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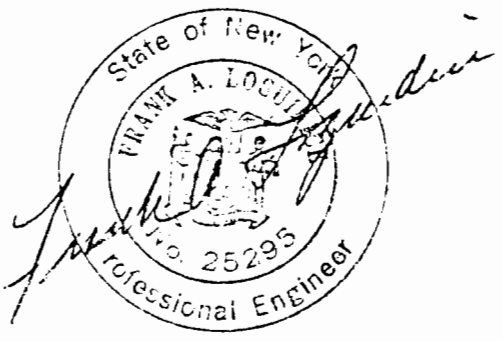
Engineering Report
For
Closure of the
Oswego Valley Sanitary Landfill

Town of Volney,
Oswego County, New York

February, 1984



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APPENDICIES

I. INTRODUCTION

This engineering report describes the closure program for the Oswego Valley Sanitary Landfill located on Silk Road in the Town of Volney, New York. The closure program contained herein is in compliance with the minimum closure requirement specified in 6 NYCRR Part 360 and the Solid Waste Management Facility Guidelines (SWMFG) and in some cases the program surpasses the minimum requirements. Specific departures from NYCRR Part 360 are identified in Section VII of this report.

The closure program is a three phased approach. Phase I consists of physical improvements to the landfill designed to minimize infiltration of precipitation and thus leachate production. Phase II establishes a long term monitoring program to verify the effect physical improvements have on leachate migration off-site. Finally, Phase III would develop remedial actions designed to mitigate off-site groundwater contamination if proven necessary by the Phase II monitoring program.

Submitted with this report, but bound separately, is a set of engineering drawings suitable for construction of the Phase I physical improvements. It is intended that the Oswego County Department of Public Works will provide equipment and labor for this project.

II. SITE HISTORY

The Oswego Valley Sanitary Landfill was constructed in 1969 (in a former gravel mine) for the Oswego Valley Solid Refuse Disposal District Board. The Board consisted of the City of Fulton, Village of Phoenix and the Towns of Granby,

Schroeppel and Volney. The landfill was operated from 1969 to 1974 by the Board. In 1974 an extension was added to the landfill to increase the life of the site and allow for improved operating conditions.

After adopting a resolution to assume the operation of the landfill in June 1974, Oswego County purchased the landfill in early 1975 as part of a County-wide solid waste disposal program. Oswego County has operated the landfill since 1975 as a municipal, commercial and light industrial landfill.

In 1976, alternative landfill sites were sought for the future disposal of Oswego County's solid waste. Further expansion of the Oswego Valley Landfill (which neighbors the County Airport) was impossible due to Federal Aviation Administration regulations governing the land use in the immediate area around the County Airport.

The selection and eventual construction of a new landfill (the Bristol Hill Landfill) enabled the County to start preparing closure plans for the Oswego Valley Landfill. The Bristol Hill Landfill was opened on September 26, 1983 and, shortly thereafter, Oswego County ceased using the Oswego Valley Landfill for refuse disposal.

In 1974, the Oswego Valley site was approved by the NYSDEC to receive discarded barrels from Pollution Abatement Services (PAS). The barrels were to contain only settled remnants (sludges) of the barrels' original contents, but in no case would phenols or chlorinated materials be permitted. In late 1974, a small number of barrels arrived with an unidentified liquid in them. The landfill operator brought this to the County's immediate attention and, in November 1974,

the County refused acceptance of any more barrels from PAS. This occurrence has resulted in much confusion and conjecture regarding what actually was placed in the landfill in 1974 by PAS. Extensive groundwater testing since 1979 has only shown slight contamination typical of a municipal landfill and, to date, has failed to show any contamination that can be attributed to placement of PAS barrels.

Oswego County was desirous of completing permanent closure of the Oswego Valley site as expeditiously as possible. Original plans projected development and implementation of the closure program through 1982-83, in advance of the New York State Superfund study. Unfortunately, time delays in excess of a year due to litigation postponed the opening of the new Bristol Hill Landfill and the subsequent closure of the Oswego Valley site.

III. EXISTING CONDITIONS

The Oswego Valley Landfill was utilized for the disposal of household, commercial, and non-hazardous industrial wastes including wastewater treatment sludges. The wastes that were received at the landfill were from individuals, commercial haulers and County owned transfer vehicles (via County operated transfer stations).

The landfill property (including soil borrow area) covers an area of approximately 85 acres. The area where refuse has been landfilled encompasses approximately 55 acres. The average depth of the refuse in the landfill is approximately 45 feet. Maximum refuse depths of sixty feet exist in the northern portion of the fill area.

The facilities on the landfill site include a maintenance building (which is used for landfill vehicle repair)

and an office trailer located near the main gate to the landfill. A concrete tank located in the northeast corner of the landfill is utilized for leachate collection and storage. The leachate storage tank collects leachate (via a pump station) from drain pipes set in the landfill bottom.

The subsurface geology in the area of the landfill consists of very dense till deposits having a very low permeability. Overlying this dense till layer exists medium to highly permeable materials comprised of lacustrine silts and sands, beach sands and ablation tills. These materials generally allow groundwater to move more freely above the dense till layer. Most of the residential drinking water wells around the landfill are dug or shallow-driven wells which draw water from the near-surface aquifer (located above the dense till layer). The configuration of the upper surface of the dense till deposits tends to control the direction of groundwater flow in the shallow aquifers near the ground surface.(1)

Testing of the groundwater in residential and on-site test wells prior to 1975 was limited to bacteriological analysis only. Requests for further investigations into the quality of the groundwater around the landfill led to several sampling programs sponsored by various agencies from 1976 to the present. The New York State Health Department in 1976 began to analyze groundwater samples taken from on-site and off-site wells for inorganic contaminants in order to characterize the quality of the groundwater in more detail. In 1978, the NYS Health Department expanded its analysis to include organic substances which are often found in leachate contaminated groundwaters. Oswego County began groundwater quality monitoring in 1979 in a cooperative effort with the

NYS Health Department as part of the on-going sampling program around the landfill.

In 1980, the Oswego County Health Department Commissioner formed an ad hoc committee composed of County and State agencies, consultants and investigators to review test results and make recommendations on future samplings. Agencies active on the ad hoc committee and involved in monitoring groundwater quality around the Oswego Valley Landfill included the State University Research Center at Oswego and the NYS Department of Environmental Conservation which sponsored a one-time special sampling.

In 1983, after seven years of sampling, the NYS Health Department discontinued its sampling program. In a letter to the Oswego County Health Department, the NYS Department of Health stated "Results to date do not indicate a problem with water quality at any of the homes" surrounding the landfill, but that monitoring should be continued by those responsible for the landfill. Since that time, Oswego County has continued sampling the wells previously monitored by the NYS Department of Health.

To date, the total amount of money spent for analyzing groundwater samples taken around the landfill is approximated at $250,000, for processing samples only. The value of labor involved in obtaining samples, attending meetings, and other discussion is not included in the figure, which easily could approach $500,000 if all costs were accounted for.

IV. DESCRIPTION OF CLOSURE PLAN

Phase I of the proposed closure plan involves construction of physical improvements to the landfill area including

installation of a PVC membrane cap over the relatively flat top area, a two foot soil cap (exhibiting 10^{-5} cm/sec permeabilities min) over relatively steep side slopes, a surface water drainage system, a methane gas control system, a leachate collection and disposal system, and a post-closure maintenance program.

The Phase I improvements are designed to minimize the infiltration of precipitation and surface runoff, thus minimizing leachate production. By significantly reducing leachate production, the appearance of off-site contaminants, specifically to the southwest and east, will diminish significantly. Accompanying this report (bound separately) is a set of closure drawings detailing the work to be completed.

Phase II of the closure plan involves the long-term (3-5 year) implementation of a new groundwater monitoring program to be developed by a groundwater consultant retained by the County. The consultant's evaluation and program recommendations should be completed by late March, 1984.

Phase III of the plan would consist of a review of the long-term sampling results, a determination of the effectiveness of the Phase I improvements with regard to groundwater quality, and implementation of additional remedial measures if deemed necessary.

All recommendations and sample results under this program will be reviewed by the County Health Commissioner's ad hoc committee. Oswego County intends to formalize this committee and establish it as a permanent advisory panel, under the administrative authority of the County.

The following sections describe the closure plan in detail.

A. PHASE I

LANDFILL CAP

The landfill cap covering the relatively flat upper area (slopes 2% to 7%) on th.. southern portion of the landfill will consist of three layers. The bottom layer will be a sandy material which will be spread over the finished subgrade. The middle layer will consist of a 20 mil polyvinyl chloride (PVC) membrane placed on the top of the sand layer. The uppermost layer will be a glacial till material capable of sustaining a vegetative cover crop.

Most of the flat plateau area exists in the southern half of the landfill. Due to past operating practices, it is this southern area that is in all likelihood contributing to the migrating contaminates identified leaving the site. In order to sufficiently minimize the amount of leachate generated from the infiltration of surface water on this relatively flat upper area, the superior performance of the 20 mil polyvinyl chloride (PVC) membrane was recommended in lieu of the NYSDEC minimum of 24 inches of compacted soil having a coefficient of permeability equal to at least 1×10^{-5} cm/sec. Use of the PVC membrane would decrease surface water infiltration to near zero.

The landfill cap covering the remaining portions of the landfill will be constructed of a compacted glacial till material. These portions of the landfill are comprised mainly of side slopes and terraces. The side slopes vary from fifteen to twenty-five percent. The more extreme side slope (as compared to the flat upper

area) capped with compacted glacial till cover resulted in a cap system with a satisfactory runoff efficiency. This cap system proved more cost effective on the steeper side slopes than the PVC membrane system.

DRAINAGE CONTROL

In order to minimize the amount of surface water runoff (collected on the capped landfill top surface) contacting the unlined side slope areas, a system of top surface collection ditches will be incorporated into the construction of the 20 mil PVC barrier layer. These drainage ditches will be constructed around the perimeter of the upper area to collect and divert water down the side slopes.

