed with H_2SO_4 in an in-line mixer which flows to a pH mixing tank to bring the pH down to 8.0 (necessary for the Ion Exchange units). 400 gpm of pH 8 wastewater will flow through two of the three Ion Exchange (IX) resin vessels (51-X211A-REAC, 51X-211B-REAC, and 51-X211C-REAC) in lead/lag series with the third vessel available for regeneration. The resin is an ion specific resin for uranium; DOWEX 21K. IX effluent flows to the pH mixing/recycle tank (51-X465-TNK) where it is combined with the stormwater groundwater IX effluent. This combined effluent is then pumped through the final multi-tube filter (51-X474-FLT) and discharged to the Great Miami River.

D-1.1.2 Uranium Removals

The clarification and multi-tube filters, prior to the IX step are estimated to remove 65% of the influent uranium. The IX system is estimated to remove 90% of the remaining uranium.

2.4 lbs. U/day X 65% = 1.56 lbs. U/day removed; 0.84 lbs. U/day to IX

0.84 lbs. U/day X 90% = 0.76 lbs. U/day removed; 0.08 lbs U/day to GMR

D-1.2 700 GPM Stormwater/Groundwater System

D-1.2.1 Influent Basis

Groundwater	0.440 MGD
Stormwater	0.568 MGD
	1.008 MGD

Influent uranium = 3.6 lbs. uranium/day. This is based on 1990 and 1991 effluent data for stormwater and an estimated 0.3 mg/l uranium in the groundwater.

Stormwater/Groundwater is pumped from the Stormwater Retention Basin Transfer Pump Station to the Ground/Storm water surge tank (51-X302-TNK) where a 20% NaOH solution is added for pH adjustment to 11.5 (necessary for the "TRU/Clear" coagulant) and is then pumped to the pH hold tank (51-X310-TNK) to insure the proper pH is obtained. pH 11.5 wastewater is sent to the Mix Tank (51-X117-TNK) where "TRU/Clear" is added to obtain a wastewater mixture containing 0.6 to 1.0 lbs. "TRU/Clear"/1000 gallons wastewater. The mix tank then discharges to a flow splitter which equally divides the flow to each of the two 85,000 gallon stormwater/groundwater clarifiers (51-X312-CLFR and 51-X313-CLFR). Clarifier effluent flows to the clarifier overflow tank (51-X317-TNK) and is then pumped through the multi-tube filter (51-X460A-FLT and 51-X460B-FLT) to the carbon filters (51-X332A-FLT, 51-X332B-FLT, 51-X332C-FLT, 51-X332D-FLT, 51-X332E-FLT). Effluent from the carbon filters is mixed with H_2SO_4 in an in-line mixer which flows to a pH mixing tank (51-X329-TNK) to bring the pH back down to 8.0 (necessary for the IX units). 700 gpm of pH 8 stormwater/groundwater is split into two, 350 gpm streams, each flowing through two IX resin vessels in lead/lag series. The other two IX vessels are available for regeneration (51-X337A-REAC, 51-X337B-REAC, 51-X337C-REAC, 51-X337D-REAC, 51-X337E-REAC, 51-X337F-REAC). Stormwater/groundwater IX effluent is combined with the process wastewater in the pH mixing/recycle tank (51-X465-TNK). This combined effluent is then pumped through the final multi-tube filter (51-X474-FLT) and discharged to the Great Miami River.

D-1.2.2 Uranium Removals

The clarification and multi-tube filters, prior to the IX step are estimated to remove 65% of the influent uranium. The IX system is estimated to remove 90% of the remaining uranium.

3.6 lbs. U/day X 65% = 2.34 lbs. U/day removed; 1.26 lbs U/day to IX

1.26 lbs. U/day X 90% = 1.14 lbs. U/day removed; 0.12 lbs U/day to GMR

D-1.3 Solids Handling System

Solids collected include multi-tube filter backwash, clarifier underflow, and solids produced in the IX Eluate Treatment System. These slurries are received in the waste slurry surge tank (51-X361-TNK) and pumped to the Plant 8 slurry receiver tank for eventual processing through the Plant 8 filtration system. Filter cake is drummed and handled as a radioactive waste while

filtrate is returned to the head of the AWWT system via the General Sump and the BDN system. Approximately 17.7 gpm of waste slurry, containing 5.8 lbs of uranium/day will be pumped to Plant 8.

D-1.3.1 Clarifier Underflow/Multi-tube Filter Backwash

The process wastewater clarifier sludge rake directs accumulated solids to the center of the clarifier. This slurry flows through underflow screens (51-X165-SEP and 51-X166-SEP) located upstream of the progressive cavity underflow pumps. These pumps discharge this underflow slurry to the waste slurry surge tank (51-X361-TNK).

A bleed stream from the process wastewater multi-tube filter (51-X170-FLT) effluent (located upstream of the process wastewater carbon filters) is used for the multi-tube filter backwash water. This bleed stream is diverted to a Backwash Water Tank (51-X173-TNK). Backwash is controlled automatically by a backwash controller, and is conducted one tube at a time. Approximately 1,200 GPD of backwash slurry will flow to the slurry surge tank. The combined clarifier underflow and filter backwash slurry is expected to contain approximately 1.56 lbs. of uranium/day.

The stormwater/groundwater clarifier's sludge rakes direct accumulated solids to the center of the clarifiers. This slurry flows through underflow screens (51-X315-SEP, 51-X316-SEP, and 51-X318-SEP) located upstream of the progressive cavity pumps. These pumps discharge this underflow slurry to the waste slurry surge tank (51-X361-TNK).

A bleed stream from the stormwater/groundwater multi-tube filters (51-X460A-FLT and 51-X460B-FLT)) effluent (located upstream of the stormwater/groundwater carbon filters) is used for the multi-tube filter backwash water. This bleed stream is diverted to a Backwash Water Tank (51-X461-TNK). Backwash is controlled automatically by a backwash controller, and is conducted one tube at a time. Approximately 2,250 GPD of backwash slurry will flow to the slurry surge tank. The combined stormwater/groundwater clarifier underflow and filter backwash slurry is expected to contain approximately 2.34 lbs. of uranium/day.

The multi-tube filter (51-X474-FLT) which receives process and stormwater/groundwater IX effluent prior to discharge to the Great Miami River is backwashed in a similar fashion. A bleed stream from the filter effluent is captured and stored in a Backflush Water Tank (51-X475-TNK). Backwash is controlled automatically by a backwash controller, and is conducted one tube at a time.

D-1.3.2 Ion Exchange Resin Regeneration

Separate IX modules are provided for the process wastewater and the stormwater/groundwater streams. There are a total of nine IX resin vessels, six regeneration work tanks, and four regeneration pumps. Three IX resin vessels, three regeneration work tanks (51-X220-TNK, 51-X221-TNK, 51-X222-TNK) and two regeneration pumps are used for the process wastewater stream while six IX resin vessels, three regeneration work tanks (51-X343-TNK, 51-X344-TNK,

51-X345-TNK) and two regeneration pumps are for the stormwater/groundwater stream.

Two of the IX resin vessels will be regenerated each week. Regeneration of one vessel requires three shifts. The regeneration procedure is initiated manually and is automatically controlled. Eluants are made up by adding strong sulfuric acid to eluate saved from previous regeneration steps. The strongest acid elution is followed by washing with treated water. Each step requires recirculation of eluant through the IX resin vessel being regenerated. Between steps, compressed air is used to drain the IX resin vessel. The eluate having the highest concentration of uranium is pumped to one of the two eluate receivers (51-X395-TNK and 51-X396-TNK). The other eluates are saved in the work tanks for regeneration of the next IX resin vessel. The eluate from the regeneration of the process IX resin vessels is expected to contain an average of 0.76 lbs. of uranium/day while the eluate from the stormwater/groundwater IX resin vessels is expected to contain 1.14 lbs. of uranium/day.

At a rate of 40 gpm, eluate is pumped from the eluate receiver tanks (51-X395-TNK and 51-X396-TNK) through an in-line mixer where 20% NaOH is added, then through a heat exchanger (51-X399-HTX). The heated mixture flows to the first stage precipitator (51-X406-TNK) followed by the second stage precipitator (51-X410-TNK). From the second precipitator, slurry is pumped through a second in-line mixer to the eluate thickener. Dilute NaOH is added in the two precipitators and in the second in-line mixer. 40 gpm of pH 7 slurry flows to the inclined plate thickener (51-X415-SEP). Thickener underflow (50 gpd) is pumped to the waste slurry surge tank. Thickener underflow is expected to contain 1.9 lbs. of uranium/day. Thickener overflow (treated eluate), containing barren sodium sulfate, is pumped to the recycle tank (51-X425-TNK). Barren sodium sulfate solution (Na_2SO_4) is produced during the reaction between sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH) according to the following reaction:

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$

This solution is pumped to the process wastewater equalization tank at a rate of approximately 3.4 gpm.

D-2 Ancillary Systems

D-2.1 "TRU/Clear" Supply System

"TRU/Clear" is a proprietary coagulant whose active ingredient is potassium ferrate. It is a Class 2 oxidizer and as such, special construction has been provided for it's storage including an air lock, controlled humidity, and dust control equipment.

"TRU/Clear" is received in powder form in 55-gallon drums. A vacuum wand is used to unload the drums; between three and six drums/day. Powder from the vacuum receivers (51-X100-RCV and 51-X101-RCV) will be dropped into two weigh tanks (51-X109-TNK and 51X-X110-TNK) which supply two weigh feeders. Each weigh feeder supplies a mix tank (51-X116-TNK and 51-X117-TNK) where

"TRU/Clear" is mixed with pH 11.5 wastewater at a rate of approximately 0.6 - 1.0 lbs/1000 gallons of wastewater. This mixture is then pumped to the clarifiers

D-2.2 Caustic Supply System

An existing 20,000 gallon carbon steel ammonia tank will be used for storage of 20% NaOH. The existing Building 51 tank truck unloading apron and storage tank containment will be used for unloading and storage of caustic. 50% NaOH will be pumped from the tank truck to an in-line mixer in which the 50% NaOH is blended with treated water and 20% NaOH recirculating through a heat exchanger to provide cooling during summer months. The resulting 20% NaOH flows to the storage tank (T-19X-3000). During cold winter weather, the caustic will be recirculated through the heat exchanger to keep the storage tank above the 13°F freezing point of 20% NaOH. The 20% NaOH is pumped from the storage tank to caustic feed tank (51-X145-TNK). From here 20% NaOH is distributed to users.

D-2.3 Sulfuric Acid Supply System

New acid unloading, storage, and containment facilities will be provided east of Building 51 and separate from the caustic supply facilities. Sulfuric acid (50 to 100%) will be pumped out of the truck tank into the heat traced, insulated, stainless steel jacketed Alloy 20 storage tank (51-X137-TNK). Acid is pumped from the storage tank to the Ion Exchange system and the acid feed tank (51-X148-TNK) which then supplies acid to other users.

D-2.4 Alum Supply System

A liquid alum (28% by weight $Al_2(SO_4)_3$) supply system is being provided as an alternate coagulant to "TRU/Clear". Alum is pumped from the truck tank to the alum storage tank (51-X193-TNK). When required, alum is metered into the mix tanks (51-X116-TNK and 51-X117-TNK) at a rate of 0.05 to 0.4 gallons of liquid alum/1000 gallons of wastewater. The alum storage tank and metering pumps are located inside an 8,000 gallon containment adjacent to the acid containment facilities.

D-2.5 Resin Removal and Replacement

Supplied with the Ion Exchange system is a hydraulic resin removal and replacement unit. This unit is capable of removing spent resin, draining it, and loading it into clamp top drums. It is also capable of hydraulically placing fresh resin into the Ion Exchange vessels. This unit will also be used for removing and replacing activated carbon from the carbon vessels.

D-3 Treatment System Equipment

Table 1 provides a listing of the equipment to be installed.

TABLE 1
ADVANCED WASTEWATER TREATMENT
EQUIPMENT LIST

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	CAPACITY	EQUIPMENT SIZE	P&ID REFERENCE
18-X100-PMP	EXISTING SWRB TRANSFER PUMP		SUBMERSIBLE	P-12
18-X101-PMP	EXISTING SWRB TRANSFER PUMP		SUBMERSIBLE	P-12
25-C101-PMP	STP LIFT STATION PUMP	300 GPM	SUBMERSIBLE	P-14
25-C102-PMP	STP LIFT STATION SWING PUMP	300 GPM	SUBMERSIBLE	P-14
51-X100-RCV	VACUUM RECEIVER		24" DIA. X 24" ST.S. 60x CONE W/12" FUNNEL OUT	P-21
51-X101-RCV	VACUUM RECEIVER		24" DIA. X 24" ST.S. 60x CONE W/12" FUNNEL OUT	P-21
51-X102-PMP	VACUUM PUMP	192 CFM @ 4" HG	4.4 GPM LIQUID FEED	P-21
51-X103-PMP	VACUUM PUMP	192 CFM @ 4" HG	4.4 GPM LIQUID FEED	P-21
51-X105-PSE	DUST HOOD		6'-0" X 4'-0"	P-20
51-X106-LFT	SCISSORS LIFT	5000 LBS	HYDRAULIC 72" X 96"	P-20
51-X107-PMP	TRANSFER PUMP	700 GPM	4 X 6	P-21
51-X108-PMP	TRANSFER PUMP	400 GPM	3 X 4	P-21
51-X109-TNK	WEIGH TANK	200 GALLONS	3'-0" O.D. X 3'-6" ST.S. 60x CONE BTM	P-21
51-X110-TNK	WEIGH TANK	200 GALLONS	3'-0" O.D. X 3'-6" ST.S. 60x CONE BTM	P-21
51-X111-PMP	TRANSFER SWING PUMP	700 GPM	4 X 6	P-21
51-X112-VLV	ROTARY VALVE	7.2 CUBIC FT/MIN	12"-12 RPM	P-21
51-X113-VLV	ROTARY VALVE	7.2 CUBIC FT/MIN	12"-12 RPM	P-21
51-X114-FDR	WEIGH FEEDER	42 LBS/HR	1 CUBIC FOOT EXTENSION & SCALE	P-21
51-X115-FDR	WEIGH FEEDER	42 LBS/HR	1 CUBIC FOOT EXTENSION & SCALE	P-21
51-X116-TNK	MIX TANK	1000 GALLONS	4'-0" O.D. X 12'-0" ST.S.	P-21
51-X117-TNK	MIX TANK	1000 GALLONS	4'-0" O.D. X 12'-0" ST.S.	P-21
51-X118-PMP	MIX PUMP	600 GPM	3" X 4"I	P-21
51-X119-PMP	MIX PUMP	900 GPM	4" X 5"	P-21
51-X120-VAC	VACUUM WAND		2" X 4'-6"	P-20
51-X121-ARM	CAUSTIC UNLOADING ARM	70 GPM	2" X 10 FT	P-24
51-X122-PMP	CAUSTIC UNLOADING PUMP	70 GPM X 120'	1 1/2 X 3-13 MT	P-24
51-X124-PMP	CAUSTIC PUMP	75 GPM X 80'	1 X 2-10 MT	P-24
51-X125-PMP	CAUSTIC SWING PUMP	75 GPM X 80'	1 X 2-10 MT	P-24
51-X126-MXR	CAUSTIC MIXER	275 GPM	4" X 3'-6"	P-24
51-X127-HTX	HEAT EXCHANGER	3,400,000 BTUH	10"O.D. X 8'-0" O.A.L., 70 SQ. FT.	P-24

51-X135-ARM	ACID UNLOADING ARM	70 GPM	2" X 10 FT.	P-25
51-X136-PMP	ACID UNLOADING PUMP	70 GPM X 100'	2 X 3 - 10 MT	P-25
51-X137-TNK	ACID STORAGE TANK	10,000 GALLONS	9'-0" X 25'-0" O.A.L.	P-25
51-X138-PMP	ACID TRANSFER PUMP	20 GPM X 75'	1 1/2", AIR	P-25
51-X139-PMP	ACID TRANSFER SWING PUMP	20 GPM X 75'	1 1/2", AIR	P-25
51-X140-PMP	SPILL PUMP	40 GPM X 75'	2", AIR	P-25
51-X141-FLT	DUPLEX FILTER	20 GPM	2" FLANGED	P-25
51-X142-SEP	ACID DEMISTER			P-25
51-X143-PMP	SPILL SWING PUMP	40 GPM X 75'	2", AIR	P-25
51-X144-PMP	WASTEWATER PUMP	400 GPM	3 X 4-10	P-27
51-X145-TNK	CAUSTIC FEED TANK	600 GALLONS	4'O.D. X 6.0 O.A.H.	P-27
51-X146-PMP	CAUSTIC PUMP	6 GPM	1'-6" X 3'-6"	P-27
51-X147-PMP	CAUSTIC SWING PUMP	6 GPM	1'-6" X 3'-6"	P-27
51-X148-TNK	ACID FEED TANK		4'O.D. X 5' T/T	P-27
51-X149-PMP	ACID PUMP	3 GPM	PIER 1'-6" X 3'-6"	P-27
51-X150-PMP	ACID SWING PUMP	3 GPM	PIER 1'-6" X 3'-6"	P-27
51-X151-PMP	EAST RAIN SUMP PUMP	40 GPM X 80'	VERTICAL CANTILEVER	P-27
51-X152-PMP	EAST RAIN SUMP SWING PUMP	40 GPM X 80'	VERTICAL CANTILEVER	P-27
51-X153-PMP	SOUTH SUMP PUMP	180 GPM X 80'	VERTICAL CANTILEVER	P-27
51-X154-PMP	SOUTH SUMP SWING PUMP	180 GPM X 80'	VERTICAL CANTILEVER	P-27
51-X155-TNK	EQUALIZATION TANK	75,000 GALLONS	25' O.D.X 24' O.A.H.	P-27
51-X156-TNK	PH HOLD TANK	75,000 GALLONS	25' O.D. X 24' O.A.H	P-27
51-X157-AGT	WASTEWATER AGITATOR			P-27
51-X158-PMP	WASTEWATER PUMP	400 GPM X 100'	3 X 4-13	P-27
51-X159-PMP	WASTEWATER SWING PUMP	400 GPM X 100'	3 X 4-13	P-27
51-X160-AGT	WASTEWATER AGITATOR			P-27
51-X161-CLFR	WASTEWATER CLARIFIER	85,000 GALLONS	40' O.D. X 10'-0" O.A.H.	P-28
51-X161-CLFR	WASTEWATER CLARIFIER (2ND MOTOR)			P-28
51-X162-TNK	OVERFLOW TANK	13,750 GALLONS	8' O.D. X 34' T/T	P-28
51-X163-PMP	OVERFLOW PUMP	450 GPM X 150'	3 X 4-13	P-28
51-X164-PMP	OVERFLOW SWING PUMP	450 GPM X 150'	3 X 4-13	P-28
51-X165-SEP	UNDERFLOW SCREEN		6" O.D. X 2' O.A.H.	P-28
51-X166-SEP	UNDERFLOW SCREEN		6" O.D. X 2' O.A.H.	P-28
51-X167-PMP	UNDERFLOW PUMP	10 GPM X 125'		P-28
51-X168-PMP	UNDERFLOW SWING PUMP	10 GPM X 125'		P-28
51-X170-FLT	MULTITUBE FILTER PACKAGE	400 GPM 1 MICRON	3564 IN} SURFACE 6 TUBES	P-28
51-X173-TNK	BACKWASH WATER TANK	1,000 GALLONS	5' O.D. X 7'-0" O.A.H.	P-28
51-X174-PMP	BACKWASH WATER PUMP	100 GPM X 173'	2 X 3-13, 254T	P-28
51-X175-PMP	BACKWASH WATER SWING PUMP	100 GPM X 173'	2 X 3-13, 254T	P-28
51-X180-SCB	DUST SCRUBBER	3,000 SCFM	28" O.D. X 91" L 80% FOR 1 MICRON	P-22

51-X181-SCB	MIST SCRUBBER	3,000 SCFM	6'-0" I.D. X 6'-0" ST.S. 4 BUBBLE CAP TRAYS	P-22
51-X182-TNK	SCRUBBER TANK	300 GALLONS	42" I.D. X 48" ST. SIDE HINGED LID	P-22
51-X183-AGT	AGITATOR	400 RPM 10" PROPELLER	PORTABLE CLAMP ON 3/4" DIA X 45" L SHAFT	P-22
51-X184-PMP	RECIRCULATION PUMP			P-22
51-X185-PMP	RECIRCULATION SWING PUMP			P-22
51-X186-FLO	FLOW SPLITTER	1 GPM PER PATH	5" W X 14" H X 20"L	P-22
51-X187-DMR	SCRUBBER EXHAUST DEMISTER	3,000 SCFM 98% REMOVAL AT 10 MICRONS	24" I.D.	P-22
51-X188-HTR	SCRUBBER EXHAUST REHEATER	3,000 SCFM, 66M BTU/HR	24" I.D. FINNED TUBE HEAT EXCHANGER-120 SQ. FT.	P-22
51-X189-FAN	EXHAUST FAN	3,000 SCFM AT 55" WC	13" INLET 11" OUTLET	P-22
51-X190-SEP	DUPLEX STRAINER	40 GPM 40 MESH	6" DIA. X 24" HT	P-22
51-X191-ARM	ALUM UNLOADING ARM	70 GPM	2"	P-19
51-X192-PMP	ALUM UNLOADING PUMP	70 GPM	2X3-10	P-19
51-X193-TNK	ALUM STORAGE TANK		HORIZONTAL 8' O.D. X 20' T/T	P-19
51-X194-PMP	METERING PUMP		2'-0" X 2'-3" PIER	P-19
51-X195-PMP	METERING PUMP		2'-0" X 2'-3" PIER	P-19
51-X196-PMP	METERING PUMP		2'-0" X 2'-3" PIER	P-19
51-X197-PMP	SPILL PUMP	20 GPM	1 1/2", AIR DIAPHRAGM	P-19
51-X198-FLT	DUPLEX FILTER	20 GPM	2" FLANGED	P-19
51-X200A-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-30
51-X200B-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-30
51-X200C-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-30
51-X203-MXR	MIXER			P-30
51-X204-TNK	PH MIXING/RECYCLE TANK	8,100 GALLONS	9 O.D. X 17' S.S.	P-30
51-X205-AGT	AGITATOR			P-30
51-X206-PMP	IX FEED PUMP	400 GPM X 160'	3 X 4-13, 284T	P-30
51-X207-PMP	IX FEED SWING PUMP	400 GPM X 160'	3 X 4-13, 284T	P-30
51-X216A-SCB	VENT SCRUBBER	220 CFM	ON SHOP ASSEMBLED SKID	P-32
51-X216B-SCB	MIST SCRUBBER			P-32
51-X217-FAN	SCRUBBER EXHAUST FAN	220 CFM	ON SKID WITH 51-X216-SCB	P-32
51-X218-PMP	SCRUBBER PUMP		ON SKID WITH 51-X216-SCB	P-32
51-X219-PMP	SCRUBBER PUMP		ON SKID WITH 51-X216-SCB	P-32
51-X228-TNK	CAUSTIC DILUTION TANK	400 GALLONS	4' O.D. X 5' S.S.	P-33
51-X230-PMP	DILUTE CAUSTIC FEED PUMP	20 GPM X 80'	1 X 2 - 10 MT	P-33
51-X296-PMP	TREATED WATER PUMP	200 GPM X 180'	PIER 2'-6" X 5'-6"	P-48
51-X297-TNK	TREATED WATER TANK	35,000 GALLONS	12' O.D. X 38'-6" S.S. HORIZ.	P-48
51-X298-PMP	TREATED WATER SWING PUMP	200 GPM X 180'	PIER 2'-6" X 5'-6"	P-48

51-X302-TNK	GROUND/STORM WATER SURGE TANK	17,000 GALLONS	12' O.D. X 20' S.S.	P-36
51-X303-AGT	GROUND/STORM WATER AGITATOR			P-36
51-X304-PMP	GROUND/STORM WATER PUMP	725 GPM	4 X 6-10	P-36
51-X305-PMP	GROUND/STORM WATER PUMP	725 GPM	4 X 6-13	P-36
51-X306-PMP	GROUND/STORM WATER SWING PUMP	725 GPM	4 X 6-13	P-36
51-X310-TNK	PH HOLDING TANK	11,750 GALLONS	10' O.D. X 20' O.A.H.	P-36
51-X311-AGT	AGITATOR			P-36
51-X312-CLFR	GROUND/STORM WATER CLARIFIER	85,000 GALLONS	40'-0" O.D. X 10'-0" O.A.H.	P-37
51-X312-CLFR	GROUND/STORM WATER CLARIFIER (2ND MOTOR)			P-37
51-X313-CLFR	GROUND/STORM WATER CLARIFIER	85,000 GALLONS	40'-0" O.D. X 10'-0" O.A.H.	P-37
51-X313-CLFR	GROUND/STORM WATER CLARIFIER (2ND MOTOR)			P-37
51-X314-FLO	FLOW SPLITTER	5400 GALLONS	3'W X 6'L X 4'H	P-37
51-X315-SEP	UNDERFLOW SCREEN		6" O.D. X 2' O.A.H.	P-37
51-X316-SEP	UNDERFLOW SCREEN		6" O.D. X 2' O.A.H.	P-37
51-X317-TNK	OVERFLOW TANK	13,750 GALLONS	8' O.D. X 34' T/T	P-37
51-X318-SEP	UNDERFLOW SCREEN		6" O.D. X 2' O.A.H.	P-37
51-X319-PMP	UNDERFLOW PUMP	10 GPM X 125'	PIER 1'-6" X 3'-6"	P-37
51-X320-PMP	UNDERFLOW PUMP	10 GPM X 125'	PIER 1'-6" X 3'-6"	P-37
51-X321-PMP	UNDERFLOW PUMP	10 GPM X 125'	PIER 1'-6" X 3'-6"	P-37
51-X322A-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-39
51-X322B-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-39
51-X322C-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-39
51-X322D-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-39
51-X322E-FLT	CARBON FILTER		6'-6" O.D. X 9' S.S.	P-39
51-X323-PMP	OVERFLOW PUMP	725 GPM X 150'	4 X 6-13	P-37
51-X324-PMP	OVERFLOW PUMP	725 GPM X 150'	4 X 6-13	P-37
51-X328-MXR	MIXER		8" DIA. X 2'-5" O.A.L.	P-39
51-X329-TNK	PH MIXING/RECYCLE TANK	14,600 GALLONS	12' O.D. 17'-4" O.A.L.	P-39
51-X330-AGT	AGITATOR			P-39
51-X331-PMP	IX FEED PUMP	725 GPM X 200'	4 X 6-17, 365TS	P-39
51-X332-PMP	IX FEED SWING PUMP	725 GPM X 200'	4 X 6-17, 365TS	P-39
51-X361-TNK	WASTE SLURRY SURGE TANK	17,000 GALLONS	12' O.D. X 20' O.A.H.	P-35
51-X362-AGT	WASTE SLURRY AGITATOR	230 RPM	(1) 24" IMPELLER	P-35
51-X363-PMP	WASTE SLURRY PUMP	30 GPM X 120'	1 1/2 X 3-13 MT	P-35
51-X364-PMP	WASTE SLURRY SWING PUMP	30 GPM X 120'	1 1/2 X 3-13 MT	P-35
51-X395-TNK	ELUATE RECEIVER	17,000 GALLONS	12' O.D. X 20 S.S.	P-33
51-X396-TNK	ELUATE RECEIVER	17,000 GALLONS	12' O.D. X 20 S.S.	P-33
51-X397-PMP	ELUATE TRANSFER PUMP	40 GPM X 110'	1 X 2 - 10 NMT	P-33
51-X398-PMP	ELUATE TRANSFER SWING PUMP	40 GPM X 110'	1 X 2 - 10 NMT	P-33
51-X399-HTX	ELUATE HEAT EXCHANGER	2,600,000 BTUH	8" DIA. X 8'-0" O.A.L. 37 SQ. FT.	P-33

51-X400-MXR	MIXER	40 GPM	2" X 2'-0"	P-33
51-X406-TNK	1ST STAGE PRECIPITATOR	2,400 GALLONS	8' O.D. X 6'-6" S.S. 17'-4" O.A.H. F & D BOTTOM	P-33
51-X407-AGT	AGITATOR	155 RPM	24" IMPELLER	P-33
51-X410-TNK	2ND STAGE PRECIPITATOR	2,400 GALLONS	8' O.D. X 5'-6" S.S. 17'-4" O.A.H. 60x CONE BOTTOM	P-33
51-X411-AGT	AGITATOR	230 RPM	21" IMPELLER	P-33
51-X412-PMP	PRECIPITATOR PUMP	40 GPM X 80'	1 X 2 - 10 NMT	P-33
51-X414-MXR	MIXER	40 GPM	2" DIA. X 1'-9" O.A.L.	P-33
51-X415-TNK	THICKENER TANK	40 GPM @ 100 PPM	9'-0"L X 6'-0"W X 10'-0"H	P-34
51-X418-PMP	UNDERFLOW PUMP	0.5 TO 3 GPM X 65'	1 1/2 X 2 X 3' O.A.L.	P-34
51-X419-PMP	OVERFLOW PUMP	40 GPM X 80'	1 X 2 - 10 MT	P-34
51-X423-PMP	TREATED ELUATE PUMP	50 GPM X 75'	2 X 3 - 8 MT	P-34
51-X424-PMP	TREATED ELUATE SWING PUMP	50 GPM X 75'	2 X 3 - 8 MT	P-34
51-X425-TNK	TREATED ELUATE TANK	35,000 GALLONS	12'-0" O.D. X 38'-6" S.S.	P-34
51-X456-TNK	FLASH TANK		2'-0" X 4'-0" T/T	P-46
51-X457-RCV	CONDENSATE RECEIVER	52 GALLONS		P-46
51-X458-PMP	CONDENSATE PUMP	25 GPM X 125'		P-46
51-X459-PMP	CONDENSATE PUMP	25 GPM X 125'		P-46
51-X460A-FLT	MULTITUBE FILTER	350 GPM 1 MICRON		P-37
51-X460B-FLT	MULTITUBE FILTER	350 GPM 1 MICRON		P-37
51-X461-TNK	BACKFLUSH WATER TANK	1000 GALLONS	5'-0" O.D. X 7'-0" S.S.	P-37
51-X462-PMP	BACKWASH PUMP	100 GPM X 173'	2 X 3-13, 254T	P-37
51-X464-PMP	BACKWASH PUMP	100 GPM X 173'	2 X 3-13, 254T	P-37
51-X465-TNK	PH MIXING/RECYCLE TANK	35,000 GALLONS	12' O.D. X 38'-6" T/T	P-44
51-X467-PMP	FILTER FEED PUMP	1,100 GPM X 150'	4 X 6-13, 364TS	P-44
51-X471-MXR	MIXER		8" DIA. X 2'-5" O.A.L.	P-44
51-X472-PMP	FILTER FEED SWING PUMP	1,100 GPM X 150'	4 X 6-13, 364TS	P-44
51-X474-FLT	MULTITUBE FILTER	1100 GPM 50 MICRON	3564 IN} SURFACE 6 TUBES	P-44
51-X475-TNK	BACKFLUSH WATER TANK	1,000 GALLONS	5'-0" O.D. X 7' S.S.	P-44
51-X476-PMP	BACKFLUSH PUMP	100 GPM X 173'	2 X 3-13, 254T	P-44
51-X477-PMP	BACKFLUSH SWING PUMP	100 GPM X 173'	2 X 3-13, 254T	P-44
51-X478-PMP	MIXING/RECYCLE PUMP	2,200 GPM	8 X 10-15	P-44
51-X479-PMP	MIXING/RECYCLE PUMP	2,200 GPM	8 X 10-15	P-44
T-19X-3000	EXISTING STORAGE TANK (CAUSTIC DILUTION)	20,020 GALLONS	11' O.D. X 32'-6" O.A.L.	P-24

APPENDIX B

EXERPTS FROM TEST PLAN REPORT

RESULTS OF DEMONSTRATION TEST FOR ION EXCHANGE ON FERNALD ENVIRONMENTAL MANAGEMENT PROJECT WASTEWATER

Prepared by:

DURATEK CORPORATION

Prepared for:

WESTINGHOUSE ENVIRONMENTAL MANAGEMENT COMPANY OF OHIO

Introduction:

DURATEK Corporation prepared a three volume report titled "Demonstration of Ion Exchange and Reverse Osmosis on FEMP Wastewater - Results of Task B Demonstration Test"; October 1991. A copy of the Test Plan for this demonstration was provided to OEPA - Southwest District Office on November 28, 1990. Exerpts from this report are being provided to document the results of this pilot study.

Volume 1 of this report contains:

* Executive Summary
* Administrative Information
* Background
* Description of the Demonstration Unit
* Information on the results - Preliminary Tests, Demonstration Tests, and Additional Tests.
* Conclusions
* References

This information is being provided. The balance of Volume 1 consists of Demonstration Unit operating procedures and analytical procedures. These procedures are not being provided but are available upon request.

Volume 2 consists of analytical results on various treatment flow schemes; used to determine the optimum process flow which then would be selected and tested fully. This volume is not being provided but is available upon request.

Volume 3 contains the Demonstration Unit analytical results for the selected process flow. It contains daily process data (approximately 300 pages) from January 21, 1991 through June 11, 1991. It also contains the results from Isotherm Tests, used to determine the ion exchange resin's saturation capacity for uranium and to estimate the effectiveness of the resin regeneration process in terms of the ability of the regenerated material to remove uranium from water. This volume is not being provided but is also available upon request.

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DEMONSTRATION OF ION EXCHANGE AND REVERSE OSMOSIS ON

FEMP WASTEWATER

RESULTS OF TASK B DEMONSTRATION TEST

for

Westinghouse Environmental Management Company of Ohio
P.O. Box 398704
Cincinnati, OH 45239-8704

Purchase Order No. 2-97577

DURATEK CORPORATION

8955 Guilford Road
Suite 200
Columbia, MD 21046

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EXECUTIVE SUMMARY

This is the final report on the Task B pilot-plant studies of the project: "Demonstration of Ion Exchange and Reverse Osmosis on FEMP Wastewaters." The final report on the Task A laboratory studies was provided earlier. The goal of this project has been to evaluate technologies and develop an effective and cost-efficient system for treating discharge waters from the Fernald Environmental Management Project (FEMP) in Fernald, Ohio.

A 10 gallon per minute (gpm) pilot-plant Demonstration Unit (DU) was designed and constructed, based on the results of the laboratory studies, for on-site evaluations at the FEMP. After a series of preliminary tests to determine the simplest combination of treatment technologies capable of meeting FEMP discharge goals, the DU was operated around the clock from mid-January through mid-June 1991. The feed to the DU during this long-term Demonstration Test was from Manhole 175, the final point for sampling water before discharge to the Great Miami River. The water at this point is an aggregate of all the water being discharged from the FEMP. This water contained an average uranium concentration of 1370 ppb, significantly exceeding the discharge goal of 20 ppb uranium.

The configuration of the DU during the demonstration test, based on the results of the optimization performed during the preliminary tests, was:

- Sand Filtration
- Ion Exchange (Dowex 21K media)
- Ion Exchange (Purolite A600 media)

The results of the demonstration test showed that this process stream effectively removed all the uranium. The sand filter lowered the uranium concentration to an average of 967 ppb. The Dowex 21K captured the remaining uranium, providing an effluent concentration of 0-2 ppb until breakthrough was approached. Breakthrough of this media, defined as the point where the effluent uranium concentration consistently remained above 20 ppb, occurred after treating 9,200 column volumes of water.

The Purolite A600 media was included in the process stream primarily to capture any heavy metals, such as chromium, which had been of concern during the laboratory tests. However, significant heavy metal contamination was not encountered during these tests.

The discharge water from the Demonstration Unit met all other FEMP goals. The concentrations of the contaminants regulated under the Safe Drinking Water Act

were all under their Maximum Contaminant Levels (MCL), except for nitrates. The effluent nitrates level was slightly above the MCL of 10 ppm but well within the NPDES requirement for the FEMP of 72.7 ppm (30 day average). The pH of the water was also within the limits prescribed in the SDWA. The Total Dissolved Solids and Total Suspended Solids levels were also under the FEMP discharge goals of 500 ppm and 30 ppm, respectively.

Several additional tests were performed - regeneration of the Dowex 21K media, isotherm tests on new and regenerated Dowex media, and Toxicity Characteristic Leach Procedure (TCLP) tests on the three media (sand, Dowex 21K, and Purolite A600) at the end of the Demonstration Test.

Regeneration of the Dowex 21K removed most of the uranium from this resin. The capacity of the regenerated material appeared to be about an order of magnitude lower than new Dowex 21K in the isotherm tests. However, the concentration of uranium in the water used to challenge the regenerated media was only 100 ppb, compared to 1100 ppb U in the water used to test the new media. This dramatic difference in the uranium levels of the challenge waters could be a significant factor in the apparent lower capacity of the regenerated Dowex 21K. In both cases, the challenge water came from Manhole 175 in which the uranium concentration was an uncontrolled variable. Another difference between the two challenge waters was the concentration of iron and manganese in the water. The water used to challenge the regenerated resin had significantly greater quantities of these ions than the water used to challenge the new resin. The data also show a significantly greater removal of these ions by the regenerated resin. Thus, the competitive removal of the iron and manganese could also have contributed to the observed lowering of uranium removal capability.

The TCLP tests of the spent sand, Dowex 21K, and Purolite A600 media were all negative. Thus, while these materials are radioactive (as a result of uranium captured), they are not hazardous.

The data obtained during this study are being used in the design of the Interim Advanced Wastewater Treatment and Advanced Wastewater Treatment systems for final treatment of FEMP waters before discharge to the Great Miami River.

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ADMINISTRATIVE INFORMATION

This work was conducted under Westinghouse Environmental Management Company of Ohio (WEMCO) Purchase Order No. 2-97577, "Demonstration of Ion Exchange and Reverse Osmosis on FEMP Wastewater." The WEMCO Project Manager was initially Marvin Gross. After Mr. Gross' transfer to another project, Robert Kneip became the WEMCO Project Manager. Mr. William Greenman was the Project Director and Dr. Stanley M. Finger was the Project Manager at Duratek Corporation. Major contributors to this project were Dr. S. Finger, G. Tinker, B. Groc, L. Colliere, and R. Mowad of Duratek Corporation; Drs. P. B. Macedo, M. Brandys, A. Alhedai, M. Adel-Hadadi, and N. Balitactac of the Catholic University of America Vitreous State Laboratory; and Mr. R. Quinn of R. Q. Associates.

BACKGROUND

The overall objective of this effort was the evaluation and demonstration of an effective and cost-efficient process scheme for treating discharge waters at the Fernald Environmental Management Project (FEMP) at Fernald, Ohio. The project was divided into two main tasks:

- Task A - Bench-scale evaluation of specific technologies as part of an overall treatment process.

- Task B - Process scheme optimization and on-site testing with a pilot-plant Demonstration Unit (DU) for the treatment of FEMP discharge waters.

This report details the results of the process scheme optimization and on-site long-term demonstration test, Task B of this project. The results of the Task A bench-scale evaluations were reported earlier(1).

The FEMP generates a wide variety of wastewaters, ranging from process water to stormwater runoff. Wastewaters are combined and monitored at the National Pollutant Discharge Elimination System (NPDES) discharge point located at Manhole 175. Specifically the following five streams constitute the flow monitored at Manhole 175:

- General Sump
- Biodenitrification (BDN) Facility

- Sewage Treatment Plant (STP)
- Stormwater Retention Basin (SWRB)
- Storm Sewer Lift Station (SSLS)

Stormwater runoff discharged via the SWRB and SSLS is the highest volume wat source in the Manhole 175 discharge. The stormwater runoff flow is highly variable a is relatively low in Total Dissolved Solids (TDS). The water from the General Sun is a relatively clean stream which results mostly from treated waste streams resulti from drinking water production and controlled coal pile stormwater runoff. The BD stream contains wastewater resulting from production facilities and controlled runc from waste storage units at the facility. The STP stream contains wastewater resulti mostly from sanitary water usage. The BDN and STP streams are the mc contaminated of the five, representing the greatest challenge to the treatment system terms of the amount of contaminants to be removed. Since Manhole 175 is the fi sampling point for all FEMP discharge streams, it represents a weighted avera composition and total flow rate of all the FEMP discharge waters.

The current practice is to treat water from process areas prior to discharge i the Great Miami River. Stormwater, which is tested before it is released, on the ot hand, is discharged with only settling prior to release. The combined discharge to river could normally contain up to 1-2 parts per million (ppm) uranium.

The FEMP is designing an Advanced Wastewater Treatment (AWWT) Plant treating the waters generated or collected at the facility. As an interim measure, Interim Advanced Wastewater Treatment (IAWWT) system is being developed for until the AWWT comes on line. This interim system will be used to remove urani from the SWRB flows to offset additional uranium loading to the Great Miami Ri that will result from the pumping of contaminated groundwater from the south plu area of the FEMP. The objective of this project is to develop an effective and cc efficient process for final treatment of the discharge water before it is released into river, providing critical input for the IAWWT and the AWWT systems.

The goal of these studies is to provide an effluent containing less than 20 p per billion (ppb) uranium and that all other contaminants in the discharge water within the Maximum Contaminant Levels (MCL) cited under the Safe Drinking W Act, as amended. It was also desired that the Total Dissolved Solids be below 500 p and the Total Suspended Solids be below 30 ppm.

The experimental program was designed with the following additional crit in mind, which are important for the development of an effective, reliable and c effective treatment system:

- Radioactive wastes separated from non-radioactive wastes to the maximum extent possible
- Volume of radioactive wastes minimized
- Treatment technologies and overall process "robust," i.e. minimally affected by wide variations in water composition and flow rate
- Process as simple and inexpensive as possible

These goals assure that the treatment system developed will be practical to operate as well as effective in removing residual contaminants in FEMP waters.

DEMONSTRATION UNIT

The Demonstration Unit (DU) was designed to allow for an effective evaluation of the process for final treatment of FEMP discharge waters. The DU system, housed in a trailer, provided the following technologies, as shown in Figure 1:

- Chemical Pretreatment
- Sand Filtration
- Ion Exchange (2 stages)
- Reverse Osmosis

The system was designed to also accommodate ozonation, if this treatment were required for organics removal. However, organics were not encountered in the FEMP water samples studied during the Task A bench-scale tests.

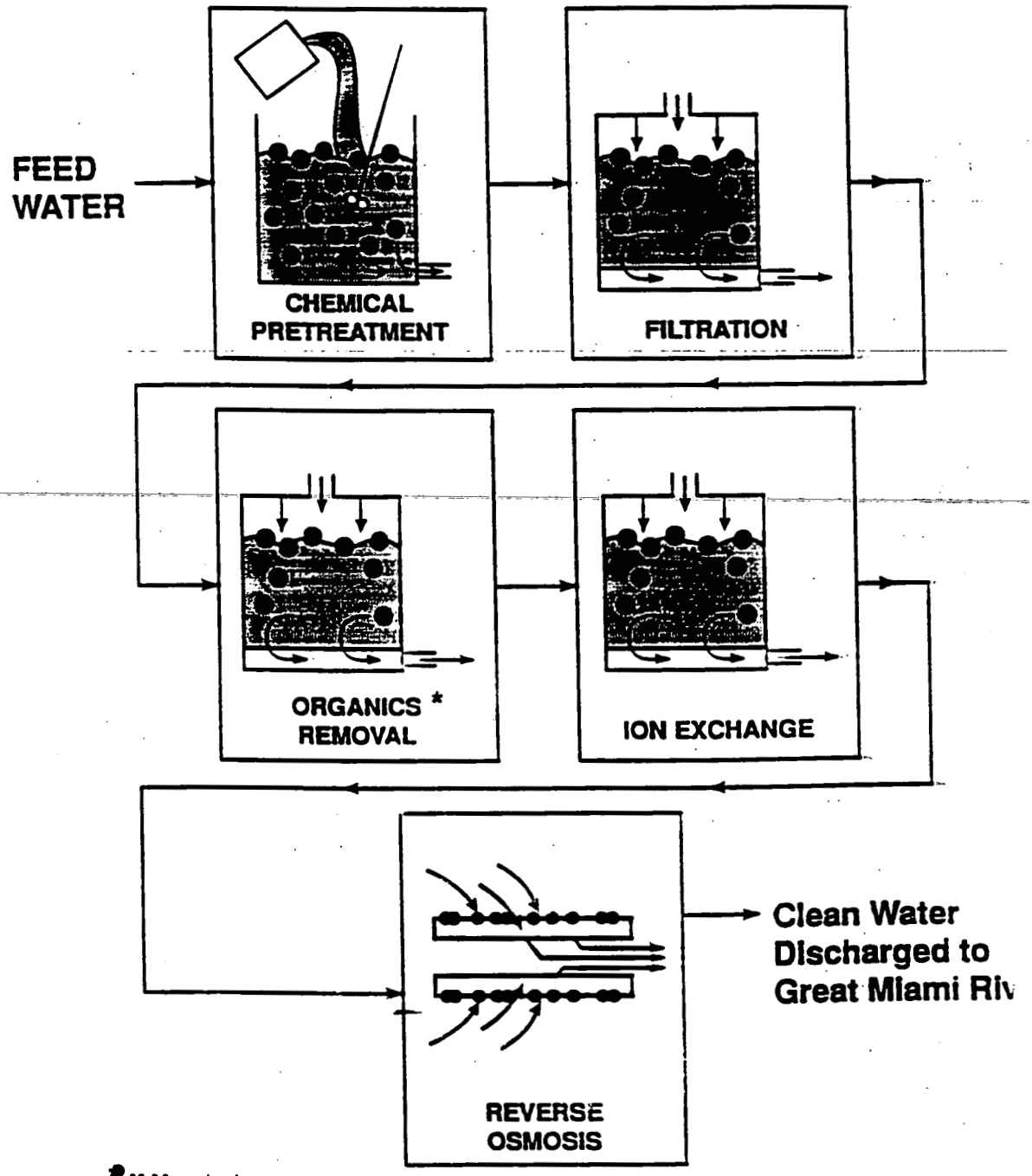
The DU is a 10 gpm continuous flow pilot-plant system operating on-site near Manhole 175. It is capable of drawing water either from Manhole 175 or from a 4,000 gallon feed tank adjacent to the DU trailer, Figure 2. This feed tank was used for running tests with water from the Stormwater Retention Basin. The feed pump could also be used to fill the feed tank from Manhole 175, as shown in the DU system piping diagram, Figure 3.

The feed water, either from the feed tank or Manhole 175, could be mixed with appropriate chemicals to precipitate dissolved solids and to coagulate precipitated and suspended solids. A combination of alum and PolyPure A-210 coagulant aid were found to be effective for chemical pretreatment during the earlier laboratory studies(1). The pretreatment chemicals were mixed with the incoming water by an in-line static mixer, as shown in Figure 4. The mixture is then fed into a coagulation/clarification tank with a two hour residence time to allow the suspended materials to settle to the bottom. Separated solids could be pumped periodically from the bottom of the tank into 55 gallon drums for drying.

Figure 1 - Flow Diagram

DURATEK CORPORATION

FMPC Advanced Wastewater Treatment Demonstration Un



* If Needed

Figure 2 - Demonstration Unit Trailer and Feed Tank

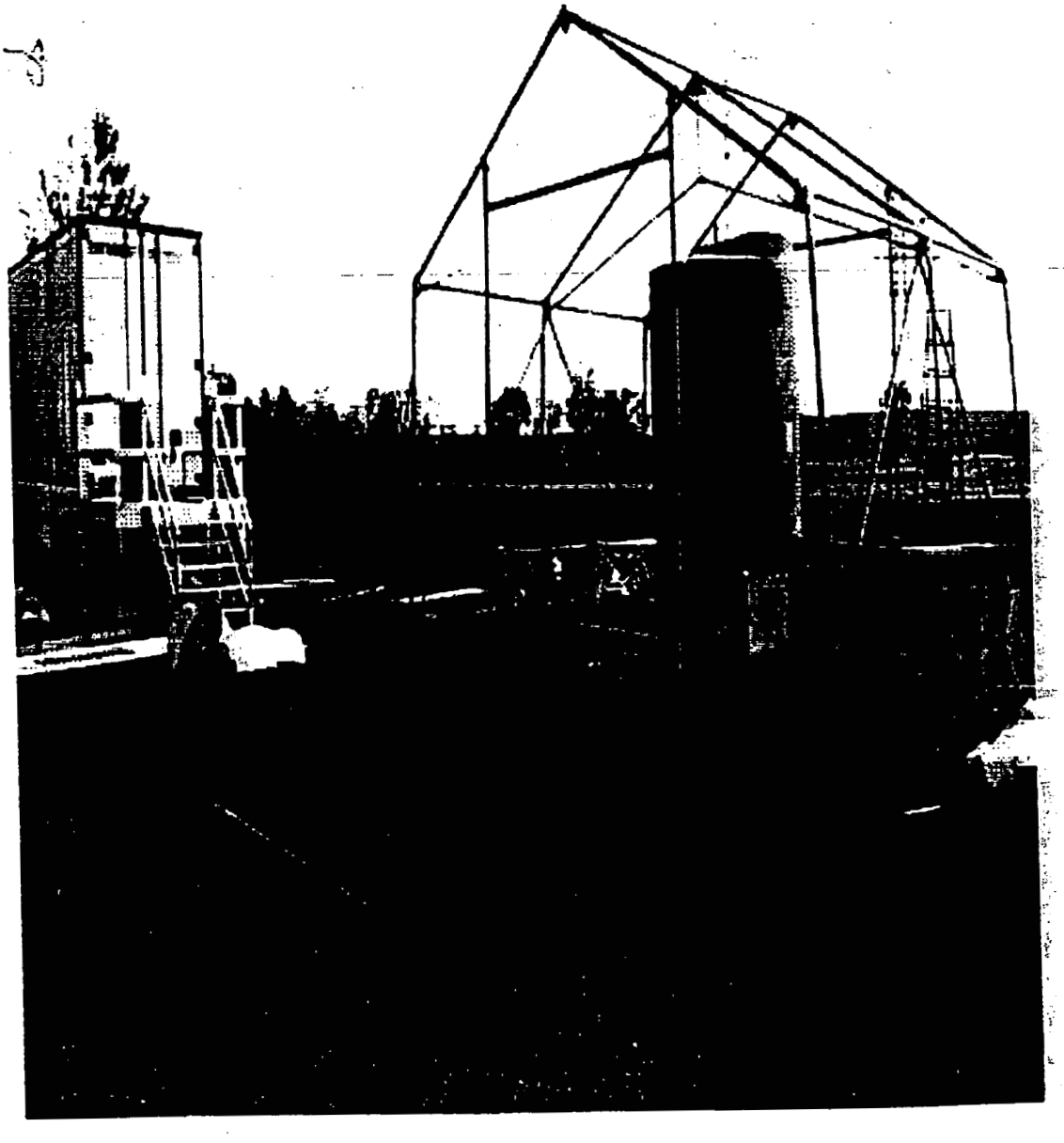


Figure 3

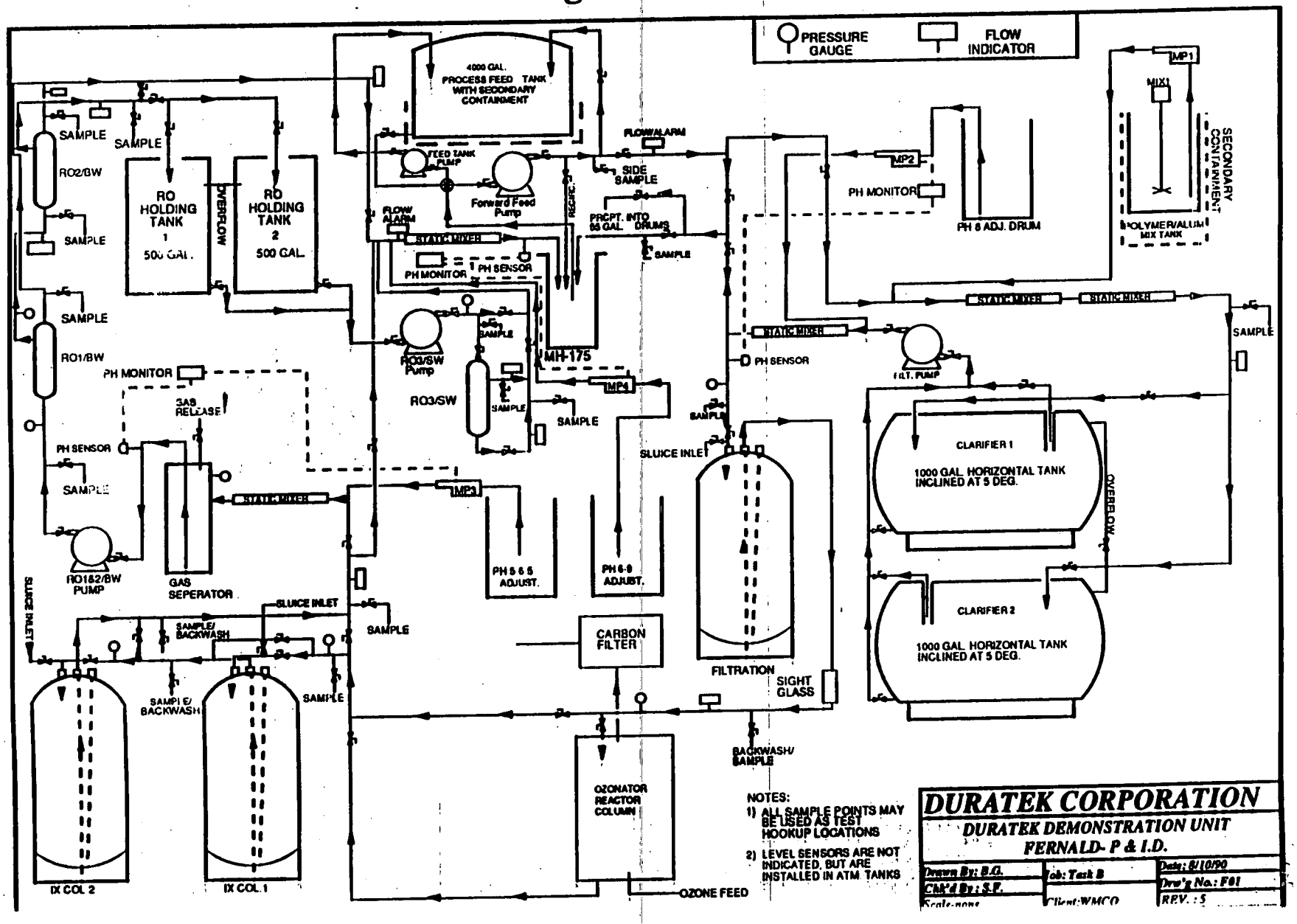
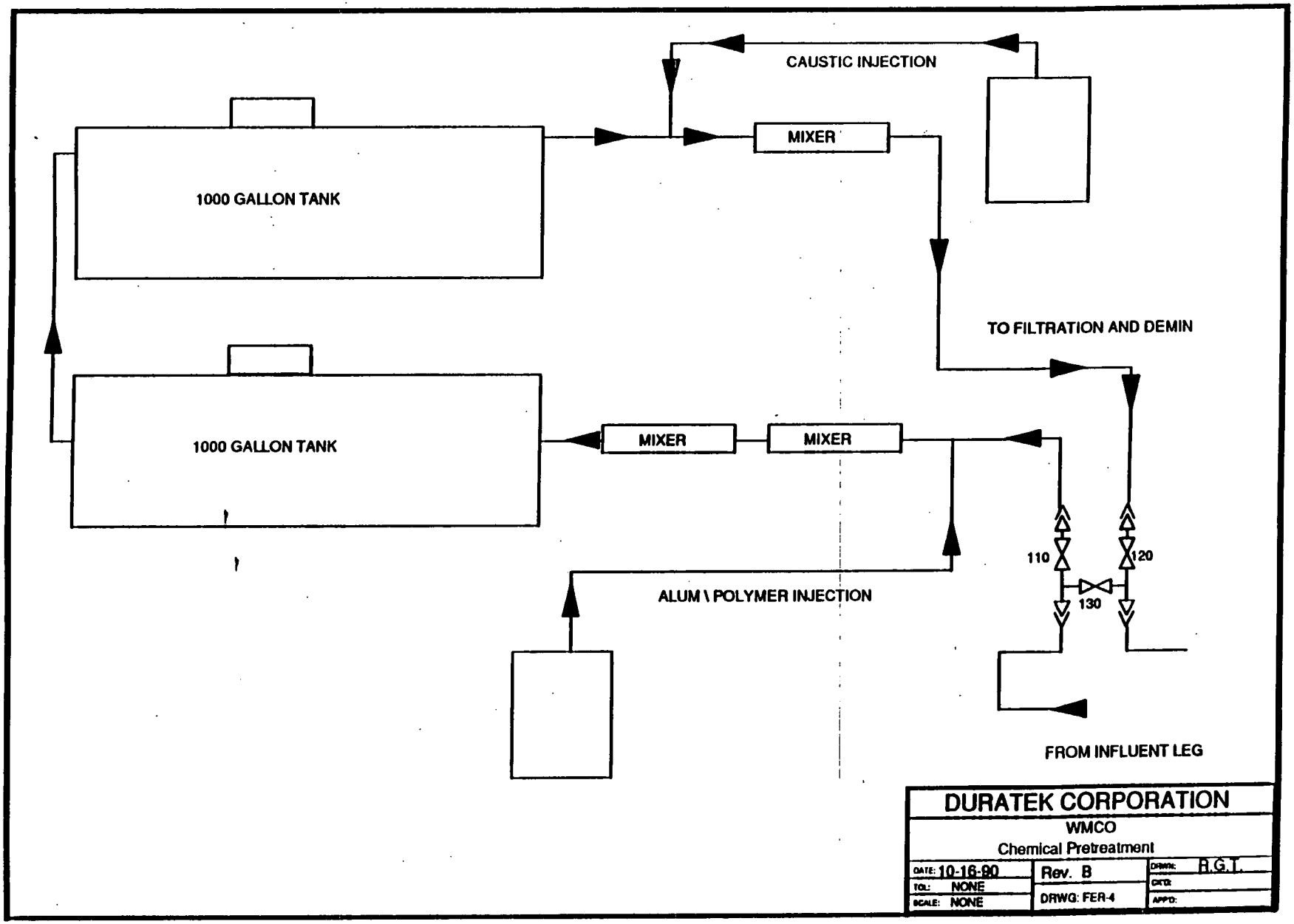

PRESSURE GAUGE
FLOW INDICATOR
4000 GAL. PROCESS FEED TANK WITH SECONDARY CONTAINMENT
FEED TANK PUMP
Forward Feed Pump
FLOW ALARM
STATIC MIXER
PH MONITOR
PH SENSOR
FLOW/ALARM
SIDE SAMPLE
PRCPT. INTO 55 GAL. DRUMS
SAMPLE
RECIRC.
RO HOLDING TANK 1 500 GAL.
RO HOLDING TANK 2 500 GAL.
OVERFLOW
RO2/BW
RO1/BW
RO3/SW Pump
RO3/SW
MH-175
IMP4
IMP3
IMP2
IMP1
MIX1
MP2
PH MONITOR
PH 6 ADJ. DRUM
POLYMER/ALUM MIX TANK
SECONDARY CONTAINMENT
FILT. PUMP
CLARIFIER 1
1000 GAL. HORIZONTAL TANK INCLINED AT 5 DEG.
CLARIFIER 2
1000 GAL. HORIZONTAL TANK INCLINED AT 5 DEG.
GAS RELEASE
GAS SEPERATOR
RO1&2/BW PUMP
SLUICE INLET
SAMPLE/ BACKWASH
PH 5 & 6 ADJUST.
PH 6-9 ADJUST.
CARBON FILTER
FILTRATION
SIGHT GLASS
BACKWASH/ SAMPLE
OZONATOR REACTOR COLUMN
OZONE FEED
IX COL 2
IX COL 1
NOTES:
1) ALL SAMPLE POINTS MAY BE USED AS TEST HOOKUP LOCATIONS
2) LEVEL SENSORS ARE NOT INDICATED, BUT ARE INSTALLED IN ATM TANKS
DURATEK CORPORATION
DURATEK DEMONSTRATION UNIT
FERNALD- P & I.D.
Drawn By: B.G.
Chk'd By: S.F.
Scale-none
Job: Task B
Client:WMCO
Date: 8/10/90
Drw'g No.: F01
REV.: 5

Figure 4


CAUSTIC INJECTION
MIXER
1000 GALLON TANK
TO FILTRATION AND DEMIN
1000 GALLON TANK
MIXER
MIXER
110
120
130
ALUM \ POLYMER INJECTION
FROM INFLUENT LEG
DURATEK CORPORATION
WMCO
Chemical Pretreatment
DATE: 10-16-90
TOL: NONE
SCALE: NONE
Rev. B
DRWG: FER-4
DRWN: R.G.T.
CKD:
APP'D:

The pH of the clarified liquid would be adjusted, if needed, to pH 8 prior t feeding to the filtration and ion exchange columns, Figure 5. Filtration is needed at thi point to remove any remaining particulates prior to ion exchange. Fifteen cubic feet o a 50 mesh sand were used in the filtration column. The filtration column wa backwashable and sluicable to facilitate media changes. Removed media was placed ir 55 gallon drums.

From the filtration tank, the water was fed to a series of two 30 inch diamete ion exchange columns, Figure 5. The first ion exchange column contained 15 cubic fee (660 lb.) of Dowex 21K media. The second column contained 15 cubic feet of Purolit A600 media. These tanks were also sluicable to facilitate media changes.

The water leaving the ion exchange columns would then have its pH lowered t 5-6.5, as required for effective reverse osmosis. This drop in pH could cause dissolve carbonates to decompose, releasing carbon dioxide. A degassifier was provided in th system to provide for the venting of any released carbon dioxide. The water was the pressurized and fed to the reverse osmosis system, Figure 6. The first two stages c reverse osmosis used brackish water membranes to achieve 80-90% water removal.

At this point, the dissolved solids remaining in the water would be very near th saturation point. Further water removal would cause dissolved solids to precipitat clogging the reverse osmosis membranes. The reject water from the second rever osmosis stage (containing the remaining dissolved solids) would, therefore, be route to holding tanks, Figure 7, for treatment to prevent scaling and retard precipita formation in the third stage of reverse osmosis. Two holding tanks were provided - o for treating the water from the second reverse osmosis stage while the other (containi already treated water) was used to feed the third stage of reverse osmosis.

After this treatment, the water would be repressurized and fed into the third sta of reverse osmosis. The third stage contained seawater membranes, allowing for fin water removal in excess of 98%. The purified water from the three stages of the rever osmosis system would be adjusted to a final pH between 6.5 and 9, as required f FEMP discharges, and then discharged into Manhole 175. Final reject water would put into 55 gallon drums. However, as discussed in the Results section of the repo it was determined that reverse osmosis was not needed to achieve treatment goals. Th was determined after testing the first and second reverse osmosis stages, so the thi stage was not activated.

Figure 5

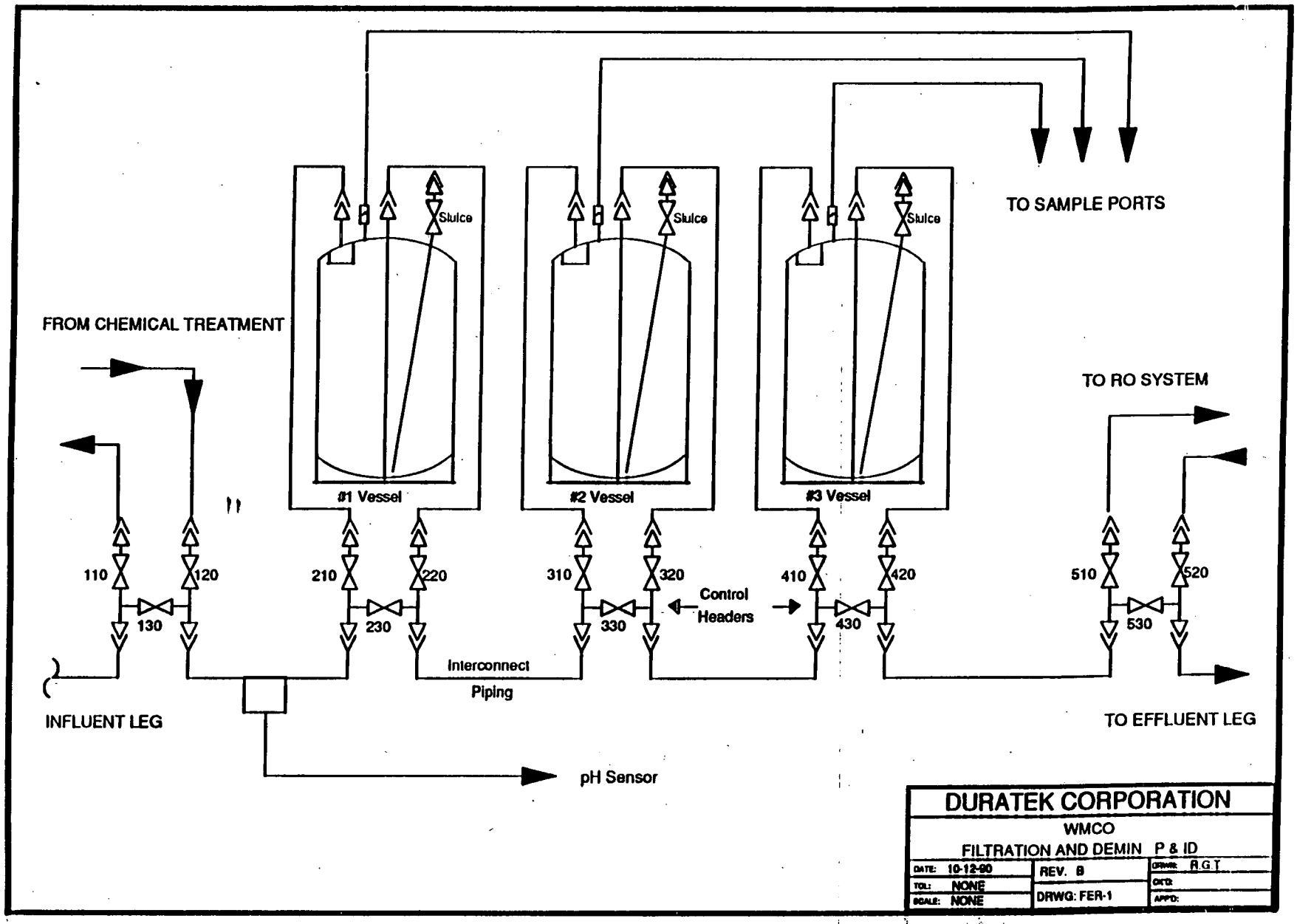

TO SAMPLE PORTS
Sluice
Sluice
Sluice
FROM CHEMICAL TREATMENT
TO RO SYSTEM
#1 Vessel
#2 Vessel
#3 Vessel
110
120
130
210
220
230
310
320
330
410
420
430
510
520
530
Control
Headers
Interconnect
Piping
INFLUENT LEG
TO EFFLUENT LEG
pH Sensor
DURATEK CORPORATION
WMCO
FILTRATION AND DEMIN P & ID
DATE: 10-12-90
TOL: NONE
SCALE: NONE
REV. B
DRWG: FER-1
DRWN: R.G.T
CKD:
APPD:

Figure 6

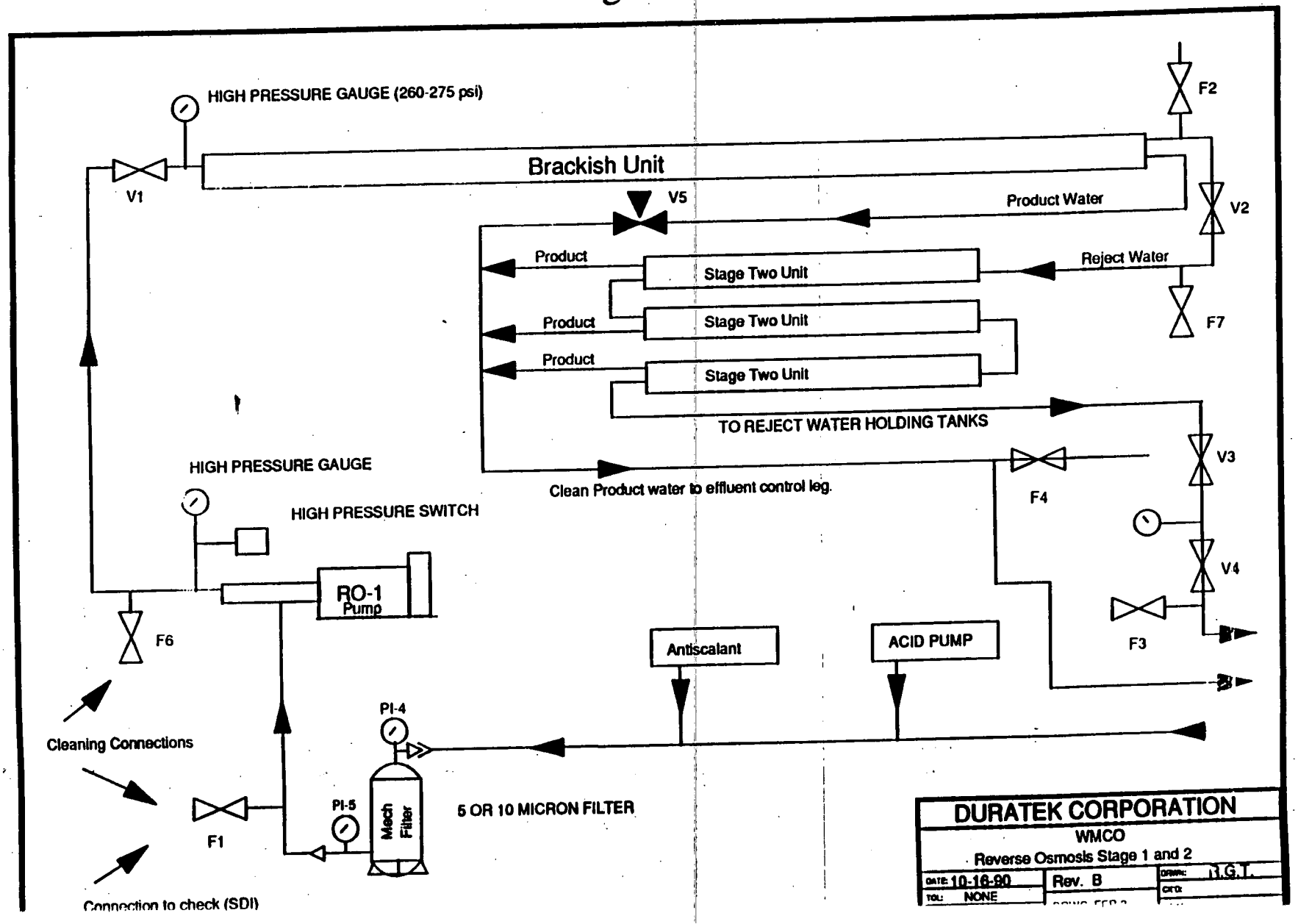
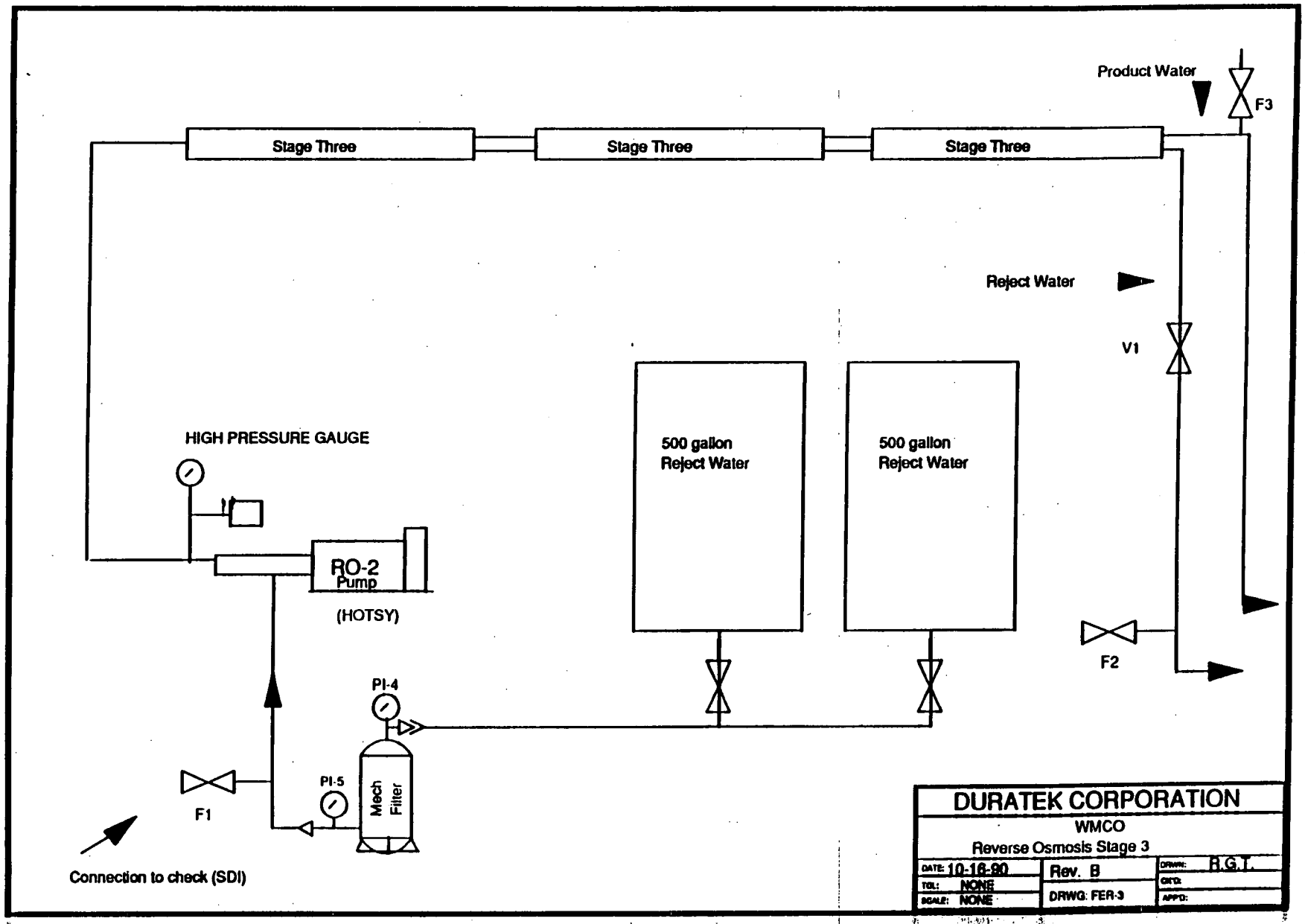

HIGH PRESSURE GAUGE (260-275 psi)
Brackish Unit
V1
V5
Product Water
F2
V2
Product
Stage Two Unit
Reject Water
F7
Product
Stage Two Unit
Product
Stage Two Unit
TO REJECT WATER HOLDING TANKS
V3
F4
Clean Product water to effluent control leg.
HIGH PRESSURE GAUGE
HIGH PRESSURE SWITCH
RO-1
Pump
V4
F3
F6
Antiscalant
ACID PUMP
PI-4
Cleaning Connections
PI-5
Mech Filter
5 OR 10 MICRON FILTER
F1
Connection to check (SDI)
DURATEK CORPORATION
WMCO
Reverse Osmosis Stage 1 and 2
DATE: 10-16-90
Rev. B
DRWN: B.G.T.
TOL: NONE

Figure 7


Product Water
F3
Stage Three
Stage Three
Stage Three
Reject Water
V1
HIGH PRESSURE GAUGE
500 gallon
Reject Water
500 gallon
Reject Water
RO-2
Pump
(HOTSY)
F2
PI-4
PI-5
Mech
Filter
F1
Connection to check (SDI)
DURATEK CORPORATION
WMCO
Reverse Osmosis Stage 3
DATE: 10-16-90
TOL: NONE
SCALE: NONE
Rev. B
DRWG: FER-3
DRWN: R.G.T.
CKD:
APP'D:

The Demonstration Unit had appropriate fittings so that individual stages could be bypassed or the processing scheme rearranged, Figure 8. This was an important consideration for the system optimization performed during the preliminary tests. Appropriate sampling points were located throughout the system to assess process performance.

The Demonstration Unit was designed to be fail-safe. Significant flow disruptions, indicative of process problems, were sensed by a flow control system. If this control system detected any flow disruption, it would automatically shut down the process system to prevent spills. The interior of the trailer housing the DU had a 6 inch tall dike all around the perimeter to prevent minor spills from escaping the trailer. A drain was provided at a low point within the diked area to drain any spillage directly into Manhole 175. Thus, the DU was designed and constructed to eliminate any uncontrolled release of water onto the ground.

The Demonstration Unit was also outfitted with appropriate fire detectors and alarms, connected to the FEMP Fire Department. A Health and Safety Plan was provided for the operation of the DU and the conduct of the required studies(2).

