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PRELIMINARY REMEDIAL ENGINEERING DESIGN NARRATIVE

FOR GROUNDWATER TREATMENT SYSTEM AND RELATED FACILITIES COLESVILLE LANDFILL

Prepared For

BROOME COUNTY DIVISION OF SOLID WASTE MANAGEMENT

AND

INTERNATIONAL SPECIALTY PRODUCTS, INC.

September 1992

WEHRAN ENGINEERING CORPORATION
Middletown, New York 10940

Environmental Engineers • Scientists • Constructors

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COLESVILLE LANDFILL, BROOME COUNTY, NEW YORK

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BROOME COUNTY, NEW YORK
AND
INTERNATIONAL SPECIALTY PRODUCTS, INC.
WAYNE, NEW JERSEY

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1.1 SCOPE

This Preliminary Remedial Engineering Design Narrative of the Groundwater Treatment System for the Colesville Landfill was prepared by Wehran Engineering Corporation for the Broome County Department of Public Works (Broome County, New York) and International Specialty Products, Inc. (Wayne, New Jersey). The scope of this design narrative consists of the following tasks: (1) address the project background; (2) provide list of drawings and outline for the technical specifications; (3) define the treatment processes involved; (4) define the basis of design; and (5) provide description of major equipment of the groundwater treatment system and its related facilities.

1.2 PREVIOUS STUDIES

The Colesville Landfill is located in Broome County, New York. It is a superfund site that has been the subject of a Remedial Investigation/Feasibility Study performed by Wehran New York, Inc. The remedy for the site includes the following major components:

- Cap Landfill
- Collect contaminated groundwater in the glacial outwash aquifer downgradient of the landfill using wells along the outside periphery of the landfill.
- Seep collection
- Groundwater and seep treatment
- Discharge of treated effluent to surface water
- New water supply for affected residences

In May 1992, Wehran-New York, Inc. prepared the Colesville Landfill Remedial Design, Conceptual Design Report. The report was prepared to provide information for the present design effort and addressed: groundwater extraction system, groundwater and seep treatment processes required, treatment plant location and the effluent discharge location.

1.3 PRELIMINARY PLANS & SPECIFICATIONS

A preliminary list of the drawings which will be required for this project are as follows:

SITE WORK

C-1 TREATMENT PLANT LOCATION PLAN

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A portion of the technical specifications have been developed and are presented in "Preliminary Construction Specification for Groundwater Treatment System and Related Facilities, Colesville Landfill, Broome County, New York" (Wehran, August 1992). The plans which have been developed to date are C-2 (Treatment Plant Site Plan), C-3 (Treatment Plant Building-Layout), and P-1 (Process and Instrumentation Diagram). These plans have been included as part of this report and are presented in Appendix A.

2.0 GROUNDWATER TREATMENT SYSTEMS

2.1 SYSTEM DESCRIPTION

Based on the findings of the Conceptual Design Report, the system required for the treatment of contaminated groundwater at the Colesville Landfill consists of two general treatment technologies: chemical precipitation for removal of iron, hardness and suspended solids, and air stripping for the removal of volatile organics. The metals removal evaluation concluded that pH adjustment with sodium hydroxide was the preferred method of chemical precipitation. The conceptual design report also concluded that a packed tower was preferred to shallow tray air strippers.

The groundwater treatment system presented in the Engineering Design Narrative includes the following processes:

- Two-Stage pH Adjustment
- Flocculation
- Sedimentation
- Two-Stage Neutralization
- Dual-Media Filtration
- Air Stripping with Vapor Phase Carbon
- Final pH Adjustment
- Effluent Monitoring
- Sludge Handling
  - Thickener
  - Filter Press

The two-stage pH adjustment, flocculation and sedimentation processes are components of the metals removal system. The two-stage neutralization process reduces the pH of the treated groundwater to stabilize the water with regards to calcium carbonate precipitation and to meet pH discharge limitations. The dual-media filter further reduces suspended solids prior to the air stripper.

2.2 BASIS OF DESIGN

2.2.1 Treatment Plant Influent

The Conceptual Design Report had used a groundwater flow rate of 130 gpm. Since the time of that submission the estimated flow rate has been increased to 175 gpm. The recommended extraction system includes both new and existing wells. The estimated flow from the wells is shown in Table 2-1. It is important to note that the flow from well PW-6, which was the most highly contaminated well, makes up over half the total. (See Table 7-1 of the Conceptual Design Report for contaminant levels found in each well). In order to obtain an estimate of the influent concentrations to the groundwater treatment plant, a flow-weighted average was calculated. The contaminant levels for the proposed wells (PWT-1 to PWT-4) and existing well (PW-2) were determined from an average of the concentrations found in PW-1 to PW-5. The total flow rate from these five wells (PWT-1 to PWT-4, PW-2) is estimated at 10 gpm. The calculated influent characteristics are presented in Table 2-2. Because of the influence of contamination levels in PW-6, the contaminant levels shown in Table 2-2 are higher than those found in Table 7-2 of the Conceptual Design Report.

