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City of Greensboro
North Carolina

January 14, 2010

North Carolina Department of
Environment and Natural Resources
Division of Waste Management
585 Waughtown Street
Winston-Salem, North Carolina 27107

Attention: Jason Watkins
Central District Supervisor

Reference: City of Greensboro – White Street Landfill
Request for Permit Renewal

Dear Mr. Watkins:

The City of Greensboro is pleased to request a permit renewal for the municipal solid waste and the compost operating permits. Per the regulatory requirements for such renewals, we are including a permit modification, revised facility operation and closure plans, the current water quality plan, and a remittance of the associated fees.

The City of Greensboro has previously submitted the water quality plan through which we are currently enacting remedial activities in order to address elevated water quality exceedances. The Division has previously approved these actions; thus, we have not duplicated the submission with this renewal request.

Included within the permit modification, is a revision to the closure-post closure plan. To date, no closure activities have been enacted for the Phase III unit.

After your review of this request, please contact our office if additional information is required.

Sincerely,

Jeryl W. Covington, P.E.
Director, Environmental Service

cc: Hugh Jernigan

Enclosures: Permit Modification
Solid Waste Operation Plan
Water Quality Plan

P.O. Box 3136 • Greensboro, NC 27402-3136 • www.greensboro-nc.gov • (336) 373-CITY (2489) • TTY # 333-6930

City of Greensboro

Department of Environmental Services
Solid Waste Management Division
White Street Waste Disposal Facility

GREENSBORO

SOLID WASTE OPERATION PLAN

January 2010

P.O. BOX 3136, GREENSBORO, NC 27402-3136

CITY OF GREENSBORO - WHITE STREET LANDFILL
OPERATION PLAN

1.1 Introduction

The purpose of this section is to identify protocols for the overall operation and maintenance of the White Street Sanitary Landfill, which is owned and operated by the City of Greensboro. The landfill, which is located at the east end of White Street and is currently permitted to accept municipal solid waste generated within the City of Greensboro and Guilford County. This Plan has been prepared in accordance with Rule .1625 and provides details of the procedures and policies which currently are, or shall be, implemented throughout the life of the City of Greensboro's White Street Sanitary Landfill. Detailed drawings for each phase of the landfill's development are presented in the Operational Drawings for this Operational Plan. These Drawings illustrate the existing conditions of the landfill (including known limits of existing and previous disposal areas; and buffer zones), the fill phasing (including the progression of operation including daily operation, transition contours and final contours), and proposed final contours and erosion control plans (including storm water controls; and, stockpile and borrow operations).

1.2 Standard Operating Procedures

1.2.1 Hours and Days of Operation

The landfill is at present, and is anticipated to be, open for operation between the hours of 7:00 AM and 4:50 PM, Monday through Friday, and from 7:00 AM and 1:00 PM on Saturday. The landfill is normally closed on Sundays except where prior permission has been given to receive waste for special instances such as a natural disaster. The observed holidays are New Year's Day, Martin Luther King Jr. Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

Special notices are posted at the scalehouse advising users of observed holidays. Such notices are posted at least one week in advance of the holiday.

1.2.2 Traffic Routing

An entrance sign is posted stating the facility name, permit number, and operating hours. Additional signs are posted for allowable speed limit and directional signs indicating the location of the disposal area.

All trucks entering the landfill to dispose of solid waste are weighed at one of two (2) 70' x 10' inbound scales at the scalehouse. Regular users may not be weighed upon leaving if vehicle tare weights are known.

Automobiles and low-sided pickup trucks are required to weigh in. However, the Scale Attendant(s) controls access to the landfill to prevent abuse and misuse. A designated area at the fill face is set aside for these small vehicles to dispose of solid waste. This area is separated from the area being used by the City and private haulers.

Internal roads are hard surface or gravel and are maintained to be passable in all weather by all vehicles so that operation areas and units are accessible.

The total length of roadway from the entrance to the scales and from the scales to the disposal area will be approximately 1,400 feet. This provides sufficient queuing distance for trucks during the peak traffic periods.

Perimeter roads and operational access roads will be built to allow for 2-way truck traffic. The operational access road on the fill has been developed with branch roads extending from the exterior to the interior. A level area for truck turning will be maintained ahead of the active disposal area. The trucks come in via the access road, dump their load, turn around, and exit via the access road.

The approach to the working face is maintained such that two or more vehicles may safely unload side-by-side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed is provided adjacent to the unloading area. The vehicles back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles immediately leave the working face area. Personnel direct traffic as necessary to expedite safe movement of vehicles.

1.2.3 Litter Control

Litter control is a prime requisite in the proper operation of the landfill. In order to control litter and windblown debris, the working face is kept as small as possible and waste is compacted soon after it is unloaded. Cover material is applied daily. If required, portable litter fences will be utilized downwind of and in close proximity to the working areas to catch blowing litter. The area around the work face and the property in general is routinely checked and the litter removed on a regular basis.

1.2.4 Odor, Dust, and Noise Control

Odors which emanate from solid waste as it is placed and compacted are generally limited to within a short distance of the working face. The covering of waste on a daily basis prevents odors from becoming a nuisance.

The access road from the scalehouse to the landfill unit is paved; all other service roads on the operating landfill are graded as necessary to maintain smooth, well-drained surfaces. During extended dry periods, operating roads may be sprayed with water to reduce dust problems. Regular maintenance of soil stockpiles, including frequent wetting or temporary seeding, serves to limit the generation of wind blown dust. Similarly, frequent wetting of on-site roads prevents truck traffic from creating dust.

Noise resulting from landfill equipment is limited to the period of time during operating hours. To reduce the nuisance of noise to neighbors or the administrative function of the landfill, a buffer of trees and other vegetation is maintained between the operating areas and other areas not designated for landfill operations. All on-site equipment is equipped with mufflers or similar noise-dampening devices. Equipment operators, drivers, and other operating personnel will be trained in the use of equipment in an effort to minimize noise generation. These efforts help to ensure that noise does not become a nuisance problem to neighbors or to the administrative function of the landfill.

1.2.5 Inclement Weather Operations

During periods of heavy rainfall, the work area is kept as close to the landfill service roads as practical.

1.2.6 Personnel Structure

Responsibility for overall facility management and operation rests with the Solid Waste Disposal Manager. This individual is designated as the contact person for matters related to regulatory compliance, and is responsible for providing adequate personnel and equipment in order to operate the facility in accordance with the approved permit documents and the North Carolina Solid Waste Management Rules and Solid Waste Management Law.

Landfill supervisory staff includes the Landfill Supervisor, and the Scalehouse Supervisor. In addition to the supervisory staff, the City has twelve other permanent staff available for operations at the landfill. These staff positions include a two person environmental staff that oversees waste screenings, load inspections, groundwater wells maintenance, and methane gas monitoring.
The Scale Attendant(s), stationed at the scalehouse at the site entrance, is responsible for maintaining complete and accurate records of vehicles and visitors entering and leaving the facility. The Scale Attendant(s) also visually inspects incoming vehicles to the extent that the loads are covered properly and determines if the load is acceptable.

An equipment operator doubles as a truck spotter directs incoming vehicles to the proper location to unload refuse at the working face. The primary function of the spotter is to prevent unloading in areas that are not designated for disposal and to visually inspect all loads as they are dumped to assure compliance with posted operating rules. A traffic controller is located at the working face to direct vehicles to the location where the waste is to be unloaded.

Equipment operators are responsible for the safe operation of site equipment. As the personnel most closely involved with the actual landfill operation, these employees are responsible for identifying any potentially dangerous conditions, monitoring waste for unauthorized or hazardous materials, as well as careless or improper actions on the part of other persons while on the premises, and reporting

such observations immediately to the Landfill Supervisor and the environmental specialist. Other services such as sediment basin maintenance, construction, site clean-up, etc. may be contracted to outside firms on a temporary basis.

1.2.7 Personnel Training

The Solid Waste Disposal Manager, the Landfill Supervisor and the Environmental Compliance Supervisor are all Certified Managers of Landfill Operations (MOLO) by the Solid Waste Association of North America (SWANA) as required by GS 130A-309.25. In addition to trained supervisory staff, each landfill employee goes through a 10-hour training course (led by supervisory staff) and is certified by SWANA as Landfill Operations personnel. These staff are then recertified on a regular basis. As part of this training, personnel learn to reorganize loads which may contain regulated hazardous waste or wastes containing PCB's. Landfill personnel are all trained in safety procedures for fire fighting, first aid, CPR, and the handling of hazardous materials.

1.2.8 Management Authority

The management authority, or chain of command for decisions regarding landfill operation is depicted in Figure 5-1.

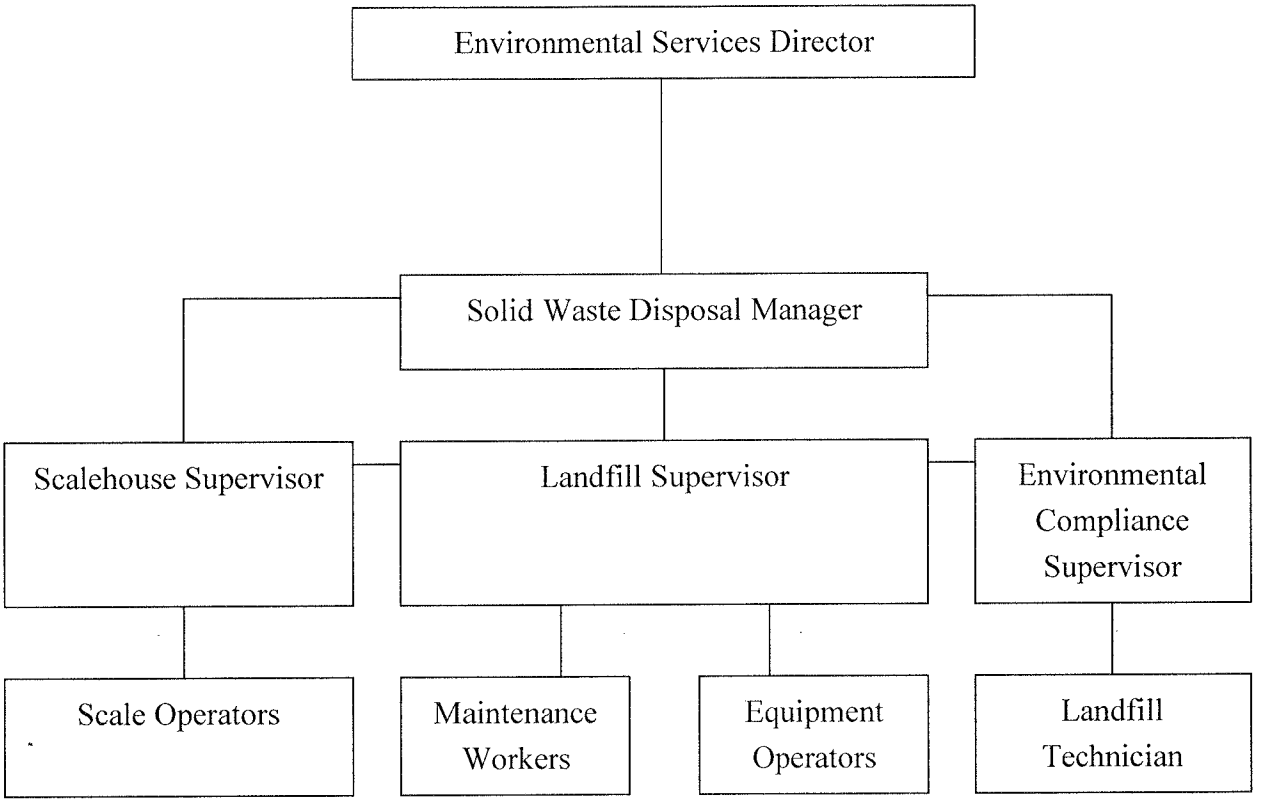
1.2.9 Equipment Requirements

Equipment requirements may vary in accordance with the method or scope of landfill operations at any given time. Additional or different types of equipment may be provided as necessary to enhance operational efficiency. The types and sizes of equipment currently in use at the White Street Sanitary Landfill are presented in Table 5-1.