The drainage ditch depressions will be formed in the final fill grade prior to the placement of the six inch sand layer and subsequent PVC membrane. The details for these ditches are shown on the closure drawings. Surface water that is collected in the top perimeter collection ditches will be diverted off the capped landfill top surface (upper area), via side slope drainage ditches, into the southern, western and northern natural drainage courses surrounding the landfill site. The eastern side slope drainage ditch will divert water from a portion of the top surface into a perimeter collection ditch. This ditch will extend from the southern entrance road north towards the leachate collection tank. All of the water collected in this drainage ditch will follow the existing drainage-way to culverts under Silk Road.

All drainage ditches have been designed to discharge the peak flow expected from a storm of at

least a 25 year return frequency. The occurrence of a 100-year storm would cause minor ponding near Silk Road at the northern portion of the site, but no damage to final covered areas or the road would occur.

LANDFILL GAS CONTROL & RECOVERY

Landfill gas, containing approximately 50% methane, is a valuable source of energy produced naturally by landfills during the anaerobic decomposition of refuse. This gas can be recovered and utilized for a wide variety of uses including gas engines and boilers, or upgraded to pipeline quality. The benefits associated with landfill gas recovery are: (1) containment of migrating and venting gas; and (2) recovery of a useful energy source.

Methane gas generated by the landfill on the unlined portions will be controlled by gas vents installed on a one per acre basis, while a gas collection-venting system will be installed to control the concentration of methane on the lined portion of the landfill. Details of the gas collection-venting system are shown in the separately bound closure drawings.

The gas collection-venting system on the lined portion of the landfill will consist of a series of perforated pipelines in trenches, to be installed concurrent to the installation of the 20 mil PVC membrane. It is proposed to install only the gas collection pipe system since it must be designed as an integral part of the PVC membrane cap system. In the future, Oswego County may elect to add to the system and begin collecting and processing the gas.

If and when gas is collected for utilization, the gas would flow towards a gas blower located at the southwest corner of the landfill through a header pipe. At this point, the gas could be processed for further utilization. During periods when gas was not being collected for utilization, the gas would pass through the vent stacks placed in the collection system on a one per acre basis.

Passive venting of areas not lined with the PVC membrane will be accomplished by installing gas vents on a one per acre basis. Gas cannot be actively withdrawn from these vents due to problems associated with oxygen infiltration.

Landfill gas is saturated with water. Moisture condensed from the gas in the collection trenches will seep back into the refuse. Condensation traps located at all low points in the header line will prevent water accumulation by returning the condensate to the refuse. When gas is collected for utilization, any moisture removed from the gas during further upgrading, would be recycled to the landfill. If and when Oswego County begins processing methane gas, recycling of the condensate would be necessary to (a) maintain adequate moisture for biological activity; (b) provide a means of nutrient, buffer and microorganism distribution within the refuse; and (c) provide a means of buffer addition for pH control. By recycling condensate, refuse stabilization would be enhanced and gas production rates increased. At maximum gas withdrawal, 300 gallons of condensate per day would be produced at 100% moisture removal from the gas. Typically, less than half this volume would be collected due to condensation dropping

out in the collection pipes and less than 100% moisture removal for upgrading.

Gas pressure, temperature and moisture content of the collection system can be monitored through probes positioned midway between parallel collection trenches, and midway between the vent port openings in the collection pipe itself. The monitoring probes provide access to observe pressure/vacuum levels in both the sand layer below the 20 mil PVC membrane, or in the refuse. When gas is actively being withdrawn for utilization, vacuum readings taken at the probe sites will provide the data necessary to adjust the collection trench valves.

VEGETATIVE COVER

After the appropriate amount of glacial till soil covering has been placed on the landfill top surface, side slopes and terraces, they will be fertilized, seeded and mulched in order to promote the establishment of a vegetative cover crop.

LEACHATE MANAGEMENT

A system for the collection and storage of leachate that has been generated from the infiltration of surface water has been incorporated into the bottom of the northern half of the Oswego Valley Landfill. Prior to first filling in the northern half of the landfill, the landfill bottom had been sloped towards a common collection trench formed in the dense glacial till layer. The trench was connected to a drain pipe that extends down to a concrete sump just west of the existing maintenance garage. The concrete sump facilitated the removal of leachate from the landfill.

As landfilling progressed farther into the northern portion of the site, an additional collection pipe and larger leachate storage capacity was required in order to handle the anticipated increase in the amount of leachate that would be generated by the extension of the landfill. The pipe was installed to direct the flow of leachate from the bottom of the landfill into a newly constructed duplex manhole pump station and concrete storage tank. The pump station houses two heavy duty, non-clog, submersible, centrifugal pump units mounted on a slide rail system which allows for easier maintenance. The pump station receives leachate from both the original leachate sump (via an interconnecting pipe) and the northern most collection pipe.

The concrete tank was constructed to store all of the leachate produced by the northern portion of the landfill. The concrete tank has a 300,000 gallon design capacity with an overflow capacity of 374,000 gallons. The volume of leachate production expected at the pump station after implementation of the closure plan is 16,000-20,000 gallons per year. This is based on a theoretical reduction in leachate generation of 90%. This reduction rate was calculated using the Water Balance Method comparing unvegetated, intermediate cover areas (existing conditions) with vegetated final cover areas. The theoretical reduction rate was then applied to the observed leachate flow of about 160,000 gallons (1981).

Subsequent to the withdrawal in October 1983, of Armstrong World Industries, Inc. offer to treat the leachate at their Industrial Wastewater Treatment Facility, Barton & Loguidice, on behalf of Oswego

County, has been reevaluating potential leachate disposal alternatives. The preferred alternative is to arrange for leachate disposal in a publicly owned municipal sewage treatment plant. The City of Oswego, Town of Minetto and City of Fulton all have such plants. The Town of Minetto and City of Fulton plants have technical constraints as outlined below, and have therefore been eliminated from consideration.

The City of Oswego has two treatment plants that utilize the activated sludge process. This process has been successfully used in treating leachate from municipal landfills[3]. The City's west treatment plant has a reported[4] 1982 operating hydraulic load of 2 million gallons per day (MGD) and a design hydraulic capacity of 3 MGD. Similarly the City's east facility is operating at a reported hydraulic load of 2 MGD and has a design hydraulic capacity of 4 MGD. The anticipated 16,000 gallons per year of leachate from the Oswego Valley site would have an unmeasurable effect at each of the City's plants. Preliminary discussions with City representatives have been held on this matter, and it is currently under review by City engineers. Still under investigation is the impact leachate organic loading will have on these plants since leachate typically has a much higher organic loading, gallon for gallon, than municipal sewage. At this time, either of the City treatment plants are the preferred alternatives as replacement to the Armstrong World Industries' treatment facility.

The Town of Minetto, like the City of Oswego, has a municipal treatment plant that uses the activated sludge process. The plant has a reported[4] operating

hydraulic loading of 0.1 MGD and a design hydraulic capacity of 0.6 MGD. Although the additional hydraulic loading that would be expected if leachate from Oswego Valley were brought to this plant is within the facility's capabilities (a 2% increase), it is doubtful that the plant would be able to handle the organic loading contributed by the leachate. Use of this facility for leachate disposal has therefore been eliminated from consideration.

The City of Fulton has a municipal sewage treatment plant utilizing the trickling filter process. This process is not particularly well suited to leachate treatment and therefore has been eliminated from consideration.

Other on-site leachate disposal options being investigated include a passive evapotranspiration system, a solar evaporation system and an active evaporation system. These systems all would be operated only during the 5 or 6 summer months. Leachate would be stored on-site in the concrete storage tank until the summer months.

The passive evapotranspiration system will saturate the root zone (top 12" of topsoil) with leachate, allow the plants to take-up the liquid and transpire it during the photosynthesis process. Additionally, a certain amount of liquid will evaporate from the top few inches of the soil layer. Excess liquid in the root zone will be collected on an underground synthetic liner and recirculated into the leachate main stream.

The solar evaporation system functions by spraying a fine mist of leachate into the air. That portion of

the mist that is not taken-up through evaporation into the ambient air falls onto a black synthetic liner where surface evaporation takes place. Excess liquids, if any, are collected in a sump and recirculated to the leachate main stream.

The active evaporation system would utilize captured methane gas from the landfill to essentially boil the liquid content of leachate to the ambient air. The concentrated sludge or solid material would be disposed in the Bristol Hill landfill. The Bristol Hill landfill has a engineered lined landfill bottom and leachate collection system.

B. PHASE II

In order to develop an effective and meaningful long-term monitoring plan for Phase II of the site closure, Oswego County has retained Geraghty & Miller, Inc. Groundwater Consultants. A proposal outlining their anticipated scope of work is included in this report as Appendix B.

In developing the Phase II monitoring program, the consultant will conduct site reconnaissance, including a field check of all existing monitoring points for condition and accessibility. A thorough review of the landfill area will be made, to gain an insight into the hydrogeologic conditions and the possible effects of the landfill on groundwater quality.

The consultant will be provided with all available reports and data to determine if trends in the groundwater quality exist. If possible, the direction of

groundwater flow in the aquifer(s) of concern will be determined.

Finally, a separate report will be prepared that summarizes the consultant's findings and sets forth a long-term monitoring program. Included in the report will be estimates of groundwater flow direction, extent of leachate migration, if any, and recommendations of locations, depths and construction methods for new monitoring wells, if required to adequately assess the water quality in the area. The report will list those existing and/or new wells that should be sampled in the on-going program, and the parameters that should be analyzed for.

It is expected that once leachate generation is stopped by placement of the cap, the segment(s) of the aquifer that were found in the consultant's study to be influenced by the landfill will show a gradual rehabilitation. If, after three to five years of the recommended monitoring program, no such trend is evidenced, then Phase III would be implemented.

C. PHASE III

Specific Phase III items have not yet been developed. It is anticipated that if Phase III work becomes necessary based on Phase II monitoring, a progressive expansion of the PVC membrane cap over those areas still producing leachate would take place.

