Recycling and Beneficial Reuse

APPENDIX E2
FIELD DEMONSTRATION

U.S. Army Engineer District, Buffalo • 1776 Niagara Street • Buffalo New York 14207

DEMONSTRATION OF MANUFACTURED SOIL FROM DREDGED MATERIAL, ORGANIC WASTE AND BIOSOLIDS

Introduction

The U.S. Army Corps of Engineers, Buffalo District, has identified manufactured soil as one of it's long-term management alternatives for dredged material removed from the Toledo Harbor. Preliminary screening tests at the U.S. Army Engineer Waterways Experiment Station and at Scott's Company Marysville, OH research facility have shown the dredged material in Cell 1 can produce a high quality soil material for landscaping or a bagged soil product (Lee et al. 1996). The WES tests indicated a blend of dredged material, cellulose (sawdust or yard waste) and N-Viro biosolids produced a fertile soil. Additional screening tests were conducted and indicated that a higher percentage of dredged material in the blend gave similar results to the lower dredged material mixture. This document describes a demonstration project of manufactured soil using a composition of dredged material plus yard waste and N-Viro biosolids and conducted 19-24 September 1996 in Toledo, OH.

Projected Characteristics of the Manufactured Soil

The expected physical and chemical composition of the manufactured soil are shown in Tables 1-5. The manufactured soil should not contain any contaminants that should be of a concern and can be used unrestricted for any landscaping purpose. For example, the metal concentrations in the manufactured soil will be a fraction of the concentrations allowed for unrestricted land use for land receiving biosolids from reconditioned sewage sludge according to the USEPA's Section 503 regulation guidance (Table 6).

Site of Manufacturing Soil

An area approximately 400 x 400 ft was cleared of all vegetation within Cell 1 of the U.S. Army Corps of Engineers' Toledo Harbor Confined Disposal Facility (Figure 1, photographs 1 and 2). The removed vegetation was windrowed and prepared as a compost pile on site. The surface foot of dredged material was removed and used to construct a 100 x 200 ft pad for processing the manufactured soil (Figure 2, photograph 3). Any weed seed existing on the soil surface of the CDF should be contained in the surface foot of dredged material and therefore should be removed and incorporated into the pad. Manufactured soil was prepared from the next foot depth of dredged material from the CDF that was pushed into a pile at the rear of the processing pad (photograph 4). The maximum amount of dredged material required for the demonstration was estimated at 1,800 cu yd (200 x 205 ft area, 1 foot deep). The general layout of the manufactured soil process is shown in Figure 2. Yard waste (maximum 140 cu yd) was delivered to the site and piled in a 30 x 30 ft area near the blending equipment (photographs 5, 6 and 7). N-Viro biosolids (maximum 140 cu yd) was delivered to the site and piled in a in a 30 x 30 ft area near the blending equipment (photograph 6).

The blending equipment was delivered and positioned on the processing pad near the yard waste, N-Viro and dredged material stock piles (photographs 8, 9, and 10). Manufactured soil was produced by adding dredged material, then yard waste and N-Viro to the blending equipment with a frontend loader (photographs 11, 12 and 13). The batch was blended with a rotary screen and released from the equipment (photographs 14, 15 and 16). The manufactured soil was stock piled (approximately 100 ft x 100 ft) until delivered to the demonstration sites at the University of Toledo or the Toledo Botanical Garden.

During the production of manufactured soil, the excavated areas around the processing pad were used to collect all storm runoff water (photograph 17). No discharge occurred from the excavated areas, all stormwater was collected and held.

Collection and Transport of Materials

Dredged material was obtained within Cell 1 with a bulldozer from the 250 x 405 foot area shown in Figure 2, photograph 4. Yard waste was obtained from the Kurtz Brothers' Company compost processing plant at Greenleaf and transported to the Toledo Harbor Cell 1 site by 40 cu yd truck (photograph 5, 6 and 7). A maximum of three truck loads of yard waste were delivered. The route to be followed by these trucks will be from the Kurtz Brothers' Processing site at Evergreen Landfill, turning left onto East Broadway, then right onto Wales Rd, onto I-280 North to Front St. exit. Proceed north on Front St. to Millard Ave; turn left on Millard Ave, proceed to Otter Creek Road. Turn left and follow Otter Creek Road past the Edison Plant entrance gate and turn left on a gravel road to the back gate of the Plant. N-Viro biosolids was obtained from the Toledo Wastewater Treatment Facility/N-Viro Facility on Simural St and transported by truck (20 cu yd capacity). A maximum of six truck loads of N-Viro was delivered. The routes used are shown in Figures 3 and 4. The trucks were covered and sealed prior to transport in accordance with DOT regulations, so that no material blew out or fell out of the truck during transport. Manufactured soil was placed in trucks with a frontend loader (photograph 18), sealed and covered at Cell 1 (photograph 19), so no material fell or blew out of the truck during transport to the field demonstration sites.

A map of the routes to be used to deliver manufactured soil to the field demonstration sites is presented in Figures 5 and 6. Twenty-five trucks were used to deliver 500 cu yd to the University of Toledo (photographs 20 and 21). The route followed was to leave the Cell 1 processing site through the back gate of the Edison Plant, right onto Otter Creek Road, right onto Millard Ave, left onto Front Road to Hwy 65 to I-75. Enter I-75 north and exit onto WEST 475 to Douglas Rd exit. Turn left onto Douglas Rd south to Dorr St. The front entrance of University of Toledo was located on the right and left sides at the stop light at the intersection of Douglas Rd and Dorr St. (photographs 22 and 23). Twelve trucks were required to deliver 160 cu yd of manufactured soil to the Toledo Botanical Garden. Nine truck loads were delivered to a parking lot near the entrance to the Botanical Garden to be used to increase the level of soil in the soil beds on both sides of the entrance (photographs 28, 29, 30 and 31) .

The remaining three truck loads were delivered to the maintenance facility off Bancroft St. The route followed was to leave the Cell 1 processing site through the back gate of the Edison Plant, right onto Otter Creek Road to Millard Ave, right on Millard Ave to Front St. Left on Front St. to Hwy 65 to I-75. Enter I-75 north and turn onto I-475 West to I-475 and 23 south to Central Ave. Turn onto Central Ave East to Reynolds Rd, right on Reynolds Rd to Rondeal St to the front entrance of the Toledo Botanical Garden. The remaining three trucks continue down Reynolds Ave. to Bancroft St. Turn right onto Bancroft St., proceed to the entrance road (before a yellow house on the right) that leads through a locked fence to the maintenance facility of the Botanical Garden.

Field Demonstration Sites

University of Toledo

Two entrance sites for the University of Toledo were used for the demonstration. Both sites consisted of a grassed lawn, Christmas trees toward the back of the area with a small shrub landscaped area around the entrance signs to the University. The University staff, Mr. Mike Young, used the manufactured soil to complete the landscaping. Manufactured soil was delivered to the demonstration site (photographs 22 and 23) and Mr. Young completed the landscaping (photographs 24, 25, 26 and 27).

Toledo Botanical Garden

Manufactured soil was delivered to a parking lot near the entrance to the Botanical Garden (photograph 28). The manufactured soil was used to increase the elevation of soil beds behind a hedge at the entrance to the Botanical Garden (photographs 29, 30, 31, 32 and 33). The remaining material will be used to rework other soil beds and landscaping needs throughout the Botanical Garden.

Monitoring

Source Materials

Each source material was sampled for any necessary physical and chemical analyses desired. The finished manufactured soil was also sampled for quality control observations and measurements. Physical and chemical analyses of the finished manufactured soil materials are being conducted. All samples will be archived for any further tested, if required. An analysis of the N-Viro biosolids used in the demonstration is presented in Appendix A.

Demonstration sites will be monitored by observation and photographed periodically to document the success of the demonstration. Grass lawn areas will be mowed and fertilized using standard operational procedures at the University of Toledo. Maintenance of the shrub and tree landscaped areas will also use standard operating procedures.

A log or diary of observations and any problems experienced at these demonstration areas was recommended to the University staff. Periodic inspection of the demonstration areas will be conducted by personnel of the cooperating entities, WES, Buffalo District, N-Viro, and Terraforms (formerly Abaris Design).

Project Activities

Each activity of this project was recorded and documented with either photographs, slides and/or video. Copies of these materials will be made available to the cooperating parties as well as other interested parties.

PROJECT SCHEDULE

The processing of manufactured soil from dredged material from Cell 1 and yard waste and N-Viro biosolids was initiated on 19 Sep 1996 and continued until 24 Sep 1996. The delivery of the source materials, yard waste and N-Viro was initiated on 19 Sep. The delivery of the manufactured soil was initiated on 21 Sep 1996 and was completed on 23 Sep 1996. The demonstration areas at the University of Toledo were planted as soon as the University staff could accomplish the plantings. The demonstration area at the entrance to the Toledo Botanical Garden was accomplished soon after 23 Sep 1996.

Points of Contact

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Mr. Douglas Truman, Toledo Botanical Garden, (419) 936-2986

Table 1. Toledo Harbor CDF Cell 1 Pesticides Concentrations 1994-1995 (mg/kg).