Several characteristics which are important in the design of a groundwater treatment plant required estimation. These parameters include: manganese, zinc, calcium, magnesium, sulfate, chloride, hardness, pH, alkalinity, and total dissolved solids. The following method was used to estimate these parameters. The uncontaminated groundwater quality was estimated from a USGS report, Records of Wells and Test Borings in the Susquehanna River Basin, New York (NYSDEC Bulletin 69, 1972). The leachate quality from Colesville Landfill was estimated from a report Characterization of MWC Ashes and Leachates form MSW Landfills, Monofills and Co-Disposal Sites (EPA 530-SW-878-028B, October 1987). Based on the level of iron in the contaminated groundwater, the uncontaminated groundwater and leachate, a ratio of uncontaminated groundwater/leachate was determined. The estimated influent concentrations for these parameters are presented in Table 2-3.

2.2.2 Treatment Plant Effluent Criteria

As indicated in the Conceptual Design Report, the proposed discharge is to the North Stream, a waterway northwest of Colesville Landfill and referred to by NYSDEC as

Table 2-1
COLESVILLE LANDFILL REMEDIAL DESIGN
ENGINEERING DESIGN NARRATIVE
GROUNDWATER FLOW RATES

Wells	Flow Rate (gpm)
PWT-1 thru PWT-4, PW-2	10
PW-6	100
PW-7	10
PW-8	5
PW-9	15
PW-10	20
PW-11	5
PW-12	10
Total	175

Table 2-2

COLESVILLE LANDFILL REMEDIAL DESIGN

ENGINEERING DESIGN NARRATIVE

MEASURED GROUNDWATER CHARACTERISTICS

Parameter	Flow-Average Contaminant Level
Conventional Parameters (mg/l)	
Ammonia Nitrogen	0.45
Biochemical Oxygen Demand	15.0
Chemical Oxygen Demand	50.0
Total Suspended Solids	470.0
Volatile Organic Compounds (ug/l)	
Vinyl Chloride	329
Chloroethane	37
Methylene Chloride	10
1,1-Dichloroethene	2
1,1-Dichloroethane	73
1,2-Dichloroethene (trans)	1
Chloroform	4
1,2-Dichloroethane	5
1,1,1-Trichloroethane	24
Trichloroethene	60
1,1,2-Trichloroethane	5
Benzene	4
Tetrachloroethene	2
Toluene	1
Chlorobenzene	31
Ethylbenzene	6
Xylenes	24
Dichlorofluoroethane	26
Trichlorofluoroethane	4
Total Toxic Volatile Organics	648
Ketones (ug/l)	
2-Propanone	25
2-Butanone	39
4-Methyl-Pentanone	1

Table 2-2

COLESVILLE LANDFILL REMEDIAL DESIGN

ENGINEERING DESIGN NARRATIVE

MEASURED GROUNDWATER CHARACTERISTICS

Parameter	Flow-Average Contaminant Level
Metals (ug/L)	
Arsenic	156
Barium	75
Iron	39,500
Lead	1

Table 2-3

COLESVILLE LANDFILL REMEDIAL DESIGN

ENGINEERING DESIGN NARRATIVE

ESTIMATED GROUNDWATER CHARACTERISTICS

Parameters	Contaminant Level (mg/l)
Conventional Parameters	
Alkalinity (as $CaCO_3$)	380
Hardness (as $CaCO_3$)	920
Total Dissolved Solids	1750
pH	6.9
Metals	
Calcium	220
Magnesium	90
Manganese	1
Zinc	0.8
Miscellaneous Inorganics	
Chloride	425
Sulfate	80

Tributary 120. Tributary 120 has a Fresh Surface Water Classification of C and Water Quality Standard of C(T). The symbol C(T) means that the tributary is a trout waterway and that the dissolved oxygen specification for trout water are applicable.

In general, effluent limitations are based upon water quality criteria applied to the minimum average 30 consecutive day receiving water flow with a one-in-ten year occurrence. The Conceptual Design Report indicated that the stream flow measurement of North Stream was conducted in August 1989 and that the stream flow was approximately 0.19 cubic feet per second. Using data in USGS Water Resources Data, New York, Volume 3: Western New York, streams in the Susquehanna River Basin had an average 30-day low flow of 0.121 cfs/sq.mi. The Conceptual Design Report estimates the drainage area of North Stream as 700 acres. This results in a 30-day low flow of 0.13 cfs. The discharge from the treatment plant is 175 gpm or 0.39 cfs. The water quality criteria for the stream is presented in Table 2-4, along with estimated influent data from Table 2-2 and 2-3. Because the plant flow rate is significantly higher than the 30-day low flow, it is anticipated that effluent criteria will be close to the corresponding water quality criteria.

2.2.3 Air Stripper Pretreatment Requirements

In addition to effluent criteria concerns, the air stripper has several pretreatment requirements to reduce the potential for the fouling and plugging of the packing material. The pretreatment requirements for the air stripper are presented in Table 2-5, along with estimated influent data.

The reduction of hardness to 100 mg/l will require that the metals removal system be designed for softening (calcium and magnesium reduction), as well as iron removal. The reduction of hardness and iron to the pretreatment levels will require filtration following sedimentation.

