ETE Sanitation and Landfill
Town of Gainesville, New York

Design Report

NYSDEC Site #9-61-005
Contract #D002925-30

Prepared for:

New York State
Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

John P. Cahill
Commissioner

Prepared by:

CDM Camp Dresser & McKee Inc.
100 Crossways Park West
Woodbury, New York 11797-2012

July 2000

Contents

Appendices

List of Tables

List of Figures

Section 1
Introduction

The ETE Sanitation and Landfill site is located in a rural agricultural area on Broughton Road in the Town of Gainesville, Wyoming County, New York, approximately 2 miles west of Silver Springs and 1-mile north of the Village of Gainesville. The 20-acre site is surrounded by woodland buffer which separates the landfill from undeveloped agricultural land on all sides. Broughton Road runs east to west to the south of the landfill and Route 19 runs north to south to the west side of the landfill. Two ponds are located within the subject area. The first being situated at the southern property line, referred to as South Pond, and the second located on the northern property line, referred to as North Pond. The landfill accounts for about seven acres of the 20-acre site. The Town of Gainesville Highway Department Garage is located in the southeast corner of the subject area.

According to the 1994 Preliminary Site Investigation Report, the ETE Sanitation and Landfill Site was owned and operated by ETE Corporation from 1972 to 1979. The site may have been in operation prior to 1972. The ETE site was a non-permitted private landfill which accepted municipal and industrial waste from surrounding towns in Wyoming County. The ETE Corporation declared bankruptcy in 1979. A number of violations cited by the New York State Department of Environmental Conservation (NYSDEC) included refuse burned on site; refuse not spread, compacted, or covered; refuse protruding through the cover soils; insufficient grading; uncontrolled release of leachate; and blowing papers.

Almor Corporation of Warsaw, New York, disposed of approximately 150 tons of leaded paint sludge on site. Plating wastes may also have been disposed on site. Additional industrial waste included halite (salt) and possibly other salts produced by Morton Salt. An estimated 4 to 5 truckloads of salt were disposed per week for an undetermined length of time.

Based on site history, findings of NYSDEC site inspections and sample results, NYSDEC elected to perform a Preliminary Site Assessment (PSA) of the site in 1990 and a Second Phase PSA in May of 1993. The PSAs included collection of onsite sediment, leachate and soil samples in addition to the installation and sampling of seven groundwater monitoring wells. These investigations confirmed that hazardous wastes were disposed onsite, groundwater standards were violated, and the contaminants have migrated into nearby surface waters.

To further evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to public health and the environment posed by the presence of hazardous waste, CDM, under contract with the NYSDEC, conducted a Remedial Investigation/Feasibility Study (RI/FS) of the site between March and June 1998. A final report was submitted in September 1998.

The results of the RI indicated that approximately seven acres of the site contains landfilled waste, with a maximum thickness of 15 feet. A portion of the waste is believed to extend under the northern slope of the South Pond.

Potential remedies were identified and evaluated in the final FS report, submitted January 1999. Four alternatives for site remediation were developed through the screening process. They were:

Alternative 1 - No Action with Environmental Monitoring

Alternative 2 - Consolidate Wastes, Install Modified Part 360 Landfill Cap, Gas Vents, and Environmental Monitoring

Alternative 3 - Consolidate Wastes, Install Modified Part 360 Landfill Cap, Gas Vents, Drain South Pond, Relocate and Expand the North Pond, and Environmental Monitoring

Alternative 4 - Consolidate Wastes, Install Modified Part 360 Landfill Cap, Gas Vents, Drain South Pond, Relocate and Expand the North Pond Install a Passive Perimeter Drain, Collection and Offsite Disposal (Alternative 4a) or Onsite Discharge (Alternative 4b) of Groundwater, and Environmental Monitoring.