Parameters	94 Site 1 0'- 4'	95 Site 1 0'- 3'	94 Site 1 4'- 8'	95 Site 1 3'- 6'	95 Site 1 6'- 9'	94 Site 1 8'- 12'	95 Site 1 9'- 12	94 Site 2 0'- 4'	94 Site 2 4'- 8'	94 Site 2 8'- 12'	94 Site 3 0'- 4'	94 Site 3 4'- 8'
ALDRIN	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	<0.0017	<0.0018	0.0039	<0.0075	<0.0075	<0.0075	<0.0075
A-BHC	<0.0014	<0.0014	<0.0015	<0.0014	<0.0014	<0.0013	<0.0013	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
B-BHC	<0.0029	<0.0027	<0.0030	<0.0027	<0.0028	<0.0026	<0.0027	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
G-BHC	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	<0.0017	<0.0018	0.0013	<0.0075	<0.0075	<0.0075	0.0014
D-BHC	<0.00044	<0.00043	<0.0045	<0.00041	<0.00042	<0.00042	<0.00040	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
PPDDD	0.0041	0.0041	0.0078	0.0067	0.0081	0.0078	0.0084	0.0035	0.0058	0.0082	0.0038	0.0034
PPDDE	0.0063	0.0064	0.0069	0.0069	0.0068	0.0059	0.0064	0.0062	0.0069	0.0070	0.0054	0.0047
PPDDT	0.013	0.012	0.017	0.018	0.028	0.013	0.016	0.0023	0.0037	0.0038	0.0026	0.0025
HPTCL	<0.0014	<0.0014	<0.0015	<0.0014	<0.0014	<0.0013	<0.0013	<0.011	<0.011	0.0032	<0.011	0.0011
DIELDRIN	<0.00096	<0.00094	<0.00098	0.0060	0.0059	<0.00087	<0.00089	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
ENDOI	<0.0067	<0.0065	<0.0068	<0.0063	<0.0065	<0.0061	<0.0062	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
ENDOII	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	<0.0017	<0.0018	<0.015	<0.015	<0.015	<0.015	<0.015
ENDOSU	<0.032	<0.031	<0.0033	<0.030	<0.031	<0.029	<0.030	<0.015	<0.015	0.00099	<0.015	<0.015
ENDRIN	0.0026	0.0022	0.0037	0.0051	0.0030	0.0034	0.0033	0.0047	<0.023	<0.023	0.0040	0.0038
ENDALD	<0.011	<0.011	0.0020	<0.010	0.0021	0.0016	0.0018	<0.015	<0.015	<0.015	<0.015	<0.015
HPTCLE	<0.039	<0.038	<0.040	<0.037	<0.038	<0.036	<0.036	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
METOXYCL	<0.084	<0.083	<0.086	<0.079	<0.081	<0.077	<0.078	<0.0075	0.0080	<0.0075	<0.0075	0.0053
CLORDANE	<0.0067	<0.0065	<0.0068	<0.0063	<0.0065	<0.0061	<0.0062	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
TOXAPHEN	<0.11	<0.11	<0.12	<0.11	<0.11	<0.10	<0.11	<0.015	<0.15	<0.15	<0.15	<0.15

Table 2. Toledo Harbor CDF Cell 1 PAH Concentrations 1994-1995 (mk/kg).

Parameters	94 Site 1 0'- 4'	95 Site 1 0'- 3'	94 Site 1 4'- 8'	95 Site 1 3'- 6'	95 Site 1 6'- 9'	94 Site 1 8'- 12'	95 Site 1 9'- 12'	94 Site 2 0'- 4'	94 Site 2 4'- 8'	94 Site 2 8'- 12'	94 Site 3 0'- 4'	94 Site 3 4'- 8'
NAPHTH	0.054	0.044	0.13	0.21	0.16	0.24	0.23	0.054	0.11	0.11	0.067	0.075
ACENAY	<0.48	<0.48	<0.50	<0.46	<0.47	<0.44	<0.44	<0.47	<0.47	<0.44	<0.49	<0.44
ACENAP	<0.48	<0.48	0.051	0.050	<0.47	0.044	0.035	<0.47	<0.47	<0.44	<0.49	<0.44
FLUORE	0.031	0.026	0.096	0.093	0.048	0.079	0.072	<0.47	<0.47	0.053	<0.49	<0.44
PHENAN	0.22	0.21	0.52	0.60	0.36	0.40	0.36	0.21	0.30	0.27	0.19	0.22
ANTRAC	0.046	0.040	0.19	0.16	0.087	0.13	0.10	0.047	0.065	0.073	0.041	0.059
FLANTHE	0.29	0.31	0.77	0.78	0.42	0.70	0.52	0.37	0.39	0.43	0.32	0.34
PYRENE	0.32	0.35	0.83	0.78	0.49	0.69	0.53	0.39	0.40	0.48	0.37	0.36
CHRYSE	0.28	0.27	0.62	0.56	0.45	0.61	0.42	0.31	0.39	0.39	0.26	0.28
BAANTHR	0.18	0.18	0.45	0.41	0.32	0.47	0.31	0.20	0.24	0.26	0.17	0.18
BBFLANT	0.20	0.19	0.41	0.28	0.30	0.32	0.20	0.26	0.37	0.33	0.20	0.19
BKFLANT	0.20	0.15	0.32	0.29	0.21	0.32	0.20	0.27	0.25	0.23	0.20	0.21
BAPYRE	0.17	0.16	0.37	0.33	0.26	0.42	0.25	0.27	0.29	0.29	0.19	0.18
I123PYR	0.14	0.15	0.29	0.27	0.25	0.31	0.18	0.20	0.23	0.21	0.14	0.14
DBAHANT	0.045	0.036	0.097	0.068	0.081	0.093	0.052	0.050	0.075	0.071	<0.49	0.045
B-GHI-PY	0.17	0.12	0.33	0.26	0.26	0.32	0.20	0.21	0.29	0.26	0.16	0.16
2MeNAPH	0.049	0.030	0.090	0.10	0.082	0.074	0.061	<0.47	0.064	0.048	<0.49	0.056
2FLBP-S	57.4%	59.1%	67.4%	67.0%	62.2%	67.5%	66.3%	53.0%	56.2%	57.8%	73.9%	68.1%

Table 3. Toledo Harbor CDF Cell 1 PCB Concentrations 1994-1995 (mg/kg).

Parameters	94 Site 1 0'- 4'	95 Site 1 0'- 3'	94 Site 1 4'- 8'	95 Site 1 3'- 6'	95 Site 1 6'- 9'	94 Site 1 8'- 12'	95 Site 1 9'- 12'	94 Site 2 0'- 4'	94 Site 2 4'- 8'	94 Site 2 8'- 12'	94 Site 3 0'- 4'	94 Site 3 4'- 8'
PCB-1016	<0.029	<0.028	<0.030	<0.027	<0.028	<0.026	<0.027	<0.15	<0.15	<0.15	<0.15	<0.15
PCB-1221	<0.029	<0.028	<0.030	<0.027	<0.028	<0.026	<0.027	<0.15	<0.15	<0.15	<0.15	<0.15
PCB-1232	<0.029	<0.028	<0.030	<0.027	<0.028	<0.026	<0.027	<0.15	<0.15	<0.15	<0.15	<0.15
PCB-1242	<0.029	<0.028	<0.030	<0.027	<0.028	<0.026	<0.027	<0.15	<0.15	<0.15	<0.15	<0.15
PCB-1248	0.064	0.063	0.133	0.133	0.116	0.134	0.159	0.044	0.074	0.103	0.046	0.049
PCB-1254	<0.029	<0.028	<0.030	<0.027	<0.028	<0.026	<0.027	0.018	0.038	0.050	0.019	0.023
PCB-1260	<0.029	<0.028	<0.030	<0.027	<0.028	<0.026	<0.027	<0.15	<0.15	<0.15	<0.15	<0.15

Table 4. Toledo Harbor CDF Cell 1 Metal Concentrations 1994-1995 (mg/kg).

Parameters	94 Site 1 0'- 4'	95 Site 1 0'- 3'	94 Site 1 4'- 8'	95 Site 1 3'- 6'	95 Site 1 6'- 9'	94 Site 1 8'- 12'	95 Site 1 9'- 12'	94 Site 2 0'- 4'	94 Site 2 4'- 8'	94 Site 2 8'- 12'	94 Site 3 0'- 4'	94 Site 3 4'- 8'
Arsenic	8.16	8.20	9.19	8.77	9.34	7.37	6.92	8.08	8.14	8.38	7.52	8.11
Cadmium	1.30	1.40	2.50	1.70	1.80	2.40	1.50	1.40	2.00	1.60	1.10	1.30
Chromium	35.90	33.20	53.50	43.60	42.60	36.00	27.10	33.60	40.40	39.20	29.90	31.20
Copper	35.80	35.70	47.20	41.50	41.20	36.70	28.50	36.20	42.00	39.00	34.50	35.00
Lead	41.60	41.20	55.80	55.50	46.30	41.40	34.10	40.40	47.70	42.10	33.30	33.30
Mercury	1.74	1.78	2.26	2.49	1.94	2.28	2.30	2.20	2.46	1.76	3.06	3.06
Nickel	34.70	35.90	42.50	41.10	38.80	33.20	27.70	35.20	38.40	36.40	33.60	33.20
Zinc	189.00	171.00	193.00	234.00	159.00	127.00	96.20	164.00	192.00	159.00	159.00	169.00

Table 5. Soil fertility analysis and physical characterization of blend 4 consisting of dredged material from cell 1.

Parameters	Blend 4 dredged material + cellulose + biosolids*	Blend 4 dredged material + cellulose + biosolids**
Total Kjeldahl Nitrogen, mg/kg	319.0	157.0
Total Phosphorus, mg/kg	140.86	278.61
Ortho-Phosphate, mg/kg	15.80	4.56
Sulfur, mg/kg	619.50	462.74
Magnesium, mg/kg	210.30	195.15
Sodium, mg/kg	79.84	35.84
Calcium, mg/kg	2867.73	5782.46
Zinc, mg/kg	16.19	10.15
Potassium, mg/kg	260.94	229.84
Organic Matter	21.83	20.00
CEC (Me/100g)	57.7	56.8
pH	7.22	8.42
Base Saturation % (Ca-Mg-K-Acid)	84-10-4-2	93-5-2-0
Particle Size		
Sand %	18.90	
Silt %	58.98	
Clay %	22.12	

* prior to plant growth test
**After the plant growth test

Table 6. Predicted metal concentrations in manufactured soil from the 0-3' surface layer at the Toledo Harbor Cell 1.