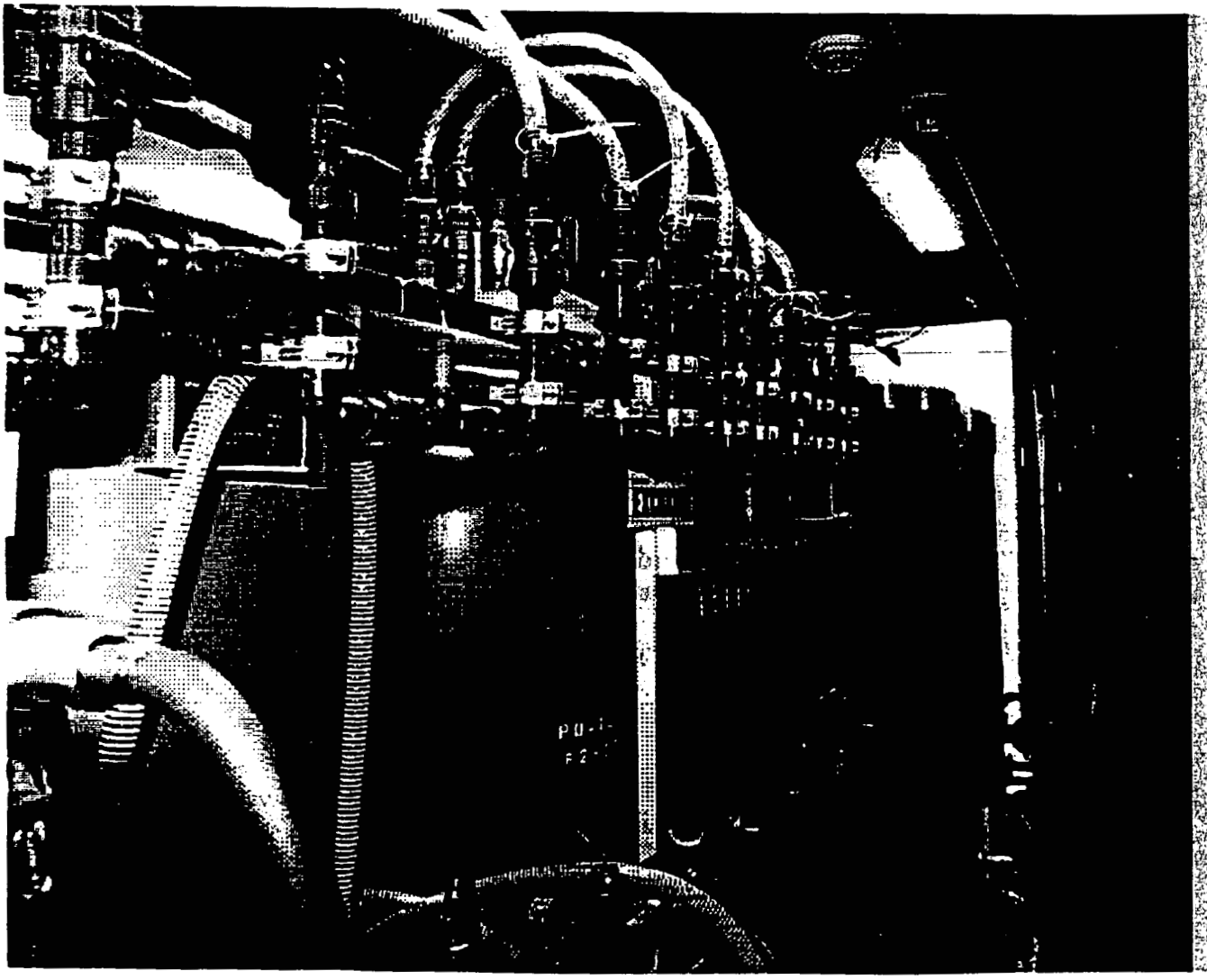
Appendix A provides the detailed operating instructions which were used to run the Demonstration Unit. This appendix includes information and operating procedures for the ion exchange and reverse osmosis sub-systems.

RESULTS

The technologies included in the DU were based on the results of the Task A laboratory evaluations. However, it was recognized that the water samples used in those studies might not accurately represent the actual water currently being discharged from the FEMP. In fact, this concern was borne out. The discharge water encountered during the Task B tests was considerably cleaner, i.e. contained fewer contaminants at levels requiring treatment, than the samples studied during the laboratory tests. Thus while the results of the laboratory tests were a valuable guide in designing the DU, the on-site tests were important in developing an effective treatment system.

For this reason, the Task B studies reported here were conducted in two parts. First, a series of preliminary tests were performed to determine the simplest combination of technologies required to achieve the treatment goals. After the process scheme was optimized during the preliminary tests, a long-term Demonstration Test was conducted to obtain performance parameters, e.g. breakthrough period, required for scale-up calculations.

Figure 8 - Interior of the Demonstration Unit



In addition, several additional tests were performed. These included regeneratio of the Dowex 21K ion exchange media, isotherm tests on the Dowex 21K (both unuse and regenerated), and Toxicity Characteristic Leach Procedure (TCLP) tests on each c the solid media used during the Demonstration Test to determine if these solids wer hazardous in addition to being radioactive (making them a mixed waste).

Approximately 1,200 samples were obtained during these studies. Each sampl was analyzed for major and minor chemical constituents, anions, radioisotopes, an physical properties, as listed on Table 1. The analytical procedures are documented i Appendix B. A total of 75 measurements were made on each sample. Thus, som 90,000 data points were obtained during these studies.

Preliminary Tests

The objective of the preliminary tests was to determine the simplest treatme scheme that would provide the necessary contaminant removal. The prima contaminant encountered in the discharge water was uranium, although it was initial felt that heavy metals at levels of regulatory concern might also be encountered. T philosophy utilized during process optimization was to proceed from the simple arrangement of technologies that could possibly meet the treatment goals and, unsuccessful, add additional treatment stages until the goals were met. Accordingly, t first tests utilized sand filtration, Dowex 21K ion exchange, and Purolite A600 i exchange, arranged in series, as the treatment scheme. The data from this and the oth preliminary tests are provided in Appendix C.

The sand-Dowex 21K-Purolite A600 arrangement was tested against water fro Manhole 175 and water from the Stormwater Retention Basin (SWRB). The syste effectively removed all the uranium from these waters. About one-third of the uraniu was removed by the sand (indicating that some of the uranium was associated w particulates) and the rest was removed by the Dowex 21K ion exchanger. The efflue uranium concentration from the Dowex 21K was consistently in the 0-2 ppb ran Neither heavy metals nor organics at levels of regulatory significance were encounter in the feed to the DU during this or the subsequent tests.

A single run was performed using only sand filtration and Dowex 21K. Wh this process scheme removed all the uranium, there was concern that the system wo not be able to remove heavy metals, e.g. chromium, should these contaminants encountered. Therefore, the Purolite A600 media was included in the subsequent te

There was a strong desire to include reverse osmosis in the system to furt reduce Total Dissolved Solids (TDS) and Total Suspended Solids (TSS) Levels. Seve

Table 1

Analyses Performed

MAJOR ALKALINE ELEMENTS [ppm]:				
Ca	Mg	Na		
TRACE ELEMENTS [ppb]:				
Al	As	B	Ba	Be
Bi	Br	Cd	Ce	Co
Cr	Cs	Cu	Fe	Hg
I	Li	Mn	Mo	Nd
Ni	Os	Pb	Rb	Ru
Sb	Sc	Sn	Sr	Th(232)
Ti	Tl	U (total)	V	W
Zn	Zr			
RADIOISOTOPES [ppb]:				
Sr90	Tc99	Ru106	Cs137	Pm147
Ra226	Ac227	Th228	Th230	Th234
U233	U235	U236	Np237	Pu239
Pu240	Pu242	Am241	Cm244	
ANIONS [ppm]:				
Cl-	F-	NO3-	SO4=(F)	SO4=
CO3=	HCO3-			
OTHER DATA:				
CaCO3=(F)	Hard.(F)	COND (F)	COND,umho	
pH (F)	pH	TDS,ppm	TSS,ppm	
TIC,ppm	TOC,ppm			

(F) Denotes data collected at the field location at the FEMP.

test runs were conducted using both Manhole 175 and SWRB waters with the followin treatment configuration:

- Sand Filtration
- Ion Exchange 1 - Dowex 21K
- Ion Exchange 2 - Purolite A600
- Reverse Osmosis - stages 1 and 2

These tests uncovered an unexpected problem - very fine, probably colloidal, particulate in the water which fouled the reverse osmosis elements. This fouling was deduced fror the high feed pressure required to achieve the desired 90% rejection. The feed pressur should have been approximately 260 pounds per square inch (psi). Instead, fee pressures in excess of 400 psi were required. As water passed through the revers osmosis system, the required feed pressure increased. The pressure drop across th reverse osmosis elements, however, remained low. This behavior is indicative of a ve fine particulate foulant coating the elements. This behavior was not observed during th relatively short reverse osmosis tests conducted during the Task A laboratory studies

Silt Density Index (SDI) measurements were obtained at all stages of the treatme system. These measurements were in excess of 5 (indicative of excessive foulant level at all stages. This meant the fouling material was present in the feed water and passe through the sand filter and both ion exchange media. During a test in which the sar was replaced with carbon filtration media, the SDI downstream of the carbon droppe to 2.5 for about 2 days (an SDI of 3 or less is acceptable), but then increased to ov 5. This indicated that the particulates moved slowly through the carbon bed, but we not captured by the carbon. The carbon filtration media is capable of removing abo 50% of 0.1 micron particulates, with filtration efficiency increasing for larg particulates. Thus, the fact that the particulates passed through the carbon bed sugges that a large fraction is smaller than 1 micron.

Analytical studies were performed to determine the nature and source of the foulir material. Fourier Transform Infrared Spectrophotometry (FTIR) analyses showed th the materials were not organic. This was consistent with the very low Total Organ Carbon (TOC) levels found in the water at all treatment stages. In addition, wat samples were filtered through 0.45 micron membrane filters which were studied l Scanning Electron Microscopy (SEM). Few particulates were collected (consistent wi a large fraction of the particulates being smaller than 1 micron). Analyses of t particulates captured showed them to be composed primarily of silicon. No uranium

environmental contaminants were observed. Inductively Coupled Plasma Mass Spectrometry (ICPMS) analyses showed the water leaving the ion exchangers to be consistently free of uranium and environmental contaminants.

The accumulated data strongly indicated that the reverse osmosis fouling was due to very fine, probably colloidal, particulates of silica. The source of this material is considered to be most likely clay from the soil. This is quite reasonable since the feed water was either SWRB water, collected from stormwater, or Manhole 175 water which we were told was primarily SWRB water during the test period. These waters could easily have picked up the particulates from the soil.

Several attempts were made to remove the offending fine particulates from the water. These included:

- Chemical treatment with alum (20 ppm) and Polypure A-210 (20 ppm) coagulant aid (based on the results of the laboratory studies) prior to sand filtration and ion exchange. The chemicals were mixed with the water by a static mixer. The residence time in the two clarifier tanks totalled 2 hours.
- Carbon depth filtration instead of sand filtration
- Chemical treatment (as specified above) and carbon filtration after the ion exchangers

Unfortunately, none of these approaches alleviated the reverse osmosis fouling problem. The SDI remained at a value of approximately 5 during all these tests.

Since the TSS, TDS, and other contaminant levels were within regulatory limits after the ion exchangers, it was decided that reverse osmosis, while desirable, was not necessary to meet the FEMP treatment goals. Thus, reverse osmosis treatment was not included in subsequent tests. This decision had the added advantage of eliminating a sludge (the dried reverse osmosis reject) which would have to be disposed of.

Based on these results, the final configuration of the DU for the long-term Demonstration Test was decided to be:

- Sand Filtration
- Ion Exchange 1 - Dowex 21K
- Ion Exchange 2 - Purolite A600

The pH of the feed water was remarkably constant at about pH 8. The treatments did not cause any pH changes to occur. Since FEMP discharges must be between pH 6.5 and 8.5, pH adjustments during or after processing were not required.

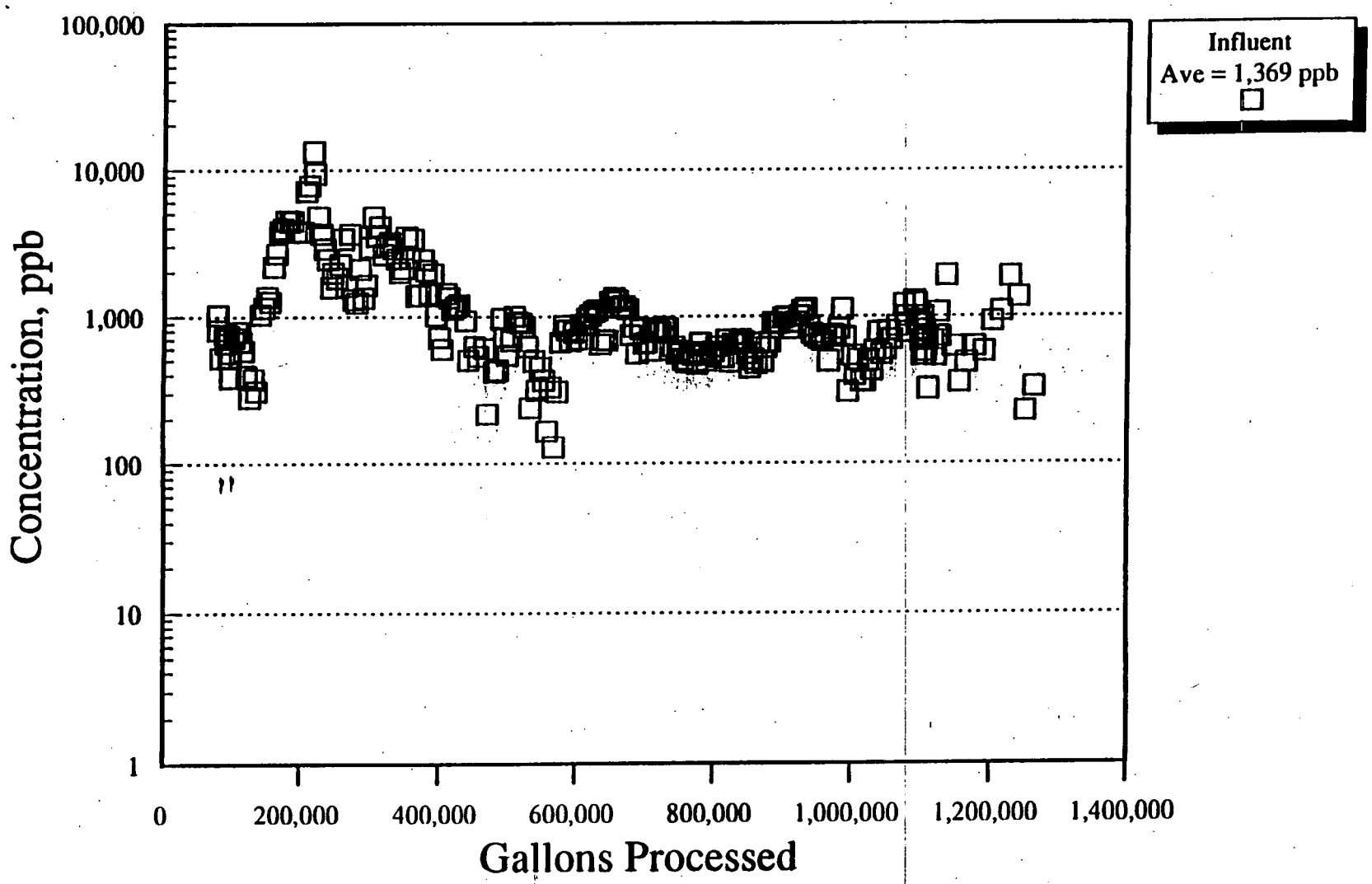
Demonstration Test

The long-term Demonstration Test was conducted from mid-January throug mid-June, 1991. The DU was operated essentially continuously (24 hours per day) : 10 gpm throughout this period. By the end of the test the DU had processed 1,276,88 gallons of water (11,380 column volumes). Samples sets were taken three times per da (except weekends) and analyzed for major and minor elements, anions, radioisotope and physical properties in accordance with the procedures of Appendix B. The operat log sheets for the Demonstration Test are provided in Appendix D. The analytical da obtained during this test are provided in Appendix E.

Figures 9-12 show the uranium concentration at each point in the treatme system as a function of the total volume of water processed. The average influe uranium concentration was 1,370 ppb. The data show that almost one-third of t uranium is captured by the sand filter, indicating that a significant portion of t uranium is associated with particulates. This phenomenon was also observed during t laboratory evaluations and doesn't appear to be a chromatographic effe Chromatographic effects are the slow elution of a contaminant from a column, as occu in a chromatograph. Chromatographic effects are characterized by a very lo concentration of contaminant in the column effluent initially, which increases over tin This build-up was not observed during either the laboratory or pilot-plant tests. T observed behavior was more consistent with fine particulates passing through the sa filter.

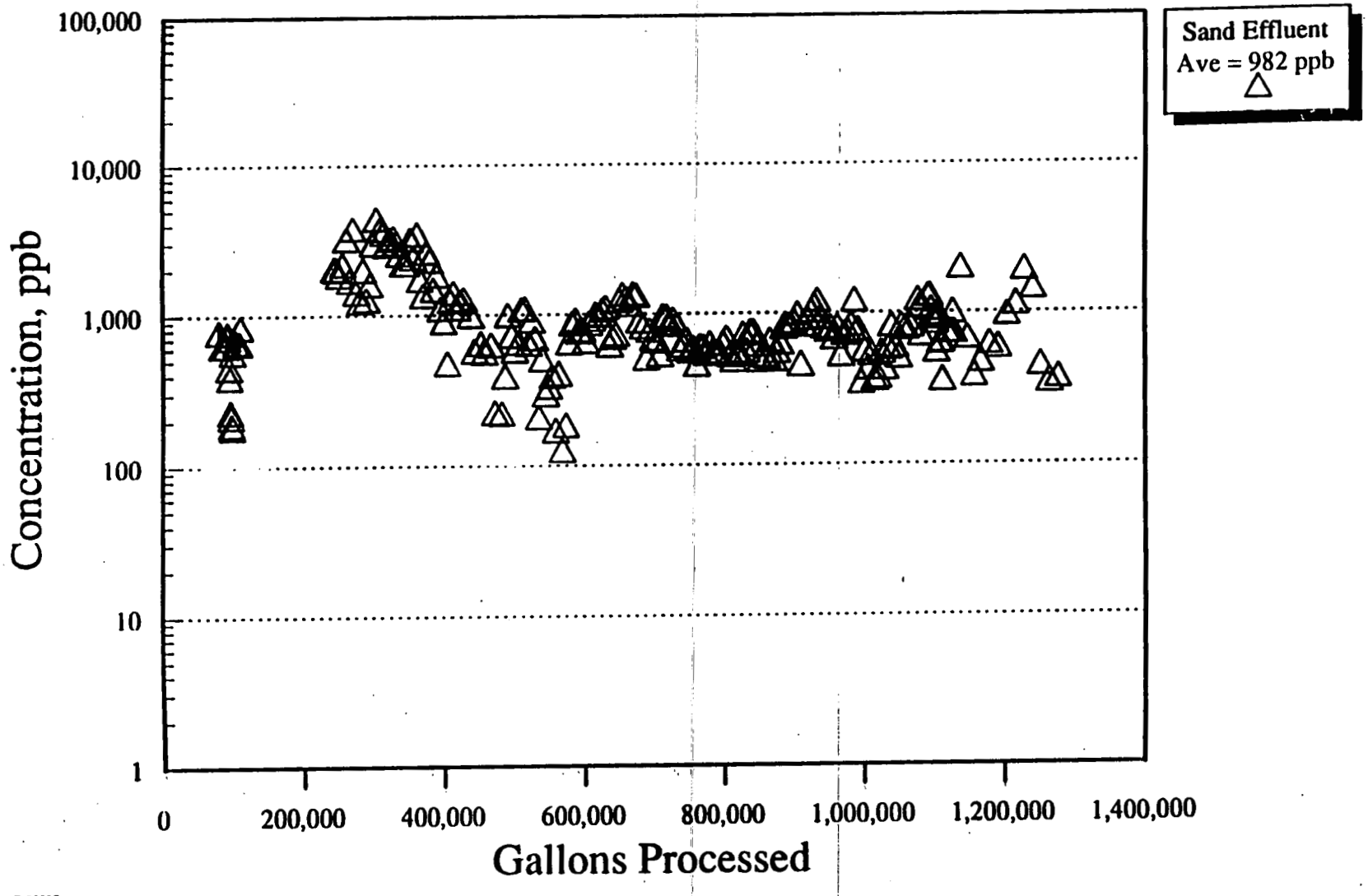
The uranium remaining in the water coming from the sand filter was captu very effectively on the Dowex 21K resin. The effluent from this media consisten contained 0-2 ppb uranium until breakthrough was approached. Breakthrough w defined as the point where the effluent concentration was consistently above 20 ppb (effluent discharge limit). The Dowex 21K processed 1,033,000 gallons of water (9,2 column volumes) before the uranium broke through this media according to t definition. However, numerous spikes in the uranium effluent concentration w encountered during processing of the 50,000 gallons of water (450 column volum prior to the formal breakthrough point. Before the spiking started, the average urani concentration in the Dowex 21K effluent was 1.85 ppb with a standard deviation of ppb. This performance was considerably better than was expected, based on laboratory data obtained earlier. This is probably due to the water challenging the exchange media during the field test being much cleaner than the water samples stud during the laboratory tests.

Figure 9
Influent Uranium Concentration



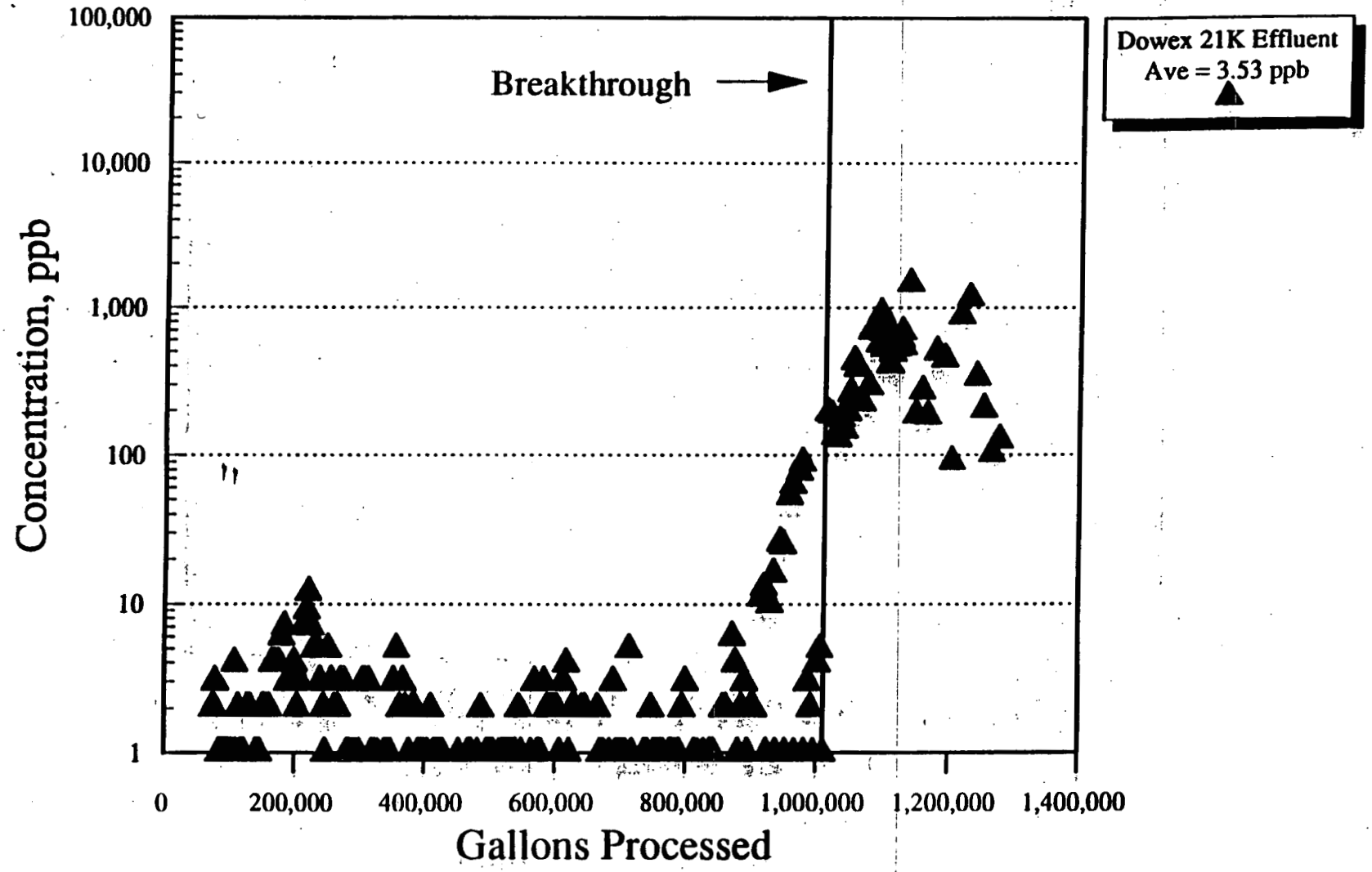
R-92005

Figure 10
Sand Effluent Uranium Concentration



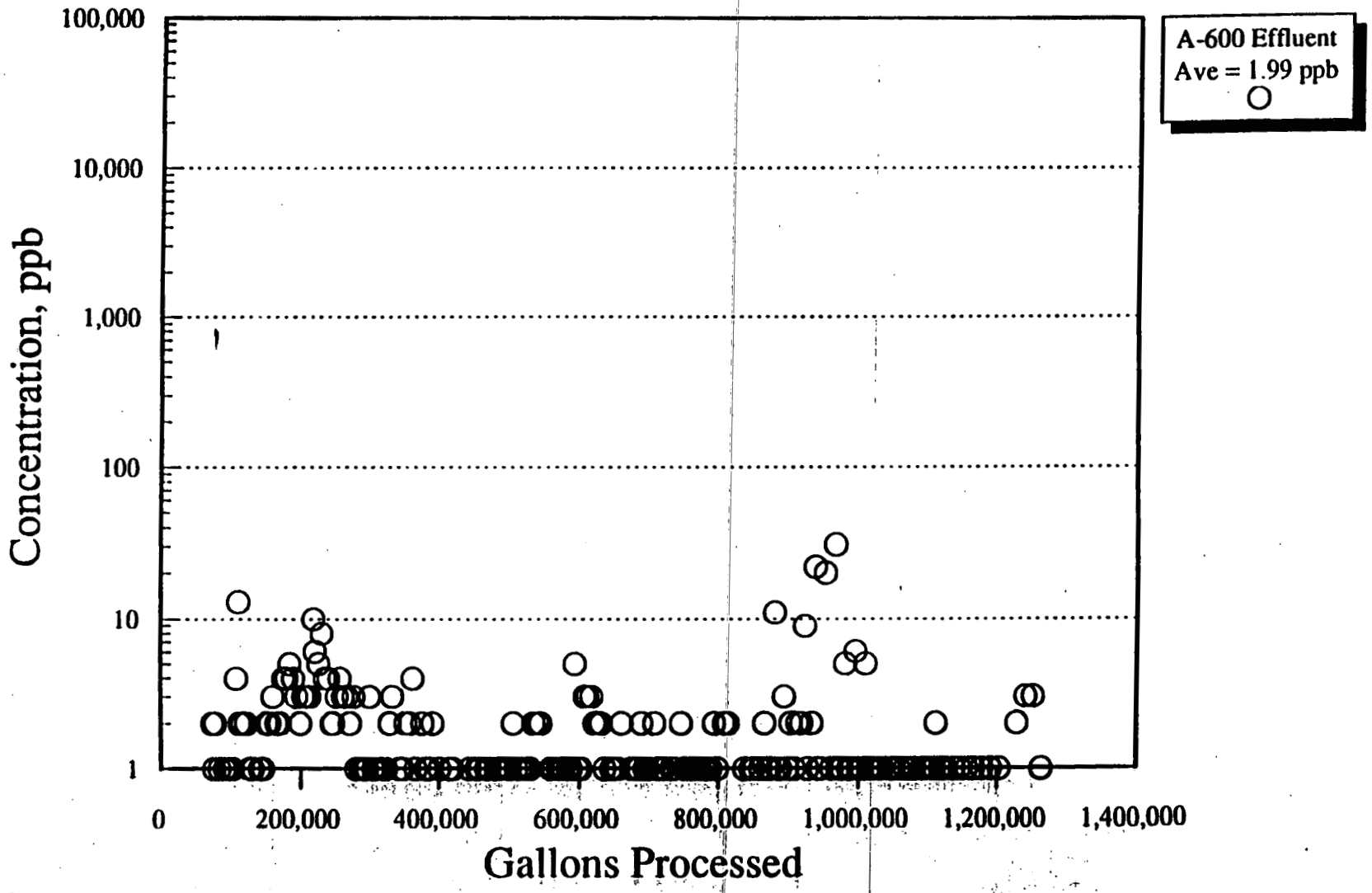
R-92035

Figure 11
Dowex 21K Effluent Uranium Concentration



R-92005

Figure 12
A-600 Effluent Uranium Concentration



R-92005

There was a short period at about the 200,000 gallon point when the DU was inadvertently challenged with water containing up to 13,300 ppb uranium. The DU responded very well to this upset condition - the uranium content in the Dowex 21K effluent never exceeded the 20 ppb requirement during this period.

The amount of uranium removed by the Dowex 21K resin prior to breakthrough was calculated. This was based on an average influent concentration to this media of 982 ppb and an average effluent concentration of 3.5 ppb. The manufacturer reports the density of the 21K media to be 44 lb/ft^3. Based on these values and the amount of water processed, a total of 3.81E3 gram (g) of uranium were removed before breakthrough. This corresponds to a loading of 1.27E-2 gram uranium per gram resin.

The Dowex 21K column was left on line after breakthrough was reached in an attempt to determine when it would become saturated (effluent uranium concentration equal to the influent concentration). After processing 1.2 million gallons of water (11,380 column volumes), the Dowex 21K was still not fully saturated. The uranium not removed by the Dowex 21K was captured by the A600 ion exchange media.

Table 2 shows the average DU influent and effluent values for heavy metals, anions, and physical properties. The concentrations of the contaminants regulated under the Safe Drinking Water Act were all under their Maximum Contaminant Levels, except for nitrates, as shown in this table. The effluent nitrates level was slightly above the MCL but well within the NPDES requirement(3) for the FEMP (72.7 ppm 30 day average). The pH of the water was also within the limits prescribed in the SDWA, as shown in the table. The Total Dissolved Solids and Total Suspended Solids levels were also under the FEMP discharge goals of 500 ppm and 30 ppm, respectively.

Additional Tests

The following additional tests were performed:

- Regeneration of the Dowex 21K media
- Isotherm Tests on new and regenerated Dowex 21K to determine saturation capacity and effectiveness of regeneration
- Toxicity Characteristic Leach Procedure (TCLP) on the sand, Dowex 21K and Purolite A600 taken from the tanks at the conclusion of the Demonstration Test to determine if these materials must be designated "hazardous"

The results of these tests are discussed on the following page.

Table 2

Average Influent and Effluent Concentrations

In Parts per Billion unless otherwise noted

Parameter	Influent		Effluent		MCL*
	Average	Standard Deviation	Average	Standard Deviation	
Cr	8	11	7	9	50
Mn	6	8	6	28	50
Ni	13	38	13	30	--
Cu	41	397	13	64	1,000
Zn	72	319	77	146	5,000
As	27	53	23	42	50
Cd	2	22	1	1	10
Hg	1	2	1	2	2
Pb	8	106	1	1	5
U(total)	1,370	1,580	2	3	--
Cl^-, ppm	105	105	104	55	250
NO_3^-, ppm	15	6	13	8	10
SO_4^{-2},ppm	96	40	83	72	250
TOC, ppm	2.86	1.08	1.72	1.00	--
pH	8.08	0.31	8.11	0.30	6.5-8.5
COND.µmho	737	394	730	239	--
TDS, ppm	413	108	410	110	500
TSS, ppm	4.83	5.10	2.72	4.35	--

* Maximum Contaminant Level under the Safe Drinking Water Act, as amended.

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A. Regeneration of Dowex 21K

A sample of Dowex 21K was obtained from the DU at the conclusion of testing. A series of regenerative treatments were evaluated, as recommended by Dow Chemical Co.(4). The treatments applied are as follows:

1. Elution with 2 column volumes of 1.0 N HCl
2. Elution with 10 column volumes of 1 N NaCl dissolved in 0.1 N HCl
3. Flush column with deionized water

A total of 40.0 mL of dry spent resin was regenerated by this method. A total of 10 column volumes of deionized water was used to flush the column.

The eluant from each regeneration step was collected and analyzed for uranium content to determine the amount of uranium removed. In addition, a sample of the regenerated Dowex 21K was allowed to equilibrate with 5% nitric acid to leach any residual uranium in the resin. The nitric acid solution was analyzed to provide an estimate of the amount of residual uranium left on the regenerated material.

The amount of uranium removed at each step of the regeneration process is provided in Table 3. A total of 5.60E-02 g of uranium was removed from the 40.0 mL of resin. This corresponds to a specific uranium removal of 1.97E-03 g U/g resin.

Table 3

Regeneration of Dowex 21K

Regeneration Step	Eluant U Conc,ppb	Eluant Volume, mL	U Removed from 40 mL of Media, g U	Specific U Removal, g U/g resin
1	523,054	80	4.18 E-02	1.47 E-03
2	34,503	400	1.38 E-02	0.49 E-03
3	949	400	≃0.04 E-02	0.01 E-03
Total U Removed			5.60 E-02	1.97 E-03

A 0.9443 g (dry weight) sample of the regenerated resin was equilibrated with 20 mL 5% nitric acid to dissolve any residual uranium. The nitric acid contained 8,583 ppb uraniu corresponding to a total of 0.172E-3 g uranium left on the sample. This equates to a resid uranium level of 0.182E-3 g uranium per gram of regenerated resin. Thus, these data indic that the regeneration process removed 91% of the uranium from the Dowex 21K ion exchan resin.

While this appears to be a very encouraging result, the amount of uranium removed fr the resin is smaller than the average uranium loading on the column, which was calculated earl to be 1.27E-2 g uranium per gram resin. However, it must be remembered that the Dowex 2 column did not reach saturation. Thus, the resin in the column was not uniformly loaded w uranium. The resin at the top of the column would have had the highest loading of urani while the loading at the bottom of the column would be significantly lower. The sample stud for regeneration was obtained during sluicing, so it's exact location in the column could not determined.

B. Isotherm Tests

Isotherm tests were performed on both new (unused) and regenerated Dowex 21K re The purpose of these tests was to determine the resin's saturation capacity for uranium an estimate the effectiveness of the regeneration process in terms of the ability of the regener material to remove uranium from water.

The tests were performed by adding 1.0 liter of water from Manhole 175 into pla containers containing pre-weighed samples of the Dowex 21K resin. It was desired to deter the saturation capacity of the resin in equilibrium with a range of effluent concentrations. was accomplished by varying the amount of resin used in each test, from 0.01 g to 1.2 g, w keeping the total volume of water constant. The test bottles were continuously rotated for hour period to allow the uranium to equilibrate between the water and the resin.

The analytical data from these tests are provided in Appendix F. The results of these are provided in Figure 13. This figure shows the expected increase in saturation capacity function of the final concentration of uranium in the water.

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APPENDIX C

PLAN SHEETS

for

ADVANCED WASTEWATER TREATMENT FACILITY

PERMIT TO INSTALL APPLICATION

Prepared by:

A. M. KINNEY, INC.

CONSULTING ENGINEERS

A logarithmic best-fit curve was calculated for the two sets of data (new and regenerated resin):

$$\text{Capacity} = a + b\ (\ln \text{Conc.}) \qquad (1)$$

where a and b are constants fitted to the data. The values of a and b were found to be:

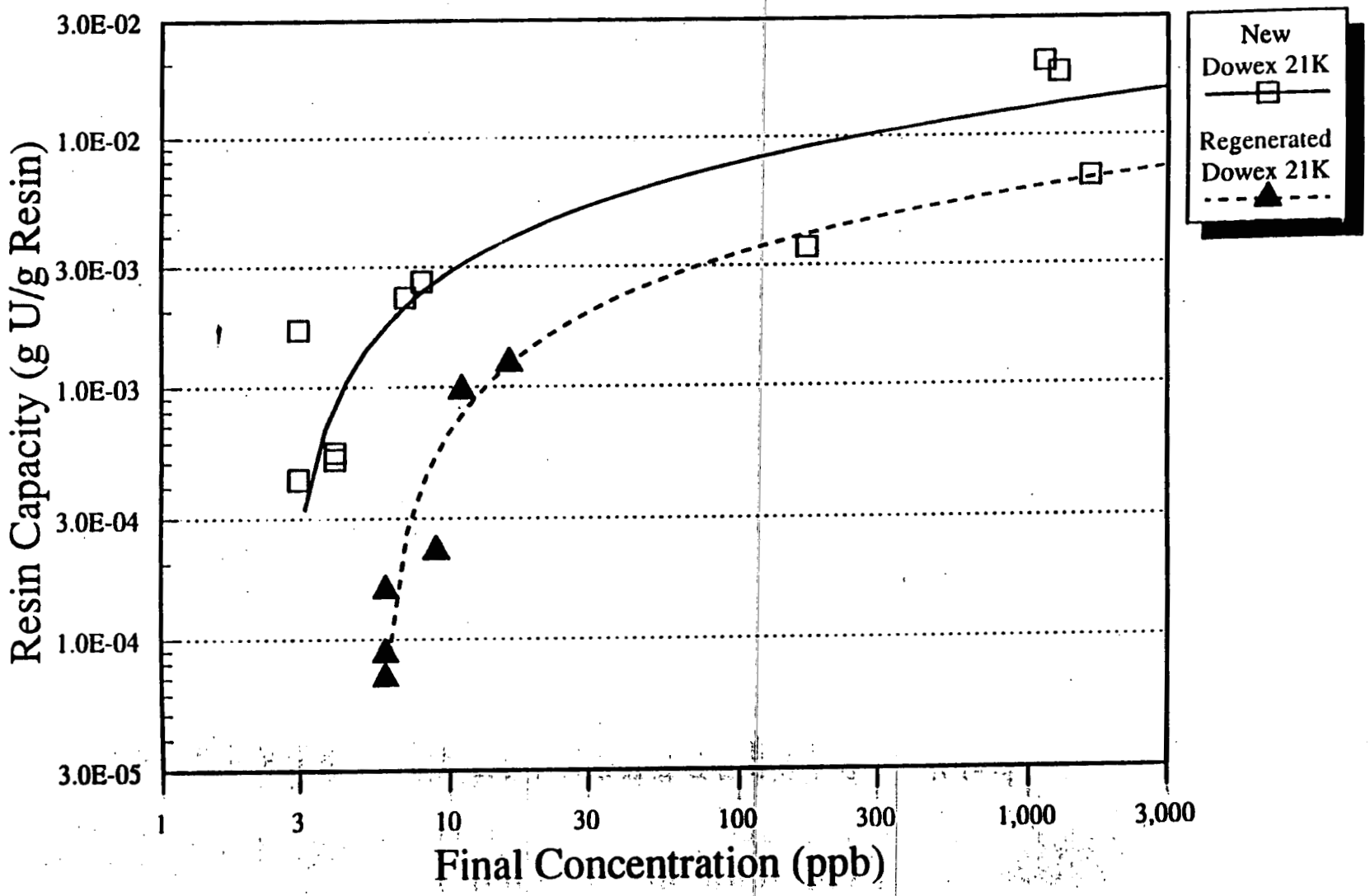
	a	b
New resin	-0.00217	0.002185
Regen. resin	-0.00204	0.001174

The correlation coefficients for the best-fit curves were 0.8275 for the new media and 0.9413 for the regenerated media. The larger the correlation coefficient, the better the data fit is to the curve. The correlation coefficients determined reflect good data fits.

The isotherm data indicate that at an equilibrium water concentration of 1,000 ppb uranium, new Dowex 21K would be expected to have a capacity of approximately 1.3E-2 g uranium per gram resin. Earlier, the uranium loading on the Dowex 21K at breakthrough was calculated to be 1.27E-2 g uranium per gram resin. This agreement is not surprising because when a large column, such as the one used in the DU, reaches breakthrough most of the column is, in fact, saturated. During operation, the top of the column is exposed to water containing the highest concentration of uranium and, therefore, removes most of this contaminant. The lower portion of the column, initially exposed to water with a lower uranium concentration, removes proportionately less uranium. As the top of the column nears saturation, it is unable to remove all the uranium, causing the lower portion of the column to be exposed to water containing progressively higher levels of uranium. As this occurs, the lower portion of the column removes larger amounts of this contaminant. At breakthrough, the ion exchange column can no longer remove all the uranium. Thus, the average column loading at breakthrough should be slightly less than the saturation capacity of the resin, measured by the isotherm tests. This behavior was, indeed, observed in the data. This agreement between the two independent methods is quite gratifying, providing an assessment of the quality of the data obtained.

The regenerated Dowex 21K resin appeared to have a significantly lower capacity than the new resin, Figure 13. The capacity of the regenerated resin appears to be approximately an order of magnitude lower than the new resin. However, the concentration of uranium in the water used to challenge the regenerated media was only 100 ppb, compared to about 1100 ppb U in the water used to test the new media. This dramatic difference in the uranium levels of the challenge waters could be a significant factor in the apparent lower capacity of the regenerated Dowex 21K. In both cases, the challenge water came from Manhole 175 in which the uranium concentration was an uncontrolled variable. Another difference between the two challenge waters was the concentration of iron and manganese in the water. The water used to challenge the

Figure 13
Dowex 21K Isotherm Tests



regenerated resin had significantly greater quantities of these ions than the water used to challenge the new resin. The data also show a significantly greater removal of these ions by the regenerated resin. Thus, the competitive removal of the iron and manganese could also have contributed to the observed lowering of uranium removal capability.

C. TCLP Tests

Toxicity Characteristic Leach Procedure tests were performed on the sand, Dowex 21K, and Purolite A600 media obtained from the DU at the conclusion of the Demonstration Test. This test is one determination of whether a material must be considered hazardous. Since the media being tested are known to be radioactive (they contain uranium), a determination that they are also hazardous would classify them as mixed wastes.

The three materials were tested in accordance with the TCLP procedure provided in Appendix B, modified to include analysis for organic species, to determine if they would leach heavy metals or organic compounds above regulatory levels. Table 4 shows the levels of the heavy metals to be well below regulatory levels. Organic compounds were also not found in the leachate water.

Table 4

Results of TCLP Tests for Heavy Metals

	Concentration in Leachate, ppm			
Contaminant	Sand	Dowex 21K	A-600	Max.Allowable
Arsenic	ND	0.017	ND	5
Barium	0.567	0.275	0.150	100
Cadmium	ND	ND	ND	1
Chromium	ND	0.027	ND	5
Lead	0.183	0.519	0.109	5
Mercury	ND	0.007	0.027	0.2
Selenium	0.069	0.289	ND	1
Silver	ND	ND	ND	5

ND = Not Detected

CONCLUSION

The extensive studies performed clearly indicate that a combination of filtration and ic exchange, using Dowex 21K media, is effective in final treatment of water from the FEMP pri to discharge to the Great Miami River. The Dowex 21K media was found to be very effecti in removing uranium from the water, providing an effluent containing 0-2 ppb uranium un breakthrough was approached. This is well under the FEMP goal of 20 ppb in the dischar water. The Dowex 21K was able to process 9,200 column volumes of water befc breakthrough. All other contaminants met FEMP requirements for discharge water.

Isotherm data on the saturation capacity of the new media compared very well with t observed loading of the Dowex 21K column during the Demonstration Test. This correlation the two independent methods provided an important assessment of the quality of the da obtained during these studies.

The Dowex was treated with a combination of hydrochloric acid and sodium chloride an attempt to regenerate the media. While much of the uranium was removed, the saturati capacity of the regenerated media appeared to be about one order of magnitude lower than n media. However, the waters used to challenge the new and regenerated media had significan different concentrations of uranium, iron, and manganese. These waters came from Manhole 1 in which the composition was an uncontrolled variable. The water used to challenge regenerated resin had significantly less uranium and significantly more iron and manganese th the water used to challenge the new resin. The regenerated resin removed significantly more i and manganese and significantly less uranium than the new resin. Thus, these differences in composition of the challenge waters could have contributed to the observed lower capacity of regenerated resin for uranium.

Toxicity Characteristic Leach Procedure tests were performed on the sand, Dowex 2 and Purolite A600 media at the conclusion of the Demonstration Test. The contaminant le in the TCLP leachate were below regulatory limits for the three media.

The data obtained in these studies are important in the design of the Advan Wastewater Treatment (AWWT) Plant and the Interim Advanced Wastewater Treatm (IAWWT) System. The reduction of the uranium discharged to the Great Miami River, a result of the IAWWT and the AWWT, represents a significant improvement over past pract

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REFERENCES

1. Duratek Corporation, "Demonstration of Ion Exchange and Reverse Osmosis on FEMP Wastewater: Results of Bench-Scale Evaluations," WEMCO Purchase Order No. 2-97577 (April 18, 1990).

2. Duratek Corporation, "FEMP Project/Task Specific Health and Safety Plan: Demonstration of Ion Exchange and Reverse Osmosis on FEMP Wastewater, Work Task B," WEMCO Purchase Order No. 2-97577 (October 12, 1990).

3. National Pollutant Discharge Elimination System Permit for the FEMP, OEPA Permit No. 1I000004*BD, February 12, 1990.

4. Yan, T. Y., "Direct Acid Elution of Anionic Exchange Resins for Recovery of Uranium, U.S. Patent 4,423,004 (December 27, 1983).

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WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE

(WBS 1.1.2.4.01.02)

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS, PHASE IV

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT,

FERNALD, OHIO

UNITED STATES DEPARTMENT OF ENERGY

DRAWING INDEX

FEMP DRAWING No.	A.M.K. SHEET No.	REV.	DATE	TITLE
5ID-4445-X-00425	X-1	0	7-7-92	COVERSHEET, 1 OF 2
5ID-4445-X-00426	X-2	0	7-7-92	COVERSHEET, 2 OF 2
5ID-4445-X-00660	X-3	0	7-7-92	COVERSHEET-REFERENCE DRAWINGS
5ID-4445-G-00427	C-0	0	7-7-92	ABBREVIATIONS AND NOTES
5ID-4445-G-00428	C-1	0	7-7-92	LOCATION PLAN
5ID-4445-G-00429	C-2	0	7-7-92	BUILDING 51 SOUTH CONTAINMENT PLAN
5ID-4445-G-00430	C-3	0	7-7-92	BUILDING 51 AND NORTH ACCESS PLAN
5ID-4445-G-00431	C-4	0	7-7-92	SITE PLAN - OVERHEAD PIPING - 'A' ST TO 'B' ST
5ID-4445-G-00432	C-5	0	7-7-92	SITE PLAN - SEWAGE TREATMENT PLANT
5ID-4445-G-00433	C-6	0	7-7-92	PIPE RACK AND CONTAINMENT FOUNDATION PLAN
5ID-4445-G-00434	C-7	0	7-7-92	SOUTH CONTAINMENT PIPE RACK PLAN - LOWER LEVEL
5ID-4445-G-00435	C-8	0	7-7-92	SOUTH CONTAINMENT PIPE RACK PLAN - UPPER LEVEL
5ID-4445-G-00436	C-9	0	7-7-92	EAST TRUCK UNLOADING FOUNDATION PLAN
5ID-4445-G-00437	C-10	0	7-7-92	SITE DETAILS
5ID-4445-G-00438	C-11	0	7-7-92	CONCRETE DETAILS
5ID-4445-G-00439	C-12	0	7-7-92	CONCRETE DETAILS
5ID-4445-G-00440	C-13	0	7-7-92	CONCRETE AND MISCELLANEOUS DETAILS
5ID-4445-G-00441	C-14	0	7-7-92	TRUCK UNLOADING DETAILS
5ID-4445-G-00442	C-15	0	7-7-92	PIPE RACK DETAILS
5ID-4445-G-00443	C-16	0	7-7-92	PIPE RACK DETAILS
5ID-4445-G-00444	C-17	0	7-7-92	STEEL DETAILS
5ID-4445-S-00445	S-1	0	7-7-92	BUILDING 51 MODIFICATIONS - GROUND FLOOR
5ID-4445-S-00446	S-2	0	7-7-92	BUILDING 51 PARTIAL PLANS
5ID-4445-S-00447	S-3	0	7-7-92	BUILDING 51 SECTIONS & DETAILS
5ID-4445-S-00448	S-4	0	7-7-92	BUILDING 51 SECTIONS & DETAILS
5ID-4445-S-00449				NOT USED
5ID-4445-D-00450	D-1	0	7-7-92	GROUND FLOOR DEMOLITION PLAN - BUILDING 51
5ID-4445-A-00451	A-1	0	7-7-92	GROUND FLOOR PLAN - BUILDING 51
5ID-4445-A-00452	A-2	0	7-7-92	NORTH AND EAST ELEVATIONS - BUILDING 51
5ID-4445-A-00453	A-3	0	7-7-92	SOUTH AND WEST ELEVATIONS - BUILDING 51
5ID-4445-A-00454	A-4	0	7-7-92	ENLARGED PLANS - BUILDING 51
5ID-4445-A-00455	A-5	0	7-7-92	SECTIONS AND DETAILS - BUILDING 51
5ID-4445-A-00456	A-6	0	7-7-92	TRUCK SHELTER AND MISCELLANEOUS DETAILS
5ID-4445-E-00457	E-1	0	7-7-92	ELECTRICAL SITE PLAN
5ID-4445-E-00458	E-2	0	7-7-92	SINGLE LINE DIAGRAMS MCC-1, MCC-2 MCC-4 & MAIN SERVICE
5ID-4445-E-00459	E-3	0	7-7-92	SINGLE LINE DIAGRAM MCC-3
5ID-4445-E-00460	E-4	0	7-7-92	SINGLE LINE DIAGRAMS MCC-5 & MCC-6
5ID-4445-E-00461	E-5	0	7-7-92	BUILDING 51 - PROCESS POWER PLAN
5ID-4445-E-00462	E-6	0	7-7-92	SOUTH CONTAINMENT - PROCESS POWER PLAN
5ID-4445-E-00463	E-7	0	7-7-92	EAST CONTAINMENT - PROCESS POWER PLAN
5ID-4445-E-00464	E-8	0	7-7-92	SOUTH CONTAINMENT - LIGHTING & GROUNDING PLAN
5ID-4445-E-00465	E-9	0	7-7-92	EAST CONTAINMENT - LIGHTING & GROUNDING PLAN
5ID-4445-E-00466	E-10	0	7-7-92	BUILDING 51 - HVAC POWER PLAN
5ID-4445-E-00467	E-11	0	7-7-92	SWRB AND TRANSFER PUMP STATION ELECTRICAL POWER & INSTRUMENTATION PLAN
5ID-4445-E-00468	E-12	0	7-7-92	STP LIFT STATION POWER & INSTRUMENTATION PLAN
5ID-4445-E-00469	E-13	0	7-7-92	GENERAL SUMP INSTRUMENT WIRING PLAN
5ID-4445-E-00470	E-14	0	7-7-92	COMMUNICATION, FIRE ALARM & SIGNAL PLAN
5ID-4445-E-00471	E-15	0	7-7-92	COMMUNICATION, FIRE ALARM & SIGNAL RISER DIAGRAMS
5ID-4445-E-00472	E-16	0	7-7-92	MCC-1, MCC-2 & MCC-4 MOTORS' PWER. & CTLS. BLOCK DIAGRAMS
5ID-4445-E-00473	E-17	0	7-7-92	MCC-3 MOTORS' PWER. & CTLS. BLOCK DIAGRAMS
5ID-4445-E-00474	E-18	0	7-7-92	MCC-3, PD-2 & PD-3 MOTORS' POWER & CTLS. BLOCK DIAGRAMS
5ID-4445-E-00475	E-19	0	7-7-92	MCC-5 & MCC-6 MOTORS' PWER. & CTLS. BLOCK DIAGRAMS
5ID-4445-E-00476	E-20	0	7-7-92	BUILDING 51 INSTRUMENTS' BLOCK DIAGRAMS
5ID-4445-E-00477	E-21	0	7-7-92	EAST UNLOADING & SOUTH CONTAINMENT INSTRUMENTS' BLOCK DIAGRAMS
5ID-4445-E-00478	E-22	0	7-7-92	PROCESS MOTORS' ELEMENTARY DIAGRAMS
5ID-4445-E-00479	E-23	0	7-7-92	HVAC MOTORS' ELEMENTARY DIAGRAMS SHEET 1 OF 2
5ID-4445-E-00480	E-24	0	7-7-92	HVAC MOTORS' ELEMENTARY DIAGRAMS SHEET 2 OF 2
5ID-4445-E-00481	E-25	0	7-7-92	MISCELLANEOUS SECTIONS & DETAILS
5ID-4445-E-00482	E-26	0	7-7-92	PANEL & LUMINAIRIES SCHEDULES
5ID-4445-E-00483				NOT USED
5ID-4445-E-00484				NOT USED
5ID-4445-E-00485				NOT USED
5ID-4445-F-00486	FP-1	0	7-7-92	FIRE PROTECTION LAYOUT - FIRST FLOOR PLAN
5ID-4445-H-00487	H-1	0	7-7-92	HVAC FLOW & CONTROL DIAGRAM
5ID-4445-H-00488	H-3	0	7-7-92	PROCESS AREA MAKE-UP AIR SYSTEM - FLOW & CONTROL DIAGRAM
5ID-4445-H-00489	H-4	0	7-7-92	TRU/CLEAN AREA MAKE-UP AIR SYSTEM - FLOW & CONTROL DIAGRAM
5ID-4445-H-00490	H-5	0	7-7-92	CHILLED WATER FLOW AND CONTROL DIAGRAM
5ID-4445-H-00491	H-6	0	7-7-92	STEAM AND CONDENSATE FLOW DIAGRAM
5ID-4445-H-00492	H-7	0	7-7-92	HVAC EQUIPMENT, DUCTWORK & PIPING LAYOUT FIRST FLOOR PLAN
5ID-4445-H-00493	H-8	0	7-7-92	HVAC EQUIPMENT, DUCTWORK & PIPING LAYOUT PARTIAL FIRST FLOOR PLAN
5ID-4445-H-00494	H-9	0	7-7-92	HVAC EQUIPMENT, DUCTWORK & PIPING LAYOUT PARTIAL FLOOR PLAN
5ID-4445-H-00495	H-10	0	7-7-92	HVAC DETAILS
5ID-4445-H-00496				NOT USED
5ID-4445-H-00497				NOT USED
5ID-4445-H-00498				NOT USED
5ID-4445-H-00499				NOT USED
5ID-4445-I-00500	I-1	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 1
5ID-4445-I-00501	I-2	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 2
5ID-4445-I-00502	I-3	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 3
5ID-4445-I-00503	I-4	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 4
5ID-4445-I-00504	I-5	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 5
5ID-4445-I-00505	I-6	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 6
5ID-4445-I-00506	I-7	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 7
5ID-4445-I-00507	I-8	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 8
5ID-4445-I-00508	I-9	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 9
5ID-4445-I-00509	I-10	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 10
5ID-4445-I-00510	I-11	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 11
5ID-4445-I-00511	I-12	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 12
5ID-4445-I-00512	I-13	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 13
5ID-4445-I-00513	I-14	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 14
5ID-4445-I-00514	I-15	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 15
5ID-4445-I-00515	I-16	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 16
5ID-4445-I-00516	I-17	0	7-7-92	NOT USED
5ID-4445-I-00517	I-18	0	7-7-92	NOT USED
5ID-4445-I-00518	I-19	0	7-7-92	NOT USED
5ID-4445-I-00519	I-20	0	7-7-92	NOT USED
5ID-4445-I-00520	I-21	0	7-7-92	I/O CONN. DIAGRAMS SHEET 1
5ID-4445-I-00521	I-22	0	7-7-92	I/O CONN. DIAGRAMS SHEET 2
5ID-4445-I-00522	I-23	0	7-7-92	I/O CONN. DIAGRAMS SHEET 3
5ID-4445-I-00523	I-24	0	7-7-92	I/O CONN. DIAGRAMS SHEET 4
5ID-4445-I-00524	I-25	0	7-7-92	I/O CONN. DIAGRAMS SHEET 5
5ID-4445-I-00525	I-26	0	7-7-92	I/O CONN. DIAGRAMS SHEET 6
5ID-4445-I-00526	I-27	0	7-7-92	I/O CONN. DIAGRAMS SHEET 7
5ID-4445-I-00527	I-28	0	7-7-92	I/O CONN. DIAGRAMS SHEET 8
5ID-4445-I-00528	I-29	0	7-7-92	I/O CONN. DIAGRAMS SHEET 9
5ID-4445-I-00529	I-30	0	7-7-92	I/O CONN. DIAGRAMS SHEET 10
5ID-4445-I-00530	I-31	0	7-7-92	I/O CONN. DIAGRAMS SHEET 11
5ID-4445-I-00531	I-32	0	7-7-92	I/O CONN. DIAGRAMS SHEET 12
5ID-4445-I-00532	I-33	0	7-7-92	I/O CONN. DIAGRAMS SHEET 13
5ID-4445-I-00533	I-34	0	7-7-92	I/O CONN. DIAGRAMS SHEET 14
5ID-4445-I-00534	I-35	0	7-7-92	I/O CONN. DIAGRAMS SHEET 15
5ID-4445-I-00535	I-36	0	7-7-92	I/O CONN. DIAGRAMS SHEET 16
5ID-4445-I-00536	I-37	0	7-7-92	I/O CONN. DIAGRAMS SHEET 17
5ID-4445-I-00537	I-38	0	7-7-92	I/O CONN. DIAGRAMS SHEET 18
5ID-4445-I-00538	I-39	0	7-7-92	I/O CONN. DIAGRAMS SHEET 19
5ID-4445-I-00539	I-40	0	7-7-92	I/O CONN. DIAGRAMS SHEET 20
5ID-4445-I-00540	I-41	0	7-7-92	PWR. DIST/RELAY PNL. LO-PORP-1
5ID-4445-I-00541	I-42	0	7-7-92	PORP-1 EXT. WIRING TERM.
5ID-4445-I-00542	I-43	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 11
5ID-4445-I-00543	I-44	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 12
5ID-4445-I-00544	I-45	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 13
5ID-4445-I-00545	I-46	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 14
5ID-4445-I-00546	I-47	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 15
5ID-4445-I-00547	I-48	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 16
5ID-4445-I-00548	I-49	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 17
5ID-4445-I-00549	I-50	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 18
5ID-4445-I-00550	I-51	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 19
5ID-4445-I-00551	I-52	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 20
5ID-4445-I-00552	I-53	0	7-7-92	INTERCONNECT CABINET TERM. - TOP
5ID-4445-I-00553	I-54	0	7-7-92	INTERCONNECT CABINET TERM. - BOTTOM
5ID-4445-I-00554	I-55	0	7-7-92	FIELD TERM. BOX LO SHEET 1
5ID-4445-I-00555	I-56	0	7-7-92	FIELD TERM. BOX LO SHEET 2
5ID-4445-I-00556	I-57	0	7-7-92	FIELD TERM. BOX LO SHEET 3
5ID-4445-I-00557	I-58	0	7-7-92	FIELD TERM. BOX LO SHEET 4
5ID-4445-I-00558	I-59	0	7-7-92	I/O CONN. DIAGRAMS SHEET 21
5ID-4445-I-00559	I-60	0	7-7-92	I/O CONN. DIAGRAMS SHEET 22
5ID-4445-I-00560	I-61	0	7-7-92	I/O CONN. DIAGRAMS SHEET 23
5ID-4445-I-00561	I-62	0	7-7-92	I/O CONN. DIAGRAMS SHEET 24
5ID-4445-I-00562	I-63	0	7-7-92	CONTROL ROOM LAYOUT
5ID-4445-I-00563	I-64	0	7-7-92	SB&S & GENERAL SUMP TANK, CONTROL PANEL CASE
5ID-4445-I-00564	I-65	0	7-7-92	INSTRUMENT CONTROL STATIONS
5ID-4445-I-00565				NOT USED
5ID-4445-I-00566				NOT USED
5ID-4445-X-00567	L-2	0	7-7-92	LEGENDS & SYMBOLS
5ID-4445-X-00568				NOT USED
5ID-4445-X-00569				NOT USED

INDUSTRIAL WASTE DISPOSAL APPROVED OHIO ENVIRONMENTAL PROTECTION AGENCY AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

RECEIVED OHIO EPA AUG 17 1992 SOUTHWEST DISTRICT

05-5722

PAID Amount 5015.00 Date 8-11-92 Check # 019089 Date 7-22-92 0110399

0 CFC

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
COVERSHEET, SHEET 1 OF 2

87-D-159 | 0087502 WBS 1.1.2.4.01.02 | 5ID-4445-X-00425 | X-1 | 0

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE

(WBS 1.1.2.4.01.02)

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS, PHASE IV

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT,

FERNALD, OHIO

UNITED STATES DEPARTMENT OF ENERGY

DRAWING INDEX

FEMP DRAWING No.	A.M.K. SHEET No.	REV.	DATE	TITLE
SID-4445-P-00570	P-12	0	7-7-92	P & ID - SWRB & TRANSFER PUMP STATION
SID-4445-P-00571	P-13	0	7-7-92	P & ID - SSLS GENERAL SUMP/TANKS 8, 9 & 14
SID-4445-P-00572	P-14	0	7-7-92	P & ID - STP LIFT STATION
SID-4445-P-00573	P-18	0	7-7-92	PFD - ADVANCED WASTEWATER TREATMENT FACILITY
SID-4445-P-00574	P-19	0	7-7-92	P & ID - BULK LIQUID ALUM SYSTEM
SID-4445-P-00575	P-20	0	7-7-92	P & ID - DRUMMED COAGULANT HANDLING
SID-4445-P-00576	P-21	0	7-7-92	P & ID - COAGULATION ADDITIVE SYSTEM
SID-4445-P-00577	P-22	0	7-7-92	P & ID - COAGULATION DUST SCRUBBING
SID-4445-P-00578	P-24	0	7-7-92	P & ID - CAUSTIC UNLOADING, STORAGE & DILUTION
SID-4445-P-00579	P-25	0	7-7-92	P & ID - ACID UNLOADING & STORAGE
SID-4445-P-00580	P-27	0	7-7-92	P & ID - 400 GPM EQUALIZATION
SID-4445-P-00581	P-28	0	7-7-92	P & ID - 400 GPM PREFILTRATION
SID-4445-P-00582	P-30	0	7-7-92	P & ID - 400 GPM CARBON FILTERS
SID-4445-P-00583	P-32	0	7-7-92	P & ID - ION EXCHANGE TIE POINTS AND SCRUBBER
SID-4445-P-00584	P-33	0	7-7-92	P & ID - ELUATE PRECIPITATION
SID-4445-P-00585	P-34	0	7-7-92	P & ID - ELUATE SLURRY THICKENING
SID-4445-P-00586	P-35	0	7-7-92	P & ID - WASTE SLURRY SURGE TANK & PUMPS
SID-4445-P-00587	P-36	0	7-7-92	P & ID - GROUND/STORM WATER PH ADJUSTMENT
SID-4445-P-00588	P-37	0	7-7-92	P & ID - 700 GPM PREFILTRATION
SID-4445-P-00589	P-39	0	7-7-92	P & ID - 700 GPM CARBON FILTERS
SID-4445-P-00590	P-44	0	7-7-92	P & ID - DISCHARGE WATER
SID-4445-P-00591	P-45	0	7-7-92	P & ID - CENTRAL SAMPLING SYSTEM
SID-4445-P-00592	P-46	0	7-7-92	P & ID - STEAM & CONDENSATE
SID-4445-P-00593	P-47	0	7-7-92	P & ID - COMPRESSED AIR
SID-4445-P-00594	P-48	0	7-7-92	P & ID - TREATED WATER AND COOLING WATER
SID-4445-P-00595	P-60	0	7-7-92	PIPING - SWRB & TRANSFER PUMP STATION
SID-4445-P-00596	P-61	0	7-7-92	PIPING - YARD PIPING SOUTH
SID-4445-P-00597	P-62	0	7-7-92	PIPING - YARD PIPING NORTH
SID-4445-P-00598	P-63	0	7-7-92	PIPING - SSLS AREA
SID-4445-P-00599	P-64	0	7-7-92	PIPING - GENERAL SUMP
SID-4445-P-00600	P-65	0	7-7-92	PIPING - STP LIFT STATION
SID-4445-P-00601	P-66	0	7-7-92	STP LIFT STATION - PIPING PLAN
SID-4445-P-00602	P-67	0	7-7-92	STP LIFT STATIONS PIPING SECTION
SID-4445-P-00603	P-68	0	7-7-92	PIPING SECTIONS & DETAILS
SID-4445-P-00604	P-69	0	7-7-92	PIPING SECTIONS & DETAILS
SID-4445-P-00605	P-70	0	7-7-92	LAYOUT PLAN - BUILDING 51
SID-4445-P-00606	P-71	0	7-7-92	LAYOUT - BUILDING 51 NORTH
SID-4445-P-00607	P-72	0	7-7-92	LAYOUT - BUILDING 51 SOUTH
SID-4445-P-00608	P-73	0	7-7-92	LAYOUT - EAST UNLOADING & STORAGE
SID-4445-P-00609	P-74	0	7-7-92	LAYOUT - OUTSIDE SOUTH
SID-4445-P-00610	P-75	0	7-7-92	PLANS & SECTIONS - BUILDING 51 NORTH
SID-4445-P-00611	P-76	0	7-7-92	PLANS & SECTIONS - BUILDING 51 NORTH
SID-4445-P-00612	P-77	0	7-7-92	PIPING SECTIONS & DETAILS
SID-4445-P-00613	P-78	0	7-7-92	PIPING SECTIONS & DETAILS
SID-4445-P-00614	P-81	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X116-TNK & 51-X117-TNK
SID-4445-P-00615	P-82	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X109-TNK & 51-X110-TNK
SID-4445-P-00616	P-83	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X101-SCB
SID-4445-P-00617	P-84	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X102-TNK
SID-4445-P-00618	P-85	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X100-SCB
SID-4445-P-00619				NOT USED
SID-4445-P-00620	P-87	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X106-FLO
SID-4445-P-00621	P-88	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X302-TNK
SID-4445-P-00622	P-89	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X310-TNK
SID-4445-P-00623	P-90	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X301-TNK
SID-4445-P-00624	P-91	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X149-TNK
SID-4445-P-00625	P-92	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X148-TNK
SID-4445-P-00626	P-93	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X155-TNK
SID-4445-P-00627	P-94	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X156-TNK
SID-4445-P-00628				NOT USED
SID-4445-P-00629	P-96	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X162-TNK
SID-4445-P-00630	P-97	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X173-TNK
SID-4445-P-00631	P-98	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X204-TNK
SID-4445-P-00632	P-99	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X193-TNK
SID-4445-P-00633	P-100	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X228-TNK
SID-4445-P-00634	P-101	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X247-TNK
SID-4445-P-00635				NOT USED
SID-4445-P-00636	P-103	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X313-CLFR, 51-X312-CLFR, 51-X161-CLFR
SID-4445-P-00637	P-104	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X314-FLO
SID-4445-P-00638	P-105	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X317-TNK
SID-4445-P-00639	P-106	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X329-TNK
SID-4445-P-00640				NOT USED
SID-4445-P-00641	P-108	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X395-TNK & 51-X396-TNK
SID-4445-P-00642	P-109	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X406-TNK
SID-4445-P-00643	P-110	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X410-TNK
SID-4445-P-00644	P-111	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X456-TNK
SID-4445-P-00645				NOT USED
SID-4445-P-00646	P-113	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X105-PSE
SID-4445-P-00647	P-114	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X137-TNK
SID-4445-P-00648	P-115	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X425-TNK
SID-4445-P-00649				NOT USED
SID-4445-P-00650	P-117	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X170-FLT 51-X468A-FLT 51-X468B-FLT & 51-X474-FLT
SID-4445-P-00651	P-118	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X465-TNK
SID-4445-P-00652	P-119	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X415-TNK
* SID-4445-P-00653	P-120	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X461-TNK
* SID-4445-P-00654	P-121	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X475-TNK
SID-4445-P-00655				NOT USED
SID-4445-P-00656				NOT USED
SID-4445-P-00657				NOT USED
SID-4445-P-00658				NOT USED
SID-4445-P-00659				NOT USED
SID-4445-P-00660				NOT USED
SID-4445-P-00661	PL-1	0	7-7-92	DOMESTIC WATER FLOW DIAGRAM
SID-4445-P-00662	PL-2	0	7-7-92	SANITARY AND LAB WASTE FLOW DIAGRAM
SID-4445-P-00663	PL-3	0	7-7-92	PLUMBING LAYOUT PARTIAL FIRST FLOOR PLAN
SID-4445-P-00664	PL-4	0	7-7-92	EMERGENCY SHOWER FLOW DIAGRAM
SID-4445-P-00665	PL-5	0	7-7-92	LABORATORY SERVICES FLOW DIAGRAM
SID-4445-P-00666	PL-6	0	7-7-92	PLUMBING DETAILS

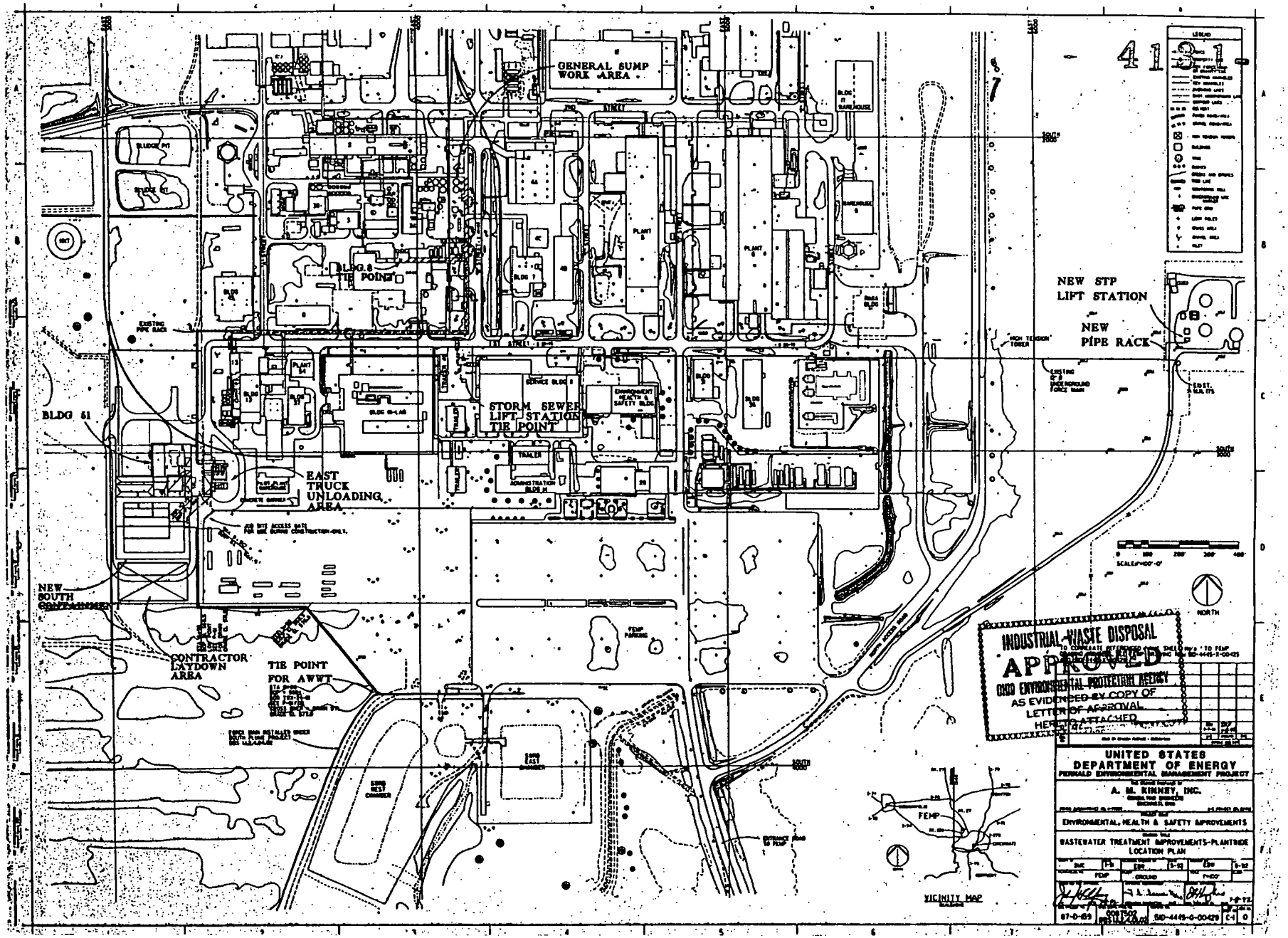
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETOFORE SUBMITTED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

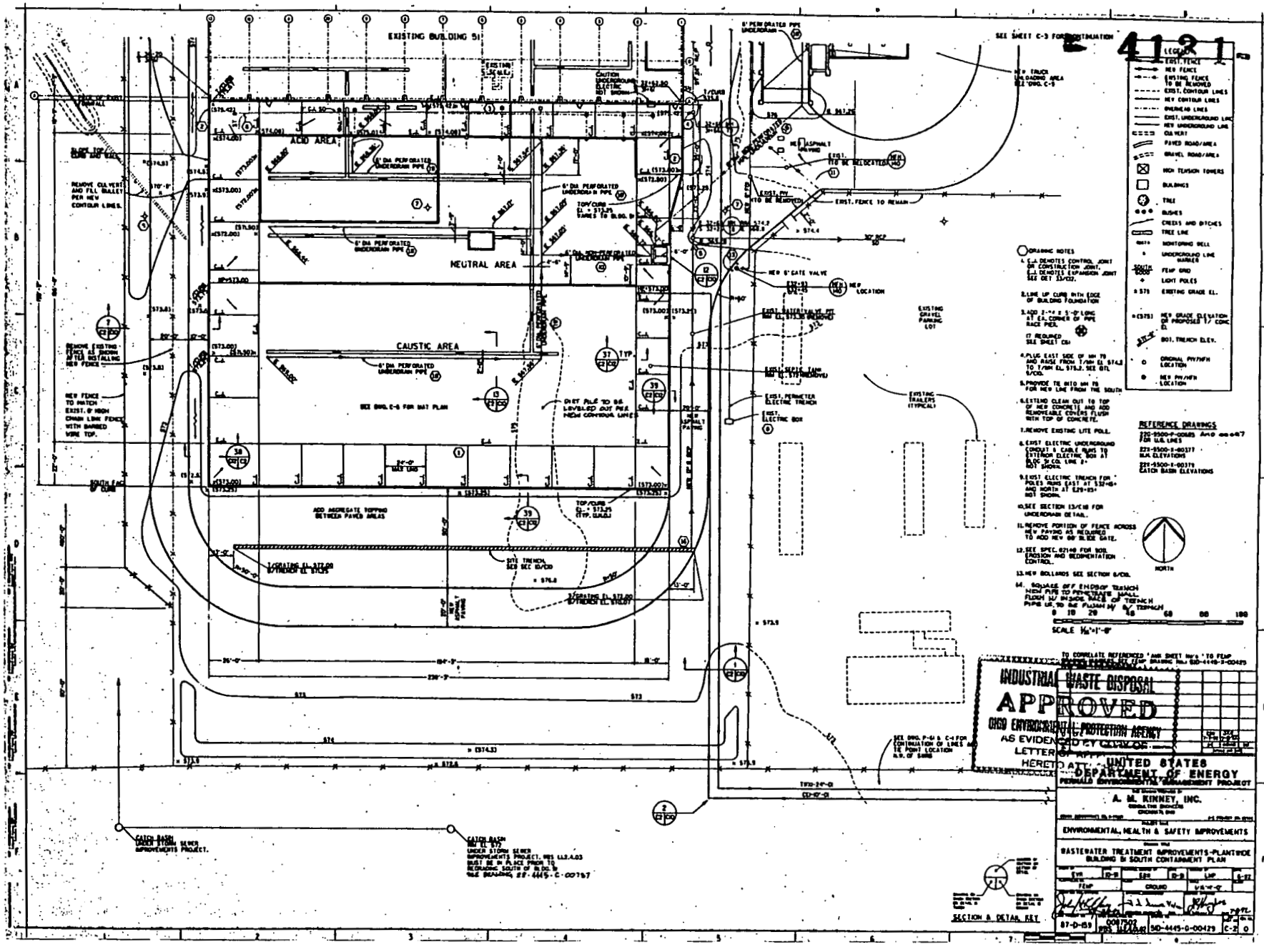
A. K. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