V. POST CLOSURE USE & MAINTENANCE

The intended future use of the Oswego Valley Landfill after its closure is to let the land remain idle. The soil

cover integrity, slopes, cover vegetation, drainage ditches, groundwater monitoring wells and gas control structures will be perpetually maintained by the County after the landfill closure.

Soil cover and drainage ditches will be inspected periodically by County personnel for evidence of erosion. These inspections will be accomplished by thoroughly walking the entire site and taking note of problem areas. The County will inspect the site for erosion problems at least once per month or immediately after major rain storms during the first twelve months following implementation of Phase I. This will allow sufficient time for the vegetative cover to become well established, thus preventing erosion itself.

Once the vegetative cover is established, the County will mow the entire area at least once a year. This activity will control natural succession of larger vegetative species whose root systems may damage the PVC membrane cap.

Groundwater monitoring wells and gas control structures will be inspected periodically and maintained in operating condition.

Once the landfill has been closed, the anticipated leachate production potential will be in the range of 16,000 to 20,000 gallons per year.

The County will maintain the leachate collection and storage system in operating condition and will continue leachate disposal in the approved manner. Leachate quality will be periodically monitored. At some future date, if and when the raw leachate quality meets NYSDEC and other regulatory discharge standards, the County will apply for a SPDES permit.

IV. PROJECT COSTS

The estimated capital cost for closure activities on the Silk Road Landfill through Phase I is $1,196,000. Of this total, $788,000 is identified as direct force account cost, that is the County's cost of labor and equipment. These costs are based on published labor and equipment rates.(5) The final value will depend on actual County rates and actual (versus estimated) time spent to complete the job. An additional $169,500 is identified as material costs only. Materials include the PVC membrane cap, sand bedding material for the cap, pipe costs for the gas collection system, leachate disposal system, drainage ditch stone lining and catch basin. The remaining $238,500 has already been spent on the leachate tank, pump station and piping, and site fencing (these costs do not include engineering or administrative expenses). Cost for additional monitoring wells that may be recommended by the groundwater consultant are not included in the above costs.

Post closure maintenance costs are estimated to range between $28,500 and $38,000 per year. This cost includes quarterly groundwater monitoring, occasional fill and regrading to eliminate ponding effects of differential settlement, occasional mowing of vegetative cover, and related leachate disposal costs.

Table A summarizes the estimated Phase I closure and post closure costs.

TABLE A

ESTIMATED CLOSURE AND POST CLOSURE COSTS
SILK ROAD LANDFILL

PROJECT CAPITAL COST (1983 Dollars)

ITEM	LABOR & EQUIPMENT	MATERIALS	TOTAL
PVC Membrane	$ 70,000	$105,000	$175,000
Sand Layer (purchase, deliver & place)	46,000	5,000	51,000
Glacial Till Layer (deliver & place)	588,000	-	588,000
Drainage Ditches (incl. stone lining, drop inlet, etc.)	19,000	6,000	25,000
Fertilize, Seed & Mulch	38,000	30,000	68,000
Landfill Gas Recovery/ Venting System	27,000	23,500	50,500
Leachate Disposal Construction, Inspection & Outside Services	-	-	10,000
Subtotal	$788,000	$169,500	
Contract price of previous closure work (leachate collection and fence work)			$ 238,500
TOTAL			$1,196,000

POST CLOSURE MAINTENANCE (1983 Dollars)

	Low	High
Groundwater Monitoring	$17,000*	$17,000*
Mow Vegetation	1,500	1,500
Fill & Regrade	5,000	10,000
Leachate Disposal & Haul	4,000	8,000
Leachate Pump O&M	1,000	1,500
TOTAL ANNUAL COST	$28,500	$38,000

*The value of groundwater monitoring may vary depending on the final results of the groundwater consultant's recommendations.

VII. COMPLIANCE WITH 6 NYCRR PART 360

The closure program described herein has been designed to be in compliance with 6 NYCRR Part 360 inasmuch as the closure and post-closure requirements are addressed in the regulations. Lacking specific closure and post-closure items in Part 360, the general requirements for landfill site operations were used as guidelines for the closure plan. The use of a PVC membrane incorporated in the final cover exceeds the requirements of Part 360. Following is the anticipated status of the Oswego Valley Landfill after implementation of the program as it relates to the requirements of 6 NYCRR Part 360.

A. Facility Requirements [360.8(a)]

(1) Surface and Groundwater Protection - The potential for surface and groundwater contamination has been identified at this site. The closure program has been designed to eliminate infiltration of precipitation in an effort to minimize to the greatest extent possible production of leachate. In addition, the closure program contains design considerations intended to provide a permanent separation between surface water and refuse thus assuring prevention of surface water contamination.

(2) Agricultural Restrictions - The landfill property is presently located in an area zoned for agricultural use. At the time this landfill first opened, 6 NYCRR Part 360 regulations were not in effect. The site was an inactive mining location prior to its development as a landfill.

(3) Leachate Control - Existing facilities on-site for leachate control include a contoured bottom surface on the northern half of the landfill, leachate collection piping in the northern half and a concrete leachate storage tank with a design capacity of 300,000 gallons. These facilities combined with the relatively steep side slopes and two feet thick soil cap incorporated in the closure plan will provide an effective leachate collection system for the northern part of the site.

Installation of the PVC membrane cap over the southern half of the site will provide an effective deterrent to infiltration of precipitation thus minimizing leachate production in this area. It is anticipated the PVC membrane cap will, with time, have the desired effect of mitigating groundwater contravention beyond the property lines along the southern and eastern boundaries.

(4) Salvaging - Closure of the landfill, including installation of the PVC membrane and soil cap will eliminate all potential for salvaging.

(5,6) Access - Access to the landfill is controlled by new perimeter fencing, locked entrance gates and appropriate warning signs.

(7) Litter - Installation of the PVC membrane and soil cap will eliminate all potential for litter to leave the site.

(8) Vectors, Dust and Odors - Installation of the soil and PVC caps will limit access to refuse (a poten-

tial food source) thereby eliminating establishment of permanent populations of vectors.

The establishment of vegetative cover over the final cap system and cessation of traffic on the site will eliminate impacts from dust. During construction of the closure improvements in the spring of 1984, appropriate actions (i.e. watering access roads) will be taken to minimize dust conditions. As with all construction projects, some dust impacts will be seen for a short time during implementation of the closure program.

The final cap system will also effectively mitigate odor impacts by containment within the fill area and decreased biological decay.

(9) Site Roads - Site roads will be maintained in operable shape for the purpose of passage to the leachate collection tank. During implementation of the closure program, site roads necessary for construction activities will be maintained in safe and passable condition. These roads will be removed upon completion of the construction activities if deemed unnecessary for post-closure maintenance.

(10) Safety Hazards - No full time operations staff will be maintained at this facility after closure. Buildings and gates will be locked at all times. The leachate collection tank is surrounded by a 8 feet high chain link fence equipped with lockable gates.

(11) Noise - No constant noise will be produced at this facility upon closure. Leachate haul vehicles and post closure maintenance (e.g. mowing equipment) will occasionally be operating at the site after closure. The noise impacts from these activities is considered minimal. Temporary noise impacts (not unlike those existing during operation of the landfill) will be evident during construction of the closure improvements.

(12) Personnel Facilities - No full time operations staff will be maintained at this facility after closure.

(13,14) Landfill Operating Equipment - No equipment will be kept at this facility after closure. The Oswego County Highway Department will provide equipment necessary to maintain the facility during the post-closure maintenance period.

(15) Open Burning - This facility will not receive waste of any kind after final closure. All areas will be capped thus eliminating the potential for burning of refuse.

(16) Working Area - This facility will not receive waste of any kind after final closure.

(17) Commercial, Industrial and Special Wastes - This facility will not receive wastes of any kind after final closure.

(18) Reports - Not applicable after closure.

(19) Operating Permit - Not applicable after closure.

(20) Flood Plain - The facility is not located in a flood plain.

(21) Compliance and Closure - This facility will be closed in accordance with this report and the separately bound closure plans.

B. Sanitary Landfills [360.8(b)(1)]

(i) Vertical Separation To Groundwater - A minimum five feet separation to groundwater and bedrock was maintained in the northern portion of the site by design. Operations in the southern portion of the site, prior to implementation of Part 360 rules and regulations, required only 3 feet although, in general, at least a five feet separation was maintainted here also.

(ii) Horizontal Separation to Surface water -The closest surface water to the closed fill area is approximately 250 feet.

(iii,iv,v) Groundwater monitoring - See Section IV, B. - Phase II of this report.

(vi) Landfill Gases - See Section IV, A. - Landfill Gas Control and Recovery of this report.

(vii) Final Cover - See Section IV, A. - Landfill Cap of this report.

(viii) Drainage Control - See Section IV, A. - Drainage Control of this report.

(ix) Vegetative Cover - See Section IV, A. - Vegetative Cover of this report.

(x) Stabilization and Maintenance - See Section V - Post Closure Use and Maintenance of this report.

(xi) Acceptable Wastes - This facility has accepted municipal, commercial and industrial wastes in addition to authorized industrial sludges. In 1974, this facility was suspected of being the depository for unknown toxic wastes. A study commissioned by the NYSDEC is currently underway with the results still pending.

(xii) Buffer Zones - Prior to establishment of 6 NYCRR Part 360, solid waste was placed closer than fifty feet to the property lines. This practice was discontinued upon takeover by Oswego County in 1974.

(xiii) Survey Bench Marks - Railroad spikes located in Niagara Mohawk power poles (numbers 33, 38) along the north side of Howard Road serve as established and maintained bench marks for the landfill site.

(xiv) Transfer of Ownership - Although Oswego County does not intend to transfer ownership of the property, the deed is in the process of being changed to note the following:

- the period of time during which property was used as a landfill
- a description of wastes accepted
- a reference to records for the facility which were filed with NYSDEC

- a reference of map filed with County Clerk showing limits of landfilled areas

(xv,xvi) Acceptance of Sludges - Industrial wastewater treatment sludges have been disposed of in this landfill. With closure, no further wastes of any kind will be disposed of here.