1.1 Recommendation of Alternatives

Seven criteria (as discussed in The Technical and Administrative Guidance Memorandum) were used in the FS to perform a detailed analysis of the four alternatives. The criteria were: compliance with Applicable or Relevant and Appropriate Requirements (ARARs); protection of human health and the environment; short term effectiveness and permanence; reduction of toxicity, mobility, or volume; implementability; and cost.

Alternative 1 was not selected because it does not sufficiently address protection of human health and the environment. Alternative 2 provided increased protection of human health and the environment over Alternative 1 but does not significantly reduce leachate generation and contaminant mobility. As a result, groundwater and surface water contamination would continue under Alternative 2 virtually unabated.

Alternative 3 was recommended for implementation at the ETE Sanitation and Landfill site given it meets all RAOs, is a reliable remedy with minimal long-term maintenance requirements, and is significantly more cost effective than Alternative 4a or 4b.

1.2 Selected Remedy

Based upon information presented in the RI/FS, the NYSDEC has identified a selected remedy. This is documented in the March 31, 1999 Record Of Decision (ROD), and includes:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS will be resolved.

2. Waste consolidation and site regrading, to minimize the footprint of the site. Design of a modified Part 360 cover system in accordance with applicable regulations and guidance including a gas collection layer and a passive gas collection and venting system. Design of surface water controls.

3. Permanently drain the South Pond to reduce leachate production. Design of drainage ditches and/or pipe conduits to drain the South Pond area. Reclamation of the South Pond area to the extent necessary. Consolidation of the wastes currently under the South Pond to the extent necessary for the remedy.

4. Excavation of contaminated sediments from the North Pond and placement under the final cover of the landfill. Extension of North Pond by approximately one acre to partially compensate for the loss of South Pond aquatic habitat and/or wetlands.

5. Installation and monitoring of two additional well clusters down gradient of the site to detect any future off-site migration of groundwater contamination towards residences.

6. Preparation of a long-term operation, monitoring, and maintenance plan (OM&M plan). The OM&M plan will include periodic sampling of the groundwater, surface water, private wells and landfill gas vents. The plan will also include periodic inspection and maintenance of the cover system and surface water controls to maintain the effectiveness of the remedy.

Section 2
Design Features

2.1 Existing Features

2.1.1 Topography

Regional topography slopes downward to the north to slightly northwest to the small stream valley occupied by Cotton Creek. The highest point on the landfill lies approximately 1680 feet above mean sea level with Cotton Creek at an elevation of 1380 feet above mean sea level, as shown on Figure 2-1. Cotton Creek runs northeast and discharges into Oatka Creek, a major tributary of the Genesee River.

The landfilled portion of the site is slightly elevated relative to the surrounding land. The surrounding topography can be described as a humocky terrain, with evidence of small glacial kettle lakes southeast of the site. The site lies on the northwest side of what appears to be a northwest to southeast trending moraine marking the final advance of glaciers responsible for scouring the valleys now occupied by Silver Lake and Oatka Creek. Unconsolidated soils found onsite consist of poorly stratified very fine sands, silts and clays deposited by glacial ice and/or glacial meltwaters.