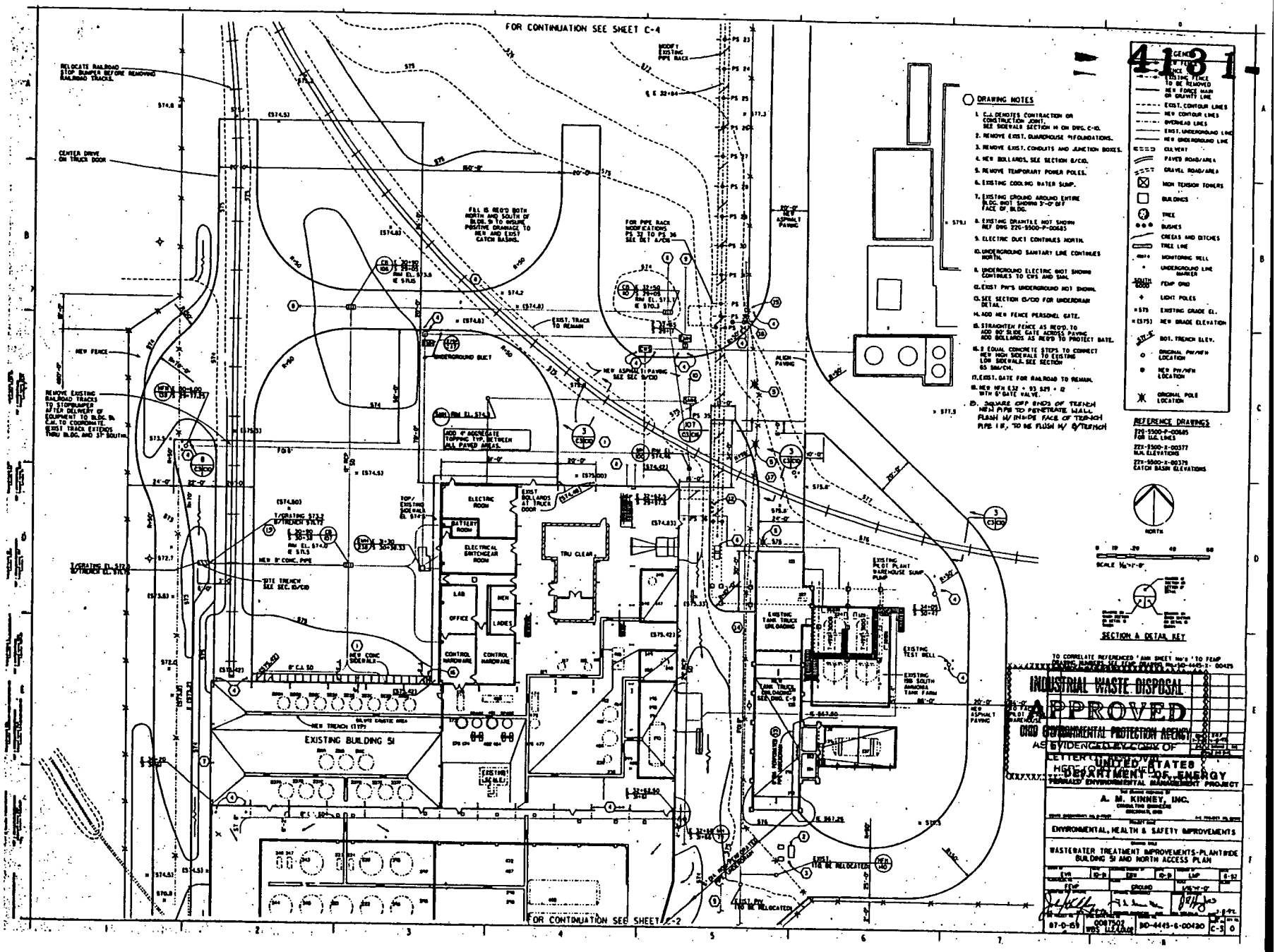
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANT. IDS
COVERSHEET, SHEET 1 OF 1

0087502
87-D-129 | WBS 1.1.2.4.01 | SID-4445-P-00439 REV. 0

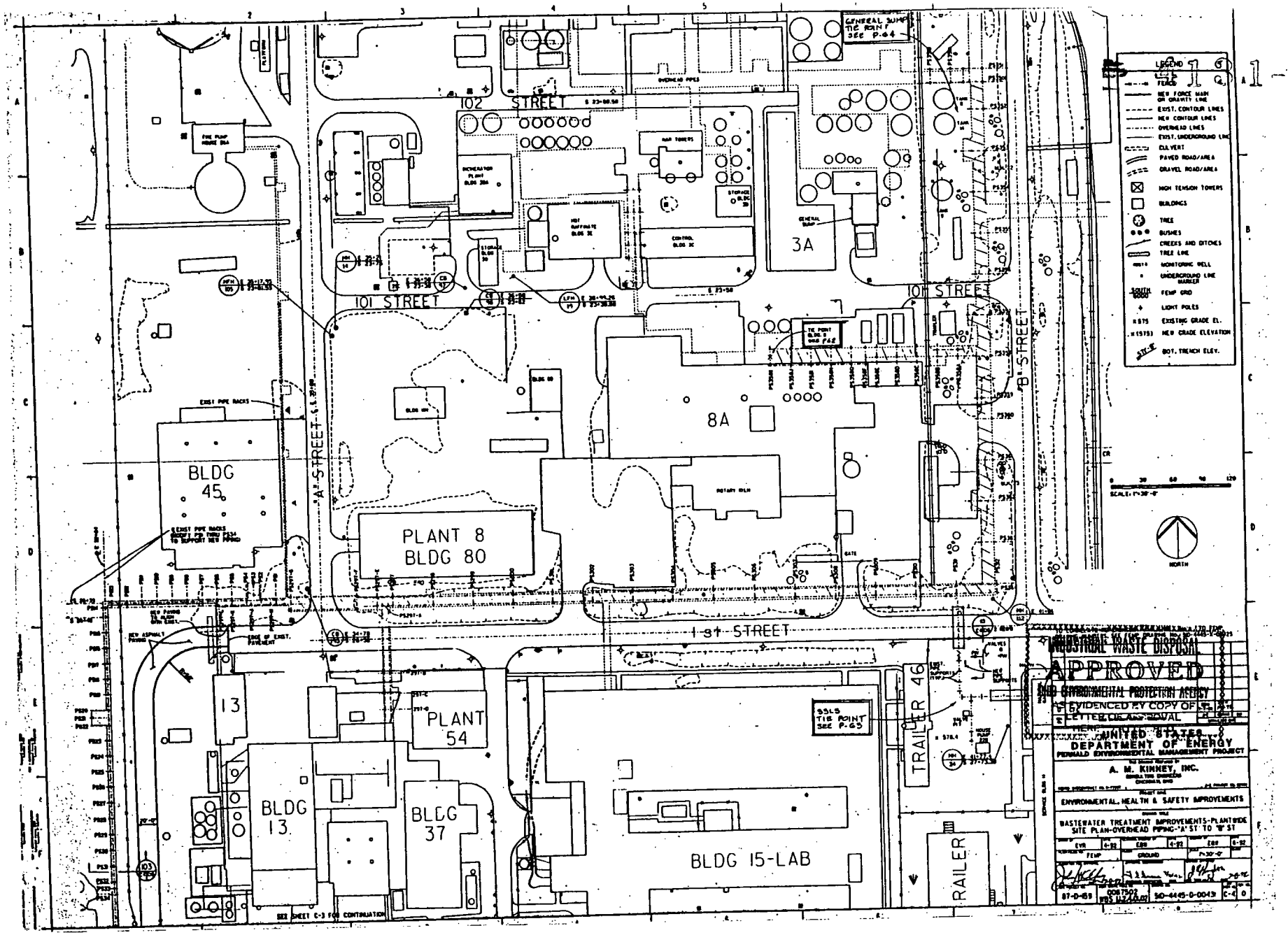

GENERAL SUMP WORK AREA
BLDG. 8 TIE POINT
BLDG 51
EAST TRUCK UNLOADING AREA
STORM SEWER LIFT STATION TIE POINT
NEW STP LIFT STATION
NEW PIPE RACK
NEW SOUTH CONTAINMENT
CONTRACTOR LAYDOWN AREA
TIE POINT FOR AWWT
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HEREIN ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
LOCATION PLAN
VICINITY MAP
FEMP
NORTH
SCALE: 1"=100'-0"
SD-4415-0-00429

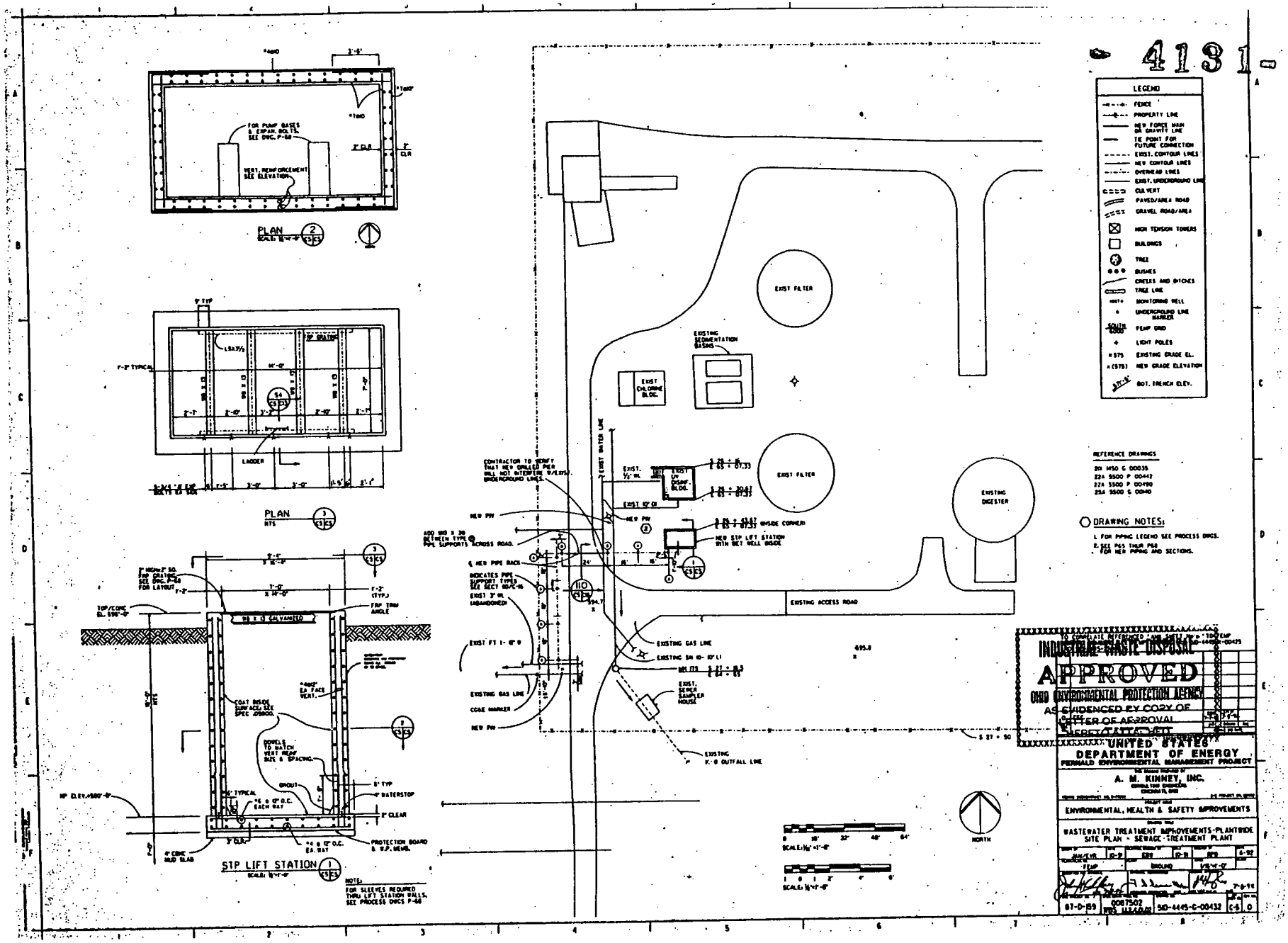

EXISTING BUILDING 51
ACID AREA
NEUTRAL AREA
CAUSTIC AREA
SEE SHEET C-3 FOR CONTINUATION
LEGEND
EXIST. FENCE
NEW FENCE
EXISTING FENCE TO BE REMOVED
EXIST. CONTOUR LINES
NEW CONTOUR LINES
OVERHEAD LINES
EXIST. UNDERGROUND LINE
NEW UNDERGROUND LINE
CULVERT
PAVED ROAD/AREA
GRAVEL ROAD/AREA
HIGH TENSION TOWERS
BUILDINGS
TREE
BUSHES
CREEKS AND DITCHES
TREE LINE
MONITORING WELL
UNDERGROUND LINE MARKER
TEMP GRID
LIGHT POLES
EXISTING GRADE EL.
NEW GRADE ELEVATION OR PROPOSED T/ CONC EL.
BOT. TRENCH ELEV.
ORIGINAL PH/HH LOCATION
NEW PH/HH LOCATION
DRAWING NOTES
REFERENCE DRAWINGS
NORTH
SCALE 1/8"=1'-0"
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY CONTROL LETTER
HERETO ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
PERMAULD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
BUILDING 51 SOUTH CONTAINMENT PLAN
SD-4445-0-00429
C-2
0
SECTION A DETAIL REF


FOR CONTINUATION SEE SHEET C-4
FOR CONTINUATION SEE SHEET C-2
RELOCATE RAILROAD
CENTER DRIVE ON TRUCK DOOR
NEW FENCE
REMOVE EXISTING RAILROAD TRACKS TO STORMWATER
EXIST. TRACK TO REMAIN
UNDERGROUND DUCT
NEW ASPHALT PAVING SEE SEC. D/C10
ADD 4" AGGREGATE TOPPING TYP. BETWEEN ALL PAVED AREAS.
ELECTRIC ROOM
BATTERY ROOM
ELECTRICAL SWITCHGEAR ROOM
LAB
OFFICE
MEN
LADIES
CONTROL HARDWARE
TRU CLEAR
EXISTING BUILDING 51
NEW TRENCH (TYP)
EXISTING TANK TRUCK UNLOADING
EXISTING TEST WELL
EXISTING PLOT PLANT WAREHOUSE SUMP PUMP
EXIST. PIPE TO BE RELOCATED
NORTH
SCALE 1/8"=1'-0"
SECTION A DETAIL KEY
DRAWING NOTES
REFERENCE DRAWINGS
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
UNITED STATES
DEPARTMENT OF ENERGY
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
BUILDING 51 AND NORTH ACCESS PLAN
87-0-159
0087502
90-4445-6-00430
C-3
0

4131

02


102 STREET
101 STREET
100 STREET
1 ST STREET
A STREET
B STREET
BLDG 45
PLANT 8
BLDG 80
8A
3A
PLANT 54
BLDG 13
13
BLDG 37
BLDG 15-LAB
TRAILER 46
TRAILER
LEGEND
NORTH
SCALE: 1"=30'-0"
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
SITE PLAN-OVERHEAD PIPING-'A' ST TO 'B' ST
87-0-159
50-4415-0-0043
C-4


PLAN
PLAN
STP LIFT STATION
LEGEND
FENCE
PROPERTY LINE
NEW FORCE MAIN OR GRAVITY LINE
TIE POINT FOR FUTURE CONNECTION
EXIST. CONTOUR LINES
NEW CONTOUR LINES
OVERHEAD LINES
EXIST. UNDERGROUND LINE
CULVERT
PAVED/AREA ROAD
GRAVEL ROAD/AREA
HIGH TENSION TOWERS
BUILDINGS
TREE
BUSHES
CREEKS AND DITCHES
TREE LINE
MONITORING WELL
UNDERGROUND LINE MARKER
PEMP GRID
LIGHT POLES
EXISTING GRADE EL.
NEW GRADE ELEVATION
BOT. TRENCH ELEV.
EXIST FILTER
EXISTING SEDIMENTATION BASINS
EXIST CHLORINE BLDG.
EXISTING DIGESTER
EXISTING ACCESS ROAD
EXISTING GAS LINE
EXISTING SEWER SAMPLER HOUSE
EXISTING 1'-0 OUTFALL LINE
NEW STP LIFT STATION WITH WET WELL INSIDE
NORTH
REFERENCE DRAWINGS
DRAWING NOTES:
1. FOR PIPING LEGEND SEE PROCESS DWGS.
2. SEE P&S TYPIC P&S
3. FOR NEW PIPING AND SECTIONS.
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
SITE PLAN - SEWAGE TREATMENT PLANT
87-D-159
00075G2
SD-4445-C-00432
C-5
0

STANDARD ABBREVIATIONS

AAD AUTOMATIC AIR DAMPER
AFF ABOVE FINISHED FLOOR
AL ALUMINUM
ANC ANCHOR
ARCH ARCHITECTURAL
ATM ATMOSPHERE
BE BEVEL END
BFP BACKFLOW PREVENTER
BFW BOILER FEED WATER
BHP BRAKE HORSEPOWER
BLDG BUILDING
BLR BOILER
BOD BOTTOM OF DUCT
BOP BOTTOM OF PIPE
BTU BRITISH THERMAL UNIT
BO BLOW OFF
C CELSIUS (DEGREES CENTIGRADE)
℄ CENTERLINE
C/C CENTER TO CENTER
CA COMPRESSED AIR
CD CEILING DIFFUSER
CFM CUBIC FEET PER MINUTE
CFS CUBIC FEET PER SECOND
CO CLEANOUT
CONC CONCRETE
CONN CONNECTION
CONT CONTINUATION
CS CARBON STEEL
CUH CABINET UNIT HEATER
CV CHECK VALVE
CWO CHAIN WHEEL OPERATOR
DL DOOR LOUVER
DA DAMPER ACTUATOR
DC DUST COLLECTOR
DIA DIAMETER
DM DAMPER MOTOR
DN DOWN
DPT DEW POINT TEMPERATURE
DR DRAIN
DWG DRAWING
EXH EXHAUST AIR
ECC ECCENTRIC
EF EXHAUST FAN
EL ELEVATION
EOV ELECTRICAL OPERATED VALVE
EQ EQUAL
ER EXHAUST REGISTER
ESP EXTERNAL STATIC PRESSURE
EVP EVAPORATOR
F FAHRENHEIT DEGREES
F&T FLOAT & THERMOSTATIC
FLT FILTER
FC FLEXIBLE CONNECTION
FD FLOOR DRAIN
FDD FIRE DAMPER
FF FINISHED FLOOR
FL FLOOR
FLG FLANGE
FND FOUNDATION
FP FIRE PROTECTION
FT FOOT (FEET)
FTG FOOTING
FT HD FEET OF HEAD
GA GAGE
GAL GALLON
GC GAS CHROMATOGRAPH
GPH GALLONS PER HOUR
GPM GALLONS PER MINUTE
HC HOSE CONNECTION
HDR HEADER
HORIZ HORIZONTAL
HP HORSE POWER
HTG HEATING
HV HEATING AND VENTILATION UNIT
HVAC HEATING VENTILATION & AIR CONDITIONING
HZ HERTZ
IE INVERT ELEVATION
IN INCH
ID INSIDE DIAMETER
IPS INSIDE PIPE DIAMETER
KW KILOWATT
LBS/HR POUNDS PER HOUR
LG LONG
MAX MAXIMUM
MCC MOTOR CONTROL CENTER
MH MANHOLE
MIN MINIMUM
MTD MOUNT
NC NORMALLY CLOSED
NEC NATIONAL ELECTRIC CODE
NO NORMALLY OPEN
NPT NATIONAL PIPE THREADS
NS NEAR SIDE
NTS NOT TO SCALE
OA OUTSIDE AIR
OC ON CENTER
OD OUTSIDE DIAMETER
OPG OPENING
OZ OUNCE
PL PLATE
PE PLAIN END
PG PIPE GUIDE
PIV POST INDICATOR VALVE
PP POLYPROPYLENE
PS POLYPROPYLENE SOLUTION
PSIA POUNDS PER SQUARE INCH ABSOLUTE
PSI POUNDS PER SQUARE INCH
PSIG POUNDS PER SQUARE INCH GAUGE
PVC POLYVINYL CHLORIDE
RED REDUCER
REQD REQUIRED
RG RETURN GRILLE
RPM REVOLUTIONS PER MINUTE
RR RETURN REGISTER
SAN SANITARY
SCFM STANDARD CUBIC FEET PER MINUTE
SD SHOWER DRAIN
SD SMOKE DETECTOR
SHT SHEET
SLA SOLVENT LADEN AIR
SP STATIC PRESSURE
SPEC SPECIFICATIONS
SP GR SPECIFIC GRAVITY
SR SUPPLY REGISTER
SRU SOLVENT RECOVERY UNIT
SS STAINLESS STEEL
SSLS STORM SEWER LIFT STATION
STM STEAM
STP SEWAGE TREATMENT PLANT
SW SOCKET WELD
SWRB STORM WATER RETENTION BASIN
T/S TOP OF SUPPORT
TDH TOTAL DYNAMIC HEAD
TEMP TEMPERATURE
THD THREAD
TK THICK
TOD TOP OF DUCT
TOP TOP OF PIPE
TOS TOP OF STEEL
TW TREATED WATER
TYP TYPICAL
UG UNDERGROUND
UH UNIT HEATER
UV ULTRA VIOLET
VAC VACUUM
VB VACUUM BREAKER
VEL VELOCITY
VERT VERTICAL
VIV VARIABLE INLET VANE
VTR VENT THRU ROOF
WG WATER GAGE COLUMN
WT WEIGHT

PIPING SERVICE

CA-XX COMPRESSED AIR (XX=PRESSURE)
CE CONTAMINATED EFFLUENT
CN STEAM CONDENSATE
CW DOMESTIC COLD WATER
CHR CHILLED WATER RETURN
CHS CHILLED WATER SUPPLY
DI DEIONIZED WATER
DW DISTILLED WATER
DWP POTABLE WATER
G NATURAL GAS
HW DOMESTIC HOT WATER
HW-XXX DOMESTIC HOT WATER (XXX=TEMP.)
HWC-XXX DOMESTIC HOT WATER RECIRCULATED (XXX=TEMP.)
LS STEAM 400 PSIG
LW LABORATORY WASTE
LWV LAB WASTE VENT
LWVTR LAB WASTE VENT THRU ROOF
NA CAUSTIC
PA PLANT AIR
BA BREATHABLE AIR
SAN SANITARY DRAIN
SAN SANITARY VENT
S-XXX STEAM (XXX=PRESSURE)
SC-XXX STEAM CONDENSATE (XXX=PRESSURE)
TW AWWT TREATED WATER
V VENT
CR COOLING WATER RETURN
CS COOLING WATER SUPPLY
CH CHEMICAL
SA STRONG ACID
DA DILUTE ACID
DI DECONTAMINATED WATER DEIONIZED

EQUIPMENT

AC AIR CONDITIONING UNIT
AGT AGITATOR
AHU AIR HANDLING UNIT
BLR BLOWER
CH CABINET HEATER
CLFR CLARIFIER
CLG COOLING SYSTEM
CONV CONVEYOR
CP CONDENSATE PUMP
DC DUST COLLECTOR
DSS DRUM DUMPING STATION
DMP DEMISTER
EUH ELECTRIC UNIT HEATER
F FAN (EXISTING)
FDR FEEDER
FLS FLOW SPLITTER
FLT FILTER
HTR HEATER
HTX HEAT EXCHANGER
LAV LAVATORY
MAU MAKE-UP AIR UNIT
MTR MOTOR
MXR MIXER
PMP PUMP
RCV RECEIVER
RH ROOF HOOD
SCB SCRUBBER
SCR SCREEN
SEP SEPARATOR
SH SHOWER
SK SINK
SSS SAFETY SHOWER SYSTEM
TNK TANK/VESSEL
UR URINAL
VAC VACUUM
VAV VARIABLE AIR VOLUME UNIT
VLV VALVE
WC WATER CLOSET

LETTERS OF INSTRUMENT IDENTIFICATION

LETTER	FIRST LETTER: MEASURED OR INITIATING VARIABLE	FIRST LETTER: MODIFIER	SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS: OUTPUT FUNCTION	SUCCEEDING LETTERS: MODIFIER
A	ANALYSIS	—			—
B	BURNER FLAME	—	—		—
C	CONDUCTIVITY	—	—	CONTROL	CLOSE
D	DENSITY	DIFFERENTIAL	—		—
E	VOLTAGE	—	PRIMARY ELEMENT		—
F	FLOW RATE	RATIO (FRACTION)	—		—
G	GAGING (DIM)	—	GLASS		—
H	HAND (MANUAL)	—			HIGH
I	CURRENT (ELECT)	—	INDICATE		—
J	POWER	SCAN	—		—
K	TIME, SCHEDULE	TIME RATE OF CHANGE	—	CONTROL STATION	—
L	LEVEL	—	LIGHT (PILOT)		LOW
M	DEW POINT, HUMIDITY	MOMENTARY	—		MIDDLE
N	—		—	TRANSDUCER	—
O	OBSERVATION	—	ORIFICE		OPEN
P	PRESSURE OR VACUUM	—	POINT (TEST)		—
Q	QUANTITY OR EVENT	TOTALIZE	—		—
R	RADIOACTIVITY	—	RECORD		—
S	SPEED OR FREQUENCY	SAFETY	—	SWITCH	—
T	TEMPERATURE	—	—	TRANSMIT	—
U	MULTIVARIABLE	—	MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VISCOSITY	—	VENT	VALVE	—
W	WEIGHT OR FORCE	—	WELL		—
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS	—	RELAY/COMPUTE	—
Z	POSITION, DIMENSION	Z AXIS	—	CONTROL DEVICE	—

SPECIAL NON-ISA INSTRUMENT CODES
PNL PANEL
DDC DIRECT DIGITAL CONTROL SYSTEM
DCS DISTRIBUTED CONTROL SYSTEM

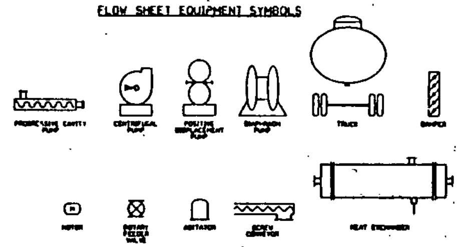
SPECIAL DESIGNATIONS

DESIGNATION	FUNCTION/ABBREVIATION
1-0	ON-OFF
Σ/n OR AVG	AVERAGING
+ OR Σ	ADD
1:1, 2:1 (TYP)	BOOST, GAIN OR ATTENUATE (INPUT/OUTPUT)
Δ OR DIF	DIFFERENTIAL
÷ OR DIV	DIVIDE
√ OR SQ. RT.	EXTRACT SQUARE ROOT
X OR MUL	MULTIPLY
X^n	RAISE TO POWER
REV	REVERSING
Σ OR SUM	SUMMING
HS	HIGH SELECTING
LS	LOW SELECTING
f	UNDETERMINED COMPUTING RELAY
d/dt	DERIVATIVE
1/d	INVERSE DERIVATIVE
∫	INTEGRATE (TIME INTEGRAL)
K	PROPORTIONAL
PB	PUSH BUTTON
PBL	PUSH BUTTON AND LIGHT
PBW	PUSH BUTTON WITH LIGHT
PB2	TWO PUSH BUTTONS
PBL2	TWO PUSH BUTTONS AND LIGHTS
PBW2	TWO PUSH BUTTONS WITH LIGHTS
SW	SELECTOR SWITCH
SWL	SELECTOR SWITCH AND LIGHTS
SWL2	SELECTOR SWITCH AND TWO LIGHTS
HOA	SELECTOR SWITCH THREE POSITION
CONVERT	FOR INPUT/OUTPUT SEQUENCES OF THE FOLLOWING: A=ANALOG, D=DIGITAL, E=VOLTAGE, H=HYDRAULIC, I=CURRENT, O=ELECTROMAGNETIC, SONIC, P=PNEUMATIC, R=RESISTANCE (ELECTRICAL)

FLOW SHEET & INSTRUMENTATION SYMBOLS

GATE VALVE
BALL VALVE
GLOBE VALVE
PLUG VALVE
BUTTERFLY VALVE
CHECK VALVE (ARROW INDICATES FLOW)
PINCH VALVE
NEEDLE VALVE
FIRE SAFE VALVE
ANGLE VALVE
3 WAY VALVE
4 WAY VALVE
SAFETY RELIEF VALVE
VACUUM RELIEF
PRESSURE/VACUUM CONSERVATION VALVE
SELF-CONTAINED BACK PRESSURE REGULATING VALVE
SELF-CONTAINED PRESSURE REGULATING VALVE
PISTON ACTUATED VALVE WITH SOLENOID AND POSITION SWITCHES
DIAPHRAGM ACTUATOR
PISTON ACTUATOR
SOLENOID ACTUATOR
MOTORIZED ACTUATOR
VACUUM BREAKER
RUPTURE DISC
DIAPHRAGM SEAL
SLIDE VALVE
MAIN OPERATING LINE
AUXILIARY PROCESS & SERVICE LINE
DIRECTION OF FLOW ARROW
CONCENTRIC REDUCER
ECCENTRIC REDUCER
STRAINER
TRAP
FILTER
REGULATOR
LUBRICATOR
ORIFICE ASSEMBLY FLANGE TAPS
ORIFICE PLATE
PIPE FLANGES
FLEXIBLE HOSE
HOSE CONNECTION
PIPE CAP
SIPHON TUBE
PIPE INSULATION
PIPE INSULATION WITH ELECTRIC TRACING
PIPE INSULATION WITH STEAM TRACING
SPECIFICATION CHANGE
DIRECT CONNECTION OR MECHANICAL LINK
ELECTRICAL SIGNAL
SONIC OR ELECTROMAGNETIC SIGNAL
CAPILLARY
INSTRUMENT AIR SUPPLY OR PNEUMATIC SIGNAL LINE
SOFTWARE LINK
EXISTING LINE
ENVIRONMENTAL EMISSION OR DISCHARGE POINT
SAFETY DEVICE
LOCAL MOUNTED INSTRUMENT
FRONT OF PANEL MOUNTED
FURNISHED WITH EQUIPMENT OR SYSTEM PACKAGE
REAR OF PANEL MOUNTED
INSTRUMENT WITH FREEZE PROTECTION
FUTURE OR EXIST.
SOFTWARE LOW AND HIGH ALARMS
SHARED DISPLAY/NORMALLY ACCESSIBLE TO OPERATOR
ANALOG INPUT TO THE DCS
ANALOG OUTPUT FROM THE DCS
DISCRETE INPUT TO THE DCS
DISCRETE OUTPUT FROM THE DCS
ELECTRICAL CONTROL/INTERLOCK OTHER THAN DCS
REMOTE SETPOINT
SAMPLE CONNECTION
FLAME ARRESTOR
TIE POINT
SIGHT GLASS

FLOW SHEET EQUIPMENT SYMBOLS



DUCTWORK SYMBOLS

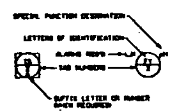
NOTES:

UP DIAMETER ROUND DUCT.
RECTANGULAR OR SQUARE DUCT. FIRST NUMBER INDICATES DIMENSION OF SIDE SHOWN, SECOND SIDE NOT SHOWN.
SUPPLY DUCT SECTION. FIRST NUMBER INDICATES HORIZONTAL DIMENSION OF DUCT, SECOND NUMBER INDICATES VERTICAL DIMENSION OF DUCT.
SUPPLY DUCT SQUARE NECK
RETURN OR EXHAUST DUCT
BLAST GATE
INCLINED DROP IN RESPECT TO AIR FLOW
INCLINED RISE IN RESPECT TO AIR FLOW
FLEXIBLE DUCT CONNECTION
BALANCING DAMPER
SQUARE ELBOW WITH TURNING VANES

PIPING SYMBOLS

BRANCH CONNECTION
PIPE CAP
90 DEG. ELBOW DOWN
90 DEG. ELBOW UP
TEE DOWN
TEE UP
PIPE OFFSETTING DOWN AT 45 DEG.
PIPE OFFSETTING UP AT 45 DEG.
PIPE FLANGES
PIPE UNION
PIPE GUIDES
PIPE ANCHOR OR HANGER
ECCENTRIC REDUCER
CONCENTRIC REDUCER
DIRECTION OF FLOW ARROW
STRAINER
WELDED CONNECTION
SOCKET WELDED CONNECTION
THREADED CONNECTION
ANGLE VALVE
GATE VALVE
CHAIN WHEEL OPERATOR
GLOBE VALVE
CHECK VALVE
BUTTERFLY VALVE
BALL VALVE
RELIEF VALVE OR SAFETY VALVE
SOLENOID VALVE
CONTROL VALVE (2 WAY)
CONTROL VALVE (3 WAY)
MOTOR OPERATED VALVE
CENTER LINE
FLEXIBLE CONNECTION
THERMOMETER WELL
CALIBRATED BALANCING VALVE W/MEMORY STOPS

LINE NUMBER DESIGNATION



INSTRUMENT DESIGNATION

TO CORRELATE REFERENCED "AMR SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. 8ID-4446-E-00429

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO

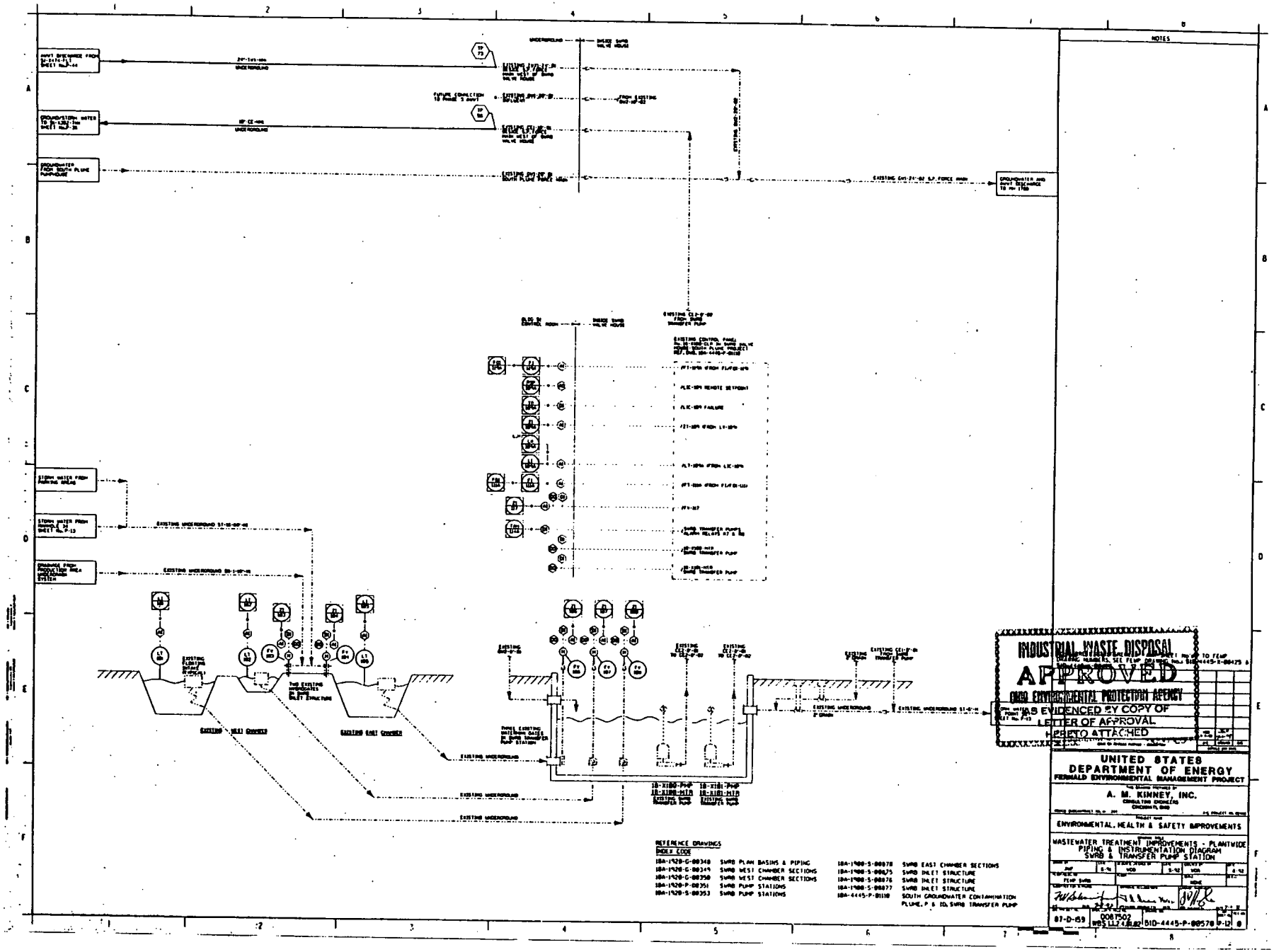
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

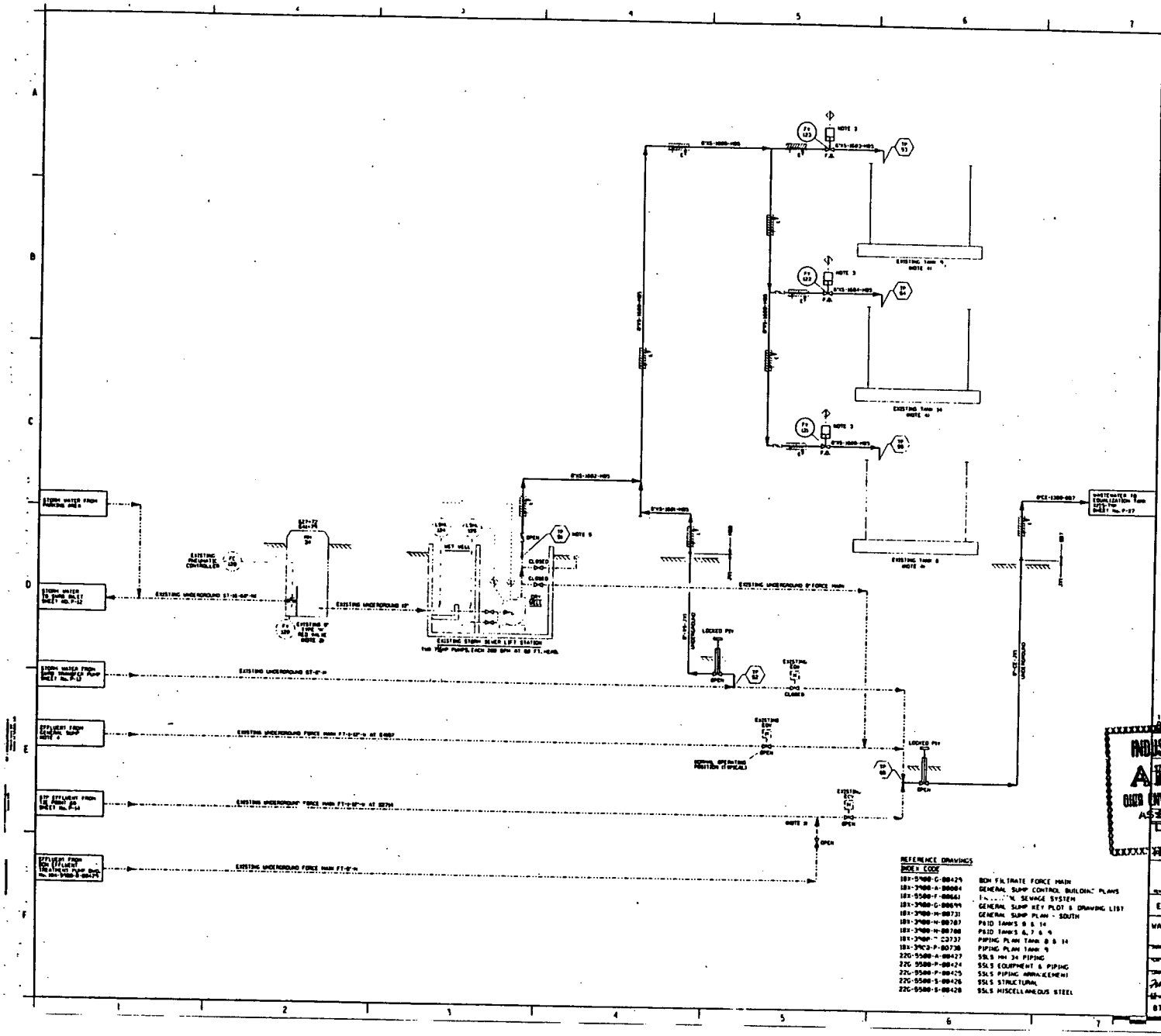
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

LEGENDS & SYMBOLS

FEMP BLDG. 18
NONE
87-D-159
0087502
8ID-4445-X-00567
L-2
0


NOTES
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
SWRB & TRANSFER PUMP STATION
87-D-159
0087502
WBS 1.1.7.4.8.02
DID-4445-P-00578
P-12
0
REFERENCE DRAWINGS
INDEX CODE
18A-1920-G-00348 SWRB PLAN BASINS & PIPING
18A-1920-G-00349 SWRB WEST CHAMBER SECTIONS
18A-1920-G-00350 SWRB WEST CHAMBER SECTIONS
18A-1920-P-00351 SWRB PUMP STATIONS
18A-1920-S-00353 SWRB PUMP STATIONS
18A-1900-S-00078 SWRB EAST CHAMBER SECTIONS
18A-1900-S-00075 SWRB INLET STRUCTURE
18A-1900-S-00076 SWRB INLET STRUCTURE
18A-1900-S-00077 SWRB INLET STRUCTURE
18A-4445-P-00110 SOUTH GROUNDWATER CONTAMINATION PLUME, P & ID, SWRB TRANSFER PUMP



1. FOR BCH EFFLUENT CONSTRUCTION AND DISCHARGE PIPING CONNECTION TO FT-1-12"-N, REFER TO DRAWING No. 187-5400-C-00424.
2. EXISTING AUTOMATED VALVE INSTALLED IN ST-16-60"-N AT MANHOLE 34. CONTROL OF THIS VALVE HAS BEEN PROVIDED IN THE GENERAL SUMP CONTROL ROOM.
3. LOCATE IN THE NEW GENERAL SUMP CONTROL ROOM THE CONTROLS FOR THE THREE AUTOMATED SPILL RETURN VALVES AT TANKS 8, 9 AND 14.
4. FOR EXISTING TANKS 8, 9, & 14, REFER TO DRAWING INDEX CODE 187-3400-H-00707, 187-3400-H-00708, 187-3400-P-00737, AND 187-3400-P-00738.
5. TIE POINT 51, REPLACE EXISTING 6" ELBOW WITH TEE AT EXISTING 8" VALVE KEY, 572-7110 EXISTING EMERGENCY BY-PASS SHOWN CAPPED ON DRAWINGS No. 22G-5500-P-00424 AND No. 22G-5500-P-00425.

TO CORRELATE REFERENCED DRAWINGS WITH PROJECT NO. 51D-4445-P-00571 SEE 51D-4445-P-00425 &

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HEREON

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

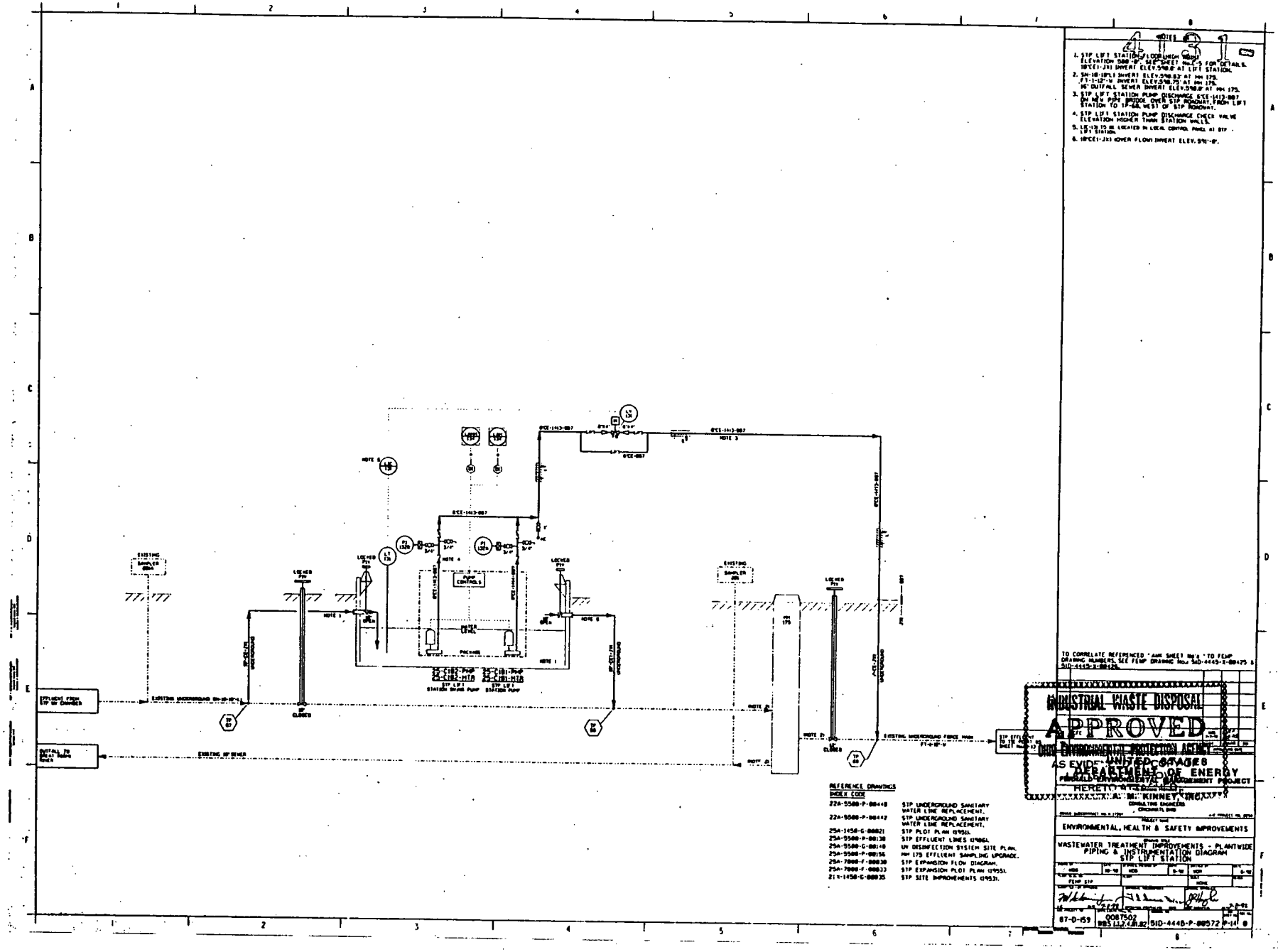
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
SSLS & GENERAL SUMP/TANKS 8, 9 & 14

DRAWN BY JEL	DATE 10-10	PROJECT ENGINEER VOB	DATE 10-10
CHECKED BY TEMP SSLS		PROJECT MANAGER VOB	DATE 10-10
		DIRECTOR NONE	DATE NONE

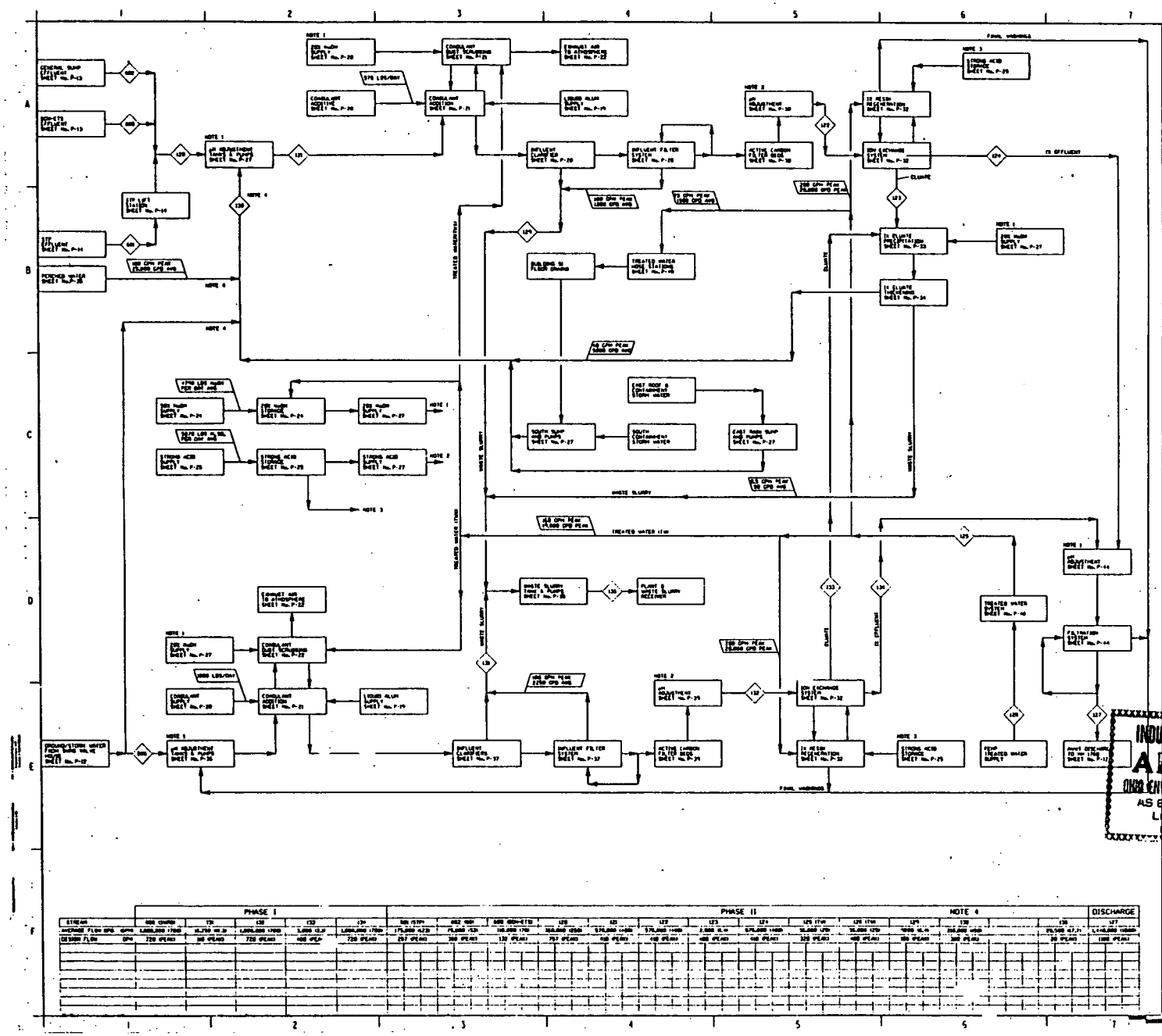
87-0-159 | 0087502 | 51D-4445-P-00571 | P-13 | 0

REFERENCE DRAWINGS

INDEX CODE	
187-5400-C-00429	BCH FILTRATE FORCE MAIN
187-3400-A-00004	GENERAL SUMP CONTROL BUILDING PLANS
187-5500-F-00661	[illegible] SEWAGE SYSTEM
187-3400-C-00699	GENERAL SUMP KEY PLOT & DRAWING LIST
187-3400-H-00731	GENERAL SUMP PLAN - SOUTH
187-3400-H-00707	P&ID TANKS 8 & 14
187-3400-H-00708	P&ID TANKS 8, 7 & 9
187-3400-P-00737	PIPING PLAN TANK 8 & 14
187-3400-P-00738	PIPING PLAN TANK 9
22G-5500-A-00427	SSLS MH 34 PIPING
22G-5500-P-00424	SSLS EQUIPMENT & PIPING
22G-5500-P-00425	SSLS PIPING ARRANGEMENT
22G-5500-S-00426	SSLS STRUCTURAL
22G-5500-S-00428	SSLS MISCELLANEOUS STEEL


NOTES
1. STP LIFT STATION FLOOR (HIGH POINT) ELEVATION 588'-9" SEE SHEET No. C-5 FOR DETAILS.
18"CE1-J11 INVERT ELEV.596.8' AT LIFT STATION.
2. 54"-18"-18"LI INVERT ELEV.596.83' AT MH 175.
7'-1"-12"-14 INVERT ELEV.596.79' AT MH 175.
36" OUTFALL SEWER INVERT ELEV.596.8' AT MH 175.
3. STP LIFT STATION PUMP DISCHARGE 6"CE-1412-007 ON NEW PIPE BRIDGE OVER STP ROADWAY FROM LIFT STATION TO TP-6A WEST OF STP ROADWAY.
4. STP LIFT STATION PUMP DISCHARGE CHECK VALVE ELEVATION HIGHER THAN STATION WALLS.
5. LS-170,75 IS LOCATED IN LOCAL CONTROL PANEL AT STP LIFT STATION.
6. 18"CE1-J11 OVER FLOW INVERT ELEV. 596'-8".
TO CORRELATE REFERENCED "AWK SHEET No." TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. 51D-4448-E-00425 & 51D-4448-E-00426.
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AS EXIDE UNITED STATES DEPARTMENT OF ENERGY
HERETO ATTACHED
ENVIRONMENTAL RESTORATION PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
STP LIFT STATION
87-0-159
0087502
51D-4448-P-00572
REFERENCE DRAWINGS
INDEX CODE
22A-9500-P-00448 STP UNDERGROUND SANITARY WATER LINE REPLACEMENT.
22A-9500-P-00442 STP UNDERGROUND SANITARY WATER LINE REPLACEMENT.
25A-1450-G-00821 STP PLOT PLAN (1955).
25A-9500-P-00130 STP EFFLUENT LINES (1986).
25A-9500-G-00148 UV DISINFECTION SYSTEM SITE PLAN.
25A-9500-P-00156 MH 175 EFFLUENT SAMPLING UPGRADE.
25A-7000-F-00830 STP EXPANSION FLOW DIAGRAM.
25A-7000-F-00833 STP EXPANSION PLOT PLAN (1955).
21A-1450-G-00835 STP SITE IMPROVEMENTS (1953).

98



NOTES

1. NOTED pH ADJUSTMENT AND OTHER STEPS ARE SUPPLIED WITH 20% NaOH FROM THE FEED PUMPS ON SHEET No. P-27.
2. NOTED pH ADJUSTMENT AND OTHER STEPS ARE SUPPLIED WITH STRONG ACID FROM THE FEED PUMPS ON SHEET No. P-27.
3. NOTED IX RESIN REGENERATION STEPS ARE SUPPLIED WITH STRONG ACID FROM THE TRANSFER PUMPS ON SHEET No. P-25.
4. PERCHED WATER AND GROUND/STORM WATER FLOW INTO THE EQUALIZATION TANK THROUGH LINES SEPARATE FROM THE LINE CARRYING THE OTHER STREAM 130 COMPONENTS.

TO CORRELATE REFERENCED "AME SHEET NOS" TO FEMP DRAWING NUMBERS, SEE FEMP DRA WING NO.: 110-4445-E 00423

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PROCESS FLOW DIAGRAM
ADVANCED WASTEWATER TREATMENT FACILITY

87-D-159 | 0087502 WBS 1.1.7.1.8.82 | SID-4445-P-00573 | 7-18 | 0

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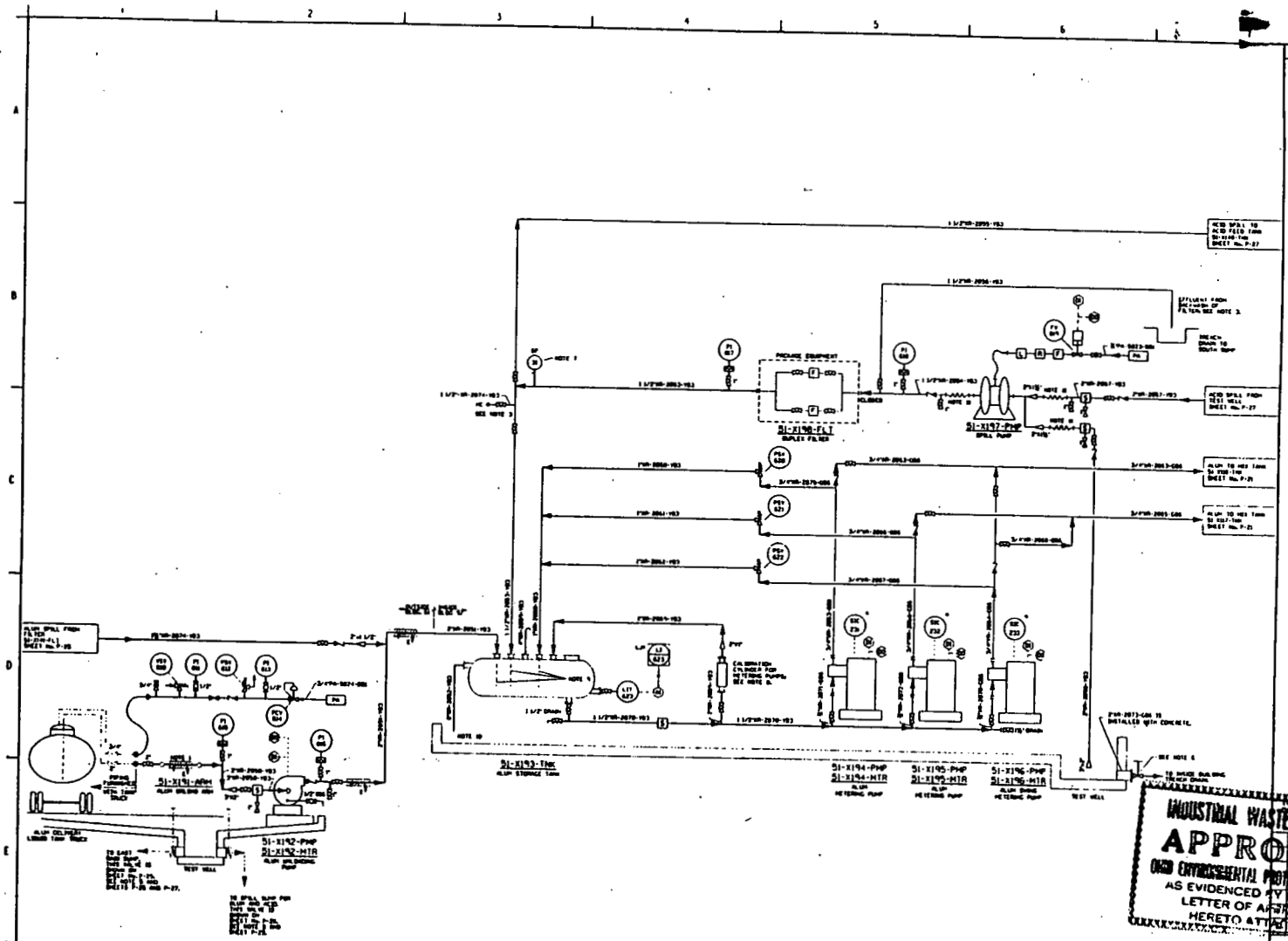

NOTES

1. LINES ARE ELECTRIC HEAT TRACED AND INSULATED IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE OUTDOOR ABOVE GROUND PIPE RACKS.
2. UNLOADING ARM TO BE FURNISHED WITH DRY-BREAK TYPE QUICK-DISCONNECT COUPLING.
3. TREATED WATER CONNECTION TO BACKWASH DUPLEX FILTER SI-X190-FLT.
4. EAST ACID/ALUM SPILL SUMP IS ADJACENT TO EAST RAIN SUMP.
5. THE ALUM AND ACID EAST UNLOADING AREAS SHARE A COMMON TEST WELL. THIS TEST WELL HAS TWO 4 INCH VALVES, ONE OF WHICH WILL BE MANUALLY OPENED INTO THE ALUM/ACID SPILL SUMP IN THE EVENT OF A CHEMICAL SPILL. THE OTHER VALVE WILL BE MANUALLY OPENED TO THE EAST UNLOADING AREA RAIN SUMP IN THE EVENT OF RAIN, AS SHOWN ON SHEET P-27.
6. 2 INCH 150 LB. FLANGED GATE VALVE IS ALLOY 20, SPEC. No. P-1015. HANDWHEEL TO EXTEND ABOVE TRENCH DRAIN COVER.
7. LOCAL SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX 1 OF SPEC. 82962-3582.
8. CALIBRATION CYLINDER, FOR DETAIL, SEE APPENDIX 1 OF SPEC. 82962-3582.
9. PROVIDE ONE 1/8" DIA. HOLE IN EACH TANK INLET DIP PIPE INSIDE TANK, LOCATED 6" BELOW TOP OF TANK.
10. OVERFLOW LINE TO EXTEND TO 6" ABOVE BLAB.
11. 2" CHEMICAL TRANSFER HOSE, SMOOTH BORE TEFLON LINED, WITH STAINLESS STEEL BRAIDED COVER, FOR B. AND STAINLESS STEEL FLANGED ENDS, 2" FLANGE, RESISTOFLEX TYPE TMH, OR APPROVED EQUAL.

INDUSTRIAL WASTE DISPOSAL
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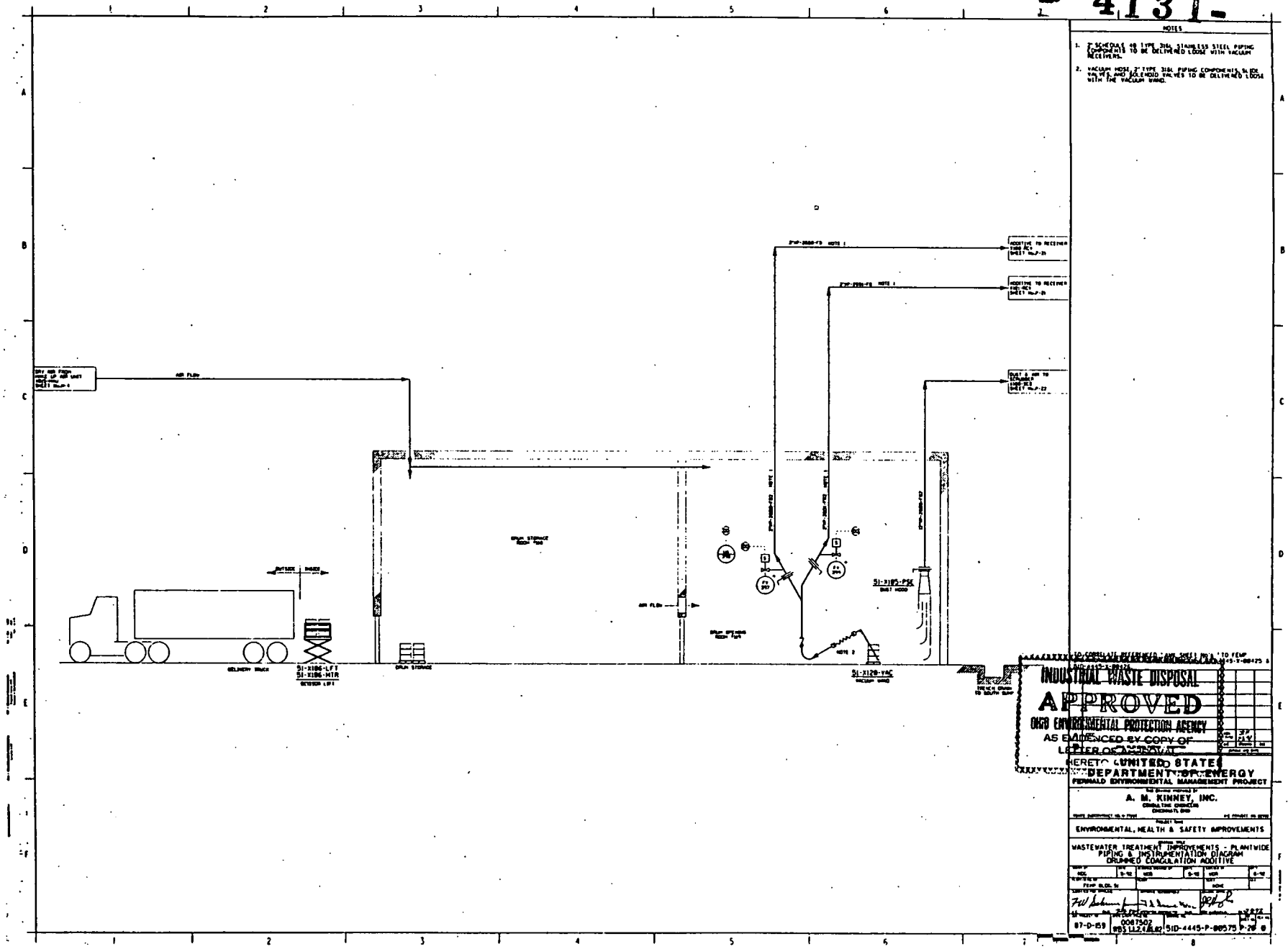
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
BULK LIQUID ALUM SYSTEM

87-0-159 | 0087502 | SD-4445-P-00574 | P-5 | 0


NOTES
1. 2" SCHEDULE 40 TYPE 316L STAINLESS STEEL PIPING COMPONENTS TO BE DELIVERED LOOSE WITH VACUUM RECEIVERS.
2. VACUUM HOSE, 2" TYPE 316L PIPING COMPONENTS, SLIDE VALVES, AND SOLENOID VALVES TO BE DELIVERED LOOSE WITH THE VACUUM WAND.
AIR FLOW
DELIVERY TRUCK
DRUM STORAGE
DRUM STORAGE ROOM TWO
DRUM OPENER ROOM TWO
SI-X106-LIFT
SI-X106-MTR
SI-X105-PSK
SI-X120-VAC
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO
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DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
DRUMMED COAGULATION ADDITIVE
0047502
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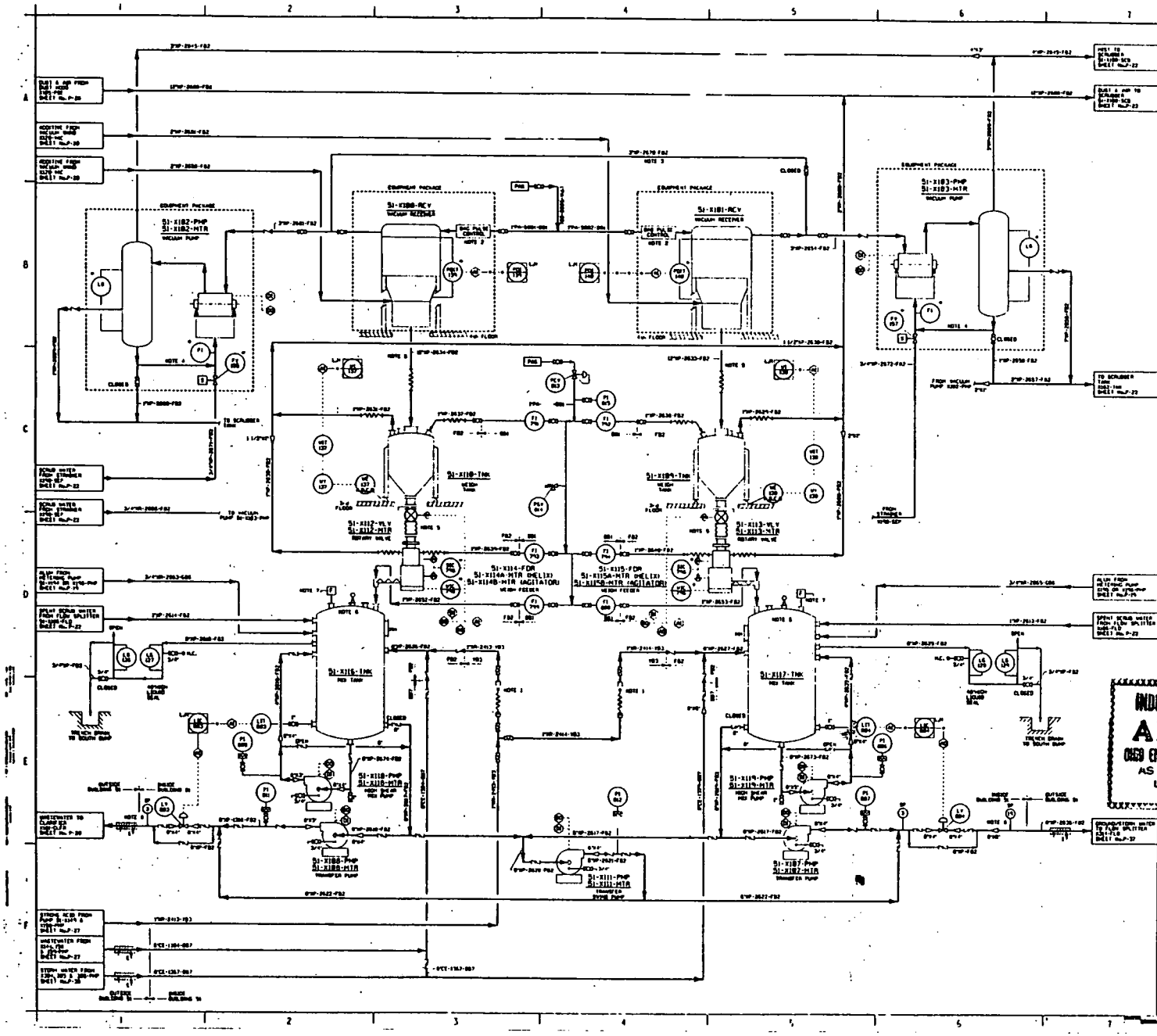
5ID-4445-P-00575 P-20 0


SI-X182-PMP
SI-X182-MTR
VACUUM PUMP
SI-X188-RCV
VACUUM RECEIVER
SI-X181-RCV
VACUUM RECEIVER
SI-X183-PMP
SI-X183-MTR
VACUUM PUMP
SI-X110-TNK
WEIGH TANK
SI-X109-TNK
WEIGH TANK
SI-X112-VLV
SI-X112-MTR
ROTARY VALVE
SI-X113-VLV
SI-X113-MTR
ROTARY VALVE
SI-X114-FDR
SI-X114A-MTR SHELL(X)
SI-X114B-MTR AGITATOR
WEIGH FEEDER
SI-X115-FDR
SI-X115A-MTR SHELL(X)
SI-X115B-MTR AGITATOR
WEIGH FEEDER
SI-X116-TNK
MIX TANK
SI-X117-TNK
MIX TANK
SI-X118-PMP
SI-X118-MTR
MIX BELT PUMP
SI-X119-PMP
SI-X119-MTR
MIX BELT PUMP
SI-X188-PMP
SI-X188-MTR
TRANSFER PUMP
SI-X187-PMP
SI-X187-MTR
TRANSFER PUMP
SI-X111-PMP
SI-X111-MTR
TRANSFER
SUMP PUMP
TO SCRUBBER TANK
TO VACUUM PUMP
TRENCH DRAIN TO SOUTH SUMP
OUTSIDE BUILDING 5A
INSIDE BUILDING 5A
CLOSED
OPEN
NOTES
1. HOSE CONNECTION FOR STRONG ACID. INSTALL AT MINIMUM DISTANCE FROM MAIN LINE.
2. BAG PULSE CONTROL INCLUDES:
FILTER REGULATOR
PRESSURE GAUGE
INTENSIFIER
ADJUSTABLE TIMER
3. MANIFOLD LINE FOR VACUUM PUMPS.
4. INSTRUMENTATION WITH LIQUID RING VACUUM PUMP EQUIPMENT PACKAGE TO INCLUDE CONTROL OF WATER FLOW INTO THE PUMP TO MAINTAIN PROPER LIQUID LEVEL IN THE PUMP DURING OPERATION AND TO PREVENT FLOODING OF THE PUMP DURING SHUTDOWN. SOLENOID VALVE FY-7551/157 CLOSES WHEN PUMP MOTOR IS DEENERGIZED.
5. FOR DETAIL OF FLEXIBLE CONNECTIONS BETWEEN VACUUM RECEIVERS AND BATCHING TANKS AND BETWEEN ROTARY VALVES AND WEIGH FEEDERS, SEE APPENDIX I OF SPEC. 82-982-3582.
6. TWO MIX TANKS EACH TO HAVE TWO 6" TRANSPARENT PORTS, ONE WITH ELECTRIC LIGHT.
7. TWO MIX TANKS EACH TO HAVE 3" VENT WITH DUST FILTER HAVING REPLACEABLE ELEMENT. FOR DETAIL, SEE APPENDIX I OF SPEC. 82-982-3582.
8. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 82-982-3582 AND P&ID SHEET No. P-15.
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
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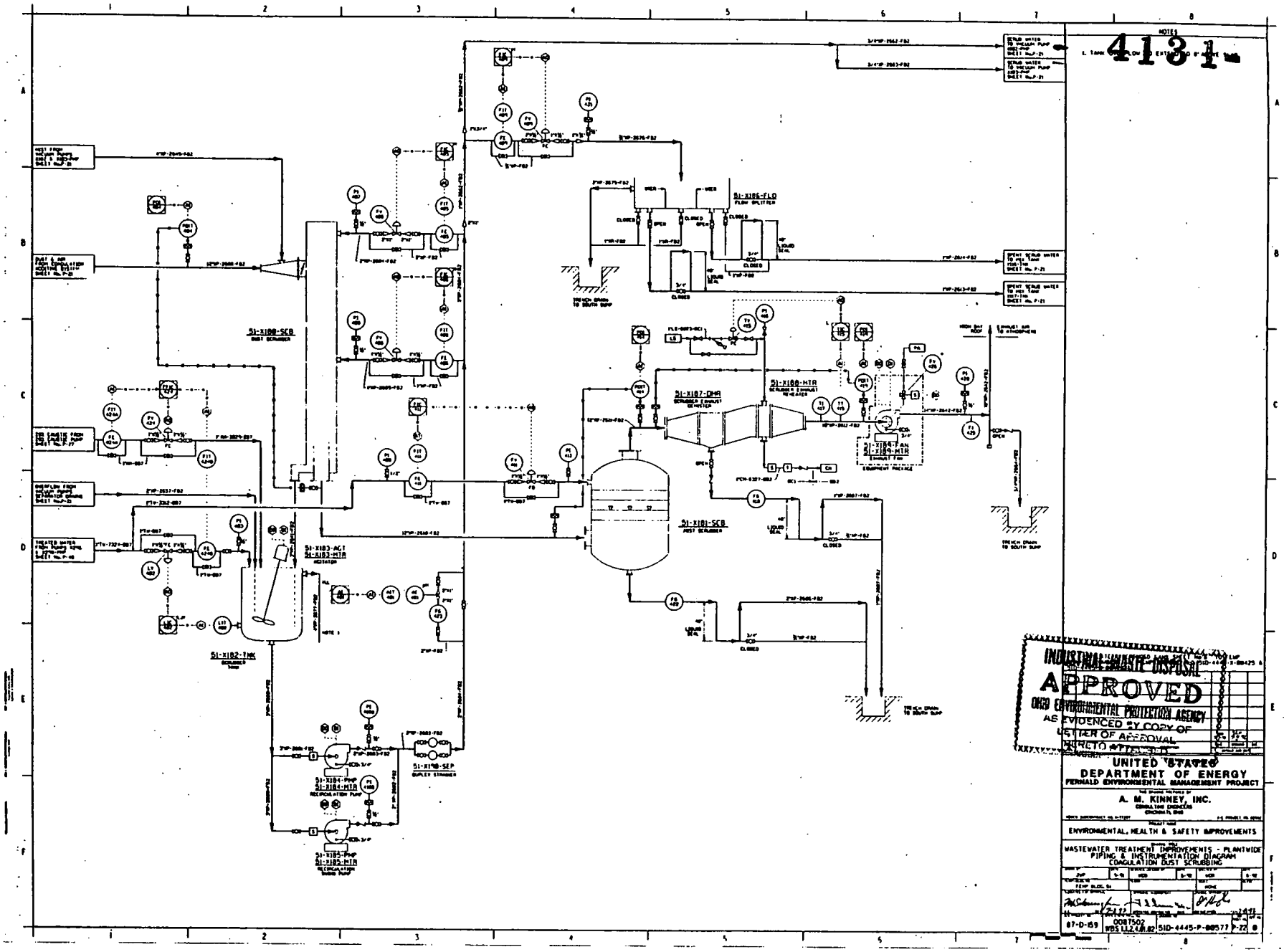
HERETO ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
COAGULATION ADDITIVE SYSTEM
87-0-159
008502
SID-4445-P-00576
P-21