2.2.4 Vapor Phase Treatment

The Conceptual Design Report concluded, based upon the average groundwater contaminant levels and present regulations, that vapor phase treatment would not be required. The only compound that was of concern was vinyl chloride. In the Conceptual Design Report, an average of 50.25 ug/l was used for vinyl chloride. As can been seen in Table 2-2, the flow weighted average is 329 ug/l. The hourly emission rate for vinyl

Table 2-4
COLESVILLE LANDFILL REMEDIAL DESIGN
ENGINEERING DESIGN NARRATIVE
AVERAGE INFLUENT CONTAMINANT LEVELS VS. WATER QUALITY CRITERIA

Parameter	Average Contaminant Level	Water Quality Criteria
Conventional Parameters (mg/l)		
Ammonia Nitrogen	0.45	2.4
Biochemical Oxygen Demand	15.0	*
Total Suspended Solids	470.0	**
Total Dissolved Solids	1,750	500
pH	6.9	6.5-8.5
Dissolved Oxygen	--	6.0(min)
Volatile Organic Compounds (ug/l)		
Chlorobenzene	31	5
Total Toxic Volatile Organics	648	100
Metals (ug/l)		
Arsenic	156	190
Iron	39,500	300
Lead	1	6.8
Zinc	800	30

* No water quality criteria for BOD5 is set forth in 6NYCRR Part 703. It is anticipated that no further reduction of BOD5 will required. This will be addressed in the SPDES permit.

** The standard for suspended solids (6NYCRR Section 703.2) states: "none from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages." It is anticipated that the treatment processes used to meet air stripper iron and hardness pretreatment levels and treatment plant iron limitations will sufficiently address suspended solids.

Table 2-5

COLESVILLE LANDFILL REMEDIAL DESIGN

ENGINEERING DESIGN NARRATIVE

AVERAGE INFLUENT CONTAMINANT LEVELS VS. AIR STRIPPER PRETREATMENT STANDARDS

Parameter	Average Contaminant Level	Air Stripper Pretreatment Standards (mg/l)
Hardness ($CaCO_3$)	920	100
Iron	39.5	0.5
Manganese	1.0	1.0

? its 1/3 of the level - below but not well below

chloride is .03 lb/hr, well below the 0.1 lb/hr level for high toxicity compounds at which vapor phase treatment becomes mandatory. As a result, the air stripper off-gases may not require treatment. However the maximum potential annual impact for vinyl chloride (.116 ug/m^3) exceeds the NYSDEC Annual Guideline Concentration of 0.02 ug/m^3. This guideline is presented in New York State Air Guide-1 (Guidance for the Control of Toxic Ambient Air Contaminants). For this engineering design report, provisions will be made for treatment of off-gases from the air stripper (see Section 3.7). The final decision must be made by a NYSDEC Regional Air Pollution Control Engineer.

3.0 EQUIPMENT DESCRIPTION

3.1 TWO-STAGE PH ADJUSTMENT PRECIPITATION SYSTEM

The first step in the metals removal system is to raise the pH to reduce the solubilities of the metals of concern. Softening can be accomplished by the addition of lime and soda ash, or caustic soda (sodium hydroxide) alone, if the water has sufficient alkalinity (in the form as $CaCO_3$). Sodium hydroxide has several advantages over lime: (1) as a solution, caustic soda is easier to store, handle and pump relative to lime; (2) in comparison to lime slurries, caustic soda will not clog valves or form undesirable insoluble reaction products; (3) caustic soda requires smaller feed system and storage tanks; and (4) caustic soda has increased reaction rates. In this particular application, the estimated influent alkalinity of 380 mg/l is more than sufficient for softening purposes, so that soda ash is not required. For these reasons, namely, ease of handling and the requirement for only one chemical, caustic soda will be used in the design.

Generally, a pH adjustment system which uses sodium hydroxide is designed to add most of the reagent in a primary precipitation stage. A secondary stage acts as a smoothing and finishing tank. The second reactor is able to compensate for pH control over shoots or temporary conditions which may overwhelm the primary reactor. The second reactor will have the capability for caustic or sulfuric acid addition, depending on the pH of the water from the primary reactor, whether it is below or above the set point.

The two design parameters for the pH adjustment system are detention time (determining reactor volume) and velocity gradient (determining mixer horsepower). The recommended detention time in the pH adjustment system is 10 minutes. At the design flow rate of 175 gpm the total volume is 1750 gallons. With two treatment trains and two tanks (primary and secondary) per train, each tank has approximately 440 gallons.

The mean velocity gradient (G) is a measure of power input required per unit volume to obtain efficient mixing of chemicals. For softening, the typical values of G are between 130-200 sec^{-1}. Using a velocity gradient of 200 sec^{-1}, the mixer horsepower must be approximately 1/4.

The tanks will be covered and vented to the carbon adsorption system.

3.2 FLOCCULATION

The flocculation process aggregates particles, which became insoluble during pH adjustment, into large particles which are more easily settled. It is a transport step which causes the necessary collisions between particles through gently mixing, resulting in particle agglomeration. Polymers help to promote large flocs by a bridging mechanism. Nonionic polymers are more effective than anionic polymers when there are increasing concentrations of divalent metal ions (Ca^{+2}, Mg^{2+}, Fe^{2+}, etc).