Parameter	Dredged Material	Manufactured Soil from Dredged Material		EPA 503 Regulations Limits
		Blend 4	Blend 5	
Metals, ppm				
Arsenic	8.20	5.0	6.6	41
Cadmium	1.40	0.84	1.1	39
Chromium	33.2	19.9	26.6	
Copper	35.7	21.4	28.6	1,500
Lead	41.2	24.7	33.0	300
Mercury	1.78	1.07	1.4	17
Nickel	35.9	21.5	28.7	420
Zinc	171.0	102.6	135.8	2,800

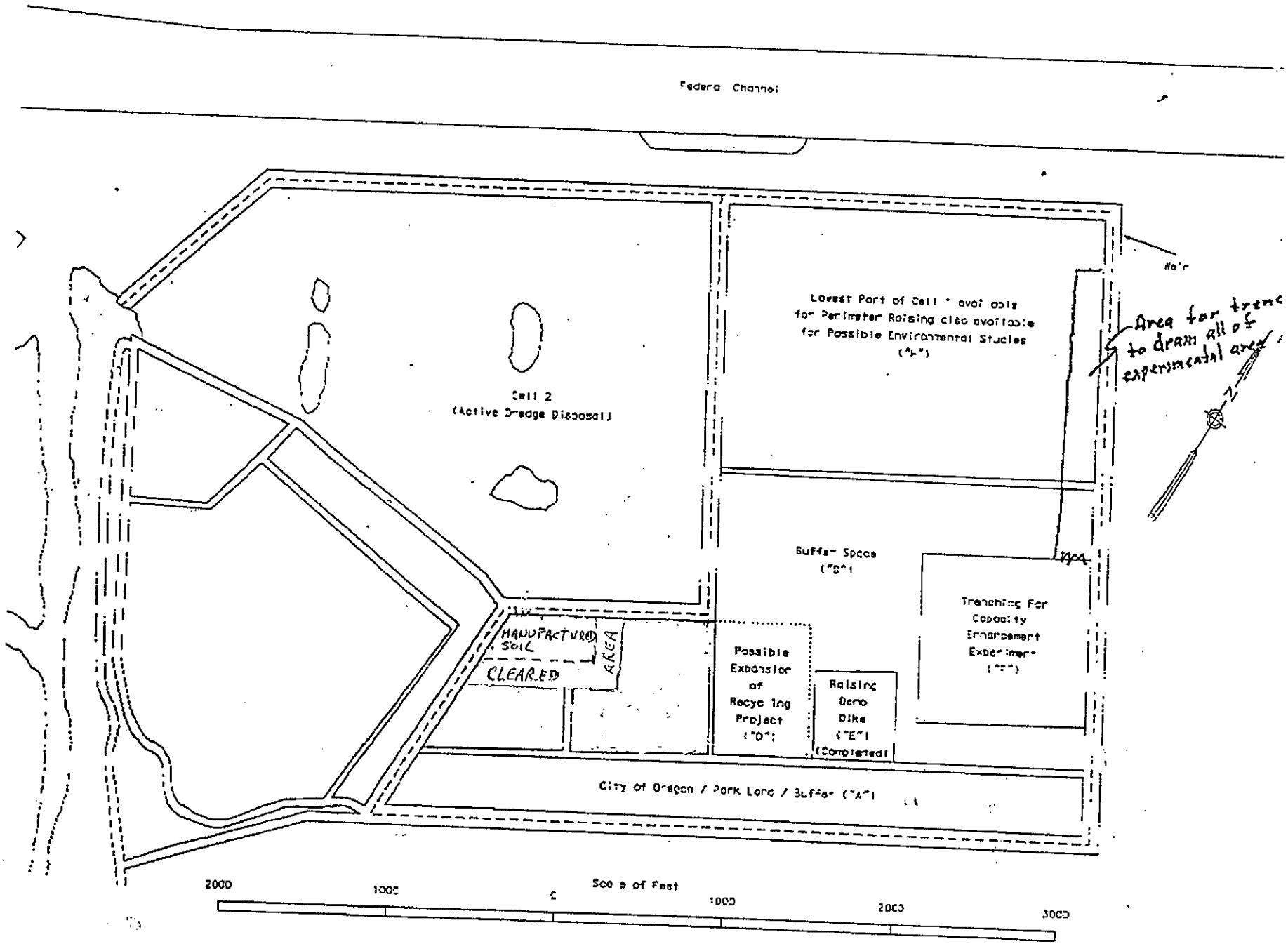
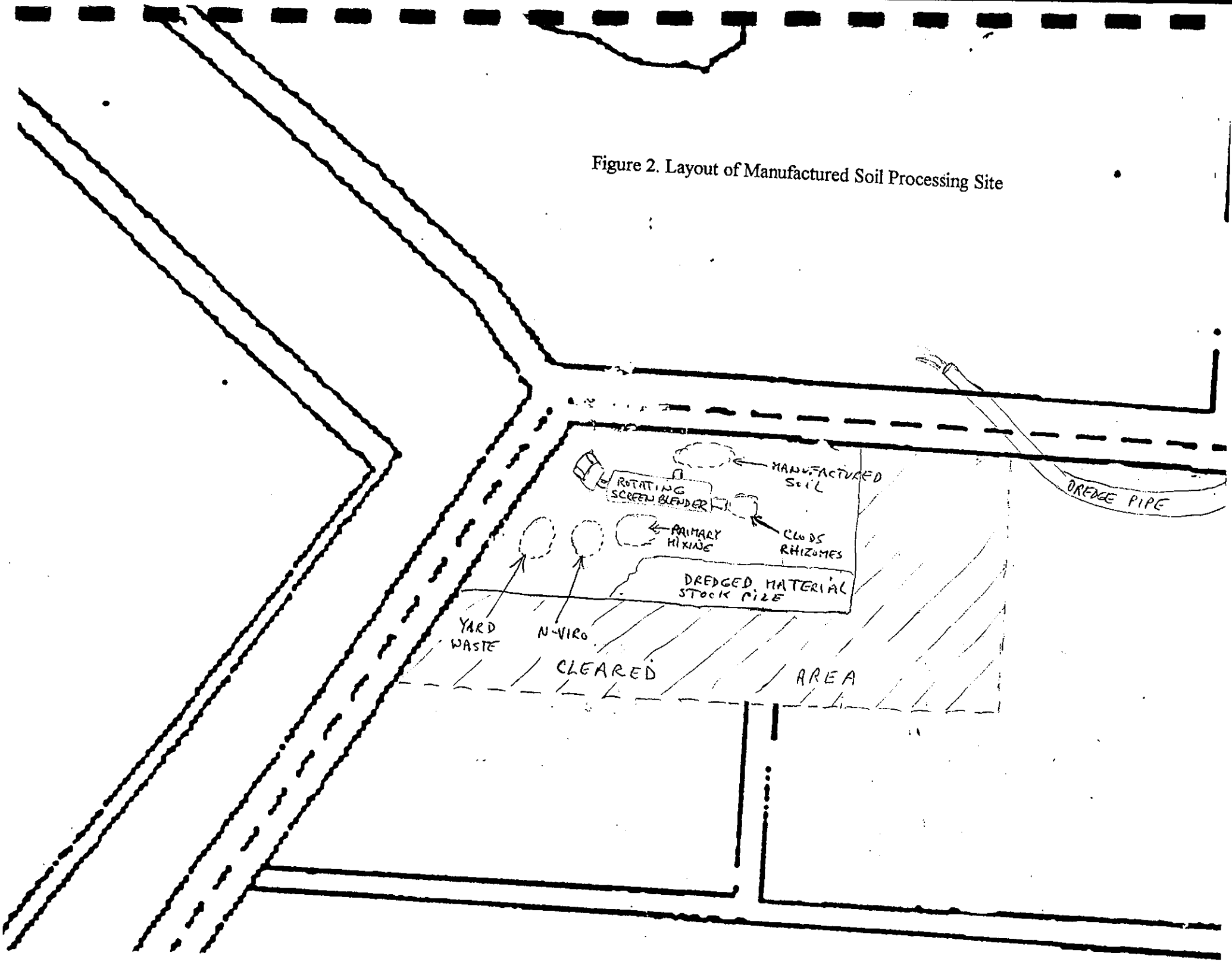