(xvii) Landfill Liners - This facility was operated prior to establishment of NYSDEC liner policies although the glacial till underlying the site acts as a natural liner.

(xviii) SPDES Requirements - The closure program does not require issuance of a SPDES permit for any of the proposed improvements.

(xix) Bird Hazard - Closure of the landfill by implementation of this closure program will eliminate bird populations that may exist at this facility.

(xx) Endangered Species - No known endangered species exist on this landfill site.

(xxi) Commercial and Industrial Wastes - No wastes of any kind will be accepted at this site upon closure.

VIII. LANDFILL CAP ALTERNATIVE

One alternative method of capping the Oswego Valley Landfill was considered during the development of the proposed closure plan. The alternative consisted of covering the entire landfill site with two feet of compacted soil capable of achieving a permeability of 1×10^{-5} cm/sec and

able to sustain a vegetative cover crop. This alternative is the minimum specified in 6 NYCRR Part 360.1(d)(32). To cap the entire landfill (assuming that approximately one half has received final cover) upon closure in accordance with Part 360 would require approximately 72,500 cubic yards of soil at a cost of approximately $441,000 including fertilizing, seeding and gas venting.

The minimum NYSDEC Part 360 requirement of 24 inches of soil would promote the generation of 1,831,924 gallons of leachate per year (based on the EPA/530/SW-168 Water Balance Method). Despite the lower cost, this alternative was rejected in favor of a landfill cap partially incorporating the 20 mil polyvinyl chloride membrane.

Leachate production will decrease significantly over the southern portion of the landfill due to the PVC membrane. It is this portion of the landfill (operational between 1969 and 1974) that has no leachate collection system and from all indications is the primary source of leachate indicators in off-site monitoring wells to the southwest and east.

IX. CLOSURE PLAN CONSTRUCTION METHODS

The following section will describe construction methods to be followed in site preparation and installation of the landfill gas collection-venting system, sand layer, 20 mil PVC membrane layer and the glacial till layer covering the top surface of the landfill.

A. SITE PREPARATION

The landfill top surface to receive the PVC membrane layer will be groomed to remove sharp rocks or

stones larger than 4 inches in any direction, roots and other obtrusive material capable of protruding through the sand layer and puncturing the PVC membrane. All of the top surface perimeter drainage ditch depressions will be formed in the final grade to the depth and grades shown on the Closure Drawings. Refuse removed while forming the ditches will be incorporated into the final fill area, compacted and covered. Refuse exposed in the bottom of the ditches will be covered with at least 12" of cover soil. The top surfaces of the landfill will be graded to minimum slopes of two percent (2.0%) to promote the runoff of surface water and avoid any ponding.

The landfill side slopes will be uniformly graded to provide direct runoff of all surface water. All terraces (incorporated into the side slopes) will have a minimum grade of 2%. All drainage ditch depressions will be formed prior to the placement of the final cover (compacted glacial till layer). Refuse removed while forming the ditches will be incorporated into the final fill area, compacted and covered. Refuse exposed in the bottom of the ditches will be covered with at least 12 inches of soil.

B. LANDFILL GAS VENTING AND RECOVERY STRUCTURES

Collection and venting or withdrawal of landfill gas from beneath the 20 mil PVC membrane will be through a PVC lateral pipe system located in a gravel filled trench, approximately 3 feet below finished grade, as detailed in the separately bound closure plan drawings. In addition to the perforations in the bottom of the 6 inch PVC collection pipe, gas will pass into the collec-

tion pipe through loose fitting connectors (made from 2 foot lengths of 8 inch PVC pipe) joining together the 12.5 foot lengths of 6 inch perforated pipe. The loose fitting couples also allow for shifting of the pipe during differential settling of the refuse.

The bottom of the 2 foot wide collection trench will be filled with 8 inches of No. 2 crushed stone. The crushed stone will be evenly spread before the 6 inch perforated PVC pipe and 8 inch PVC pipe connectors are set in place. The trench will be backfilled with No. 2 crushed stone to a level even with the existing final cover. The gravel filled trench will be covered by a geotextile strip to prevent infiltration of fines from the sand layer (immediately below the 20 mil PVC membrane) from entering the trench. The geotextile strip will be tacked into place with nails to keep the material from shifting while the sand layer is being spread. The sand layer will act as a conduit for gas flow towards the trenches as well as a protective bed for the PVC membrane cap.

When gas is not being utilized, passive venting will be accomplished by attaching vent stacks to the subsurface collection trench on a one per acre basis. The gas vents, detailed in the accompanying closure drawings, are 4 inch PVC pipe stacks, threaded into access ports in the gas collection pipe. The vents rise 3 feet above the finished surface grade of the soil, and have a gooseneck attached on top. These vents are replaced with threaded plugs when gas is being withdrawn for utilization.

The gas collection lateral pipes will tie into a PVC header pipe located at the west end of the laterals

as shown in the drawings. Each collection lateral is connected to the header line with a 6 inch butterfly valve. The valve stem is accessed via a 4 inch PVC pipe riser. The header line is buried approximately 3 feet below finished grade, following the gradual surface slope towards the southwest corner of the landfill at Howard Road. After the southern-most lateral is tied into the header, the header pipe must begin to drop to a lower elevation so that it is at least 12 inches below the bottom of the surface drainage ditch it passes under 100 feet to the south. The header line is located in a 2 foot wide trench, on top of 8 inches of crushed gravel, and additional crushed gravel placed over the pipe until it is completely covered. The rest of the trench is filled with clean backfill to a level even with the surface of the existing final cover.

Placement and construction of the gas vents on the unlined portion of the landfill is shown in the drawings. The gas vent density is approximately one per acre. The vent is constructed of 4 inch PVC pipe. The bottom of the pipe, perforated with 1/8 inch holes, extends down into a 24 inch diameter hole, 4 feet deep, backfilled with crushed stone. The top of the vent pipe extends 3 feet above the soil surface, with a gooseneck attached.

C. SAND LAYER

Once the site preparations have been completed and the landfill gas venting and recovery system installed, a six (6) inch sand layer will be spread over the graded landfill top surface. The sand layer will provide a smooth bedding for the PVC membrane to lie upon. The

sand layer will be a select material with a maximum size of 2 inches in any direction. The sand layer will also facilitate the movement of decomposition gases towards gas control structures.

During installation of the sand layer, vehicles hauling sand onto the site will be guided between the gas pipes to prevent damage to the buried lines. Traffic over the pipelines by equipment spreading the sand will be kept to a minimum.

D. LANDFILL GAS CONDENSATE COLLECTION AND RECYCLING

Condensate that forms in the header line will flow to either self-draining condensate traps located at low points in the line, or to the processing facility at the end of the header line in the southwest corner of the landfill. Condensate from self-draining in-line traps will diffuse back into the refuse, while condensate collected at the processing facility will ultimately be recycled back to the top of the landfill via a pressurized condensate recycle system.

The self-draining condensate traps, detailed in the closure drawings, will be located at all low points in the header line as designated by the engineer in the field. The trap will be self-draining via perforations at the top on the reservoir, located at the bottom of the device. The two foot diameter hole, in which the condensate trap will be placed, will be carefully back-filled with No. 2 crushed stone around the trap. The top of the hole will be filled with clean backfill.

Condensate eventually collected at the processing facility will be pumped to the distribution grid through

the 3/4 inch PVC condensate return line. The condensate return line is buried with the gas header line at the lower end in the southwest corner of the landfill; continues at this depth under the surface drainage ditch; and starts to rise up to the top of the sand layer, north of the surface ditch. This line feeds the 3/4 inch PVC condensate distribution lines. Condensate distribution lines are located in the sand layer, immediately below the 20 mil PVC membrane. Distribution grid pipes are fabricated by manually drilling 1/8 inch holes in 3/4 inch PVC Schedule 40 pipe on 18 inch centers. All holes will be drilled in the same side of the pipe and will face down when installed. The perforated distribution lines are located midway between, and parallel to the gas collection trenches, as shown in the accompanying closure drawings. During installation of the PVC membrane and final glacial till cover, all vehicle traffic must be kept off the 3/4 inch PVC pipe. Once the 12 inch glacial till cover is in place, soil spreading equipment, such as dozers, can travel over the pipe.

E. LANDFILL GAS MONITORING PROBES

Monitor probes are located halfway between the collection trenches (approximately 100 feet away) at a 200 foot spacing. The probes will be positioned at least 3 feet away from the nearest condensate distribution line. The probes provide a site to monitor the gas pressure/vacuum, temperature and moisture distribution in the refuse. When not in use, the probe sites will be capped to prevent oxygen infiltration.

The monitor probes are constructed of 4 inch PVC pipe, perforated with 1/4 inch holes and wrapped in

filter fabric. The filter fabric is held in place with hose clamps. The probes extended down into the refuse approximately 28 inches below the PVC membrane. The top of the probes, recessed below finished grade as shown in the detail drawings, are capped with a threaded plug.

F. 20 MIL POLYVINYL CHLORIDE (PVC) MEMBRANE

The initial placement of the PVC panels, on top of the 6 inch sand layer, will involve unfolding and removing wrinkles to insure a smooth and wrinkle-free surface. The PVC panels will be positioned with a minimum eighteen (18) inch overlap. Overlaps at all seams shall be made such that the uphill sheet of PVC membrane lays over the downshill sheet. Seams or overlaps of adjacent sheets do not have to be permanently made with adhesives. The assembled PVC membrane will be held down on the sand layer by the weight of the overlying glacial till layer.

During installation of the PVC membrane, all vehicle traffic will be guided around the PVC pipe condensate line.

G. GLACIAL TILL LAYER

After membrane placement is complete in a given area, a twelve (12) inch glacial till layer will be spread over the PVC. The overlying glacial till layer will protect the integrity of the PVC membrane and provide an adequate zone to support vegetative growth.

During installation of the PVC membrane and final glacial till cover, all vehicle traffic must be kept off

the 3/4 inch PVC pipe. Once the 12 inch glacial till cover is in place, soil spreading equipment, such as dozers, can travel over the pipe, but heavy wheeled vehicles must be routed around the buried lines.