As with the pH adjustment system, two design parameters are important for flocculation: detention time and mean velocity gradient. The recommended detention time for the flocculation basins is 15 minutes. At the design flow rates of 175 gpm, the total volume is 2625 gallons or 1315 gallons per tank (1 tank per treatment train).

The recommended G values for the flocculation step of water softening are 20-70 sec^{-1}. Using a velocity gradient of 70 sec^{-1}, the flocculator horsepower must be approximately 1/8. The flocculator will be driven by a variable speed drive.

The tanks will be covered and vented to the carbon adsorption system.

3.3 SEDIMENTATION

Due to the high levels of iron, calcium, magnesium and suspended solids, sedimentation follows flocculation in order to reduce the load of solids applied to the filter. A major portion of the solids can be removed from the water by gravity settling. The design of this groundwater treatment plant utilizes a "lamella" clarifier for the removal of metal hydroxide and other insoluble pollutants from the treated water.

The two design parameters associated with the clarifier are surface overflow rate (related to the area of the clarifier) and the rate of flow over the outlet weir (related to weir length). For the softening process, the recommended maximum overflow rate is 600 gpd/ft^2 (0.42 gpm/ft^2) and the rate of flow over the weir is 20,000 gpd/ft (13.9 gpm/ft). Each treatment train has an inclined plate separator with 412 ft^2 of effective surface and 32 ft of weir length. These result in a surface overflow rate of 0.21 gpm/ft^2 (<0.42) and a weir overflow rate of 2.7 gpm/ft (<13.9). The tank will be covered and vented to carbon adsorption system.

The sludge that collects in the conical sludge compartment is pumped to the sludge thickener. To withdraw sludge, the normally closed air operated diaphragm valve and the double diaphragm sludge pump are activated by a timer system. The volume of sludge withdrawn is regulated by a duration timer and variable pumping rates, while the frequency of the withdrawal is controlled by an interval timer.

3.4 TWO-STAGE NEUTRALIZATION

This unit process is very similar to the two stage pH adjustment system, except that sulfuric acid is the primary chemical added. The purpose of this step is to reduce the pH from the 9-11 range to approximately 7-8. This must be accomplished for two reasons: (1) the effluent from the plant must have a pH between 6.5-8.5 and (2) the effluent to the filter and air stripper must be in calcium carbonate equilibrium to avoid problems of deposition of calcium.

As with the pH adjustment system, the neutralization system which uses sulfuric acid is designed to add most of the reagent in the primary neutralization stage. A secondary neutralization tank is provided to compensate for pH overshoots (by caustic addition) or temporary conditions which may overwhelm the primary tank (by additional sulfuric acid addition).

The design parameters will be the same as for the pH adjustment system; a total detention time of 10 minutes and velocity gradient of 200 sec^{-1}. This system will have only one train, so that there will be only one primary and one secondary tank. The volume of each tank is 875 gallons. The power rating of the mixers must be approximately 1/2 hp. As with all other tanks in the system, these tanks will be covered and vented to the carbon adsorption system.

3.5 FILTRATION SYSTEM

The effluent from the sedimentation basin will have a total suspended solids concentration between 20-40 mg/l, which include calcium, magnesium and iron precipitates. These precipitates can affect air stripper efficiency by fouling packing material. A filtration system following the neutralization system will reduce the suspended solids to the desired level.

This design will employ a dual media system, consisting of a bed of anthracite and sand with supporting gravel. The maximum allowable filter rate for a dual-media filter is 5 gpm/ft^2 compared to 2 gpm/ft^2 for sand filters. The filter system will consist of two 40 ft^2

beds. The filter rate at the design flow rate is 2.19 gpm/ft^2 or 4.38 gpm/ft^2 when one filter is off-line during backwashing.

The duplex gravity filter unit is composed of two filter cells of equal filtration areas (as described above), a backwash storage tank with two submersible backwash pumps and a mudwell with submersible mud well pump.

Each filtration unit shall be capable of automatically initiating the cleaning cycle when the pressure drops across the filter bed exceeds 3' of water. Cleaning shall consist of both an up-flow air scour period and a water backwash period. The duration of the air scour is 5 minutes at an air flow rate of 3-5 cfm/ft^2 of filter area. The duration of the backwash period is 5 minutes, during which time filtrate from the clearance shall be pumped back through the filter bed at a flow rate of 15 gpm/ft^2 of filter area. Backwash water discharges from the filter cell through an overflow trough to the mudwell chamber. The overflow of the clearwell flows to the air stripper influent lift station. The mudwell pump discharges spent backwash water to the sludge thickener.

3.6 AIR STRIPPER

Air stripping is a process in which water and air are brought into contact with each other for the purpose of transferring volatile substances from water to air. The method of air stripping used in the design is a countercurrent packed tower. Water containing a high level of contaminant enters the top of the tower and flows downward at a superficial velocity $v_L = Q_L/A$, (Q_L = volumetric flow rate), exiting at the bottom with a low concentration. Correspondingly, forced air containing little or no contaminant enters the bottom of the tower and travels upward at a superficial velocity $V_G = Q_G/A$ exiting the top of the tower with a higher level of contaminant. The necessary depth of packing is determined from the product of the number of transfer units (NTrU) and the height of a transfer unit (HTU). The term NTrU characterizes the difficulty in stripping a compound to a desired level and is dependent on desired removal efficiency, the air-to-water ratio, and Henry's constant. The HTU characterizes the efficiency of mass transfer from water to air and is a function of the liquid loading rate and the mass transfer rate.