Figure 1. Overall View of Toledo Harbor Confined Disposal Facility

Figure 2. Layout of Manufactured Soil Processing Site



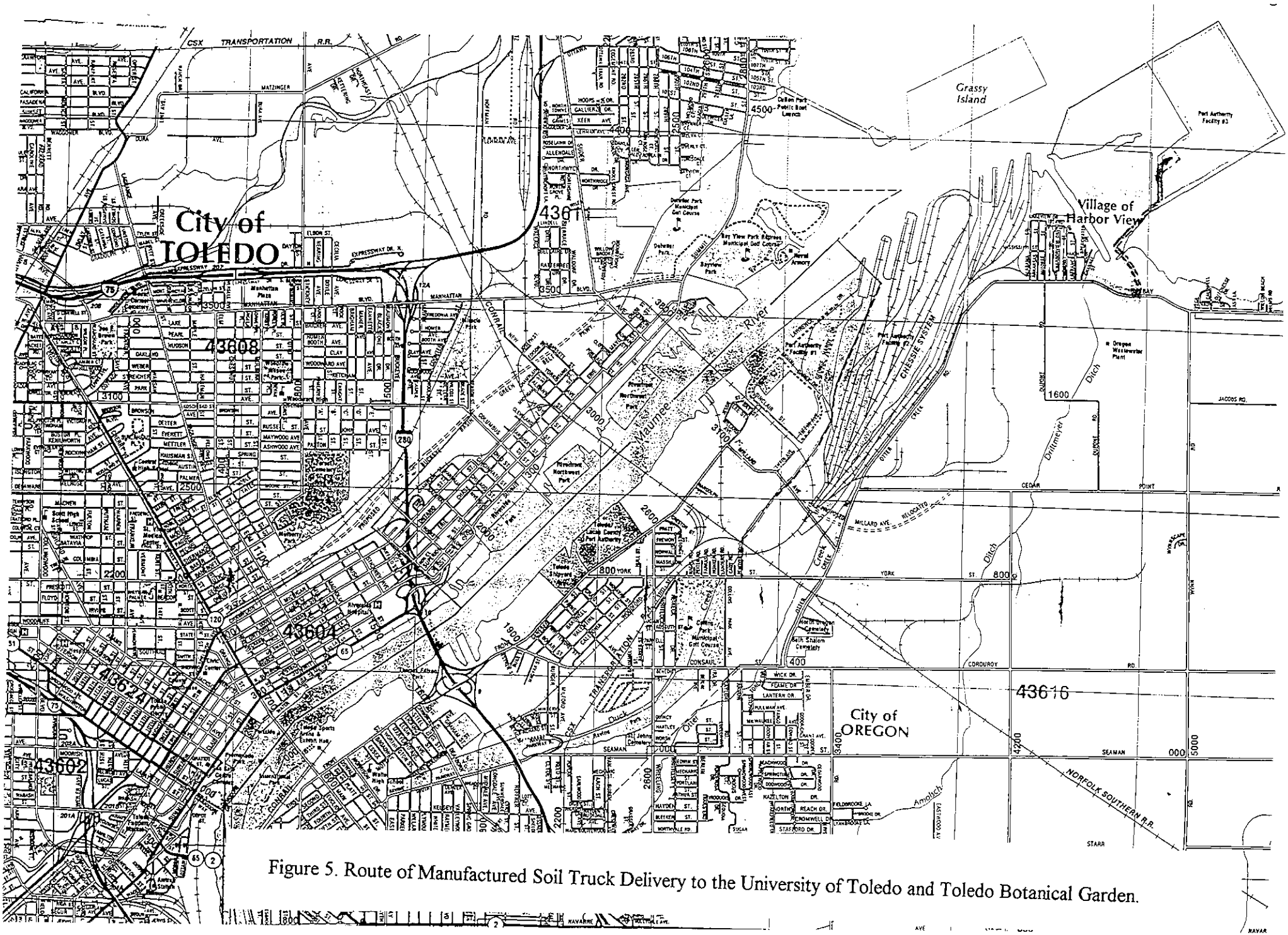


Figure 5. Route of Manufactured Soil Truck Delivery to the University of Toledo and Toledo Botanical Garden.

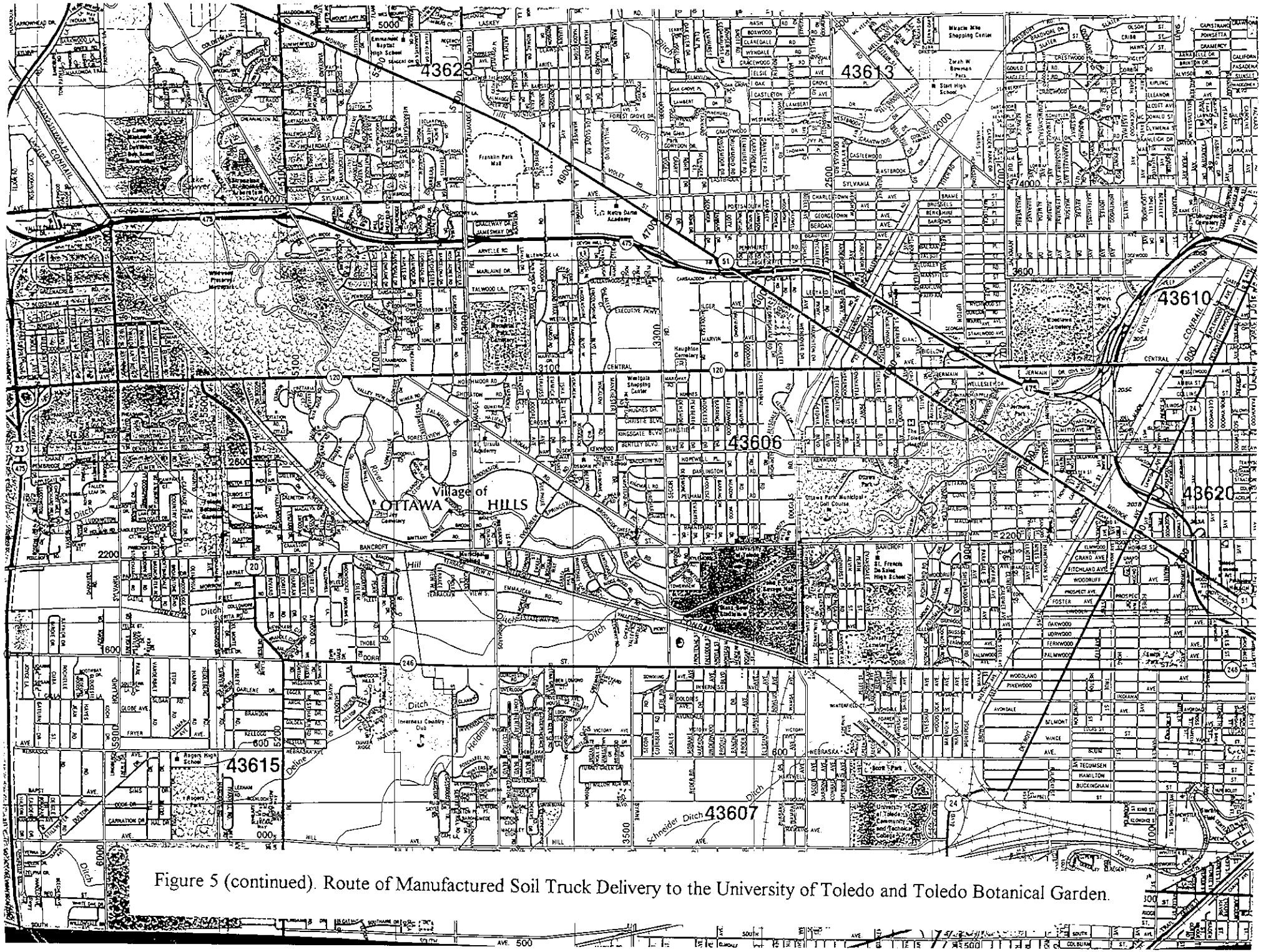


Figure 5 (continued). Route of Manufactured Soil Truck Delivery to the University of Toledo and Toledo Botanical Garden.