1.3 Waste Screening Programs

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the White Street Sanitary Landfill. Waste received at both the scalehouse entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placarding or markings; liquids; powders or dusts; sludges;

FIGURE 5-1
CITY OF GREENSBORO
WHITE STREET SANITARY LANDFILL ORGANIZATIONAL CHART



bright or unusual colors; drums or commercial size containers; and "Chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes are an ongoing part of the landfill operation. These programs are implemented in accordance with Rule .1626 Part (1)(f).

5.3.1 Waste Receiving and Inspection

All vehicles must stop at the scalehouse located at the entrance of the landfill facility and visitors are required to sign-in. All refuse transportation vehicles are weighed and the content of the load assessed. Any materials which pose health hazards, cause fire, or which could impact negatively on the environment are deemed unacceptable. The Scale Attendant(s) requests from the driver of the vehicle entering the landfill a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The Attendant(s) then visually checks the vehicle as it crosses the scale. Signs are conspicuously posted informing users of the acceptable and unacceptable types of waste.

TABLE 5-1
CITY OF GREENSBORO, WHITE STREET SANITARY LANDFILL
CURRENT EQUIPMENT INVENTORY (1-2009)

Description	Make/Model	No.	Comment
Landfill Compactor	836C Cat	3	
Bulldozer	D8N Cat	3	
Grader	140G Cat	1	
Loader	WA250-1 Komatsu FR20B Fiat Allis	1 1	
Off-road haul trucks	Cat D-400	3	
Excavator	Samsung 100,000 lb class	1	
Water Truck	International	1	3500 gallon capacity w/external fire hose
Dump Truck	Sterling	1	On Road
Other Trucks	F350 HD Ford 1994 C3400 Chevrolet S-10 Four wheel drive Chev.	1 1 2	Dump bed maintenance truck Fuel Truck Maint.
Other (specify):	New Holland John Deere 2355 7' bush hog 16' bat wing bush hog Polaris 700 Bobcat Polaris	1 1 1 1 1 1 1	Farm Tractor Farm Tractor Mower Mower ATV ATV ATV

Each day trucks hauling commercial and industrial loads of waste are selected for screening at random on an appropriate percentage basis. Selected vehicles are directed to a lined area separate from the working face where the vehicle will be unloaded. Waste is carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill inspects the waste discharged at the screening site.

If waste is detected which is suspected to be unauthorized liquid waste (liquids in containers or non-bulk/non-containerized liquids other than household wastes), the attendant will perform a paint filter test on a sample of the suspect waste. The paint filter test will be performed as follows:

- a 100 milligram sample of waste will be placed in a conical, 400 micron paint filter;
- if liquid passes through the paint filter in five minutes, the conclusion that the waste contains free liquid will be made.

If unacceptable waste is found, including wastes generated from outside of Guilford County, the load will be isolated and secured by berming off the area. The Solid Waste Disposal Manager or the Landfill Supervisor will then notify the following official of the North Carolina Department of Environment, Health, and Natural Resources, Division of Solid Waste Management within 24 hours of attempted disposal of any waste the landfill is not permitted to receive in order to determine the proper course of action (it should be noted that the hauler is responsible for removing unacceptable waste from the landfill property):

Mr. Hugh Jernigan
Waste Management Specialist
585 Waughtown Street
Winston-Salem, NC 27107
(910) 771-4600

The following records are kept on-site to document all inspections:

- The date and times wastes were received for inspection
- Source and type of wastes
- Vehicle and driver identification
- All observations made by the inspector
- Final disposition of waste after inspection

1.3.2 Prohibited Waste Types

The following wastes are prohibited from disposal within a municipal solid waste landfill (MSWLF) unit:

- Whole Scrap Tires
- Used Oil
- White Goods
- Lead Acid Batteries
- Yard Trash
- Asbestos Waste
- Wooden Pallets
- Aluminum Cans
- Rigid plastic containers

In addition, operating criteria prohibit other materials from disposal at the MSWLF unit. These criteria address the following types of waste:

- Hazardous waste as defined within 15A NCAC 13A, including hazardous waste from conditionally exempt small quantity generators.

- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761.

- Bulk or non-containerized liquid wastes unless the waste is household waste other than septic waste and waste oil; or the waste is leachate or gas condensate derived from the MSWLF unit, whether it is a new or existing MSWLF unit or lateral expansion, is designed with a composite liner and leachate collection system.

- Containers holding liquid wastes unless the container is a small container similar in size to that normally found in household waste; the container is designed to hold liquids for use other than storage; or the waste is household waste.

- Wastewater treatment sludges unless they are used as a soil conditioner and incorporated or applied to the vegetative growth layer (at a depth no greater than six inches).

1.3.3 Hazardous Waste Contingency Plan

WHITE STREET LANDFILL
HAZARDOUS MATERIALS CONTINGENCY PLAN

BACKGROUND:

This plan is developed to meet the requirements of the North Carolina Administrative Code 13B.1626 (1) (f) (iv). The White Street Sanitary Landfill is a Municipal Solid Waste Landfill. The unit is owned and operated by the City of Greensboro for the disposal of solid waste from residential, commercial and industrial sources within Greensboro and Guilford County. The White Street Sanitary Landfill does not accept any liquid or hazardous waste. Active measures are taken to insure that hazardous materials do not enter the landfill. These include signage, customer screening, radiation scanning and load inspections.

This plan establishes procedures that must be taken to minimize hazards to human health and the environment caused by sudden, non-sudden, or unplanned explosion, fire, discovery, or release of an unknown or hazardous material to the air, soil, surface water, or ground water.

HAZARDOUS MATERIALS CONTINGENCY PLAN

1. Facility Identifications and General Information

Name: The City of Greensboro
Department of Environmental Services
Division of Solid Waste Management
White Street Sanitary Landfill

Location: 2503 White Street
Greensboro, North Carolina

Mailing Address: PO Box 3136
Greensboro, NC 27402-3136

Telephone: (336) 373-7658 (Administration Office)
336-373-7661 (Landfill Operations)
336-430-6171 (Landfill Operations Cell Phone)

Facility Type:
A Municipal Solid Waste Landfill with the following operations on site: (a) MSWLF disposal sites (active and closed), (b) Construction and Demolition Debris landfill, (c) Yard Waste composting facility, (d) Heavy Equipment maintenance garage, (e) Fuel dispensing station (automated), (f) Administrative offices and scale facility, (g) storage facility, (h) two phase landfill gas system.

The White Street Sanitary Landfill is not a RCRA Hazardous Waste generator or disposer. Used oil generated in the maintenance garage is pumped out of the aboveground storage tank and sent for recycling. Any hazardous materials encounter on this site will be as a result of an attempt to improperly dispose of materials banned from this site or materials exempt from regulation.

Personal Training:

Facility personnel are properly instructed in the operation and maintenance of all equipment used to prevent discharges from the site. Personnel receive training upon employment and annual refreshers. The Contingency Plan is reviewed and updated annually.

2. Emergency Coordinators

Primary Emergency Coordinator	Home Phone	Business Phone	Cellular
David Scott Bost Solid Waste Disposal Manager 814 Olive St Greensboro, NC 27401	(336) 430-6171	(336) 373-7661	(336) 430-6171

Secondary Emergency Coordinators	Home Phone	Business Phone	Cellular
Jason Jernigan Operations Supervisor 711 N. Church Street Greensboro, NC 27401	(336) 215-5606	(336) 373-3959	(336) 557-3445
Lewis Walker Environmental Compliance Specialist 2310 1D Bellemeade St. High Point, NC 27263	(336) 491-1367	(336) 373-7662	(336) 254-8096
Robert Rash Composting Facility Supervisor 5594 Wild Turkey Road Whitsett, NC 27377	(336) 698-0206	(336) 373-7659	(336) 442-4776
Dewayne Wheeler Landfill Gas Technician 3844 Battleground Ave. Apt 117 Greensboro, NC 27410	(704) 902-0495	NA	(336) 383-6534

3. Emergency Phone Numbers

Fire and/or Hazmat	911 or 373-2222
Police	911 or 373-2222
Emergency Medical Service	911
Emergency Management (Greensboro/Guilford Co.)	373-2278
Emergency Management Operations (NCDENR)	(800) 858-0368
Division of Solid Waste Management (NCDENR – Winston-Salem)	771-5000
NC Department of Labor – OSHA	(919) 807-2796
CHEMTREC	(800) 262-8200
National Response Center	(800) 424-8802
Medical Services (City of Greensboro)	373-2412
Moses Cone Hospital (Emergency Department)	832-8040

4. Emergency Response Procedures

In the event that hazardous or suspicious materials are detected at the landfill, the following steps will be taken:

NOTIFICATION

The individual discovering the situation will immediately notify the Administrative Building. The operator receiving the call shall immediately notify the Emergency Coordinator.

The Emergency Coordinator shall assess the situation and take action as necessary. In the event of an actual emergency situation, the Emergency Coordinator must immediately:

1. Notify all landfill personnel
2. Evacuate personnel and customers to a safe location, as appropriate
3. Require transporter to remain at facility, as appropriate
4. Implement the appropriate Action Plan (see appendix)
5. Notify Greensboro fire Department Hazmat Team if appropriate
6. Notify NCDENR Division of Solid Waste Management, Solid Waste Section

7. If the Emergency Coordinator has determined that the facility has had a release, fire or explosion that could threaten human health, or the environment, outside the facility, then the NCDENR Emergency Management Center (800-858-0368) and the National Response Center (800-424-8802) must be notified as follows:

   Report should include the following information:
   a. Name and telephone number of reporter
   b. Name and address of facility
   c. Time and type of incident (release, fire, etc.)
   d. Name and quantity of material involved
   e. The extent of injuries, if any
   f. Possible hazards to human health, or the environment, outside the facility
   g. Corrective actions taken or planned

1. Follow-up

The Emergency Coordinator will ensure that, after a hazardous materials emergency has occurred, all recovered waste, contaminated soil and water will be disposed of in accordance with EPA guidelines.

The Emergency Coordinator will see that all materials used in the containment or cleanup are replaced in a timely manner.