Air strippers generally are designed with the following limitations:

Column Diameters:	1.5-8.0 ft
Liquid Mass Loading:	370-22,000 1b/ft^2/hr

Air Mass Loading:	12.5 - 1250 $1b/ft^2/hr$
Air to Water Ratio:	10-300:1 (volumetric)
Tower Pressure Drop:	<1 in W.C/ft.

In order to obtain the desired removal, a 4 foot diameter by 25 foot packing depth is required using an air-to-water ratio of 75. This results in liquid mass loading of 6800 $1b/ft^2/hr$ and air mass loading of 725 $lb/ft^2/hr$. The packing material proposed is 2" Jaeger Tri-packs; a pressure drop of 0.05 in WC/ft is associated with this packing at the design water and air loading rates.

The system includes a 35 foot FRP column, with integral treated water collection sump, a PVC water distribution system, mist eliminator and 5 HP fan. The collection sump is equipped with a transfer pump for discharging of air stripper effluent to the final pH adjustment system.

The off-gas from the air stripper is sent to the carbon adsorption system and/or vented to the atmosphere (see Section 3.7). The vinyl chloride concentration in the off-gas from the stripper will be reduced from 4400 ug/m^3 to well below NYSDEC requirements.

3.7 VAPOR PHASE CARBON ADSORPTION SYSTEM

As indicated in Section 2.2.4, vapor phase treatment of air stripping off-gases may be required for vinyl chloride. If a limitation is set by the NYSDEC, it is estimated that 8,000 lbs of vapor phase carbon would be required monthly.

The design of the treatment system makes provision for a transportable absorber which contains approximately 12,500 pounds of granular vapor phase carbon and can treat air flows up to 10,000 cfm. When the activated carbon has fully utilized its capacity to remove the VOCs, the on stream adsorber is replaced with one containing fresh carbon. This is done on a rental basis, so there are no major capital expenditures. If actual plant operation indicates that vapor phase carbon treatment of off-gases is not required, the transportable adsorber can be replaced with carbon canisters sized to handle vapors from covered tanks within the treatment building.

3.8 SLUDGE HANDLING

The sludge handling system consist of a sludge thickener and a filter press. The sludge from the sedimentation tanks is pumped to the sludge thickener. Gravity thickening reduces the sizing of subsequent dewatering equipment. The solids content of the sludge is increased from 2.5 percent to 5% in the thickener. The estimated sludge production is 2,750 lb/day. This sludge production rate is dependent upon estimates made for calcium and magnesium in Section 2.2.1. The design criteria for a gravity thickening of softening sludge 60-200 lbs of solids loading per square foot of thickener surface area/day. Using a solids loading of 60 lbs/sq.ft/d, the diameter of the thickener required is 8 feet. The volume of thickener must be able to hold 8 hours (the filter press cycle time) of sludge from the sedimentation tanks or 4,400 gallons. This anticipates the operation of the sludge handling facilities 24 hours per day, 7 days per week. In order to more accurately estimate sludge production, as well as chemical requirements (see Section 3.9), we are recommending that additional testing be performed for the following parameters; calcium, magnesium, alkalinity, pH, sulfates and chloride.

The supernatant from the thickener flows back to the flocculation tanks. The underflow is pumped to a filter press for further dewatering.

A plate and frame filter press consists of a number of plates that are held rigidly in a frame to ensure alignment and are pressed together hydraulically, between a fixed and a moving end. Liquid sludge is pumped by a high pressure pump into the volume between filter plates. On the back of each plate a filter cloth is mounted. As a result of the high pressure that the sludge is under, a substantial portion of the water in the feed sludge passes through the filter cloth and drains from the press. The filtrate is pumped back to the head of the treatment plant, in that it is very low in suspended solids content. Sludge solids and remaining water eventually fill the void volume between filter cloths. At this point, pumping is stopped and the press is opened to release the dewatered sludge cake. Solids content as high as 40% may be obtained using a plate and frame filter press.

The filter press will be installed on a platform above floor level so that cake can drop out into a roll-off container. The total volume (per cycle) is 40 cubic feet. The filter press has 40" x 40" plates, and it will operate at 100 psi.

3.9 CHEMICAL FEED SYSTEMS

The treatment system requires the addition of three chemicals: caustic, sulfuric acid and polymer. These chemicals will be delivered to the site in bulk in the following forms: caustic - 50% liquid; sulfuric acid - 60° Be (77.7% liquid); and polymer liquid. It is estimated that 250 gallons per day of 50% caustic is required for the pH adjustment system and 45 gpd of sulfuric acid is required for the neutralization system. Bulk storage tanks for these chemicals will be sized for 30 day supply (7,500 gallons and 1,350 gallon for caustic and sulfuric acid respectively). The bulk storage tanks will have secondary containment. Metering pumps for these chemicals are controlled by 4-20 ma outputs from the pH analyzers. The polymer is fed at a rate of between 0.5-1.5 mg/l.