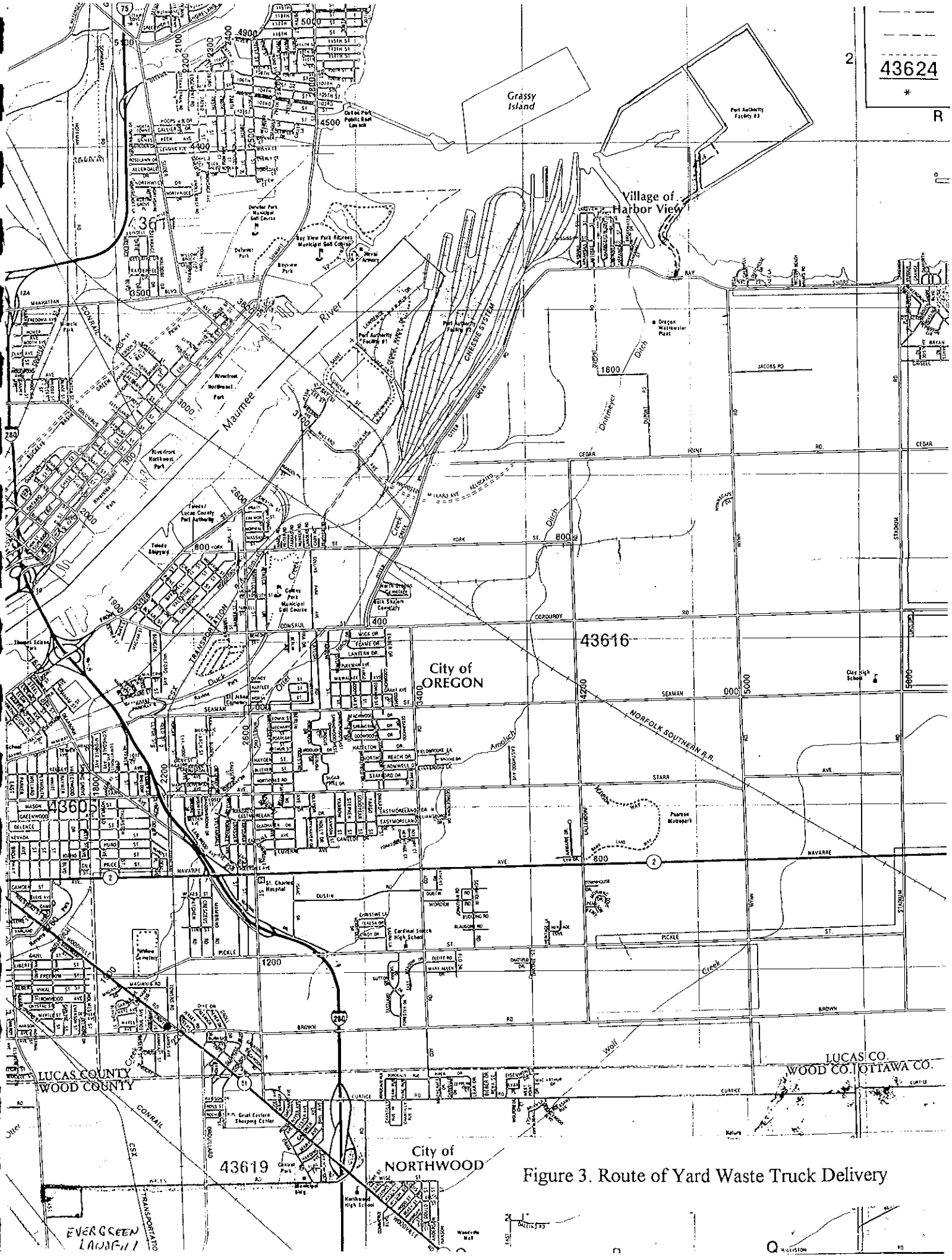


Figure 3. Route of Yard Waste Truck Delivery

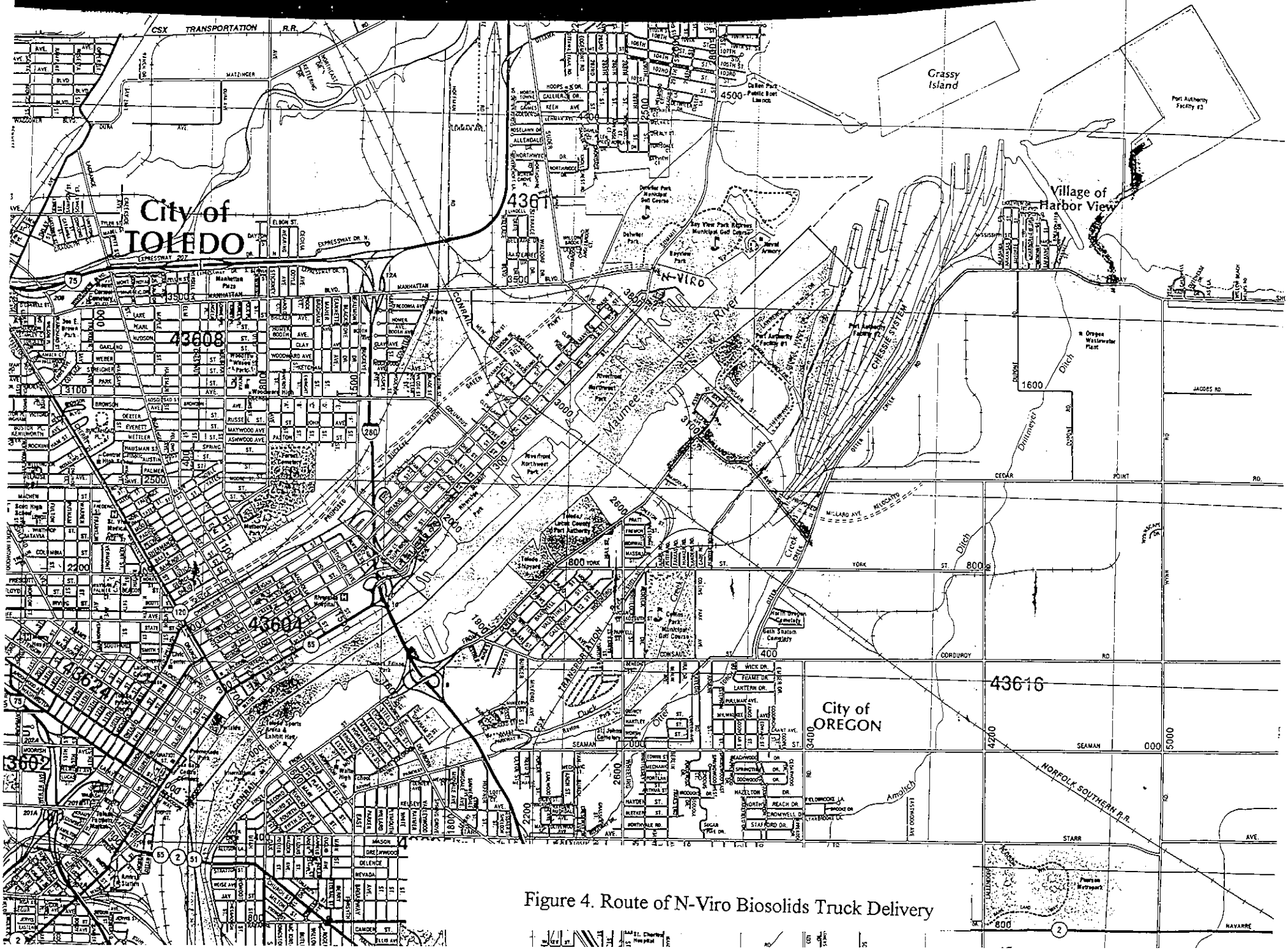


Figure 4. Route of N-Viro Biosolids Truck Delivery

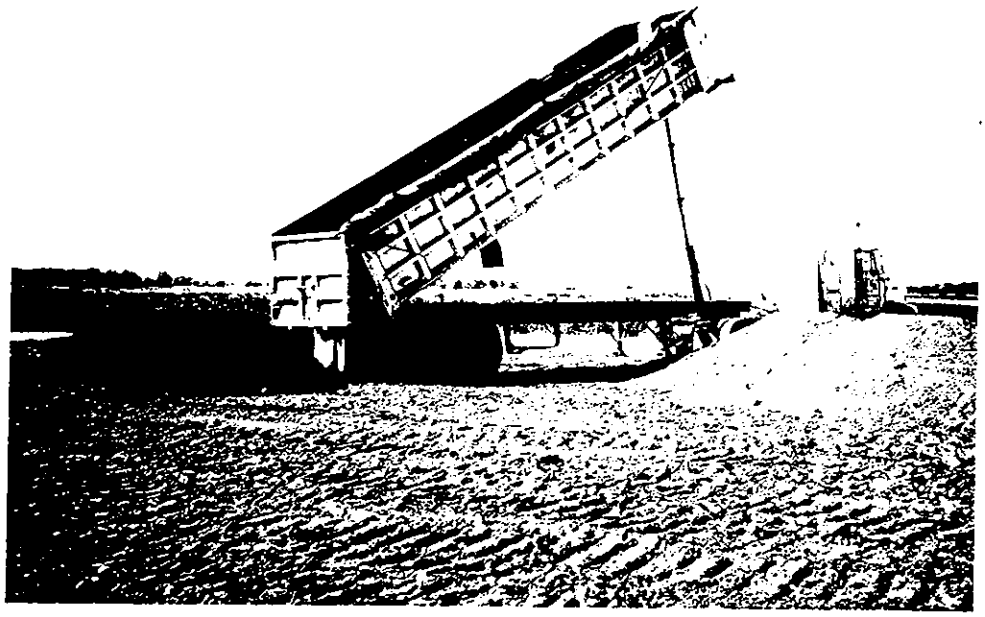
Photograph 1. Clearing and stockpiling vegetation from surface of the Toledo Harbor Confined Disposal Facility.

Photograph 2. Removal of surface dredged material for construction of a processing pad.

Photograph 3. Overview of the processing pad on Cell 1 of the Toledo Harbor CDF.

Photograph 4. Dredged material was piled at the back of the processing pad.

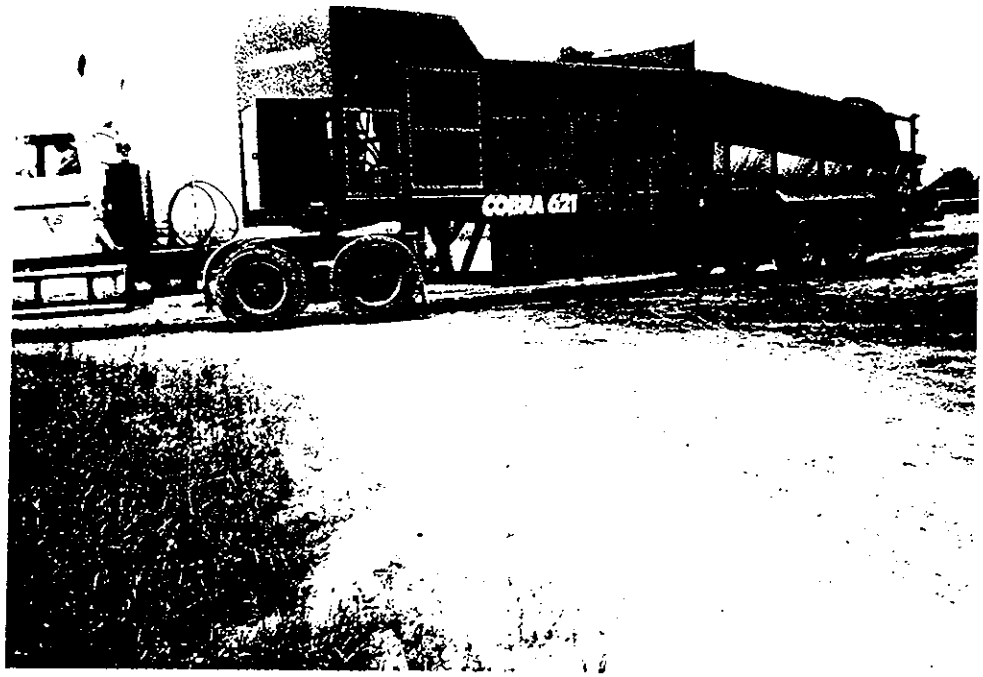
Photograph 5. Yard waste was delivered in a 40 cu yd truck.