The Emergency Coordinator will also ensure that an investigation be conducted to determine the cause of the incident and the steps will be taken to prevent its reoccurrence.

The Emergency Coordinator shall notify NCDENR within 24 hours of an attempted disposal of any waste the landfill is not permitted to receive, including waste from outside the area the landfill is permitted to serve. Within five days of the incident, the Emergency Coordinator must submit a written report to the NCDENR, Division of SWM, Solid Waste Section. The report must include the following:

a. The name, address, and telephone umber of the facility

b. The name, address and telephone number of the transporter

c. The name address and telephone number of the waste generator

d. When the incident took place

e. Who was responsible for responding the incident (Hazmat Team, Environmental Clean-up contractor, etc.)

f. The response actions taken

g. The extent of human injuries caused by the incident

h. An assessment of harm to both human health and environment

i. The amount of materials recovered and disposed of the incident

j. Additionally, the report should contain documentation of calls of notification to the state or EPA as appropriate.

k. Note preventative measures, if any, and historical incidents at the site.

6. Appendix

Hazardous or Suspect Materials Action Plan

1. The employee that discovers hazardous or suspected waste shall see that all personnel, customers and visitors are evacuated a safe distance upwind from the waste. Then;

2. Notify the Emergency Coordinator. The Emergency Coordinator will notify the Emergency Team.

3. The Emergency Coordinator shall assess the situation and determine if an emergency exists and the appropriate action.

4. The transporter of the material will be instructed to remain on the landfill.

5. If the Emergency Coordinator determines an emergency exists, the Greensboro Police/Fire communications shall be notified and request a response from the Hazmat Team.

6. Lead operators will be responsible for a "roll call" in their area, as well as accounting for customers and visitors. The lead operators will report personnel status to the Landfill or Transfer Station Supervisor immediately. If anyone is injured and unable to evacuate him or herself from the hazard area, this shall be reported immediately. In order to prevent additional causalities, rescue will be the responsibility of Fire and/or EMS personnel and will not be attempted by landfill personnel.

7. Due to the landfill waste disposal activities being considered an essential and critical function of the City of Greensboro, should a spill or release of material occur, interrupting the normal operation of the landfill or transfer station, a secondary disposal area will be opened as soon as possible to allow disposal operations to continue. Selection of an alternative disposal area will be based on distance from spill area, wind direction and any other factors that will affect safety.

8. Containment and clean up of hazardous materials shall be the responsibility of GFD Hazmat and the owner of the material. Landfill personnel are not trained to attempt containment or cleanup of hazardous materials.

Radiation Emergency Action Plan

1. If the radiation detectors located on either Scale 1 or Scale 2 goes to alarm mode (>1000 cpm) the scale operator will instruct the driver to turn off all unnecessary electrical components on his vehicle. If the detector continues to alarm, the driver will be instructed to move his vehicle to the paved road leading to the Operations Building. Once the driver has moved his vehicle to the road and parked it halfway between the scalehouse and the Operations Building, he/she will secure the vehicle, abandon the vehicle, and report to the scalehouse.

2. The scale operator shall notify the Emergency Coordinator.

3. All personnel will be kept a safe distance from the vehicle.

4. The Emergency Coordinator will notify GFD Hazmat (373-2222), Greensboro/Guilford County Emergency Management (373-2278) and NCDENR Emergency Management (800-858-0368).

5. Containment, cleanup and removal of material shall be the responsibility of GFD Hazmat and the owner.

1.4 Waste Disposal

Solid waste transportation vehicles arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the off loading of waste, a certain number of vehicles are allowed on the working face at a time. The actual number is determined by the truck spotter. This procedure is used in order to minimize the potential of off loading non-acceptable waste and to control disposal activity. Operations at the working face are conducted in a manner which will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of solid waste.

Solid waste unloading at the landfill is controlled to prevent disposal in locations other than those specified by site management. Such control is also used to confine the working face to a minimum width, yet allow safe and efficient operations. The width of the working face is maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of cover soil required each day. Normally, only one working face is active on any given day, with all deposited waste in other areas covered by either daily, intermediate cover or final cover, as appropriate.

Other services such as sediment basin maintenance, construction, site clean-up, etc. may be contracted to outside firms on a temporary basis.

The sequence of fill will proceed uphill from the low end, subcell by subcell. Using multiple lifts allows filling to occur uniformly across the subcells, eliminates depressed areas and facilitates movement of storm water off site. Less extreme elevation differences occur during construction when using multiple lifts. Waste disposal activities are expected to start in the northeastern corner and progressing south and west across the cells.

All putrescible solid waste delivered to the working face, such as spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste, is covered immediately. Asbestos waste is not accepted at the landfill.

Use of portable signs with directional arrows and portable traffic barricades facilitates the unloading of wastes to the designated disposal locations. These signs and barricades are placed along the access route to the working face of the landfill or other designated disposal areas which may be established.

1.5 Spreading and Compacting

The procedures for the placement of waste in the landfill include the unloading of trucks, checking of waste for fire, the even spreading of waste, and compaction using the landfill compactor equipment in layers not to exceed eighteen inches in depth. These layers are applied to construct a lift of approximately ten (10) feet in depth after compaction. The level of compactive effort should be sufficient to produce a waste cohesion volume of 300 pounds per square foot. Cover material will be placed over the compacted waste at the end of each day. The size of the working face where unloading, spreading, and compacting takes place will be limited to allow for the most efficient use of cover material.

1.6 Cover Requirements

A significant volume of soil is required to provide for the cover requirements of the White Street Sanitary Landfill. In order to provide for these requirements, on-site borrow areas are excavated in stages to keep pace with the demand for soil. The borrow areas are located south of the entrance road. During normal operations material is excavated,

loaded, hauled and then placed over the waste. The development of large stockpiles which result in double handling of materials is avoided. However, stockpiling of material may be necessary prior to the winter when excavating materials is more difficult due to colder, wetter weather. Off-site soil or alternative cover may be used to reduce the on-site requirements for soil cover.

1.6.1 Daily Cover

In accordance with Rule .1626 (2)(a) disposed solid waste is covered with six inches of earthen material at the end of each operating day, or at more frequent intervals if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging.

The City plans to use either soil or an approved alternative cover on a daily basis. This alternate cover may be used on a daily. On weekends and holidays the lift face will be covered with six inches of compacted soil.

The White Street Sanitary Landfill has an adequate quantity of acceptable earth cover for routine operations.

1.6.2 Intermediate Cover

Intermediate cover consisting of a total thickness of twelve inches is applied to all areas which will not have wastes placed on them for 12 months or more, but where final termination of disposal operation has not occurred. The areas which have received intermediate cover are graded to prevent ponding and temporary grass cover is planted. Any erosion or other damage which has occurred to the intermediate cover is repaired on a routine basis. Litter fences are installed to reduce blowing litter.

1.7 Disease Vector Control

The need for extensive disease vector control (control of rodents, flies, mosquitoes, or other animals, including insects, capable of transmitting disease to humans) is minimized through proper site operation, including on-going compaction and application of daily and final cover. If vector problems develop that require control beyond the measures indicated above, appropriate measures will be taken.

1.8 Explosive Gases Control

Landfill gases are the product of solid waste decomposition under anaerobic conditions. The quantity and types of gas generated depend on the type of waste disposed of. The largest amount of gas generated is generally from waste containing a high percentage of readily degradable organic matter. The rate of generation depends mainly on the moisture content, temperature, and particle size of the waste and the age of the fill. High temperature and moisture content, along with small particle size, tend to result in higher gas production. Gas production from a landfill can last from two to 100 years, but generally peaks after approximately five years, if the moisture content is not limited. Landfill gases predominately consist of methane and carbon dioxide. Initially, the gas is mostly carbon dioxide with methane production beginning later; however, the gas eventually reaches approximately 50% methane by volume.

A gas monitoring system will be constructed along the perimeter of the landfill. This system will be monitored with a mobile combustible gas indicator (CGI) to check for gas migration along the perimeter of the landfill nearest any residential structures. All buildings and enclosed structures on the landfill are monitored as part of a routine methane monitoring program. Routine monitoring for gas migration is performed in accordance with Rule .1626 Part (4)(b) on a quarterly basis to ensure that the following compliance levels for methane concentration are not exceeded: 1) the concentration of methane gas generated by the facility does not exceed 25% of the lower explosive limit (LEL) for methane in facility structures (1.25% methane); and 2) the concentration of methane gas migrating from the landfill does not exceed the LEL for methane at the facility property boundary (5% methane).

If concentrations are measured at greater than 25 percent of the LEL for methane in facility structures then the City will immediately take all necessary steps to ensure protection of human health and shall notify the Division of Solid Waste Management. Within seven days of detection, the methane gas levels detected and a description of the steps taken to protect human health shall be placed in the operating record. Within sixty days of detection, a remediation plan describing the nature and extent of the problem and the proposed remedy for methane gas releases shall be placed in the operating record, the remediation plan shall be implemented, and the Division of Solid Waste Management shall be notified that the remediation plan has been implemented.

1.8.1 Methane Monitoring Program

The City of Greensboro will continue to conduct routine methane monitoring events to ensure that methane concentrations do not exceed 25% of the lower explosive limit (LEL) in facility structures or 100% of the LEL at property boundaries, as required in Rule 1626 (4). Methane wells and locations along North Buffalo Creek will continue to be monitored quarterly as part of the program.

1.8.2 Sampling Procedures

The monitoring device that will be used during each quarterly monitoring event will be a portable combustible gas indicator. This is equipped with a flexible hose and rigid probe. Calibration of the instrument will be performed in accordance with the manufacturer's specifications.

Personnel designated to perform the monitoring program will be trained in the operation, maintenance, and calibration of the monitoring equipment. The following operating procedures and safety precautions will be adhered to by all personnel when monitoring for methane gas:

1: At least two people should be present at all times when monitoring for explosive gases.

2: At a minimum, safety glasses, gloves, work boots, will be worn. Other appropriate personal protective equipment will be worn as needed.

3: Smoking and open flames are strictly prohibited at all times during the monitoring event.

4: Fire extinguishers will be readily available when performing the monitoring event.

5: Personnel performing the monitoring event will have the City radio readily available as it has direct access to emergency personnel.

1.8.3 Emergency Response Plan

In the event gas levels are detected that exceed allowable limits, the emergency response plan will be as follows:

1: For 100% LEL at landfill boundaries less than 250 feet from structures:

a: Greensboro Fire Department and Hazardous Material Team will be notified.

b: Implement procedures as outlined in Rule 1624 (4).

2: For 100% LEL at landfill boundaries where the distance is greater than 250 feet from structures:

a: Notify the Division.

3: For structures detection levels greater than 25% LEL:

a: Evacuate the structure immediately.

b: Notify Greensboro Fire Department and Hazardous Material Team.