4131
NOTES
51-X100-SCB
JET SCRUBBER
51-X186-FLO
FLOW SPLITTER
51-X187-DMR
SCRUBBER EXHAUST REHEATER
51-X188-HTR
SCRUBBER EXHAUST REHEATER
51-X189-HTR
51-X181-SCB
JET SCRUBBER
51-X183-AGT
51-X183-HTR
AGITATOR
51-X182-TNK
SCRUBBER TANK
51-X184-PMP
51-X184-HTR
RECIRCULATION PUMP
51-X185-PMP
51-X185-HTR
RECIRCULATION SUMP PUMP
51-X188-SEP
SUPPLY STRAINER
TRENCH DRAIN TO SOUTH SUMP
HIGH BAY ROOF
EXHAUST AIR TO ATMOSPHERE
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
DIRECTOR
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
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CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
COAGULATION DUST SCRUBBING
87-D-159
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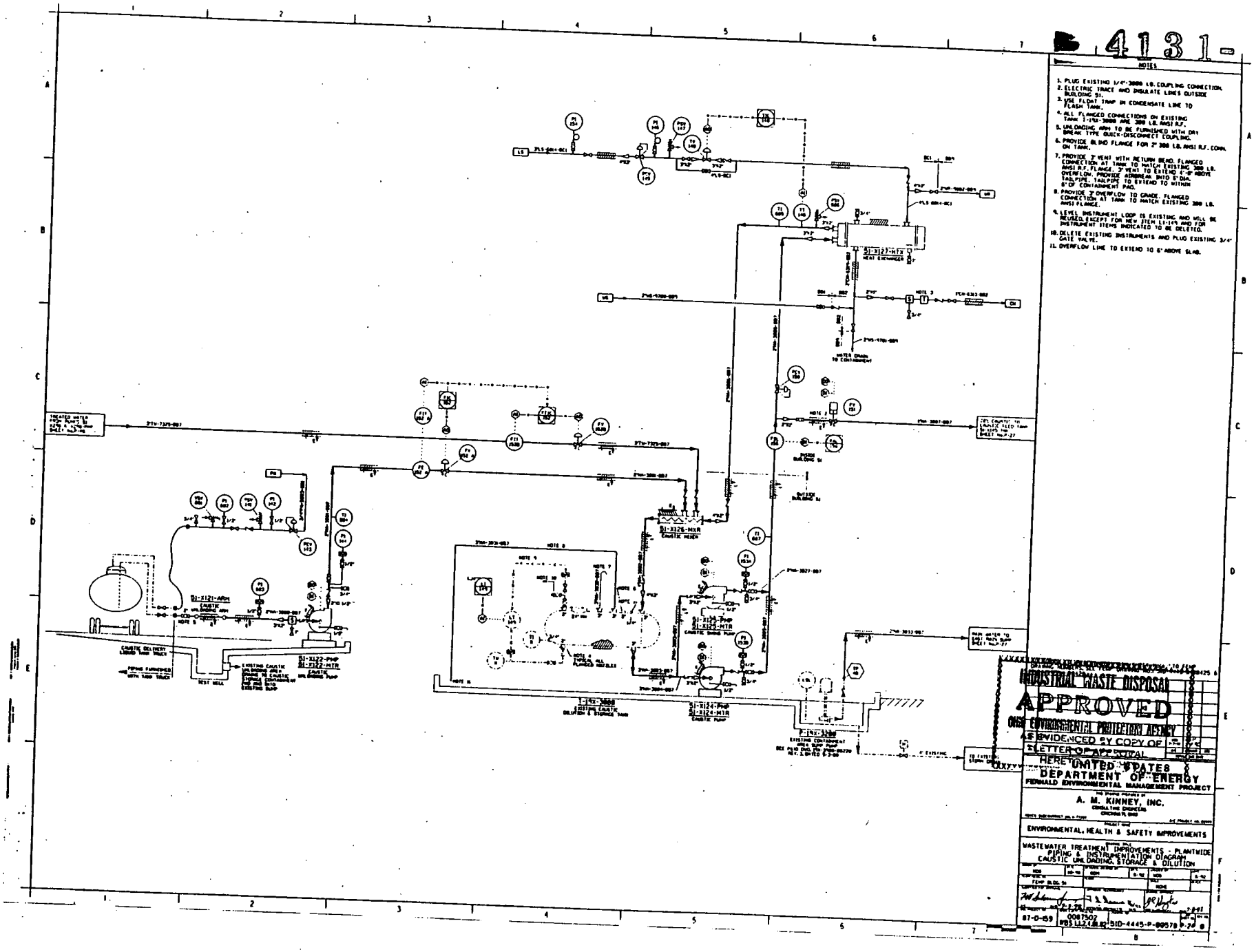
NOTES
1. PLUG EXISTING 3/4"-3000 LB. COUPLING CONNECTION.
2. ELECTRIC TRACE AND INSULATE LINES OUTSIDE BUILDING 51.
3. USE FLOAT TRAP IN CONDENSATE LINE TO FLASH TANK.
4. ALL FLANGED CONNECTIONS ON EXISTING TANK T-192-3000 ARE 300 LB. ANSI R.F.
5. UNLOADING ARM TO BE FURNISHED WITH DRY BREAK TYPE QUICK-DISCONNECT COUPLING.
6. PROVIDE BLIND FLANGE FOR 2" 300 LB. ANSI R.F. CONN. ON TANK.
7. PROVIDE 3" VENT WITH RETURN BEND. FLANGED CONNECTION AT TANK TO MATCH EXISTING 300 LB. ANSI R.F. FLANGE. 3" VENT TO EXTEND 6'-0" ABOVE OVERFLOW. PROVIDE ADDERMAK BHTO 5" DIA. TAILPIPE. TAILPIPE TO EXTEND TO WITHIN 6" OF CONTAINMENT PAD.
8. PROVIDE 3" OVERFLOW TO GRADE. FLANGED CONNECTION AT TANK TO MATCH EXISTING 300 LB. ANSI FLANGE.
9. LEVEL INSTRUMENT LOOP IS EXISTING AND WILL BE REUSED, EXCEPT FOR NEW ITEM LI-149 AND FOR INSTRUMENT ITEMS INDICATED TO BE DELETED.
10. DELETE EXISTING INSTRUMENTS AND PLUG EXISTING 3/4" GATE VALVE.
11. OVERFLOW LINE TO EXTEND 10 6" ABOVE SLAB.
51-X127-HTX
HEAT EXCHANGER
51-X126-MXR
CAUSTIC MIXER
51-X121-ARM
CAUSTIC UNLOADING ARM
51-X122-PMP
51-X122-MTR
CAUSTIC UNLOADING PUMP
51-X124-PMP
51-X124-MTR
CAUSTIC PUMP
51-X125-PMP
51-X125-MTR
CAUSTIC MIXER PUMP
T-192-3000
CAUSTIC DILUTION & STORAGE TANK
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
CAUSTIC UNLOADING, STORAGE & DILUTION
87-0-159
0087502
51D-4445-P-00578

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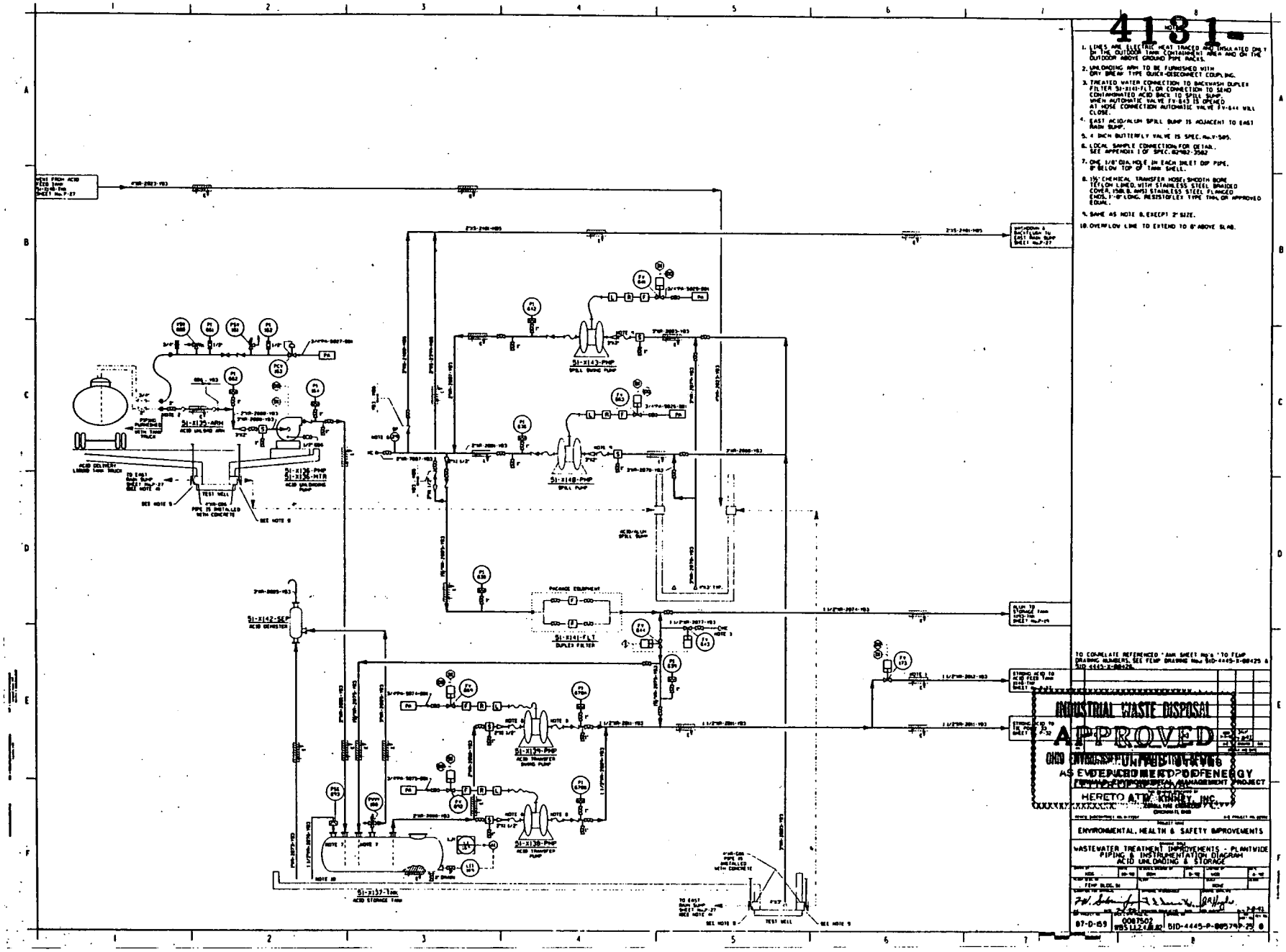
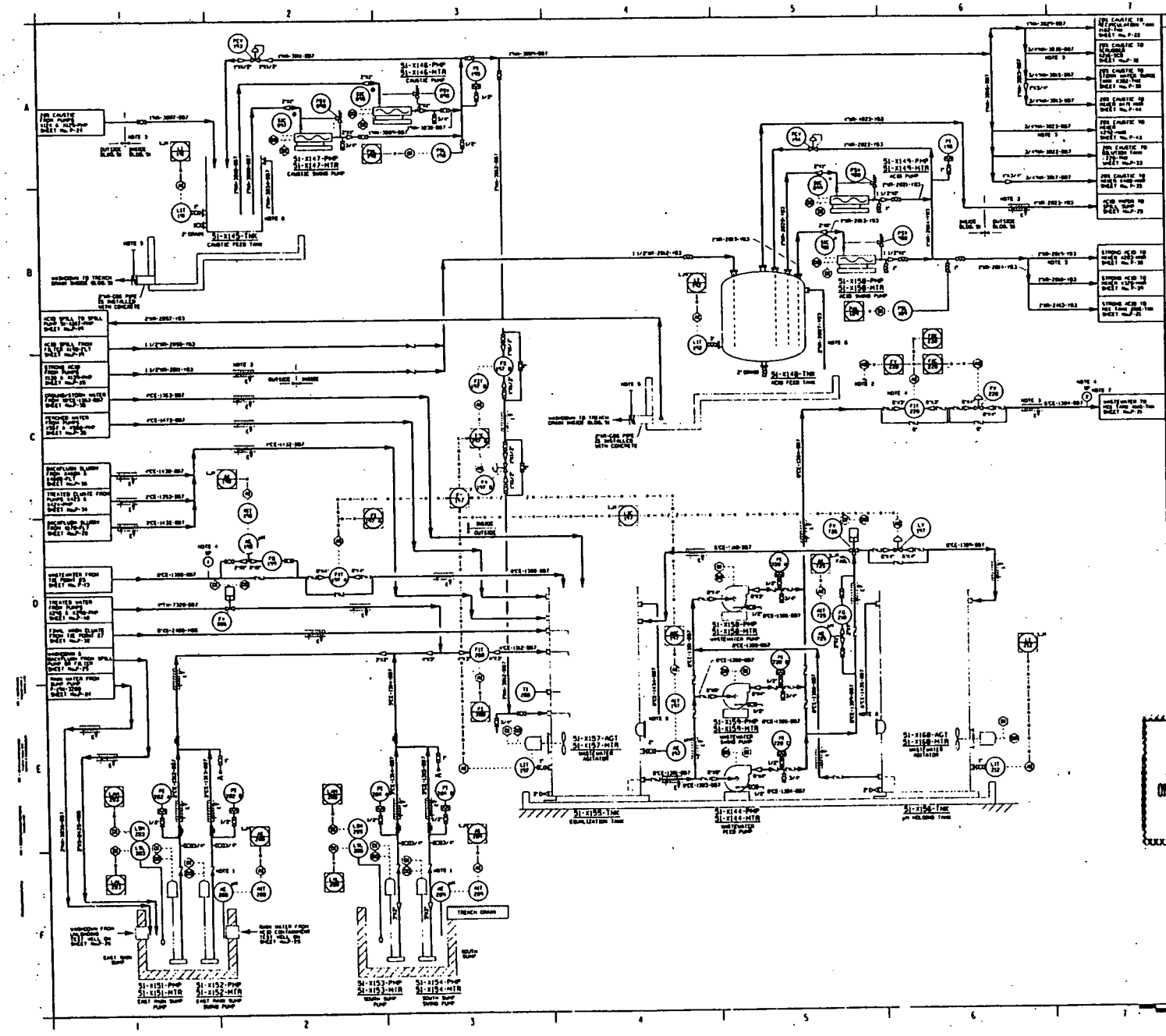

NOTES
1. LINES ARE ELECTRIC HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR 1mm CONTAINMENT AREA AND ON THE OUTDOOR ABOVE GROUND PIPE RACKS.
2. UNLOADING ARM TO BE FURNISHED WITH DRY BREAK TYPE QUICK-DISCONNECT COUPLING.
3. TREATED WATER CONNECTION TO BACKWASH DUPLEX FILTER SI-X141-FLT, OR CONNECTION TO SEND CONTAMINATED ACID BACK TO SPILL SUMP. WHEN AUTOMATIC VALVE FV-843 IS OPENED AT HOSE CONNECTION AUTOMATIC VALVE FV-844 WILL CLOSE.
4. EAST ACID/ALUM SPILL SUMP IS ADJACENT TO EAST MAIN SUMP.
5. 4 INCH BUTTERFLY VALVE IS SPEC. No. V-505.
6. LOCAL SAMPLE CONNECTION FOR DETAIL SEE APPENDIX I OF SPEC. 02702-3502
7. ONE 1/8" DIA. HOLE IN EACH INLET DIP PIPE, 8" BELOW TOP OF TANK SHELL.
8. 1½" CHEMICAL TRANSFER HOSE: SMOOTH BORE TEFLON LINED WITH STAINLESS STEEL BRAIDED COVER, 150 LB. ANSI STAINLESS STEEL FLANGED ENDS, 3'-0" LONG. RESISTOFLEX TYPE TMH, OR APPROVED EQUAL.
9. SAME AS NOTE 8, EXCEPT 2" SIZE.
10. OVERFLOW LINE TO EXTEND TO 8" ABOVE SLAB.
SI-X143-PMP SPILL SUMP PUMP
SI-X144B-PMP SPILL PUMP
SI-X135-ARM ACID UNLOAD ARM
SI-X136-PMP
SI-X136-MTR
ACID UNLOADING PUMP
SI-X142-SEP ACID DEMISTER
SI-X141-FLT DUPLEX FILTER
SI-X139-PMP ACID TRANSFER SUMP PUMP
SI-X138-PMP ACID TRANSFER PUMP
SI-X137-TANK ACID STORAGE TANK
TEST WELL
TO COORDINATE REFERENCED "AAM SHEET No's" TO TEMP DRAWING NUMBERS, SEE TEMP DRAWING Nos. SID-4445-P-00425 & SID-4445-P-00426.
INDUSTRIAL WASTE DISPOSAL
APPROVED
AS EVIDENCED BY THE DOE ENERGY
HERETO ATTACHED
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ACID UNLOADING & STORAGE
07-0-89
SID-4445-P-00579P-29


NOTES
1. SUMP PUMP DISCHARGE CHECK VALVE ELEVATION HIGHER THAN CONTAINMENT WALLS.
2. THIS ANALOG OUTPUT SIGNAL IS A REMOTE SETPOINT INPUT TO VIC-795 SHOWN ON DWG. P-21.
3. ELECTRIC TRACE AND INSULATE ACID, CAUSTIC, AND WATER LINES OUTSIDE BUILDING 51.
4. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 82-187-3502 AND P&ID SHEET No. P-15.
5. 2 INCH ALLOY 20150 LB. ANSI R.F. GATE VALVE IS SPEC. No. V-195.
6. TANK OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
7. SAMPLE CONNECTION SP-2 TO BE INSIDE BUILDING 51.
INDUSTRIAL WASTE DISPOSAL
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OHIO ENVIRONMENTAL PROTECTION AGENCY
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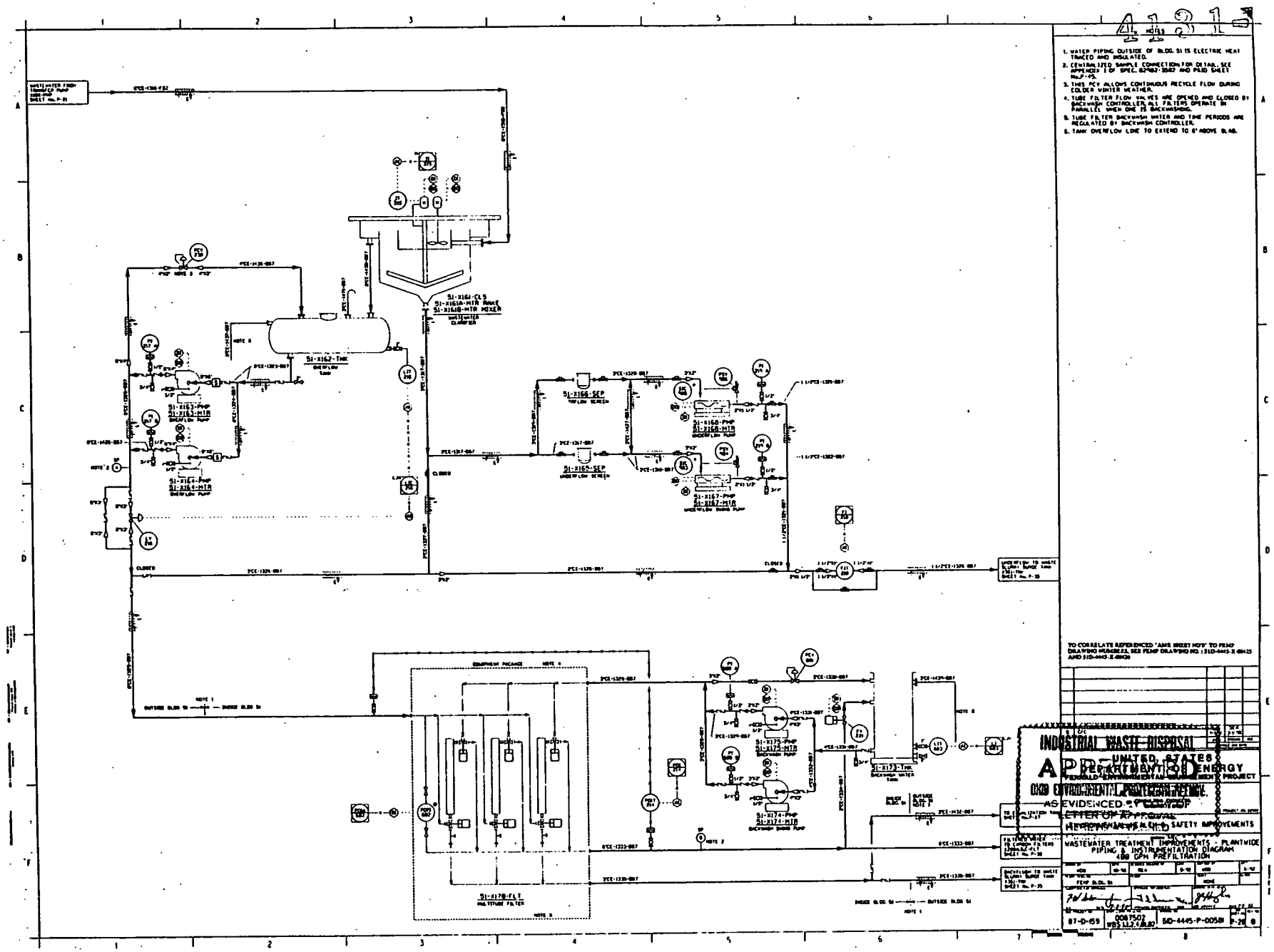
DEPARTMENT OF ENERGY
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
400 GPM EQUALIZATION
87-0-159
0087502
SID-4445-P-00500
P-21


1. WATER PIPING OUTSIDE OF BLDG. S115 ELECTRIC HEAT TRACED AND INSULATED.
2. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 62982-3062 AND P&ID SHEET No.P-95.
3. THIS PCV ALLOWS CONTINUOUS RECYCLE FLOW DURING COLDER WINTER WEATHER.
4. TUBE FILTER FLOW VALVES ARE OPENED AND CLOSED BY BACKWASH CONTROLLER. ALL FILTERS OPERATE IN PARALLEL WHEN ONE IS BACKWASHING.
5. TUBE FILTER BACKWASH WATER AND TIME PERIODS ARE REGULATED BY BACKWASH CONTROLLER.
6. TANK OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
TO CORRELATE REFERENCED "AMS SHEET NO" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING NO. 13ID-4445-X-00425 AND 13ID-4445-X-00426
INDUSTRIAL WASTE DISPOSAL
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
AS EVIDENCED BY THE CONCURRENCE LETTER OF APPROVAL
SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
400 GPM PREFILTRATION
87-D-159
0087502
WBS 1.1.2.1.8.80
SD-4445-P-00581
P-26
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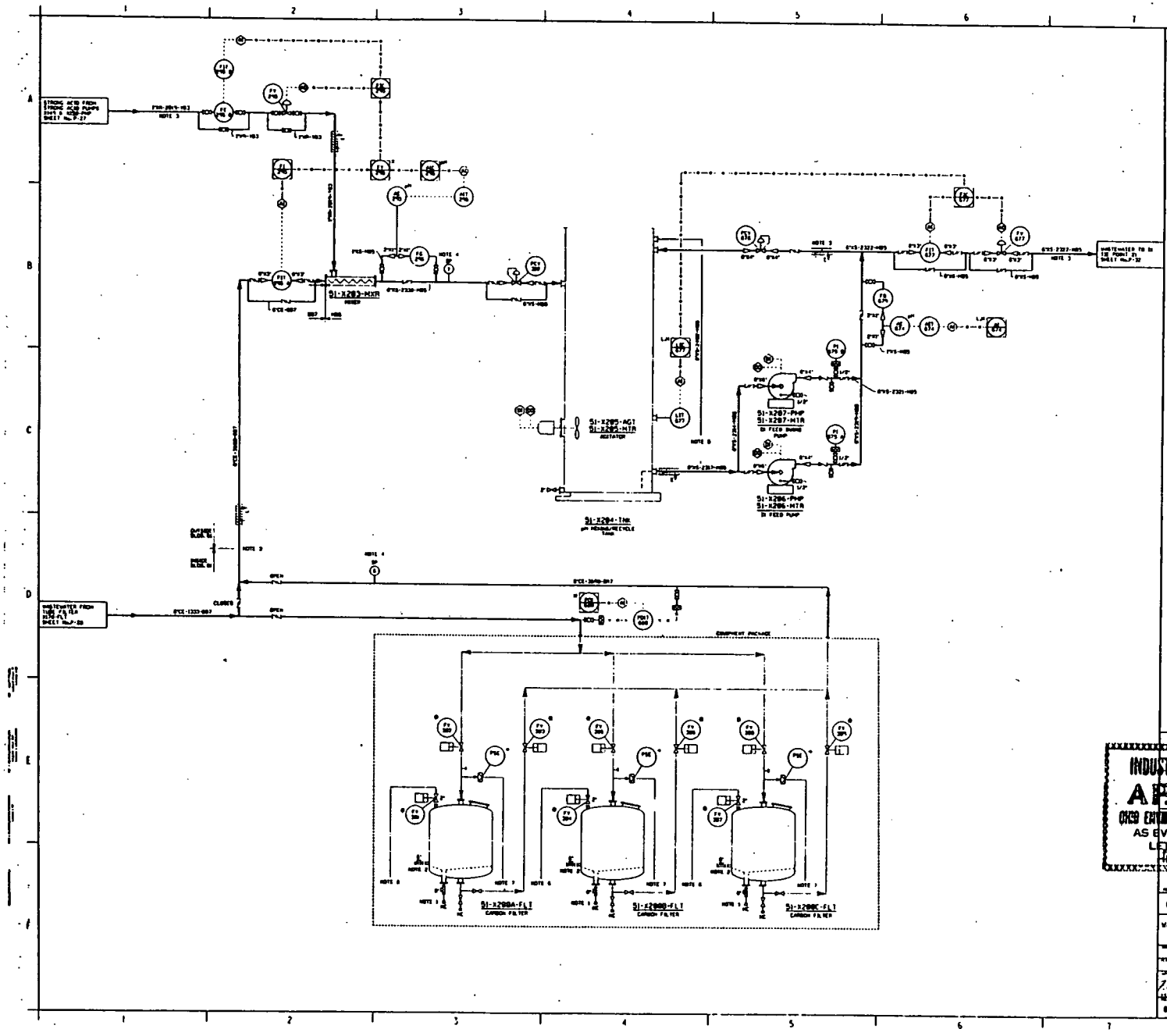

NOTES

1. CONNECTIONS FOR REMOVAL OF SPENT ACTIVATED CARBON USING A PORTABLE HYDRAULIC UNIT.
2. CARBON SAMPLING PORT AND SLUICING WATER INLET ON SIDE OPPOSITE BOTTOM CONNECTION FOR REMOVAL OF SPENT CARBON.
3. ELECTRIC TRACE AND INSULATE ACID AND WATER LINES OUTSIDE BUILDING 51.
4. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX 1 OF SPEC. 62982-3662 AND P&ID SHEET No.P-15.
5. TANK OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
6. VENT LINE TO EXTEND TO 6" ABOVE SLAB.
7. SAFETY RELIEF DISCHARGE LINE TO EXTEND TO 6" ABOVE SLAB.

TO CORRELATE REFERENCED "AHK SHEET NO". TO PEMP DRAWING NUMBERS, SEE PEMP DRAWING NO. 13ID-4443-2-69135 AND 31ID-4443-2-69136

INDUSTRIAL WASTE DISPOSAL
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AS EVIDENCED BY UNITED STATES
LETTER DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
HEREBY APPROVED

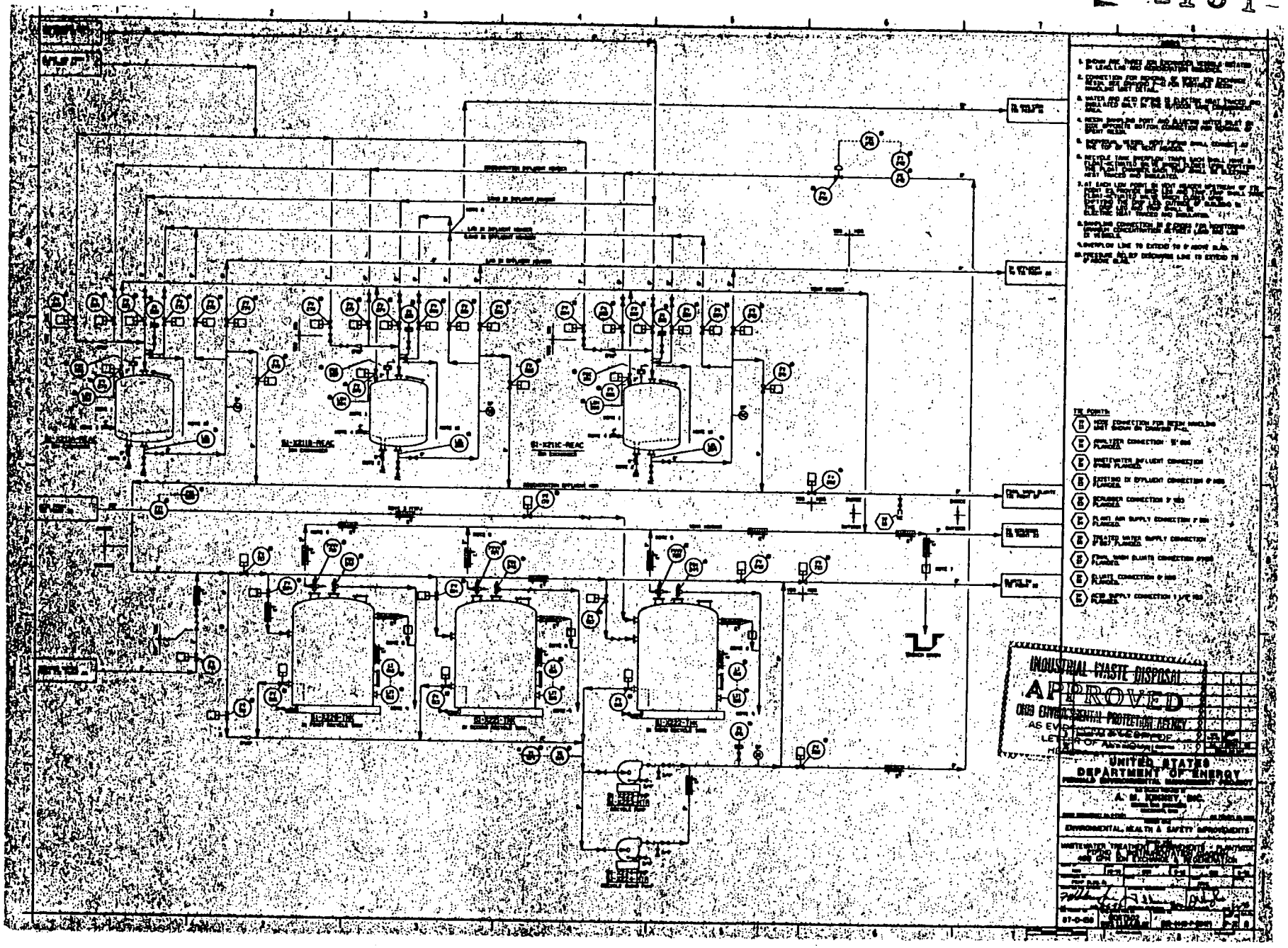
A.M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
400 GPM CARBON FILTERS

DRN	12-10	REA	5-10
CHK			5-10
PEMP BLDG. 51		HOME	

87-D-159 | 0087502 PES 113.7.8.82 | SD-4445-P-00562 | 7-30 | 0


INDUSTRIAL WASTE DISPOSAL
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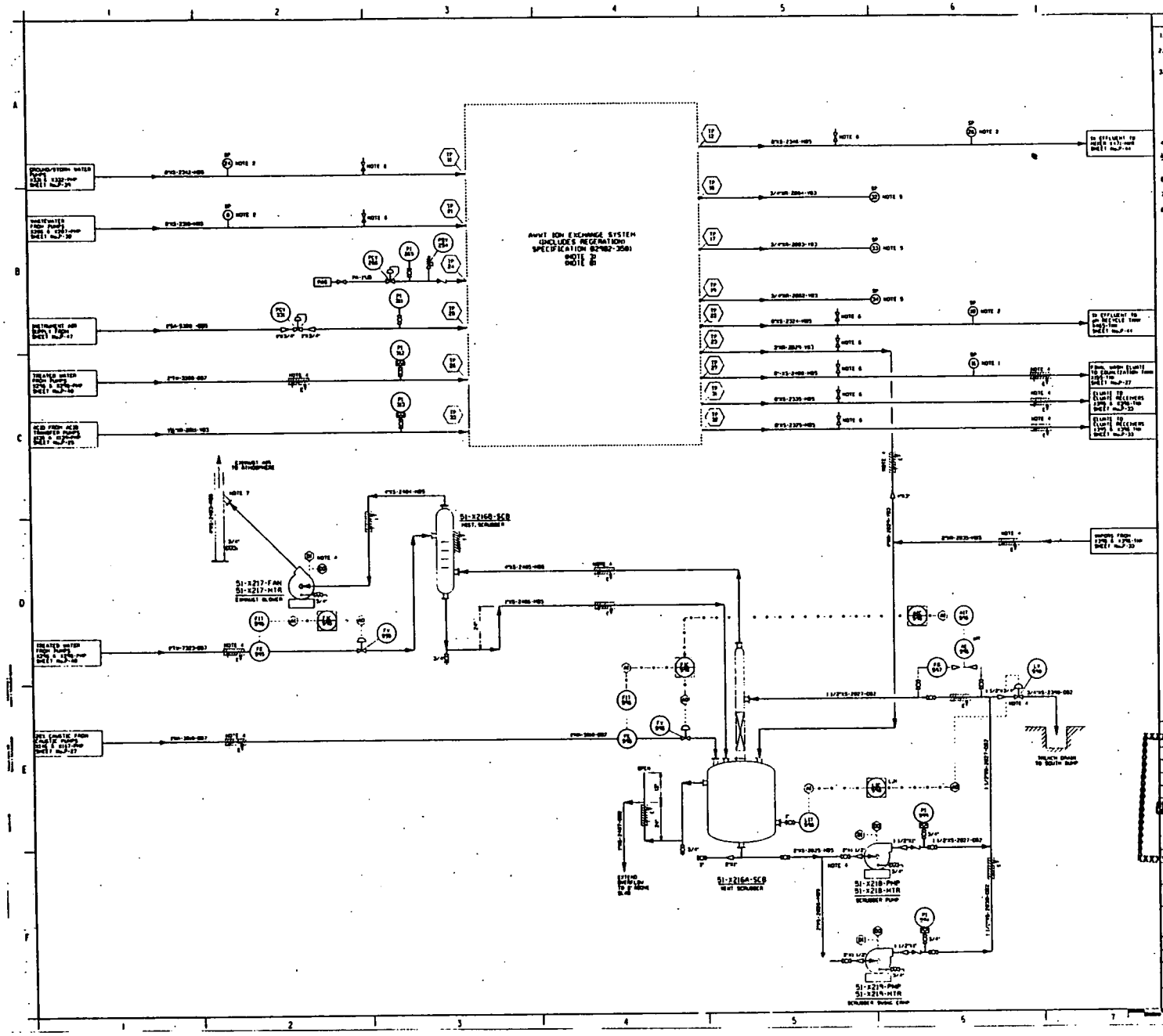
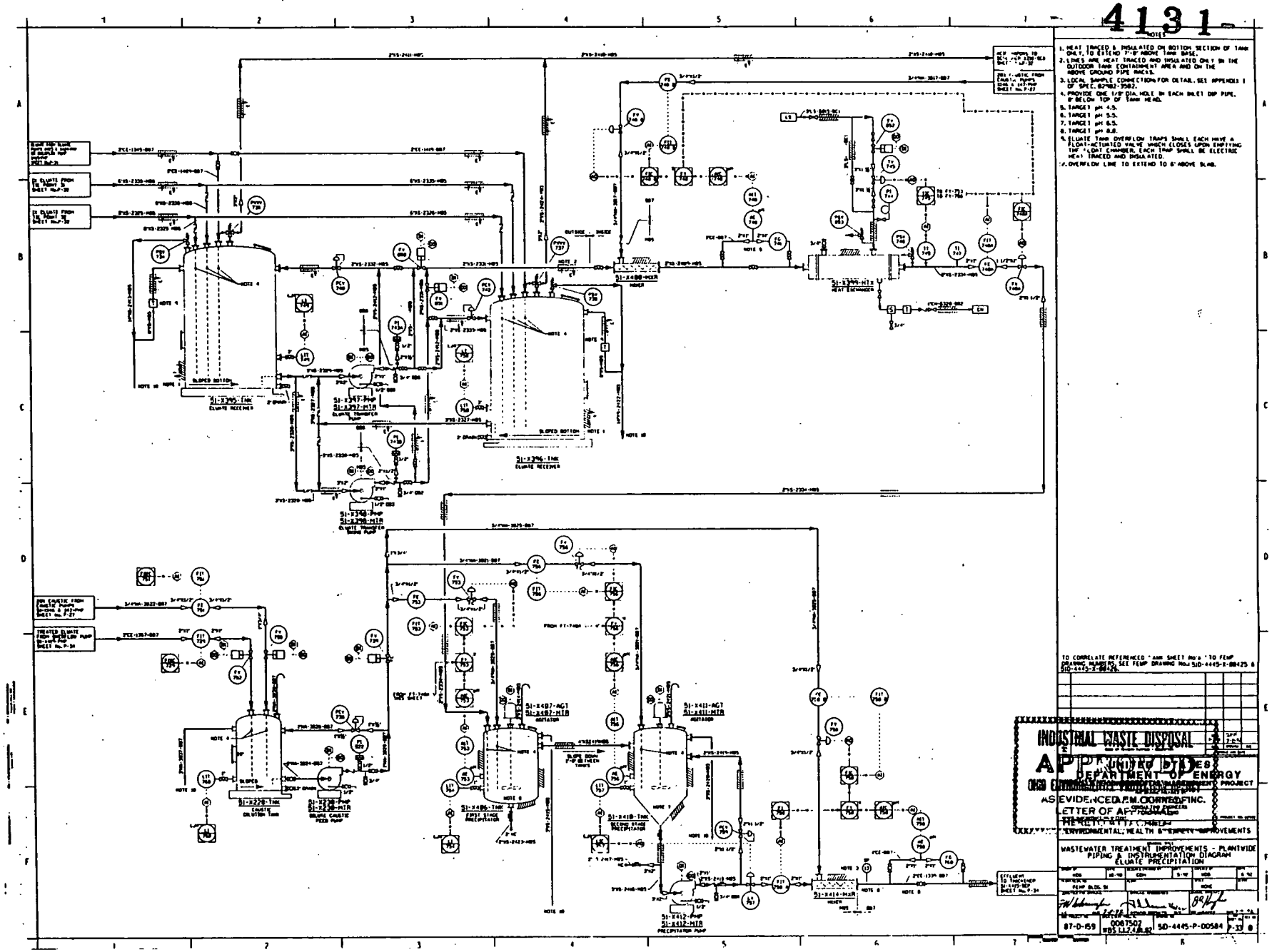
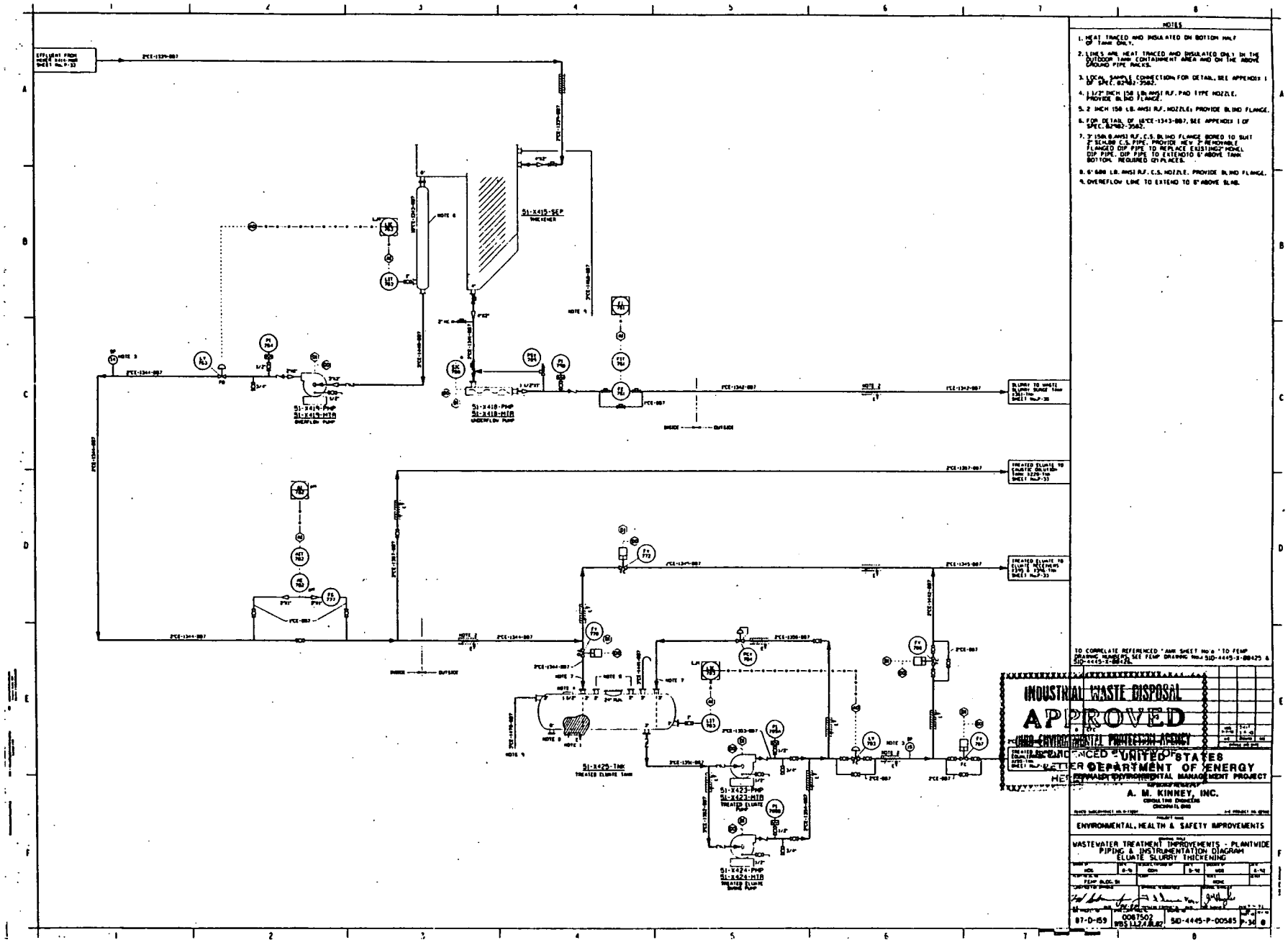
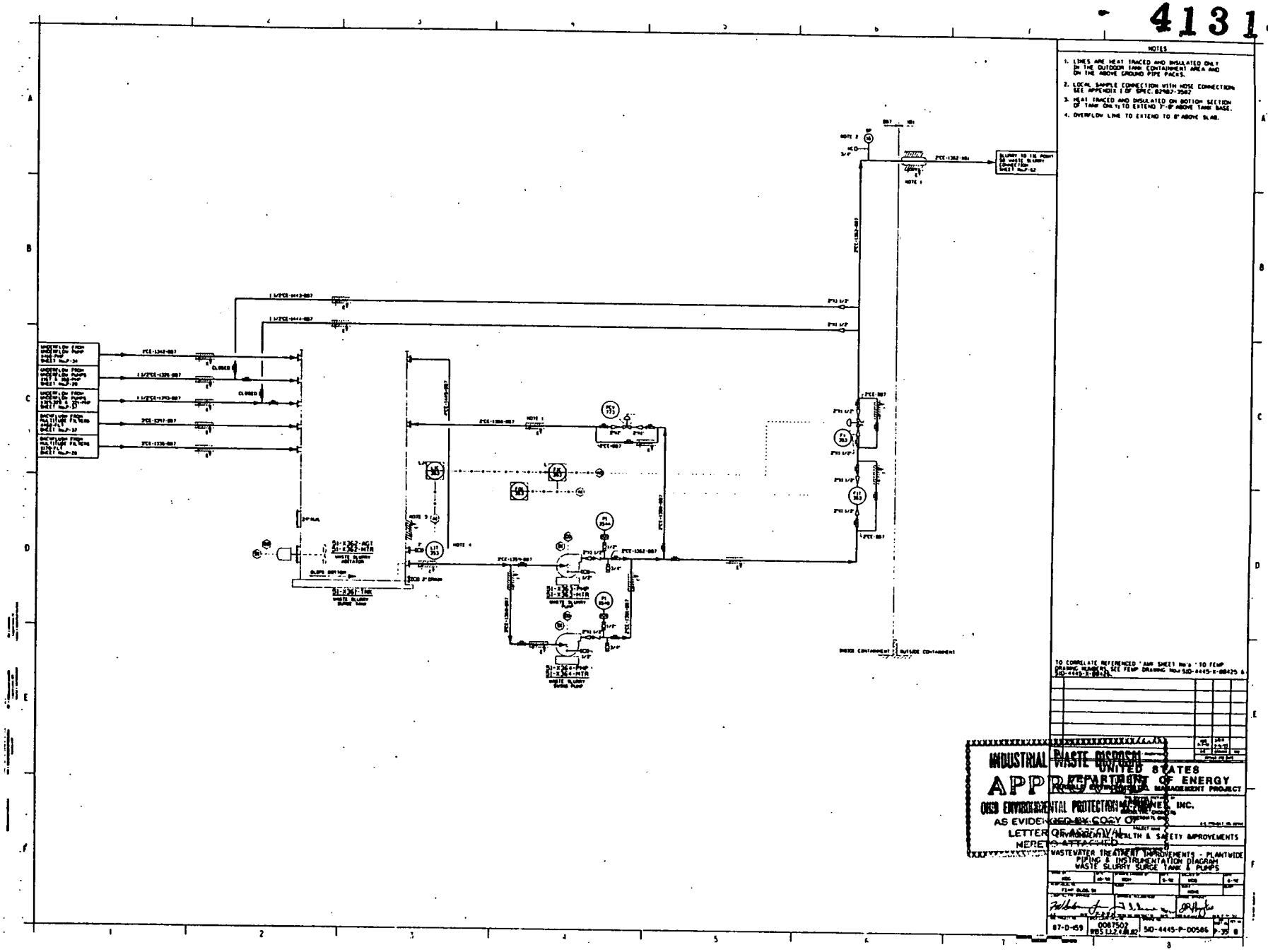
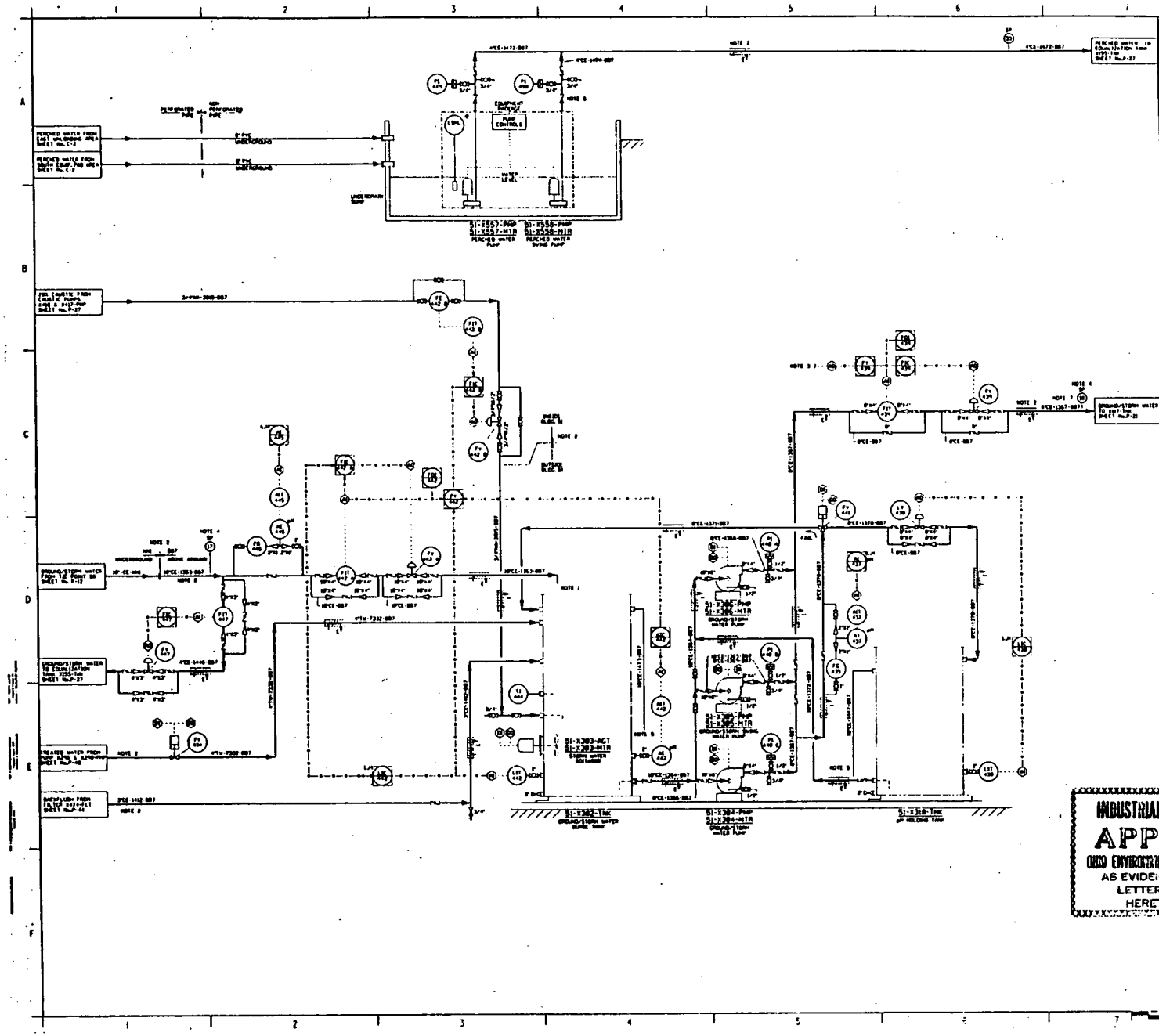
A. G. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS


AWWT ION EXCHANGE SYSTEM
(INCLUDES REGENERATION
SPECIFICATION 82482-3581)
NOTE 2
NOTE 8
GROUND/STORM WATER
WASTEWATER
INSTRUMENT AIR
TREATED WATER
ACID FROM ACID TRANSFER PUMPS
TREATED WATER
CAUSTIC FROM CAUSTIC PUMPS
TO EFFLUENT TO
TO EFFLUENT TO
EFFLUENT TO
EFFLUENT TO
EFFLUENT TO
EFFLUENT TO
EXHAUST HOOD
NO ATMOSPHERE
SI-X216B-SCB
HEAT SCRUBBER
SI-X217-FAN
SI-X217-HTR
EXHAUST BLOWER
SI-X216A-SCB
HEAT SCRUBBER
SI-X218-PMP
SI-X218-HTR
SCRUBBER PUMP
SI-X219-PMP
SI-X219-HTR
SCRUBBER PUMP
TRENCH DRAIN
TO SOUTH SUMP
EXTEND
TO 2' MIN
BELOW
NOTES
1. LOCAL SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC 82482-3582.
2. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 82482-3582 AND P&ID SHEET No.P-45.
3. MAKE CENTRALIZED SAMPLE CONNECTIONS AT THE FOLLOWING LISTED MINE TOP SAMPLE POINTS IN THE AWWT ION EXCHANGE SYSTEM
SP 34 SP 236
SP 34 SP 250
SP 34 SP 236
SP 236 SP 250
SP 236
FOR DETAIL, SEE APPENDIX I OF SPEC. 82482-3582 AND P&ID SHEET No.P-45.
4. ELECTRIC HEAT TRACE AND INSULATE CAUSTIC, WATER, AND VAPOR LINES OUTSIDE BUILDING 51.
5. ANALYZER SAMPLE CONNECTIONS FOR DETAIL, SEE APPENDIX I OF SPEC. 82482-3582 AND P&ID SHEET No. P-45.
6. PRESSURE TEST CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 82482-3582.
7. FOR DETAIL OF EXHAUST STACK, SEE APPENDIX I OF SPEC. 82482-3582.
8. MAKE LOCAL SAMPLE CONNECTIONS AT THE FOLLOWING LISTED THREE OF SAMPLE POINTS WITHIN AWWT ION EXCHANGE SYSTEM
SP 15
SP 21
SP 26
FOR DETAIL, SEE APPENDIX I OF SPEC. 82482-3582.
TO CORRELATE REFERENCED 'AWW SHEET No's' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. SID-4445-S-00425 & SID-4445-S-00426.
INDUSTRIAL WASTE DISPOSAL
APPROVED
AS EVIDENCED BY
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
HERE IT IS
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ION EXCHANGE TIE POINTS AND SCRUBBER
07-0-59
0087502
SID-4445-P-00583


1. HEAT TRACED & INSULATED ON BOTTOM SECTION OF TANK ONLY, TO EXTEND 7'-0" ABOVE TANK BASE.
2. LINES ARE HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE ABOVE GROUND PIPE RACKS.
3. LOCAL SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 82962-3582.
4. PROVIDE ONE 1/8" DIA. HOLE IN EACH INLET DIP PIPE, 8" BELOW TOP OF TANK HEAD.
5. TARGET pH 4.5.
6. TARGET pH 5.5.
7. TARGET pH 6.5.
8. TARGET pH 8.0.
9. ELUATE TANK OVERFLOW TRAPS SHALL EACH HAVE A FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE FLOAT CHAMBER. EACH TRAP SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
10. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
TO CORRELATE REFERENCED "AAR SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING Nos SD-4445-X-00425 & SD-4445-X-00426.
INDUSTRIAL WASTE DISPOSAL
APPROVED BY
DEPARTMENT OF ENERGY
AS EVIDENCED BY M. CORWIN, INC.
LETTER OF APPROVAL
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ELUATE PRECIPITATION
87-D-159
0067502
SD-4445-P-00584


NOTES
1. HEAT TRACED AND INSULATED ON BOTTOM HALF OF TANK ONLY.
2. LINES ARE HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE ABOVE GROUND PIPE RACKS.
3. LOCAL SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 62982-3562.
4. 1 1/2" INCH 150 LB. ANSI R.F. PAD TYPE NOZZLE. PROVIDE BLIND FLANGE.
5. 2 INCH 150 LB. ANSI R.F. NOZZLES PROVIDE BLIND FLANGE.
6. FOR DETAIL OF 18"CE-1343-007, SEE APPENDIX I OF SPEC. 62982-3562.
7. 3" 150 LB. ANSI R.F. C.S. BLIND FLANGE BORED TO SUIT 3" SCH.80 C.S. PIPE. PROVIDE NEW 3" REMOVABLE FLANGED DIP PIPE TO REPLACE EXISTING 2" MONEL DIP PIPE. DIP PIPE TO EXTEND TO 6" ABOVE TANK BOTTOM. REQUIRED (2) PLACES.
8. 6" 600 LB. ANSI R.F. C.S. NOZZLE. PROVIDE BLIND FLANGE.
9. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
TO CORRELATE REFERENCED "ANK SHEET No's" TO FEMP DRAWING NUMBERS SEE FEMP DRAWING No's SID-4445-3-00425 & SID-4445-2-00426.
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ELUATE SLURRY THICKENING
87-D-159
0087502
SID-4445-P-00585
SI-X415-SEP
THICKENER
SI-X416-PMP
SI-X416-MTR
OVERFLOW PUMP
SI-X418-PMP
SI-X418-MTR
OVERFLOW PUMP
SI-X425-TNK
TREATED ELUATE TANK
SI-X423-PMP
SI-X423-MTR
TREATED ELUATE PUMP
SI-X424-PMP
SI-X424-MTR
TREATED ELUATE SLURRY PUMP
INSIDE
OUTSIDE


NOTES
1. LINES ARE HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE ABOVE GROUND PIPE PACKS.
2. LOCAL SAMPLE CONNECTION WITH HOSE CONNECTION SEE APPENDIX I OF SPEC. 82982-3582
3. HEAT TRACED AND INSULATED ON BOTTOM SECTION OF TANK ONLY TO EXTEND 7'-8" ABOVE TANK BASE.
4. OVERFLOW LINE TO EXTEND TO 8" ABOVE SLAB.
TO CORRELATE REFERENCED "AAR SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No's SID-4445-S-00425 & SID-4445-S-00426.
INDUSTRIAL WASTE DISCHARGE
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
FEMP PROJECT MANAGEMENT PROJECT
FERNALD ENVIRONMENTAL RESTORATION MANAGEMENT, INC.
HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
WASTE SLURRY SURGE TANK & PUMPS
87-D-659
0067502
SID-4445-P-00586



1. AIR BREAK REQUIRED TO PREVENT BACKFLOW OF GROUND/STORM WATER.
2. LINES ARE ELECTRIC HEAT TRACED AND INSULED ONLY CAUSTIC AND WATER OUTSIDE BLDG. 51 AND ABOVE GROUND.
3. THIS ANALOG OUTPUT SIGNAL IS A REMOTE SETPOINT INPUT TO HIC-796 SHOWN ON DWG. P-21.
4. CENTRALIZED SAMPLE CONNECTION FOR DETAIL SEE APPENDIX I OF SPEC. 82982-3587 AND P&ID SHEET No. P-15.
5. TANK OVERFLOW LINE TO EXTEND TO 8" ABOVE SLAB.
6. PUMP DISCHARGE CHECK VALVE ELEVATION HIGHER THAN SUMP WALLS.
7. SAMPLE CONNECTION SP-18 TO BE LOCATED INSIDE BUILDING 51.

TO CORRELATE REFERENCED "AAR SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426

INDUSTRIAL WASTE DISCHARGE
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FEMP WASTE MANAGEMENT PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
PROJECT NO. 5100
FEMP BLDG. 51
PROJECT NO. 5100
ENVIRONMENTAL HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
GROUND/STORM WATER pH ADJUSTMENT

REVISED BY	KDS	10-10	REA	9-10	KDS
REVISED BY					
FEMP BLDG. 51					
COMPUTER IMAGE					

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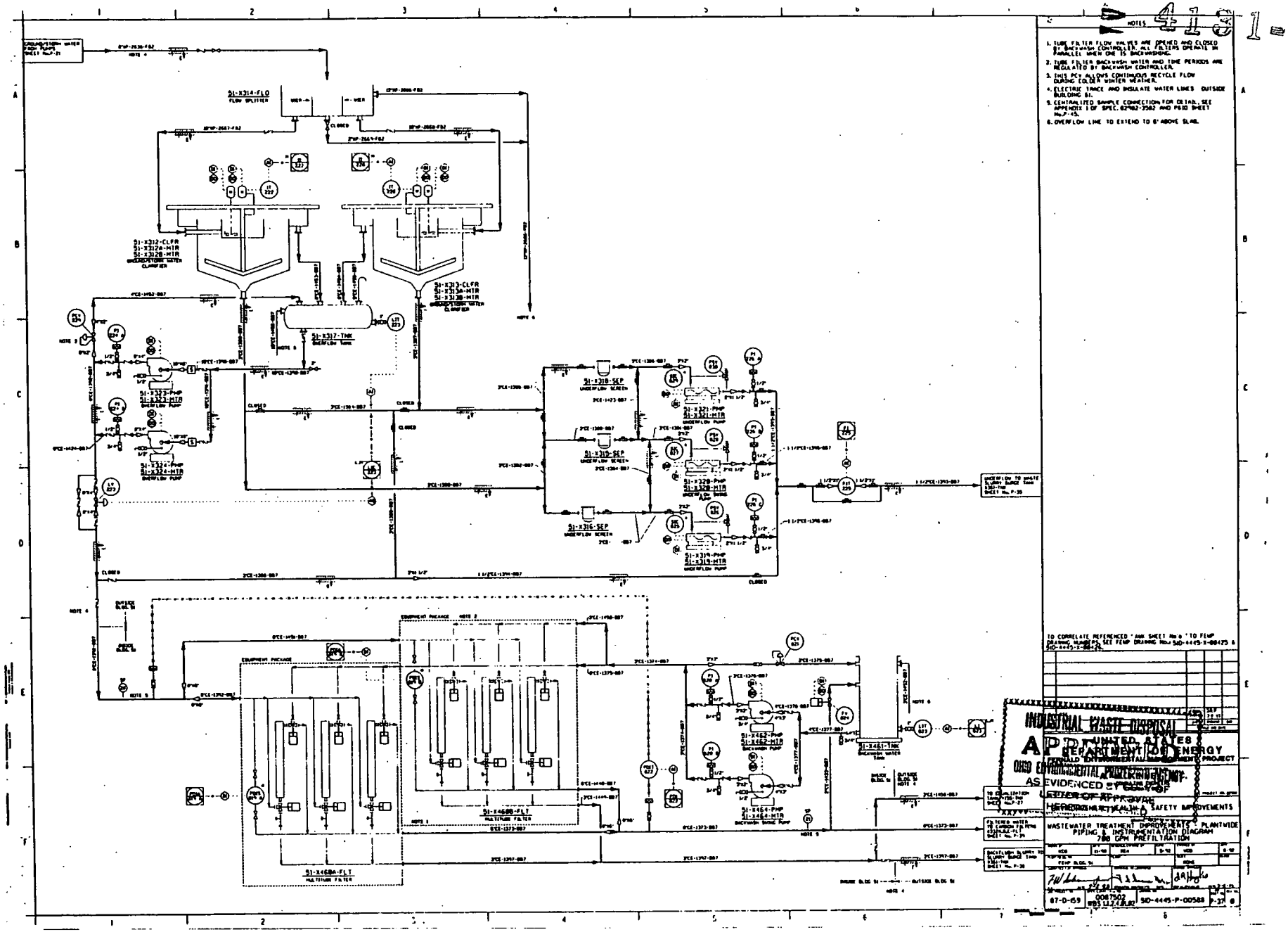
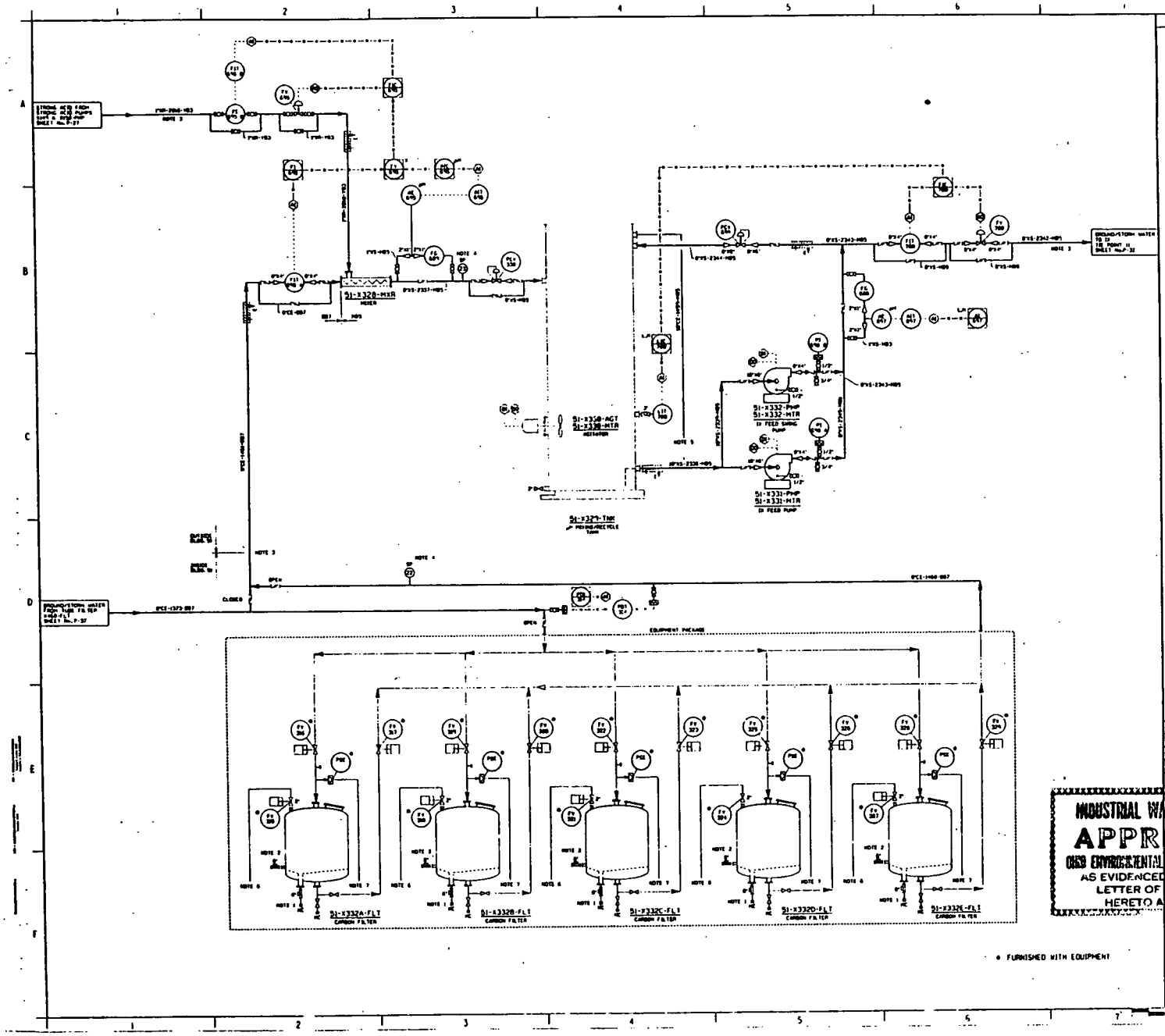

NOTES
1. TUBE FILTER FLOW VALVES ARE OPENED AND CLOSED BY BACKWASH CONTROLLER. ALL FILTERS OPERATE IN PARALLEL WHEN ONE IS BACKWASHING.
2. TUBE FILTER BACKWASH WATER AND TIME PERIODS ARE REGULATED BY BACKWASH CONTROLLER.
3. THIS PCV ALLOWS CONTINUOUS RECYCLE FLOW DURING COLDER WINTER WEATHER.
4. ELECTRIC TRACE AND INSULATE WATER LINES OUTSIDE BUILDING 51.
5. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX 1 OF SPEC. 02982-3502 AND P&ID SHEET No. P-15.
6. OVERFLOW LINE TO EXTEND TO 6' ABOVE SLAB.
51-X314-FLO
FLOW SPLITTER
51-X312-CLFR
51-X312A-MTR
51-X312B-MTR
51-X313-CLFR
51-X313A-MTR
51-X313B-MTR
51-X317-TNK
UNDERFLOW TANK
51-X323-PMP
51-X323-MTR
UNDERFLOW PUMP
51-X324-PMP
51-X324-MTR
UNDERFLOW PUMP
51-X318-SEP
UNDERFLOW SCREEN
51-X319-SEP
UNDERFLOW SCREEN
51-X316-SEP
UNDERFLOW SCREEN
51-X321-PMP
51-X321-MTR
UNDERFLOW PUMP
51-X320-PMP
51-X320-MTR
UNDERFLOW SURGE PUMP
51-X319-PMP
51-X319-MTR
UNDERFLOW PUMP
UNDERFLOW TO WASTE SLURRY SURGE TANK 5361-TNK SHEET No. P-20
EQUIPMENT PACKAGE
51-X4680-FLT
MULTIMEDIA FILTER
51-X4684-FLT
MULTIMEDIA FILTER
51-X463-PMP
51-X463-MTR
BACKWASH PUMP
51-X464-PMP
51-X464-MTR
BACKWASH SURGE PUMP
51-X461-TNK
BACKWASH WATER TANK
TO CLARIFICATION TANK 5361-TNK SHEET No. P-27
FILTERED WATER TO CARBON FILTERS 4320-AC-FLT SHEET No. P-24
BACKFLUSH SLURRY TO SLURRY SURGE TANK 5361-TNK SHEET No. P-20
TO CORRELATE REFERENCED "AWK SHEET No." TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. SD-4445-X-00475 & SD-4445-X-00476.
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
FEMP
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY CERTIFICATE OF APPROVAL
FEMP ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM PREFILTRATION
87-0-69
0087502
WBS U.2.1.6.8.2
SD-4445-P-00588
P-27



NOTES

1. CONNECTION FOR REMOVAL OF SPENT ACTIVATED CARBON USING A PORTABLE HYDRAULIC UNIT.
2. CARBON SAMPLING PORT AND SLURRYING WATER INLET ON SIDE OPPOSITE BOTTOM CONNECTION FOR REMOVAL OF SPENT CARBON.
3. ELECTRIC TRACE AND INSULATE ACID AND WATER LINES OUTSIDE BUILDING 51.
4. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 62982-3502 AND P&ID SHEET No. P-15.
5. TANK OVERFLOW LINE TO EXTEND 6' ABOVE SLAB.
6. VENT LINE TO EXTEND TO 6' ABOVE SLAB.
7. SAFETY RELIEF DISCHARGE LINE TO EXTEND TO 8' ABOVE SLAB.

TO CORRELATE REFERENCED "ANN SHEET No." TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. SID-4445-X-00425 & SID-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FEMP PROJECT MANAGEMENT PROJECT

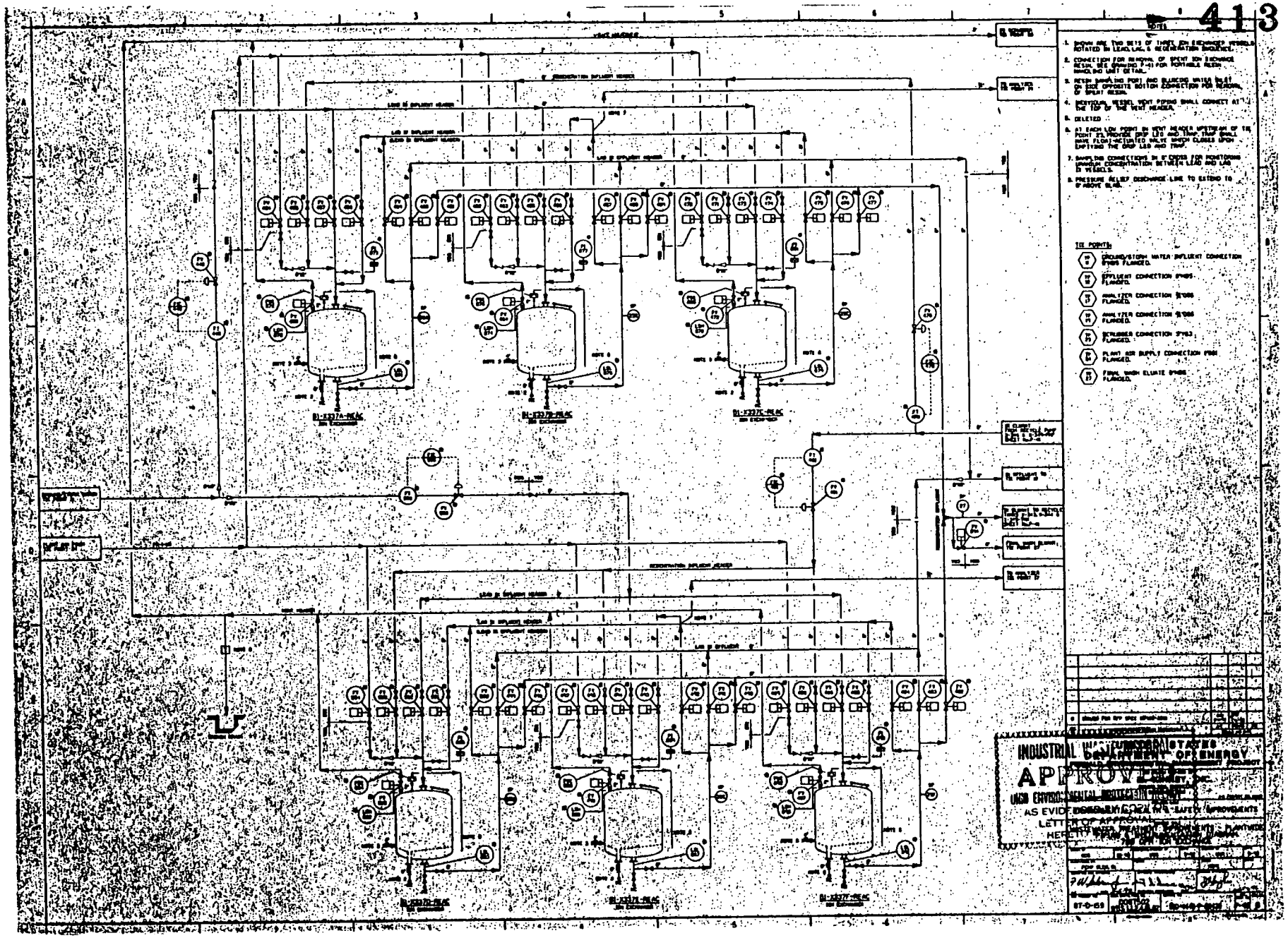
FEMP ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM CARBON FILTERS

FEMP ELDS, 91

87-D-159 | 0087502 WBS 1.1.7.4.1.1.0 | SID-4445-P-00589 | P-34 | 0

* FURNISHED WITH EQUIPMENT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LOG OF EFFLUENT HEADER
TIE POINTS
INDUSTRIAL DEPARTMENT OF ENERGY
APPROVED
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LETT
HER
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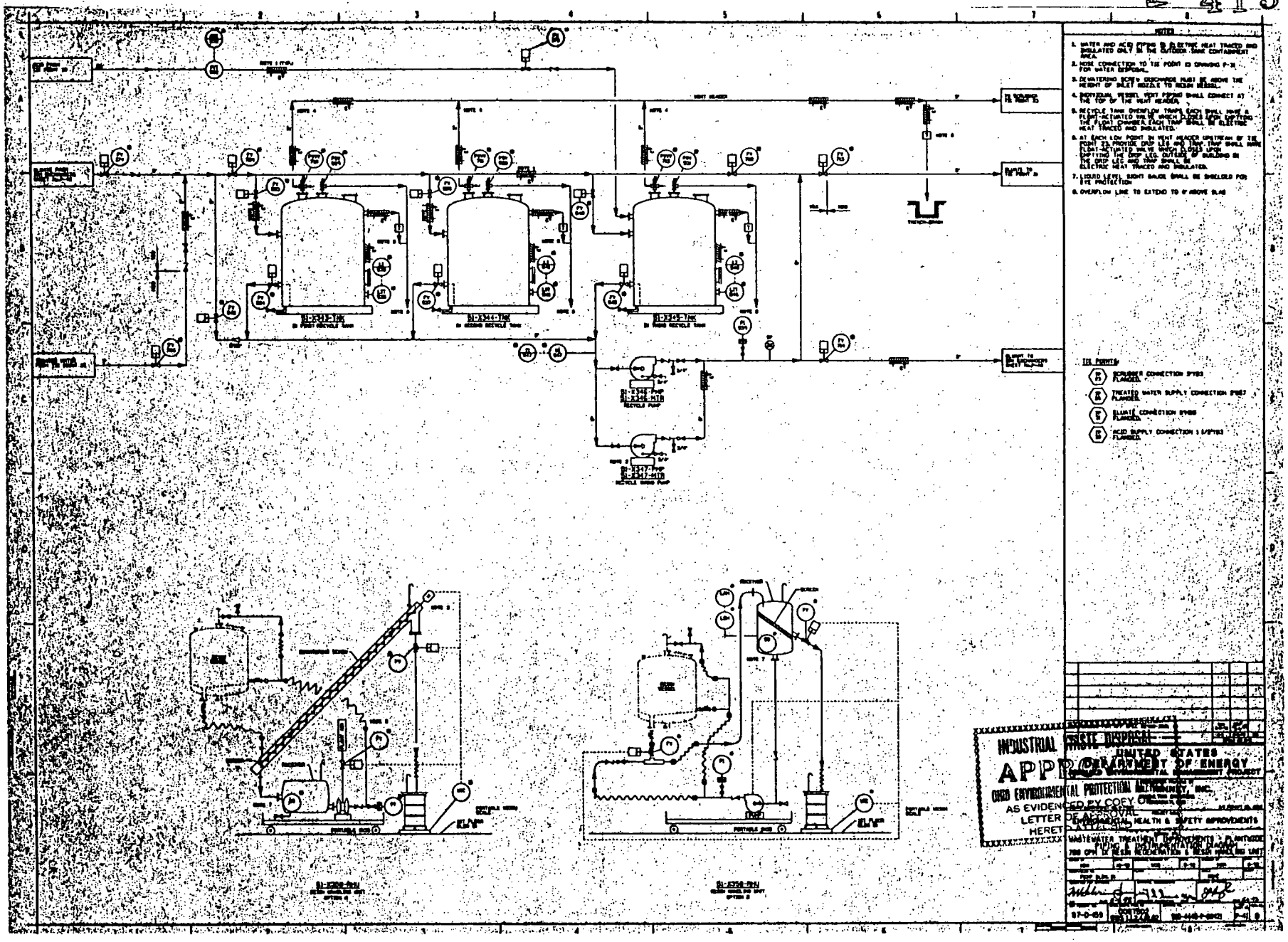
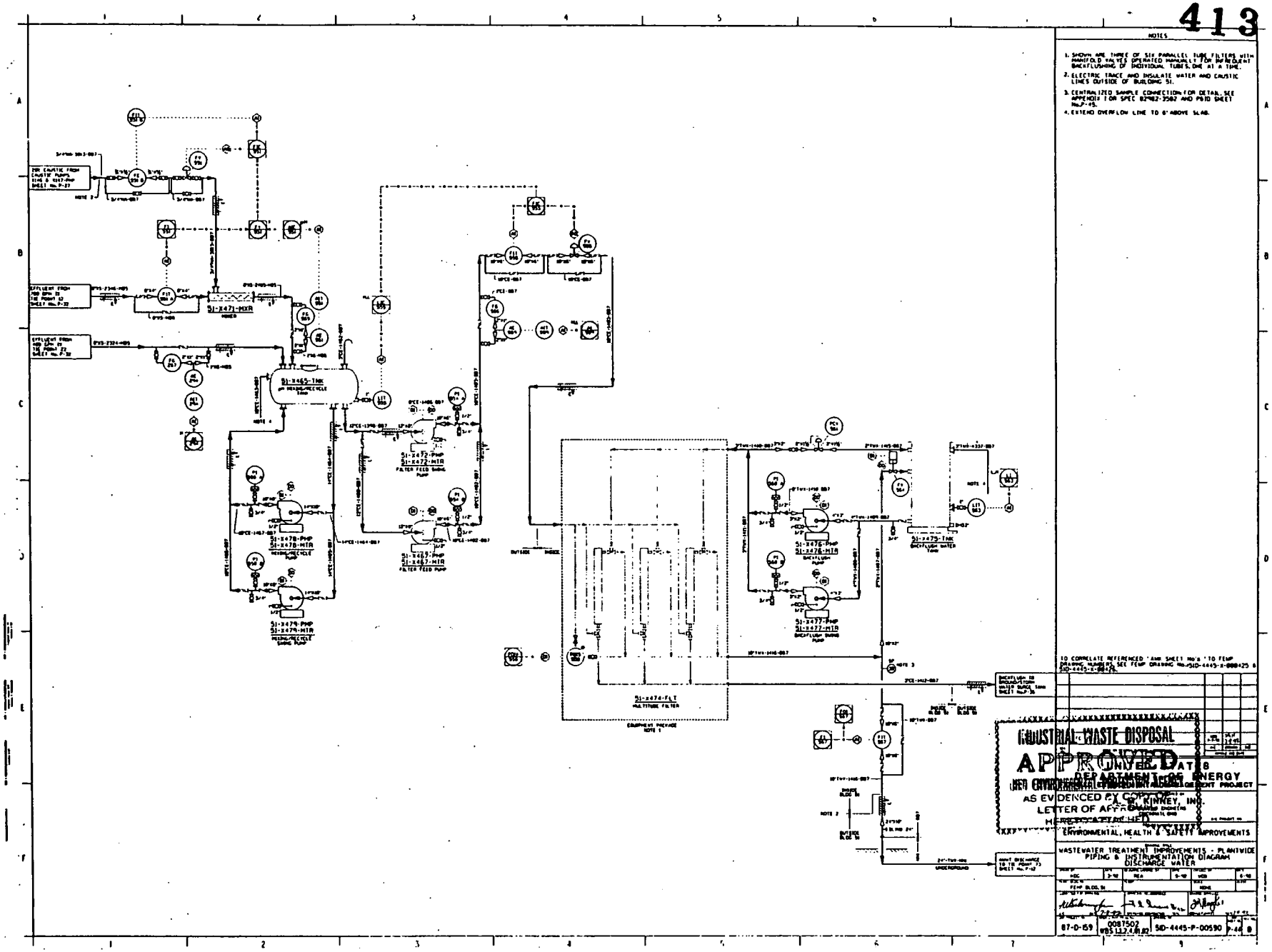
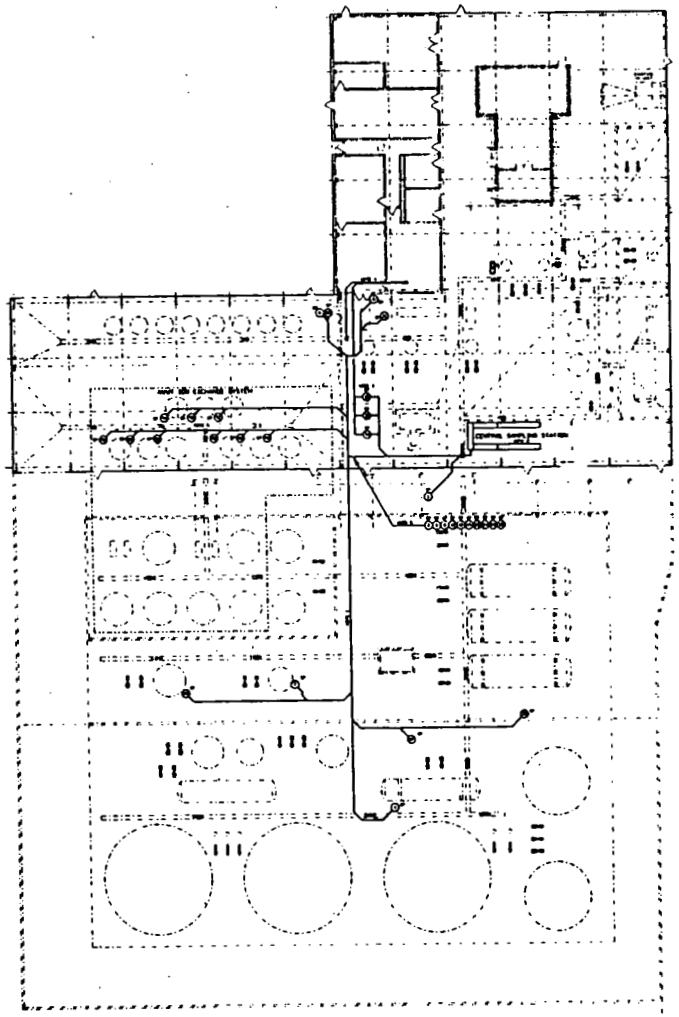

NOTES
TIE POINTS
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
OHIO ENVIRONMENTAL PROTECTIVE ENTERPRISES, INC.
AS EVIDENCED BY COPY
LETTER OF APPROVAL
HERETO
INDUSTRIAL HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM ION REGENERATION & REUSE WASTE UNIT


NOTES
1. SHOWN ARE THREE OF SIX PARALLEL TUBE FILTERS WITH MANIFOLD VALVES OPERATED MANUALLY FOR INFREQUENT BACKFLUSHING OF INDIVIDUAL TUBES, ONE AT A TIME.
2. ELECTRIC TRACE AND INSULATE WATER AND CAUSTIC LINES OUTSIDE OF BUILDING 51.
3. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC 82-982-3502 AND P&ID SHEET No.P-45.
4. EXTEND OVERFLOW LINE TO 6" ABOVE SLAB.
51-X471-MXR
51-X465-TNK
51-X472-PMP
51-X472-MTR
FILTER FEED SWING PUMP
51-X467-PMP
51-X467-MTR
FILTER FEED PUMP
51-X478-PMP
51-X478-MTR
51-X479-PMP
51-X479-MTR
51-X476-PMP
51-X476-MTR
BACKFLUSH PUMP
51-X477-PMP
51-X477-MTR
BACKFLUSH SWING PUMP
51-X475-TNK
BACKFLUSH WATER TANK
51-X474-FLT
MULTIMEDIA FILTER
EQUIPMENT PACKAGE
NOTE 1
INDUSTRIAL WASTE DISPOSAL
APPROVED
DATE
DEPARTMENT OF ENERGY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERE LOCATED HERE
B. K. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
DISCHARGE WATER
87-D-159
0087502
SD-4445-P-00590



1. SEPARATE ½" TEFLON TUBE LINES FROM EACH SAMPLE POINT TO THE CENTRAL SAMPLING STATION FOR DETAIL, SEE APPENDIX I OF SPEC. 82982-3582. OUTSIDE BUILDING 51, SAMPLE LINES ELECTRIC HEAT TRACED AND INSULATED.
2. CENTRAL SAMPLING STATION FOR DETAIL, SEE APPENDIX I OF SPEC. 82982-3582.
3. CENTRALIZED SAMPLE CONNECTIONS SP-32, 33 & 34 ON THREE ½" HM-GBS LINES FROM 1X SYSTEM TIE POINTS 16, 17, AND 19, P&ID SHEET No. P-321
4. THREE LINES FROM 1X TIE POINTS 16, 17 AND 19 TO URANIUM ANALYZER AEAI-293 IN THE BUILDING 51 CONTROL ROOM, AND ONE LINE FROM THE ANALYZER BACK TO THE TRENCH DRAIN FOR DETAIL, SEE APPENDIX I OF SPEC. 82982-3582.
5. TEN (10) CENTRALIZED SAMPLING CONNECTIONS TO BE LOCATED IN PIPE RACK INSIDE BUILDING 51.
6. NONE (9) CENTRALIZED SAMPLE CONNECTIONS TO BE MADE IN ANNEX ION EXCHANGE SYSTEM.