3.10 SUMMARY

A summary of the design criteria for the treatment system is presented in Table 3-1.

Table 3-1

COLESVILLE LANDFILL REMEDIAL DESIGN

ENGINEERING DESIGN NARRATIVE

PRELIMINARY DESIGN CRITERIA SUMMARY

METALS REMOVAL SYSTEM

1. Two-Stage pH Adjustment (2 trains, 2 tanks/train)

Detention Time= 10 minutes (5 min/reactor)
Volume= 1,750 gallons (440 gal/reactor)
Velocity Gradient= 200 sec^{-1}
Mixers= 1/4 hp

2. Flocculation Tanks (2 trains, 1 floc tank/train)

Detention Time= 15 minutes
Volume= 2,625 gallons (1,315 gal/floc tank)
Velocity Gradient= 70 sec^{-1}
Paddle= 1/8 hp

3. Corrugated Plate Sedimentation Tanks (2 trains, 1 clarifier/train)

Surface Overflow Rate$\leq$ 600 gpd/ft^2
Weir Overflow Rate$\leq$ 20,000 gpd/ft
Effective Surface Area= 824 ft^2 (412 ft^2/clarifier)
Weir Length= 32 ft (16 ft/clarifier)

4. Two-Stage Neutralization System (2 reactors)

Detention Time= 10 minutes (5 min/reactor)
Volume= 1,750 gallons (875 gal/reactor)
Velocity Gradient= 200 sec^{-1}
Mixers= 1/2 hp

5. Dual Media Filtration

Filter Rate< 5 gpm/ft^2 (w/one cell off-line for backwashing)
Area= 80 ft^2 ([2] 40 ft^2 cells)
Media= 12" anthracite coal
= 12" sand
= 15" graduated support gravel
Backwash pumps= 15 gpm/ft^2 of filter area

Air Scour= 3-5 cfm/ft^2 of filter area

Clearwell
Detention Time= 5 minutes
Volume= 3,000 gallons

Mudwell= 3,400 gallons

Table 3-1

COLESVILLE LANDFILL REMEDIAL DESIGN

ENGINEERING DESIGN NARRATIVE

PRELIMINARY DESIGN CRITERIA SUMMARY

6. Chemical Feed Systems

a. Caustic (50%)7500 gal tank,250 gpd pump, feed 700.0 mg/l
b. Sulfuric Acid (77.7%)1350 gal tank, 45 gpd pump, feed 30.0 mg/l
c. Polyelectrolyte (1%)100 gal tank, 30 gpd pump, feed 1.0 mg/l

AIR STRIPPER

Water Temperature= 50°F
Air Temperature= 0°F
Diameter= 4.0 feet (1.5 <d <8.0)
Liquid Mass Loading= 6,800 lb/hr/ft^2
Air-to-Water Ratio= 75
Gas Mass Loading= 725 lb/hr/ft^2
Height of Packing = 25 ft
Packing= 2" Jaeger Tri-Packs

SLUDGE HANDLING SYSTEM

1. Sludge Thickener

Solids Loading= < 60 lbs solids/ft^2/d
Detention Time= 8 hours

2. Filter Press

Feed Solids= 5%
Filter Cake Solids= 30%
Cycle Time= 7-8 hours
Total Volume (per cycle)= 40 ft^3
Plate Size= 40" x 40"

4.0 RELATED DESIGN CONSIDERATIONS

4.1 OUTFALL DIFFUSER

The outfall sewer will be designed to discharge to North Stream in a manner which will assure adequate dispersion. This will be accomplished by placing a headwall at the end of the plant outfall sewer. The headwall will be followed by rip rap which will result in the aeration of the effluent.