1.9 Air Criteria

In accordance with the State Implementation Plan developed under the Clean Air Act Section 110, open burning is prohibited at the site, unless approved by the Division for the infrequent burning of land clearing debris generated on site or debris from emergency clean-up operations. In order to control accidental fires from occurring at the site, the following preventative measures have been taken:

- The Scale Attendant(s) and equipment operators screen incoming waste loads for signs of hot loads, such as smoke, steam or heat being released from the waste, in order to prevent such loads from being off-loaded in the active area of the landfill.

- Smoking is confined to designated areas only, away form active areas of the landfill, fuel stations, methane collection and treatment equipment and other fire-sensitive areas.

- Motorized equipment is not parked near fuel stations longer than necessary for refueling.

- Fuel spills are contained by berming and cleaned up immediately using some type of absorbent material.

- Landfill equipment does not remain in the active area of the site overnight.

- Dead trees, brush, or vegetation adjacent to the landfill are removed immediately, and grass and weeds mowed so that brush fires cannot spread to the landfill. A mower/shredder is available to control grass and brush.

Fire fighting equipment is available on-site to control fires should they occur. In addition, all equipment is equipped with automatic fire extinguisher systems and all landfill personnel have been certified in CPR as of July 1, 1995. In the event that additional fire protection is needed, the City of Greensboro Fire Department will be contacted immediately to provide fire-fighting services. The Division of Solid Waste Management will be notified verbally within 24 hours of any fire occurrence at the landfill, and written notification shall be submitted to the Division within 15 days of the fire incident.

1.10 Access and Safety Requirements

Entry to the site is limited to landfill personnel, approved waste haulers and properly identified persons whose entry is authorized by the site management. The City reserves the right to restrict access to the site. Visitors may be allowed near the active area only when accompanied by a site representative.

An entrance sign is posted stating the facility name, permit number and operating hours. Additional signage regulates traffic flow, provides information on dumping procedures, the type of waste the facility is permitted to receive as well as those wastes banned from disposal at the facility, and indicates the location of the disposal area.

Facility roads are maintained to be passable to ensure that all operation areas and units are accessible in all weather conditions. Dust control measures, including wetting or temporary seeding of soil stockpiles and wetting of on-site roads, are implemented when necessary.

All facilities are surrounded on all sides by natural barriers, fencing, or an equivalent means of controlling vehicular access and preventing illegal disposal. All access is limited by gates, and such gates are securable and equipped with locks.

Scavenging is not permitted at the landfill. If the volume of salvageable goods is sufficient, those items are set aside for salvage disposal by the City of Greensboro; however, under no circumstances are goods to be salvaged from the working face. Items stockpiled for possible salvage are maintained in a neat and orderly fashion.

Barrels and drums are not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein, except fiber drums containing asbestos.

1.11 Sedimentation and Erosion Control

The landfill will be constructed with maximum 4:1 side slopes and minimum 12.5:1 top slopes to promote runoff and prevent ponding over or in the waste. Perimeter drainage channels at the toe of the slope will provide runoff, erosion, and sediment control. The drainage channel allows for the movement of surface water from landfilling activities and provides a settling zone for sediments carried from the site. The channel is constructed to allow drainage via sediment basins through natural outfalls to North Buffalo Creek. In

addition to the drainage channel, sediment basins, silt fences, slope drains, and sediment traps, temporary and permanent seeding will be used to mitigate sedimentation and erosion control problems. All measures will be constructed or installed in accordance with standards specified in the North Carolina Erosion and Sediment Control Planning and Design Manual.

Sediment basins will also prevent the discharge of pollutants that violate requirements of the Clean Water Act, including, but not limited to, NPDES requirements, into the waters and wetlands of the United States.

The landfill will have a comprehensive surface and groundwater monitoring program to provide early detection of any leachate migration problems. In the event any constituents are detected above allowable limits, measures will be taken to begin assessing the extent of contamination and, if necessary, corrective actions will be taken to prevent the pollution of waters and wetlands of the United States, that violate any requirements of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

1.12 Drainage Control and Water Protection Requirements

The landfill will be constructed with 4:1 side slopes and 12.5:1 top slopes to promote runoff and prevent ponding over or in the waste. Perimeter drainage channels at the toe of the slope provide runoff, erosion, and sediment control. Sediment basins will also prevent the discharge of pollutants into the waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to, NPDES requirements.

The landfill has a comprehensive surface and groundwater monitoring program to provide early detection of any leachate migration problems (see Section 11.0). In the event any constituents are detected above allowable limits, measures will be taken to begin assessing the extent of contamination and, if necessary, corrective actions will be taken to prevent the pollution of waters of the United States, including wetlands, that violate any requirements of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

1.13 Leachate Management

The leachate collection system will be inspected on an annual basis to determine if clean-out of the lines is required. Any unusual fluctuation in leachate quantity or incident affecting the collection system will also trigger a complete inspection of the system. Records will be kept indicating any maintenance performed on the system and all associated test results. Leachate samples will be obtained semi-annually from the pump station for quality analysis. These results will be forwarded to the treatment plant operator and maintained on-site for regulatory review. Provisions will be made for hauling leachate by truck should that become necessary. The tank's final sizing will be determined by the allowable discharge rate into a POTW pipeline and a minimum of one week emergency capacity. The emergency capacity is to account for repairs to system pumps of discharge lines. The plan will be revised after any unexpected condition to reflect the appropriate action in the event of a recurrence.

1.14 Record Keeping

The City of Greensboro maintains detailed records of all activities relating to the landfill. These records are either kept on site or at the office of the City's Public Works Department and include: types and quantities of waste received; source of waste received; revenue generated from waste received; applications for industrial waste disposal and related analyses; well water usage; results from surface and groundwater monitoring, landfill gas monitoring; leachate quantity and quality results; correspondence from regulatory agencies; accident reports; and reports of site and random load inspections. Table 5-2 provides a summary of the records kept, their frequency of completion, and the locations where the records are maintained.

TABLE 5-2
CITY OF GREENSBORO
WHITE STREET SANITARY LANDFILL RECORD KEEPING

Type of Record	Frequency of Completion	Location Maintained
Waste quantities received	Daily	Landfill
Source of waste received	Daily	Landfill
Revenue from waste received	Daily	Landfill
Industrial waste applications and analyses	Before initial waste disposal and annually thereafter	Landfill
Employee Training and Certifications	As performed	Landfill
Surface and groundwater monitoring data	Semi-annually	Landfill
Related correspondence	As received	Landfill
Accident reports	After each occurrence	Landfill
Site inspections	Daily, quarterly, annually	Landfill
Results of random waste load inspections	After each inspection	Landfill
Gas monitoring results	Quarterly	Landfill
Leachate quality	Semi-annually	Landfill
Leachate quantity	Monthly	Landfill
Closure/ Post Closure estimate	Annually	Landfill

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Results of random waste load inspections	After each inspection	Landfill
Gas monitoring results	Quarterly	Landfill
Leachate quality	Semi-annually	Landfill
Leachate quantity	Monthly	Landfill
Closure/ Post Closure estimate	Annually	Landfill

City of Greensboro

Department of Environmental Services
Solid Waste Management Division
White Street Waste Disposal Facility

GREENSBORO

WATER QUALITY MONITORING PLAN

P.O. BOX 3136, GREENSBORO, NC 27402-3136

WATER QUALITY MONITORING PLAN
WHITE STREET LANDFILL
PHASE III AREA

WHITE STREET
GREENSBORO, NORTH CAROLINA
S&ME PROJECT NO. 1584-98-081

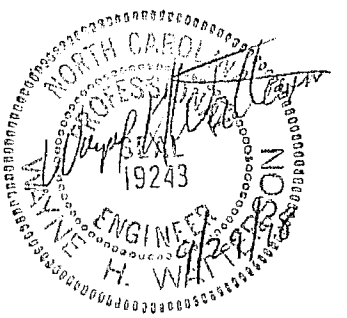
Prepared For:

THE CITY OF GREENSBORO

Prepared By:

S&ME, Inc.
3718 Old Battleground Road
Greensboro, North Carolina 27401

September 1998



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1.0 WATER QUALITY MONITORING PLAN

1.1 PURPOSE AND INTENT

The purpose of this plan is to provide a program which describes the collection and evaluation of ground-water monitoring samples collected from compliance wells installed within the uppermost aquifer adjacent to the proposed expansion area and surface water quality samples from the same vicinity. The intent of this plan is to provide detection monitoring throughout the active life and post closure care period at the White Street Sanitary Landfill Subtitle D MSWLF expansion.

This plan was prepared in accordance with the rules codified under North Carolina Solid Waste Management Rules 15A NCAC 13B, Sections .1630 through .1637 under the guidance of a North Carolina Professional Engineer, and it is certified that this water quality monitoring plan for the White Street Sanitary Landfill Subtitle D MSWLF expansion is effective in providing early detection of any release of hazardous constituents (from any point in this expansion) to the uppermost aquifer, so as to be protective of public health and the environment.

The plan presented herein is a revision of the Water Quality Monitoring Plan prepared for the facility by HDR Engineering, Inc. of North Carolina dated January 1, 1997. The plan is revised to include procedures to sample ground water monitor wells with dedicated pneumatic sampling pumps. No other parts of the January 1, 1997 plan prepared by HDR have been modified.

1.2 DESCRIPTION OF PLAN COMPONENTS

The following is a brief description of the main components of this water quality monitoring plan.

1.2.1 Water Quality Sampling Locations

The following sections discuss the general ratioale used to select the upgradient (background) compliance well and the downgradient (detection) compliance wells based on the geologic and hydrogeologic data obtained during the development of the Hydrogeologic Design Report. All well locations were selected on their basis to provide water quality data from the uppermost aquifer beneath the facility. The rationale for selection of surface water monitoring points is also discussed.

Using the historical water-table elevation data collected during multiple ground-water monitoring events at the facility, and the geology of the site, two background compliance wells were selected on the basis of hydraulic position in relation to the solid waste management unit. Background well MW-15 is hydraulically "upgradient" of the unit and was completed in the gneissic material. Background well MW-16 is hydraulically sidegradient of the unit and was completed in the granitic material. Table 1-1 summarizes the proposed background monitoring wells for this plan and their approximate distance from the edge of the proposed solid waste cell.

1.2.1.2 Downgradient (Detection) Wells

The hydrogeologic and geologic characteristics of the facility and surrounding land, the quantity, quality, and direction of ground-water flow were evaluated to determine the appropriate selection of downgradient (detection) wells. In addition to the criteria above, the distance of each proposed well relative to the waste unit (100 to 150 feet) and the boundary of the property (50 feet or greater) were also considered. Table 1-1 summarizes the proposed downgradient (detection) monitoring wells for this plan and their estimated distance from the subject compliance boundary.

Each downgradient well was installed with a screened interval of Schedule 40 PVC well screen with a 0.010-inch slotted opening.