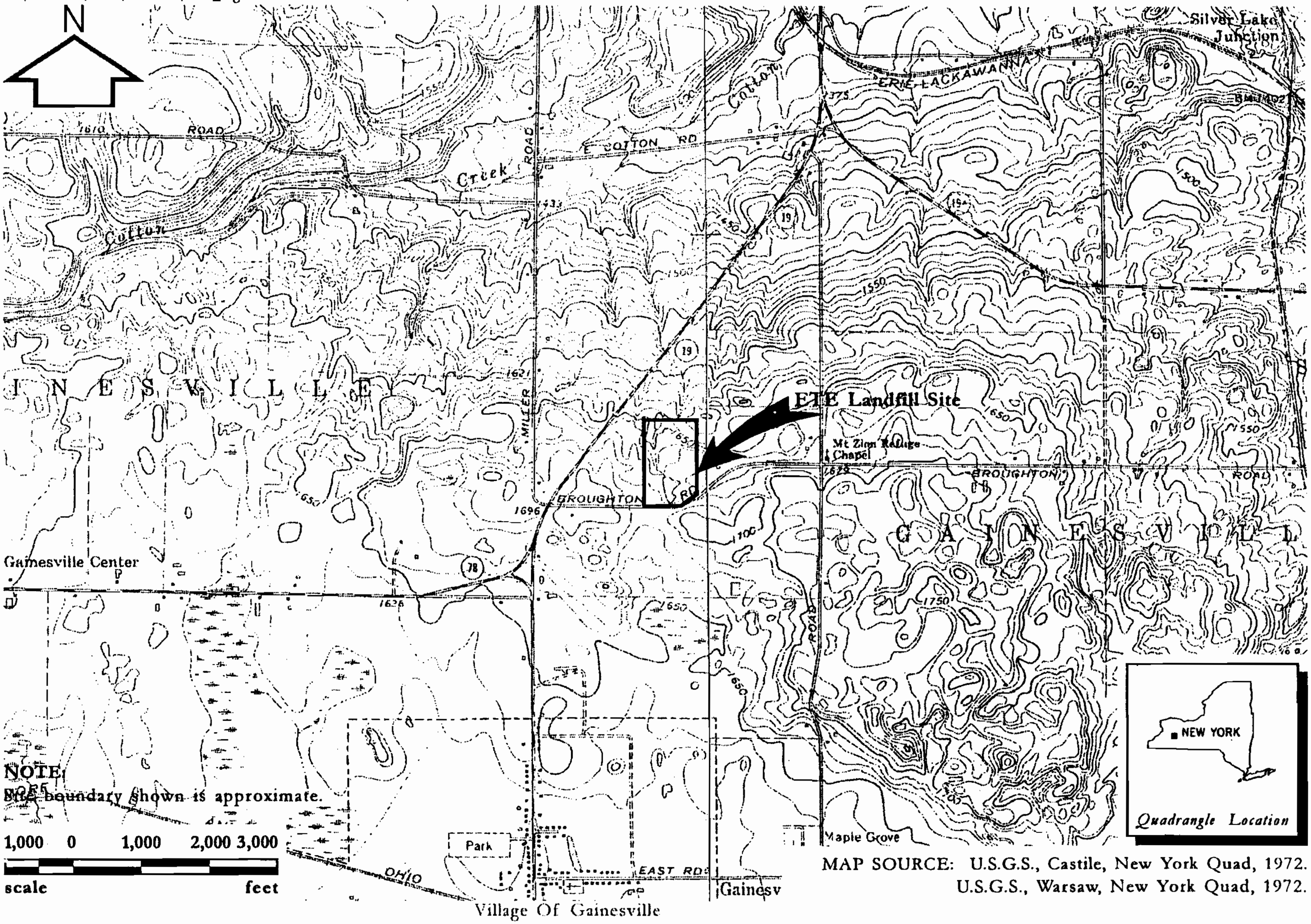
The site vegetation is dominated by grasses, immature trees and shrubs, with mature trees forming a perimeter around the landfilled portion of the property. A limited amount of debris protrudes through the ground cover in certain portions of the landfill, particularly along the steep-sloping north and northeast edge of the landfill. Total relief at the site is approximately 55 feet from south to north with 13 feet of elevation change occurring at the landfill toe. The local topography has been modified by landfilling activities.

2.1.2 Site Geology

Soils found at the ETE Landfill were deposited by glaciers that covered this area of New York during the Wisconsin stage of glaciation in this region. Sediments in this part of Wyoming County are likely to be composed of a Wisconsin moraine sediments and/or ice contact stratified drift (Van Diver, 1997). Soils in the vicinity of the ETE site are Bath-Valois gravelly loams and the Mardin Channery silt loam (USDA, 1974). These soils are characterized by deep, well-drained low lime soils on hill slopes and concave areas or depressions, respectively (USDA, 1974).