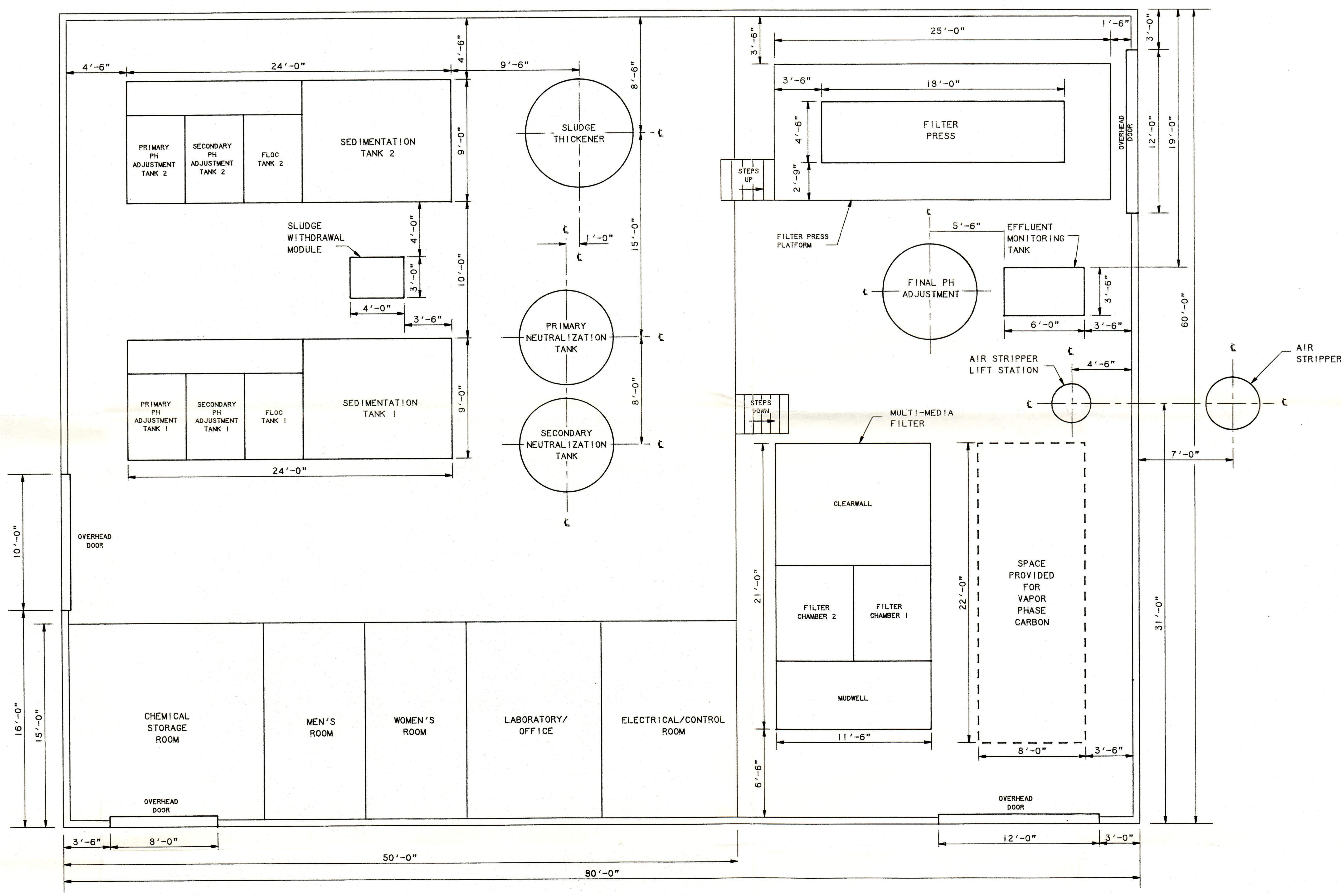
4.2 PROCESS BUILDING

With the exception of the air stripper, all process equipment will be placed within a pre-engineered building. This building will have overhead doors for chemical delivery, vapor-phase carbon adsorber delivery (if required) and sludge roll-off removal. The plant will be equipped with a laboratory in order that analyses, required for efficient operation, can be performed on-site (e.g., jar tests).

4.3 FOUNDATION

The foundation for the process building will include a foundation wall and strip footing. The depth to the top of footing will be 4.5 feet. Existing soil conditions are assumed, at the stage, to be adequate for support without special design considerations (i.e., piles, mat foundation).

APPENDIX A
PRELIMINARY DESIGN DRAWINGS



4CM:(02260.GT.PD)FLOOR PLAN DWG:ML079218

WehranEnviroTech

	DATE
DESIGN BY:	
DRAWN BY:	
CHECKED BY:	
SUPV. BY:	
APP'VD BY:	

Scales

1/8" = 1'-0"

PATRICK G. GILLESPIE, P.E.