TABLE 1-1
SUMMARY OF PROPOSED DETECTION MONITORING SAMPLE LOCATIONS
White Street Sanitary Landfill
Phase III
Greensboro, North Carolina

SAMPLE ID	SAMPLE TYPE	INTERVAL MONITORED	SAMPLE LOCATION AND POSITION		DETECTION MONITORING FUNCTION
			Distance and Direction From Waste Cell Boundary	Hydrogeologic Position	
MW-15	Ground Water	Uppermost Aquifer Gneissic Material	225 Feet Southwest	Upgradient	Provide Background Water Quality Data
MW-16	Ground Water	Uppermost Aquifer Granitic Material	450 Feet Southeast	Sidegradient	Provide Background Water Quality Data
MW-17	Ground Water	Uppermost Aquifer	125 Feet East	Downgradient	Provide Release Detection Data
MW-18	Ground Water	Uppermost Aquifer	135 Feet East	Downgradient	Provide Release Detection Data
MW-19	Ground Water	Uppermost Aquifer	110 Feet Northeast	Downgradient	Provide Release Detection Data
MW-20	Ground Water	Uppermost Aquifer	125 Feet North	Downgradient	Provide Release Detection Data
MW-21	Ground Water	Uppermost Aquifer	125 Feet West	Downgradient	Provide Release Detection Data
MW-22	Ground Water	Uppermost Aquifer	150 Feet North-Northwest	Downgradient	Provide Release Detection Data
MW-23	Ground Water	Uppermost Aquifer	150 Feet West-Northwest	Downgradient	Provide Release Detection Data
MW-24	Ground Water	Uppermost Aquifer	150 Feet West	Downgradient	Provide Release Detection Data
MW-25	Ground Water	Uppermost Aquifer	135 Feet North	Downgradient	Provide Release Detection Data
MW-25D	Ground Water	Deeper Portions of Uppermost Aquifer	125 Feet North	Downgradient	Provide Release Detection Data
SU-1	Surface Water	Tributary/Stream	See Drawing G-1	Upstream	Provide Background Water Quality Data
SU-2	Surface Water	Tributary/Stream	See Drawing G-1	Downstream	Provide Surface Water Quality Data
SU-3	Surface Water	Tributary/Stream	See Drawing G-1	Downstream	Provide Surface Water Quality Data
SU-4	Surface Water	Tributary/Stream	See Drawing G-1	Downstream	Provide Surface Water Quality Data

Shallow wells have 15-foot screens and deep wells will have 10-foot screens. The construction of the final ground water monitoring wells will be in general accordance with the North Carolina Well Construction Standards. A schematic showing general well construction details is shown on Construction Permit Application Drawing C-12 (see January 1997 plan).

The number and location of the proposed monitoring wells have been selected based on several considerations. First, knowledge of ground water flow at the proposed expansion area, as described in the accompanying "Design Hydrogeologic Report," indicates that these wells encompass the downgradient area of the expansion. Second, each shallow well will be completed in the uppermost aquifer, with well screens that span the water table. Third, the lateral spacing of these wells was chosen because it is more than adequately close together considering the fine-grained nature of the saprolite aquifer in which dispersion is high. Finally, a well was located downgradient of the leachate collection sump, an area that the State considers particularly vulnerable. Well MW-25 will monitor the northeastern sump, as well as provide monitoring for that general portion of the lined facility.

In addition, a deep well, MW-25D, was installed as a nest at MW-25. Note also that this well pair is located along the axis of the prominent bedrock surface valley that trends through that area.

1.2.1.3 Surface Water Sample Locations

Four surface water sample locations have been proposed to monitor the quality of surface water near the solid waste unit. A surface water sample representing background water quality will be collected from the upstream portion of the creek that flows to the east of the disposal area. The downstream surface water samples will be collected from streams that will receive run-off from the landfill area. The location of these proposed surface water sampling locations can be seen on Drawing G-1.

1.2.2 Monitoring Well Data Collection

The following data will be collected and reported during the period of performance for this water quality plan. A brief discussion on the collection of and analysis of these data is provided in the sections to follow.

1.2.2.1 Ground Water Level Data Measurements

Static ground-water levels (and total well depth) will be obtained from the proposed ground-water compliance monitoring wells immediately prior to purging during each required water quality sampling event. An electronic water level meter capable of measuring differences in water levels of 0.01 feet will be used to obtain these measurements.

All measurements will be obtained from a reference point at the top of each PVC well casing which has an elevation established by a North Carolina registered land surveyor. The horizontal position of each well will be established using North Carolina Plane Coordinates. These data will be used to calculate the volume of standing water in each well and will provide information concerning well integrity (e.g., identify the presence of excessive siltation or casing breaches). All measuring equipment will be decontaminated between use at each well by washing in a non-phosphate detergent solution and rinsing in distilled or deionized water.

1.2.2.2 Ground Water Direction and Flow Measurements

Water table elevations will be calculated for each monitoring well using surveyed top-of-casing elevations prepared by a North Carolina registered land surveyor. Calculated potentiometric surface elevations, for each sampling event, will be placed on a scaled base map of the facility beside each respective monitoring point and contoured to produce a water table potentiometric surface map depicting potential ground-water flow direction(s) across the expansion area. In addition, estimated ground-water flow velocities for each compliance monitoring point will be calculated for each water quality sampling event. Using the static water table potentiometric data, effective porosities for each well, hydraulic conductivities determined from slug tests of each well, and the calculated hydraulic gradients at each monitoring well for the respective sample event, an estimated seepage (pore water) velocity at each monitoring well will be calculated to evaluate potential contaminant migration.

1.2.2.3 Ground Water Sampling With Dedicated Pneumatic Pumps

The City of Greensboro has elected to use dedicated sampling pumps to collect groundwater samples from monitor wells at the landfill. With proper techniques for low-flow purging and sampling, the pumps offer the potential of obtaining groundwater samples with lower turbidity than

would be obtainable with bailers. The following text provides specifications and procedures applicable to groundwater sampling with dedicated pneumatic pumps.

Dedicated sampling pumps shall be all pneumatic, bladder pumps driven by a portable cycling air controller supplied with compressed air from a portable oil-less air compressor or compressed air bottle. Pump effluent will pass through a portable flow-through cell and water analyzer, which will monitor temperature, pH, conductivity, oxidation-reduction potential (ORP), and dissolved oxygen to indicate when stabilization has occurred.

The sampling pump shall be a positive gas displacement pin construction bladder pump. The pump shall be constructed such that no gas or liquid is introduced into the well during the pump operation. The pump shall be constructed of 316 stainless steel with a Teflon bladder. Bladders shall be field-replaceable and warranted for a period of 10 years. Bladder clamps shall also be constructed of 316 stainless steel. Pumps will be equipped with a screen having an opening not exceeding 0.012 inches. Sample pumps shall employ self-polishing hard seat internal check valves.

The manufacturer shall warrant all pumps to be new construction and shall certify all pumps to be free of all EPA Method 601,602, base neutral, and acid extractable contaminants. Certification and copies of the analytical reports with test batch numbers will be provided with each pump.

Pump airline and discharge tubing shall be of new material, sized to match the fittings supplied with each pump. The tubing bundle will consist of polyethylene air supply line heat bonded to a Teflon-lined polyethylene water supply line. The sample discharge tube shall provide a separate flow path without exposure to pump drive air and shall assure that discharge from the pump contacts only the Teflon inner tubing. The manufacture shall certify that only virgin PTFE (Teflon) has been used in the manufacture of the inner tubing.

The pump air supply line and discharge tubing shall be attached to a well head assembly that will allow attachment of the air supply line to the well head with the use of a quick-connect fitting. The well head assembly shall have an opening to allow measurement of water level with an electric water level probe. The discharge piping shall allow attachment of a Teflon elbow (QED part number 34485 or equivalent) to facilitate collection of the sample.

The air compressor shall be portable, gasoline-powered, of an oil-less design to prevent potential cross-contamination to the sample in the event of malfunction and capable of supplying air to the controller at a minimum rate of 4.3 SCFM at 100 psi. The compressor shall be supplied with a

minimum of 40 feet of air-line to allow for operation of the gasoline engine downwind of the well during sampling.

The controller shall be capable of regulating both pressure and duration of bladder inflation and deflation cycles to allow optimum pump performance. A pause feature shall be provided to allow manual discharging and filling of sample during sample collection.

Purging should be performed by removing water from the well at a flow rate of less than 500 ml per minute. Purging rates should be less than the well recovery rate. The purge rate should be low enough that recharge water does not become excessively agitated or that colloids are drawn into the well bore. Purging should be continued until field measurements of turbidity, oxidation-reduction potential (ORP), and dissolved oxygen in-line analyses of groundwater have stabilized to within 10 percent over at least two measurements made 3 minutes apart.

Following stabilization of the field parameters, the well head should be fitted with the Teflon elbow and the discharge regulated to allow the filling of sample containers. Flow rates should be low enough to prevent aeration of the samples. For the volatile organic compound (VOCs) containers, the vials should be filled so that there are no air bubbles or "headspace".

A complete set of pre-cleaned and pre-labeled sample bottles will be removed from the cooler, prior to turning on the pump, to collect the sample. Once collected, a portion of the sample from the pump (for each well) will be transferred into a fresh container. Preservatives will be added as necessary (in accordance with EPA Methods SW-846) to the sample bottles, either by the laboratory or in the field immediately prior to sampling. A duplicate water quality sample will be collected, at least once a year, from a selected monitoring well in order to verify laboratory accuracy and QA/QC. One trip blank prepared by the laboratory will be analyzed for each sampling event. Equipment blanks are not recommended since the equipment is dedicated.

The sample collection sequence will proceed as follows: volatile organics (VOCs) and/or total organic halogens (TOX) will be collected first in 40 ml glass vials with Teflon-lined caps. The vials will be filled completely with no headspace. Samples to be analyzed for inorganic compounds (metals) will be collected next. The containers are most often plastic cubes or bottles that have acid placed inside as a preservative. These containers should not be rinsed prior to filling. Semi-volatiles will be collected following the inorganics. Generally, the semi-volatiles are collected in 1-liter amber glass bottles. Water samples to be analyzed for radiological parameters will be collected next, followed by the bacteriological parameters, if necessary. The radiological

parameters will be collected in 1-liter bottles, and the bacteriological parameters will be collected in 120 ml plastic bottles containing sodium thiosulfate as a preservative.

After transferring the samples to the appropriate containers, they will be sealed and placed in a chilled cooler, or transpack, pending the completion of the sampling event. Upon completion of sampling at each well location, the well will be capped and secured.

All samples will be transferred directly to the appropriate sample containers in a manner which minimizes the sample agitation, and the potential for cross-contamination. A Chain of Custody Record will accompany the samples to document changes in the custody of the samples in the period between sampling and receipt of the sealed sample containers by the laboratory. The samples will be analyzed for the designated list of parameters by a North Carolina certified laboratory.

1.2.3 Sample Parameters and Frequency

1.2.3.1 Analytical Methods

All water quality samples will be analyzed for the constituents listed in Appendix I of 40 CFR Part 258 entitled "Constituents for Detection Monitoring." Table 1-2 lists the Appendix I constituents as well as the preferred analytical method and Practical Quantitation Limit (PQL) for each constituent.

During the purging process, field measurements (i.e., pH, temperature, and specific conductance) will be collected at each sample location in order to evaluate the effectiveness of purging procedures. These measurements will be obtained from a field-calibrated instrument in accordance with the manufacturers' specifications and industry standards (SW-846). If these field indicators do not appear to have stabilized after 5 well volumes, then well purging efforts will continue until "stabilized" conditions occur.