Boring logs from monitoring well installations conducted by CDM and Engineering Science indicate that the subsurface material is primarily composed of poorly stratified glacial till comprised of poorly sorted very fine sands, silts, gravels and occasional clay lenses. Glacial till found at the site is a characteristic of lodgement and melt-out type tills. Lodgement tills are formed by the plastering of glacial debris on the underlying bedrock surface by the sliding base of a moving glacier via meltout and mechanical processes. Sediment material derived from the local bedrock appears to increase in abundance towards this lower portion of the substratum. Meltout tills

O:\KALNY\ETE\ETE FS\ETE_Figure 1-1.PM6 0897-22149/T2.GEOP *Issued: December 1998.*



MAP SOURCE: U.S.G.S., Castile, New York Quad, 1972.
U.S.G.S., Warsaw, New York Quad, 1972.

Figure 2-1
Site Location
ETE Sanitation and Landfill Feasibility Study

CDM Camp Dresser & McKee

form as the glacier reaches its stagnation point and begins to melt. Sediment-rich glacial ice begins to melt forming gradational contacts as various sediment debris bands once present in the glacial ice, are deposited on top of the lodgement till as the supporting glacial ice begins to melt. Gravel clasts are a mix of bedrock materials found north of the site and include siltstones, shales and dolomites of Devonian age. Both slug testing and grain size characterization indicate that the material is primarily a very fine sandy silt with a permeability ranging from $1x10^{-5}$ to $1x10^{-3}$ cm/sec. The glacially derived unconsolidated sediment overlies bedrock, which was not encountered during drilling activities conducted during the RI. A well log from the Town of Silver Springs' municipal well, located 3 miles from the site, indicates that glacial overburden is approximately one hundred and sixty feet thick (160 ft) near the site. Glacial deposits overlie gray to light gray colored shale possibly belonging to the West Falls Group of Upper Devonian shales and sandstones exposed in a cliff face of the Letchworth State Park located 6.5 miles east of the site.

Fill materials found at the site are primarily composed of municipal solid waste. Drilling logs indicate that the fill material was occasionally blanketed with cover soil taken from an onsite borrow areas. However, it does not appear that a uniform cover soil layer was spread over the municipal waste on a regular basis.

The geologic cross sections were created by compiling boring log data collected during recent and past investigations. Monitoring wells used to construct the cross sections are shown along with their corresponding well screen intervals. Piezometric/potentiometric head measurements are also plotted for two of six synoptic water level rounds conducted in May and June 1998.

When considering the potential for migration of chemical constituents in groundwater, these cross sections can be used to predict major flow paths at the site. The hydrogeology of the ETE Landfill can be broken down into five distinct geologic units that are grouped according to soil type. These soil types are found at various depths across the site commonly found in glaciated regions.

Stratigraphic Unit	*Soil Descriptions*	*Hydraulic Conductivity (cm/sec)*
Unit 1	Alternating layers of brown silt, little sand and gravel with brown medium-fine sand with silt and gravel, loose, poorly sorted.	10-4 to 10-5 (a)
Unit 2	Gray silt and very fine sand, little clay, little pebbles, medium to no plasticity, poorly sorted.	10-4 to 10-6 (b)
Unit 3	Gray fine to medium sand and silt, occasionally containing pebbles and cobbles, low plasticity, poorly sorted.	10-4 (a)
Unit 4	Gray-tan/Brown fine sand and silt, with orange mottling, loose, poor to well sorting.	10-4 (a)

Stratigraphic Unit	*Soil Descriptions*	*Hydraulic Conductivity (cm/sec)*
Unit 5	Greenish-gray, medium to coarse sands, sandstone fragments, pebbles, cobbles, boulders, loose, poorly sorted.	10 -1 to 10-3 (b)
Municipal and Industrial Solid Waste	Primarily household trash and some construction debris. This unit also includes potential sources of hazardous materials such as lead paint sludge and chemical solvents.	Highly Variable

(a) Hydraulic conductivity from onsite slug testing.