SAMPLE POINT SCHEDULE

SAMPLE POINT	P&ID SHEET NO.
1	P-27
2	P-27
3	P-21
4	P-29
5	P-29
6	P-30
7	P-30
8	P-32
9A	P-32 NOTE 6
9B	P-32 NOTE 6
9C	P-32 NOTE 6
10	P-32
17	P-36
18	P-36
19	P-21
20	P-37
21	P-37
22	P-29
23	P-34
24	P-32
25A	P-32 NOTE 6
25B	P-32 NOTE 6
25C	P-32 NOTE 6
25D	P-32 NOTE 6
25E	P-32 NOTE 6
25F	P-32 NOTE 6
26	P-32
30	P-44
32	P-32
33	P-32
34	P-32
35	P-36

TO CORRELATE REFERENCED "AWM SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.s SID-4445-X-88429 & SID-4445-X-88428.

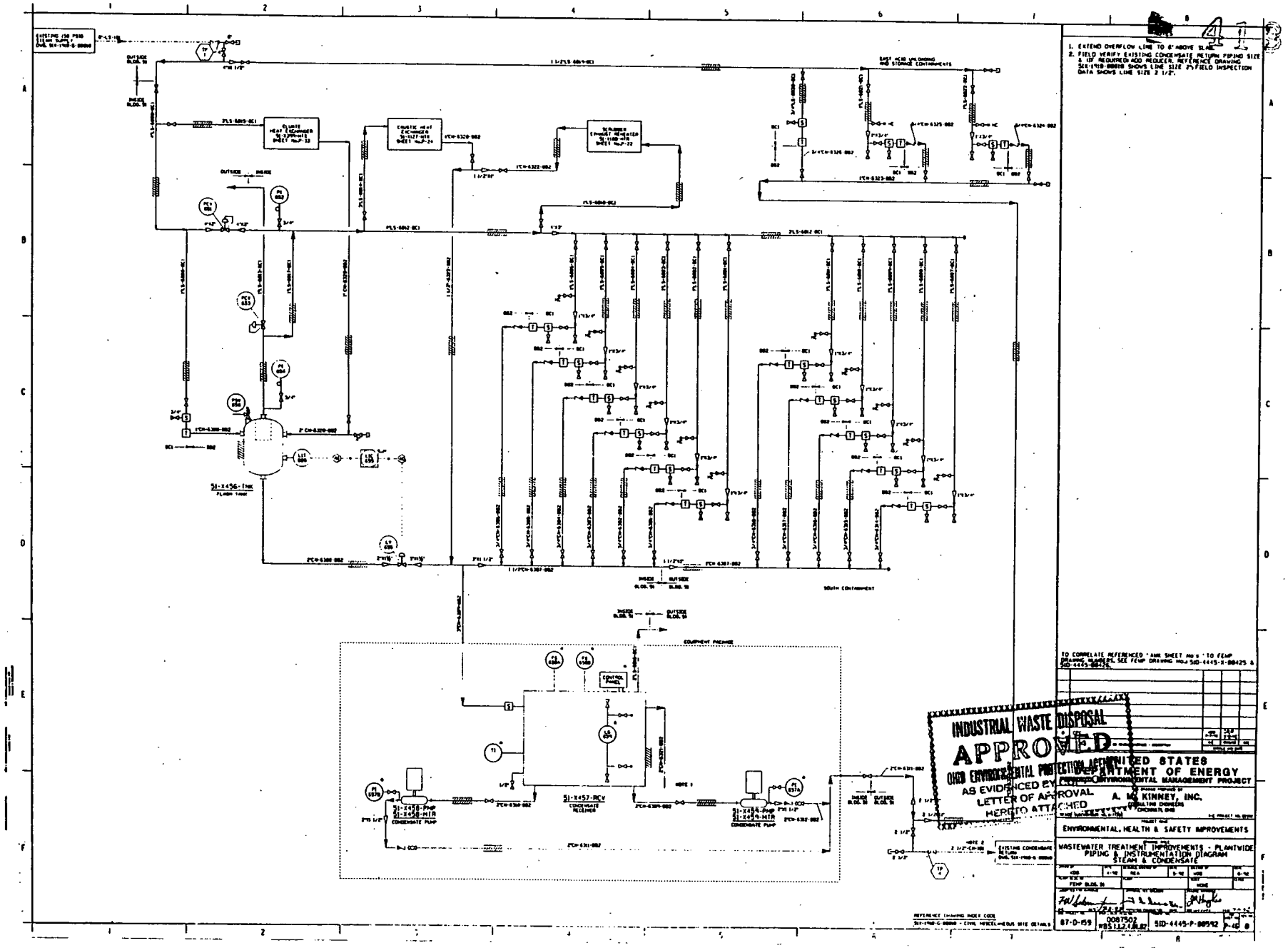
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

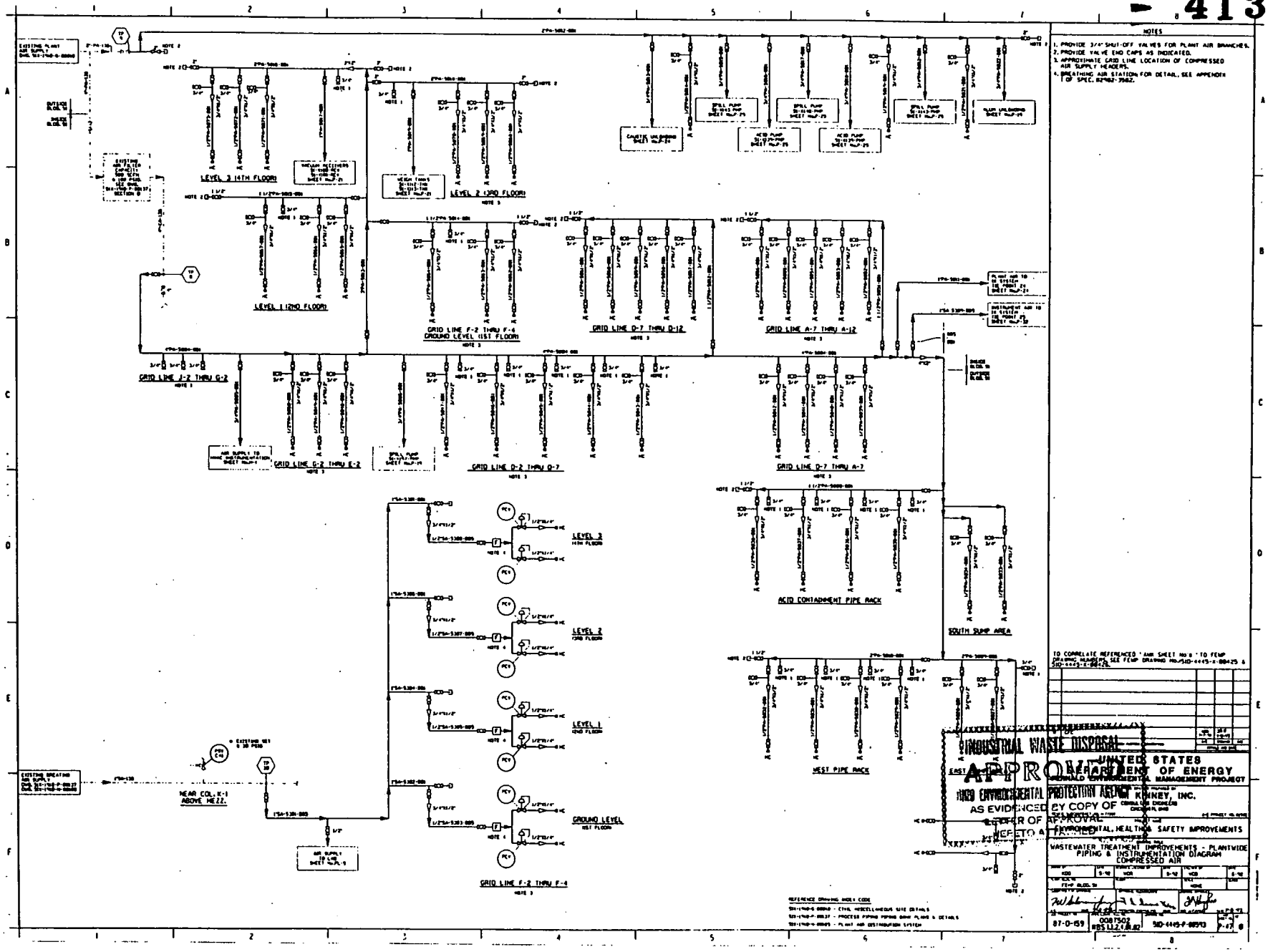
UNITED STATES
DEPARTMENT OF ENERGY
FEMP ENVIRONMENTAL MANAGEMENT PROJECT
PREPARED BY
RE-ENGINEERING, INC.
CINCINNATI, OHIO

HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING AND INSTRUMENTATION DIAGRAM
CENTRAL SAMPLING SYSTEM

87-0-159	0087502	SID-4445-P-88598	7-49	0

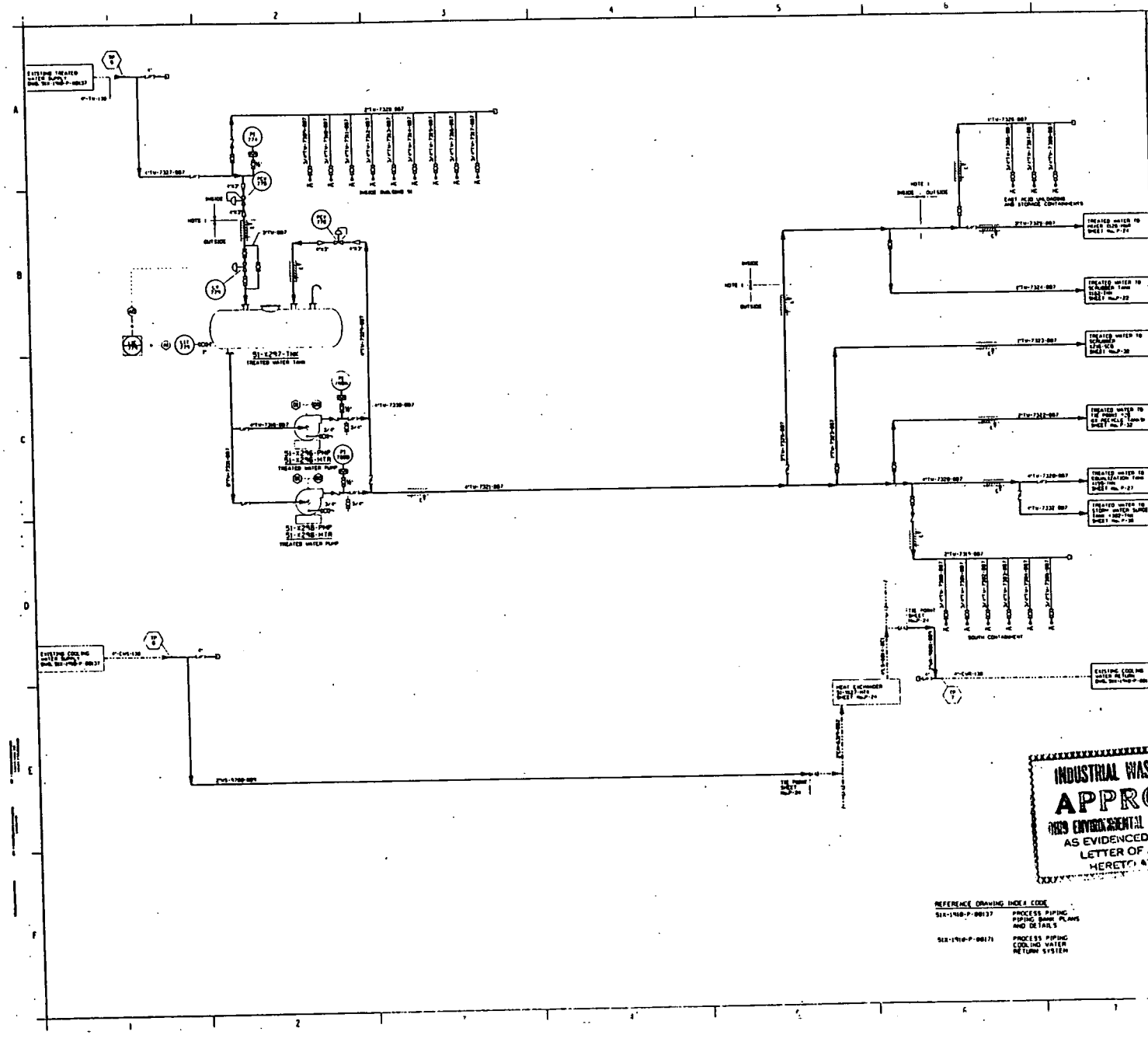

1. EXTEND OVERFLOW LINE TO 6" ABOVE SLAB.
2. FIELD VERIFY EXISTING CONDENSATE RETURN PIPING SIZE & IDF REQUIRED ADD REDUCER. REFERENCE DRAWING SIX-1450-00010 SHOWS LINE SIZE 2½ FIELD INSPECTION DATA SHOWS LINE SIZE 2 1/2".
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY
LETTER OF APPROVAL
HERETO ATTACHED
UNITED STATES
DEPARTMENT OF ENERGY
ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
STEAM & CONDENSATE
SI-X456-TNK
FLASH TANK
SI-X457-RCV
CONDENSATE RECEIVER
SI-X458-PMP
SI-X458-HTR
CONDENSATE PUMP
SI-X459-PMP
SI-X459-HTR
CONDENSATE PUMP
CONTROL PANEL
EQUIPMENT PACKAGE
SOUTH CONTAINMENT
EAST ACID UNLOADING AND STORAGE CONTAINMENTS
87-D-159
008752
SID-4445-P-00542


NOTES
1. PROVIDE 3/4" SHUT-OFF VALVES FOR PLANT AIR BRANCHES.
2. PROVIDE VALVE END CAPS AS INDICATED.
3. APPROXIMATE GRID LINE LOCATION OF COMPRESSED AIR SUPPLY HEADERS.
4. BREATHING AIR STATION FOR DETAIL, SEE APPENDIX I OF SPEC. RFP62-3962.
LEVEL 3 (4TH FLOOR)
LEVEL 2 (3RD FLOOR)
LEVEL 1 (2ND FLOOR)
GRID LINE F-2 THRU F-4
GROUND LEVEL (1ST FLOOR)
GRID LINE D-7 THRU D-12
GRID LINE A-7 THRU A-12
GRID LINE J-2 THRU G-2
GRID LINE G-2 THRU E-2
GRID LINE D-2 THRU D-7
GRID LINE D-7 THRU A-7
ACID CONTAINMENT PIPE RACK
SOUTH SUMP AREA
WEST PIPE RACK
LEVEL 3
LEVEL 2
LEVEL 1
GROUND LEVEL
NEAR COL. K-1 ABOVE HEZ.
GRID LINE F-2 THRU F-4
INDUSTRIAL WASTE DISPOSAL
APPROVED
AS EVIDENCED BY COPY OF
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD ENVIRONMENTAL PROTECTION AGENCY
KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
COMPRESSED AIR
87-0-159
SID-4445-F-00513

413 I-

NOTES

1. ELECTRIC HEAT TRACE AND INSULATE WATER LINES OUTSIDE OF BUILDING 51.



REFERENCE DRAWING INDEX CODE

SIX-1960-P-00137	PROCESS PIPING PIPING BANK PLANS AND DETAILS
SIX-1960-P-00171	PROCESS PIPING COOLING WATER RETURN SYSTEM

TO CORRELATE REFERENCED DWG SHEET NO. TO FEMP DRAWING NUMBER, SEE FEMP DRAWING NO. 510-4445-P-00425 & 510-4445-P-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY
LETTER OF APPROVAL
HERETO ATTACHED

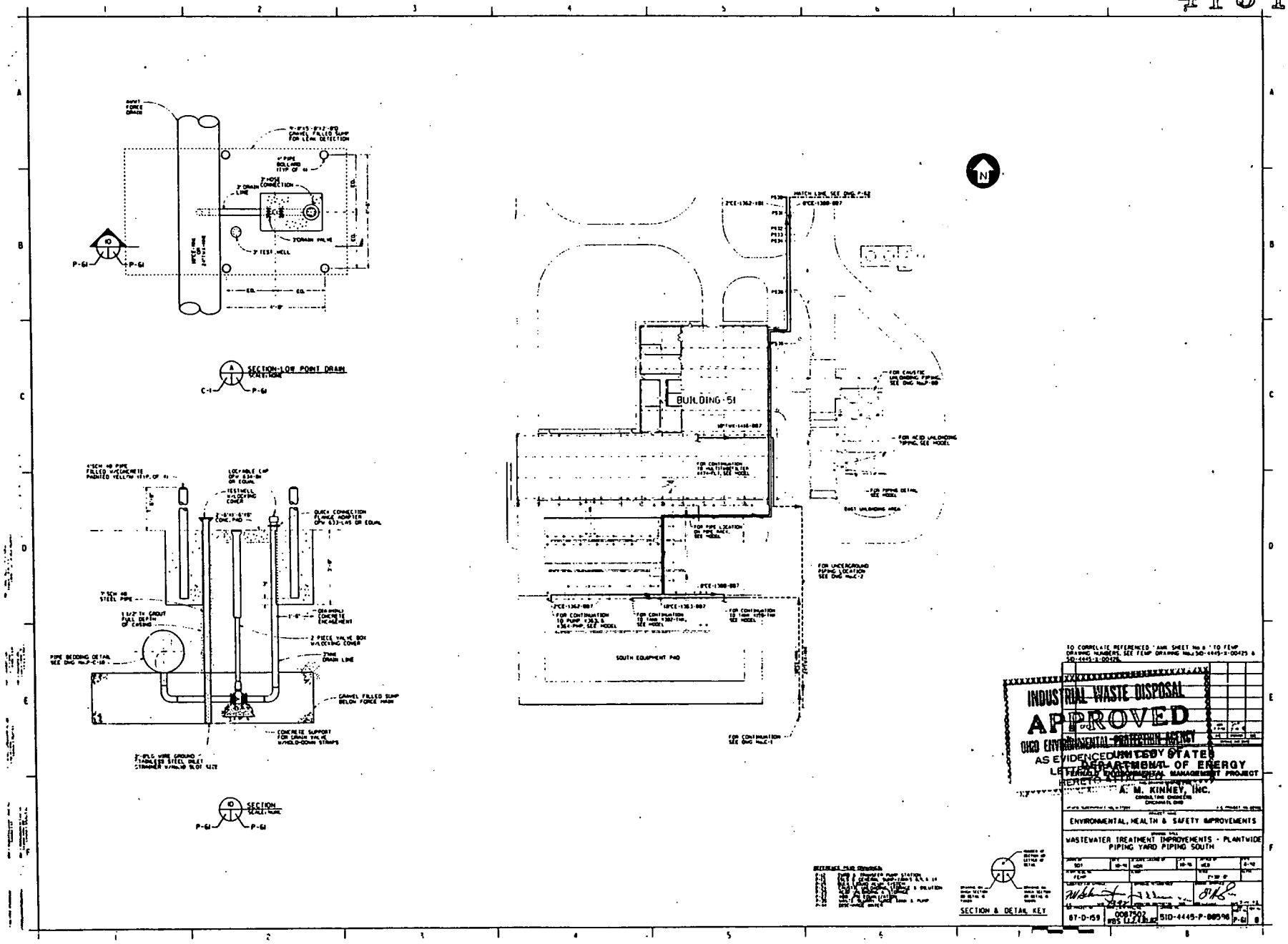
UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
ENVIRONMENTAL MANAGEMENT PROJECT

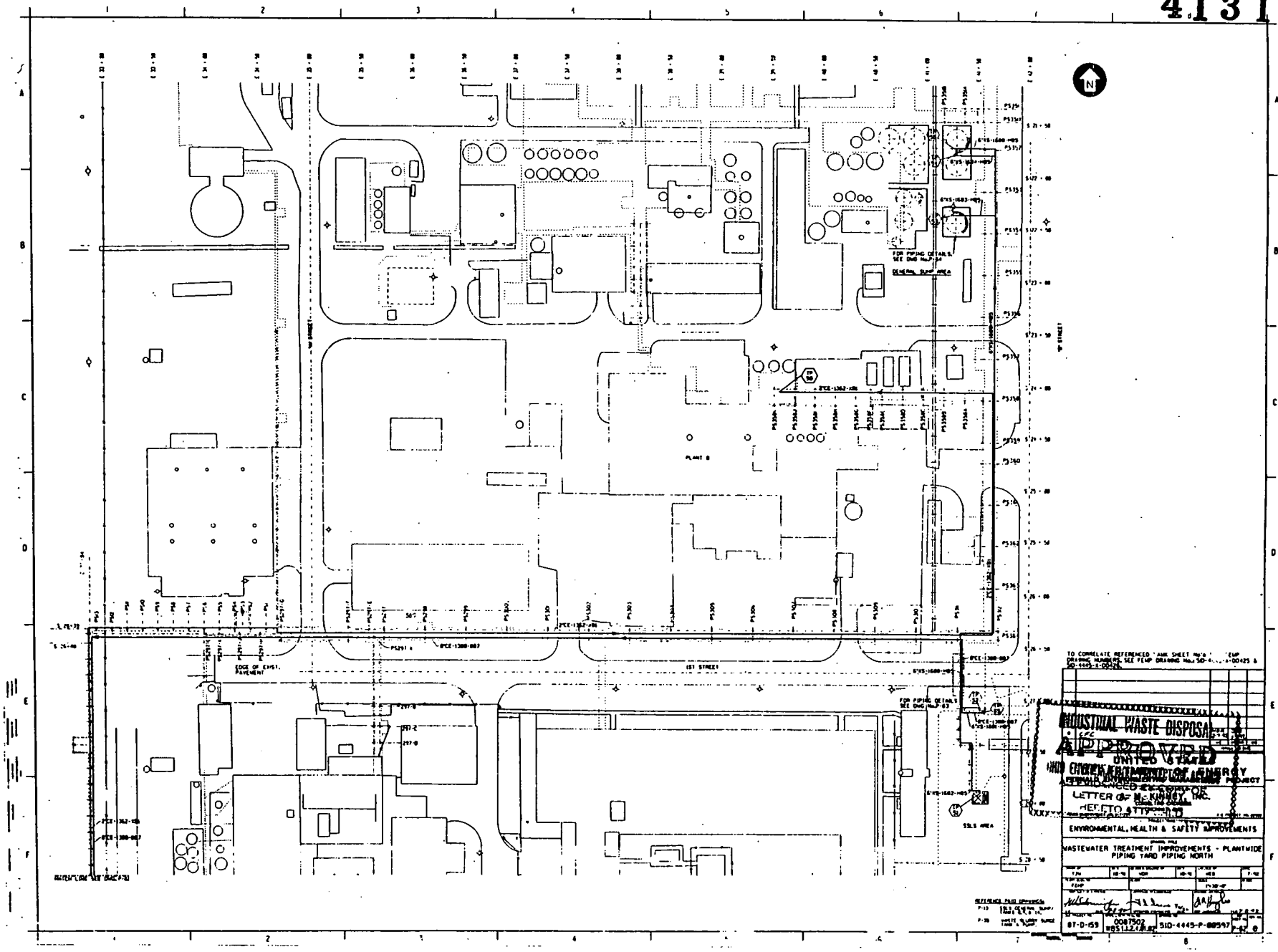
A. M. KINNEY, INC.
CINCINNATI, OHIO

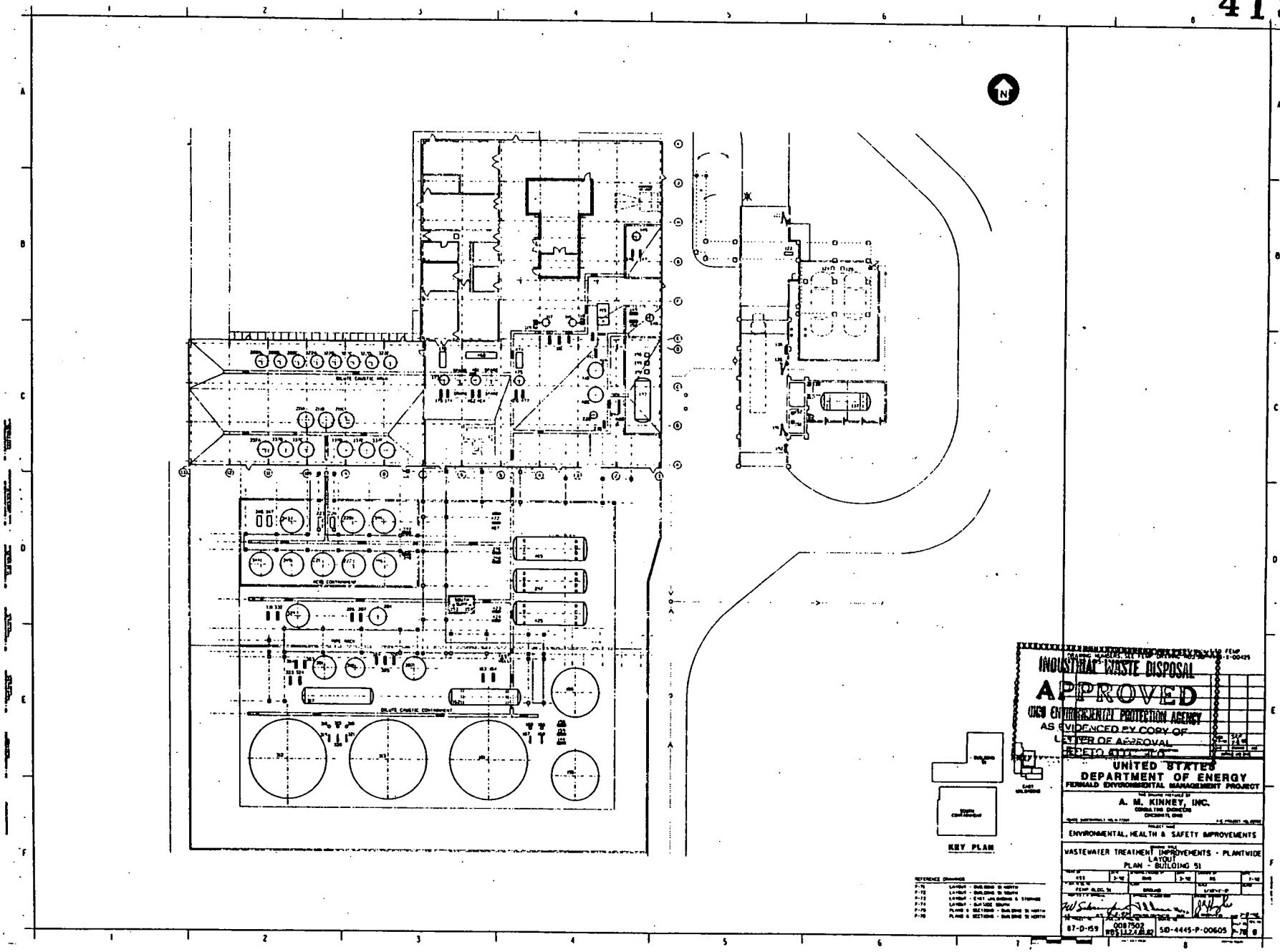
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

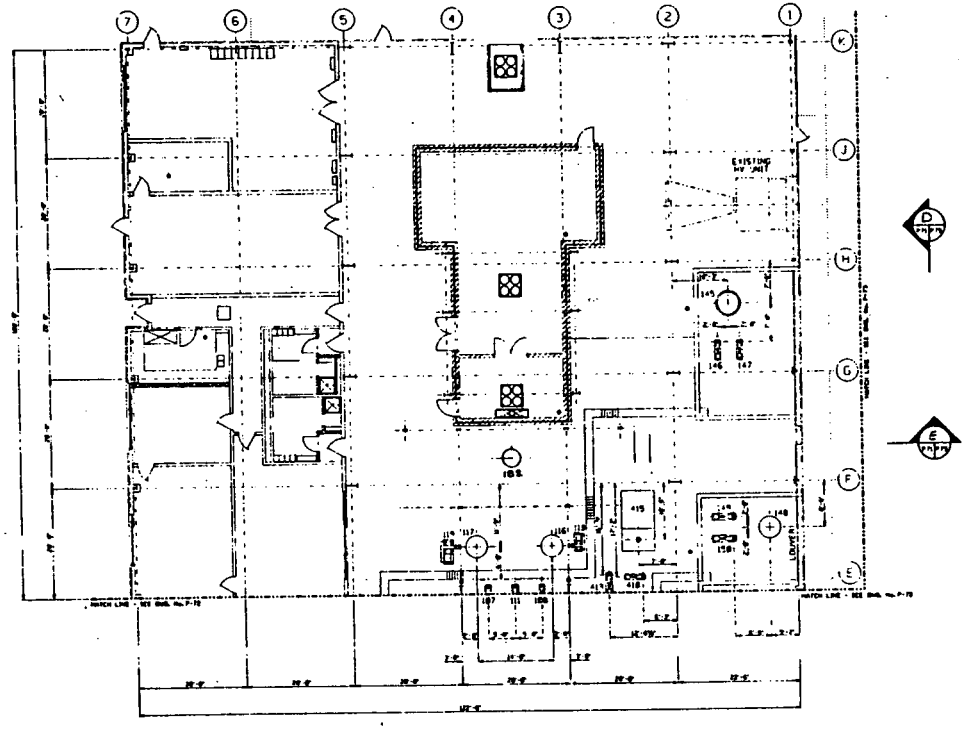
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
TREATED WATER AND COOLING WATER

87-0-159 | 008750 | 510-4445-P-00594 | 0

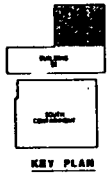

SECTION-LOW POINT DRAIN
BUILDING-51
SOUTH EQUIPMENT PAD
SECTION
SECTION & DETAIL KEY
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED
UNITED STATES
DEPARTMENT OF ENERGY
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING YARD PIPING SOUTH
87-D-159
SID-4445-P-00596


PLANT B
1ST STREET
EDGE OF EXIST. PAVEMENT
FOR PIPING DETAILS SEE DWG No. P-63
GENERAL SUMP AREA
SSLS AREA
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
ADVANCED ENGINEERING
LETTER OF W. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING YARD PIPING NORTH
87-D-159
SID-4445-P-00547


INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
KEY PLAN
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
PLAN - BUILDING 51
87-D-159
0087502
SD-4445-P-00605



BUILDING "5I NORTH
GROUND FLOOR PLAN @ ELEV. 575'-0"



KEY PLAN

TO CORRELATE REFERENCED "AIR SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.s 5D-4445-X-00425 & 5D-4445-X-00426

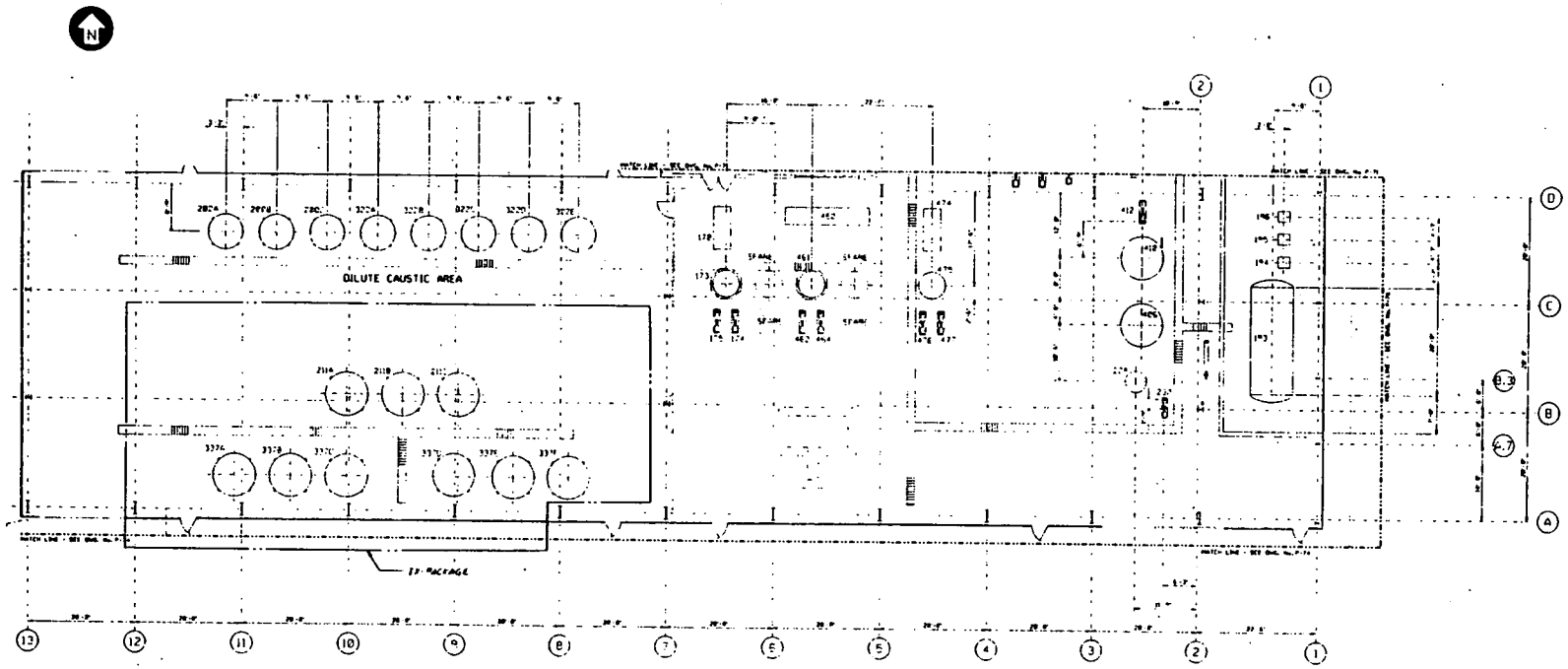
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
AS PER
LETTER OF APPROVAL, INC.
HERETO ATTACHED

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

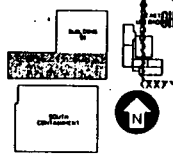
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
BUILDING 5I NORTH

DRAWN BY STEB	DATE 2-90	DESIGNED BY RHG	DATE 2-90
FEMP BLDG. 5I		SCALE 1/8"=1'-0"	
		GROUND	

87-0-159 | 0087502 WBS 1.1.2.4.8.82 | 5D-4445-P-00606 | P-71 | 0



TO CORRELATE REFERENCED "Ann SHEET No's" TO TEMP DRAWING NUMBERS, SEE TEMP DRAWING No.: SD-4445-P-00425 & SD-4445-P-00426



KEY PLAN

REFERENCE DRAWINGS

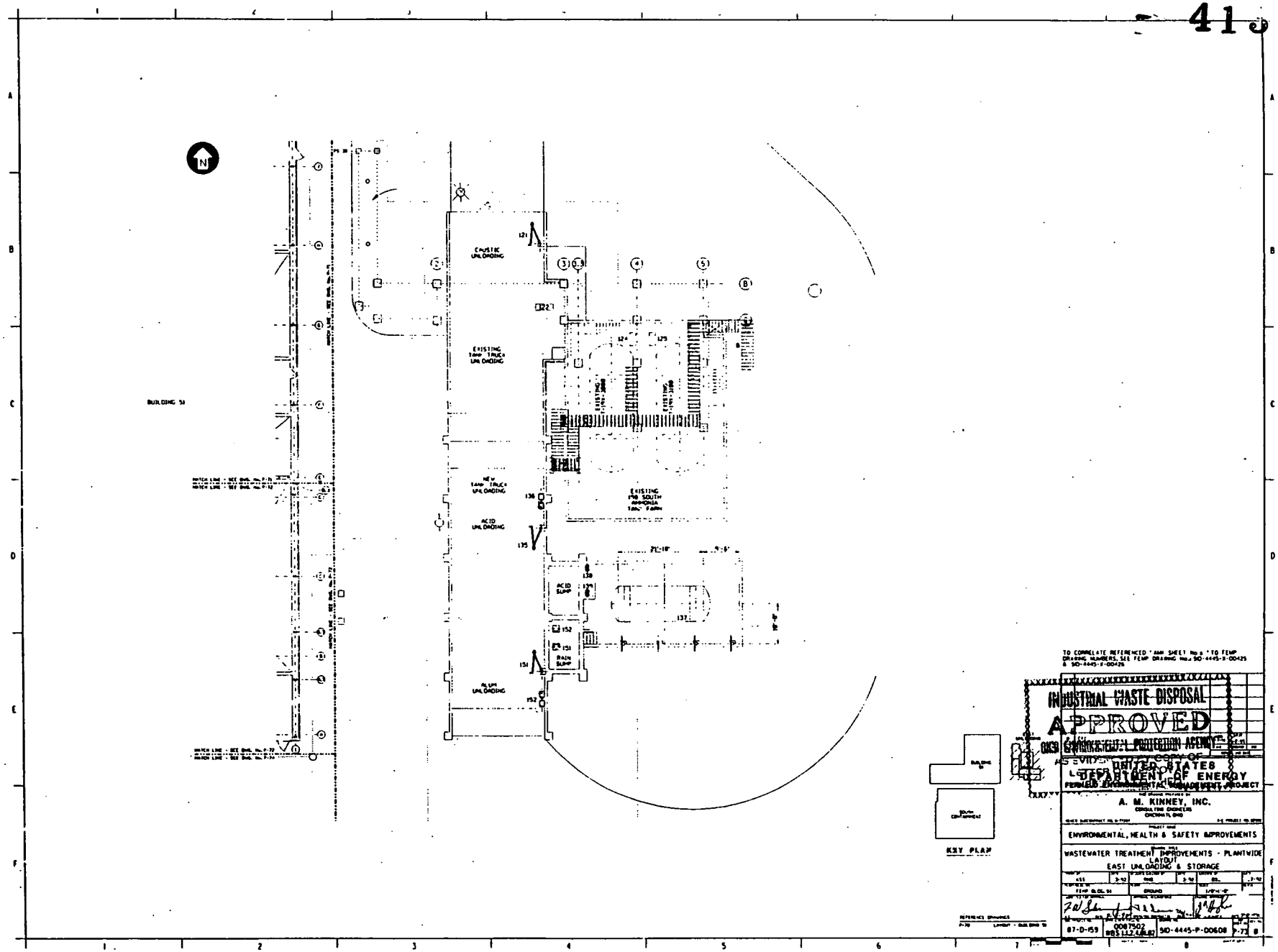
INDUSTRIAL WASTE DISPOSAL
APPROVED
ENVIRONMENTAL PROTECTION AGENCY
A SUBSIDIARY OF
LETTER DATED
UNITED STATES
DEPARTMENT OF ENERGY
PORTSMOUTH ENVIRONMENTAL MANAGEMENT PROJECT

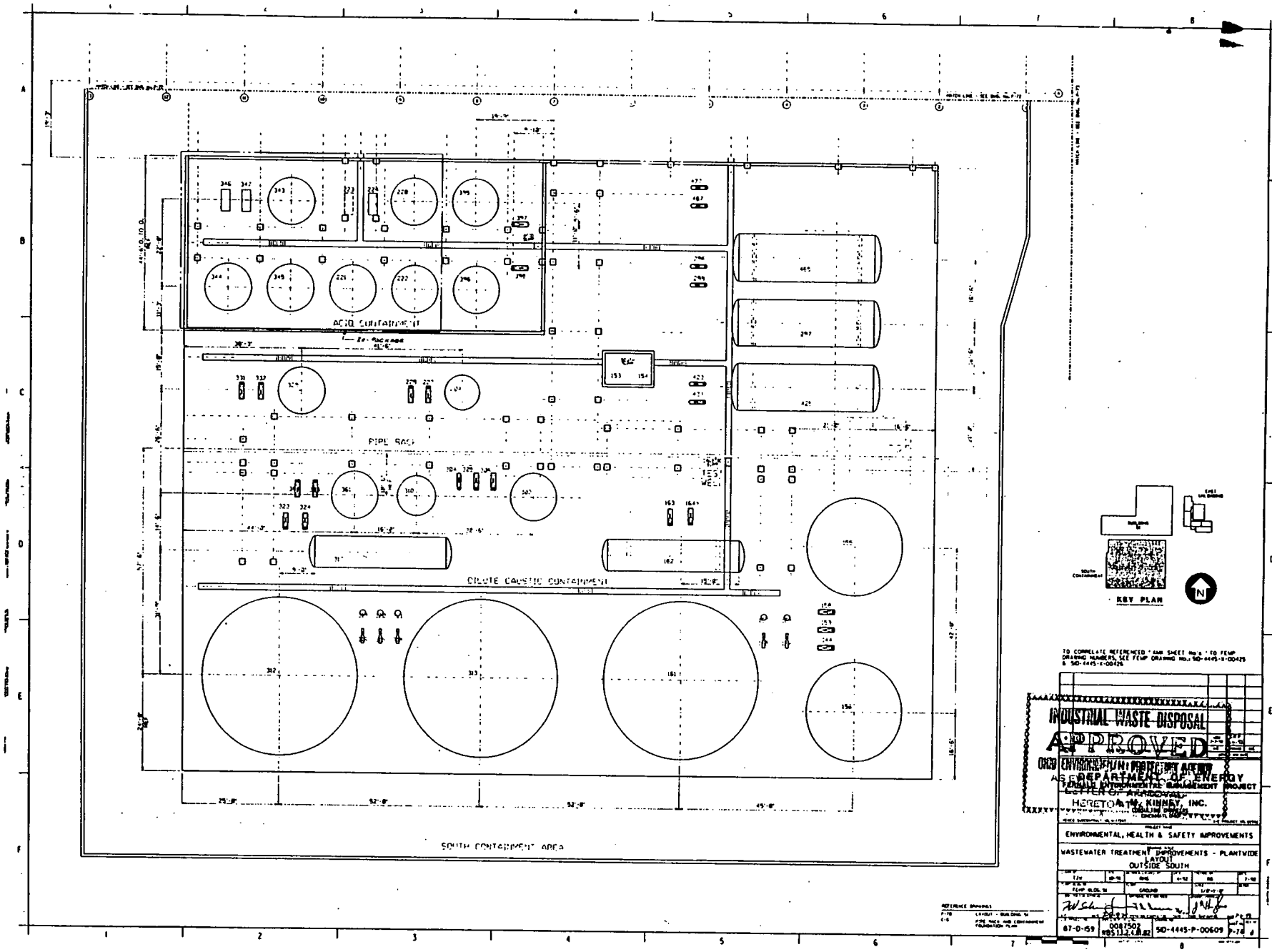
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

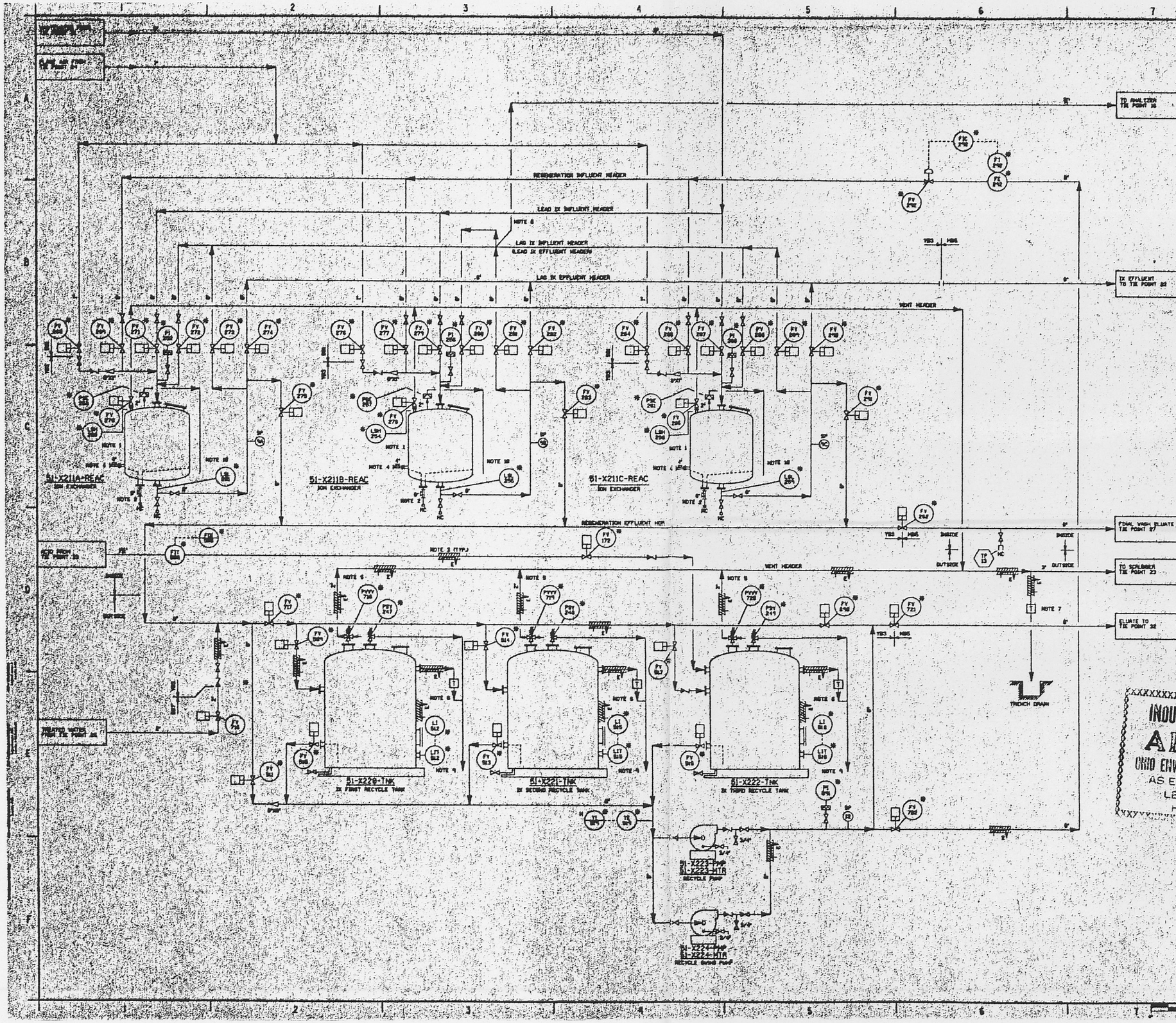
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
BUILDING 51 SOUTH

DRAWN BY RSS	DATE 3-72	DESIGN REVIEWED BY RMS	DATE 3-72	CHECKED BY RS	DATE 7-72
TEMP BLDG. No.		TEMP		SCALE 1/8"=1'-0"	
COMPUTER DRAWING		DRAWING REVIEWED BY		DATE DRAWN	
87-D-159	0067502 WBS 1.1.2.7.8.1.07	SD-4445-P-00607		P-72 0	


N
BUILDING 51
CAUSTIC UNLOADING
EXISTING TANK TRUCK UNLOADING
NEW TANK TRUCK UNLOADING
ACID UNLOADING
ALUM UNLOADING
ACID SUMP
RAIN SUMP
EXISTING 1750 SOUTH AMMONIA TANK FARM
KEY PLAN
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
EAST UNLOADING & STORAGE
87-D-159
0087502
SD-4445-P-00608


ACID CONTAINMENT
PIPE RACK
DILUTE CAUSTIC CONTAINMENT
SOUTH CONTAINMENT AREA
KEY PLAN
INDUSTRIAL WASTE DISPOSAL
APPROVED
DEPARTMENT OF ENERGY
HERETON W. KINNEY, INC.
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
OUTSIDE SOUTH
SD-4445-P-00609



NOTES

1. SHOWN ARE THREE ION EXCHANGER VESSELS ROTATED IN LEAD, LAG AND REGENERATION SEQUENCE.
2. CONNECTION FOR REMOVAL OF SPENT ION EXCHANGE RESIN. SEE DRAWING P-41 FOR PORTABLE RESIN HANDLING UNIT DETAIL.
3. WATER AND ACID PIPING IS ELECTRIC HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA.
4. RESIN SAMPLING PORT AND SLUICING WATER INLET ON SIDE OPPOSITE BOTTOM CONNECTION FOR REMOVAL OF SPENT RESIN.
5. INDIVIDUAL VESSEL VENT PIPING SHALL CONNECT AT THE TOP OF THE VENT HEADER.
6. RECYCLE TANK OVERFLOW TRAPS EACH SHALL HAVE A FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE FLOAT CHAMBER. EACH TRAP SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
7. AT EACH LOW POINT IN VENT HEADER UP-STREAM OF TIE POINT 23, PROVIDE DRIP LEG AND TRAP. TRAP SHALL HAVE FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE DRIP LEG. OUTSIDE OF BUILDING 51 THE DRIP LEG AND TRAP SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
8. SAMPLING CONNECTION IN 6" CROSS FOR MONITORING URANIUM CONCENTRATION BETWEEN LEAD AND LAG IX VESSELS.
9. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
10. PRESSURE RELIEF DISCHARGE LINE TO EXTEND TO 6" ABOVE SLAB.

TIE POINTS:

- TP 15 — HOSE CONNECTION FOR RESIN HANDLING UNIT SHOWN ON DRAWING P-41.
- TP 16 — ANALYZER CONNECTION 3/4" GD6 FLANGED.
- TP 21 — WASTEWATER INFLUENT CONNECTION 6"HB5 FLANGED.
- TP 22 — EXISTING IX EFFLUENT CONNECTION 6" HB5 FLANGED.
- TP 23 — SCRUBBER CONNECTION 3" YB3 FLANGED.
- TP 24 — PLANT AIR SUPPLY CONNECTION 1" BB1 FLANGED.
- TP 26 — TREATED WATER SUPPLY CONNECTION 2" BB7 FLANGED.
- TP 27 — FINAL WASH ELUATE CONNECTION 6"HB5 FLANGED.
- TP 32 — ELUATE CONNECTION 6" HB5 FLANGED.
- TP 33 — ACID SUPPLY CONNECTION 1 1/2" YB3 FLANGED.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY THE ISSUANCE OF
LETTER OF APPROVAL

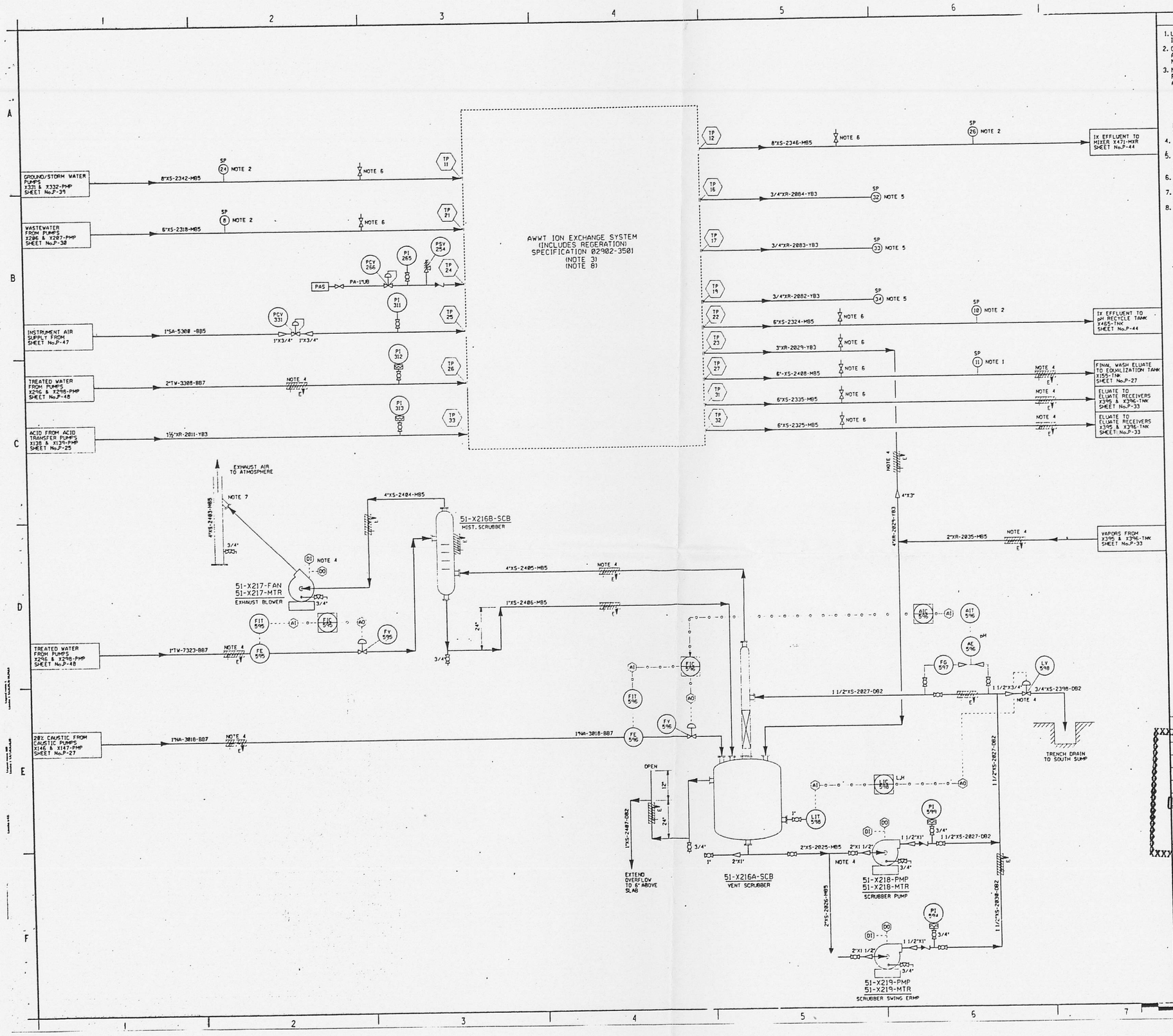
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.
CINCINNATI, OHIO

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
400 GPM ION EXCHANGE & REGENERATION

KDS | 12-90 | 9-90 | 9-90
FEMP BLDG. 51 | NONE
87-D-59 | 008T502 | 51D-M45-P-00415 | P-21 | 0



NOTES

1. LOCAL SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC 02902-3502.
2. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
3. MAKE CENTRALIZED SAMPLE CONNECTIONS AT THE FOLLOWING LISTED NINE (9) SAMPLE POINTS IN THE AWWT ION EXCHANGE SYSTEM:
   SP 9A SP 25C
   SP 9B SP 25D
   SP 9C SP 25E
   SP 25A SP 25F
   SP 25B
   FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
4. ELECTRIC HEAT TRACE AND INSULATE CAUSTIC, WATER, AND VAPOR LINES OUTSIDE BUILDING 51.
5. ANALYZER SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No. P-45.
6. PRESSURE TEST CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.
7. FOR DETAIL OF EXHAUST STACK, SEE APPENDIX I OF SPEC. 02902-3502.
8. MAKE LOCAL SAMPLE CONNECTIONS AT THE FOLLOWING LISTED THREE (3) SAMPLE POINTS INTHE AWWT ION EXCHANGE SYSTEM:
   SP 12
   SP 27
   SP 28
   FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.

TO CORRELATE REFERENCED 'AMK SHEET No's' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-444-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY ATTACHED LETTER DATED
HEREIN

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. W-17201
A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

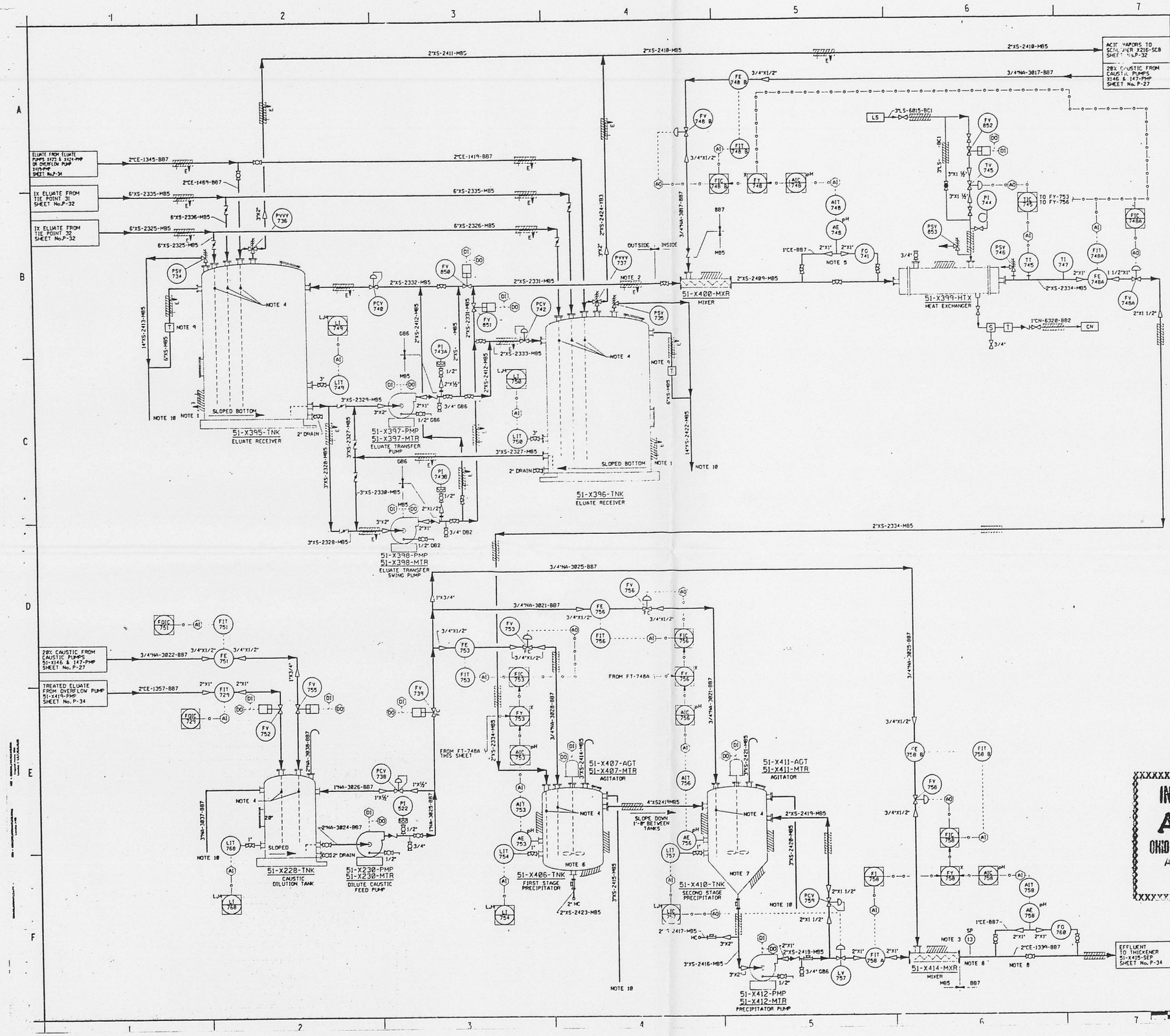
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ION EXCHANGE TIE POINTS AND SCRUBBER

DRAWN BY	DATE	DESIGNED BY	DATE	CHECKED BY	DATE
KDG	4-92	WDB	5-92	WDR	6-92

PLANT BLDG. NO.: FEMP BLDG. 51 — FLOOR — SCALE: NONE — SHEET

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — DRAWING APPROVED

A-E SUB-PROJECT NO.	DATE	OPER. & MAINTENANCE	DATE	GENERAL NO.	SHEET NO.	REV. NO.
87-D-159	7-8-92	0087502 WBS 1.1.2.4.01.02	7-8-92	51D-4445-P-00583	P-32	0



NOTES

1. HEAT TRACED & INSULATED ON BOTTOM SECTION OF TANK ONLY, TO EXTEND 7'-0" ABOVE TANK BASE.
2. LINES ARE HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE ABOVE GROUND PIPE RACKS.
3. LOCAL SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.
4. PROVIDE ONE 1/8" DIA. HOLE IN EACH INLET DIP PIPE, 8" BELOW TOP OF TANK HEAD.
5. TARGET pH 4.5.
6. TARGET pH 5.5.
7. TARGET pH 6.5.
8. TARGET pH 8.0.
9. ELUATE TANK OVERFLOW TRAPS SHALL EACH HAVE A FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE FLOAT CHAMBER. EACH TRAP SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
10. OVERFLOW LINE TO EXTEND TO 6' ABOVE SLAB.

TO CORRELATE REFERENCED "AWK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

REV.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DRAWN	DATE
0	IFC	DKE	7-7-92

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
ENVIRONMENTAL IMPROVEMENTS MANAGEMENT PROJECT
J.A.M. CONNOR INC.
CONSULTING ENGINEERS
PROJECT NO. 02902

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

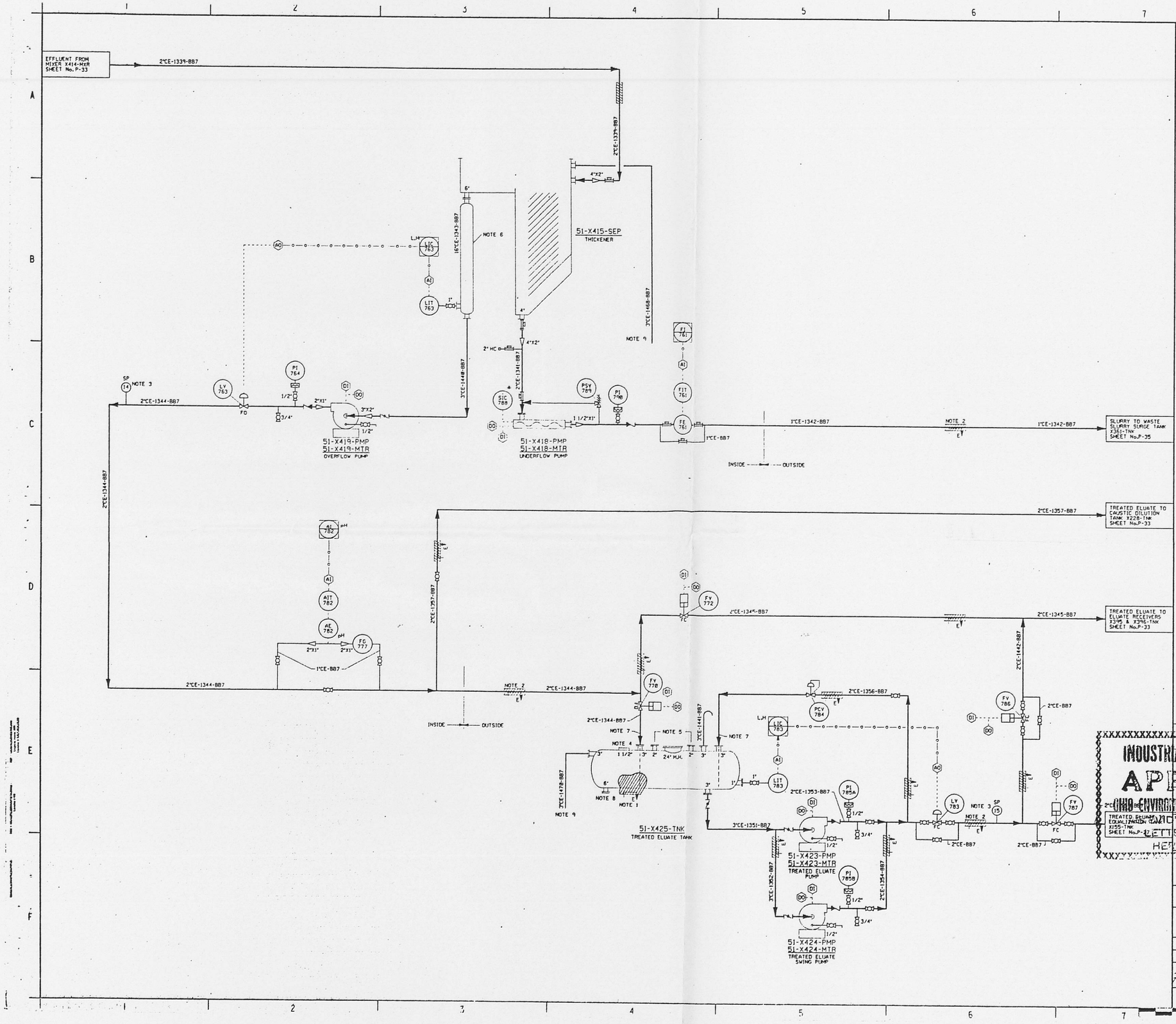
DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ELUATE PRECIPITATION

DRAWN BY	CHECKED BY	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KDG	10-90	GDM	5-92	VDB	6-92

PLANT/BLDG. NO.: FEMP BLDG. 51
SCALE: NONE
STATUS:

SUBMITTED BY: F.W. Schwinger 7-8-92
APPROVAL RECOMMENDED: J.E. Deere 7/8/92
OPERATING PROJECT ENGINEER: J.R. Hughes 7-6-92

DOE PROJECT NO.	SYS. & DWG. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00584	P-33	0



NOTES

1. HEAT TRACED AND INSULATED ON BOTTOM HALF OF TANK ONLY.
2. LINES ARE HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE ABOVE GROUND PIPE RACKS.
3. LOCAL SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.
4. 1 1/2" INCH 150 LB; ANSI R.F. PAD TYPE NOZZLE. PROVIDE BLIND FLANGE.
5. 2 INCH 150 LB. ANSI R.F. NOZZLE; PROVIDE BLIND FLANGE.
6. FOR DETAIL OF 16"CE-1343-BB7, SEE APPENDIX I OF SPEC. 02902-3502.
7. 3" 150LB.ANSI R.F. C.S. BLIND FLANGE BORED TO SUIT 2" SCH.80 C.S. PIPE. PROVIDE NEW 2" REMOVABLE FLANGED DIP PIPE TO REPLACE EXISTING2" MONEL DIP PIPE. DIP PIPE TO EXTENDTO 6" ABOVE TANK BOTTOM. REQUIRED (2) PLACES.
8. 6" 600 LB. ANSI R.F. C.S. NOZZLE. PROVIDE BLIND FLANGE.
9. OVEREFLOW LINE TO EXTEND TO 6" ABOVE SLAB.

TO CORRELATE REFERENCED 'AMK SHEET No's 'TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 510-4445-X-00425 & 510-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
PRODUCED BY CITY OF CINCINNATI
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMCO SUBCONTRACT NO. M-11201 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

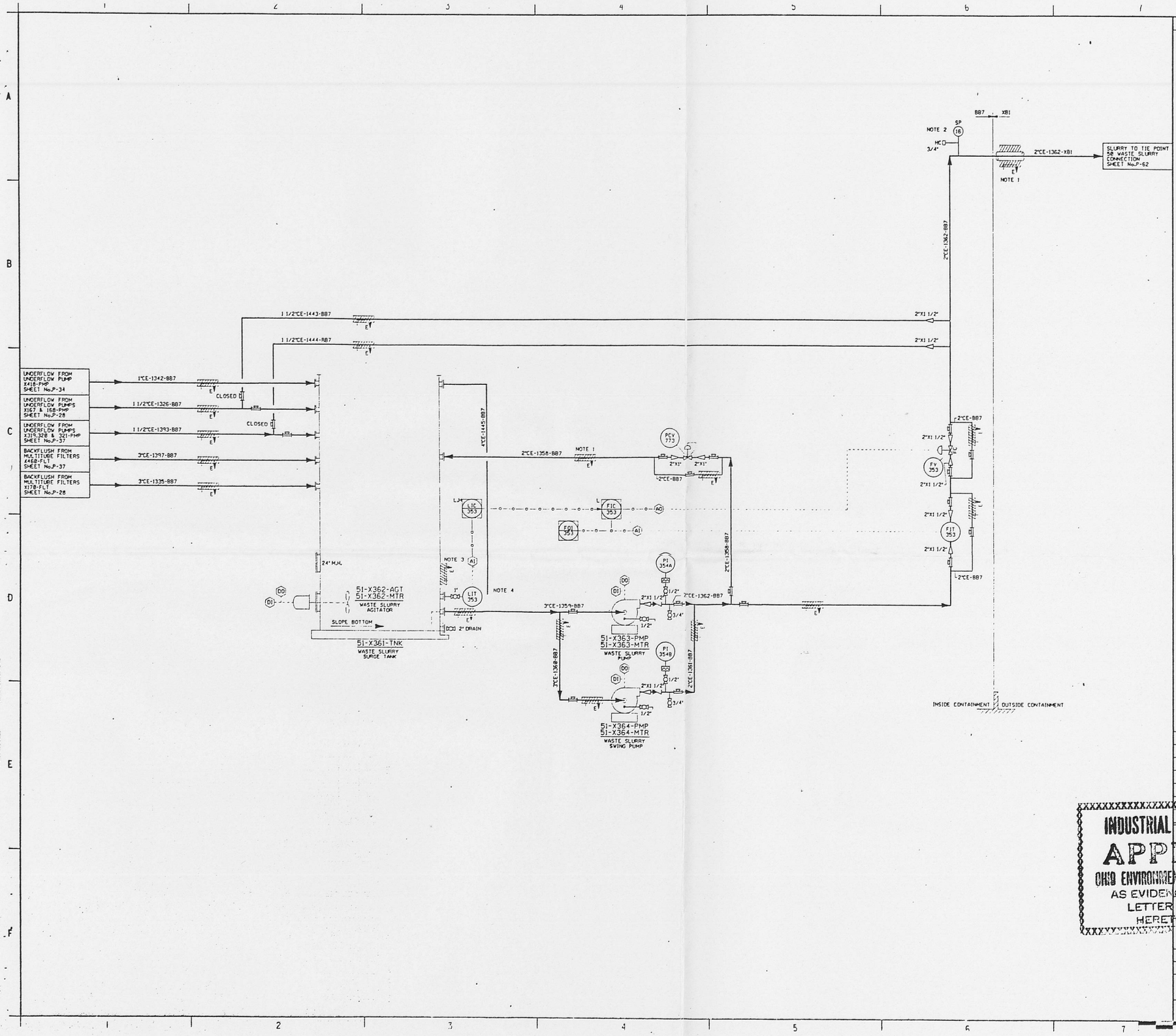
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
ELUATE SLURRY THICKENING

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
KDG	8-91	GDM	5-92	WDB	5-92

PLANT/BLDG. NO.: FEMP BLDG. 51 — FLOOR: — SCALE: NONE — CLASS:

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — DRAWING APPROVED

DOE PROJECT NO.: 87-D-159 — TYPE CONTROL NO.: 0087502 WBS 1.1.2.4.01.02 — DRAWING NO.: 510-4445-P-00585 — SHEET NO.: P-34 — REV. NO.: 0



NOTES

1. LINES ARE HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE ABOVE GROUND PIPE RACKS.
2. LOCAL SAMPLE CONNECTION WITH HOSE CONNECTION; SEE APPENDIX I OF SPEC. 02902-3502
3. HEAT TRACED AND INSULATED ON BOTTOM SECTION OF TANK ONLY; TO EXTEND 7'-0" ABOVE TANK BASE.
4. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.