N.Y. P.E. LIC. NO. 059853-1

COLESVILLE LANDFILL

COLESVILLE BROOME COUNTY NEW YORK

PROPOSED GROUNDWATER TREATMENT PLANT
BUILDING LAYOUT

Sheet C-3 of

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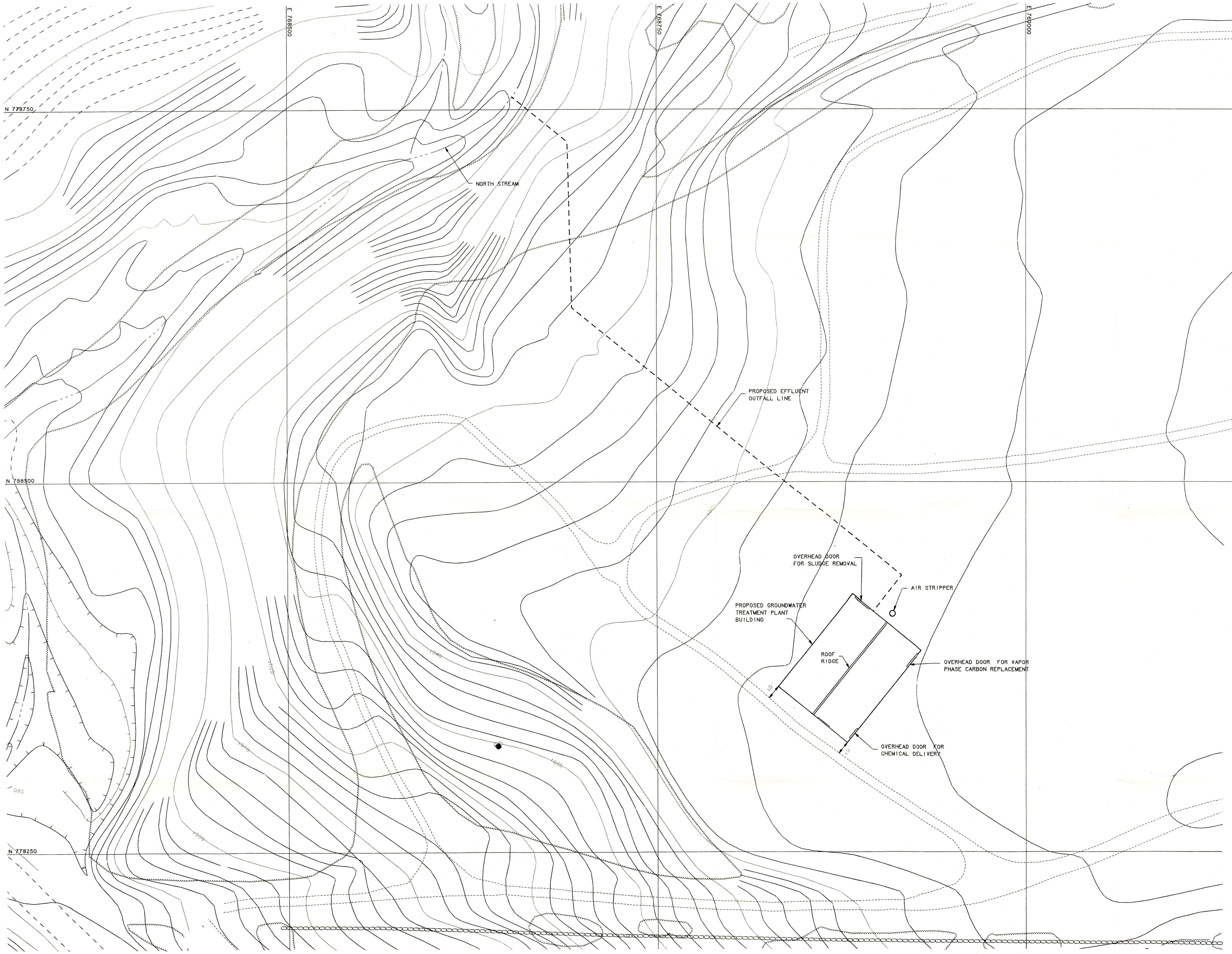

4CM:f02260.CD.PD120 SCALE BASE MAP DWG:E5079229

LEGEND:

EXISTING WOODS

EXISTING GROUND SURFACE ELEVATION CONTOUR (IN FEET,MSL)

+ 1047.4 EXISTING SPOT ELEVATION

STREAM

EXISTING ROAD

PROPOSED BUILDING

NOTES:

1. TOPOGRAPHIC MAPPING WAS PREPARED PHOTOGRAMMETRICALLY BY R.M. KEDDALL ASSOCIATES FROM AERIAL PHOTOGRAPHY DATED 12-31-91.
2. TOPOGRAPHIC MAPPING CONTROL WAS PROVIDED BY WEHRAN ENGINEERING AND IS BASED UPON U.S.G.S. DATUM OF 1929. ELEVATIONS WITHIN THE LANDFILL LIMIT HAVE BEEN FIELD VERIFIED BY WEHRAN ENGINEERING
3. PROPERTY BOUNDARY SHOWN ON THIS PLAN IS FROM AERIAL PHOTOGRAPHS PROVIDED BY BROOME COUNTY, DATED 12-87 AND ARE APPROXIMATE ONLY. WEHRAN-NEW YORK ASSUMES NO RESPONSIBILITY FOR ACCURACY OF SAME.
4. APPROXIMATE LIMITS OF LANDFILL SHOWN ON THIS PLAN ARE FROM AERIAL PHOTOGRAPHS PROVIDED BY THE U.S. DEPARTMENT OF AGRICULTURE, DATED 5-26-77. WEHRAN-NEW YORK, INC. ASSUMES NO RESPONSIBILITY FOR ACCURACY OF SAME.
5. GRID COORDINATES SHOWN HEREON ARE BASED UPON NEW YORK STATE PLANE COORDINATE GRID SYSTEM.

NO.	DATE	REVISIONS	CHK BY:	DATE

WehranEnviroTech

	DATE
DESIGN BY:	
DRAWN BY:	
CHECKED BY:	
SUPV. BY:	
APP'VD BY:	

Scales
30 0 30
SCALE IN FEET

PATRICK G. GILLESPIE, P.E.
N.Y. P.E. LIC. NO. 059853-1

COLESVILLE LANDFILL
COLESVILLE BROOME COUNTY NEW YORK

PROPOSED GROUNDWATER TREATMENT PLANT
SITE PLAN AND YARD PIPING

Sheet C-2 of
Project No. 02260.GT

WehranEnviroTech

DESIGN BY:	DATE
DRAWN BY:	
CHECKED BY:	
SUPV. BY:	
APP'VD BY:	

Scales: N.T.S.

PATRICK G. GILLESPIE, P.E.

N.Y. P.E. LIC. NO. 059853-1

COLESVILLE LANDFILL

COLESVILLE BROOME COUNTY NEW YORK

GROUNDWATER TREATMENT PLANT PROCESS AND INSTRUMENTATION DIAGRAM

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