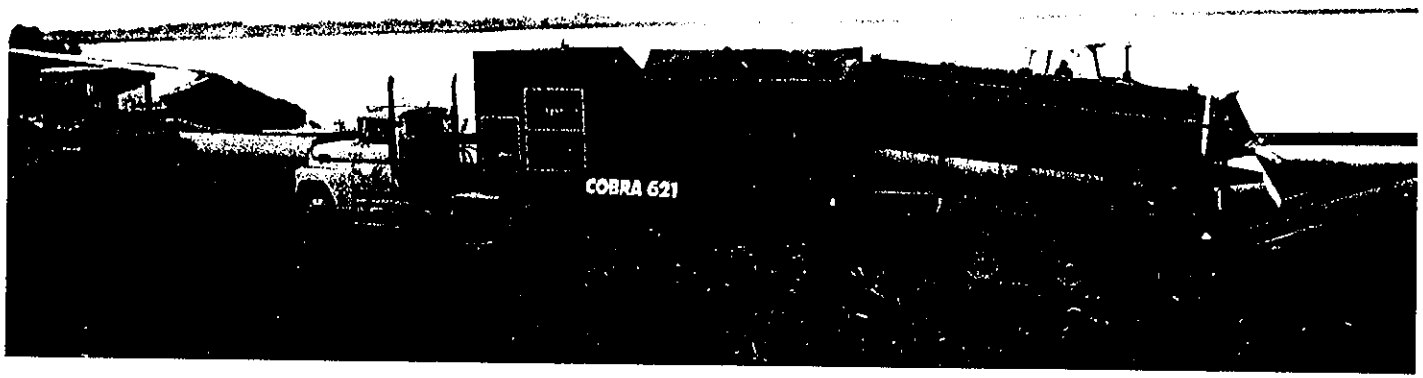
Photograph 6. Yard waste was placed near the N-Viro material (piles on right).

Photograph 7. Dump trucks supplied from the City of Toledo lined up to transport the manufactured soil to the demonstration sites.

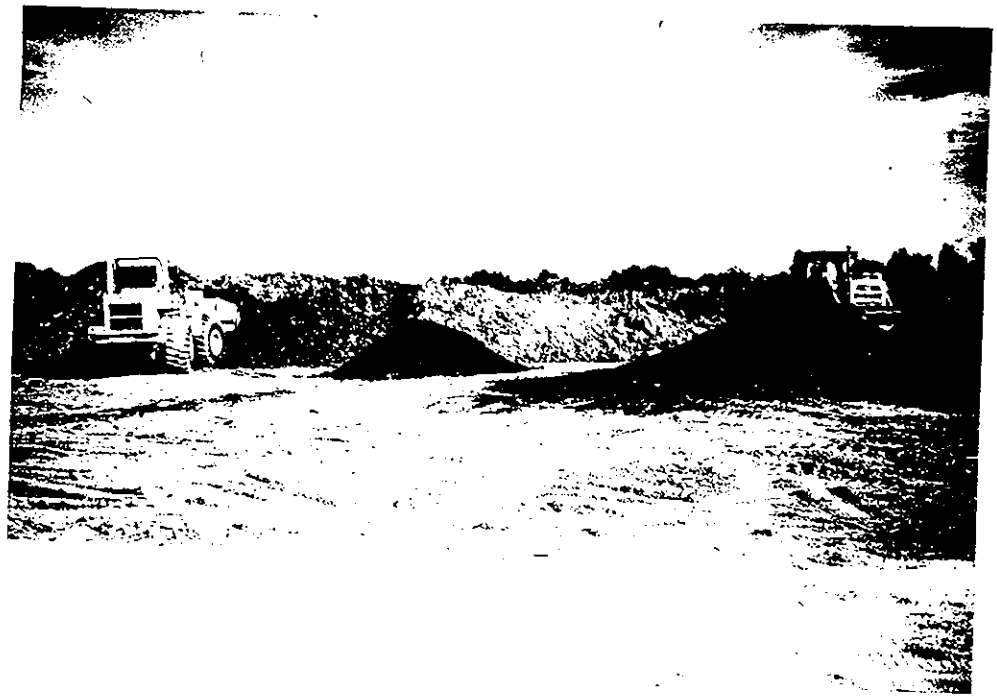
Photograph 8. Rotator screen blender arrived at processing site.



Photograph 9. Rotator screen blended was backed onto processing pad into position.



Photograph 10. Rotator screen blender in position to process manufactured soil.



Photograph 11. Initially yard waste plus N-Viro were mixed together.

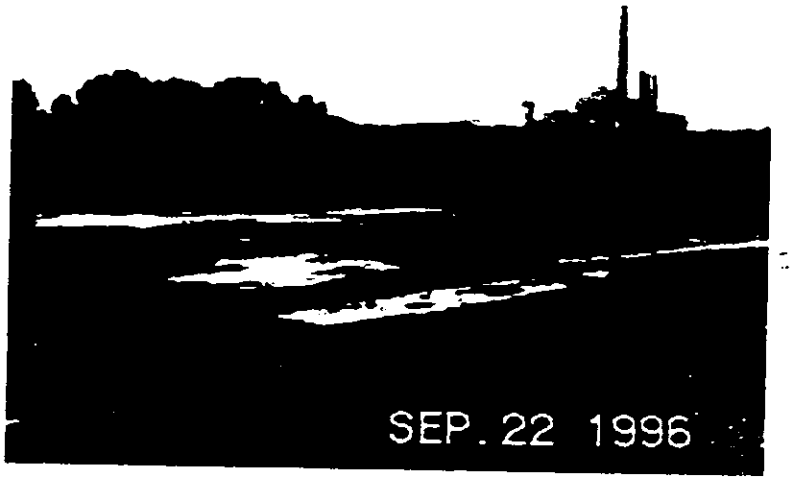
Photograph 12. Dredged material was mixed with the yard waste and N-Viro.

Photograph 13. The mixture was placed into the hopper of a rotating 1 inch screen blender.

Photograph 14. The Blender discharges clods and *Phragmites* rhizomes out in the foreground and manufactured soil out a conveyor belt to the right into a pile.

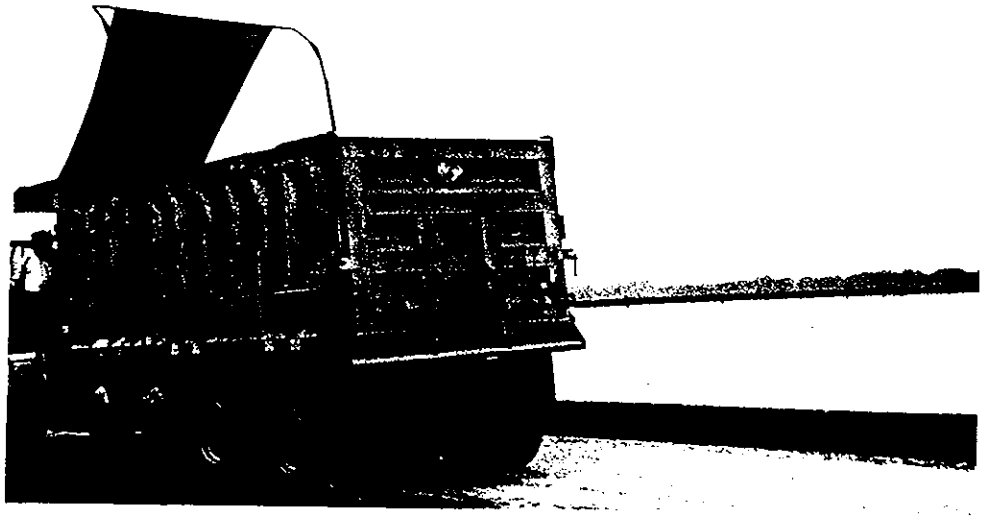
Photograph 15. A pile of dark rich topsoil was produced. Quality control was performed by Mr. Wiener Cadet, Buffalo District (on the left) and Mr. Norm Murray, Terraforms, Process Engineer.

Photograph 16. Quality control was continually checked by Mr. Norm Murray.

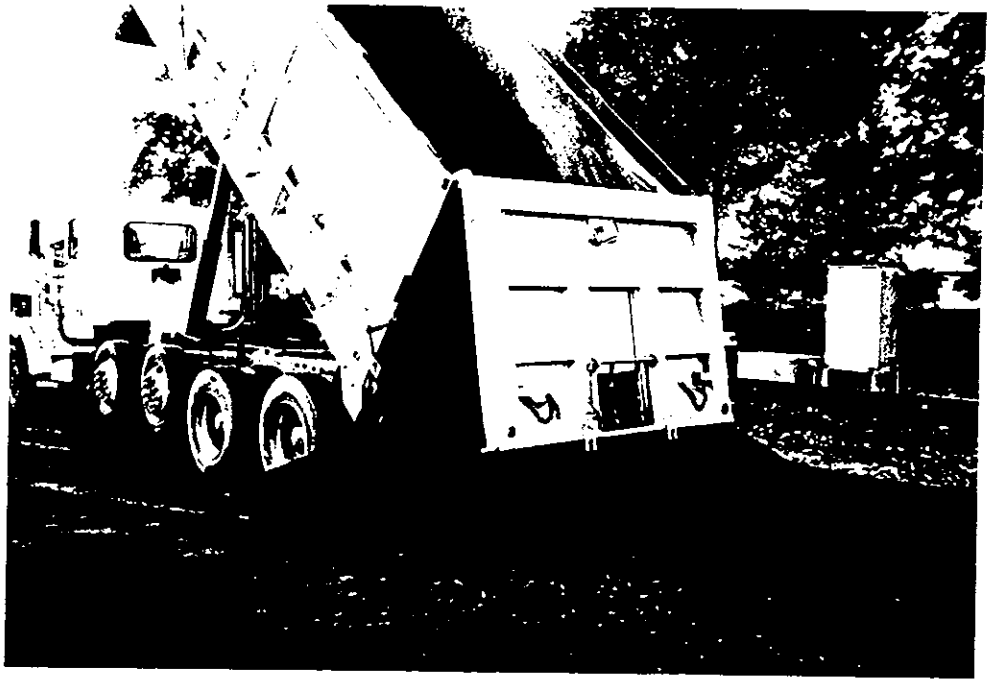


Photograph 17. All surface rainfall/runoff was collected on site in the excavated areas during the soil manufacturing process.