After the grading has been completed on the side slopes and terraces, the first of two 12-inch glacial till layers will be spread and compacted. A second 12-inch layer of glacial till will then be spread and compacted over the first creating a 24-inch compacted glacial till layer.

H. VEGETATIVE COVER CROP

Once the 12-inch glacial till layer has been spread over the PVC membrane and the 24 inch glacial till layer is placed over the side slopes and terraces, the site will be fertilized, seeded and mulched.

The entire area will be raked to loosen the soil to a depth of approximately two inches. A commercial fertilizer containing no less than 10% nitrogen, 10% phosphorous and 10% potassium will be evenly applied at a rate of no less than 500 pounds per acre.

The seed will be sown by approved machine, in such a manner that a uniform stand will result. Agway's Soil Conservation Mix or equal will be used to seed the landfill site. The Soil Conservation mixture contains the following:

Approx. Percentage by Weight	Species or Variety
28%	Red Fescue
26%	Kentucky Bluegrass
19%	Annual Rye
10%	Perennial Rye
6%	Highland Bentgrass
5%	White Clover

The seed mixture will be applied at a rate of approximately 120 pounds per acre. Within three days after the seed is sown, the seeded areas will be covered with a uniform blanket of mulch or hydroseeded.

X. BIBLIOGRAPHY

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APPENDIX A

OVERVIEW

OF

PREVIOUS GROUNDWATER INVESTIGATIONS

AT THE

OSWEGO VALLEY LANDFILL

FEBRUARY, 1984

TABLE OF CONTENTS

I. INTRODUCTION

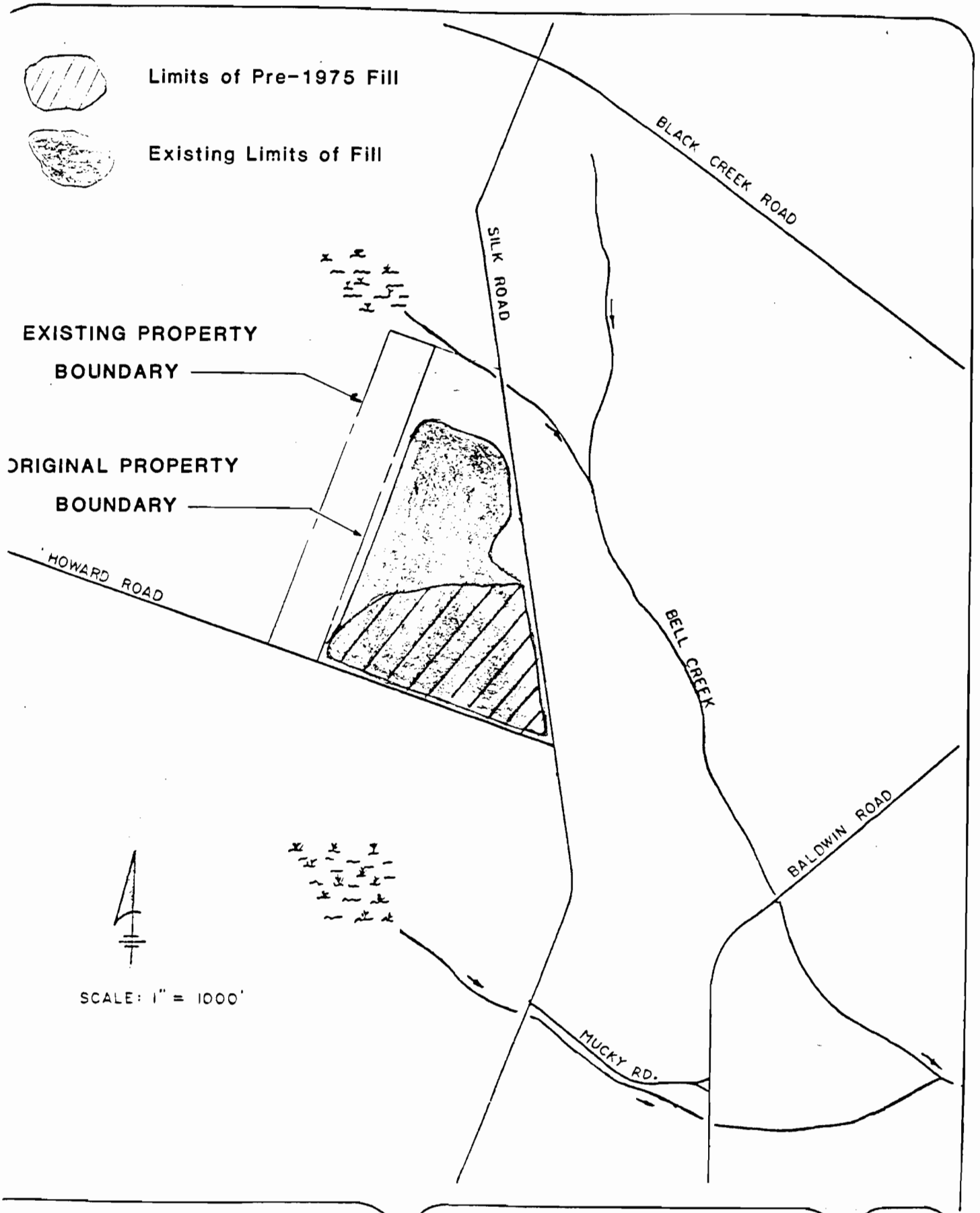
Purpose

The purpose of this report is to compile, analyze and summarize all of the groundwater investigation information pertaining to the Oswego Valley Landfill. This information will assist in determining if further hydrogeological investigation is necessary or if the pending site closure efforts and continued monitoring will mitigate the potential for future contaminant migration.

Ownership and Operating History of the Site

The Oswego Valley Sanitary Landfill was developed in 1969 by the Oswego Valley Solid Refuse Disposal District Board, consisting of the City of Fulton, Village of Phoenix, and Towns of Granby, Schroeppel and Volney, In 1974, an extension of the Landfill was designed for the Board to allow greater site life and improved operation. The limits of the original and expanded landfill designs are shown in Figure 1.

Between April and November, 1974, Pollution Abatement Services (PAS) delivered approximately 8,000 barrels to the site. The barrels contained residues of waste products, primarily solid coatings (sludges) stuck to the container walls. This activity was permitted by DEC. The barrels were crushed and incorporated into the work area as part of the everyday operation of the Landfill.



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290 ELWOOD DAVIS ROAD / LIVERPOOL NEW YORK 13088

FILL LIMITS

OSWEGO VALLEY LANDFILL

FIGURE 1

PROJECT NO. 132.19C

On occasion, some barrels were identified as containing liquid waste and were refused acceptance at the Landfill. In these instances, the hauler was directed to return the barrels to the PAS site.

Occasionally, when barrels already off-loaded at the fill area were crushed, it was evident that a barrel did contain amounts of liquid. According to the landfill supervisor, possibly 50 to 200 barrels accepted at the site may have contained some liquids.

In response to this frequency of dumping barrels containing liquid waste instead of the residues that were agreed upon, PAS was refused to dispose of any more barrels in November, 1974.

In June, 1974, Oswego County adopted a resolution to assume operation of the site as part of a County-wide solid waste disposal program. The County purchased the Landfill in early 1975 and received an operating permit from New York State. Oswego County operated the site until mid-1983, when the Bristol Hill landfill opened. Solid waste is no longer delivered to the site, which will be closed according to 6 NYCRR Part 360 in early 1984.

Since Oswego County assumed operation in 1975, the Landfill has been used for disposal of household, commercial and non-hazardous industrial wastes including wastewater

treatment plant sludges. A leachate collection system consisting of a sloped landfill bottom, piping system and collection sump has produced 500 to 5,000 gallons/day of leachate during 1980, 1981 and 1982. This system was expanded in 1983 to collect leachate from new fill areas. A concrete storage tank and pumping station have recently been added to facilitate leachate collection. During design of the leachate collection and storage system, an agreement with Armstrong World industries' Fulton plant for disposal of the leachate was under negotiation. Armstrong retracted its offer to take the leachate in late 1983, and Oswego County is currently considering disposal alternatives. The preferred alternative would be disposal in one of the publicly owned treatment works in the County with adequate capacity and treatment process to treat the leachate.

Closure measures include a PVC cover over 20 acres with relatively shallow slopes (i.e. less than 7%). The remaining 35 acres, with slopes of greater than 7%, will have a two foot layer of compacted glacial till exhibiting a maximum permeability of 1×10^{-5} cm/sec.

II. HISTORY OF GROUNDWATER INVESTIGATIONS AT THE SITE

Pre-1975 Monitoring

Prior to 1975, monitoring of groundwater consisted of limited bacteriological testing of nearby residential wells, the landfill trailer well and two on-site test wells. As a result, no background information exists on the presence of inorganic and organic constituents in the groundwater prior to any landfill activity on this site.

NYSHD - Sponsored Sampling

New York State Health Department Laboratory involvement in groundwater monitoring at the Oswego Valley Landfill began in 1976. From 1976 to 1978, samples from as many as eleven wells were analyzed for bacteriological and inorganic contamination.

In 1978, the analytical work performed by the Health Department was expanded to include organic substances. From September, 1978 to October, 1980, a total of 30 samples were taken from twelve monitoring points.

In October, 1980, the Oswego County Health Department Commissioner formed an ad hoc committee to review the test results, procedures and parameters and prepare recommendations for future sampling. The ad hoc committee was composed of County and State agencies, consultants and University researchers. Sampling continued with an additional 55 samples taken from eleven monitoring points.

During the period from June, 1976 to June, 1982, when New York State Health Department analytical services were last used by Oswego County, approximately $58,000.00 worth of analysis was performed (based on private laboratory costs for the same set of analyses). Results of all New York State Health Department-sponsored groundwater quality monitoring are detailed in Section III of this report.