TO CORRELATE REFERENCED * AMK SHEET No's * TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

REVISIONS AND DATE			
A-E	BROWN	DOE	
WDB 7-7-92	SRH 7-14-92		

INDUSTRIAL WASTE DISPOSAL
APPROVAL
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
MORRISON KNUDSEN CORPORATION, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

A-E PROJECT NO. 02907

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

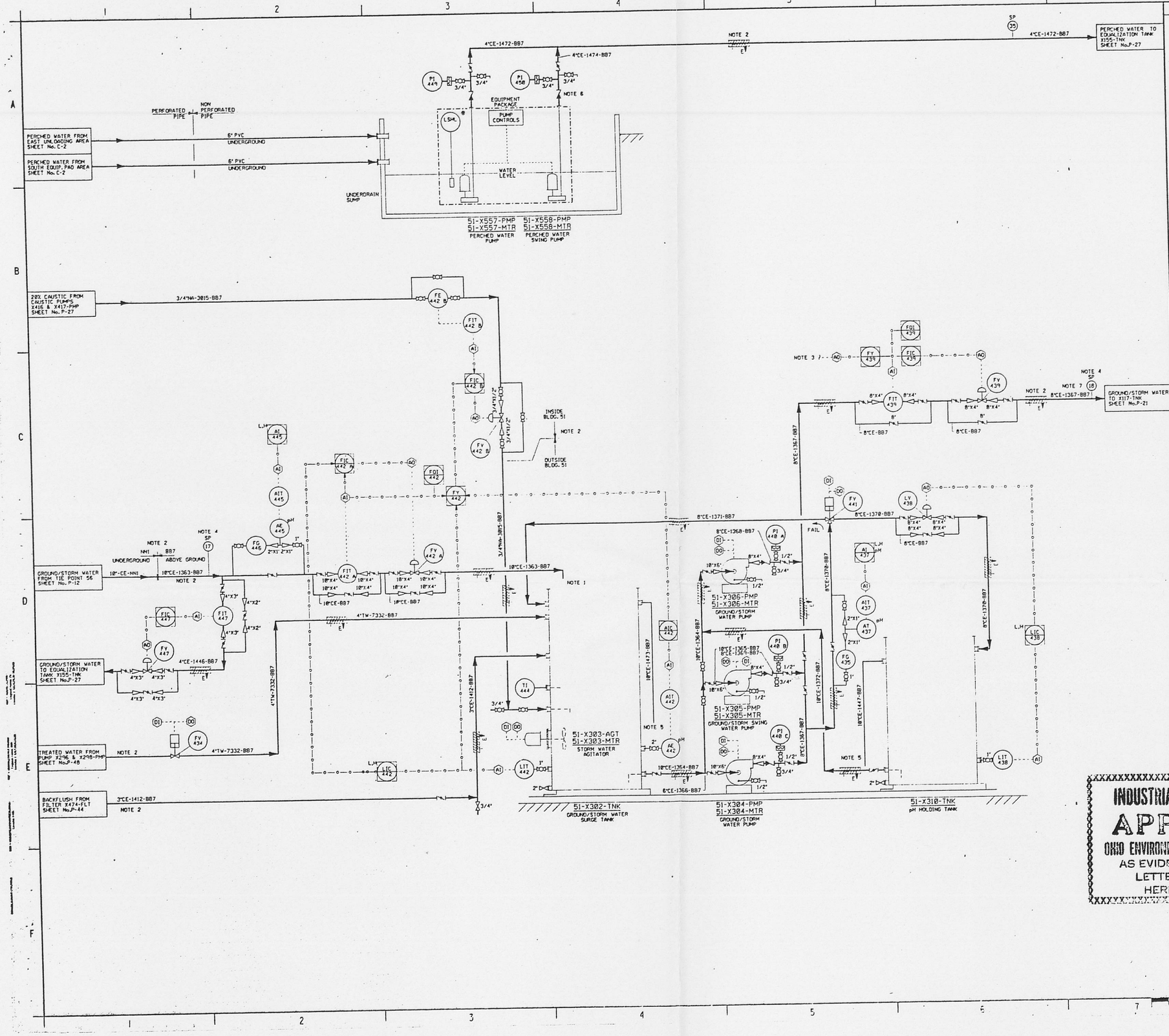
DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
WASTE SLURRY SURGE TANK & PUMPS

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
KDG	10-90	GDM	5-92	WDB	6-92

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
FEMP BLDG. 51		NONE	

SUBMITTED FOR APPROVAL	APPROVAL RECOMMENDED	(BRANCH OFFICE)
7-8-92	7/8/92	7-14-92

JOB PROJECT NO.	OPERATING NO.	ORIGINAL NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00586	P-35	0



NOTES

1. AIR BREAK REQUIRED TO PREVENT BACKFLOW OF GROUND/STORM WATER.
2. LINES ARE ELECTRIC HEAT TRACED AND INSULED ONLY CAUSTIC AND WATER OUTSIDE BLDG. 51 AND ABOVE GROUND.
3. THIS ANALOG OUTPUT SIGNAL IS A REMOTE SETPOINT INPUT TO NIC-796 SHOWN ON DWG. P-21.
4. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
5. TANK OVERFLOW LINE TO EXTEND TO 6' ABOVE SLAB.
6. PUMP DISCHARGE CHECK VALVE ELEVATION HIGHER THAN SUMP WALLS.
7. SAMPLE CONNECTION SP-18 TO BE LOCATED INSIDE BUILDING 51.

TO CORRELATE REFERENCED 'AMK SHEET No's' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426

REV	DESCRIPTION	BY	CHK	DATE
A-E		WDB 7-7-92	CRH 7-10-92	

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

PREPARED BY
FLUOR DANIEL, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

A-E PROJECT NO. 02902

PROJECT NAME
ENVIRONMENTAL HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
GROUND/STORM WATER pH ADJUSTMENT

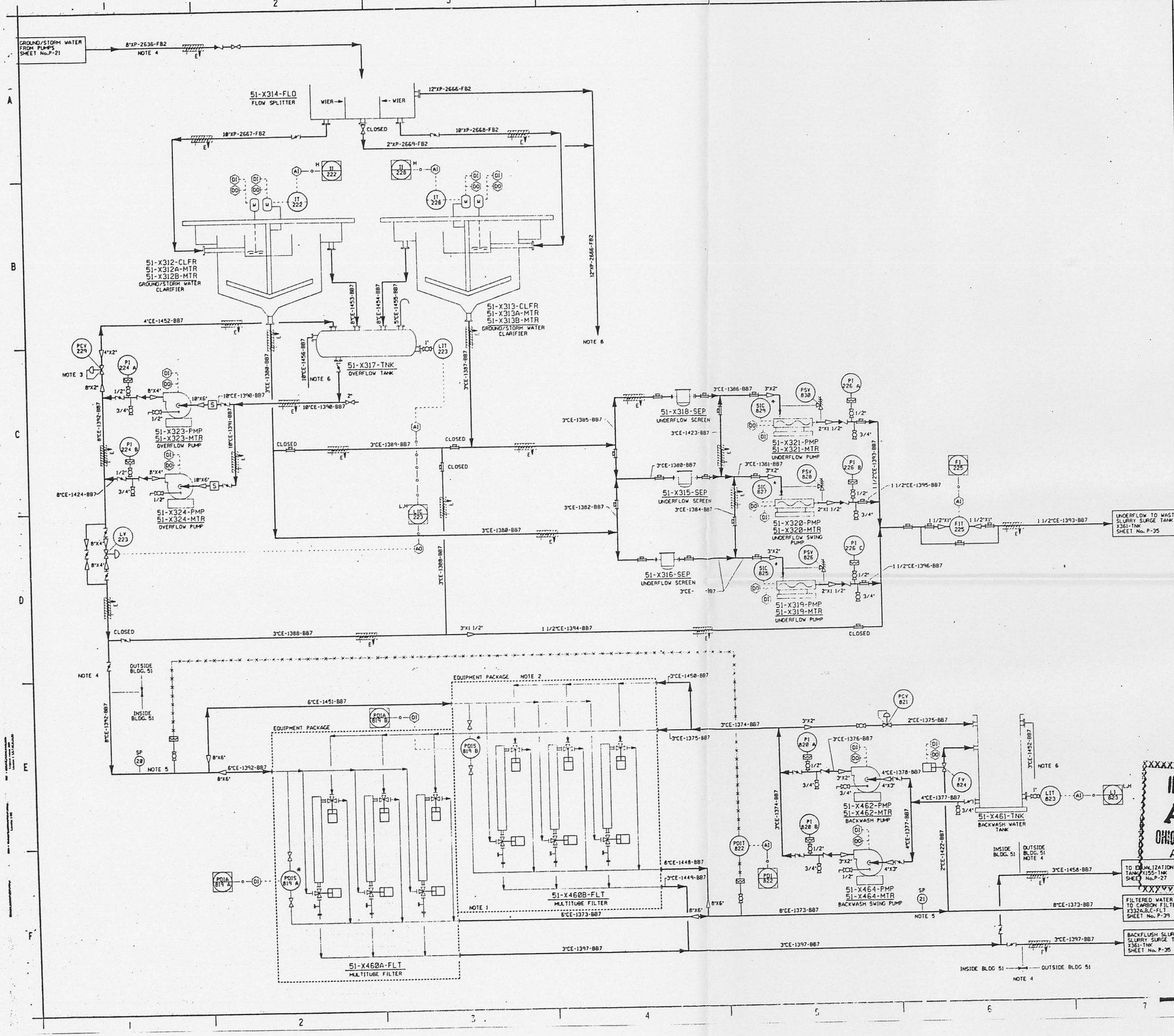
DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
KDG	10-90	REA	5-92	WDB	6-92

PLANT & DIV. NO.: FEMP BLDG. 51 — FLOOR — SCALE: NONE — CLASS

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — FINAL APPROVAL

DATE 7-8-92 — OPERATING CONTRACTOR — DATE — DATE 7-10-92

A-E PROJECT NO.	SPEC. LOCATION PER LA NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00587	P-36	0



NOTES

1. TUBE FILTER FLOW VALVES ARE OPENED AND CLOSED BY BACKWASH CONTROLLER. ALL FILTERS OPERATE IN PARALLEL WHEN ONE IS BACKWASHING.
2. TUBE FILTER BACKWASH WATER AND TIME PERIODS ARE REGULATED BY BACKWASH CONTROLLER.
3. THIS PCV ALLOWS CONTINUOUS RECYCLE FLOW DURING COLDER WINTER WEATHER.
4. ELECTRIC TRACE AND INSULATE WATER LINES OUTSIDE BUILDING 51.
5. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
6. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.

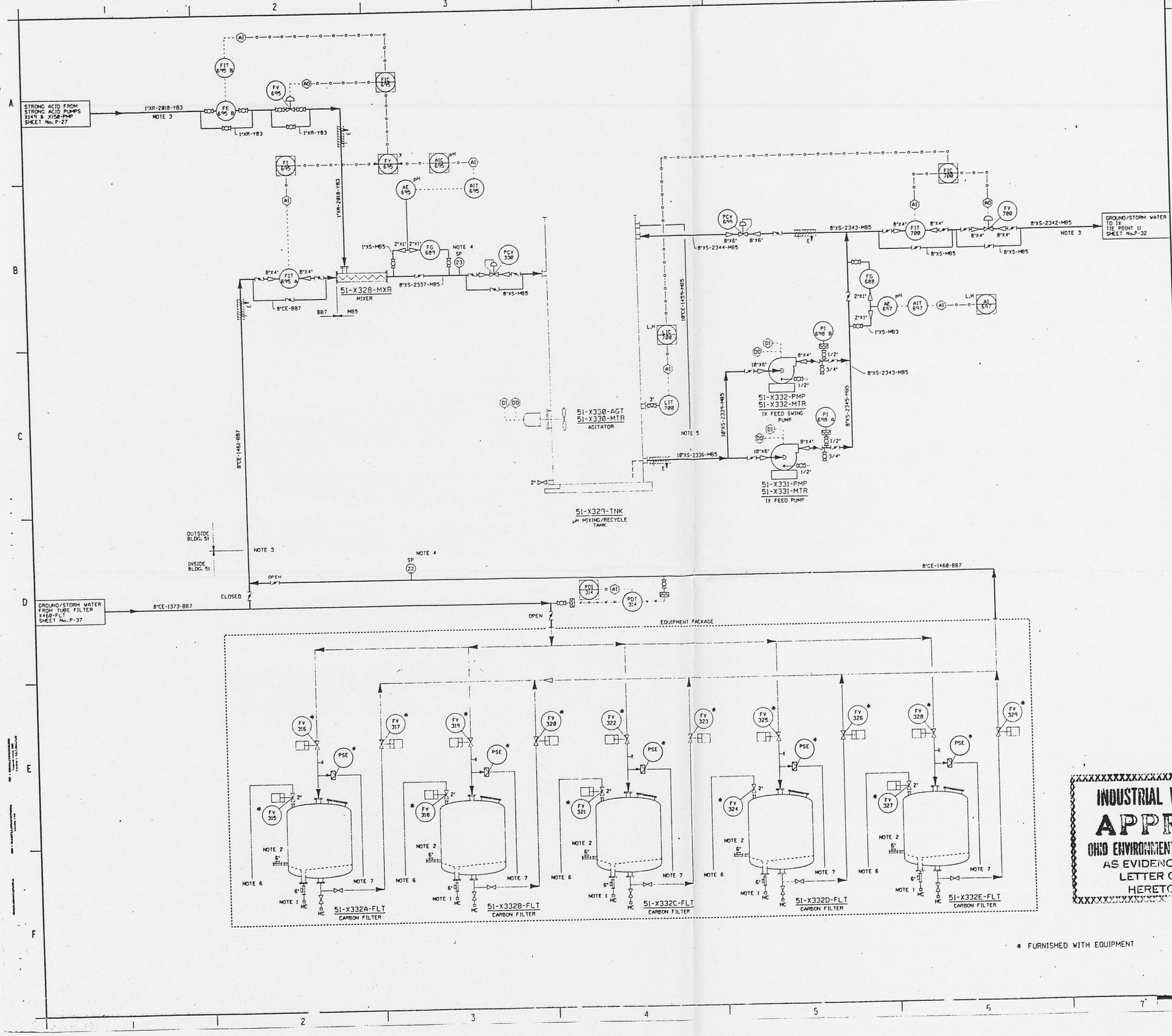
TO CORRELATE REFERENCED ' AMK SHEET No's ' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY
LETTER OF APPROVAL
HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM PREFILTRATION

DRAWN BY KDG	DATE 11-90	DESIGNED CHECKED BY REA	DATE 5-92	CHECKED BY WDB	DATE 6-92
PLANT/BLDG. NO. FEMP BLDG. 51	FLOOR			SCALE NONE	

87-D-159 | 0087502 WBS 1.1.2.4.01.02 | 51D-4445-P-00588 | SHEET P-37 | REV. 0



NOTES

1. CONNECTION FOR REMOVAL OF SPENT ACTIVATED CARBON USING A PORTABLE HYDRAULIC UNIT.
2. CARBON SAMPLING PORT AND SLUICING WATER INLET ON SIDE OPPOSITE BOTTOM CONNECTION FOR REMOVAL OF SPENT CARBON.
3. ELECTIC TRACE AND INSULATE ACID AND WATER LINES OUTSIDE BUILDING 51.
4. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX 1 OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
5. TANK OVERFLOW LINE TO EXTEND 6' ABOVE SLAB.
6. VENT LINE TO EXTEND TO 6' ABOVE SLAB.
7. SAFETY RELIEF DISCHARGE LINE TO EXTEND TO 6' ABOVE SLAB.

TO CORRELATE REFERENCED 'AMK SHEET No's 'TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

REV.	PURPOSE - DESCRIPTION	DRAWN	CHECKED
A-4	UPDATED	WOB 7-7-92	JKH 7-9-92

INITIALS AND DATE

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

AE DRAWING PREPARED BY
KIDDER, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

A-E PROJECT NO. 0290

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

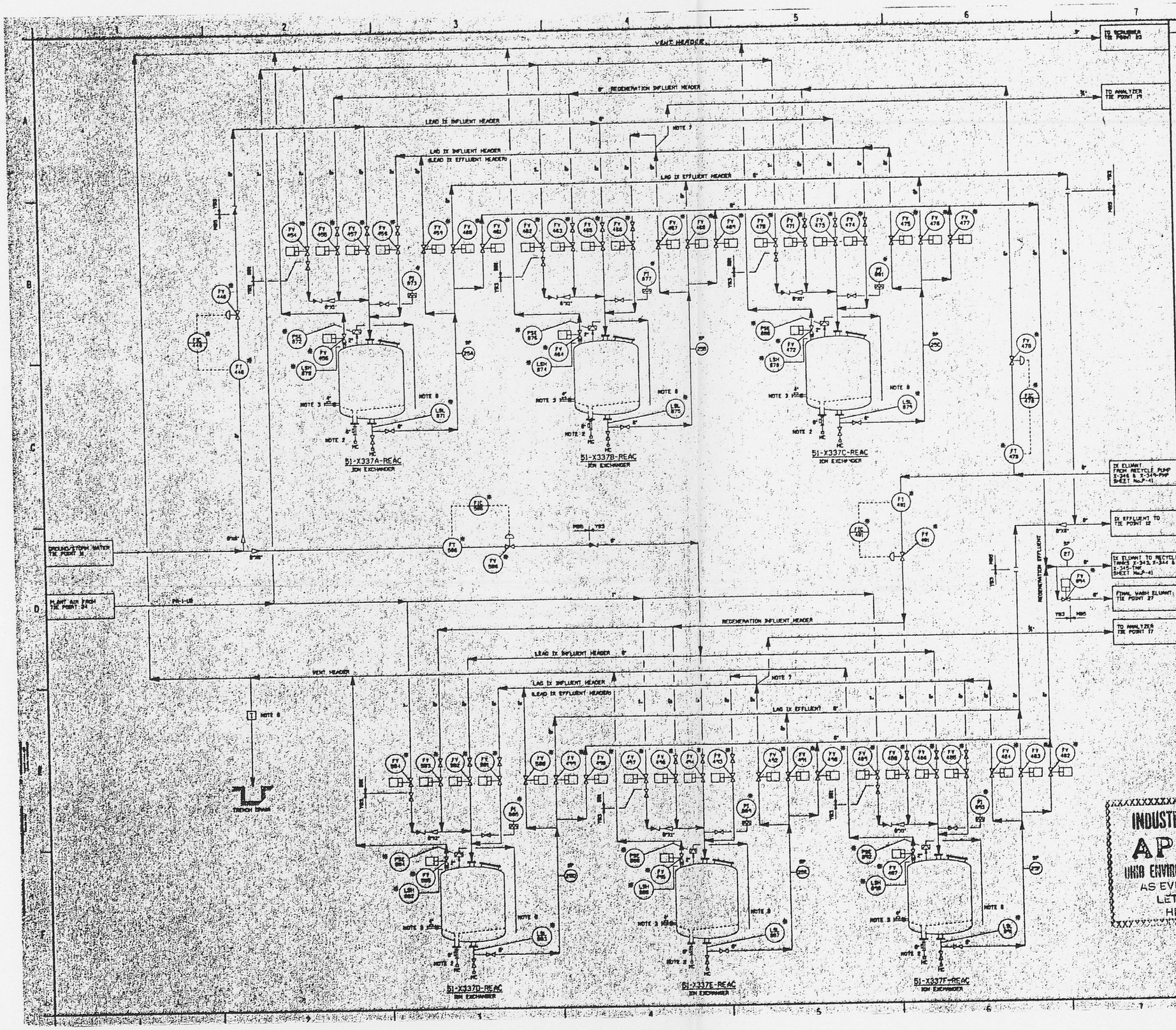
DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM CARBON FILTERS

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KDG	8-91	REA	5-92	WOB	6-92

P.DATUM DG. NO.	FLOOR	SCALE	CLASS
FEMP BLDG. 51		NONE	

SUBMITTED FOR APPROVAL: 7-8-92
APPROVAL RECOMMENDED: OPERATING CONTRACTOR DATE
DRAWING APPROVED: DOE REP. DATE 7-8-92

A-E PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.1.01.02	51D-4445-P-00589	P-39	0



NOTES

1. SHOWN ARE TWO SETS OF THREE ION EXCHANGER VESSELS ROTATED IN LEAD, LAG, & REGENERATION SEQUENCE.
2. CONNECTION FOR REMOVAL OF SPENT ION EXCHANGE RESIN. SEE DRAWING P-41 FOR PORTABLE RESIN HANDLING UNIT DETAIL.
3. RESIN SAMPLING PORT AND SLUICING WATER INLET ON SIDE OPPOSITE BOTTOM CONNECTION FOR REMOVAL OF SPENT RESIN.
4. INDIVIDUAL VESSEL VENT PIPING SHALL CONNECT AT THE TOP OF THE VENT HEADER.
5. DELETED
6. AT EACH LOW POINT IN VENT HEADER UPSTREAM OF TIE POINT 23, PROVIDE DRIP LEG AND TRAP. TRAP SHALL HAVE FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE DRIP LEG AND TRAP.
7. SAMPLING CONNECTIONS IN 6" CROSS FOR MONITORING URANIUM CONCENTRATION BETWEEN LEAD AND LAG IX VESSELS.
8. PRESSURE RELIEF DISCHARGE LINE TO EXTEND TO 6' ABOVE SLAB.

TIE POINTS:

- TP 11 — GROUND/STORM WATER INFLUENT CONNECTION 8"HB5 FLANGED.
- TP 12 — EFFLUENT CONNECTION 8"HB5 FLANGED.
- TP 17 — ANALYZER CONNECTION ¾"GB6 FLANGED.
- TP 19 — ANALYZER CONNECTION ¾"GB6 FLANGED.
- TP 23 — SCRUBBER CONNECTION 3"YB3 FLANGED.
- TP 24 — PLANT AIR SUPPLY CONNECTION 1"BB1 FLANGED.
- TP 27 — FINAL WASH ELUATE 8"HB5 FLANGED.

#	ISSUED FOR RFP SPEC SEPARATION

INDUSTRIAL WASTE TREATMENT PROJECT
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FLUOR FERNALD, INC.

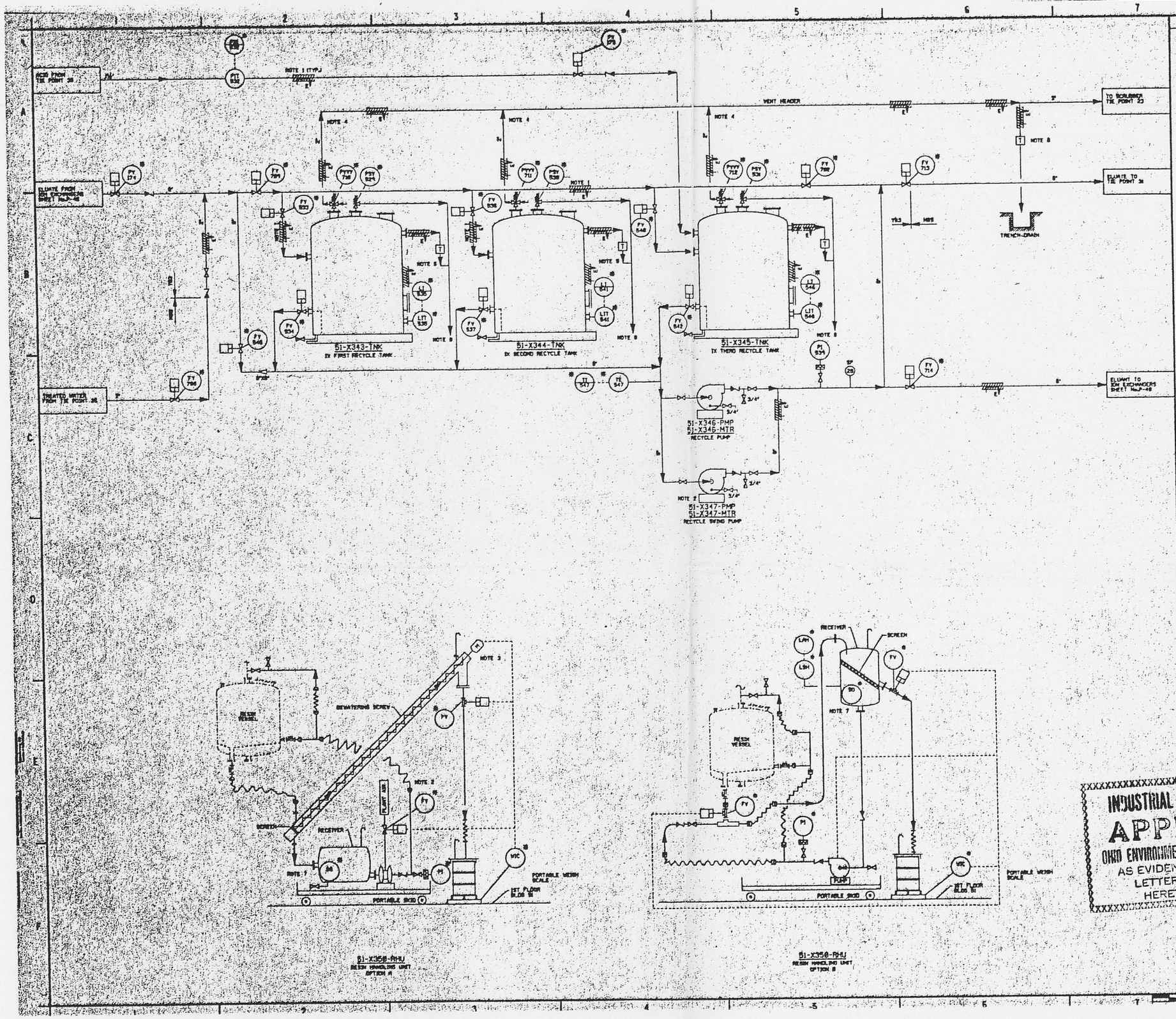
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY THE ENGINEERING, HEALTH & SAFETY IMPROVEMENTS
LETTER OF APPROVAL DATED
HEREWITH

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM ION EXCHANGE

DRAWN	CHECKED	ENGINEER	PROJECT ENGINEER
RDG	LE-HB	WDS	F-HB

FEMP BLDG. 56

87-D-159 | 008TS02 | WBS 1.1.2.1.8.07 | 650-44-P-P-00428 | F-HB



NOTES

1. WATER AND ACID PIPING IS ELECTRIC HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA.
2. HOSE CONNECTION TO TIE POINT 13 DRAWING P-31 FOR WATER DISPOSAL.
3. DEWATERING SCREW DISCHARGE MUST BE ABOVE THE HEIGHT OF INLET NOZZLE TO RESIN VESSEL.
4. INDIVIDUAL VESSEL VENT PIPING SHALL CONNECT AT THE TOP OF THE VENT HEADER.
5. RECYCLE TANK OVERFLOW TRAPS EACH SHALL HAVE A FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE FLOAT CHAMBER. EACH TRAP SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
6. AT EACH LOW POINT IN VENT HEADER UPSTREAM OF TIE POINT 23, PROVIDE DRIP LEG AND TRAP. TRAP SHALL HAVE FLOAT-ACTUATED VALVE WHICH CLOSES UPON EMPTYING THE DRIP LEG. OUTSIDE OF BUILDING 51 THE DRIP LEG AND TRAP SHALL BE ELECTRIC HEAT TRACED AND INSULATED.
7. LIQUID LEVEL SIGHT GAUGE SHALL BE SHIELDED FOR EYE PROTECTION
8. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB

TIE POINTS:

- TP 23 — SCRUBBER CONNECTION 3"TB3 FLANGED.
- TP 26 — TREATED WATER SUPPLY CONNECTION 2"BB7 FLANGED.
- TP 34 — ELUATE CONNECTION 8"MB5 FLANGED.
- TP 33 — ACID SUPPLY CONNECTION 1 1/2"TB3 FLANGED.

INDUSTRIAL WASTE DISPOSAL
APPROVAL
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

OHIO ENVIRONMENTAL PROTECTION AGENCY

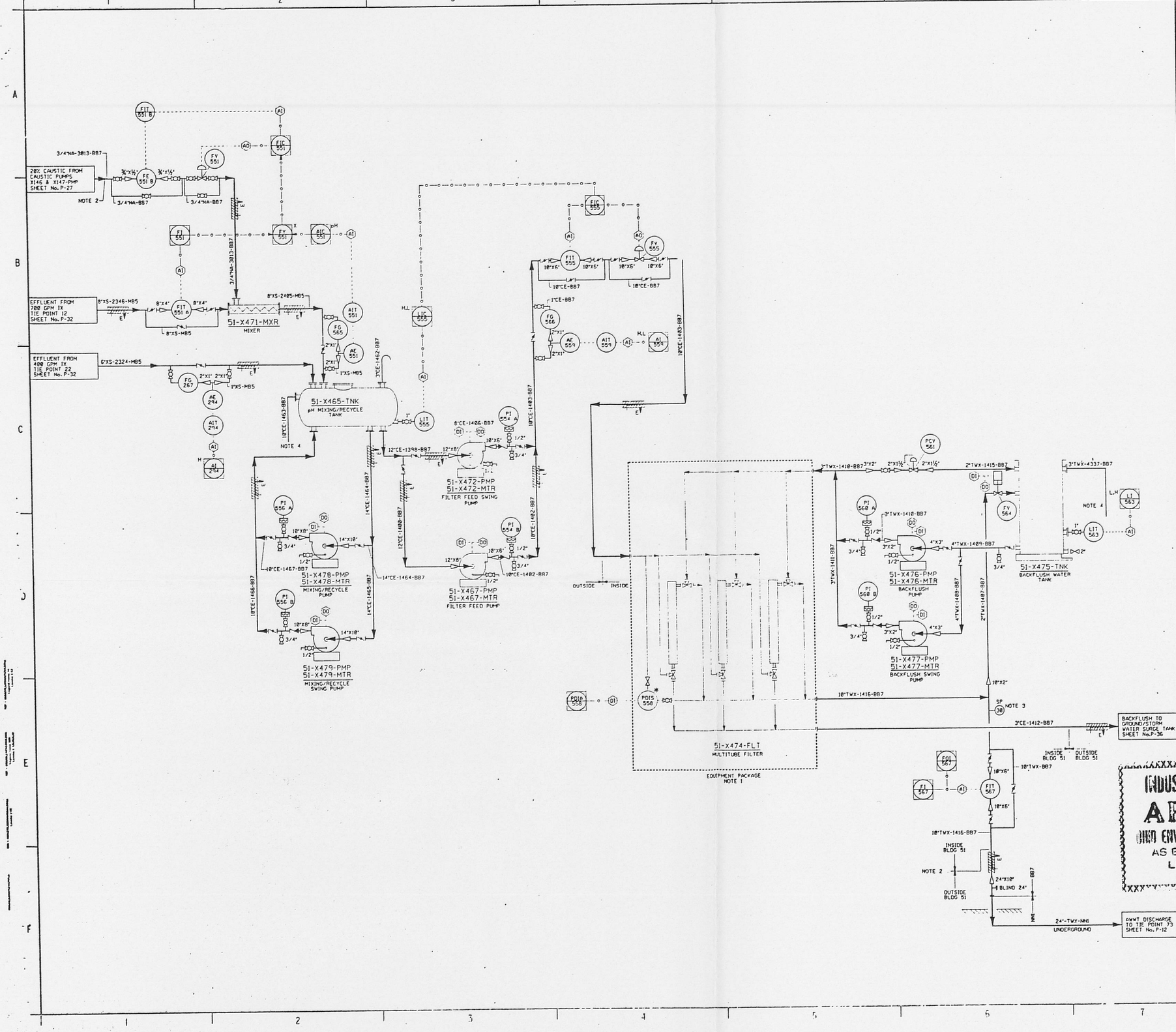
UNITED STATES
DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
FEED MATERIALS ENVIRONMENTAL MANAGEMENT PROJECT

ARCHITECT-ENGINEER: FLUOR ENGINEERS AND CONSTRUCTORS, INC.
CONSULTING ENGINEERS: MORRISON-KNUDSEN CORPORATION

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
700 GPM IX RESIN REGENERATION & RESIN HANDLING UNIT

DRAWN BY: WDB 12-88	DESIGNED BY: WDB 6-88	CHECKED BY: WDB 6-88	APPROVED BY: 6-88
PLANT ENGINEER: FEMP BLDG 51		DATE: MONE	
DIRECTOR OF ENGINEERING:	DIVISION ENGINEER:	DIVISION DIRECTOR:	
87-D-159	0087302 WBS 1.1.7.1.8.02	110-4148-P-00421	P-41 B



NOTES

1. SHOWN ARE THREE OF SIX PARALLEL TUBE FILTERS WITH MANIFOLD VALVES OPERATED MANUALLY FOR INFREQUENT BACKFLUSHING OF INDIVIDUAL TUBES, ONE AT A TIME.
2. ELECTRIC TRACE AND INSULATE WATER AND CAUSTIC LINES OUTSIDE OF BUILDING 51.
3. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OR SPEC 02902-3502 AND P&ID SHEET No. P-45.
4. EXTEND OVERFLOW LINE TO 6' ABOVE SLAB.

TO CORRELATE REFERENCED 'AMK SHEET No's 'TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-000425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL

APPROVED

UNITED STATES DEPARTMENT OF ENERGY

AS EVIDENCED BY CONCURRENCE BY A. M. KINNEY, INC. CINCINNATI, OHIO ENGINEERS LETTER OF APPROVAL

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

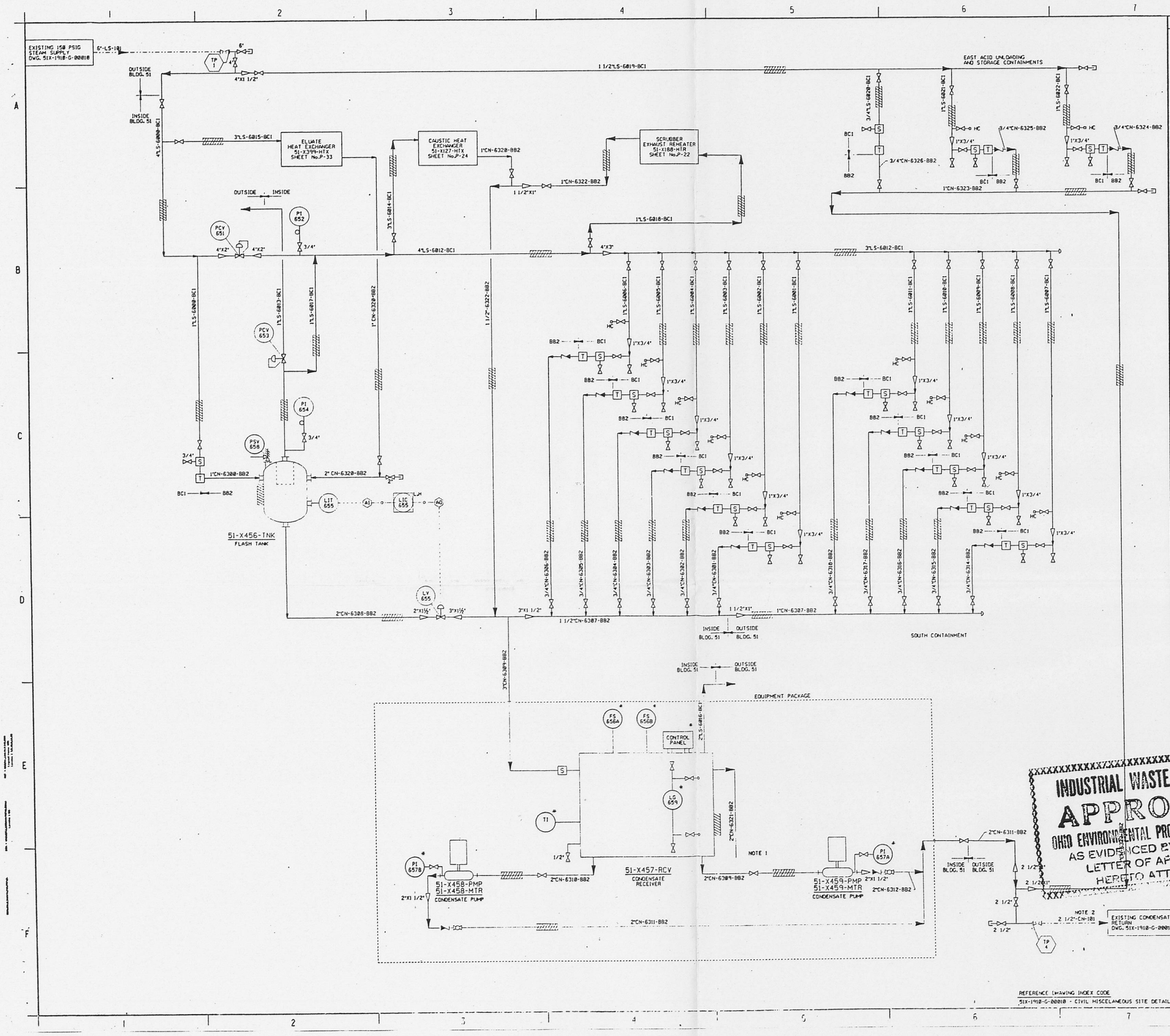
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
DISCHARGE WATER

DRAWN BY	DATE	DESIGNED BY	DATE	CHECKED BY	DATE
KDG	3-92	REA	5-92	WDB	6-92

PLANT BLDG. No.: FEMP BLDG. 51 — FLOOR — SCALE: NONE

A-E PROJECT No.	SPEC. CLASS. PA. No.	DRAWING No.	SHEET No.	REV. No.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00590	P-44	0

118



REFERENCE DRAWING INDEX CODE
51X-1910-G-00010 - CIVIL MISCELLANEOUS SITE DETAILS

NOTES

1. EXTEND OVERFLOW LINE TO 6" ABOVE SLAB.
2. FIELD VERIFY EXISTING CONDENSATE RETURN PIPING SIZE & (IF REQUIRED) ADD REDUCER. REFERENCE DRAWING 51X-1910-00010 SHOWS LINE SIZE 2", FIELD INSPECTION DATA SHOWS LINE SIZE 2 1/2".

TO CORRELATE REFERENCED "AWK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-00426.

REV	DESCRIPTION	DRAWN	CHKD	APPR	DATE
B	CFC	WOB 7-31-92	JRH 7-31-92	A-E	OPERATOR

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY
LETTER OF APPROVAL
ATTACHED
HERETO

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

MEACE SUBCONTRACT NO. K-17501 — A-E PROJECT NO. 02502

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
STEAM & CONDENSATE

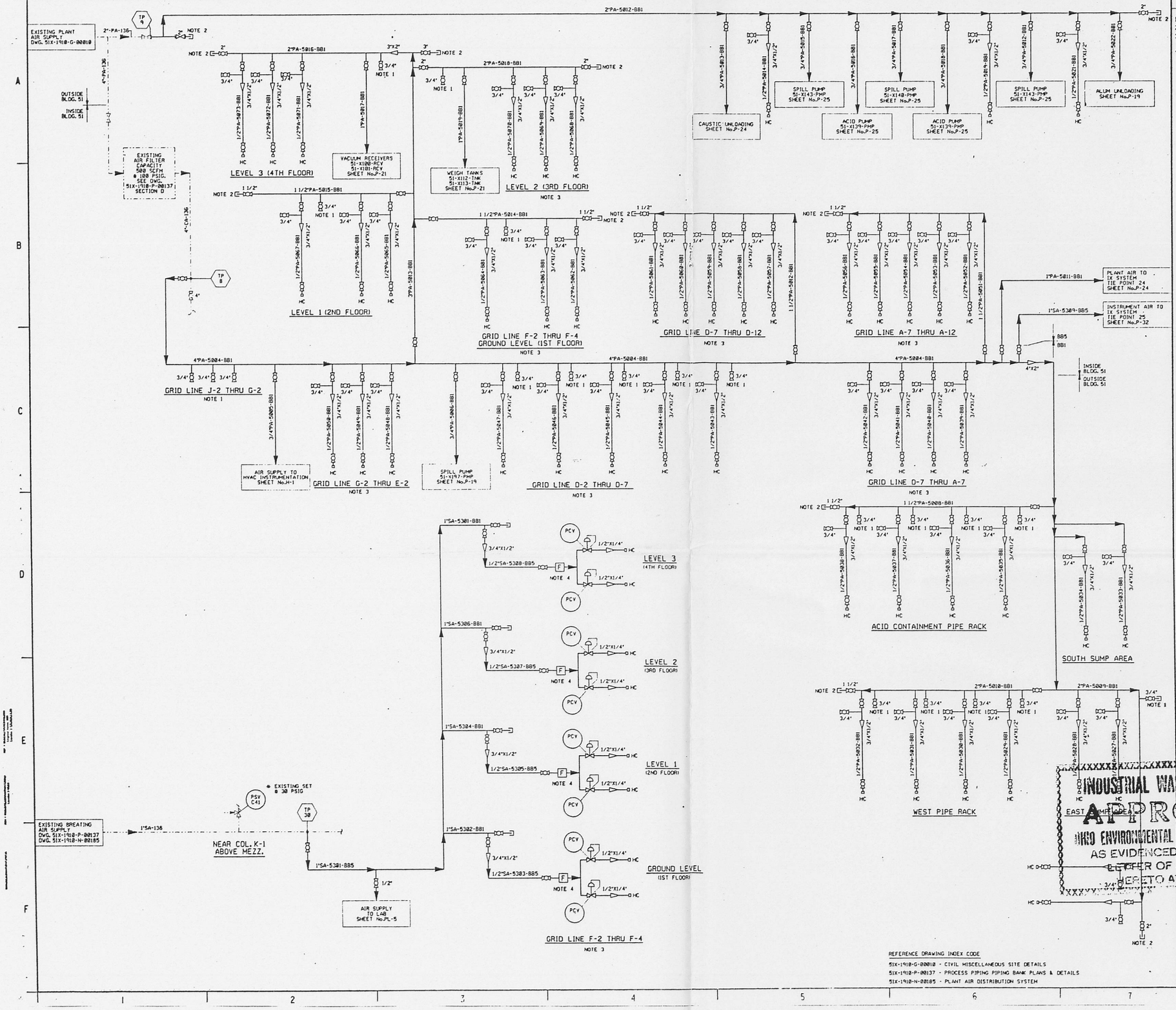
DRAWN BY	SITE	DESIGN CHECKED BY	DATE	CHECKED BY	DATE
KDG	4-92	REA	5-92	WOB	6-92

PLANT BLDG. NO.: FEMP BLDG. 51 — FLOOR — SCALE: NONE — CLASS

SUBMITTED FOR APPROVAL: FW Schroeder — DATE 7-28-92
APPROVAL RECOMMENDED: R. E. Drescher
MEACE CONTRACTOR — DATE
FEMP APPROVAL: J.R. Hughes — DATE 7-6-92

DOE PROJECT NO.	WBS/CLIN/PBS NO.	PROJ. NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00592	9-46	0

- 4131 -



NOTES

1. PROVIDE 3/4" SHUT-OFF VALVES FOR PLANT AIR BRANCHES.
2. PROVIDE VALVE END CAPS AS INDICATED.
3. APPROXIMATE GRID LINE LOCATION OF COMPRESSED AIR SUPPLY HEADERS.
4. BREATHING AIR STATION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-350Z.

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.:51D-4445-X-00425 & 51D-4445-X-00426.

	WDB 7-7-92	SAW 7-7-92	
A-E	SPONSOR	ADE	
INITIALS AND DATE			

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

DRAWING PREPARED BY
A.M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEWCS SUBCONTRACT NO. W-17207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE PIPING & INSTRUMENTATION DIAGRAM COMPRESSED AIR

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
KDG	5-92	WDR	5-92	WDB	6-92
PLANT/BLDG. NO. FEMP BLDG. 51		FLOOR		SCALE NONE	CLASS

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — FEDERAL CONTRACTING OFFICER

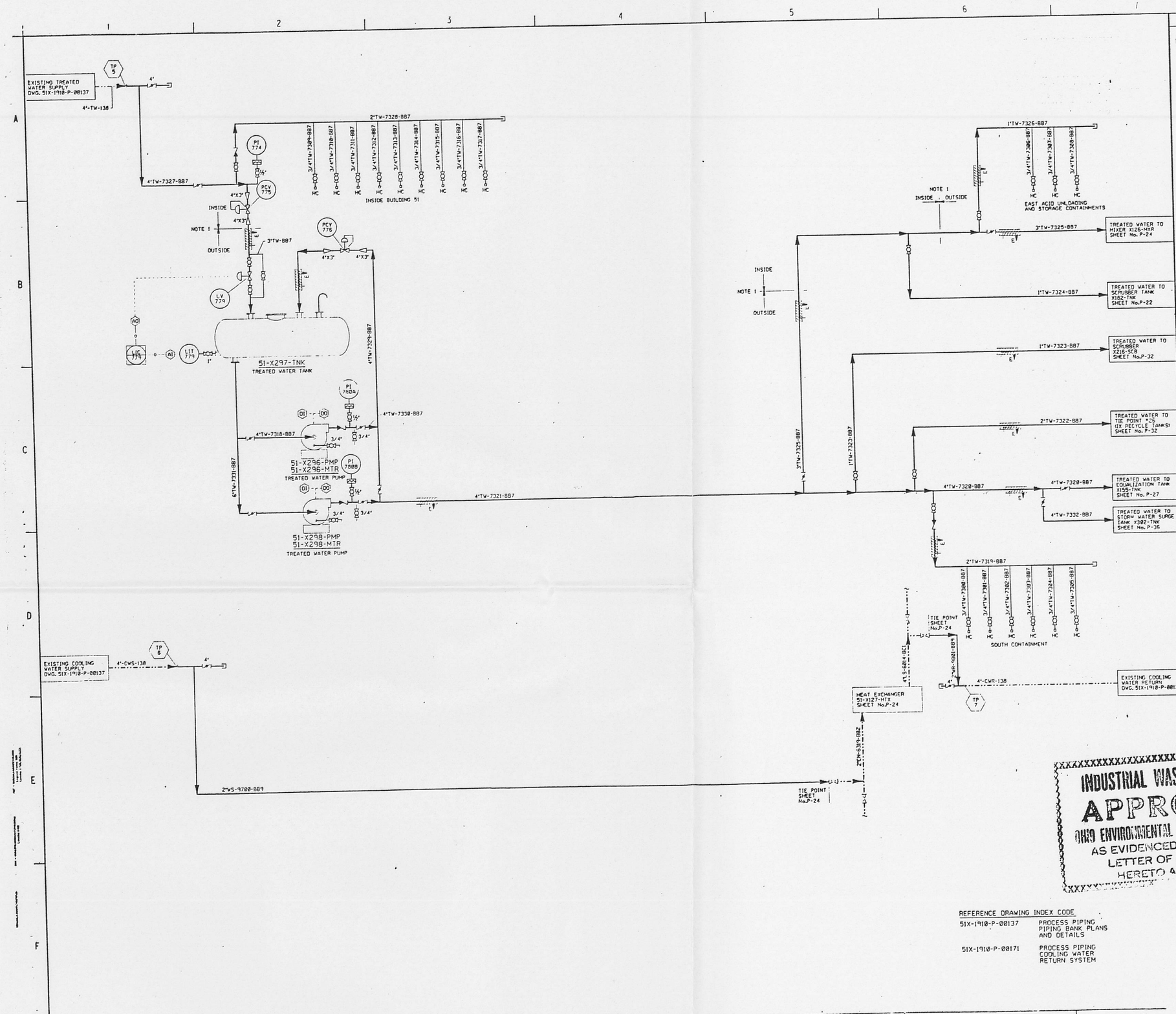
A-E PROJECT NO.	DATE	SUBCONTR. PROJ. NO.	CONTRACTOR	DATE	SPEC NO.	DATE	SHEET NO.	REV.
87-D-159		0087502 WBS 1.1.2.4.01.02			51D-4445-P-00593	7-8-92	P-47	0

REFERENCE DRAWING INDEX CODE

51X-1918-G-00010 - CIVIL MISCELLANEOUS SITE DETAILS
51X-1918-P-00137 - PROCESS PIPING PIPING BANK PLANS & DETAILS
51X-1918-N-00185 - PLANT AIR DISTRIBUTION SYSTEM

321

4131



NOTES

1. ELECTRIC HEAT TRACE AND INSULATE WATER LINES OUTSIDE OF BUILDING 51.

TO CORRELATE REFERENCED "AMK" SHEET No's TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.s 51D-4445-X-00425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY
LETTER OF APPROVAL
HERETO ATTACHED

REFERENCE DRAWING INDEX CODE

51X-1910-P-00137	PROCESS PIPING PIPING BANK PLANS AND DETAILS
51X-1910-P-00171	PROCESS PIPING COOLING WATER RETURN SYSTEM

REVISION NUMBER - DESCRIPTION	DRAWN	CHKD	APPD
A-1	WDB 7-7-92	JRH 7/8/92	

INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY A. M. KINNEY, INC. CONSULTING ENGINEERS CINCINNATI, OHIO
A-E PROJECT NO. 02902
FEMCO SUBCONTRACT NO. A-17297

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

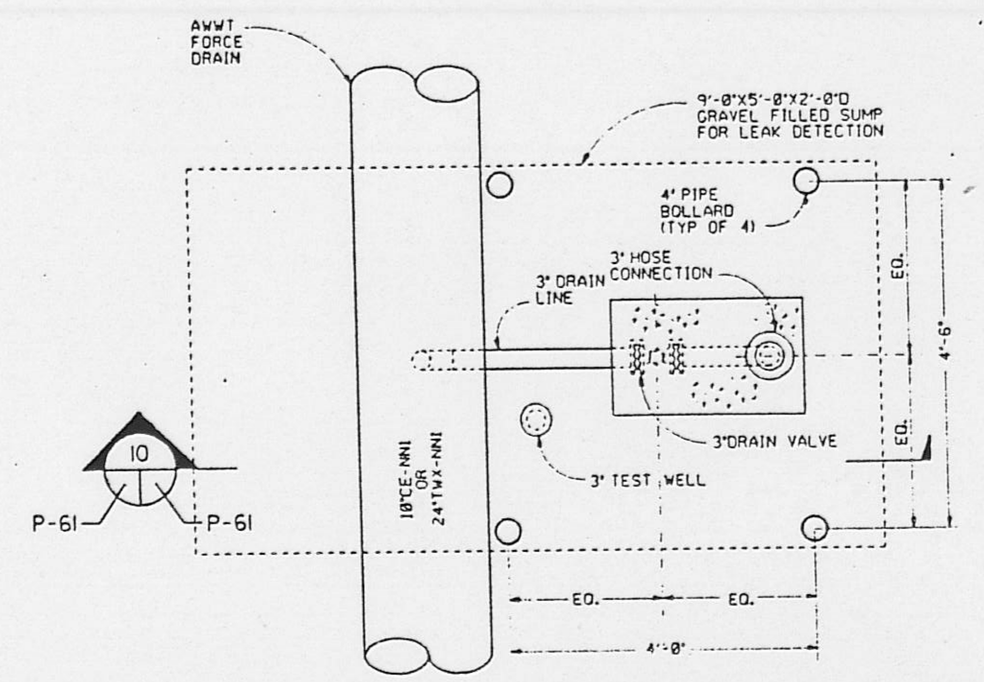
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE PIPING & INSTRUMENTATION DIAGRAM TREATED WATER AND COOLING WATER

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
KDG	3-92	WDR	5-92	WDB	6-92

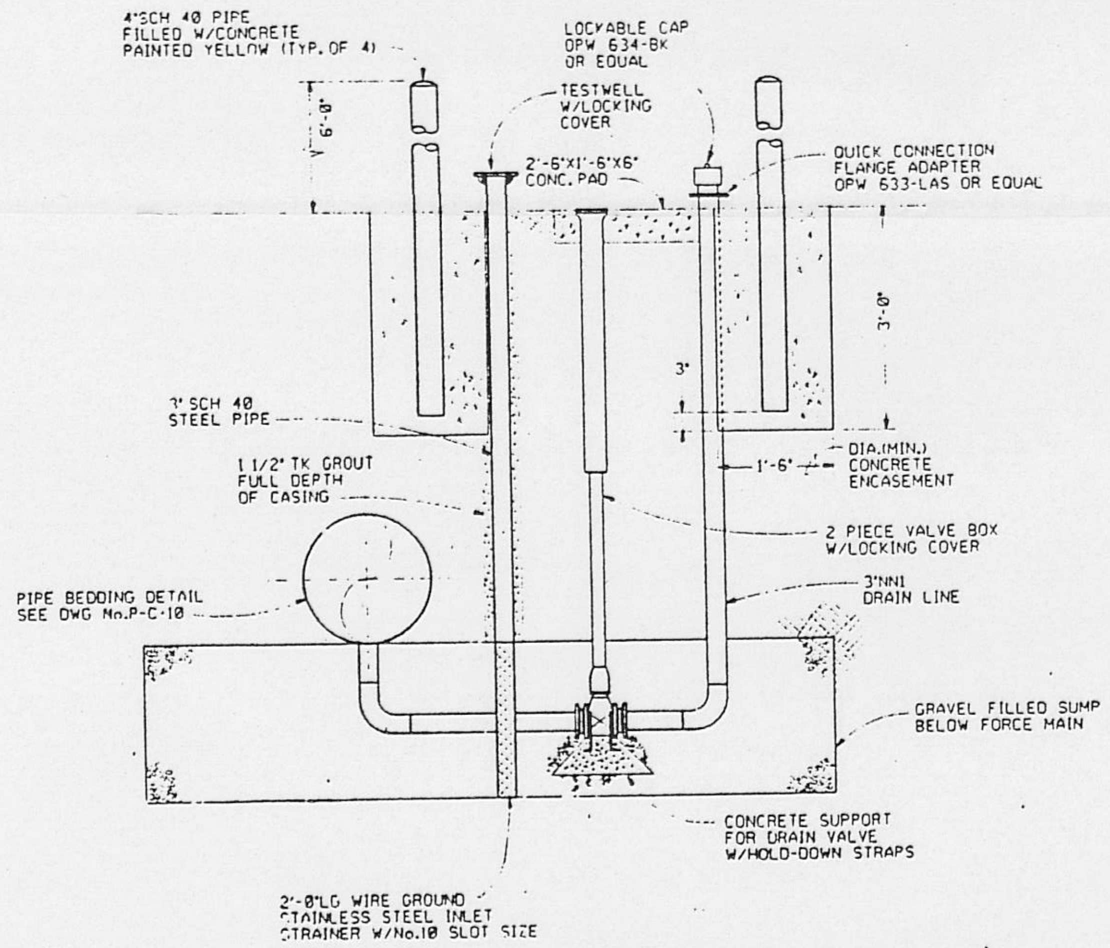
PLANT BLDG. NO.: FEMP BLDG. 51 | FLOOR | SCALE: NONE | SIZE

SUBMITTED FOR APPROVAL | APPROVAL RECOMMENDED | OPERATING CONTRACTOR | DATE | APPROVED | DATE 7-6-92

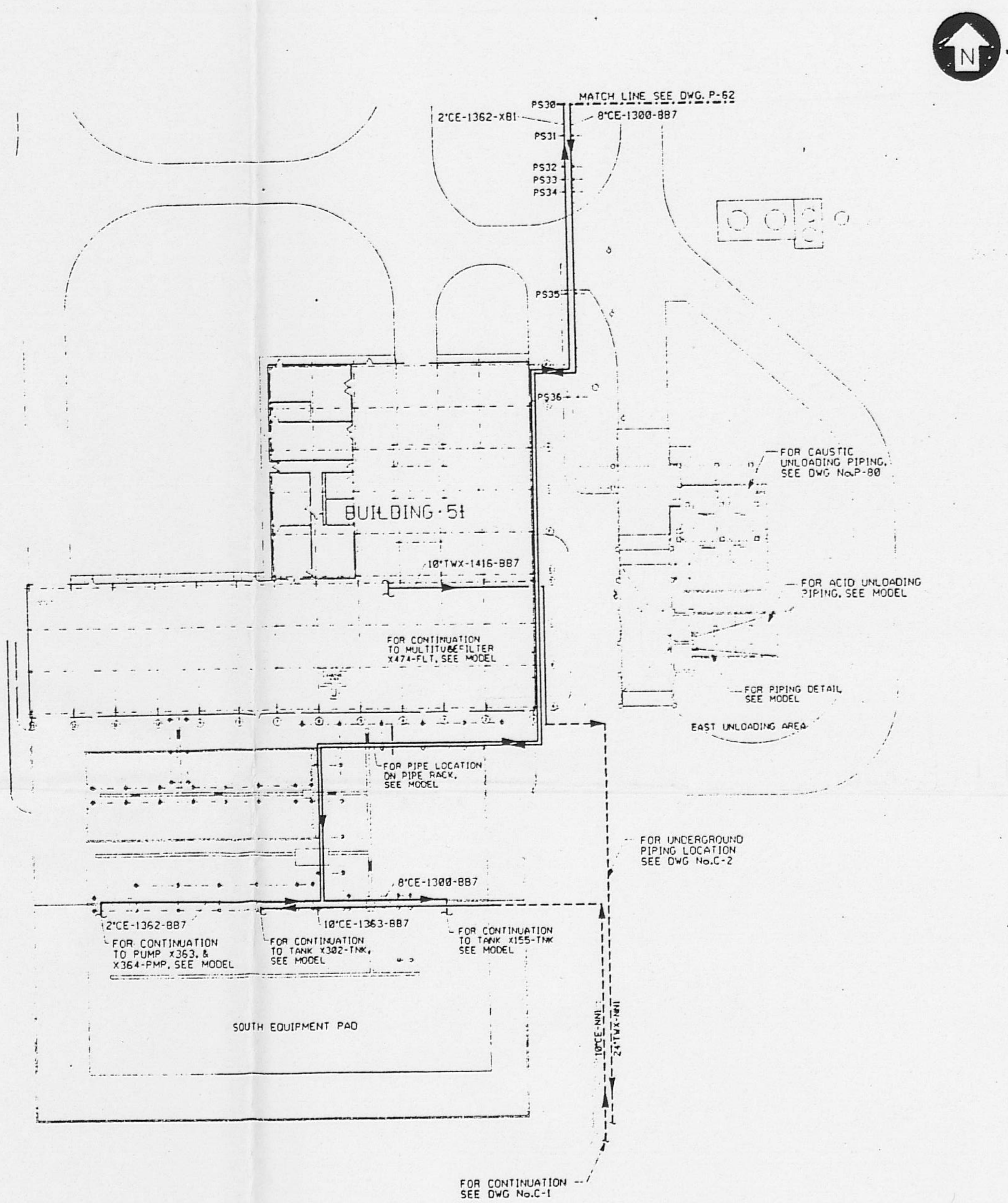
A-E PROJECT NO.	CONTRACT NO.	DRAWING NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00594	P-48 0



SECTION-LOW POINT DRAIN
SCALE: NONE
A
C-1 P-61

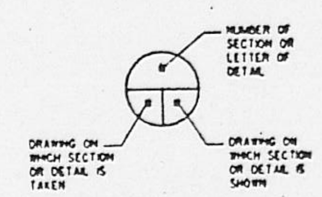


SECTION
SCALE: NONE
10
P-61 P-61



REFERENCE P&ID DRAWINGS:

P-12	SWRB & TRANSFER PUMP STATION
P-13	SSLS & GENERAL SUMP/TANKS 8,9, & 14
P-19	BULK LIQUID ALUM SYSTEM
P-24	CAUSTIC UNLOADING, STORAGE & DILUTION
P-25	ACID UNLOADING & STORAGE
P-27	400 GPM EQUALIZATION
P-35	WASTE SLURRY SURGE TANK & PUMP
P-44	DISCHARGE WATER



SECTION & DETAIL KEY

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

CFC
WDR 7-7-92 | JAH 7-16-92
A-E | OPERATOR | DOE
INITIALS AND DATE

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 | A-E PROJECT NO. 02902

PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

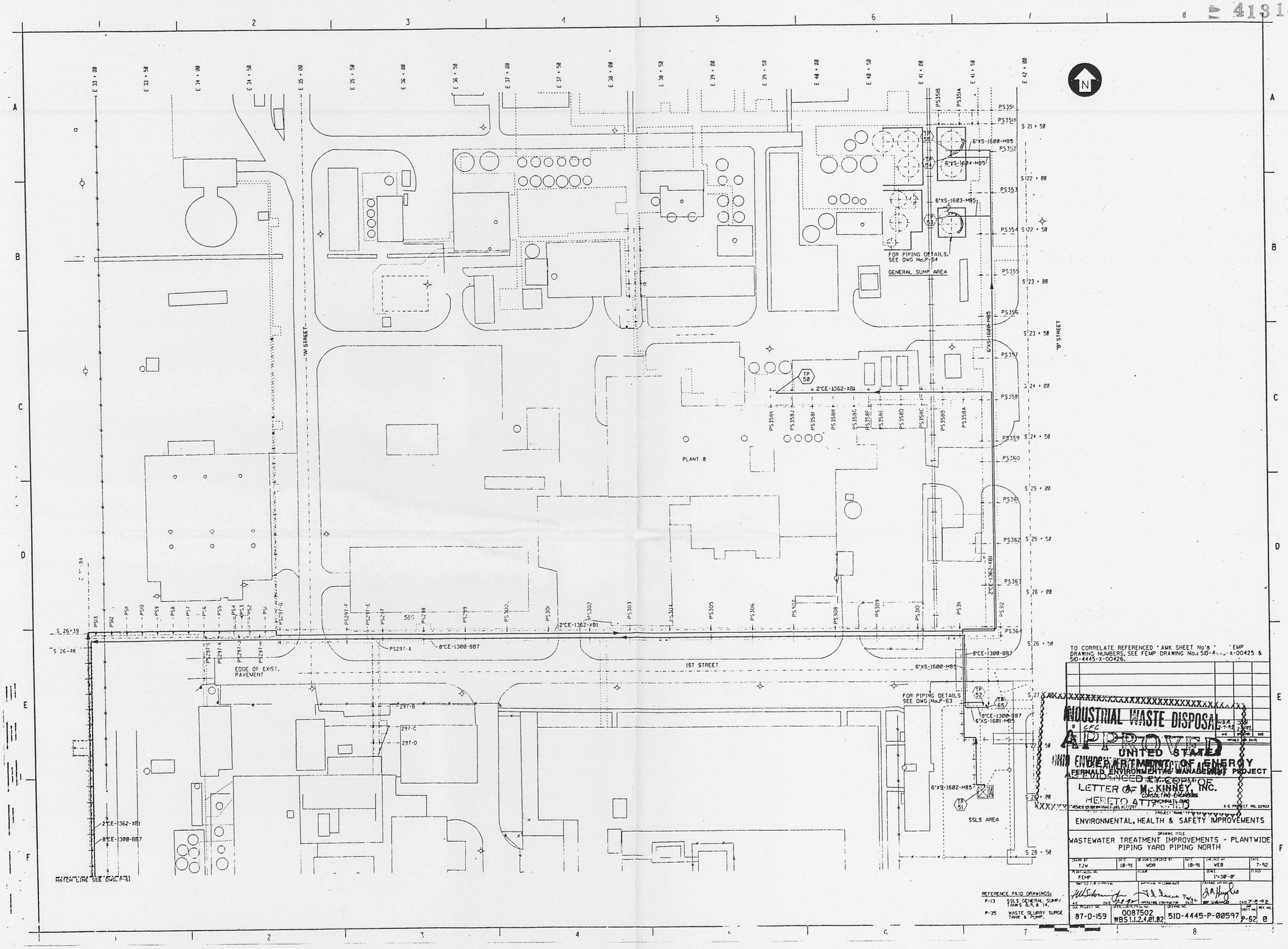
DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING YARD PIPING SOUTH

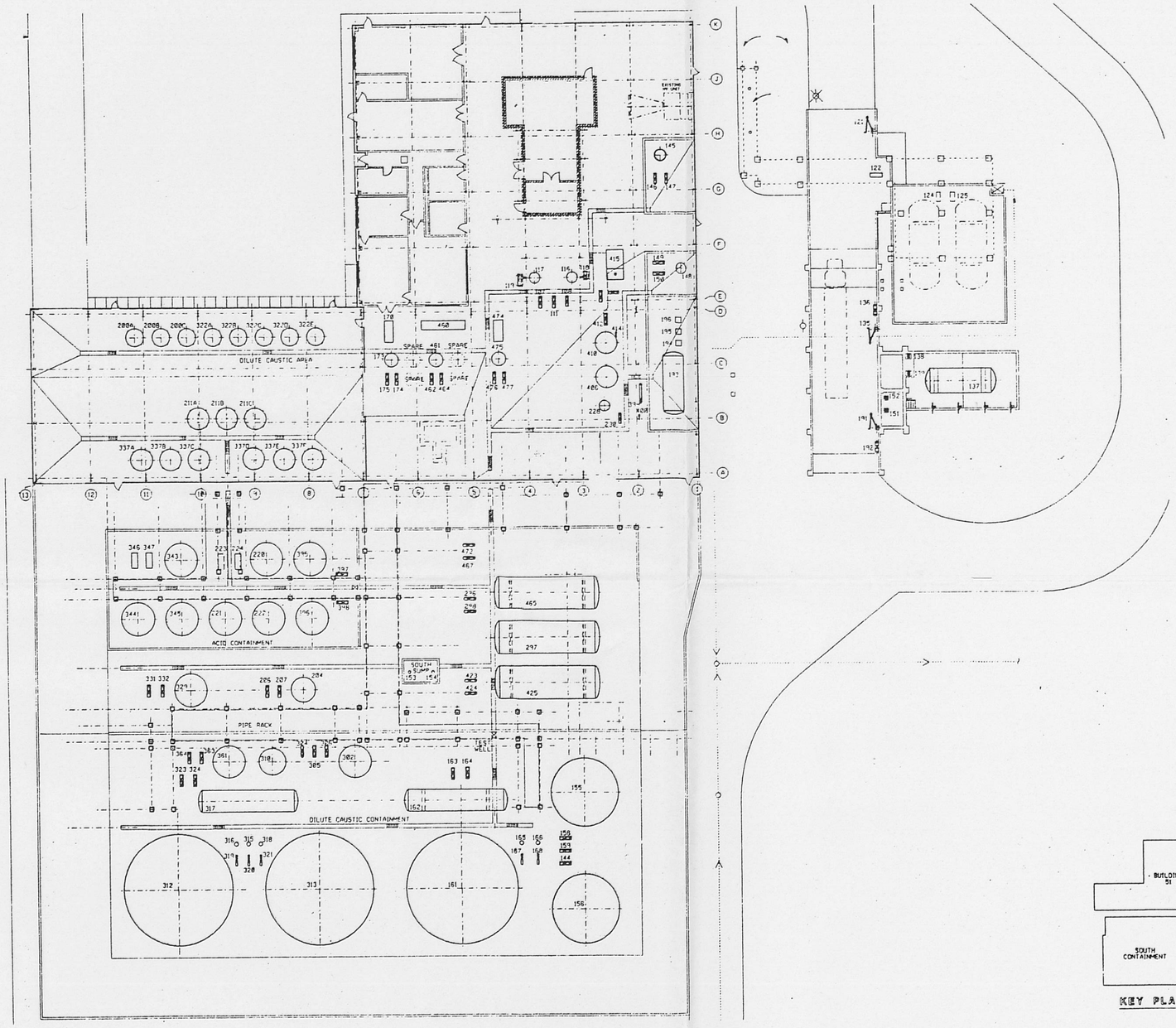
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
SDT	10-91	WDR	10-91	WEB	6-92
PLANT BLDG. NO. FEMP		FLOOR		SCALE 1"=30'-0"	CLASS

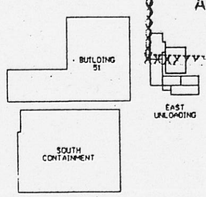
SUBMITTED FOR APPROVAL: [signature] DATE 7-8-92 | APPROVAL RECOMMENDED: [signature] OPERATING CONTRACTOR DATE | DRAWING APPROVED: [signature] DATE 7-16-92

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00596	P-61	0

4131


N
'N' STREET
'B' STREET
1ST STREET
PLANT 8
GENERAL SUMP AREA
FOR PIPING DETAILS, SEE DWG No.P-54
FOR PIPING DETAILS SEE DWG No.P-63
SSLS AREA
EDGE OF EXIST. PAVEMENT
MATCH LINE SEE DWG. P-61
2"CE-1362-XB1
8"CE-1300-BB7
6"XS-1600-MB5
6"XS-1604-MB5
6"XS-1603-MB5
6"XS-1601-MB5
6"XS-1602-MB5
TO CORRELATE REFERENCED 'AMK SHEET No's' WITH FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.
REFERENCE P&ID DRAWINGS:
P-13 SSLS GENERAL SUMP/ TANKS 8, 9, & 14.
P-35 WASTE SLURRY SURGE TANK & PUMP.
INDUSTRIAL WASTE DISPOSAL
APPROVED
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
ACCEPTANCE OF M-KINNEY, INC. CONSULTING ENGINEERS CINCINNATI, OHIO
LETTER OF ATTACHED
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING YARD PIPING NORTH
TJV
WDR
WEB
FEMP
1"=30'-0"
87-D-159
0087502
WBS 1.1.2.4.01.02
51D-4445-P-00597
P-62
0





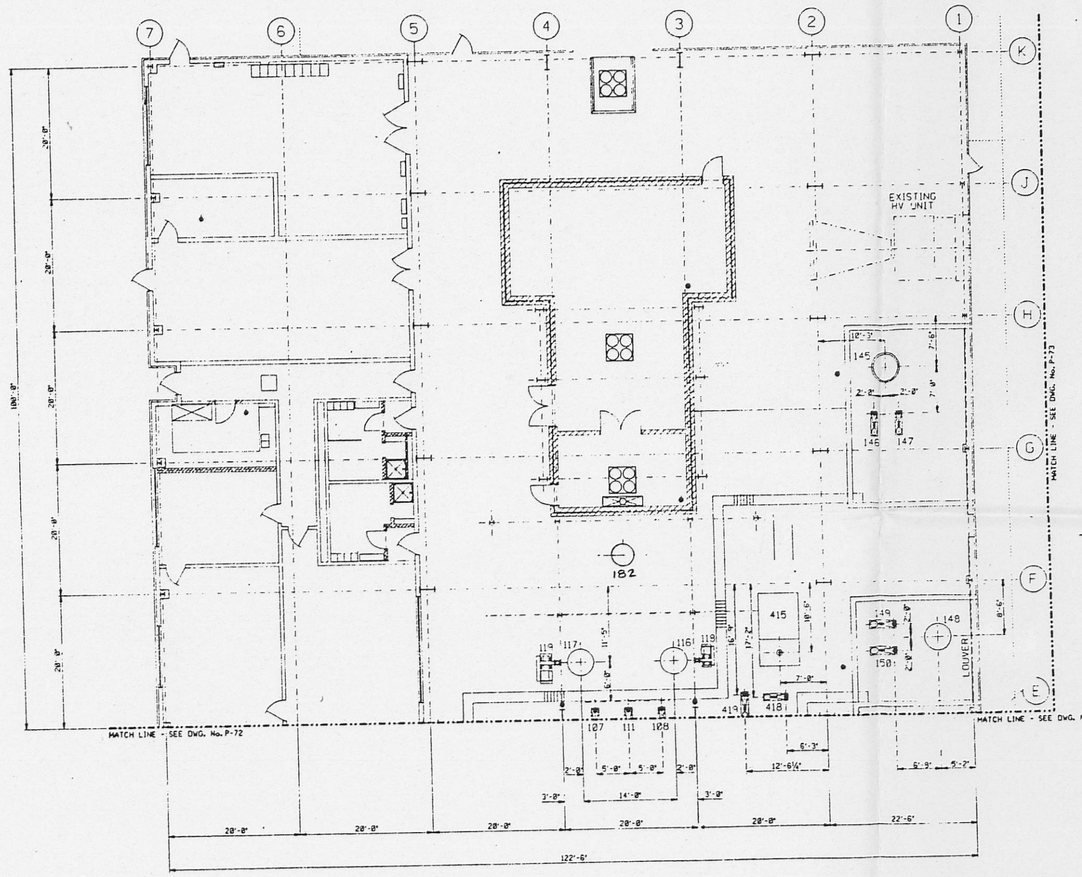
KEY PLAN

REFERENCE DRAWINGS

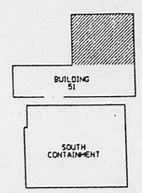
P-71	LAYOUT - BUILDING 51 NORTH
P-72	LAYOUT - BUILDING 51 SOUTH
P-73	LAYOUT - EAST UNLOADING & STORAGE
P-74	LAYOUT - OUTSIDE SOUTH
P-75	PLANS & SECTIONS - BUILDING 51 NORTH
P-76	PLANS & SECTIONS - BUILDING 51 NORTH

DRAWING NUMBERS SEE FEMP DRAWING NO. 1-45-X-00425

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
ATTACHED



BUILDING #51 NORTH
GROUND FLOOR PLAN @ ELEV. 575'-0"



KEY PLAN

REFERENCE DRAWINGS
P-78 LAYOUT - BUILDING 51

TO CORRELATE REFERENCED AMK SHEET No's TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY THE SIGNATURE OF THE
LETTER OF APPROVAL ATTACHED
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A.M. McKINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
A-E PROJECT NO. 02902

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

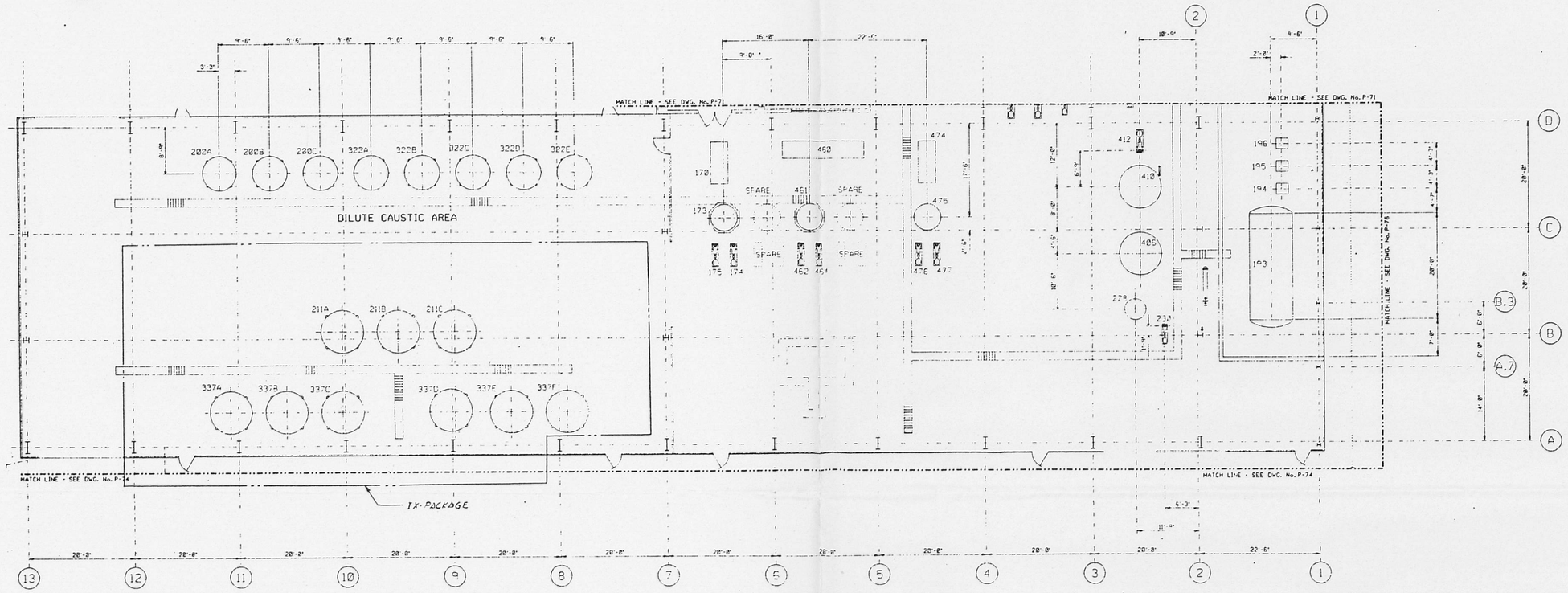
DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
BUILDING 51 NORTH

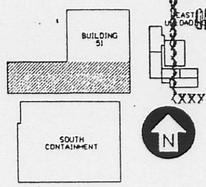
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KSS	3-92	RMS	3-92	RS	7-92

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
FEMP BLDG. 51	GROUND	1/8"=1'-0"	

LOCATION OF APPROVAL	APPROVAL RECOMMENDED	DRAWING APPROVAL
DATE 7-7-92	DATE 7/6/92	DATE 7-6-92

SUBPROJECT NO.	SPECIFICATION NO.	DRAWING NO.	SHEET NO.	REV.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00606	P-71	0





KEY PLAN

REFERENCE DRAWINGS

P-78	LAYOUT - BUILDING 51

TO CORRELATE REFERENCED 'AMK SHEET No's' TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER DATED

NO.	REVISION NUMBER - DESCRIPTION	BY	APPROVAL AND DATE

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

KEMCO SUBCONTRACT NO. H-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
BUILDING 51 SOUTH