Photograph 18. Manufactured soil was loaded into sealed trucks with a frontend loader.



Photograph 19. Once filled, trucks were covered to ensure nothing blew out during transport.

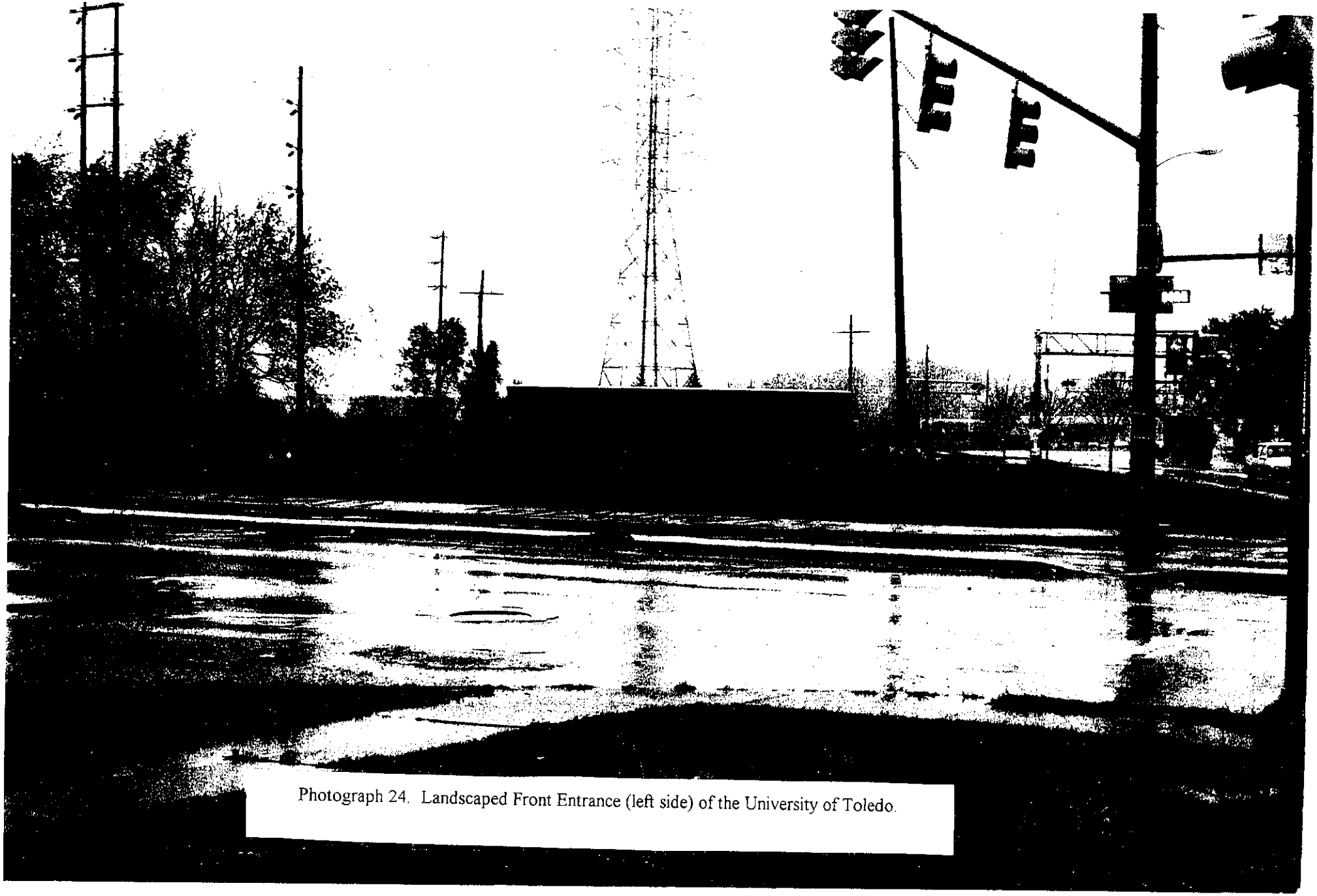


Photograph 20. Manufactured soil was delivered to the demonstration sites.

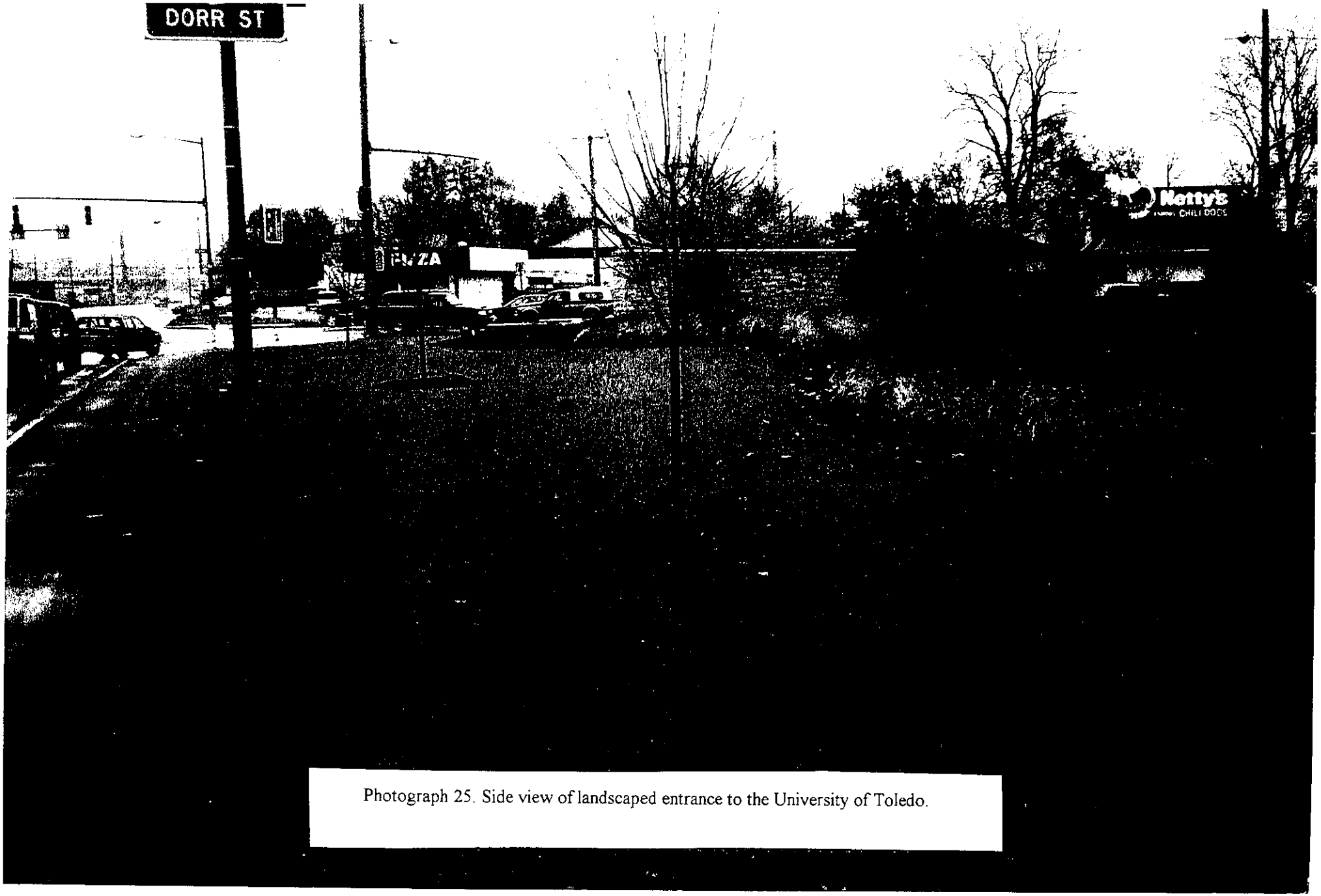
Photograph 21. Manufactured soil off loaded at the entrance of the University of Toledo

Photograph 22. Piles of manufactured soil placed at the entrance to the University of Toledo.