Oswego County - Sponsored Sampling

During March, 1979, the New York State Department of Environmental Conservation entered into a Consent Order with Oswego County. One of the terms of that Order was to resume groundwater quality monitoring around the Landfill. Five wells and Bell Creek were sampled in June, 1979, and seven wells and Bell Creek were sampled in July, 1980.

With the establishment of the Oswego County Health Commissioner's ad hoc committee on groundwater quality monitoring in October, 1980, an agreement was made to coordinate the Health Department-sponsored sampling with the County-sponsored sampling. The State Health Department assumed the responsibility of sampling the residences near the Landfill (Auringer, Coakley, Durant, Durfey, Gilliland, D. Kerfien, L. Kerfien, Nastasi, Stevens, the Kerfien Mobil Home Park and the Niagara Mohawk Garage) and the County agreed to sample the on-site test wells, the landfill trailer well and the raw leachate.

APPENDIX B

Geraghty & Miller, Inc.
GROUND-WATER CONSULTANTS

North Shore Atrium
6800 Jericho Turnpike
Syosset, New York 11791
Cable: WATER
Telephone: 516/921-6060

January 27, 1984

Mr. Arthur Ospelt
Superintendant of Public Works
Oswego County
46 E. Bridge Street
Oswego, New York 13126

Dear Mr. Ospelt:

This is in response to your request for a proposal outlining a scope of work and cost information for the Oswego Valley Landfill - Closure Project. The project will be divided into two phases consisting of an analysis of the existing data including a site visit and preparation of a report of findings. The two phases and costs of the project will be as follows:

Phase I - Data Review and Site Visit
Estimated Cost $5,000

Geraghty & Miller, Inc., will meet representatives of Oswego County at the Oswego Valley Landfill on a mutually acceptable date for a site reconnaissance. At that time, Oswego County will provide us with all available data and reports as well as a verbal history of the landfill site. The locations of all existing monitoring wells and monitored domestic wells will be field checked for condition and accessibility. A thorough reconnaissance of the general area will be carried out to gain an insight into the hydrogeologic conditions and the possible effects of the landfill on ground-water quality.

Following the site visit, Geraghty & Miller, Inc., will review the available reports and data to determine, if possible, the trends of ground-water quality at the site. Ground-water flow directions will be determined if there is an adequate areal distribution (and accurate water-level elevations) of monitoring wells. A large part of this work will probably consist of tabulation and subsequent analysis of ground-water quality compared to background conditions and ground-water standards set by New York State Health Department.

Phase II - Report Preparation
Estimated Cost $5,000

Upon completion of the data analysis, a draft report will be prepared for submission to Oswego County. The draft report will contain an

evaluation of hydrogeologic conditions at the Oswego County Landfill and its vicinity based on available reports, drilling logs, and the Geraghty & Miller, Inc., field reconnaissance. A water table map(s) will be included if there are sufficient data points or, in the event that data is lacking, estimates of ground-water flow directions will be presented in the report. Ground-water occurrence will also be discussed in relation to its possible shallow occurrence in the unconsolidated overburden materials and in the underlying bedrock (and the interaction of the two zones). Based on these analyses of ground-water occurrence and flow directions, ground-water quality will be evaluated with respect to historical upgradient and downgradient water-quality data at the site. If an apparent plume of degraded ground water is present, maps will be presented showing the direction and extent of the plume. Since the amount and quality of of the data is not known to Geraghty & Miller, Inc., at present, the accurate mapping of water-quality data may require additional monitoring wells which will be recommended in the report.

Geraghty & Miller, Inc., will provide a proposal for a permanent monitoring well sampling program which will consist of recommendations for which of the existing wells to continue sampling and the locations, depths, and construction of new monitoring wells. We will also provide a list of recommended water-quality parameters for monitoring well sampling and analysis as well as the proper protocols.

Geraghty & Miller, Inc., is pleased to provide this proposal and we look forward to working on the Oswego Valley Landfill - Closure Project. Your counter-signature below will constitute a formalized agreement for this work.

Respectfully Submitted,

GERAGHTY & MILLER, INC.

David W. Miller
Principal

DWM:dt

_____
Arthur Ospelt - Superintendant

_____
Date

NUMBER OF SAMPLES TAKEN/APPROXIMATE COST						
YEAR	O.V.S.R.D.D.	NYSHD	OSWEGO COUNTY	USGS/SURCO	DEC	REMARKS
1969-1974	Limited Sampling only					Landfill owned and operated by Oswego Valley Solid Refuse Disposal District. Sampling consisted of bacteriological testing of a few residences and on-site wells, limited in scope.
1975						Oswego County took over ownership and operation of the Oswego Valley Landfill.
1976		6 Residential 2 Test Well				Well samples for bacteria and inorganics only. Bacteriological failures were common (indicating poor well construction). No residential wells showed contravention of limits set for inorganic parameters.
1977		8 Residential 2 Test Well				Well samples for bacteria and inorganics only. Some bacteriological failures occurred. No contravention of limits set for inorganic levels.
1978		14 Residential 4 Test Well				Analysis expanded to include organic substances. No contravention of State Drinking Water Standards or Oswego County Health Department's informal levels was found in any residential well.
1979		20 Residential 2 Test Well	4 Residential 2 Test Well			Health Department continued sampling program. Oswego County started sampling under a DEC Consent Order. No contraventions of State limits or County action levels were found in any residential wells. Trace levels of organic compounds occasionally found.
1980		20 Residential 2 Test Well	7 Residential 4 Test Well 2 Raw Leachate	76 Test Well		Health Commissioner's Ad Hoc Committee formed in October. Health Department and County continue sampling programs. No contraventions in residential wells. USGS/SURCO program begins. Test wells were installed and in-field testing performed.
1981		40 Residential	4 Residential 4 Raw Leachate	55 Test Well		Health Dept. & County programs continue. Benzene found in 4 residential wells, retesting does not confirm presence of benzene. USGS/SURCO testing continues - program yields questionable conductivity data. MEK found to be important leachate constituent. Occasional trace organics found.
1982		22 Residential $58,533[1]	3 Residential	6 Test Well $85,000[3]	22 Test Well $21,696[4]	Health Department withdraws from program after June sampling. County takes over program. Although occasional trace levels of organics are found, they do not exceed County action levels or State limits. SURCO and DEC testing indicate possible migration.
1983-Present			22 Residential 2 Raw Leachate $83,635[2]			County continues sampling program - Closure plan developed in residential wells.

1. Includes value of analytical work only.
2. Includes actual cost of analytical work & fees covering sample collection.
3. Estimated.
4. Includes analytical costs only.

APPENDIX C

May 6, 1983

Mr. Evan Walsh
Oswego Co. Health Dept.
70 Bunner Street
Oswego, NY 13126

Dear Evan:

RE: Volney Landfill

Regarding Commissioner Collins' letter of January 27, 1983, we have approached our Central Office with a proposal for continued water quality monitoring around the Silk Rd. landfill. It is the Department's position that continued monitoring is in order however we cannot continue to provide laboratory support for such a program. We have been advised that monitoring should be carried out by those responsible for the landfill with the analyses done through a State approved lab.

Results to date do not indicate a problem with water quality at any of the homes and there is no problem with the parameters chosen however, after much consideration it is felt that a series of strategically located test wells around the perimeter of the landfill would be more appropriate as, test sites than continued monitoring of the home owners' wells. Test wells, properly located and constructed, would yield more control and reliability and would serve an early warning should any contaminants begin to move toward any of the residences.

It is therefore our recommendation that a requirement for additional hydrogeological investigation, around the landfill including development of test wells should be included in the closure plan.

Should there be a problem indicated with any of the residences, we would provide any support necessary. We can discuss this further at our next meeting however, should you have any questions feel free to contact me.

Very truly yours,

Ronald Heerkens, R.S.
Senior Sanitarian

cc: Mr. Barry
Mr. McCarthy
Mr. Hudson
Mr. Kyhos
Mr. Collins
Mr. Sheaner
Mr. Scrudato
Mr. Branagh

Prior to the April, 1981 sampling, Methy Ethyl Ketone (MEK) was found to be a constituant of the raw leachate and so was added to the list of parameters to be analyzed for. Oswego County agreed to submit a portion of the Health Department samples to a separate laboratory for MEK analysis.

Monitoring of the on-site test wells ceased after the October, 1980 sampling because they were found to be inadequately located to detect leachate migration from the landfill and one of the wells (TW #15) was found to be consistently dry.

In June, 1982, the County contracted to have three additional monitoring wells installed into the deep bedrock aquifer to be used as new water supply wells for the Kerfien, Coakley and Durfey residences. After initial attempts yielded naturally salty water from the bedrock formation, the wells were re-drilled to the top of the rock. Two wells (Durfey and Kerfien) yielded sufficient quantity of water for use. The Coakley well, which yielded less than 1 gpm, will be re-drilled in early 1984.

Oswego County assumed responsibility for all the groundwater quality monitoring (including residential wells) when the New York State Health Department withdrew its analytical services from the program. In January, 1983, the ad hoc committee developed an on-going sampling program for the County

to follow. This program includes twelve quarterly samples at a yearly laboratory expense of $17,160.00.

From May, 1979 to June, 1983, a total of $45,635.00 has been spent by Oswego County for groundwater monitoring. In addition, $38,000 was spent on developing new residential wells at the Coakley, Kerfien and Durfey properties. Results of all Oswego County-sponsored testing are discussed in Section III of this report.

SURCO/USGS - Sponsored Sampling

In 1979, a cooperative study involving the State University Research Center at Oswego (SURCO) and the United States Geological Survey (USGS) was initiated by an Oswego County Legislature resolution. The purpose of this study was to assess chemical waste disposal sites in Oswego County. One of the main sites of concern in the 26-month program was the Oswego Valley (Volney) Landfill, because of the reported disposal of 8,000± barrels from Pollution Abatement Services, Inc. in 1974.

During the study, a total of 30 shallow (6 to 35 feet) soil borings were performed, 28 of which were converted to monitoring wells (see Figure 2). These wells were subjected to conductivity testing from May, 1980 to February, 1982 and limited analysis for inorganic and organic substances. Results of these tests are discussed in Section III of this report.