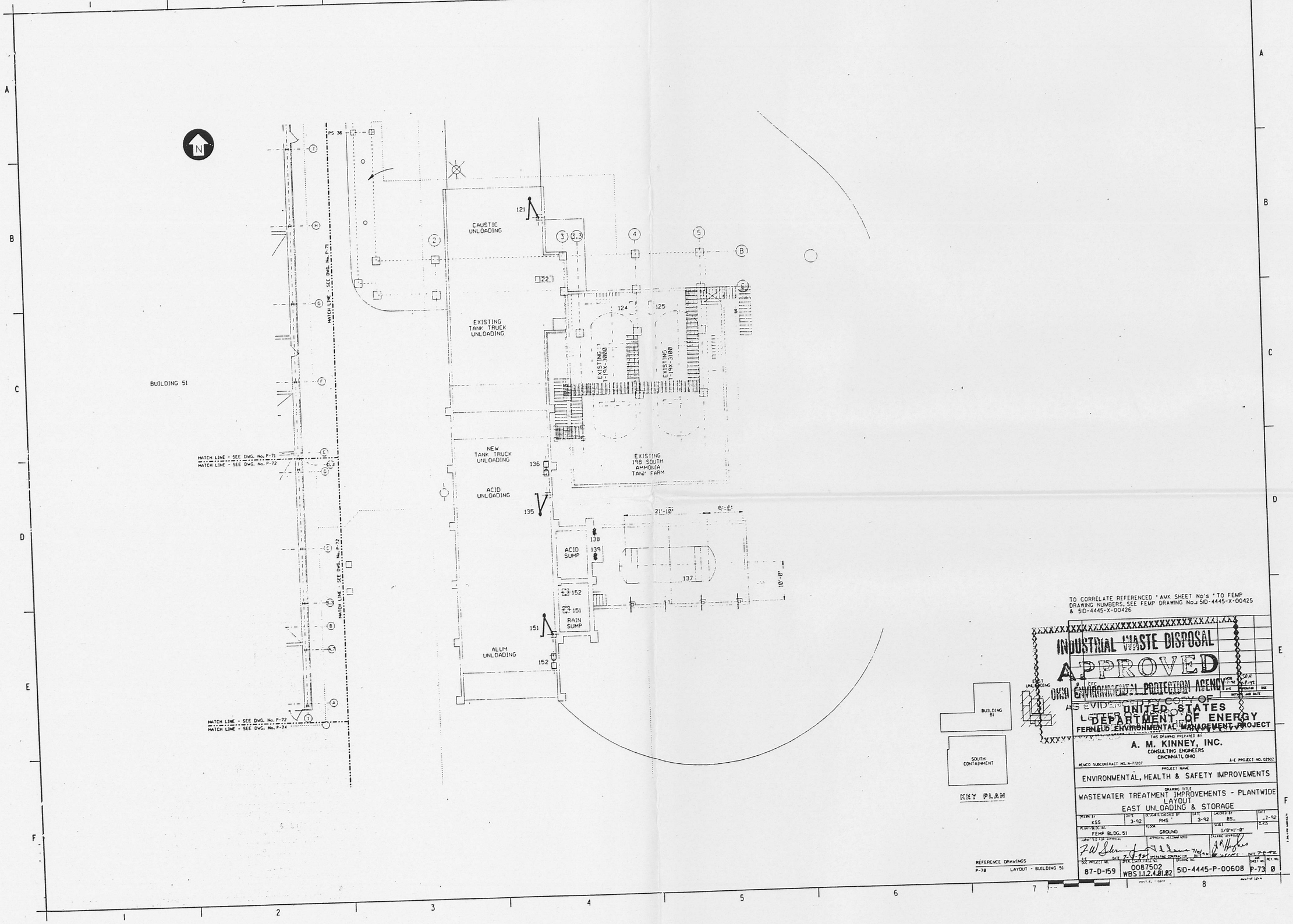
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KSS	3-92	RHS	3-92	RS	7-92

PLANTWIDE NO.	FLOOR	SCALE	CLASS
FEMP BLDG. 51	GROUND	1/8"=1'-0"	

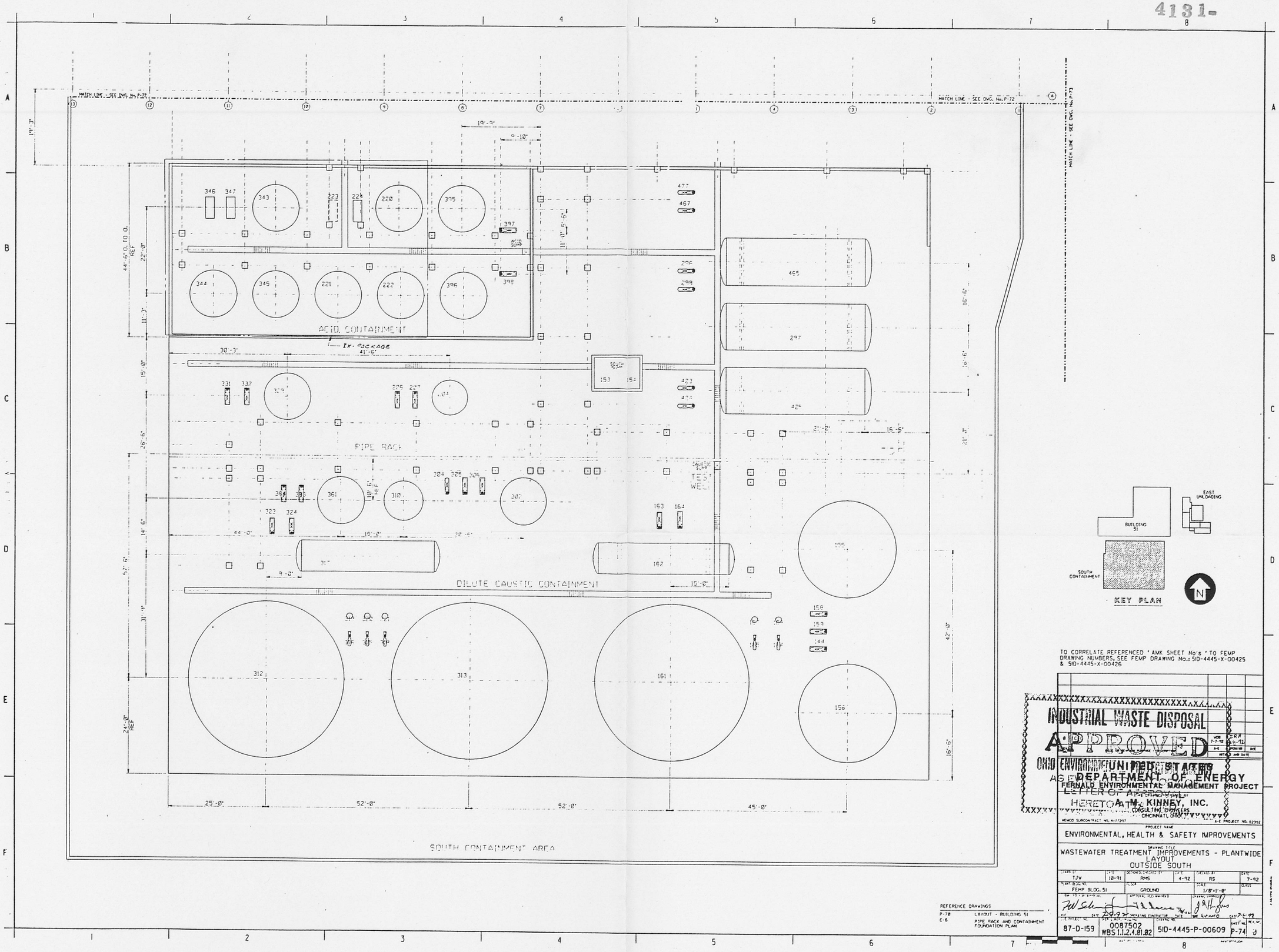
SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — DRAWING APPROVED

A-E PROJECT NO.	DATE	OPERATING CONTRACTOR	DATE	DRAWING NO.	DATE	SHEET NO.	REV. NO.
87-D-159		7-8-92	0087502 WBS 1.1.2.4.8.1.82	51D-4445-P-00607	7-8-92	P-72	0

4131


N
PS 36
MATCH LINE - SEE DWG. No. P-71
BUILDING 51
MATCH LINE - SEE DWG. No. P-71
MATCH LINE - SEE DWG. No. P-72
MATCH LINE - SEE DWG. No. P-72
MATCH LINE - SEE DWG. No. P-74
CAUSTIC UNLOADING
121
122
EXISTING TANK TRUCK UNLOADING
124
125
EXISTING 198K 3000
EXISTING 198K 3100
NEW TANK TRUCK UNLOADING
136
EXISTING 198 SOUTH AMMONIA TANK FARM
ACID UNLOADING
135
21'-10"
9'-6"
ACID SUMP
138
139
137
10'-0"
152
151
RAIN SUMP
151
ALUM UNLOADING
152
BUILDING 51
SOUTH CONTAINMENT
KEY PLAN
REFERENCE DRAWINGS
P-78 LAYOUT - BUILDING 51
TO CORRELATE REFERENCED AMK SHEET No's TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. 51D-4445-X-00425 & 51D-4445-X-00426
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
A COPY OF
LETTER DATED
AS EVIDENCE OF APPROVAL
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
FEMCO SUBCONTRACT NO. N-77207
A-E PROJECT NO. 02502
PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
LAYOUT
EAST UNLOADING & STORAGE
DRAWN BY KSS
DATE 3-92
DESIGNED BY RMS
DATE 3-92
CHECKED BY BS
DATE 7-92
PLANT/BLDG. NO. FEMP BLDG. 51
FLOOR GROUND
SCALE 1/8"=1'-0"
CLASS
SUBMITTED FOR APPROVAL
APPROVAL RECOMMENDED
DRAWING APPROVED
DATE 7-6-92
DATE 7/6/92
DATE 7-6-92
DOE PROJECT NO. 87-D-159
DOE CONTROL NO. 0087502 WBS 1.1.2.4.01.02
DRAWING NO. 51D-4445-P-00608
SHEET NO. P-73
REV. NO. 0

4131-



REFERENCE DRAWINGS

P-78	LAYOUT - BUILDING 51
C-6	PIPE RACK AND CONTAINMENT FOUNDATION PLAN

TO CORRELATE REFERENCED 'AMK SHEET No's 'TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: SID-4445-X-00425 & SID-4445-X-00426

128

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE

(WBS 1.1.2.4.01.02)

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS, PHASE IV

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT,

FERNALD, OHIO

UNITED STATES DEPARTMENT OF ENERGY

DRAWING INDEX

FEMP DRAWING No.	A.M.K. SHEET No.	REV.	DATE	TITLE
51D-4445-X-00425	X-1	0	7-7-92	COVERSHEET, 1 OF 2
51D-4445-X-00426	X-2	0	7-7-92	COVERSHEET, 2 OF 2
51D-4445-X-00660	X-3	0	7-7-92	COVERSHEET-REFERENCE DRAWINGS
51D-4445-G-00427	C-0	0	7-7-92	ABBREVIATIONS AND NOTES
51D-4445-G-00428	C-1	0	7-7-92	LOCATION PLAN
51D-4445-G-00429	C-2	0	7-7-92	BUILDING 51 SOUTH CONTAINMENT PLAN
51D-4445-G-00430	C-3	0	7-7-92	BUILDING 51 AND NORTH ACCESS PLAN
51D-4445-G-00431	C-4	0	7-7-92	SITE PLAN - OVERHEAD PIPING - 'A' ST TO 'B' ST
51D-4445-G-00432	C-5	0	7-7-92	SITE PLAN - SEWAGE TREATMENT PLANT
51D-4445-G-00433	C-6	0	7-7-92	PIPE RACK AND CONTAINMENT FOUNDATION PLAN
51D-4445-G-00434	C-7	0	7-7-92	SOUTH CONTAINMENT PIPE RACK PLAN - LOWER LEVEL
51D-4445-G-00435	C-8	0	7-7-92	SOUTH CONTAINMENT PIPE RACK PLAN - UPPER LEVEL
51D-4445-G-00436	C-9	0	7-7-92	EAST TRUCK UNLOADING FOUNDATION PLAN
51D-4445-G-00437	C-10	0	7-7-92	SITE DETAILS
51D-4445-G-00438	C-11	0	7-7-92	CONCRETE DETAILS
51D-4445-G-00439	C-12	0	7-7-92	CONCRETE DETAILS
51D-4445-G-00440	C-13	0	7-7-92	CONCRETE AND MISCELLANEOUS DETAILS
51D-4445-G-00441	C-14	0	7-7-92	TRUCK UNLOADING DETAILS
51D-4445-G-00442	C-15	0	7-7-92	PIPE RACK DETAILS
51D-4445-G-00443	C-16	0	7-7-92	PIPE RACK DETAILS
51D-4445-G-00444	C-17	0	7-7-92	STEEL DETAILS
51D-4445-S-00445	S-1	0	7-7-92	BUILDING 51 MODIFICATIONS - GROUND FLOOR
51D-4445-S-00446	S-2	0	7-7-92	BUILDING 51 PARTIAL PLANS
51D-4445-S-00447	S-3	0	7-7-92	BUILDING 51 SECTIONS & DETAILS
51D-4445-S-00448	S-4	0	7-7-92	BUILDING 51 SECTIONS & DETAILS
51D-4445-S-00449				NOT USED
51D-4445-D-00450	D-1	0	7-7-92	GROUND FLOOR DEMOLITION PLAN - BUILDING 51
51D-4445-A-00451	A-1	0	7-7-92	GROUND FLOOR PLAN - BUILDING 51
51D-4445-A-00452	A-2	0	7-7-92	NORTH AND EAST ELEVATIONS - BUILDING 51
51D-4445-A-00453	A-3	0	7-7-92	SOUTH AND WEST ELEVATIONS - BUILDING 51
51D-4445-A-00454	A-4	0	7-7-92	ENLARGED PLANS - BUILDING 51
51D-4445-A-00455	A-5	0	7-7-92	SECTIONS AND DETAILS - BUILDING 51
51D-4445-A-00456	A-6	0	7-7-92	TRUCK SHELTER AND MISCELLANEOUS DETAILS
51D-4445-E-00457	E-1	0	7-7-92	ELECTRICAL SITE PLAN
51D-4445-E-00458	E-2	0	7-7-92	SINGLE LINE DIAGRAMS MCC-1, MCC-2 MCC-4 & MAIN SERVICE
51D-4445-E-00459	E-3	0	7-7-92	SINGLE LINE DIAGRAM MCC-3
51D-4445-E-00460	E-4	0	7-7-92	SINGLE LINE DIAGRAMS MCC-5 & MCC-6
51D-4445-E-00461	E-5	0	7-7-92	BUILDING 51 - PROCESS POWER PLAN
51D-4445-E-00462	E-6	0	7-7-92	SOUTH CONTAINMENT - PROCESS POWER PLAN
51D-4445-E-00463	E-7	0	7-7-92	EAST CONTAINMENT - PROCESS POWER PLAN
51D-4445-E-00464	E-8	0	7-7-92	SOUTH CONTAINMENT - LIGHTING & GROUNDING PLAN
51D-4445-E-00465	E-9	0	7-7-92	EAST CONTAINMENT - LIGHTING & GROUNDING PLAN
51D-4445-E-00466	E-10	0	7-7-92	BUILDING 51 - HVAC POWER PLAN
51D-4445-E-00467	E-11	0	7-7-92	SWRB AND TRANSFER PUMP STATION ELECTRICAL POWER & INSTRUMENTATION PLAN
51D-4445-E-00468	E-12	0	7-7-92	STP LIFT STATION POWER & INSTRUMENTATION PLAN
51D-4445-E-00469	E-13	0	7-7-92	GENERAL SUMP INSTRUMENT WIRING PLAN
51D-4445-E-00470	E-14	0	7-7-92	COMMUNICATION, FIRE ALARM & SIGNAL PLAN
51D-4445-E-00471	E-15	0	7-7-92	COMMUNICATION, FIRE ALARM & SIGNAL RISER DIAGRAMS
51D-4445-E-00472	E-16	0	7-7-92	MCC-1, MCC-2 & MCC-4 MOTORS' PWER. & CTLS. BLOCK DIAGRAMS
51D-4445-E-00473	E-17	0	7-7-92	MCC-3 MOTORS' PWER. & CTLS. BLOCK DIAGRAMS
51D-4445-E-00474	E-18	0	7-7-92	MCC-3, PD-2 & PD-3 MOTORS' POWER & CTLS. BLOCK DIAGRAMS
51D-4445-E-00475	E-19	0	7-7-92	MCC-5 & MCC-6 MOTORS' PWER. & CTLS. BLOCK DIAGRAMS
51D-4445-E-00476	E-20	0	7-7-92	BUILDING 51 INSTRUMENTS' BLOCK DIAGRAMS
51D-4445-E-00477	E-21	0	7-7-92	EAST UNLOADING & SOUTH CONTAINMENT INSTRUMENTS' BLOCK DIAGRAMS
51D-4445-E-00478	E-22	0	7-7-92	PROCESS MOTORS' ELEMENTARY DIAGRAMS
51D-4445-E-00479	E-23	0	7-7-92	HVAC MOTORS' ELEMENTARY DIAGRAMS SHEET 1 OF 2
51D-4445-E-00480	E-24	0	7-7-92	HVAC MOTORS' ELEMENTARY DIAGRAMS SHEET 2 OF 2
51D-4445-E-00481	E-25	0	7-7-92	MISCELLANEOUS SECTIONS & DETAILS
51D-4445-E-00482	E-26	0	7-7-92	PANEL & LUMINAIRIES SCHEDULES
51D-4445-E-00483				NOT USED
51D-4445-E-00484				NOT USED
51D-4445-E-00485				NOT USED
51D-4445-F-00486	FP-1	0	7-7-92	FIRE PROTECTION LAYOUT - FIRST FLOOR PLAN
51D-4445-H-00487	H-1	0	7-7-92	HVAC FLOW & CONTROL DIAGRAM
51D-4445-H-00488	H-3	0	7-7-92	PROCESS AREA MAKE-UP AIR SYSTEM - FLOW & CONTROL DIAGRAM
51D-4445-H-00489	H-4	0	7-7-92	TRU/CLEAR AREA MAKE-UP AIR SYSTEM - FLOW & CONTROL DIAGRAM
51D-4445-H-00490	H-5	0	7-7-92	CHILLED WATER FLOW AND CONTROL DIAGRAM
51D-4445-H-00491	H-6	0	7-7-92	STEAM AND CONDENSATE FLOW DIAGRAM
51D-4445-H-00492	H-7	0	7-7-92	HVAC EQUIPMENT, DUCTWORK & PIPING LAYOUT FIRST FLOOR PLAN
51D-4445-H-00493	H-8	0	7-7-92	HVAC EQUIPMENT, DUCTWORK & PIPING LAYOUT PARTIAL FIRST FLOOR PLAN

FEMP DRAWING No.	A.M.K. SHEET No.	REV.	DATE	TITLE
51D-4445-H-00494	H-9	0	7-7-92	HVAC EQUIPMENT, DUCTWORK & PIPING LAYOUT PARTIAL FLOOR PLAN
51D-4445-H-00495	H-10	0	7-7-92	HVAC DETAILS
51D-4445-H-00496				NOT USED
51D-4445-H-00497				NOT USED
51D-4445-H-00498				NOT USED
51D-4445-H-00499				NOT USED
51D-4445-I-00500	I-1	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 1
51D-4445-I-00501	I-2	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 2
51D-4445-I-00502	I-3	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 3
51D-4445-I-00503	I-4	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 4
51D-4445-I-00504	I-5	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 5
51D-4445-I-00505	I-6	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 6
51D-4445-I-00506	I-7	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 7
51D-4445-I-00507	I-8	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 8
51D-4445-I-00508	I-9	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 9
51D-4445-I-00509	I-10	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 10
51D-4445-I-00510	I-11	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 11
51D-4445-I-00511	I-12	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 12
51D-4445-I-00512	I-13	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 13
51D-4445-I-00513	I-14	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 14
51D-4445-I-00514	I-15	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 15
51D-4445-I-00515	I-16	0	7-7-92	INSTRUMENT LOOP DIAGRAMS, SHEET 16
51D-4445-I-00516	I-17	0	7-7-92	NOT USED
51D-4445-I-00517	I-18	0	7-7-92	NOT USED
51D-4445-I-00518	I-19	0	7-7-92	NOT USED
51D-4445-I-00519	I-20	0	7-7-92	NOT USED
51D-4445-I-00520	I-21	0	7-7-92	I/O CONN. DIAGRAMS SHEET 1
51D-4445-I-00521	I-22	0	7-7-92	I/O CONN. DIAGRAMS SHEET 2
51D-4445-I-00522	I-23	0	7-7-92	I/O CONN. DIAGRAMS SHEET 3
51D-4445-I-00523	I-24	0	7-7-92	I/O CONN. DIAGRAMS SHEET 4
51D-4445-I-00524	I-25	0	7-7-92	I/O CONN. DIAGRAMS SHEET 5
51D-4445-I-00525	I-26	0	7-7-92	I/O CONN. DIAGRAMS SHEET 6
51D-4445-I-00526	I-27	0	7-7-92	I/O CONN. DIAGRAMS SHEET 7
51D-4445-I-00527	I-28	0	7-7-92	I/O CONN. DIAGRAMS SHEET 8
51D-4445-I-00528	I-29	0	7-7-92	I/O CONN. DIAGRAMS SHEET 9.
51D-4445-I-00529	I-30	0	7-7-92	I/O CONN. DIAGRAMS SHEET 10
51D-4445-I-00530	I-31	0	7-7-92	I/O CONN. DIAGRAMS SHEET 11
51D-4445-I-00531	I-32	0	7-7-92	I/O CONN. DIAGRAMS SHEET 12
51D-4445-I-00532	I-33	0	7-7-92	I/O CONN. DIAGRAMS SHEET 13
51D-4445-I-00533	I-34	0	7-7-92	I/O CONN. DIAGRAMS SHEET 14
51D-4445-I-00534	I-35	0	7-7-92	I/O CONN. DIAGRAMS SHEET 15
51D-4445-I-00535	I-36	0	7-7-92	I/O CONN. DIAGRAMS SHEET 16
51D-4445-I-00536	I-37	0	7-7-92	I/O CONN. DIAGRAMS SHEET 17
51D-4445-I-00537	I-38	0	7-7-92	I/O CONN. DIAGRAMS SHEET 18
51D-4445-I-00538	I-39	0	7-7-92	I/O CONN. DIAGRAMS SHEET 19
51D-4445-I-00539	I-40	0	7-7-92	I/O CONN. DIAGRAMS SHEET 20
51D-4445-I-00540	I-41	0	7-7-92	PWR. DIST/RELAY PNL LO-PDRP-1
51D-4445-I-00541	I-42	0	7-7-92	PDRP-1 EXT. WIRING TERM.
51D-4445-I-00542	I-43	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 11
51D-4445-I-00543	I-44	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 12
51D-4445-I-00544	I-45	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 13
51D-4445-I-00545	I-46	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 14
51D-4445-I-00546	I-47	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 15
51D-4445-I-00547	I-48	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 16
51D-4445-I-00548	I-49	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 17
51D-4445-I-00549	I-50	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 18
51D-4445-I-00550	I-51	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 19
51D-4445-I-00551	I-52	0	7-7-92	FOXBORO I/O CAB. TERM./L.O. - UCM 20
51D-4445-I-00552	I-53	0	7-7-92	INTERCONNECT CABINET TERM. - TOP
51D-4445-I-00553	I-54	0	7-7-92	INTERCONNECT CABINET TERM. - BOTTOM
51D-4445-I-00554	I-55	0	7-7-92	FIELD. TERM. BOX LO SHEET 1
51D-4445-I-00555	I-56	0	7-7-92	FIELD TERM. BOX LO SHEET 2
51D-4445-I-00556	I-57	0	7-7-92	FIELD TERM. BOX LO SHEET 3
51D-4445-I-00557	I-58	0	7-7-92	FIELD TERM. BOX LO SHEET 4
51D-4445-I-00558	I-59	0	7-7-92	I/O CONN. DIAGRAMS SHEET 21
51D-4445-I-00559	I-60	0	7-7-92	I/O CONN. DIAGRAMS SHEET 22
51D-4445-I-00560	I-61	0	7-7-92	I/O CONN. DIAGRAMS SHEET 23
51D-4445-I-00561	I-62	0	7-7-92	I/O CONN. DIAGRAMS SHEET 24
51D-4445-I-00562	I-63	0	7-7-92	CONTROL ROOM LAYOUT
51D-4445-I-00563	I-64	0	7-7-92	SSLS & GENERAL SUMP TANK, CONTROL PANEL CRGST
51D-4445-I-00564	I-65	0	7-7-92	INSTRUMENT CONTROL STATIONS
51D-4445-I-00565				NOT USED
51D-4445-I-00566				NOT USED
51D-4445-X-00567	L-2	0	7-7-92	LEGENDS & SYMBOLS
51D-4445-X-00568				NOT USED
51D-4445-X-00569				NOT USED

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

RECEIVED OHIO EPA
AUG 17 1992
SOUTHWEST DISTRICT

05-5722

PAID
Amount 5015.00 Date 8-17-92
Check # 009989 Date 7-22-92
016399

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E	OPERATOR	DOE
0	CFC	VOS 7-7-92	JKH 7-8-92	

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. H-7720T — A-E PROJECT NO. 0290

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE COVERSHEET, SHEET 1 OF 2

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KSS	5-92	FWS	6-92	RS	7-92

PLANT/BLDG NO.: FEMP BLDG. 51 — SCALE: NONE

SUBMITTED FOR APPROVAL: [signature] 7-8-92 — APPROVAL RECOMMENDED: [signature] 7/8/92 — DRAWING APPROVED: [signature] 7-8-92

SCE PROJECT NO.	OPER. CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-X-00425	X-1	0

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE

(WBS 1.1.2.4.01.02)

ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS, PHASE IV

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT,

FERNALD, OHIO

UNITED STATES DEPARTMENT OF ENERGY

DRAWING INDEX

FEMP DRAWING No.	A.M.K. SHEET No.	REV.	DATE	TITLE
51D-4445-P-00570	P-12	0	7-7-92	P & ID - SWRB & TRANSFER PUMP STATION
51D-4445-P-00571	P-13	0	7-7-92	P & ID - SSLS GENERAL SUMP/TANKS 8, 9 & 14
51D-4445-P-00572	P-14	0	7-7-92	P & ID - STP LIFT STATION
51D-4445-P-00573	P-18	0	7-7-92	PFD - ADVANCED WASTEWATER TREATMENT FACILITY
51D-4445-P-00574	P-19	0	7-7-92	P & ID - BULK LIQUID ALUM SYSTEM
51D-4445-P-00575	P-20	0	7-7-92	P & ID - DRUMMED COAGULANT HANDLING
51D-4445-P-00576	P-21	0	7-7-92	P & ID - COAGULATION ADDITIVE SYSTEM
51D-4445-P-00577	P-22	0	7-7-92	P & ID - COAGULATION DUST SCRUBBING
51D-4445-P-00578	P-24	0	7-7-92	P & ID - CAUSTIC UNLOADING, STORAGE & DILUTION
51D-4445-P-00579	P-25	0	7-7-92	P & ID - ACID UNLOADING & STORAGE
51D-4445-P-00580	P-27	0	7-7-92	P & ID - 400 GPM EQUALIZATION
51D-4445-P-00581	P-28	0	7-7-92	P & ID - 400 GPM PREFILTRATION
51D-4445-P-00582	P-30	0	7-7-92	P & ID - 400 GPM CARBON FILTERS
51D-4445-P-00583	P-32	0	7-7-92	P & ID - ION EXCHANGE TIE POINTS AND SCRUBBER
51D-4445-P-00584	P-33	0	7-7-92	P & ID - ELUATE PRECIPITATION
51D-4445-P-00585	P-34	0	7-7-92	P & ID - ELUATE SLURRY THICKENING
51D-4445-P-00586	P-35	0	7-7-92	P & ID - WASTE SLURRY SURGE TANK & PUMPS
51D-4445-P-00587	P-36	0	7-7-92	P & ID - GROUND/STORM WATER PH ADJUSTMENT
51D-4445-P-00588	P-37	0	7-7-92	P & ID - 700 GPM PREFILTRATION
51D-4445-P-00589	P-39	0	7-7-92	P & ID - 700 GPM CARBON FILTERS
51D-4445-P-00590	P-44	0	7-7-92	P & ID - DISCHARGE WATER
51D-4445-P-00591	P-45	0	7-7-92	P & ID - CENTRAL SAMPLING SYSTEM
51D-4445-P-00592	P-46	0	7-7-92	P & ID - STEAM & CONDENSATE
51D-4445-P-00593	P-47	0	7-7-92	P & ID - COMPRESSED AIR
51D-4445-P-00594	P-48	0	7-7-92	P & ID - TREATED WATER AND COOLING WATER
51D-4445-P-00595	P-60	0	7-7-92	PIPING - SWRB & TRANSFER PUMP STATION
51D-4445-P-00596	P-61	0	7-7-92	PIPING - YARD PIPING SOUTH
51D-4445-P-00597	P-62	0	7-7-92	PIPING - YARD PIPING NORTH
51D-4445-P-00598	P-63	0	7-7-92	PIPING - SSLS AREA
51D-4445-P-00599	P-64	0	7-7-92	PIPING - GENERAL SUMP
51D-4445-P-00600	P-65	0	7-7-92	PIPING - STP LIFT STATION
51D-4445-P-00601	P-66	0	7-7-92	STP LIFT STATION - PIPING PLAN
51D-4445-P-00602	P-67	0	7-7-92	STP LIFT STATIONS PIPING SECTION
51D-4445-P-00603	P-68	0	7-7-92	PIPING SECTIONS & DETAILS
51D-4445-P-00604	P-69	0	7-7-92	PIPING SECTIONS & DETAILS
51D-4445-P-00605	P-70	0	7-7-92	LAYOUT PLAN - BUILDING 51
51D-4445-P-00606	P-71	0	7-7-92	LAYOUT - BUILDING 51 NORTH
51D-4445-P-00607	P-72	0	7-7-92	LAYOUT - BUILDING 51 SOUTH
51D-4445-P-00608	P-73	0	7-7-92	LAYOUT - EAST UNLOADING & STORAGE
51D-4445-P-00609	P-74	0	7-7-92	LAYOUT - OUTSIDE SOUTH
51D-4445-P-00610	P-75	0	7-7-92	PLANS & SECTIONS - BUILDING 51 NORTH
51D-4445-P-00611	P-76	0	7-7-92	PLANS & SECTIONS - BUILDING 51 NORTH
51D-4445-P-00612	P-77	0	7-7-92	PIPING SECTIONS & DETAILS
51D-4445-P-00613	P-78	0	7-7-92	PIPING SECTIONS & DETAILS
51D-4445-P-00614	P-81	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X116-TNK & 51-X117-TNK
51D-4445-P-00615	P-82	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X109-TNK & 51-X110-TNK
51D-4445-P-00616	P-83	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X181-SCB
51D-4445-P-00617	P-84	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X182-TNK
51D-4445-P-00618	P-85	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X180-SCB
51D-4445-P-00619				NOT USED
51D-4445-P-00620	P-87	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X186-FLO
51D-4445-P-00621	P-88	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X302-TNK
51D-4445-P-00622	P-89	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X310-TNK
51D-4445-P-00623	P-90	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X361-TNK
51D-4445-P-00624	P-91	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X145-TNK
51D-4445-P-00625	P-92	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X148-TNK
51D-4445-P-00626	P-93	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X155-TNK
51D-4445-P-00627	P-94	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X156-TNK
51D-4445-P-00628				NOT USED
51D-4445-P-00629	P-96	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X162-TNK
51D-4445-P-00630	P-97	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X173-TNK
51D-4445-P-00631	P-98	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X204-TNK
51D-4445-P-00632	P-99	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X193-TNK
51D-4445-P-00633	P-100	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X228-TNK
51D-4445-P-00634	P-101	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X297-TNK
51D-4445-P-00635				NOT USED
51D-4445-P-00636	P-103	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X313-CLFR, 51-X312-CLFR, 51-X161-CLFR
51D-4445-P-00637	P-104	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X314-FLO
51D-4445-P-00638	P-105	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X317-TNK
51D-4445-P-00639	P-106	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X329-TNK
51D-4445-P-00640				NOT USED
51D-4445-P-00641	P-108	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X395-TNK & 51-X396-TNK
51D-4445-P-00642	P-109	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X406-TNK
51D-4445-P-00643	P-110	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X410-TNK
51D-4445-P-00644	P-111	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X456-TNK
51D-4445-P-00645				NOT USED
51D-4445-P-00646	P-113	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X105-PSE
51D-4445-P-00647	P-114	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X137-TNK
51D-4445-P-00648	P-115	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X425-TNK
51D-4445-P-00649				NOT USED
51D-4445-P-00650	P-117	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X170-FLT 51-X460A-FLT 51-X460B-FLT & 51-X474-FLT
51D-4445-P-00651	P-118	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATION 51-X485-TNK
51D-4445-P-00652	P-119	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X415-SEP
* 51D-4445-P-00653	P-120	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X461-TNK
* 51D-4445-P-00654	P-121	0	7-7-92	EQUIPMENT DIMENSIONS & CONFIGURATIONS 51-X475-TNK
51D-4445-P-00655				NOT USED
51D-4445-P-00656				NOT USED
51D-4445-P-00657				NOT USED
51D-4445-P-00658				NOT USED
51D-4445-P-00659				NOT USED
51D-4445-P-00660				NOT USED
51D-4445-P-00661	PL-1	0	7-7-92	DOMESTIC WATER FLOW DIAGRAM
51D-4445-P-00662	PL-2	0	7-7-92	SANITARY AND LAB WASTE FLOW DIAGRAM
51D-4445-P-00663	PL-3	0	7-7-92	PLUMBING LAYOUT PARTIAL FIRST FLOOR PLAN
51D-4445-P-00664	PL-4	0	7-7-92	EMERGENCY SHOWER FLOW DIAGRAM
51D-4445-P-00665	PL-5	0	7-7-92	LABORATORY SERVICES FLOW DIAGRAM
51D-4445-P-00666	PL-6	0	7-7-92	PLUMBING DETAILS

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
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HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

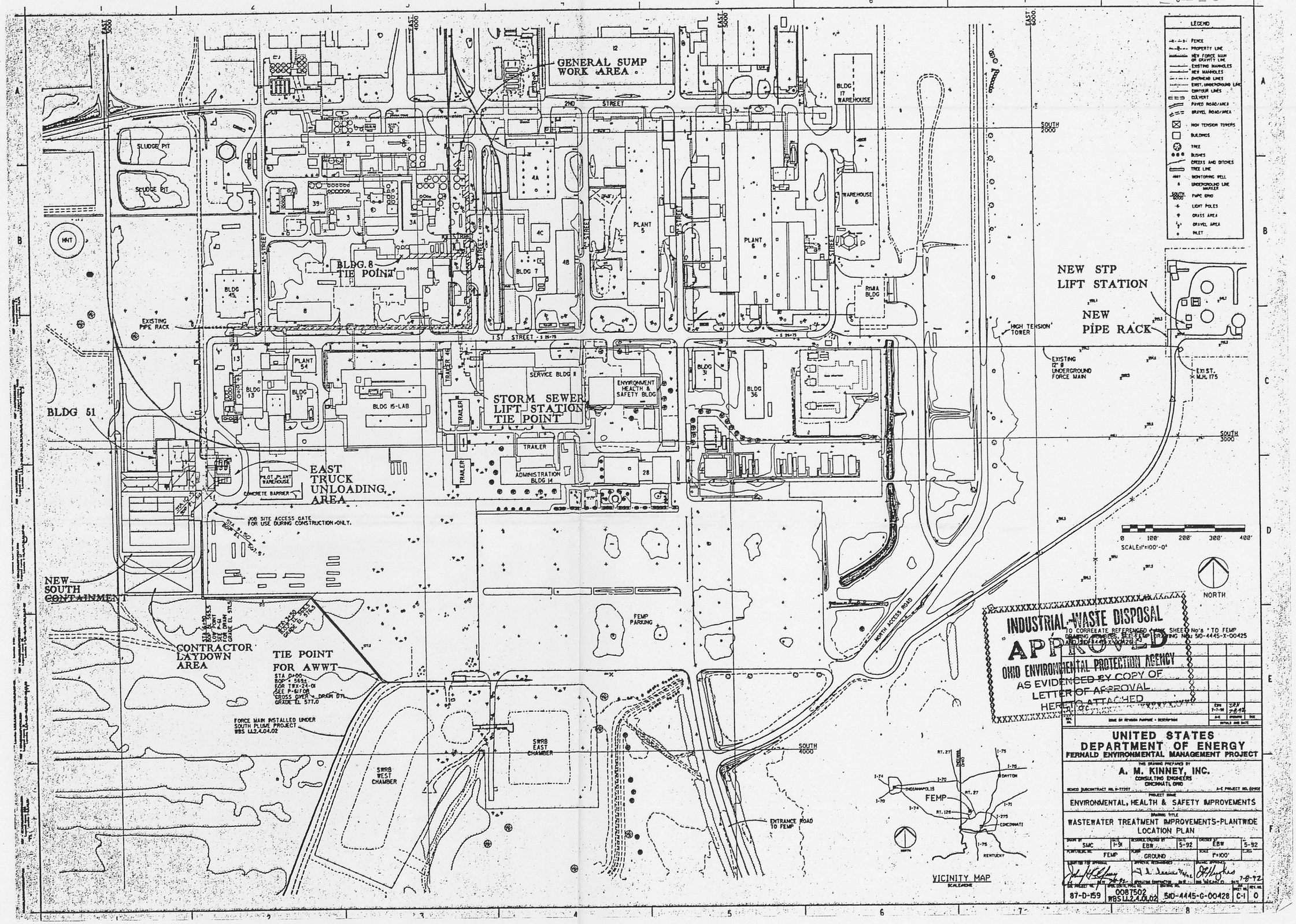
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

WASTEWATER TREATMENT IMPROVEMENTS - PLANT IDS
COVERSHEET, SHEET 1 OF

FEMP BLDG. 51

87-D-159 | 0087502 WBS 1.1.2.4.01.02 | 51D-4445-P-00426 X2 | 0

089


GENERAL SUMP WORK AREA
SLUDGE PIT
SLUDGE PIT
BLDG. 8 TIE POINT
EXISTING PIPE RACK
BLDG 51
EAST TRUCK UNLOADING AREA
PILOT PLANT WAREHOUSE
CONCRETE BARRIER
JOB SITE ACCESS GATE FOR USE DURING CONSTRUCTION ONLY.
NEW SOUTH CONTAINMENT
CONTRACTOR LAYDOWN AREA
TIE POINT FOR AWWT
STA 0+00
ROP = 569±
FOR TWX-24-01
SEE P-617 OR
CROSS OVER + DRAIN DTL
GRADE EL 577.0
FORCE MAIN INSTALLED UNDER SOUTH PLUME PROJECT WBS 1.1.2.4.04.02
SWRB WEST CHAMBER
SWRB EAST CHAMBER
FEMP PARKING
NORTH ACCESS ROAD
ENTRANCE ROAD TO FEMP
STORM SEWER LIFT STATION TIE POINT
SERVICE BLDG 11
ENVIRONMENT HEALTH & SAFETY BLDG
ADMINISTRATION BLDG 14
BLDG 15-LAB
TRAILER
PLANT 5
PLANT 6
WAREHOUSE 6
BLDG 17 WAREHOUSE
RMWA BLDG
HIGH TENSION TOWER
EXISTING 12" Ø UNDERGROUND FORCE MAIN
NEW STP LIFT STATION
NEW PIPE RACK
EXIST. MH 175
SOUTH 2000
SOUTH 3000
SOUTH 4000
EAST 3000
EAST 4000
EAST 5000
EAST 6000
1ST STREET
2ND STREET
A STREET
B STREET
N STREET
P STREET
LEGEND
FENCE
PROPERTY LINE
NEW FORCE MAIN OR GRAVITY LINE
EXISTING MANHOLES
NEW MANHOLES
OVERHEAD LINES
EXIST. UNDERGROUND LINE
CONTOUR LINES
CULVERT
PAVED ROAD/AREA
GRAVEL ROAD/AREA
HIGH TENSION TOWERS
BUILDINGS
TREE
BUSHES
CREEKS AND DITCHES
TREE LINE
MONITORING WELL
UNDERGROUND LINE MARKER
PIPE BRID
LIGHT POLES
GRASS AREA
GRAVEL AREA
INLET
0 100' 200' 300' 400'
SCALE: 1"=100'-0"
NORTH
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A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
LOCATION PLAN
SMC
1-91
EBW
5-92
EBW
5-92
FEMP
GROUND
1"=100'
87-D-159
0087502
WBS 1.1.2.4.04.02
5-D-4445-G-00428
C-1
0
VICINITY MAP
FEMP
INDIANAPOLIS
DAYTON
CINCINNATI
KENTUCKY
RT. 27
RT. 126
I-70
I-74
I-75
I-71
I-275

EXISTING BUILDING 51

SEE SHEET C-3 FOR CONTINUATION

ACID AREA

NEUTRAL AREA

CAUSTIC AREA

SEE DWG. C-6 FOR MAT PLAN

ADD AGGREGATE TOPPING BETWEEN PAVED AREAS

SITE TRENCH, SEE SEC 10/C10

REMOVE CULVERT AND FILL GULLEY PER NEW CONTOUR LINES.

REMOVE EXISTING FENCE AS SHOWN AFTER INSTALLING NEW FENCE

NEW FENCE TO MATCH EXIST. 8' HIGH CHAIN LINK FENCE WITH BARBED WIRE TOP.

DIRT PILE TO BE LEVELED OUT PER NEW CONTOUR LINES

NEW TRUCK UNLOADING AREA SEE DWG. C-9

EXISTING GRAVEL PARKING LOT

EXISTING TRAILERS (TYPICAL)

SEE DWG. P-61 & C-1 FOR CONTINUATION OF LINES AND TIE POINT LOCATION N.W. OF SWRB

CATCH BASIN UNDER STORM SEWER IMPROVEMENTS PROJECT.

CATCH BASIN RIM EL 572 UNDER STORM SEWER IMPROVEMENTS PROJECT. WBS 1.1.2.4.03 MUST BE IN PLACE PRIOR TO REGRADING SOUTH OF BLDG. 51 SEE DRAWING 22-4445-C-00737

LEGEND

- EXIST. FENCE
- NEW FENCE
- EXISTING FENCE TO BE REMOVED
- EXIST. CONTOUR LINES
- NEW CONTOUR LINES
- OVERHEAD LINES
- EXIST. UNDERGROUND LINE
- NEW UNDERGROUND LINE
- CULVERT
- PAVED ROAD/AREA
- GRAVEL ROAD/AREA
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- SOUTH 6000 FEMP GRID
- LIGHT POLES
- x 575 EXISTING GRADE EL.
- x [575] NEW GRADE ELEVATION OR PROPOSED T/ CONC. EL
- 571'-6" BOT. TRENCH ELEV.
- ORIGINAL PIV/HFH LOCATION
- NEW PIV/HFH LOCATION

DRAWING NOTES

1. C.J. DENOTES CONTROL JOINT OR CONSTRUCTION JOINT. E.J. DENOTES EXPANSION JOINT SEE DET 33/C12.
2. LINE UP CURB WITH EDGE OF BUILDING FOUNDATION
3. ADD 2-#4 X 5'-0" LONG AT EA. CORNER OF PIPE RACK PIER. (7 REQUIRED SEE SHEET C6)
4. PLUG EAST SIDE OF MH 79 AND RAISE FROM T/MH EL 574.2 TO T/MH EL. 575.2. SEE DTL 9/C10.
5. PROVIDE TIE INTO MH 78 FOR NEW LINE FROM THE SOUTH
6. EXTEND CLEAN OUT TO TOP OF NEW CONCRETE AND ADD REMOVEABLE COVERS FLUSH WITH TOP OF CONCRETE.
7. REMOVE EXISTING LITE POLE.
8. EXIST ELECTRIC UNDERGROUND CONDUIT & CABLE RUNS TO EXTERIOR ELECTRIC BOX AT BLDG 51 COL LINE 2+ NOT SHOWN.
9. EXIST ELECTRIC TRENCH FOR POLES RUNS EAST AT 532+15+ AND NORTH AT E29+85+ NOT SHOWN.
10. SEE SECTION 13/C10 FOR UNDERDRAIN DETAIL.
11. REMOVE PORTION OF FENCE ACROSS NEW PAVING AS REQUIRED TO ADD NEW 80' SLIDE GATE.
12. SEE SPEC. 02140 FOR SOIL EROSION AND SEDIMENTATION CONTROL.
13. NEW BOLLARDS SEE SECTION 8/C10.
14. SQUARE OFF ENDS OF TRENCH NEW PIPE TO PENETRATE WALL FLUSH W/ INSIDE FACE OF TRENCH PIPE I.E. TO BE FLUSH W/ B/ TRENCH

REFERENCE DRAWINGS

22G-5500-P-00685 AND 00687 FOR U.G. LINES

22X-5500-X-00377 MH. ELEVATIONS

22X-5500-X-00379 CATCH BASIN ELEVATIONS

NORTH

0 10 20 40 60 80 100

SCALE 1/16"=1'-0"

TO CORRELATE REFERENCED AMK SHEET No's TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. 51D-4445-X-00425

INDUSTRIAL WASTE DISPOSAL APPROVED OHIO ENVIRONMENTAL PROTECTION AGENCY AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

EPW 7-7-92	JEI 7-8-92		
A-E	DESIGNER	DATE	
DETAILS AND DATE			

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

SENCO SUBCONTRACT NO. 8-77287 — A-E PROJECT NO. 02908

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

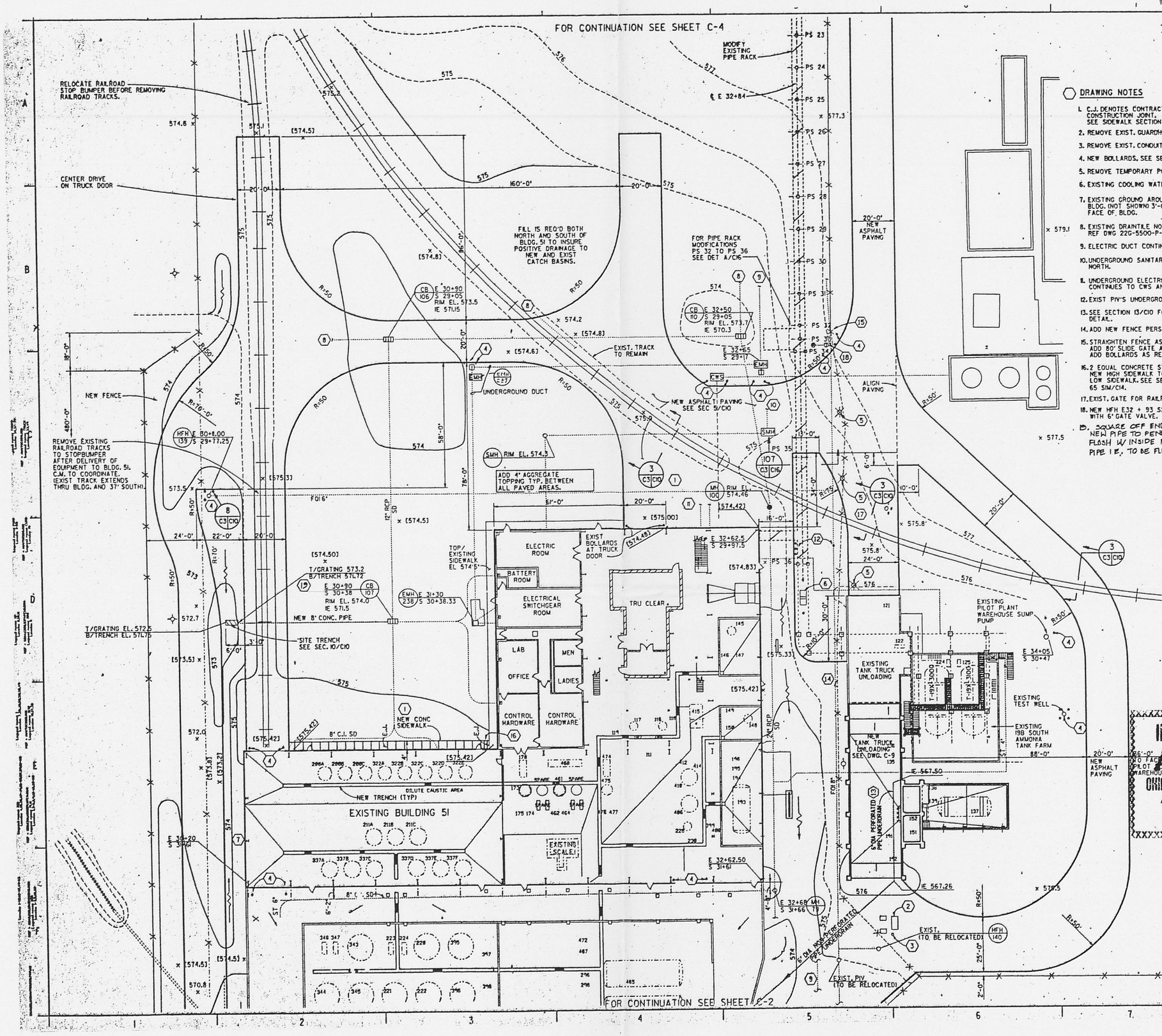
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE BUILDING 51 SOUTH CONTAINMENT PLAN

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
EVR	10-91	EBW	10-91	LMP	6-92
PLANT/BLDG. NO. FEMP		FLOOR GROUND		SCALE 1/16"=1'-0"	

SUBMITTED FOR APPROVAL — APPROVED/ACCEPTED — DRAWING APPROVED

PROJECT NO.	WBS CONTR. PKG. NO.	DRAWING NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.0.02	51D-4445-G-00429	C-2 0

SECTION & DETAIL KEY



DRAWING NOTES

1. C.J. DENOTES CONTRACTION OR CONSTRUCTION JOINT. SEE SIDEWALK SECTION 14 ON DWG. C-10.
2. REMOVE EXIST. GUARDHOUSE #1 FOUNDATIONS.
3. REMOVE EXIST. CONDUITS AND JUNCTION BOXES.
4. NEW BOLLARDS. SEE SECTION 8/C10.
5. REMOVE TEMPORARY POWER POLES.
6. EXISTING COOLING WATER SUMP.
7. EXISTING GROUND AROUND ENTIRE BLDG. (NOT SHOWN) 3'-0" OFF FACE OF BLDG.
8. EXISTING DRAINTILE NOT SHOWN REF DWG 22G-5500-P-00685
9. ELECTRIC DUCT CONTINUES NORTH.
10. UNDERGROUND SANITARY LINE CONTINUES NORTH.
11. UNDERGROUND ELECTRIC (NOT SHOWN) CONTINUES TO CWS AND SMH.
12. EXIST PIV'S UNDERGROUND NOT SHOWN.
13. SEE SECTION 13/C10 FOR UNDERDRAIN DETAIL.
14. ADD NEW FENCE PERSONEL GATE.
15. STRAIGHTEN FENCE AS REQ'D. TO ADD 80' SLIDE GATE ACROSS PAVING ADD BOLLARDS AS REQ'D TO PROTECT GATE.
16. 2 EQUAL CONCRETE STEPS TO CONNECT NEW HIGH SIDEWALK TO EXISTING LOW SIDEWALK. SEE SECTION 6S SIM/C14.
17. EXIST. GATE FOR RAILROAD TO REMAIN.
18. NEW HFH E32 + 93 S29 + 12 WITH 6" GATE VALVE.
19. SQUARE OFF ENDS OF TRENCH NEW PIPE TO PENETRATE WALL FLUSH W/ INSIDE FACE OF TRENCH PIPE I.E. TO BE FLUSH W/ B/TRENCH

LEGEND

- NEW FENCE
- FENCE
- EXISTING FENCE TO BE REMOVED
- NEW FORCE MAIN OR GRAVITY LINE
- EXIST. CONTOUR LINES
- NEW CONTOUR LINES
- OVERHEAD LINES
- EXIST. UNDERGROUND LINE
- NEW UNDERGROUND LINE
- CULVERT
- PAVED ROAD/AREA
- GRAVEL ROAD/AREA
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- MONITORING WELL
- UNDERGROUND LINE MARKER
- FEMP GRID
- LIGHT POLES
- EXISTING GRADE EL.
- NEW GRADE ELEVATION
- BOT. TRENCH ELEV.
- ORIGINAL PIV/HFH LOCATION
- NEW PIV/HFH LOCATION
- ORIGINAL POLE LOCATION

REFERENCE DRAWINGS

22G-5500-P-00685 FOR U.G. LINES

22X-5500-X-00377 M.H. ELEVATIONS

22X-5500-X-00379 CATCH BASIN ELEVATIONS

NORTH

SCALE 1/16"=1'-0"

SECTION & DETAIL KEY

TO CORRELATE REFERENCED AMK SHEET No's TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No. 51D-4445-X-00425

INDUSTRIAL WASTE DISPOSAL APPROVED OHIO ENVIRONMENTAL PROTECTION AGENCY AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THE DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMPCO SUBCONTRACT NO. B-17207 — A-E PROJECT NO. 92102

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE BUILDING 51 AND NORTH ACCESS PLAN

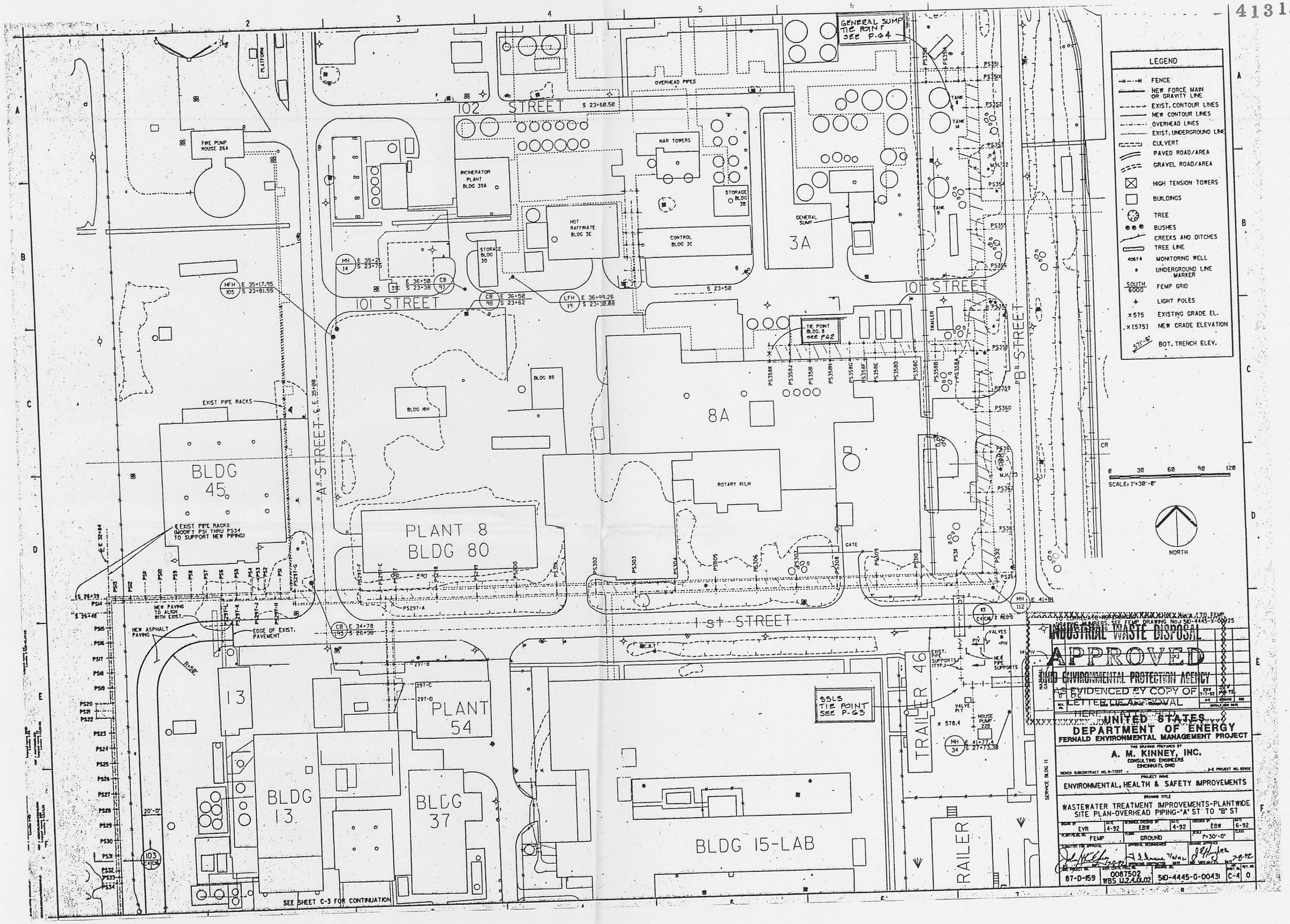
DRAWN BY	DATE	REVIEWED CHECKED BY	DATE	CHECKED BY	DATE
EVR	10-91	EBW	10-91	LMP	6-92

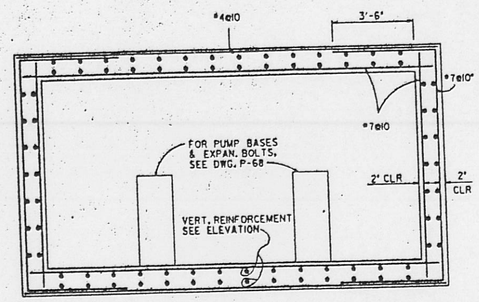
PLANT/BLDG. NO.: FEMP — FLOOR: GROUND — SCALE: 1/16"=1'-0"

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — OPERATIONS INSPECTION — DATE — DRAWING CHECKED — DATE 7-8-92

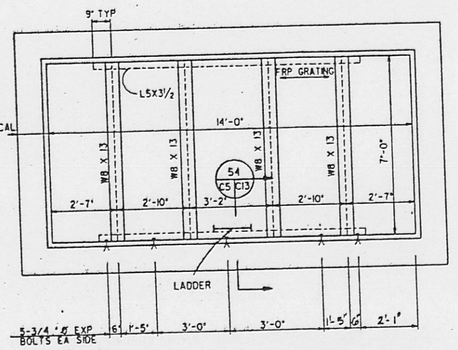
DOE PROJECT NO. 87-D-159 — SPEC. CONTR. PACK. NO. 0087502 WBS 1.2.4.0.0.02 — DRAWING NO. 51D-4445-G-00430 — SHEET NO. C-3 — REV. NO. 0

092

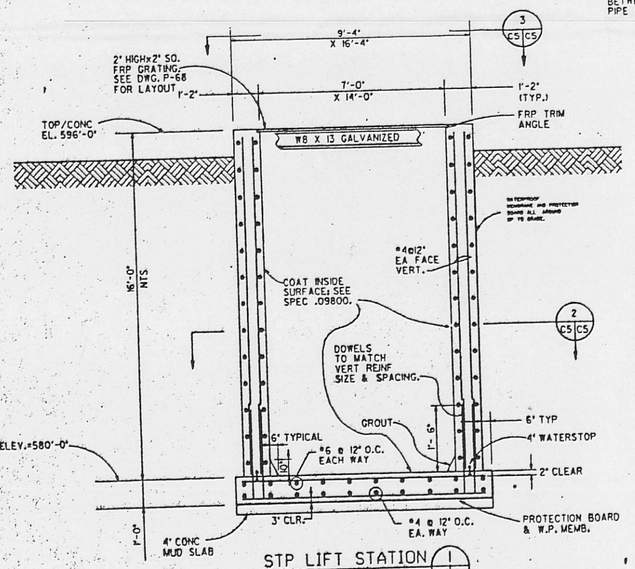

LEGEND
FENCE
NEW FORCE MAIN OR GRAVITY LINE
EXIST. CONTOUR LINES
NEW CONTOUR LINES
OVERHEAD LINES
EXIST. UNDERGROUND LINE
CULVERT
PAVED ROAD/AREA
GRAVEL ROAD/AREA
HIGH TENSION TOWERS
BUILDINGS
TREE
BUSHES
CREEKS AND DITCHES
TREE LINE
MONITORING WELL
UNDERGROUND LINE MARKER
SOUTH 6000 FEMP GRID
LIGHT POLES
x 575 EXISTING GRADE EL.
x [575] NEW GRADE ELEVATION
BOT. TRENCH ELEV.
SCALE: 1"=30'-0"
NORTH
GENERAL SUMP TIE POINT SEE P-64
102 STREET
101 STREET
"A" STREET
"B" STREET
1st STREET
FIRE PUMP HOUSE 26A
INCINERATOR PLANT BLDG 39A
HOT RAFFINATE BLDG 3E
STORAGE BLDG 30
CONTROL BLDG 3C
STORAGE BLDG 3B
NAR TOWERS
OVERHEAD PIPES
GENERAL SUMP
3A
TIE POINT BLDG. 8 SEE P-62
8A
ROTARY KILN
BLDG 8B
BLDG 16H
BLDG 45
EXIST PIPE RACKS
PLANT 8 BLDG 80
PLANT 54
BLDG 13
BLDG 37
BLDG 15-LAB
TRAILER 46
RAILER
SSLS TIE POINT SEE P-63
SEE SHEET C-3 FOR CONTINUATION
INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS
WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE
SITE PLAN-OVERHEAD PIPING-"A" ST TO "B" ST
87-D-159
0087502
WBS 1.2.4.0.02
SID-4445-G-00431
C-4
0



PLAN (2 / C5 C5)
SCALE: ½"=1'-0"

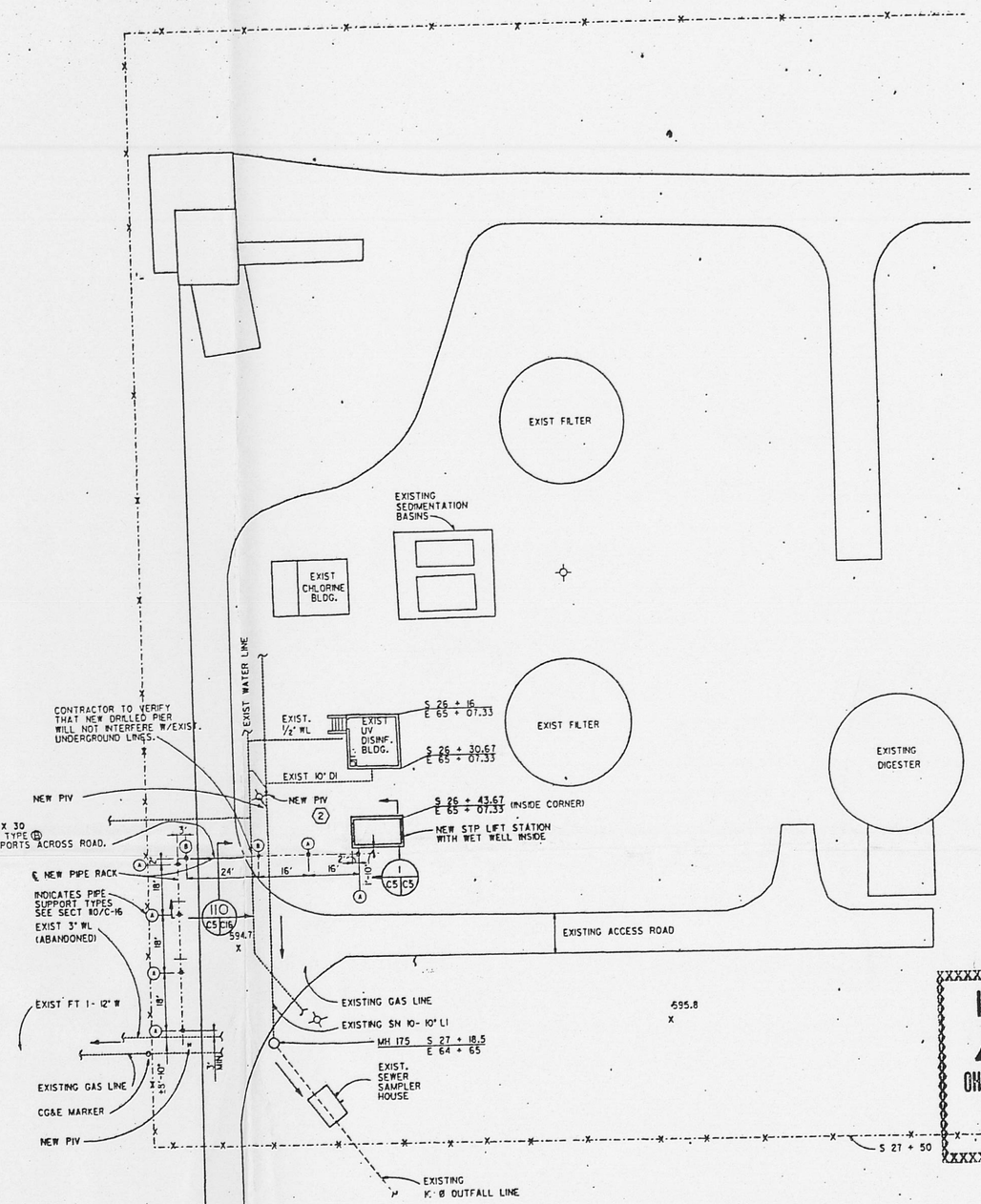


PLAN (3 / C5 C5)
NTS



STP LIFT STATION (1 / C5 C5)
SCALE: ½"=1'-0"

NOTE:
FOR SLEEVES REQUIRED THRU LIFT STATION WALLS, SEE PROCESS DWGS P-68



LEGEND

- FENCE
- PROPERTY LINE
- NEW FORCE MAIN OR GRAVITY LINE
- TIE POINT FOR FUTURE CONNECTION
- EXIST. CONTOUR LINES
- NEW CONTOUR LINES
- OVERHEAD LINES
- EXIST. UNDERGROUND LINE
- CULVERT
- PAVED/AREA ROAD
- GRAVEL ROAD/AREA
- HIGH TENSION TOWERS
- BUILDINGS
- TREE
- BUSHES
- CREEKS AND DITCHES
- TREE LINE
- 406 ⊕ MONITORING WELL
- UNDERGROUND LINE MARKER
- SOUTH 6000 FEMP GRID
- LIGHT POLES
- x 575 EXISTING GRADE EL.
- x (575) NEW GRADE ELEVATION
- 571-5' BOT. TRENCH ELEV.

REFERENCE DRAWINGS

21X 1450 G 00035
22A 5500 P 00442
22A 5500 P 00490
25A 5500 G 00140

DRAWING NOTES:

1. FOR PIPING LEGEND SEE PROCESS DWGS.
2. SEE P65 THUR P68 FOR NEW PIPING AND SECTIONS.

TO CORRELATE REFERENCED "AMK SHEET NO's" TO FEMP DRAWING NUMBERS SEE 5ID-4445-X-00425

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

NO.	REVISION	DATE	DRAWN	CHECKED	DATE
0	CFC	1-7-92			7-8-92

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

MEMCO SUBCONTRACT NO. 9-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS-PLANTWIDE SITE PLAN - SEWAGE TREATMENT PLANT

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JAM/EVR	10-91	EBW	10-91	RPD	6-92

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
FEMP	GROUND	1/16"=1'-0"	

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — APPROVED — 7-8-92

FEMP PROJECT NO.	DATE	PROJ. DRAFT. PROC. NO.	DATE	CONTRACT NO.	DATE	DWG. SHEET NO.	REV. NO.
87-D-159		0087502 WBS U2.4.0.0.02		5ID-4445-G-00432		C-5	0

STANDARD ABBREVIATIONS

AAD	AUTOMATIC AIR DAMPER
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ANR	ANCHOR
ARCH	ARCHITECTURAL
ATM	ATMOSPHERE
BE	BEVEL END
BDM	BIODEMINERALIZATION PLANT
BFP	BACKFLOW PREVENTER
BFW	BOILER FEED WATER
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BLR	BOILER
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BTU	BRITISH THERMAL UNIT
BO	BLOW OFF
°	CELSIUS (DEGREES CENTIGRADE)
℄	CENTERLINE
C/C	CENTER TO CENTER
CA	COMPRESSED AIR
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CO	CLEANOUT
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUATION
CS	CARBON STEEL
CUH	CABINET UNIT HEATER
CV	CHECK VALVE
CWO	CHAIN WHEEL OPERATOR
℄	DOOR LOUVER
DA	DAMPER ACTUATOR
DB	DECIBEL
DC	DUST COLLECTOR
DIA	DIAMETER
DM	DAMPER MOTOR
DN	DOWN
DPT	DEW POINT TEMPERATURE
DR	DRAIN
DWG	DRAWING
EXHA	EXHAUST AIR
ECC	ECCENTRIC
EEW	EMERGENCY EYE WASH STATION
EF	EXHAUST FAN
EL	ELEVATION
END	END OF MAIN WIP CONNECTION
EOV	ELECTRICAL OPERATED VALVE
EQ	EQUAL
ER	EXHAUST REGISTER
ESH	EMERGENCY SHOWER STATION
ESP	EXTERNAL STATIC PRESSURE
EVP	EVAPORATOR
F	FAHRENHEIT (DEGREES)
F&T	FLOAT & THERMOSTATIC
FLT	FILTER
FC	FLEXIBLE CONNECTION
FD	FLOOR DRAIN
FDD	FIRE DAMPER
FF	FINISHED FLOOR
FL	FLOOR
FLG	FLANGE
FND	FOUNDATION
FP	FIRE PROTECTION
FT	FOOT (FEET)
FTG	FOOTING
FT HD	FEET OF HEAD
F4	FREON F-114
GA	GAGE
GAL	GALLON
GC	GAS CHROMATOGRAPH
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HC	HOSE CONNECTION
HGR	HANGER
HORIZ	HORIZONTAL
HP	HORSE POWER
HTG	HEATING
HV	HEATING AND VENTILATION UNIT
HVAC	HEATING VENTILATION & AIR CONDITIONING
HZ	HERTZ
IE	INVERT ELEVATION
IN	INCH
ID	INSIDE DIAMETER
IPS	INSIDE PIPE DIAMETER
KW	KILOWATT
LBS/HR	POUNDS PER HOUR
LG	LONG
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MH	MANHOLE
MIN	MINIMUM
MT	MOUNT
NC	NORMALLY CLOSE
NEC	NATIONAL ELECTRIC CODE
NO	NORMALLY OPEN
NPT	NATIONAL PIPE THREADS
NS	NEAR SIDE
NTS	NOT TO SCALE
OA	OUTSIDE AIR
ON	ON CENTER
OD	OUTSIDE DIAMETER
OPG	OPENING
OZ	OUNCE
ℙ	PLATE
PE	PLAIN END
PG	PIPE GUIDE
PIV	POST INDICATOR VALVE
PP	POLYPROPYLENE
PS	POLYPROPYLENE SOLUTION
PSIA	POUNDS PER SQUARE INCH (ABSOLUTE)
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH (GAUGE)
PVC	POLYVINYL CHLORIDE
RED	REDUCER
REQ'D	REQUIRED
RG	RETURN GRILLE
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER
SAN	SANITARY
SCFM	STANDARD CUBIC FEET PER MINUTE
SD	SHOWER DRAIN
SD	SMOKE DETECTOR
SHT	SHEET
SLA	SOLVENT LADEN AIR
S.P.	SOUTH PLUME
SP	STATIC PRESSURE
SPEC	SPECIFICATIONS
SP GR	SPECIFIC GRAVITY
SR	SUPPLY REGISTER
SRU	SOLVENT RECOVERY UNIT
SS	STAINLESS STEEL
SSLS	STORM SEWER LIFT STATION
STM	STEAM
STP	SEWAGE TREATMENT PLANT
SW	SOCKET WELD
SWRB	STORM WATER RETENTION BASIN
T/S	TOP OF SUPPORT
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
THD	THREAD
TK	THICK
TOD	TOP OF DUCT
TOP	TOP OF PIPE
TOS	TOP OF STEEL
TW	TREATED WATER
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UV	ULTRA VIOLET
VAC	VACUUM
VB	VACUUM BREAKER
VEL	VELOCITY
VERT	VERTICAL
VIV	VARIABLE INLET VANE
VTR	VENT THRU ROOF
WG	WATER GAGE (COLUMN)
WT	WEIGHT

PIPING SERVICE

CA-XX	COMPRESSED AIR (XX=PRESSURE)
CE	CONTAMINATED EFFLUENT
CN	STEAM CONDENSATE
CV	DOMESTIC COLD WATER
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
DI	DEIONIZED WATER
DW	DISTILLED WATER
DW3	POTABLE WATER
G	NATURAL GAS
HW	DOMESTIC HOT WATER
HW-XXX	DOMESTIC HOT WATER (XXX=TEMP.)
HWC-XXX	DOMESTIC HOT WATER RECIRCULATED (XXX=TEMP.)
LS	STEAM (150 PSIG)
LW	LABORATORY WASTE
LWV	LAB WASTE VENT
LWVTR	LAB WASTE VENT THRU ROOF
NA	CAUSTIC
PA	PLANT AIR
SA	BREATHABLE AIR
SAN	SANITARY DRAIN
SANV	SANITARY VENT
S-XXX	STEAM (XXX=PRESSURE)
SC-XXX	STEAM CONDENSATE (XXX=PRESSURE)
TWX	AWWT TREATED WATER
V	VENT
VR	COOLING WATER RETURN
VS	COOLING WATER SUPPLY
XP	CHEMICAL
XR	STRONG ACID
XS	DILUTE ACID
XT	DECONTAMINATED WATER (DEIONIZED)

EQUIPMENT

AC	AIR CONDITIONING UNIT
AGT	AGITATOR
AHU	AIR HANDLING UNIT
BLW	BLOWER
CH	CABINET HEATER
CLFR	CLARIFIER
CLG	COOLING SYSTEM
CON	CONVEYOR
CP	CONDENSATE PUMP
DC	DUST COLLECTOR
DDS	DRUM DUMPING STATION
DMR	DEMISTER
EUH	ELECTRIC UNIT HEATER
F	FAN (EXISTING)
FDR	FEEDER
FLO	FLOW SPLITTER
FLT	FILTER
HTR	HEATER
HTX	HEAT EXCHANGER
LAV	LAVATORY
MAU	MAKE-UP AIR UNIT
MTR	MOTOR
MXR	MIXER
PMP	PUMP
RCV	RECEIVER
RH	ROOT HOOD
SCB	SCRUBBER
SCR	SCREEN
SEP	SEPARATOR
SH	SHOWER
SK	SINK
SSS	SAFETY SHOWER SYSTEM
TNK	TANK/VESSEL
UR	URINAL
VAC	VACUM
VAV	VARIABLE AIR VOLUME UNIT
VLV	VALVE
WC	WATER CLOSET

LETTERS OF INSTRUMENT IDENTIFICATION

	FIRST LETTER	SUCCEEDING LETTERS			
LETTER	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS	----	----		----
B	BURNER FLAME	----	----		----
C	CONDUCTIVITY	----	----	CONTROL	CLOSE
D	DENSITY	DIFFERENTIAL	----		----
E	VOLTAGE	----	PRIMARY ELEMENT		----
F	FLOW RATE	RATIO (FRACTION)	----		----
G	GAGING (DIM)	----	GLASS		----
H	HAND (MANUAL)	----	----		HIGH
I	CURRENT (ELECT)	----	INDICATE		----
J	POWER	SCAN	----		----
K	TIME, SCHEDULE	TIME RATE OF CHANGE	----	CONTROL STATION	----
L	LEVEL	----	LIGHT (PILOT)		LOW
M	DEW POINT, HUMIDITY	MOMENTARY	----		MIDDLE
N	----	----	----	TRANSDUCER	----
O	OBSERVATION	----	ORIFICE		OPEN
P	PRESSURE OR VACUUM	----	POINT (TEST)		----
Q	QUANTITY OR EVENT	TOTALIZE	----		----
R	RADIOACTIVITY	----	RECORD		----
S	SPEED OR FREQUENCY	SAFETY	----	SWITCH	----
T	TEMPERATURE	----	----	TRANSMIT	----
U	MULTIVARIABLE	----	MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VISCOSITY	----	VENT	VALVE	----
W	WEIGHT OR FORCE	----	WELL		----
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS	----	RELAY/COMPUTE	----
Z	POSITION, DIMENSION	Z AXIS	----	CONTROL DEVICE	----

SPECIAL NON-ISA INSTRUMENT CODES

PNL	PANEL
DDC	DIRECT DIGITAL CONTROL SYSTEM
DCS	DISTRIBUTED CONTROL SYSTEM

SPECIAL DESIGNATIONS

DESIGNATION	FUNCTION/ABBREVIATION
I-O	ON-OFF
Σ /N OR AVG	AVERAGING
± OR BI	BIAS
[illegible] (TYP)	BOOST, GAIN OR ATTENUATE (INPUT/OUTPUT)
Δ OR DIF	DIFFERENTIAL
÷ OR DIV	DIVIDE
√ OR SQ. RT.	EXTRACT SQUARE ROOT
X OR MUL	MULTIPLY
X^n	RAISE TO POWER
REV	REVERSING
Σ OR SUM	SUMMING
HI	HIGH SELECTING
LO	LOW SELECTING
Y	UNDETERMINED COMPUTING RELAY
d/dt	DERIVATIVE
1/D	INVERSE DERIVATIVE
∫	INTEGRATE (TIME INTEGRAL)
K	PROPORTIONAL
PB	PUSH BUTTON
PBL	PUSH BUTTON AND LIGHT
PBI	PUSH BUTTON WITH LIGHT
PB2	TWO PUSH BUTTONS
PBL2	TWO PUSH BUTTONS AND LIGHTS
PB2I	TWO PUSH BUTTONS WITH LIGHTS
SV	SELECTOR SWITCH
SVL	SELECTOR SWITCH AND LIGHTS
SVL2	SELECTOR SWITCH AND TWO LIGHTS
HOA	SELECTOR SWITCH THREE POSITION
CONVERT	FOR INPUT/OUTPUT SEQUENCES OF THE FOLLOWING
	A=ANALOG; D=DIGITAL; E=VOLTAGE; H=HYDRAULIC; I=CURRENT; O=ELECTROMAGNETIC, SONIC; P=PNEUMATIC; R=RESISTANCE (ELECTRICAL)

FLOW SHEET & INSTRUMENTATION SYMBOLS

BATF VALVE
BALL VALVE
GLOBE VALVE
PLUG VALVE
BUTTERFLY VALVE
CHECK VALVE (ARROW INDICATES FLOW)
PINCH VALVE
NEEDLE VALVE
FIRE SAFE VALVE
ANGLE VALVE
3 WAY VALVE
4 WAY VALVE
SAFETY RELIEF VALVE
VACUUM RELIEF
PRESSURE/VACUUM CONSERVATION VALVE
SELF-CONTAINED BACK PRESSURE REGULATING VALVE
SELF-CONTAINED PRESSURE REGULATING VALVE
PISTON ACTUATED VALVE WITH SOLENOID AND POSITION SWITCHES
DIAPHRAGM ACTUATOR
PISTON ACTUATOR
SOLENOID ACTUATOR
MOTORIZED ACTUATOR
VACUUM BREAKER
RUPTURE DISC
DIAPHRAGM SEAL
SLIDE VALVE

MAIN OPERATING LINE
AUXILIARY PROCESS & SERVICE LINE
DIRECTION OF FLOW ARROW
CONCENTRIC REDUCER
ECCENTRIC REDUCER
STRAINER
TRAP
FILTER
REGULATOR
LUBRICATOR
ORIFICE ASSEMBLY FLANGE TAPS
ORIFICE PLATE
PIPE FLANGES
FLEXIBLE HOSE
HOSE CONNECTION
PIPE CAP
SIPHON TUBE
PIPE INSULATION
PIPE INSULATION WITH ELECTRIC TRACING
PIPE INSULATION WITH STEAM TRACING
SPECIFICATION CHANGE
DIRECT CONNECTION OR MECHANICAL LINK
ELECTRICAL SIGNAL
SONIC OR ELECTROMAGNETIC SIGNAL
CAPILLARY
INSTRUMENT AIR SUPPLY OR PNEUMATIC SIGNAL LINE
SOFTWARE LINK
EXISTING LINE
ENVIRONMENTAL EMMISSION OR DISCHARGE POINT
SAFETY DEVICE

LOCAL MOUNTED INSTRUMENT
FRONT OF PANEL MOUNTED
FURNISHED WITH EQUIPMENT OR SYSTEM PACKAGE
REAR OF PANEL MOUNTED
INSTRUMENT WITH FREEZE PROTECTION
FUTURE OR EXISTING
SOFTWARE LOW AND HIGH ALARMS
SHARED DISPLAY/NORMALLY ACCESSIBLE TO OPERATOR
ANALOG INPUT TO THE DCS
ANALOG OUTPUT FROM THE DCS
DISCRETE INPUT TO THE DCS
DISCRETE OUTPUT FROM THE DCS
ELECTRICAL CONTROL/INTERLOCK OTHER THAN DCS
REMOTE SETPOINT
SAMPLE CONNECTION
FLAME ARRESTOR
TIE POINT
SIGHT GLASS

FLOW SHEET EQUIPMENT SYMBOLS

PROGRESSIVE CAVITY PUMP
CENTRIFUGAL PUMP
POSITIVE DISPLACEMENT PUMP
DIAPHRAGH PUMP
TRUCK
DAMPER
MOTOR
ROTARY FEEDER VALVE
AGITATOR
SCREW CONVEYOR
HEAT EXCHANGER

TO CORRELATE REFERENCED * AMX SHEET No's TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 510-4445-X-00425 &

DUCTWORK SYMBOLS

NOTES:

1. FOR METAL DUCTS, DOUBLE DIMENSION ON OUTSIDE - SIZE INDICATED. FOR DIMENSION ON "FINAL DUCT, ADD FOR STIFFENERS AND FLANGES. TO GET OVERALL DUCT DIMENSION ADD FOR INSULATION TO GET FINAL OVERALL CLEARANCE REQUIRED.
2. FOR LINE SIZE PER ASHRAE GIVEN IS INSIDE DIMENSION OF LINING. ADD FOR LINING, DUCT THICKNESS, STIFFENERS AND FLANGES TO GET OVERALL CLEARANCE REQUIRED.