TABLE 1-2
SUMMARY OF WATER QUALITY ANALYTICAL PARAMETERS

White Street Sanitary Landfill
Greensboro, North Carolina

Metals:

PARAMETER	CERTIFICATION	METHOD	PQL
Antimony	Low level	7041	30
Arsenic	Low level	7060,7061	10
Barium	(20)	7080,6010	500
Beryllium	Low level	7091	2
Cadmium	Low level	7131	1
Chromium	Low level	7191	10
Cobalt	Low level	7201	10
Copper	Regular level	7210,6010	200
Lead	Low level	7421	10
Nickel	Regular level	7520,6010	50
Selenium	Low level	7740,7741	20
Silver	Low level	7761	10
Thallium	Low level	7841	10
Vanadium	Low level	7911	40
Zinc	Regular level	7950,6010	50

PQL - Practical Quantitation Limit in parts per billion (ppb).

TABLE 1-2 (continuation)
SUMMARY OF WATER QUALITY ANALYTICAL PARAMETERS

White Street Sanitary Landfill
Greensboro, North Carolina

Volatile Organics:

ORGANIC CONSTITUENT	METHOD	PQL
Acetone	8240/8260	100
Acrylonitrile	8240/8260	200
Benzene	8240/8260	5
Bromochloromethane	8240/8260	5
Bromodichloromethane	8240/8260	5
Bromoform	8240/8260	5
Carbon Disulfide	8240/8260	100
Carbon Tetrachloride	8240/8260	10
Chlorobenzene	8240/8260	5
Chloroethane	8240/8260	10
Chloroform	8240/8260	5
Chlorodibromomethane	8240/8260	5
1,2-Dibromo-3-Chloropropane	8240/8260	25
Ethylene Dibromide	8240/8260	5
O-Dichlorobenzene	8240/8260	5
P-Dichlorobenzene	8240/8260	5
T-1,4-Dichloro-2-Butene	8240/8260	100
1,1-Dichloroethane	8240/8260	5
Ethylene Dichloride	8240/8260	5
Vinylidene Chloride	8240/8260	5
Cis-1,2-Dichloroethene	8240/8260	5
T-1,2-Dichloroethene	8240/8260	5
Propylene Dichloride	8240/8260	5
Cis-1,3-Dichloropropene	8240/8260	10

PQL - Practical Quantitation Limit in micrograms per liter (µg /l).

TABLE 1-2 (continuation)
SUMMARY OF WATER QUALITY ANALYTICAL PARAMETERS

White Street Sanitary Landfill
Greensboro, North Carolina

Volatile Organics:

ORGANIC CONSTITUENT	METHOD	PQL
T-1,3-Dichloropropene	8240/8260	10
Ethylbenzene	8240/8260	5
Methyl Butyl Ketone	8240/8260	50
Methyl Bromide	8240/8260	10
Methyl Chloride	8240/8260	10
Methylene Bromide	8240/8260	10
Methylene Chloride	8240/8260	10
MEK; 2-Butanone	8240/8260	100
Methyl Iodide	8240/8260	10
Methyl Isobutyl Ketone	8240/8260	100
Styrene	8240/8260	10
1,1,1,2-Tetrachloroethane	8240/8260	5
1,1,2,2-Tetrachloroethane	8240/8260	5
Tetrachloroethylene	8240/8260	5
Toluene	8240/8260	5
1,1,1-Trichloroethane	8240/8260	5
1,1,2-Trichloroethane	8240/8260	5
Trichloroethylene	8240/8260	5
Trichlorofluoromethane	8240/8260	5
1,2,3-Trichloropropane	8240/8260	15
Vinyl Acetate	8240/8260	50
Vinyl Chloride	8240/8260	10
Xylenes	8240/8260	5

PQL - Practical Quantitation Limit in micrograms per liter (µg /l)

Trip blanks will be analyzed for volatile organics only, while equipment blanks will be analyzed for volatile organics and metals. Duplicate samples will be analyzed for the entire parameter list.

1.2.3.2 Sampling Frequency

Ground-water samples will be obtained during four independent events during the first 6 months of baseline sampling in order to provide enough data to adequately determine background/natural ground-water conditions or trends. For the remainder of the required monitoring period, water quality samples from all sample points will be collected on a semiannual basis.

1.3 STATISTICAL EVALUATION OF MONITORING DATA

Five methods have been deemed acceptable by the NCDEHNR for the statistical evaluation of ground-water quality data from MSWLF facilities (as referenced in Section .1632 of the Ground-Water Sampling and Analysis Requirements, 15A NCAC 13B). Each of these tests have inherent advantages and disadvantages which render them more or less useful, depending on site and data set characteristics. Each method is briefly described below. In addition to the statistical analysis of the data, all sampling analytical data will be compared to the North Carolina Ground-Water Standards, 15A NCAC 2L, .0202.

1.3.1 ANOVA (Parametric)

A parametric analysis of variance (ANOVA) followed by multiple comparison procedures to identify specific sources of difference is the preferred method for a facility in the early stages of monitoring. The procedures include estimation and testing of the contrasts between the mean concentrations at each compliance well and those at the background well for each constituent.

Analysis-of-variance models are used to analyze the effects of an independent variable on a dependent variable. For ground-water monitoring data, a well or group of wells is the independent variable, and the aqueous concentration of certain constituents or of a specified contaminant or contaminants is the dependent variable. An analysis-of-variance can determine whether observed variations (differences) in aqueous concentrations between compliance and background wells are

statistically significant. Use of analysis-of-variance models is appropriate in situations where background concentrations of specific constituents can be determined and the data are normally or log normally distributed. The constituents which are most appropriately evaluated using ANOVA approaches are naturally occurring metals and other geochemical parameters such as chloride, nitrate-N, and specific conductivity.

1.3.2 ANOVA (Non-parametric)

A non-parametric analysis of variance (ANOVA) based on ranks followed by multiple comparison procedures to identify specific sources of difference can be used when the data are not normally distributed and cannot be transformed into a log-normal distribution. The procedure includes estimation and testing of the contrasts between the median of each compliance well and the background well for each constituent. This is a non-parametric procedure, which means that the laboratory values are not used; only the relative ranks are used.

1.3.3 Tolerance/Prediction Intervals

A tolerance interval or a prediction interval for each constituent is established from the background data. The concentration of each constituent in each compliance well is compared to set upper (or lower) tolerance or prediction limits.

Tolerance intervals define, with a specified probability, a range of values that are expected to contain a discrete percentage of the sample population (95%). Tolerance intervals are most appropriate for facilities which do not have high degrees of spatial variability between background and compliance well (e.g., areas underlain by homogeneous geologic materials such as granitic saprolite). With ground-water monitoring data, tolerance intervals can be constructed from concentrations found in the background well(s); these intervals are most often expressed as limits defined by the mean background well concentration plus a population size determined multiple of the standard deviation of the mean. Possible ground-water contamination is indicated when concentrations of the specified constituent(s) at the compliance well(s) plot above the calculated tolerance interval limits.

Prediction intervals are intervals in which the user is confident at a specified percentage (95%) that the next observation will lie within the interval, and are based on the number of previous

observations, the number of new measurements to be made, and the level of confidence that the user wishes to obtain. This method of statistical analysis can be used in both detection and compliance monitoring programs. The mean concentration and standard deviation are estimated from the background wells. In a compliance monitoring program, prediction intervals are constructed from compliance well concentrations beginning at the time the facility entered the compliance monitoring program. Each compliance well observation is tested to determine if it lies within the prediction interval. If it is greater (or lower) than the historical prediction limits, water quality has deteriorated to such a point that further action may be warranted.

1.3.4 Control Charts

A control chart approach provides control limits for each constituent which can be used to evaluate data produced by repeated sampling and analysis for each well in the monitoring network. This is an intrawell approach which does not involve a comparison between background and compliance wells. If any compliance well has a value or a sequence of values that lie outside of the control limits for that constituent, this may constitute statistically significant evidence of contamination.

Control charts are based on repeated independent sampling events conducted over time and may be developed for each constituent of interest. Different statistical measurements, such as the means, standard deviation and mean of replicate values at a point in time, are computed and plotted graphically together with upper predetermined limits on a chart in which the x-axis represents time. When a data point plots above these boundaries, the process is "out of control," and when it plots below the boundaries the process is "in control." Control charts can be used to analyze the inherent statistical variation of ground-water monitoring data, to note aberrations and to detect trends in the data. Further investigation of "out of control" points is necessary before taking any direct action. A control chart can be constructed for each constituent in each well to monitor the concentration of that constituent over time. New samples can be compared to the historical data from the well to determine if the well is "in or out of control." Control charts can also be used to evaluate ground-water monitoring data when these data have been adjusted and/or transformed as appropriate.

1.3.5 Other Statistical Methods

Other statistical methods submitted by the facility owner or operator and approved by the NCDEHNR may also be used. This could include development of confidence intervals in which data are compared to Federal or State established maximum contaminant limits (MCLs) or alternate contaminant limits (ACLs).

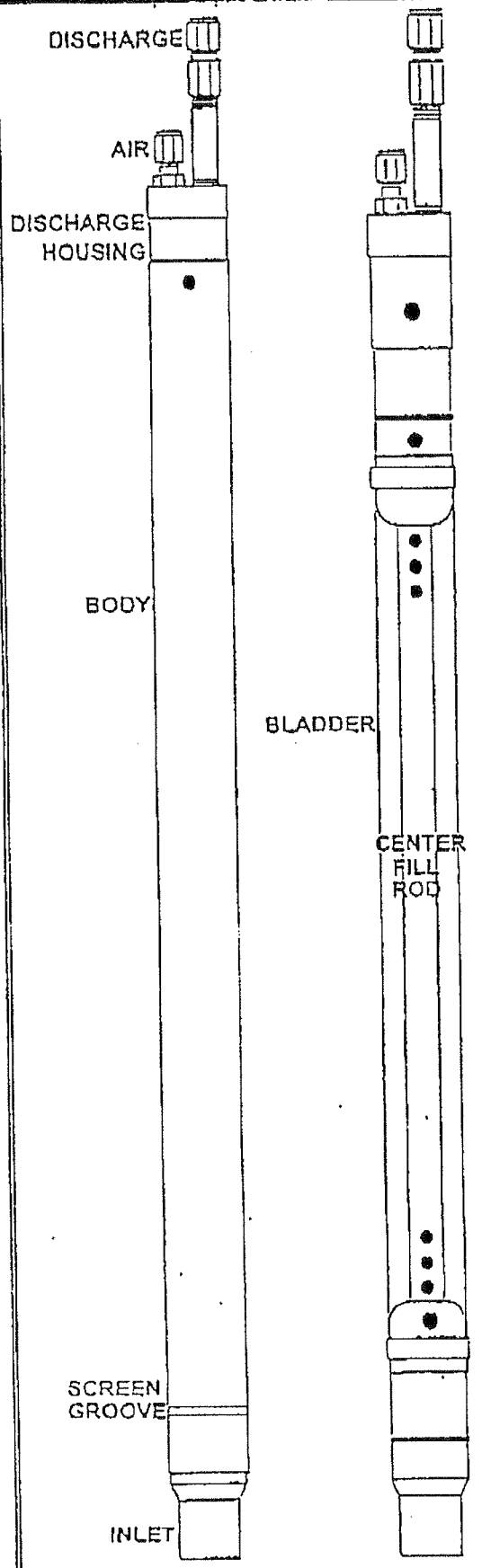
1.4 DETECTION MONITORING REPORTING

The reporting of detection monitoring data will occur within 14 days from the completion of the statistical analysis of the ground-water quality analytical data. A report will be prepared which summarizes the sampling event; including field observations relating to the condition of the monitoring wells, field data, laboratory data, statistical analysis, sampling methodologies, quality assurance and quality control data, information on ground-water flow direction, and calculations of ground-water flow rate.