(b) Hydraulic conductivity range from Fetter, 1994, p. 98.

Site hydrogeology is dominated by the low permeable Unit 2, which appears to be interbedded with occasional beds of Unit 3 providing the more permeable horizontal flow path for contaminants traveling in the deeper flow regime. Unit 3 is a discontinuous unit of coarser grained materials. These were likely deposited by periodic high energy glaciofluvial meltwater events. Deposits of this type are highly variable and often times do not conform to "straight line" stratigraphic correlations. At the site, the contact between Unit 3 and the surrounding units should be considered gradational both vertically and horizontally. The cross sections appear to show Unit 3 as a glaciofluvial channelized deposit trending in a NW to SE direction.

Shallow flow is dominated by the alternating layers of silt and very fine sand which comprise Unit 1. Horizontal groundwater flow is likely to be controlled by the very thin (less than 0.5 inch thick) lenses of very fine to fine sand interbedded within the less permeable silt component of Unit 1. Generally, more permeable glacial sediments were found along the western border of the landfilled area. High water production rates were noted in the MW-1 and MW-8 deep wells which are screened in coarser sands and gravels. Water production rates from these wells averaged approximately 1.5 gallons per minute (gpm) whereas other monitoring wells typically produced less than 0.5 gpm.

2.1.3 Site Hydrogeology

Site hydrogeology is influenced by both regional and local hydrogeologic processes acting upon groundwater flow at the landfill. The regional hydrogeology is controlled by topography. Groundwater in this region tends to flow north to northeast towards Cotton Creek. Cotton Creek is likely to derive its baseflow from groundwater flowing northward. The topographic high controlling groundwater flow is composed of glacial moraine material which trends from NW to SE between the towns of Silver Spring and Gainesville. Small ponds and swampy areas are found locally at elevations corresponding to the South Pond elevation suggesting that the pond may be a product of a natural spring along the northeast facing slope of this glacial moraine.

A shallow water table aquifer is present in the unconsolidated sediments found at the site. Stratified deposits of clay and silt provide discontinuous confining layers for the shallow water table to perch upon. Water levels in the shallow and deep monitoring well pairs indicated a slight downward vertical gradient. Piezometric heads measured m the shallow monitoring wells were approximately one foot higher than water levels in corresponding deep wells.

The South Pond is likely to be recharged from regional groundwater flow and to a lesser degree, surface water runoff. The South Pond acts as an area of local groundwater recharge for the landfill. The hydraulic head of the South Pond increases the hydraulic gradient acting on local groundwater flow and is likely to promote horizontal flow in the shallow groundwater table aquifer from south to north towards the north toe of the landfill where leachate seeps are evident.