12" DIAMETER ROUND DUCT.
RECTANGULAR OR SQUARE DUCT, FIRST NUMBER INDICATES DIMENSION OF SIDE SHOWN SECOND NUMBER SIDE NOT SHOWN.
SUPPLY DUCT SECTION FIRST NUMBER INDICATES HORIZONTAL DIMENSION IN VIEW, SECOND NUMBER INDICATES VERTICAL DIMENSION IN VIEW.
SUPPLY DUCT TURNING TOWARD VIEWER
SUPPLY DUCT TURNING AWAY VIEWER
RETURN OR EXHAUST DUCT TURNING TOWARD VIEWER
RETURN OR EXHAUST DUCT FROM VIEWER.
BLAST GATE (GB)
INCLINED DROP IN RESPECT TO AIR FLOW
INCLINED RISE IN RESPECT TO AIR FLOW
FLEXIBLE DUCT CONNECTION
BALANCING DAMPER
SQUARE ELBOW WITH TURNING VANES

PIPING SYMBOLS

DRAIN (EQUIPMENT)
PIPE CAP
90 DEG. ELBOW DOWN
90 DEG. ELBOW UP
TEE DOWN
TEE UP
PIPE OFFSETTING DOWN AT 45 DEG.
PIPE OFFSETTING UP AT 45 DEG.
PIPE FLANGES
PIPE UNION
PIPE GUIDES
PIPE ANCHOR OR HANGER
ECCENTRIC REDUCER
CONCENTRIC REDUCER
DIRECTION OF FLOW ARROW
STRAINER
WELDED CONNECTION
SOCKET WELDED CONNECTION
THREADED CONNECTION

ANGLE VALVE
GATE VALVE (CWO) (CHAIN WHEEL OPERATOR)
GLOBE VALVE
CHECK VALVE
BUTTERFLY VALVE
BALL VALVE
RELIEF VALVE OR SAFETY VALVE
SOLENOID VALVE
CONTROL VALVE (2 WAY)
CONTROL VALVE (3 WAY)
MOTOR OPERATED VALVE
CENTER LINE
FLEXIBLE CONNECTION
THERMOMETER WELL
CALIBRATED BALANCING VALVE W/MEMORY STOPS

1-1/2"CE-1400-BB1
PIPE SPECIFICATION
LINE NUMBER
SERVICE
LINE SIZE

LINE NUMBER DESIGNATION

SPECIAL FUNCTION DESIGNATION
LETTERS OF IDENTIFICATION
ALARMS REQ'D
TAG NUMBERS
SUFFIX LETTER OR NUMBER (WHEN REQUIRED)

INSTRUMENT DESIGNATION

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

NEMCO SUBCONTRACT NO. R-17207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: LEGENDS & SYMBOLS

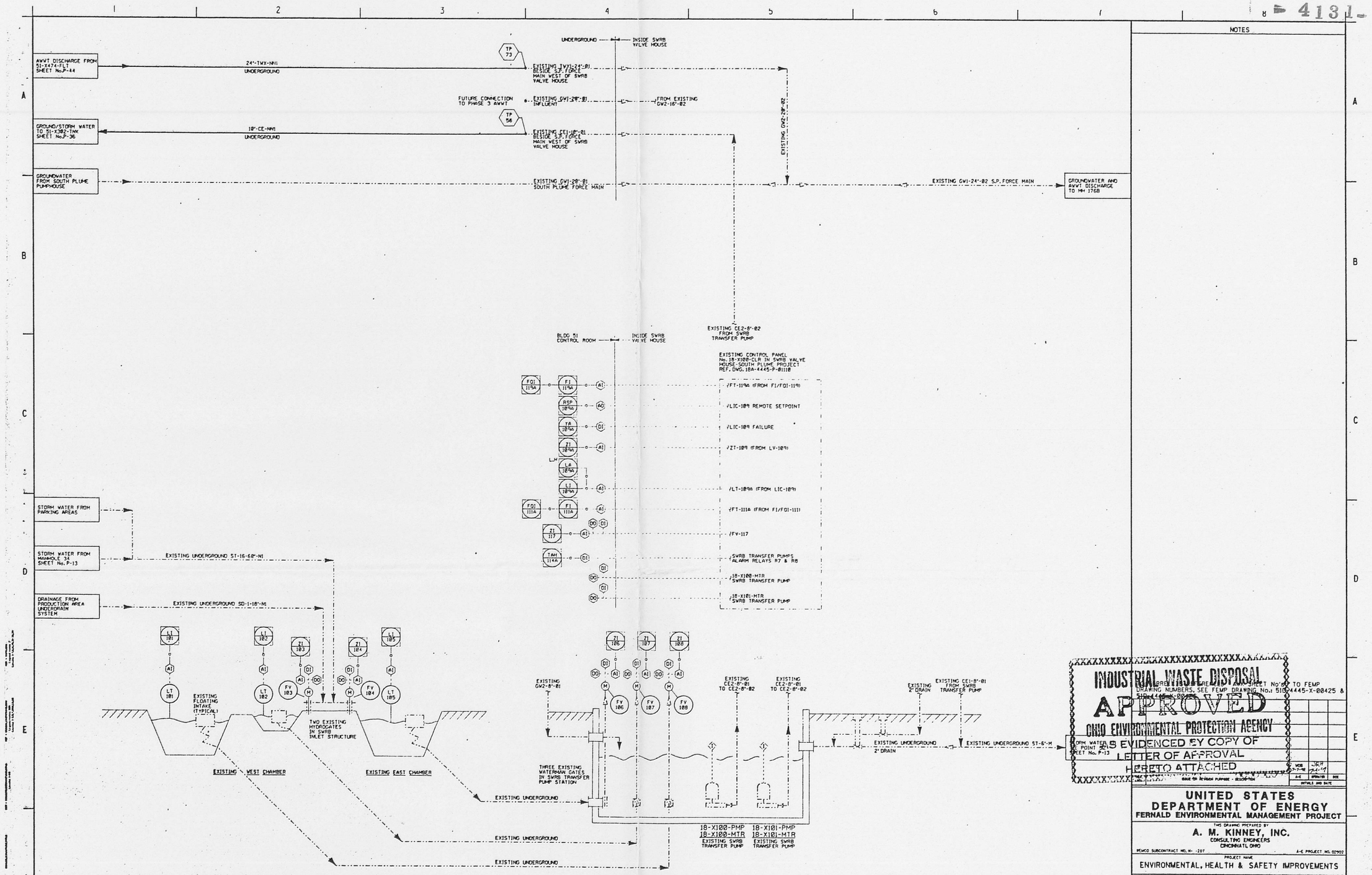
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JVP	2-91	WDB	8-92	WEB	7-92

PLANT/BLDG. NO.: FEMP BLDG. 51 — FLOOR: — SCALE: NONE — CLASS:

SUBMITTED FOR APPROVAL: F.W. Schu — DATE 7-8-92
APPROVAL RECOMMENDED: F.E. Lowe — DATE 7/8/92
OPERATING DIVISION: — DATE
DRAWING APPROVED: J.R. Hoy — DATE 7-8-92
ENG. MANAGER

A-E PROJECT NO.	WORK CONTROL NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.2.1.01.02	510-4445-X-00567	L-2	0

4131



NOTES

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

REFERENCE DRAWINGS

INDEX CODE			
18A-1920-G-00348	SWRB PLAN BASINS & PIPING	18A-1900-S-00870	SWRB EAST CHAMBER SECTIONS
18A-1920-G-00349	SWRB WEST CHAMBER SECTIONS	18A-1900-S-00875	SWRB INLET STRUCTURE
18A-1920-G-00350	SWRB WEST CHAMBER SECTIONS	18A-1900-S-00876	SWRB INLET STRUCTURE
18A-1920-P-00351	SWRB PUMP STATIONS	18A-1900-S-00877	SWRB INLET STRUCTURE
18A-1920-S-00353	SWRB PUMP STATIONS	18A-4445-P-01110	SOUTH GROUNDWATER CONTAMINATION PLUME, P & ID, SWRB TRANSFER PUMP

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMCO SUBCONTRACT NO. N- -207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE PIPING & INSTRUMENTATION DIAGRAM SWRB & TRANSFER PUMP STATION

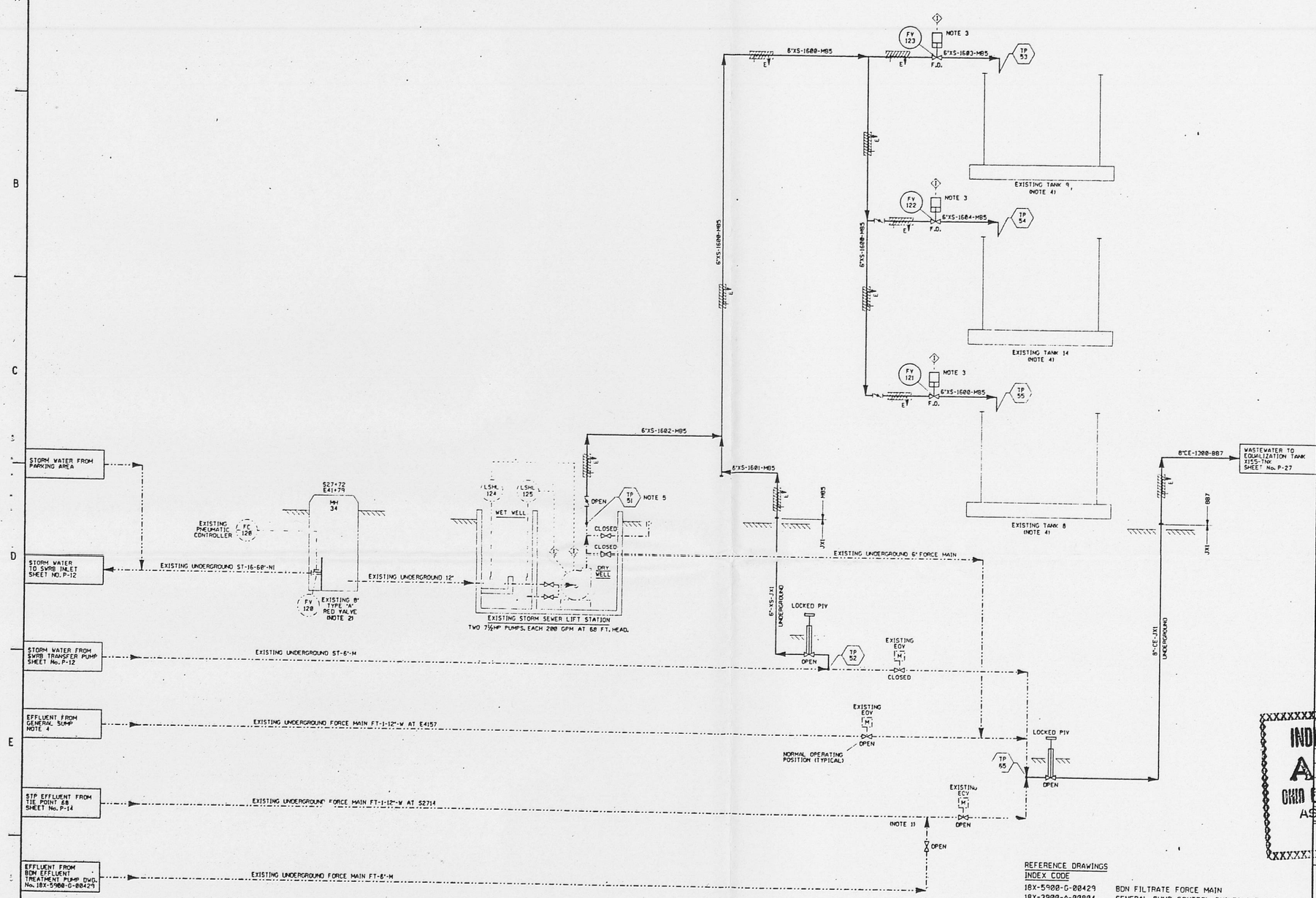
DRAWN BY	DATE	DESIGN CHECKED BY	DATE	CHECKED BY	DATE
JVP	6-91	VDB	5-92	VDB	6-92

PLANT/BLDG. NO.: FEMP SWRB — FLOOR: — SCALE: NONE — CLASS:

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — APPROVED FOR CONSTRUCTION

A-E — DATE 7-8-92 — OPERATING CONTRACTOR — DATE — DOE REPRESENTATIVE — DATE 7-8-92

A-E PROJECT NO.	DOE CONTR. PROJ. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00570	P-12	0



NOTES

1. FOR BDN EFFLUENT TREATMENT PLANT DISCHARGE PIPING CONNECTION TO FT-1-12"-W, REFER TO DRAWING No. 18X-5900-G-00429.
2. EXISTING AUTOMATED VALVE INSTALLED IN ST-16-60"-NI AT MANHOLE 34. CONTROL OF THIS VALVE HAS BEEN PROVIDED IN THE GENERAL SUMP CONTROL ROOM.
3. LOCATE IN THE NEW GENERAL SUMP CONTROL ROOM THE CONTROLS FOR THE THREE AUTOMATED SPILL RETURN VALVES AT TANKS 8, 9 AND 14.
4. FOR EXISTING TANKS 8, 9, & 14, REFER TO DRAWING INDEX CADE 18X-3900-N-00707, 18X-3900-N-00708, 18X-3900-P-00737, AND 18X-3900-P-00738.
5. TIE POINT 51, REPLACE EXISTING 6" ELBOW WITH TEE AT EXISTING 6" VALVE (ELEV. 572'-3") TO EXISTING EMERGENCY BY-PASS SHOWN CAPPED ON DRAWINGS No. 22G-5500-P-00424 AND No. 22G-5500-P-00425.

REFERENCE DRAWINGS
INDEX CODE

18X-5900-G-00429	BDN FILTRATE FORCE MAIN
18X-3900-A-00804	GENERAL SUMP CONTROL BUILDING PLANS
18X-5500-F-00661	INDUSTRIAL SEWAGE SYSTEM
18X-3900-G-00699	GENERAL SUMP KEY PLOT & DRAWING LIST
18X-3900-M-00731	GENERAL SUMP PLAN - SOUTH
18X-3900-N-00707	P&ID TANKS 8 & 14
18X-3900-N-00708	P&ID TANKS 6, 7 & 9
18X-3900-P-00737	PIPING PLAN TANK 8 & 14
18X-3900-P-00738	PIPING PLAN TANK 9
22G-5500-A-00427	SSLS MH 34 PIPING
22G-5500-P-00424	SSLS EQUIPMENT & PIPING
22G-5500-P-00425	SSLS PIPING ARRANGEMENT
22G-5500-S-00426	SSLS STRUCTURAL
22G-5500-S-00428	SSLS MISCELLANEOUS STEEL

TO CORRELATE REFERENCED DRAWING NUMBERS WITH FEMP DRAWING NUMBERS, REFER TO DRAWING No. 51D-4445-X-00425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL
HEPA
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-17707 — B-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

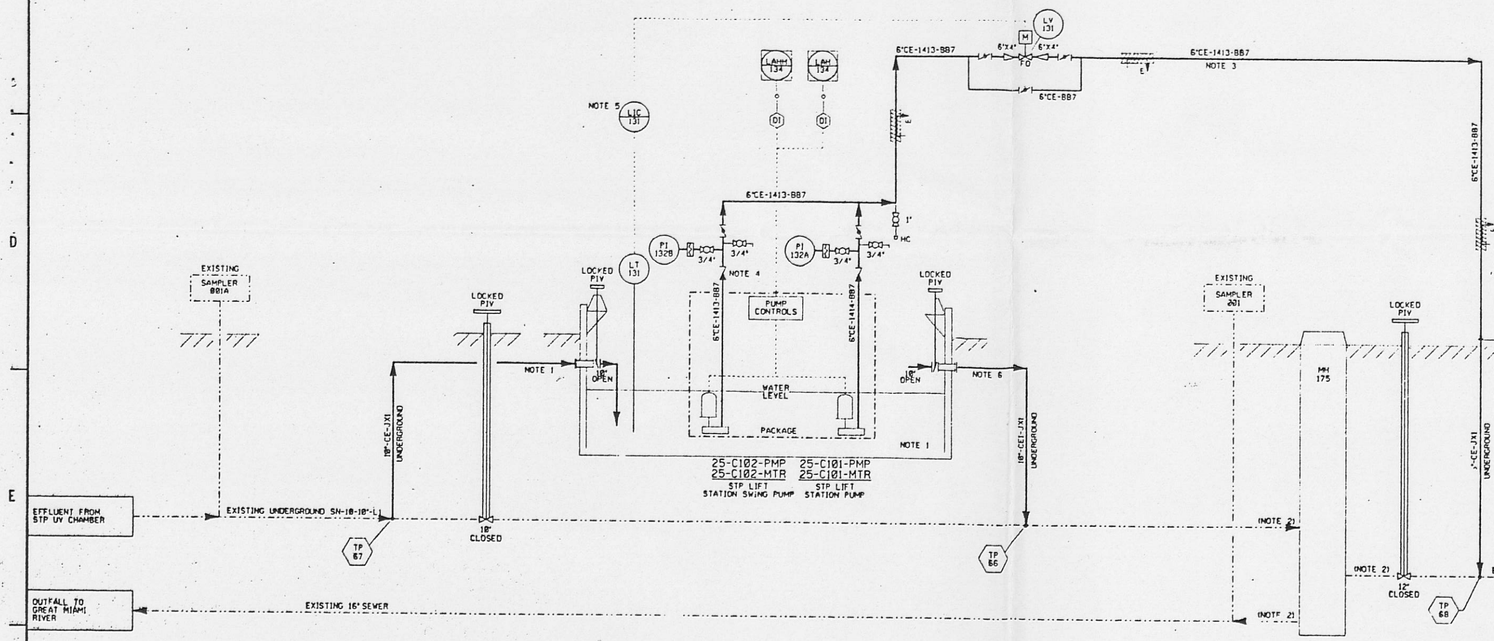
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
SSLS & GENERAL SUMP/TANKS 8, 9 & 14

DRAWN BY	DATE	DESIGN REVIEWED BY	DATE	CHECKED BY	DATE
JEL	10-90	WDB	5-92	WDB	6-92

PLANT/BLDG. NO. FEMP SSLS — FLOOR — SCALE NONE

SUBMITTED FOR APPROVAL — DATE 7-8-92 — OPERATIONAL RECOMMENDED — DATE 7/8/92 — DRAWING APPROVED — DATE 7-8-92

B-E PROJECT NO.	DATE	OPER. CONTROL NO.	DRAWING NO.	DATE	SHEET NO.	REV. NO.
87-D-159		0087502 WBS 1.1.2.4.01.82	51D-4445-P-00571		P-13	0



NOTES

1. STP LIFT STATION FLOOR HIGH POINT ELEVATION 580'-0". SEE SHEET No.C-5 FOR DETAILS. 10"CE1-JX1 INVERT ELEV.590.0' AT LIFT STATION.
2. SN-10-10"L1 INVERT ELEV.590.83' AT MH 175. FT-1-12"-W INVERT ELEV.590.75' AT MH 175. 16" OUTFALL SEWER INVERT ELEV.590.0' AT MH 175.
3. STP LIFT STATION PUMP DISCHARGE 6"CE-1413-BB7 ON NEW PIPE BRIDGE OVER STP ROADWAY, FROM LIFT STATION TO TP-68, WEST OF STP ROADWAY.
4. STP LIFT STATION PUMP DISCHARGE CHECK VALVE ELEVATION HIGHER THAN STATION WALLS.
5. LIC-131 TO BE LOCATED IN LOCAL CONTROL PANEL AT STP LIFT STATION.
6. 10"CE1-JX1 (OVER FLOW) INVERT ELEV. 591'-0".

TO CORRELATE REFERENCED "AWK SHEET No's "TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL APPROVED OHIO ENVIRONMENTAL PROTECTION AGENCY AS EVIDENCE OF APPROVAL HERETO ATTACHED

REFERENCE DRAWINGS

INDEX CODE	
22A-5500-P-00440	STP UNDERGROUND SANITARY WATER LINE REPLACEMENT.
22A-5500-P-00442	STP UNDERGROUND SANITARY WATER LINE REPLACEMENT.
25A-1450-G-00021	STP PLOT PLAN (1951).
25A-5500-P-00138	STP EFFLUENT LINES (1986).
25A-5500-G-00140	UV DISINFECTION SYSTEM SITE PLAN.
25A-5500-P-00156	MH 175 EFFLUENT SAMPLING UPGRADE.
25A-7000-F-00030	STP EXPANSION FLOW DIAGRAM.
25A-7000-F-00033	STP EXPANSION PLOT PLAN (1955).
21X-1450-G-00035	STP SITE IMPROVEMENTS (1953).

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

BECO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 0290

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE PIPING & INSTRUMENTATION DIAGRAM STP LIFT STATION

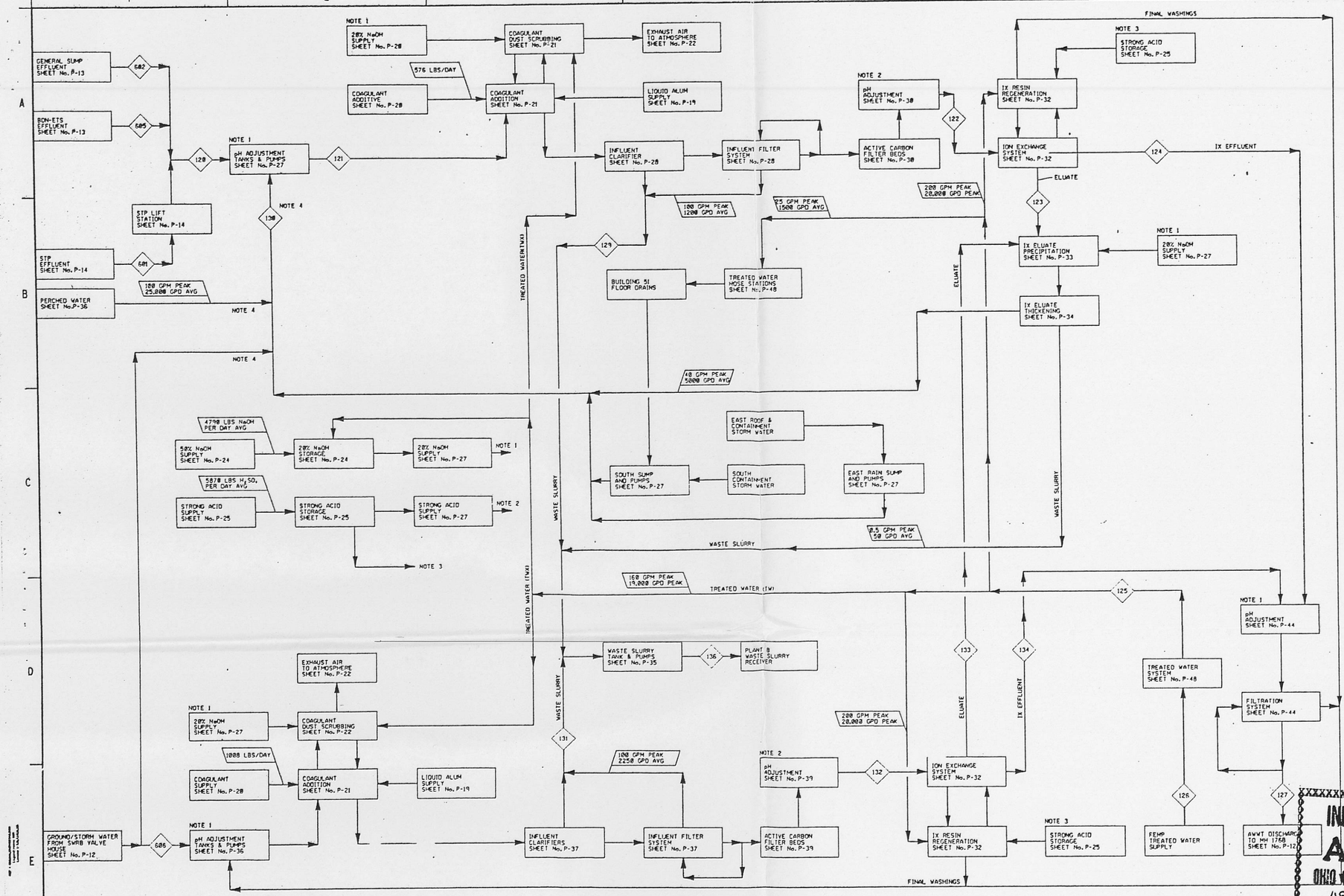
DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KDG	10-90	WDB	5-92	WDR	6-92

PLANT/BLDG. NO.: FEMP STP — FLOOR: — SCALE: NONE — CLASS:

SUBMITTED FOR APPROVAL: F.W. Schaeffer 7-8-92 — APPROVAL RECOMMENDED: T. J. Greene 7/8/92 — OPERATING CONTRACTOR DATE — APPROVED: J. D. Hughes 7-8-92

DOE PROJECT NO.	OPER. CONTR. PROJ. NO.	LATEST REV.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00572	P-14	0

660



NOTES

1. NOTED pH ADJUSTMENT AND OTHER STEPS ARE SUPPLIED WITH 20% NaOH FROM THE FEED PUMPS ON SHEET No. P-27.
2. NOTED pH ADJUSTMENT AND OTHER STEPS ARE SUPPLIED WITH STRONG ACID FROM THE FEED PUMPS ON SHEET No. P-27.
3. NOTED IX RESIN REGENERATION STEPS ARE SUPPLIED WITH STRONG ACID FROM THE TRANSFER PUMPS ON SHEET No. P-25.
4. PERCHED WATER AND GROUND/STORM WATER FLOW INTO THE EQUALIZATION TANK THROUGH LINES SEPARATE FROM THE LINE CARRYING THE OTHER STREAM 130 COMPONENTS.

	PHASE I					PHASE II										NOTE 4				DISCHARGE
STREAM	606 (SWRB)	131	132	133	134	601 (STP)	602 (GS)	605 (BON-ETS)	120	121	122	123	124	125 (TW)	126 (TW)	129	130	136	127	
AVERAGE FLOW GPD. (GPM)	1,868,000 (780)	16,250 (11.3)	1,800,000 (780)	3,000 (2.1)	1,868,000 (780)	175,000 (122)	75,000 (52)	110,000 (76)	360,000 (250)	576,000 (400)	576,000 (400)	2,000 (1.4)	576,000 (400)	36,000 (25)	36,000 (25)	9200 (6.4)	216,000 (150)	25,500 (17.7)	1,440,000 (1000)	
DESIGN FLOW GPM	720 (PEAK)	110 (PEAK)	720 (PEAK)	400 (PEAK)	720 (PEAK)	257 (PEAK)	368 (PEAK)	132 (PEAK)	757 (PEAK)	410 (PEAK)	410 (PEAK)	400 (PEAK)	410 (PEAK)	320 (PEAK)	400 (PEAK)	195 (PEAK)	300 (PEAK)	28 (PEAK)	1100 (PEAK)	

TO CORRELATE REFERENCED "AMK SHEET NO'S" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING NO.: 51D-4445-X-00425

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

REV.	ISSUE OR REVISION PURPOSE	DR	CK	APP	DATE
		WDB	JKH		7-9-92

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMCO SUBCONTRACT NO. N-17207 — A-E PROJECT NO. 02907

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PROCESS FLOW DIAGRAM
ADVANCED WASTEWATER TREATMENT FACILITY

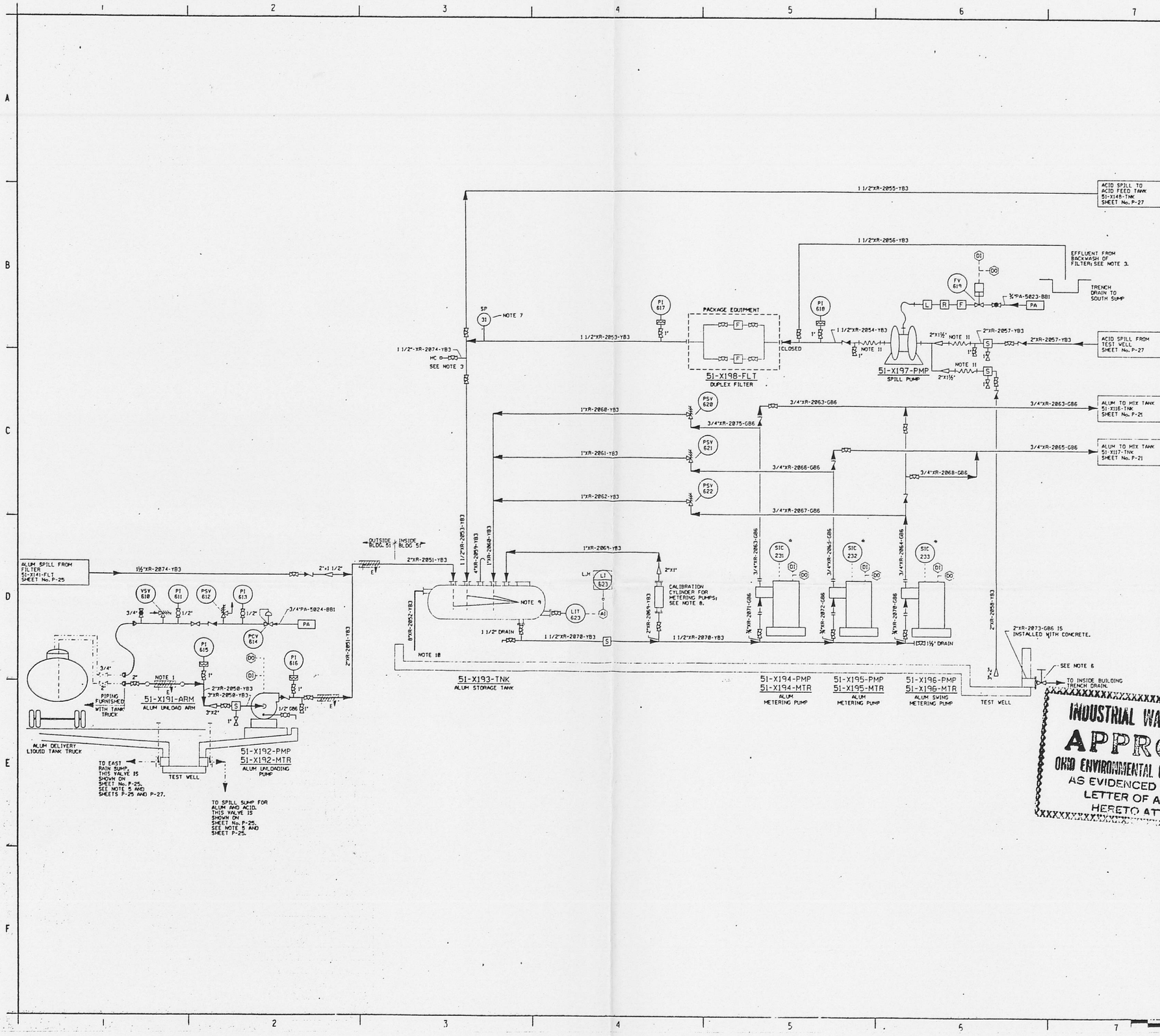
DRAWN BY	DATE	ORIGINAL CREATED BY	DATE	LAYOUT BY	DATE
JVP	10-90	WDB	5-92	WDR	6-92

PLANT/BLDG. NO.: FEMP BLDG. 51 — FLOOR: — SCALE: NONE — CLASS:

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — FEMP APPROVALS

LEAD PROJECT NO. 87-D-159 — DATE 7-9-92 — OPERATING CONTRACTOR — DATE — DOE MANAGER — DATE 7-9-92

WORK CONTROL NO. 0087502 — DRAWING NO. WBS 1.1.2.4.01.02 51D-4445-P-00573 — SHEET NO. P-18 — REV. NO. 0



NOTES

1. LINES ARE ELECTRIC HEAT TRACED AND INSULATED IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE OUTDOOR ABOVE GROUND PIPE RACKS.
2. UNLOADING ARM TO BE FURNISHED WITH DRY-BREAK TYPE QUICK-DISCONNECT COUPLING.
3. TREATED WATER CONNECTION TO BACKWASH DUPLEX FILTER 51-X198-FLT.
4. EAST ACID/ALUM SPILL SUMP IS ADJACENT TO EAST RAIN SUMP.
5. THE ALUM AND ACID EAST UNLOADING AREAS SHARE A COMMON TEST WELL.
   THIS TEST WELL HAS TWO 4 INCH VALVES, ONE OF WHICH WILL BE MANUALLY OPENED INTO THE ALUM/ACID SPILL SUMP IN THE EVENT OF A CHEMICAL SPILL.
   THE OTHER VALVE WILL BE MANUALLY OPENED TO THE EAST UNLOADING AREA RAIN SUMP IN THE EVENT OF RAIN, AS SHOWN ON SHEET P-27.
6. 2 INCH 150 LB. FLANGED GATE VALVE IS ALLOY 20, SPEC. No. V-105, HANDWHEEL TO EXTEND ABOVE TRENCH DRAIN COVER.
7. LOCAL SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.
8. CALIBRATION CYLINDER; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.
9. PROVIDE ONE 1/8" DIA. HOLE IN EACH TANK INLET DIP PIPE INSIDE TANK, LOCATED 8" BELOW TOP OF TANK.
10. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
11. 2" CHEMICAL TRANSFER HOSE; SMOOTH VORE TEFLON LINED, WITH STAINLESS STEEL BRAIDED COBER, 150LB. ANSI STAINLESS STEEL FLANGED ENDS, 1'-0" LONG, RESISTOFLEX TYPE TMH, OR APPROVED EQUAL.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

DRAWING NUMBERS SEE FEMP AMK SHEET NOS TO FEMP DRAWING NO.: 51D-4445-X-00425

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	A-E INITIALS	APPROVAL DATE
		VDB 7-7-92	7-7-92

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-7720T — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
BULK LIQUID ALUM SYSTEM

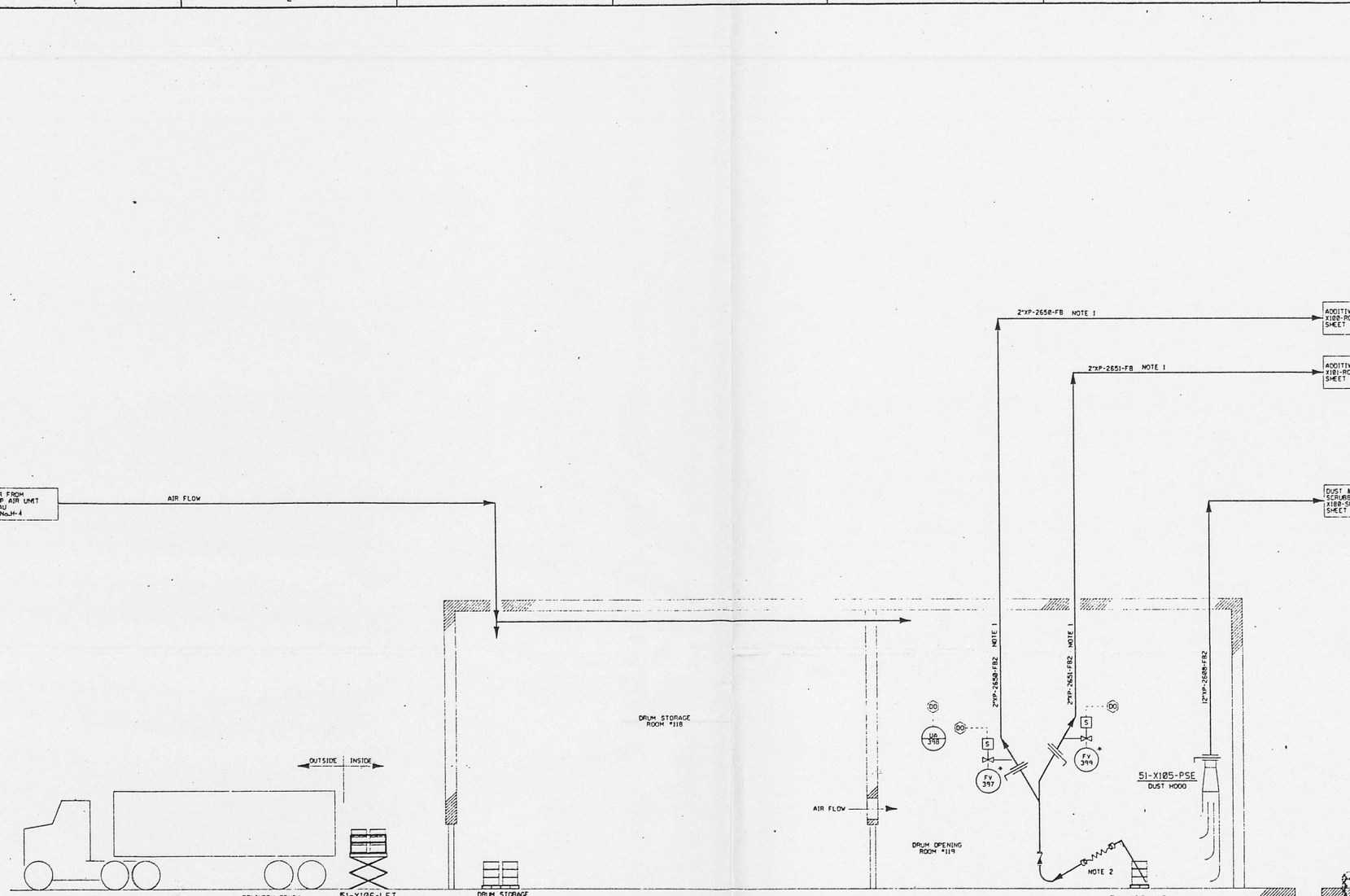
DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE	DATE
KDG	5-92	GDM	5-92	VDB		6-92

PLANT/BLDG. NO.: FEMP BLDG. 51 — FLOOR: — SUBJ.: HOME

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — APPROVED FOR CONSTRUCTION — DATE 7-8-92

DOE PROJECT NO.	OPER. CONTR. NO.	CATALOG NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00574	P-19	0

4131-
4132



NOTES

1. 2" SCHEDULE 40 TYPE 316L STAINLESS STEEL PIPING COMPONENTS TO BE DELIVERED LOOSE WITH VACUUM RECEIVERS.
2. VACUUM HOSE, 2" TYPE 316L PIPING COMPONENTS, SLIDE VALVES, AND SOLENOID VALVES TO BE DELIVERED LOOSE WITH THE VACUUM WAND.

TO CORRELATE REFERENCED AWK SHEET No's TO FEMP DRAWING No's 51D-4445-X-00425 & 51D-4445-X-00426

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER OF APPROVAL HERETO ATTACHED

NO.	BASIS OF RE-ISSUE PURPOSE / DESCRIPTION	K-E	OPERATOR	DATE
		WDR 5-7-92	JFH 7-8-92	

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02903

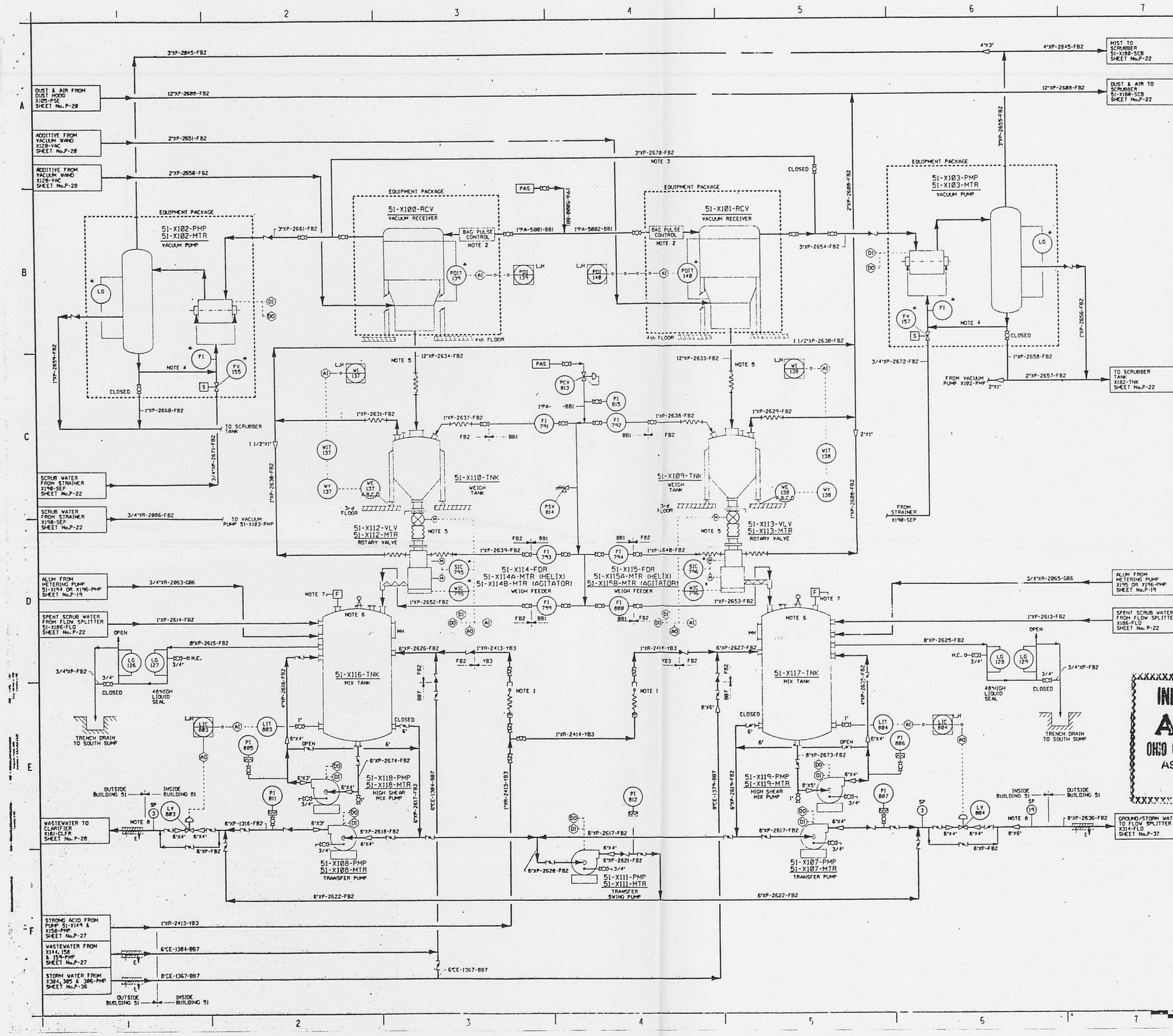
PROJECT NAME
ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE
WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
DRUMMED COAGULATION ADDITIVE

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
KDG	5-92	WDR	5-92	WDR	6-92
PLANT/BLDG. NO. FEMP BLDG. 51		FLOW		SCALE NONE	

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — DRAWING APPROVED
K-E — DATE — OPERATING CONTRACTOR — DATE — DOE W/CCAA/LAD — DATE 7-17-92

K-E PROJECT NO.	SITE CONTROL NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.61.02	51D-4445-P-00575	P-20	0



NOTES

1. HOSE CONNECTION FOR STRONG ACID. INSTALL AT MINIMUM DISTANCE FROM MAIN LINE.
2. BAG PULSE CONTROL INCLUDES:
   FILTER REGULATOR
   PRESSURE GAUGE
   INTENSIFIER
   ADJUSTABLE TIMER
3. MANIFOLD LINE FOR VACUUM PUMPS.
4. INSTRUMENTATION WITH LIQUID RING VACUUM PUMP EQUIPMENT PACKAGE TO INCLUDE CONTROL OF WATER FLOW INTO THE PUMP TO MAINTAIN PROPER LIQUID LEVEL IN THE PUMP DURING OPERATION, AND TO PREVENT FLOODING OF THE PUMP DURING SHUTDOWN; SOLENOID VALVE FV-155/157 CLOSES WHEN PUMP MOTOR IS DEENERGIZED.
5. FOR DETAIL OF FLEXIBLE CONNECTIONS BETWEEN VACCUM RECEIVERS AND BATCHING TANKS, AND BETWEEN ROTARY VALVES AND WEIGH FEEDERS, SEE APPENDIX I OF SPEC. 02902-3502.
6. TWO MIX TANKS EACH TO HAVE TWO 6' TRANSPARENT PORTS, ONE WITH ELECTRIC LIGHT.
7. TWO MIX TANKS EACH TO HAVE 2" VENT WITH DUST FILTER HAVING REPLACEABLE ELEMENT. FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502.
8. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.

INDUSTRIAL WASTE DISPOSAL
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AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

TO CORRELATE WITH REFERENCED DWG SHEET No's 1 & 2 FEMP DRAWING NUMBERS SEE FEMP DRAWING No. 51D-4445-X-00425 & 00426

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DRAWN	CHECKED	APPROVED	DATE
0	ISSUED FOR CONSTRUCTION	KDG	WDB	WDR	6-92

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. P-77207 — A-E PROJECT NO. 0299

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

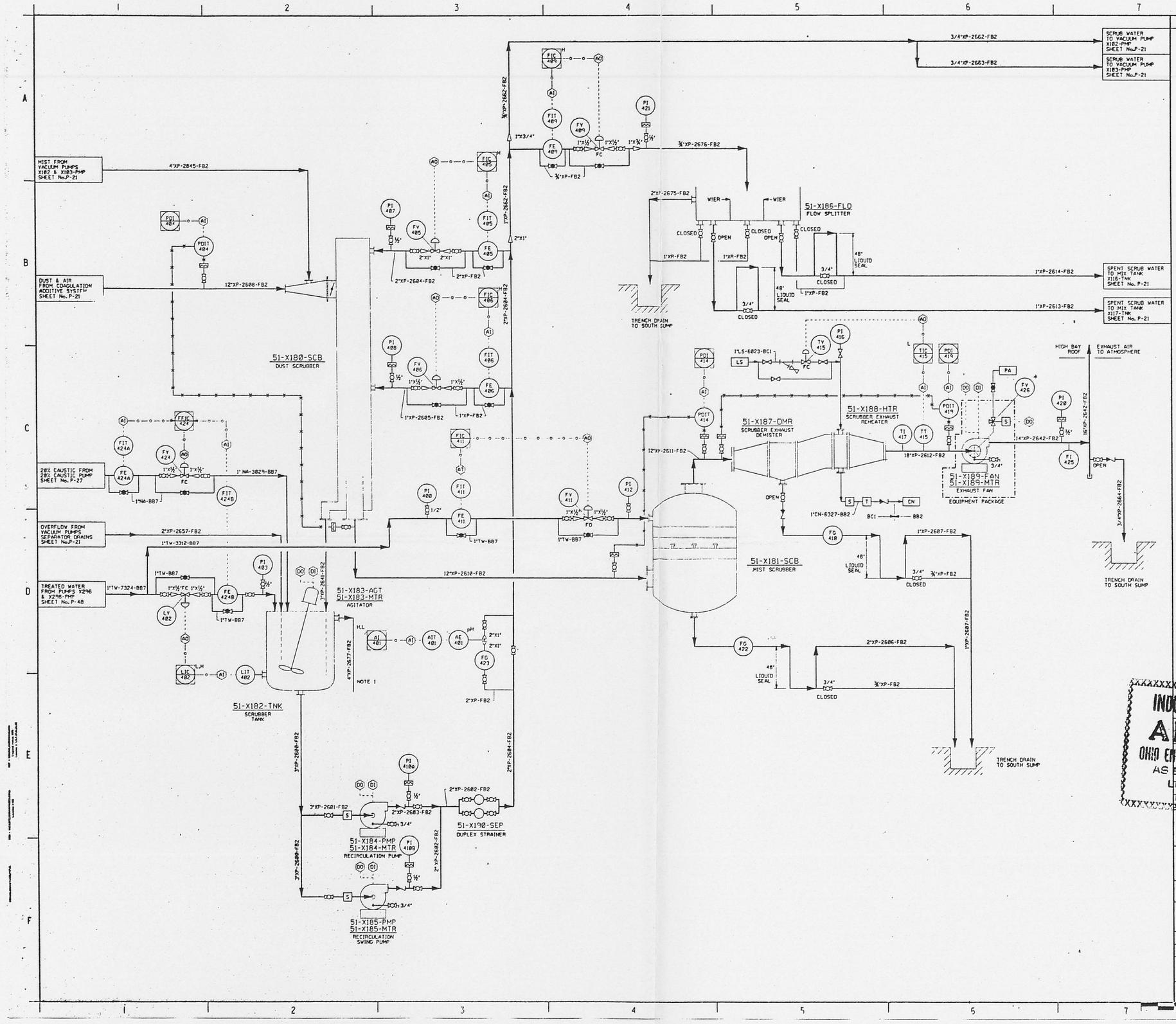
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
COAGULATION ADDITIVE SYSTEM

DRAWN BY	DATE	DESIGNED CHECKED BY	DATE	CHECKED BY	DATE
KDG	8-91	WDB	5-92	WDR	6-92

PLANT NO. / BLDG. NO.: FEMP BLDG. 51 — FLOOR: — SCALE: NONE

SUBMITTED FOR APPROVAL: F.W. Schmitt 7-8-92 — APPROVAL RECOMMENDED: T.E. Sievers 7/8/92 — DRAWING APPROVED: J. Hughes 7-9-92

DOC. PROJECT NO.	SYSTEM NO.	BASIC NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-A445-P-00576	P-21	0



NOTES

1. TANK OVERFLOW TO EXTEND TO 6' ABOVE SLAB.

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER OF APPROVAL
HERETO ATTACHED

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

FEMP SHEET NO'S 1 TO FEMP 51D-4445-X-00425 & 51D-4445-X-00426

MEMCO SUBCONTRACT NO. M-77207 A-E PROJECT NO. 62902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

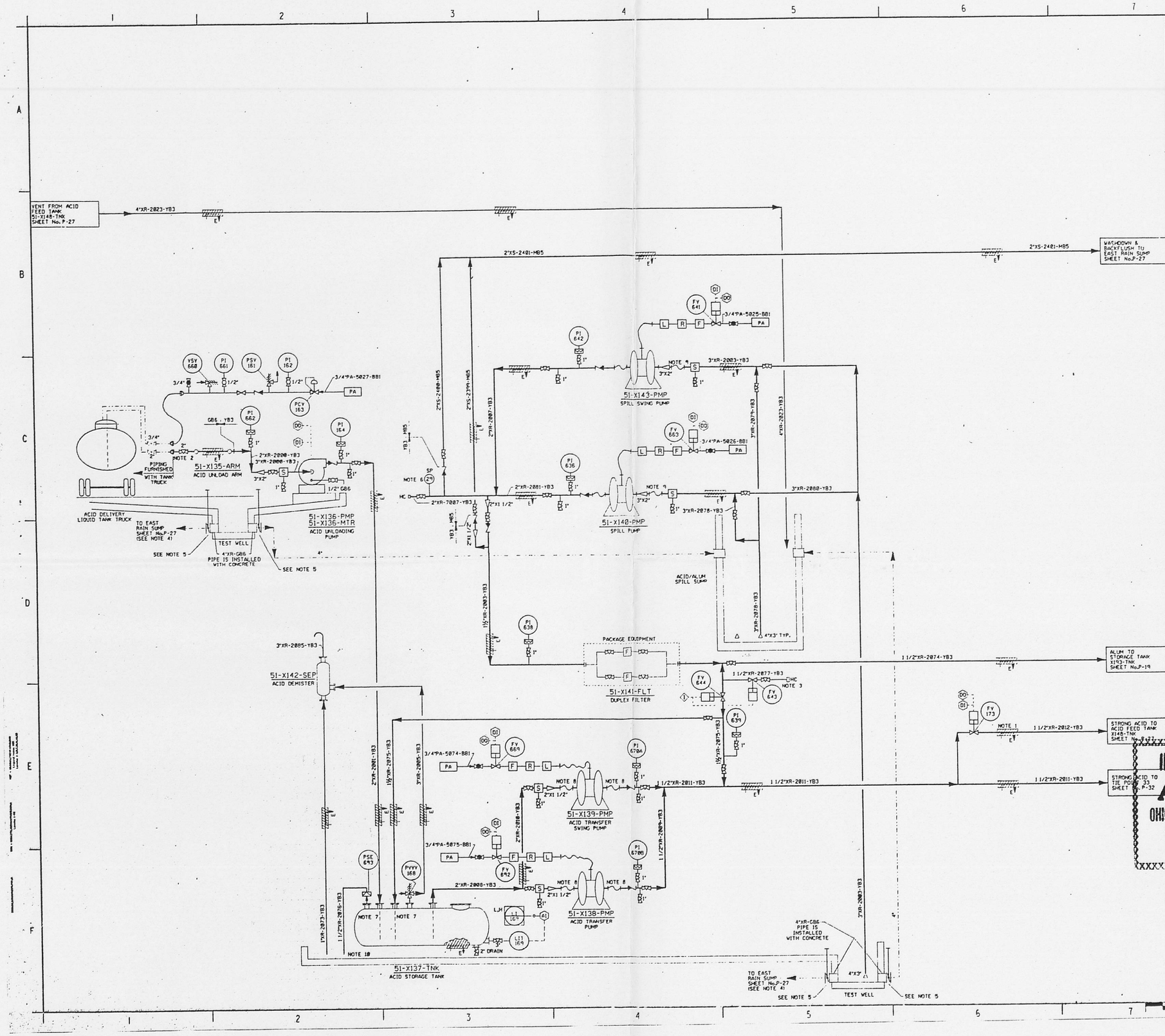
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
COAGULATION DUST SCRUBBING

DRAWN BY	DATE	DESIGNED/CREATED BY	DATE	CREATED AT	DATE
JVP	4-91	WDB	5-92	WDB	6-92

PLANT/BLDG. NO.: FEMP BLDG. 51 | FLOOR | SCALE: NONE | CLASS

SUBMITTED FOR APPROVAL: F.W. Schroer 7-8-92 | APPROVAL RECOMMENDED: 7-8-92 | DRAWING APPROVED: 7-8-92

DOE PROJECT NO.	OPER. CONTRACT NO.	CONTRAC NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00577	P-22	0



NOTES

1. LINES ARE ELECTRIC HEAT TRACED AND INSULATED ONLY IN THE OUTDOOR TANK CONTAINMENT AREA AND ON THE OUTDOOR ABOVE GROUND PIPE RACKS.
2. UNLOADING ARM TO BE FURNISHED WITH DRY BREAK TYPE QUICK-DISCONNECT COUPLING.
3. TREATED WATER CONNECTION TO BACKWASH DUPLEX FILTER 51-X141-FLT, OR CONNECTION TO SEND CONTAMINATED ACID BACK TO SPILL SUMP. WHEN AUTOMATIC VALVE FV-643 IS OPENED AT HOSE CONNECTION AUTOMATIC VALVE FV-644 WILL CLOSE.
4. EAST ACID/ALUM SPILL SUMP IS ADJACENT TO EAST RAIN SUMP.
5. 4 INCH BUTTERFLY VALVE IS SPEC. No.V-505.
6. LOCAL SAMPLE CONNECTION; FOR DETAIL. SEE APPENDIX I OF SPEC. 02902-3502
7. ONE 1/8" DIA. HOLE IN EACH INLET DIP PIPE. 8" BELOW TOP OF TANK SHELL.
8. 1½" CHEMICAL TRANSFER HOSE; SMOOTH BORE TEFLON LINED, WITH STAINLESS STEEL BRAIDED COVER, 150LB. ANSI STAINLESS STEEL FLANGED ENDS, 1'-0" LONG. RESISTOFLEX TYPE TMH, OR APPROVED EQUAL.
9. SAME AS NOTE 8. EXECPT 2" SIZE.
10. OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426.

INDUSTRIAL WASTE DISPOSAL APPROVED OHIO ENVIRONMENTAL PROTECTION AGENCY AS EVIDENCED BY THE UNITED STATES DEPARTMENT OF ENERGY FEMP/ASD ENVIRONMENTAL MANAGEMENT PROJECT HERETO ATTACHED

WE DRAWING PREPARED BY: A.T. KINNEY, INC. CONSULTING ENGINEERS CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. N-77207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

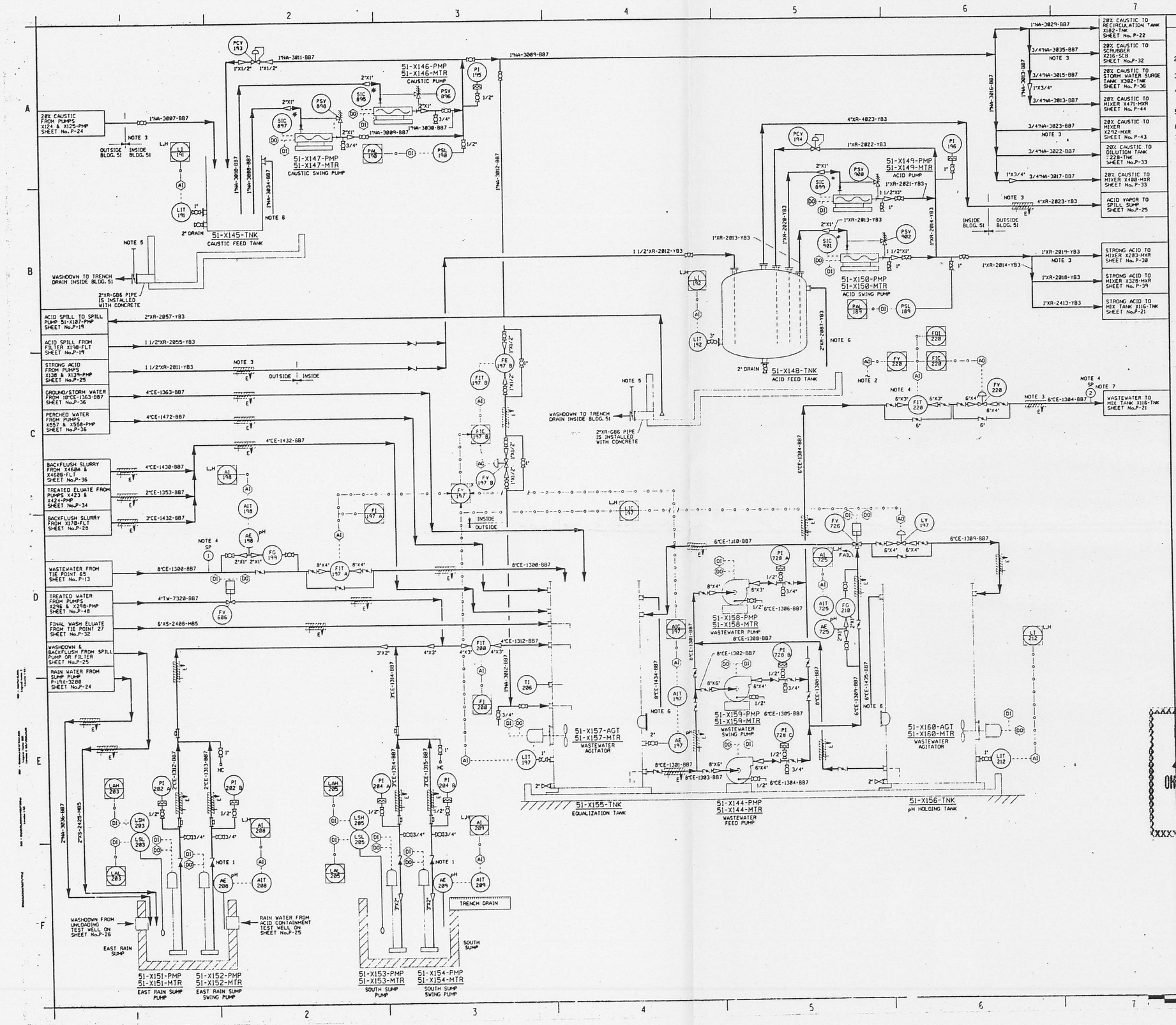
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE PIPING & INSTRUMENTATION DIAGRAM ACID UNLOADING & STORAGE

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
KDG	10-90	GDH	5-92	WDB	6-92
PLANT/BLDG. No. FEMP BLDG. 51		FLOW		SCALE NONE	CLASS

SUBMITTED FOR APPROVAL: F.W. Schmidt 7-8-92 — APPROVAL RECOMMENDED: T. L. Bennett — DRAWING APPROVED: G.R. Hughes 7-8-92

OPERATING CONTRACTOR — DATE — DOE REPRESENTATIVE — DATE

DOE PROJECT NO.	OPERATING CONTRACT NO.	OPTIONAL NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00579	P-25	0



NOTES

1. SUMP PUMP DISCHARGE CHECK VALVE ELEVATION HIGHER THAN CONTAINMENT WALLS.
2. THIS ANALCG OUTPUT SIGNAL IS A REMOTE SETPOINT INPUT TO WIC-795 SHOWN ON DWG. P-21.
3. ELECTRIC TRACE AND INSULATE ACID, CAUSTIC, AND WATER LINES OUTSIDE BUILDING 51.
4. CENTRALIZED SAMPLE CONNECTION FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
5. 2 INCH ALLOY 20150 LB. ANSI R.F. GATE VALVE IS SPEC. No.V-105.
6. TANK OVERFLOW LINE TO EXTEND TO 6" ABOVE SLAB.
7. SAMPLE CONNECTION SP-2 TO BE INSIDE BUILDING 51.

TO CORRELATE REFERENCED "AMK SHEET No's" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING No.: 51D-4445-X-00425 & 51D-4445-X-00426

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF LETTER DATED
UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

WEMCO SUBCONTRACT NO. W-17207 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

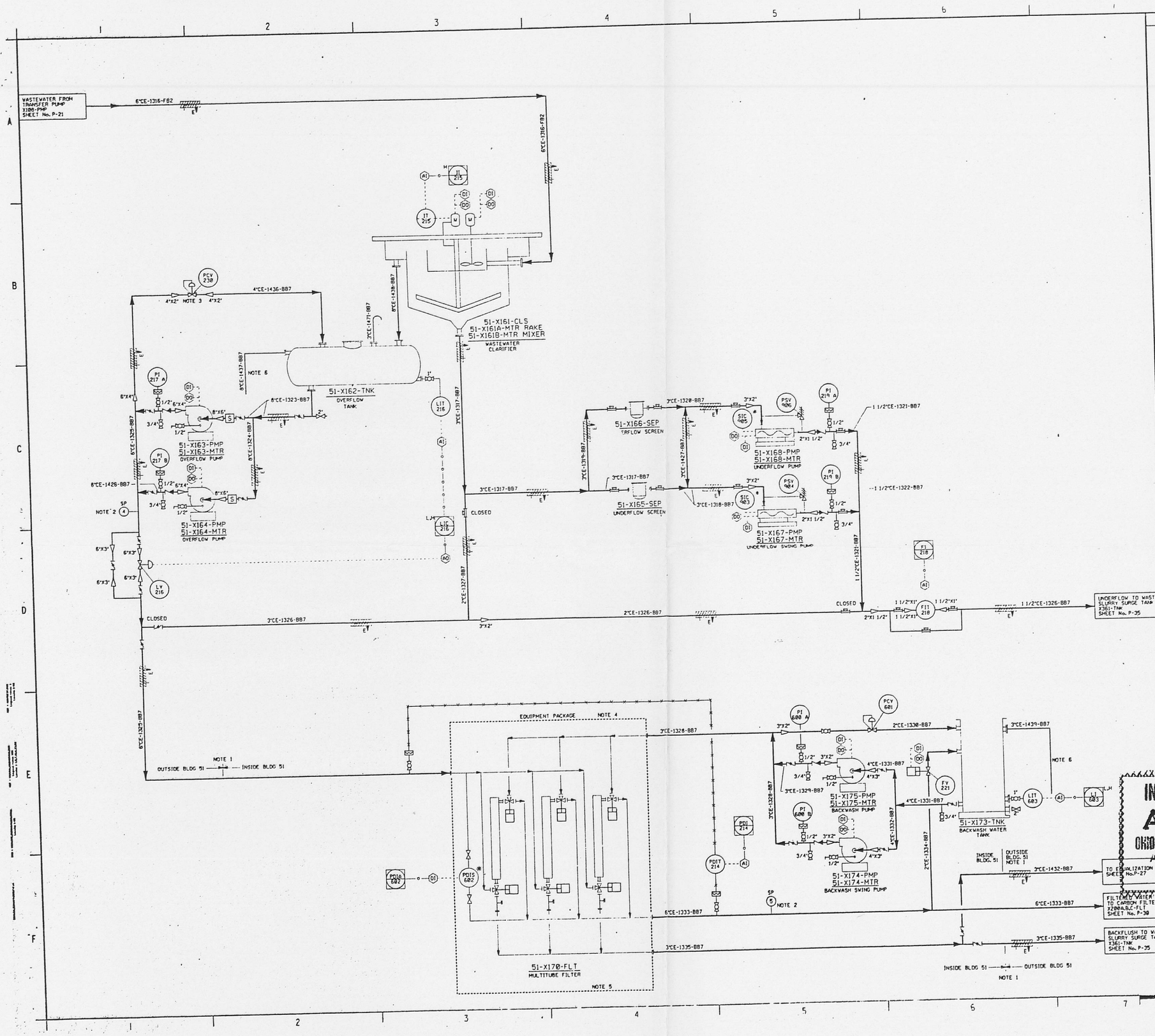
DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE PIPING & INSTRUMENTATION DIAGRAM 400 GPM EQUALIZATION

DRAWN BY	DATE	DESIGNED, CHECKED BY	DATE	CHECKED BY	DATE
JEL	10-90	REA	5-92	VDB	6-92

PLANT/BLDG. NO.: FEMP BLDG. 51 — FLOOR — SCALE: NONE — SCALE

SUBMITTED FOR APPROVAL: FW Schroeder — DATE 7-8-92 — WEMCO CONTRACTOR — APPROVAL RECOMMENDED — CERTIFIED CORRECT: JR Hughes — DATE 7-8-92

DOE PROJECT NO.	DWG. CATG. NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00508	P-27	0



NOTES

1. WATER PIPING OUTSIDE OF BLDG. 51 IS ELECTRIC HEAT TRACED AND INSULATED.
2. CENTRALIZED SAMPLE CONNECTION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
3. THIS PCV ALLOWS CONTINUOUS RECYCLE FLOW DURING COLDER WINTER WEATHER.
4. TUBE FILTER FLOW VALVES ARE OPENED AND CLOSED BY BACKWASH CONTROLLER. ALL FILTERS OPERATE IN PARALLEL WHEN ONE IS BACKWASHING.
5. TUBE FILTER BACKWASH WATER AND TIME PERIODS ARE REGULATED BY BACKWASH CONTROLLER.
6. TANK OVERFLOW LINE TO EXTEND TO 6' ABOVE SLAB.

TO CORRELATE REFERENCED "AMK SHEET NO'S" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING NO.: 51D-4445-X-00425 AND 51D-4445-X-00426

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY SIGNATURE OF
ENVIRONMENTAL HEALTH & SAFETY IMPROVEMENTS

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

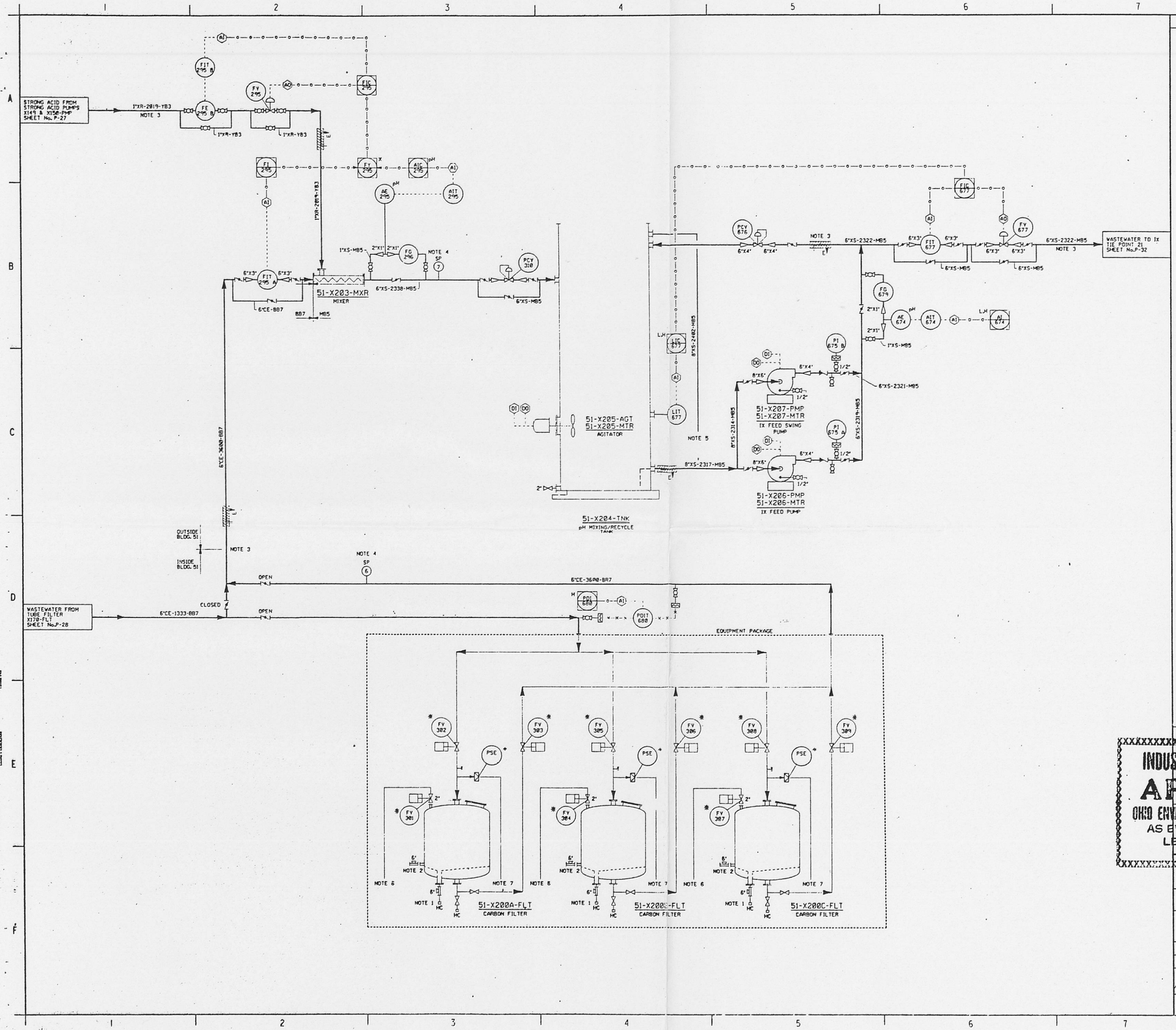
PROJECT NO. 02902

WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
400 GPM PREFILTRATION

DRAWN BY	DATE	DESIGNED BY	DATE	CHECKED BY	DATE
KDG	10-90	REA	5-92	VDB	6-92

FEMP BLDG. 51 — FLOOR — SCALE: NONE

CONTRACT NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02	51D-4445-P-00581	P-28 0



NOTES

1. CONNECTIONS FOR REMOVAL OF SPENT ACTIVATED CARBON USING A PORTABLE HYDRAULIC UNIT.
2. CARBON SAMPLING PORT AND SLUICING WATER INLET ON SIDE OPPOSITE BOTTOM CONNECTION FOR REMOVAL OF SPENT CARBON.
3. ELECTRIC TRACE AND INSULATE ACID AND WATER LINES OUTSIDE BUILDING 51.
4. CENTRALIZED SAMPLE CONNCETION; FOR DETAIL, SEE APPENDIX I OF SPEC. 02902-3502 AND P&ID SHEET No.P-45.
5. TANK OVERFLOW LINE TO EXTEND TO 6' ABOVE SLAB.
6. VENT LINE TO EXTEND TO 6' ABOVE SLAB.
7. SAFETY RELIEF DISCHARGE LINE TO EXTEND TO 6' ABOVE SLAB.

TO CORRELATE REFERENCED "AMK SHEET NO'S" TO FEMP DRAWING NUMBERS, SEE FEMP DRAWING NO.: 51D-4445-X-00425 AND 51D-4445-X-00426

INDUSTRIAL WASTE DISPOSAL
APPROVED
OHIO ENVIRONMENTAL PROTECTION AGENCY
AS EVIDENCED BY COPY OF
LETTER ATTACHED

FOR O.E.P.A. USE ONLY	3/11 -1-92	
O.E.P.A.	SIGNATURE	DATE
	INITIALS AND DATE	

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

PREPARED BY
A. M. KINNEY, INC.
CONSULTING ENGINEERS
CINCINNATI, OHIO

NEMCO SUBCONTRACT NO. N-17201 — A-E PROJECT NO. 02902

PROJECT NAME: ENVIRONMENTAL, HEALTH & SAFETY IMPROVEMENTS

DRAWING TITLE: WASTEWATER TREATMENT IMPROVEMENTS - PLANTWIDE
PIPING & INSTRUMENTATION DIAGRAM
400 GPM CARBON FILTERS

DRAWN BY	DATE	DESIGNED/CHECKED BY	DATE	CHECKED BY	DATE
KDG	12-90	REA	5-92	WDB	6-92
PLANT/BLDG. NO. FEMP BLDG. 51		FLOOR		SCALE NONE	CLASS

SUBMITTED FOR APPROVAL — APPROVAL RECOMMENDED — CONTRACT APPROVAL
F. W. Schmidt — R. E. Deere — J. E. Hawkins
DATE 7-1-92 — REQUESTING CONTRACTOR — DATE 7/14/92 — DOE PROJECT ENGINEER — DATE 7-6-92

U.S. PROJECT NO.	OPER. CONTROL NO.	UNIT NO.	DRAWING NO.	SHEET NO.	REV. NO.
87-D-159	0087502 WBS 1.1.2.4.01.02		51D-4445-P-00582	P-30	0