Appendix

TECHNICAL DATA/SPECIFICATION SHEET

WELL WIZARD® PUMP MODEL T1200(M)



PUMP TYPE: POSITIVE DISPLACEMENT BLADDER PUMP

MATERIALS:

BODY - 316 STAINLESS STEEL
BLADDER - TEFLON®
INLET & DISCHARGE HOUSINGS - 316 STAINLESS STEEL
O-RINGS - VITON

DIMENSIONS:

DIAMETER - 1.5"
LENGTH - 42.25"
LENGTH WITH SCREEN - 47.75"
WEIGHT - 4.05 LBS.
SCREEN MESH - 50 (.010)

FITTINGS:

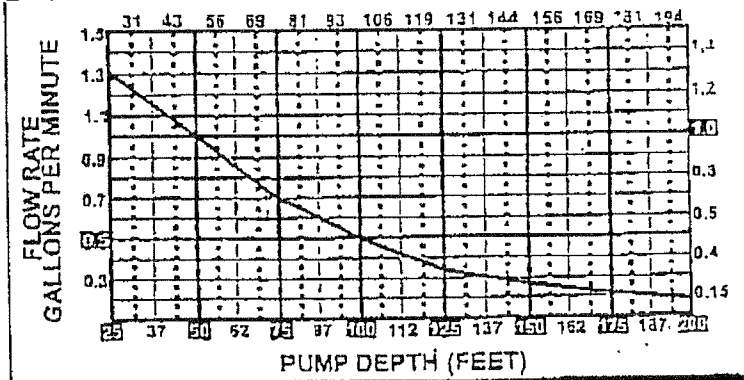
STAINLESS STEEL COMPRESSION-TYPE
AIR - ¼" O.D., 3/16" I.D.
DISCHARGE - 1/2" O.D., 3/8" I.D.
(M) DISCHARGE - 3/8" O.D., 1/4" I.D.

PUMP VOLUME:

LITERS	MILILITERS	GALLONS	OUNCES
.495	495	.13	16.6

MAXIMUM LIFT: 300 FEET

T1200 FLOW RATES



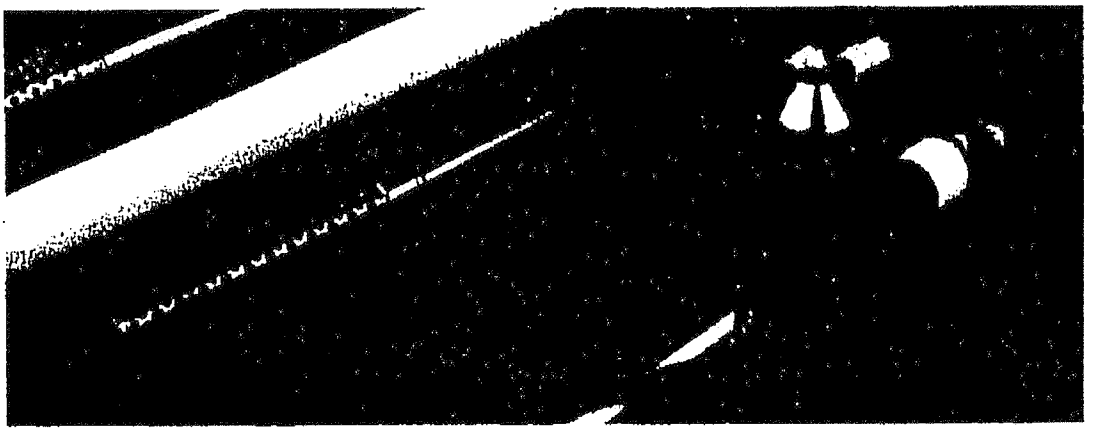
NOTE: Flow rates are based on a pump submergence of 25 feet, 1/2" discharge tubing and an operating gas pressure of 100 P.S.I. from an 3111HR air source/controller

ACCESSORIES:

INLET SCREEN 6" STAINLESS STEEL P/N 35200
BLADDER KIT P/N 35313
CLAMP HAND TOOL/PUNCH KIT P/N 35314

MICROPURGE

Well Wizard® Bladder Pumps: The Low-Flow Sampling Standard



The leaders since 1982 in dedicated pump technology, performance, and support.

The heart of every MicroPurge low-flow ground water monitoring program is the sampling device. For the system to do its job properly, the sampler must:

- run reliably and at low rates (100 ml/min or less) over a wide range of conditions;
- operate gently without increasing turbidity or altering samples;
- deliver reliable performance for many years without needing frequent repairs.

For nearly 15 years, Well Wizard pumps from QED have been doing all this...at more sites...for more users... then any other system.

The most complete low-flow pump selection

MicroPurge system pumps come in an unsurpassed range of sizes, materials, and capabilities, including models for deep wells, narrow or obstructed casings, and small-volume pumps for low-recovery wells. Together with MicroPurge controllers, flow cells, and accessories, they create the most reliable, cost-effective low-flow system available.

Field proven pump materials and exclusive, high performance bladder polymers offer the reliability critical to long-term monitoring. QED was first in the industry with a standard 10-year sampling pump warranty.

Unmatched regulatory and user acceptance

Bladder pumps, EPA-accepted for low-flow sampling, have been shown to deliver superior sample accuracy in dozens of independent studies. Almost 40,000 Well Wizard bladder pumps are in use — more than all other brands and types of dedicated ground water samplers combined.

Well Wizard Advantages

- EPA-accepted low-flow sampling accuracy.
- Models for every well — pump volumes as low as 100ml, well depths to 1,000 feet, casing I.D. from 1.25".
- Proven reliability since 1982, with the industry's first standard 10-year warranty.
- Exclusive bladder polymer rated 200,000 cycles for years more flex life.

ESHELMAN CAROLINAS, INC.
1127 Commercial Avenue
CHARLOTTE, NORTH CAROLINA 28205
(704) 376-6408 FAX (704) 376-2439

MICROPURGE®
From The Leader in Low-Flow Sampling QED

QED *Environmental Systems, Inc.*® P.O. Box 3726, Ann Arbor, MI 48106 1-800-624-2026
FAX 313-995-1170 www.qedenv.com e-mail info@qedenv.com

HOW THEY WORK

Well Wizard Bladder Pumps

Designed for superior low-flow sampling performance

Pneumatic bladder pumps operate with a unique, gentle action ideal for low-flow sampling. Timed on/off pulses of compressed air alternately squeeze the flexible bladder to displace water out of the pump, and release it to allow the pump to refill under the natural in-situ hydrostatic pressure of the aquifer. Bladder pumps run easily at low rates for extended times, without the problems of other samplers.

- No overheating of high-speed electric pump motors, which can alter samples and even ruin the pumps.
- No churning action, like that of bailers or foot-valve samplers, which increases turbidity.
- No suction to cause degassing of dissolved volatile contaminants.

The bladder prevents contact between the pump drive air and the sample, and the downwell equipment is permanently dedicated to each well, so both samples and the well are protected from disturbance or the threat of cross-well contamination.

The easiest system to order and use

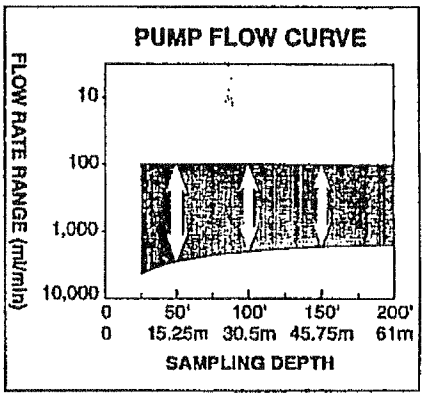
Well Wizard Bladder Pumps are part of the complete low-flow MicroPurge sampling system engineered for easy installation and use. QED application specialists will help specify the most effective, economical pumps and accessories for your site.

Each pump is cleaned and laboratory-certified to be free of all EPA 601, 602, base neutral and acid extractable contaminants. Your system is preassembled, with tubing cut to length, ready to install.

If desired, installation by OSHA-certified field engineers can be provided. QED customer support — with trained local representatives, 24-hour toll-free hotline, and next-day loaners or service turnaround — backs you with unmatched expertise and service.

More MicroPurge dedicated sampling systems and pumps have been chosen since 1982 than all other manufacturers' equipment combined.

To find out why, call QED today for a Low-Flow Data Sheet and site-specific cost analysis.



This graph shows the range of precisely controlled flow rates available from Well Wizard Bladder Pumps and the MicroPurge Model 400 controller. Consult QED for flow rates at greater depths or other special applications.

MICROPURGE PUMP SPECIFICATIONS

Model No.	Pump Materials	Length	O.D.	Fitting Material	*Tubing Size	Volume (ml)	Max. Lift
T1100	Teflon	3.3' (1.0 m)	1.66" (4.2 cm)	Teflon	1/4 x 1/2" (6 x 13 mm)	395	250' (75m)
P1101	PVC	3.4' (1.04 m)	1.66" (4.2 cm)	Polypropylene	1/4 x 1/2" (6 x 13 mm)	395	300' (90m)
P1101H	PVC	3.3' (1.0 m)	1.66" (4.2 cm)	Stainless Steel	1/4 x 1/2" (6 x 13 mm)	395	600' (180m)
ST1101P	316 Stainless Steel	3.4' (1.04 m)	1.66" (4.2 cm)	Stainless Steel	1/4 x 1/2" (6 x 13 mm)	395	1,000' (305m)
T1200	316 S.S. and Teflon	3.4' (1.04 m)	1.50" (3.8 cm)	Stainless Steel	1/4 x 1/2" (6 x 13 mm)	495	300' (90m)
T1250	316 Stainless Steel	1.25' (0.38 m)	1.50" (3.8 cm)	Stainless Steel	1/4 x 3/16" (6 x 5 mm)	100	300' (90m)
P1150	PVC, Teflon	1.63' (0.5 m)	1.66" (4.2 cm)	Polypropylene	1/4 x 3/16" (6 x 5 mm)	130	300' (90m)
T1300	316 S.S. and Teflon	3.8' (1.16 m)	1.00" (2.5 cm)	Stainless Steel	1/4 x 3/8" (6 x 9 mm)	220	300' (90m)

* To choose 3/8" (9 mm) rather than 1/2" (13 mm) discharge tube option, add suffix M to pump model number.