Of the approximately $175,000 allocated to the County-wide study, an estimated $85,000 was spent on the Oswego Valley Landfill investigation.

DEC Special Sampling

In March of 1982, DEC notified the Oswego County Health Department that year-end funds were available to conduct water quality sampling and analysis around landfill sites. At a subsequent meeting of the County Health Commissioner's ad hoc committee, approval was given to take advantage of the available monies to supplement data from the Oswego Valley Landfill monitoring program.

Later the same month, samples were taken from sixteen locations and each was analyzed for a group of 135 parameters. Upon review of the results from the March testing, the ad hoc committee requested that four sample points and two field blanks be retested under the same year-end funding; this sampling was completed in October, 1982. Final cost of the analysis was $21,696.00.

Analytical results of the DEC special sampling and all other testing are discussed in Section III of this report.

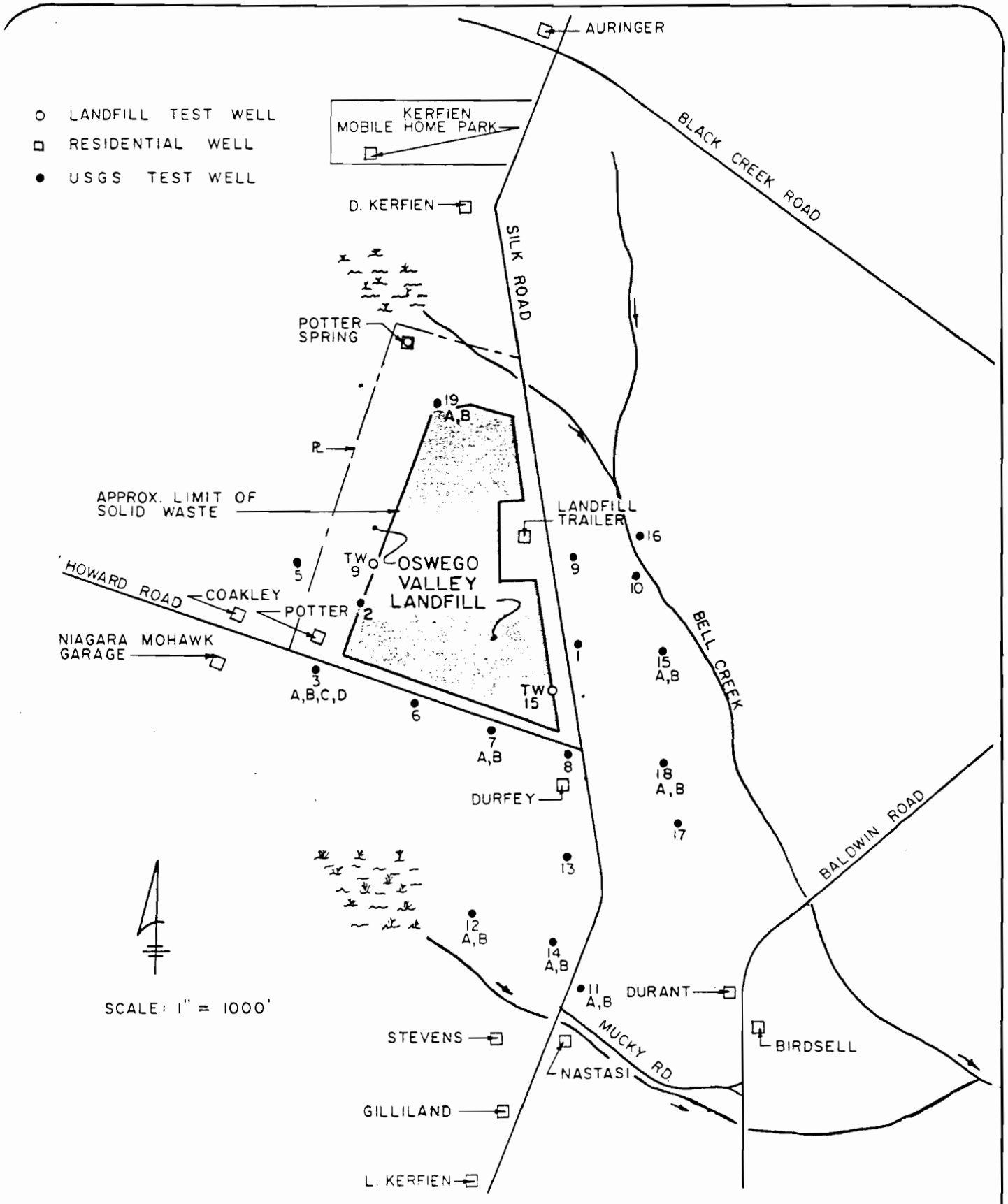
III. SUMMARY OF TEST RESULTS

Different combinations of as many as 78 parameters were analyzed for in each sample. The volume and complexity of all sampling results makes it impossible to list a summary of test results in tabular form. For this reason, only those results that showed concentrations of a parameter at or above acceptable levels (or detectable levels, in the case of organics) are discussed below. The reader should be aware, however, that those test results discussed below represent less than 2% of all results and that the vast majority of all results indicated water of acceptable quality.

Residential Wells

Since 1976, fourteen residential wells (including the landfill trailer well and the Niagara Mohawk Garage) and one spring have been sampled by various agencies at various times. A summary of the sampling history and test results for each residential well is presented below (see Figure 2 for locations of monitoring points).

Auringer: Shallow driven well sampled seven times between 1/14/81 and 6/21/82. This well was included in the program as an upgradient control well. The well failed bacteriological examination on 11/17/81 and 6/21/82 and had 0.001 mg/l of benzene detected on 1/14/81. Immediate retesting did not



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GROUNDWATER MONITORING LOCATIONS

OSWEGO VALLEY LANDFILL

FIGURE 2

PROJECT NO. 132.19C

show the presence of benzene. The one-time detection of this parameter without accompanying elevated levels of leachate-indicator parameters such as Chloride, Iron or TOC was not considered to be evidence of leachate migration. All other results indicate no influence from landfill contaminant migration and are below Part 703 Class GA Groundwater Quality Standards.

Coakley: Shallow well sampled seventeen times between 7/1/76 and 9/13/83. The iron standard was contravened on 7/2/80 (0.51 mg/l) and manganese on 6/22/82 (0.58 mg/l). The well failed bacteriological examination on 1/13/81, 4/20/81, 7/21/81, 11/15/81 and 6/22/83 indicating improper sanitary protection of the well. 1,1-Dichloroethane has been detected in small amounts six times: 7/2/80 - 0.014 mg/l, 11/16/81 - 0.006 mg/l, 6/22/82 - 0.009 mg/l, 3/22/83 -0.012 mg/l, 6/83 - 0.018 mg/l, 9/83 -0.028 mg/l. Other organic compounds detected in the Coakley well are: Dichloromethane - 7/2/80, 0.025 mg/l and 11/16/82, 0.002 mg/l; Benzene -1/13/81, 0.005 mg/l (again, the one-time detection of this parameter in January, 1981, was not considered evidence of leachate contamination); Trichloromethane - 7/21/81, 0.002 mg/l; Bromodichloromethane -

11/16/81, 0.002 mg/l; Chloroform - 11/16/81, 0.021 mg/l; and Tetrachloroethene - 11/16/81, 0.011 mg/l. This well has consistantly yielded fairly high conductivities from 390 to 909 umhos/cm. All other parameters were either below the detectable levels of the analytical equipment, or were below the Part 703 Groundwater Standards. All levels are below those considered a health risk by the New York State Department of Health. The detection of organic compounds and relatively high conductivities suggests the possible influence of the landfill on the Coakley well. However, the lack of recurring, elevated levels of iron, chloride, Zinc, MEK and other possible indicators of landfill leachate leaves the source of the organics and conductivity levels in question. The detection of organic compounds and high conductivity may be explained by the location of the Coakley well, adjacent to the driveway in the front lawn, where it is susceptible to contamination from gasoline, oil, antifreeze, road/driveway deicing compounds, fertilizer and leach field discharge.

Durant: Deep well sampled fourteen times from 10/29/80 to 12/6/83. The Part 703 Standard for iron was contravened on 7/21/81. On 10/29/80, carbon tetrachloride was detected at 0.002 mg/l, and

dichloromethane was detected at 0.010 mg/l. All other parameters in all other samplings were below the limits of detection of the analytical equipment, or below Part 703 Standards. This well consistently exhibited a strong sulfur odor, relatively high conductivity, and high color. All of these characteristics are typical for drilled wells finished in the local Medina Sandstone Group bedrock formation. The lack of recurring leachate indicators and the depth of this well imply that influence by the Landfill is unlikely.

Durfey: Shallow well sampled fifteen times from 7/1/76 to 12/6/83, new deep well sampled twice. The old shallow well failed eight of nine bacteriological examinations. Iron was above the Part 703 standard twice, 2/5/80 and 7/2/80, and benzene was detected once at 0.010 mg/l on 1/14/81 (again, the one-time detection of this parameter in January, 1981, was not considered to be evidence of leachate contamination since immediate retesting did not confirm the presence of benzene). All other parameters for all tests were either below the limit of detectability of the analytical equipment, or were below the Part 703 Groundwater Standards. The new deep well exhibits naturally high iron (above the Part 703 Standard) and con-

ductivity, typical for water from the Medina Sandstone Group. The absence of recurring leachate indicators in both wells implies no influence from the Landfill.

Gilliland: Shallow well sampled four times from 2/17/81 to 6/22/82. Except for bateriological examination failure, there has been no contravention of Part 703 Standards and no indication of influence from the Oswego Valley Landfill.

L. Kerfien, Sr.: Shallow well sampled five times from 1/14/81 to 6/21/82. Except for two bacteriological examination failures, there has been no contravention of Part 703 Standards and no indication of influence from the Landfill.