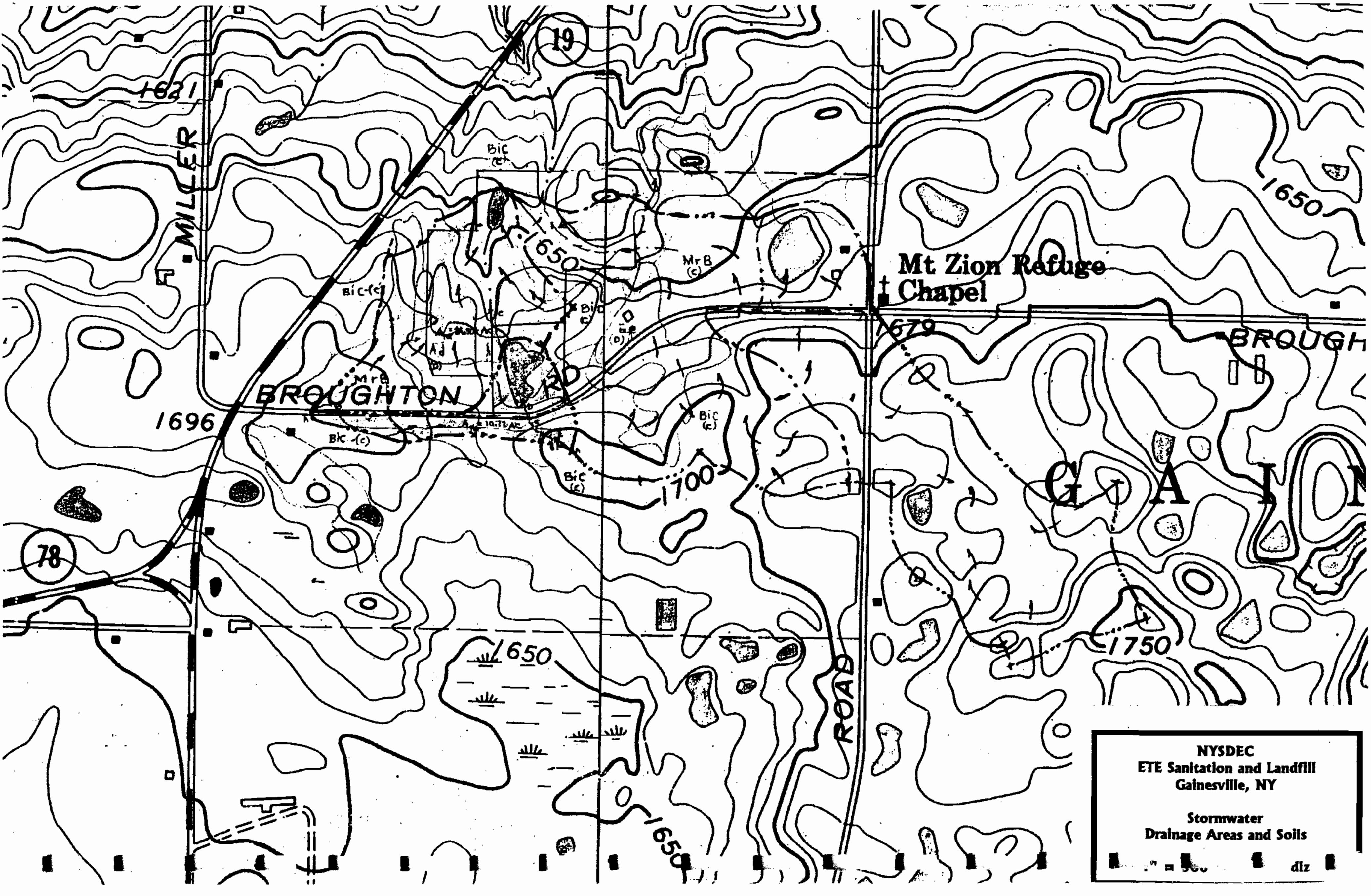
Data presented in the RI indicates shallow groundwater flow from the landfill is in a north to northeast direction. However, local deviation to the northwest appears to occur near the MW-8 well cluster. This slight deviation in groundwater flow direction is likely the result of groundwater mounding within the landfill. Groundwater mounding occurs as the highly permeable municipal solid waste becomes saturated with groundwater and infiltrated water from precipitation (Watson et al. 1993, pp 106-107). As a result, the artificial "bubble", or mound of water forms within the landfilled area. As mounding increases, the differential head between the center of the landfill and the surrounding area, groundwater flow radiates away from the center portion of the landfill towards the landfill perimeter. The groundwater mound appears to have resulted in the formation of a small artificial groundwater "divide", which diverts a small portion of leachate enriched groundwater to the northwest. The majority of leachate enriched groundwater flows to the northeast from the center of the landfill towards the MW-3 well cluster.