Intake Screen Specifications

Model No.	Material	Screen Size	Fits Pump Model(s)
35200	Stainless Steel	0.01" (0.25 mm) mesh	T1200, T1250
37347	PVC	.010" (0.25 mm) slot	P1101, P1101H
37727	PVC	.010" (0.25 mm) slot	P1250 (also P1101, P1101H)
37733	Teflon	.010" (0.25 mm) slot	T1100

Note: Pump models ST1101P, T1300 include intake screens. Screens are optional on other pump models, but are required for full 10-year warranty coverage.

Materials Specifications

Stainless Steel:	Type 316 electropolished
PVC:	NSF-grade, extruded specifically for QED with no markings or lubricants.
Teflon (pumps):	duPont Teflon® and other premium PTFE resins
Teflon (bladders):	Q-flex exclusive 200,000 cycle rated PTFE.

Teflon is a registered duPont trademark.

Dedicated Groundwater Monitoring Pumping System Specifications

1.0 Manufacturer

The manufacturer shall have a minimum of 13 years experience providing pneumatic bladder pumps in groundwater monitoring applications. The manufacturer shall warranty all components for a minimum of one year. Bladder pumps with inlet screens shall be warranted for a period of 10 years. The manufacturer shall have a local, factory trained agent, and shall have OSHA certified technicians available for installation or start-up assistance. The manufacturer shall maintain a toll-free, 24-hour service line, 365 days a year, provide 24-hour service turnaround, have a minimum of eleven (11) years experience with a pump certification program as described in 1.21. Manufacturer's facility shall include a 300' test well for flow rate verification. Manufacturer must be capable of shipping all standard equipment within ten working days of receipt of order. The manufacturer shall provide an instructional video tape with the system.

1.1 Overview of Operation

An all pneumatic, bladder pump will pump water from a groundwater monitoring well. The pump will be driven by a portable cycle controller, with air supplied by a portable air compressor. Pump effluent will pass through a portable flow-through cell and water analyzer which will monitor temperature, pH, conductivity, ORP, and dissolved oxygen to indicate when stabilization has occurred.

1.2 System Components

1.21 Pump. Sampling pumps shall be positive gas displacement, pin construction bladder pumps, constructed such that no gas or liquid is introduced into the well or sample during the pumping operation. The pumps shall be fabricated of electro-polished 316 stainless steel with a Q-flex Teflon bladder. Bladders shall be field replaceable by replacement of the bladder only, and be warranted for a period of ten (10) years (if a pump inlet screen is used). Bladder life shall be rated for a minimum of 200,000 cycles. Bladder clamps shall be electro-polished 316 stainless steel Oetiker low profile earless type. Each pump shall be fitted with an electropolished inlet screen, having a screen opening size not to exceed 0.012 inches. The screen shall attach directly by means of three Allen set screws, to the stainless steel pump body for maximum strength. The

screens shall be fabricated of Type 316 stainless steel, and shall have a total surface area of 36 square inches. The screen length shall be eight (8) inches to provide stand off in wells with silt. These pumps shall be designed to pump water which may contain small amounts of fine silt and sand without accumulation of such materials in the pump or bladder. Each pump shall be provided with stainless steel, non-lubricated, replaceable nut compression (not barbed) fittings and hardware needed to connect sample discharge and air supply tubing. Sample pumps shall employ self-polishing, hard seat, internal check valves to eliminate wear prone elastomeric seals and avoid mineral deposit build up. The pump inlets shall be capable of easily adapting to optional flow reducers to reduce the pump refill rate when micropurging/ low flow purging. The pump inlets shall be threaded with 1/2" FNPT threads so as to be easily adapted to dip tubes for specific well applications. Pumps shall be capable of pumping dry without damage. All pumps and screens shall be laboratory-certified to be free of all EPA 601, 602, base neutral, and acid extractable contaminants. This shall be verified by soaking the pumps in lab-grade water for a minimum of 18 hours and analyzing the soak water. The analysis shall be performed by an independent certified laboratory. Copies of the analytical results with test batch numbers must be provided in writing with each pump.

1.22 Sample Pump Tubing. Tubing shall be sized to match the appropriate bladder pump fittings. The tubing bundles shall consist of an air supply line and water sample line that are continuously heat bonded to each other (no adhesives or mechanical fastener) for ease of handling, yet be manually separable and sealable via standard compression fittings. The tubing bundles shall be fabricated of polyethylene with the discharge tube lined with Teflon. All materials are to be 100% virgin grade with no regrind, additives or mold release agents used. The sample discharge tube shall provide a separate flow path without exposure to pump drive air, and be fully and continuously visible and accessible for inspection. Each tubing bundle shall be provided with a Type 316 stainless steel insert for maximum holding strength connection to the pump discharge fitting. The system shall be available with the tubing cut to exact length (to nearest foot) as specified by the customer, pre-assembled to pump and well cap and factory tested for leakage.

1.23 Wellhead Assemblies. Each wellhead assembly shall have a quick-connect fitting for attachment of the air supply line from the air source to the air supply line of the bladder pump. Each wellhead assembly shall have a flexible, corrugated Teflon discharge tubing of appropriate size for ease of sample collection. The corrugated discharge tubing shall be attached to the pump discharge tubing with an Oetiker 316 stainless steel ear clamp, and using a 316 stainless steel insert. Sample discharge line shall be compatible for use with in-line filter attachments.

QED Environmental Systems, Inc.
MicroPurge™ System
Sole Source Justification

QED Environmental Systems, Inc. is the sole vendor able to supply a complete MicroPurge system of its own manufacture to be used for low impact sampling. Only the Well Wizard® MicroPurge system components and accessories are designed to work as a totally integrated system and to achieve **all** the technical and commercial benefits that are associated with the low impact approach to groundwater sampling: **sample quality, method control, labor savings, flow control accuracy, reliability,** and where applicable **disposal costs.** Additionally, the Well Wizard MicroPurge System leads in the field of low flow sampling; proven both by numbers sold and years of use. It is the combination of these factors and the following criteria listed that make QED the sole source for a MicroPurge system.

The **Well Wizard Programmable Pump Controller/Model 400** was specifically designed to facilitate low flow sampling, making it an integral component of the MicroPurge System from QED. The 400 Digital Controller is capable of storing both site and well identification and timer settings for up to 10 sites and 50 wells per site. This feature insures consistency for subsequent sampling events even with changes in personnel. For micropurging, it is essential the controller be capable of accurately minimizing flow to 100 ml/min. or less. The 400 also has repeatable digital timer settings with 1/10th of a second intervals which allow for accurate adjustment, simplified flow rate control, which insures achievement low flow minimal draw down sampling efforts. The unique drive air regulator allows adjustment of the exact pump discharge pressure without cycling the controller, preventing the unnecessary loss of sample volume. The repeatability and accuracy of QED's Model 400 make it the desired controller for use with low-flow sampling.

NOW FC4000

The **Model FC2000 Water Analyzer** from QED allows for quick, easy monitoring of indicator parameters as requried when micropurging. The flow cell simultaneously measures, compensates, displays and records temperature, dissolved oxygen (DO), conductivity, pH, and oxygen/reduction (ORP) with a single probe and meter. The FC2000, unique in the instrumentation market, is the only flow cell with the capability of simultaneously reading pH and conductivity without drift. The probe may also be used downwell in 2" or larger wells or for surface water sampling. Characteristic only to the FC2000 unit are the specially engineered domed top design and flow distribution plates that eliminate dead space and turbulent flow. The resulting even flow insures accurate readings with quick response time to changes. The cell is designed to be used in its own case, and does not require a level surface at the well site to operate. The meter is capable of storing up to *199* sets of readings and may be downloaded via the RS-232 port.

Well Wizard MicroPurge Pumps are unequaled in terms of the reliability and durability they provide. This can be directly attributed to the most essential part of the pump, the bladder. Well Wizard bladders are made from an *exclusive* proprietary TFE formulation to provide the longest "flex life" in the industry, averaging over 200,000+ cycles. PFA and TEP formulations used by other manufacturers tend to average only a few thousand cycles. A certification program, a *standard* procedure exclusive to QED since 1986, insures that all Well Wizard pumps are **certified clean** for the absence of EPA 601, 602 acid extractables, and base neutral parameters. The analysis is performed by an independent qualified testing laboratory, and the resulting data is logged and stored. This certification is provided in writing with each pump. A comprehensive list of various pump accessories including tubing, caps and discharge adapters is available to complete pump portion of the Well Wizard Micro Purge System from QED.

WELL WIZARD PUMP CERTIFICATION PROCEDURE

After cleaning of all components prior to assembly, all Well Wizard sampling pumps are passed through a rigorous certification procedure before they are shipped. Each batch of pumps to be tested is immersed in a sealed, high purity water bath for 24 hours, with samples taken of the water before and after the soak period. During the soak period the water is recirculated through all of the pumps, to ensure exposure of the internal and external surfaces of the pumps.

No pumps are released for shipment until the test results are received. Each pump is then tagged and shipped with the certification batch number. All results are kept on file, tying pump serial numbers to the specific analytical test results from the pump batch.

In addition to the certification of the sampling pumps, QED keeps a file of vendor affidavits verifying that suppiled materials meet QED's purity and handling requirements. Tubing, packaging materials and raw materials are batch certified at regular intervals.

EVALUATING PUMP CERTIFICATION RESULTS

Enclosed you will find the analytical results of the Well Wizard pump certification batch which included pumps shipped to you. The procedure employed in pump certification is detailed on the attached sheet labeled Well Wizard Pump Certification Procedure.

Note that QED has employed a 20 ppb cut-off limit for any parameter in the total group being analyzed for; pumps with any parameter above 20 ppb are not certified. The level of any parameter that does show up between the detection limit for the parameter and the 20 ppb cut-off is not related to levels detected in actual monitoring use for the following reasons:

1. Certification tests both internal and external surfaces.

2. The ratio of pump surface area(s) to water volume is much higher than that found in monitoring wells.

3. Most importantly, the certification allows pumps to soak for 24 hours in contrast to the 10 second exposure to the internal pump surface a sample normally experiences in actual use.

The results of the certification procedure are carefully monitored by our production and engineering staff. Testing has confirmed that limits of detection for the certification procedure we employ are two or more orders of magnitude better that what would be detected in a normally pumped sample taken with a Well Wizard Teflon bladder pump. What this means is that the 20 ppb cut-off limit employed in the certification procedure translates to a 0.2 ppb cut-off limit for actual pump use.

WELL WIZARD CLEANING PROCEDURES

The following outlines QED's Well Wizard sampling pump cleaning procedures.

1. All pump parts are batch cleaned in an alkaline, non-organic industrial cleaning solution (Alconox type) maintained at 130 degrees Fahrenheit.
2. The parts are rinsed with 130 degree F tap water.
3. The parts are double washed with water which has been treated as follows:
    a. Tap water is filtered to remove particulates.
    b. The filtered water is passed through an activated carbon column to remove organic compounds.
    c. The water is passed through a series of ion-exchange columns to remove inorganic compounds.
4. Assembly and pump testing is done using the treated water.