D. Kerifien: Old shallow well sampled seventeen times from 7/7/76 to 9/13/83, and the new deep well was sampled twice. The shallow well had a few bacteriological examination failures, and the detection of trichloromethane at 0.003 mg/l on 1/13/81 and .004 mg/l on 7/21/81. All other parameters for all other sample dates were either below the detectable limit of the analytical equipment or below the Part 703 Standards. The deep well exhibited slightly high iron, typical for water from the Medina Sandstone Group. There is no evidence

of influence from the Landfill on the D. Kerfien well.

Kerifien Mobile Home Park: Sampled sixteen times from 11/8/78 to 12/6/83. A new, slightly deeper well was drilled between the 10/7/80 and 8/20/81 samplings. Since this well serves a public water system, the water is chlorinated before distribution. Samples taken 11/8/78, 6/2/80, 10/7/80, 4/20/81 and 7/21/81 from the chlorinated water exhibited trace levels of halogenated organics such as bromodichloromethane, chloroform, bromoform, etc. However, simultaneous testing and immediate retesting of the untreated water showed no presence of these compounds, indicating they are due to the disinfection of the water. Benzene was detected once (7/2/80) at 0.010 mg/l but was not detected in subsequent testing. All other parameters from all other test dates were either below the detectable limits of the analytical equipment or below the Part 703 Groundwater Standards, indicating no influence from the Landfill.

Landfill Trailer: Sampled eighteen times from 7/1/76 to 9/13/83. The trailer's deep well has always exhibited very high iron, conductivity, hardness,

chlorides and sodium. In addition, the Part 703 Standard for arsenic was contravened in the 6/13/79, 10/29/80, 1/13/81, 7/19/81 and 11/16/81 samples. Since hard, salty or sulfur water is often found in the Medina Sandstone Group, relatively high concentrations of iron, conductivity, hardness, chlorides and sodium are not an indication of leachate contamination. Arsenic has been detected in two drilled wells near the proposed Bristol Hill Landfill and one well at the Oswego County Airport, indicating that levels of this constituent may also occur naturally in the formation. The absence of any organic compounds implies that the poor water quality in this well is not due to landfill leachate, but to natural conditions.

Nastasi: Shallow well sampled nine times from 10/29/80 to 6/22/82. Except for the detection of bromodichloromethane at 0.002 mg/l and dichloromethane at 0.010 mg/l on 10/29/80, all parameters were either below the detectable limit of the analytical equipment or below the Part 703 Standard. No indication of influence from the Landfill has been found.

Niagara Mohawk Garage: Deep well sampled fourteen times from 5/15/79 to 12/6/83. Iron concentrations have

contravened Part 703 Standards 9 of 12 times, at levels typical for water from the Medina Sandstone Group. The detection of low levels of halogenated organics on 10/7/80 has been attributed to chlorination of the water supply, since retesting on 1/13/81 from a raw water tap indicated no organic compounds were present. All other parameters for all other sample dates were below detectable limits or below Part 703 Standards, suggesting no influence from the Landfill.

Potter: Shallow wellpoint sampled six times from 6/16/76 to 5/19/80. The well was located approximately 20' from a septic tank, 40' from a leaching pit and 200' from the limit of refuse fill. A November, 1978 NYS Health Department Memo based on sampling from 1976, 1977 and 1978 indicated that the well was improperly located, constructed and sealed, and was polluted by high concentrations of chloride, alkalinity, iron and C.O.D. The Memo concluded that the source of contamination was most likely a combination of landfill leachate and septic system discharge. Toluene and Benzene were detected at 200 and 10 ug/l respectively in May, 1980. Oswego County purchased the property in May, 1981 for additional cover material to be used at the Landfill, and no further water quality analysis has been performed since.

Potter Spring: Slightly developed spring located north of the former Potter residence, sampled four times from 10/18/78 to 7/2/80. This spring is one of the headwaters of Bell Creek. All analytical results indicate no contraventions of Part 703 Standards and no influence from the Landfill.

Stevens: Shallow well sampled sixteen times from 7/2/80 to 12/6/83. This well failed bacteriological examination on 10/7/80, 7/21/81 and 11/17/81. Benzene was detected in trace amounts on 7/2/80 and 1/13/81, but has not been detected since. All other results from all other sampling dates are either below the limits of detection or below the Part 703 Groundwater Standards. There is no evidence of influence from the Landfill on this well.

Birdsell: Shallow well sampled four times from 3/22/82 to 12/6/83. This residence was recently added to the Oswego Valley Landfill Groundwater Monitoring Program. To date the results indicate no contravention of Part 703 Standards and no detection of organic compounds. There is no evidence of influence from the Landfill.

Test Wells

Thirty "non-residential" test wells exist around the Oswego Valley Landfill that have been sampled at various

times (see Figure 2 for locations).

On-site test well TW15, installed in 1973, has consistently shown high levels of iron, COD, hardness and alkalinity in the four samples taken from 7/28/76 to 5/2/79. Sampling of this well was curtailed in 1979 because it was found to be consistently dry. Test well TW9 was sampled seven times from 7/28/76 to 10/24/80. This well also yielded high iron consistently, as well as manganese and turbidity. The construction of both TW15 and TW9 was such that only a very small volume of water could be removed prior to sampling, and a true representative sample was never obtained.

The remaining test wells are those installed by the United States Geological Survey (USGS) for the USGS/SURCO cooperative study (Scrudato, 1982). These wells were subjected to a number of in-field conductivity and temperature analyses between 5/80 and 2/82. A limited number of laboratory analyses were conducted during the study, with some wells tested for inorganic constituents up to three times. Samples from test wells #3a, 10, 11a, 11b, 14b and 15a were analyzed once for volatile organic compounds. Results of this program indicated possible landfill contaminant migration to the south/southwest (wells #3a and 6) and to the east (well #10).

During the March, 1982 DEC special funded sampling, test wells 3a, 3b, 6, 8, 10, 11 and six locations on Bell Creek

were analyzed, with wells 3a, 6 and 10 showing elevated or detectable levels of benzene, trans-1,2-dichlorethylene, and total purgeable phenolics. In addition, well #3a exhibited elevated or detectable levels of trichloroethylene, phenol and MEK. Well #6 showed elevated or detectable levels of chloroethane, 1,1-dichloroethane, ethylbenzene and 1,4-dichlorobenzene. Well #10 exhibited elevated or detectable levels of ethylbenzene, phenol and MEK. All of the above-mentioned parameters were detected in the raw leachate samples and were not detected in the distilled water field blanks.

Test wells #3a and 10 were re-sampled under the DEC program in October, 1982. Elevated or detectable levels of benzene, 1,1-dichloroethane, trans-1,2-dichloroethylene, trichloroethylene, phenol and MEK were found in the well #3a sample. Well #10 showed elevated or detectable levels of benzene, ethylbenzene and phenol.

The results of both sets of DEC-sponsored analyses support those of the USGS/SURCO analyses with regard to the detection of organics in the test wells to the east and southwest of the landfill.

IV. HYDROGEOLOGIC OVERVIEW

Basal or lodgment till, a very dense, compact, poorly sorted matrix of clays, silts, sands and gravel underlies the landfill area at depths of 5 to 40 feet. This deposit generally contacts the bedrock (Medina Sandstone Group), separated in places by a layer of weathered sandstone (transitional soil) that often yields sufficient water for domestic use. Above the basal till lies varying deposits of ablation tills, lacustrine silts and sands, and beach sands and gravels. Since the dense basal till acts as an "effective aquiclude" (Scrudato, 1982) and underlies deposits of medium to high permeability, its surface configuration controls the direction of groundwater flow in the shallow system.

Generally, two distinct aquifers are used for water supply in the landfill area. Dug or shallow driven wells most commonly draw water from the near-surface aquifer. This aquifer is not necessarily continuous over the entire area. Some wells in the area are drilled to the transition zone at the sandstone-basal till contact with resulting water of varying quality. Typically, wells drilled into the bedrock formation yield hard, salty and/or sulfur water, although these effects can sometimes be seen in wells finished in the overburden (Kantrowitz, 1970).

The expected directions of groundwater flow from the landfill are to the east, toward Bell Creek (a groundwater

discharge point) and to the south/ southwest, to a buried depression in the basal till and eventually a swampy area (discharge point) east of the County Airport.

Flow in the deeper aquifer is confined and more regional in nature, and trends northwest based on water level observations in the three wells drilled into this zone at the Durfey, Coakley and Kerfien residences. This aquifer is well protected from effects of the shallow zones by the dense basal till overlying it.

Within the landfill property, excavation prior to solid waste deposition has changed the original configuration of the basal till surface. Much of the overlying sand and gravel was removed from the site before 1969, and landfilling efforts since 1975 included contouring and sloping the landfill bottom of dense till to collect leachate at a central point near the landfill entrance.

V. CONCLUSIONS

After reviewing all the available data, several conclusions can be drawn:

1. To date, approximately $250,000 has been spent gathering water quality and hydrogeologic data on the Oswego Valley Landfill.

2. Based on the results of all residential well monitoring performed to date, no health risks have been detected at any of the residences surrounding the Landfill from a water quality standpoint. This conclusion was also reached by the New York State Department of Health (see Appendix C).

3. Based on test well information and operational history of the site, contaminants have occasionally migrated to the south/southwest across Howard Road and to the east across Silk Road to Bell Creek in the shallow (5 to 40 feet deep) layers.

4. Contaminant migration from the landfill should be stopped when leachate production is eliminated by the placement of a landfill cap and startup of leachate collection, storage and treatment.

5. Continued groundwater monitoring should take place as part of the final closure and post-closure maintenance of the Landfill. Recommendations for a new

monitoring program and any additional hydrogeological studies, if necessary, will be submitted by the County's hydrogeological consultant.

REFERENCES

1. Kantrowitz, I.H., 1970. Ground-Water Resources in the Eastern Oswego River Basin, New York; Basin Planning Report ORB-2; p. 90.

2. Scrudato, R.J, and Hinrich, R.A., 1982. Migration of Pollutants in Groundwater from the Oswego County Landfill, Volney, New York presented at the Northeast Conference on Impact of Waste Storage and Disposal on Groundwater Resources, June 28, 1982, p. 5.