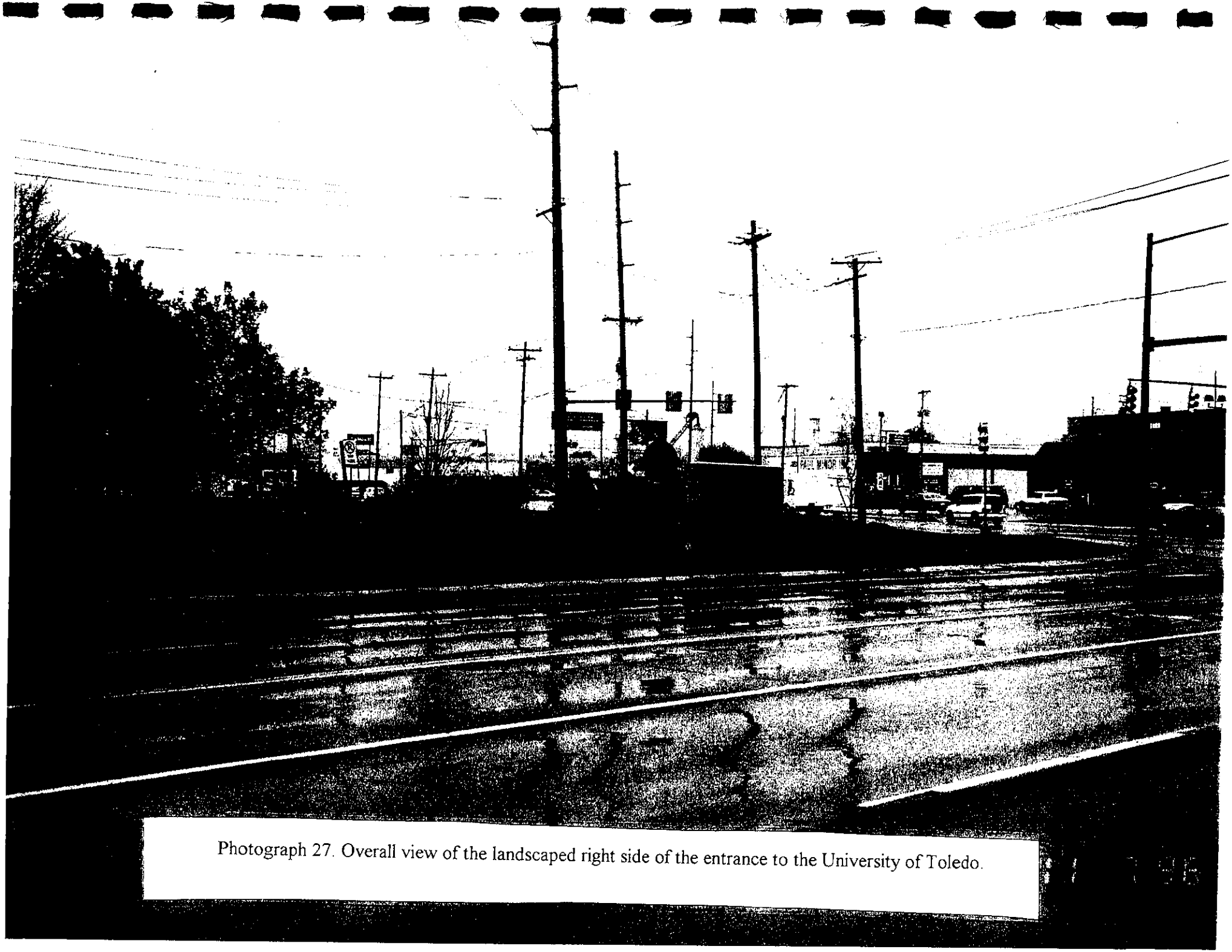
Photograph 23. Piles of manufactured soil at the second entrance across the street from the other entrance sign.



Photograph 24. Landscaped Front Entrance (left side) of the University of Toledo.



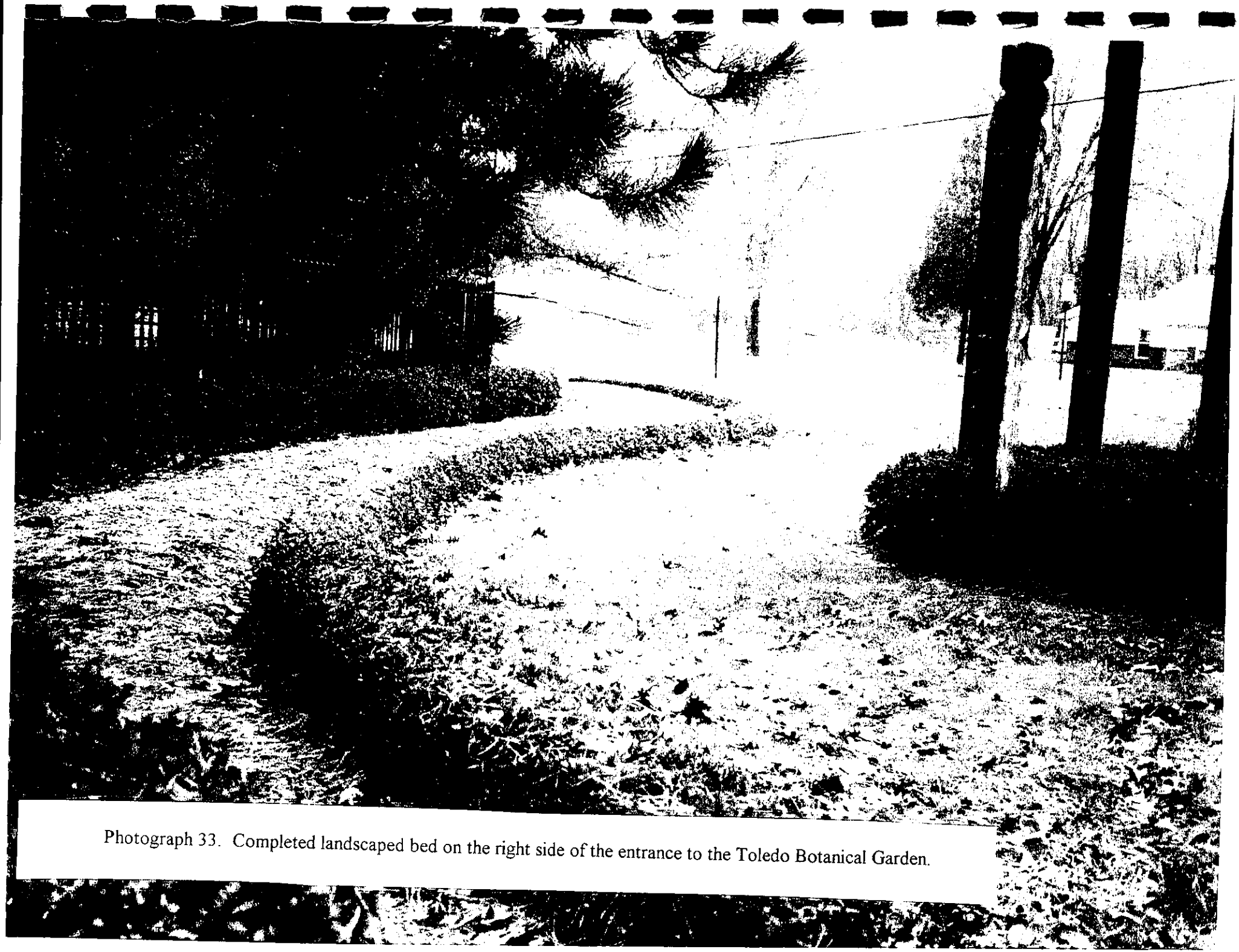
Photograph 25. Side view of landscaped entrance to the University of Toledo.



Photograph 27. Overall view of the landscaped right side of the entrance to the University of Toledo.

Photograph 28. Manufactured soil was delivered to a parking lot near the front entrance to the Toledo Botanical Garden.

Photograph 29. Entrance to the Toledo Botanical Garden.



Photograph 33. Completed landscaped bed on the right side of the entrance to the Toledo Botanical Garden.

APPENDIX A

N-Viro Biosolid Material

Physical and Chemical Analysis

JONES & HENRY LABORATORIES, INC. / 2567 TRACY ROAD, NORTHWOOD, OHIO 43619 / (419) 666-0411

September 19, 1996

N-Viro International Corp.
3450 W. Central Ave., Suite 328
Toledo, OH 43606
ATTN: Ms. Cindy Drill

SEP 2 3 1996

Dear Ms. Drill:

Below are the results of analysis of 1 sample received for examination on September 3, 1996:

Sample I.D. AC60912 Location code: NVIN
Project account code: 427
Location Description: Soil composite - August 1996
Sample collector: CLIENT Sample collection date: 09/03/96
Lab submittal date: 09/03/96 Time: 14:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
pH @ 25 DEG C, 20g+20ml @ 60 min	Std.	12.53	1.00
SOLIDS, DRY, 104 DEG C	%	58.1	0.01
PERCENT CaCO3 EQUIVALENT	%	21.1	2
NITROGEN, KJELDAHL	mg/dry kg	5620	1940
NITROGEN, AMMONIA	mg/dry kg	359	100
NITROGEN, NITRATE	mg/dry kg	Not detected	16
NITROGEN, NITRITE	mg/dry kg	Not detected	16
PHOSPHORUS	mg/dry kg	6260	400
ARSENIC	mg/dry kg	21.7	2.0
BORON	mg/dry kg	56.3	10
CADMIUM	mg/dry kg	1.4	1.0
CALCIUM	mg/dry kg	165000	5.0
CHROMIUM	mg/dry kg	124	2.0
COPPER	mg/dry kg	118	2.0
LEAD	mg/dry kg	167	2.0
MAGNESIUM	mg/dry kg	13900	5.0
MANGANESE	mg/dry kg	249	2.0
MERCURY	mg/dry kg	Not detected	0.5
MOLYBDENUM	mg/dry kg	8.8	1.0
NICKEL	mg/dry kg	92.9	2.0
POTASSIUM	mg/dry kg	3090	5
SELENIUM	mg/dry kg	6.3	2.0
ZINC	mg/dry kg	370	2.0

FILE NO: **61142**

CLIENT NAME : **Great Lakes N-Viro**

PROJECT NAME :

REPORT NUMBER: **SE66358**

REVIEWER INITIALS: PAC

TEST NAME: ** GENERAL ANALYSIS **

SAMPLE MATRIX : **SOIL**

SAMPLE ID : **AUGUST COMP. 1996**

SAMPLE DESCRIPTION : **N-VIRO SOIL**

LAB NUMBER : **SE66358**

DATE SAMPLED:

DATE RECEIVED:**09/05/96**

CODE	ANALYTE	PREPARATION METHOD	ANALYTICAL METHOD	DATE ANALYZED	ANALYST	RESULT	REPORTING LIMIT
IA760	SULFUR - TOTAL	EPA 3050	EPA 6010 A	09/19/96	KSG	22318* mg/kg	925 mg/kg

* Results are on a dry weight basis.