Hydraulic heads for monitoring wells screened in the deeper glacial formations are presented in the RI. The data indicates a slight to moderate downward vertical hydraulic gradient. This gradient promotes vertical groundwater flow from the shallow water table aquifer to the deeper glacial aquifer and ultimately into the underlying fractured bedrock.

2.1.4 Surface Water and Site Drainage

Surface water bodies and drainage features are shown in Figure 2-2.

Two ponds are located on site. The South Pond and North Pond are shown on Figure 2-2. The South Pond, approximately 3.5 acres in size, is drained by two seasonal tributaries. The primary tributary, the western drainage channel, drains water north to northwest along the western perimeter of the landfill within the confines of a wooded area which divides the landfilled area from the adjacent property to the west. During periods of heavy precipitation, the South Pond's secondary discharge is due



NYSDEC
ETE Sanitation and Landfill
Gainesville, NY

Stormwater
Drainage Areas and Soils

dlz

east, across the access road into the eastern drainage channel, a seasonal tributary which runs along the eastern boundary of the site.

The North Pond, approximately 0.5 acres in size, (also known as the Leachate Collection Pond) appears to be fed by three sources of recharge; the western drainage channel fed by the South Pond discharge, which runs along the western edge of the landfill and turns east just north of the landfill, discharging water into the North Pond; leachate seeps emanating from the landfill's north toe that flow directly into the North Pond; and direct source of recharge from groundwater infiltration. Surface water is discharged from the North Pond via the North Pond overflow stream, located in the northeast comer of the North Pond. From this location water flows offsite and to the north towards Cotton Creek which is located approximately 0.75 miles north of the site.

A water supply dam used by the Village of Warsaw for drinking water is located upstream from where the landfill's surface water enters Cotton Creek (NYSDOH, 1982). Upstream from the water supply dam, Cotton Creek is classified as a Class A waterbody suitable as a public drinking water source (NYSDEC, 1991). Downstream from the supply dam, where site surface waters enter, Cotton Creek is classified as a Class C water body suitable for fishing, fish propagation and primary contact recreation (NYSDEC, 1991). Cotton Creek flows east at this point where it eventually discharges into Oatka Creek. Oatka Creek flows north and discharges into the Genesee River. Oatka Creek is a Class C water body upstream from the Village of Warsaw (NYSDEC, 1985). According to NYSDEC, Oatka Creek supports moderate fishing pressure and has a wild brown trout population that is augmented by NYSDEC stocking of approximately 1,850 brown trout annually.

The seasonal tributary bordering the eastern portion of the site and fed by the South Pond overflow, drains much of the area located southeast of the landfill. The tributary appears to be impacted by runoff from the Town of Gainesville Garage area. At the garage area, a gravel-salt mixture is stored in uncovered stockpiles. Precipitated salt-residue is visible along small runoff channels entering this seasonal tributary suggesting that surface water runoff from the adjacent Town of Gainesville property is impacting the quality of water entering the tributary.

During the 1998 field investigation, numerous bodies of standing water were observed on the landfilled portion of the site. The result of heavy snowfall and rainfall, numerous 10 to 20 foot wide puddles were observed lying in topographic lows on the ungraded landfill surface and may provide a minor source of recharge to the underlying formations.

2.1.5 Land Use

Wyoming County is predominantly agricultural. Diary farming and grain and forage used in dairy farming are the predominant agricultural enterprises (USGS, 1974). Other agricultural activities include maple products, dried beans, and potatoes. The principle manufacturing industries located in the county within the last 25 years include cutlery, time clocks, knit goods, electronic parts, and manufacturers of various other metal, wood, and plastic parts. In addition, a salt mine is located in the Village of Silver Spring, less than 5 miles northeast of Gainesville (Engineering Science, 1994).

2.2 Cap System

The Record of Decision (ROD) and 6 NYCRR Part 360 landfill closure regulations govern the response action at the ETE Sanitation and Landfill site as Applicable or Relevant and Appropriate Requirements (ARARs). The most recent version of this regulation, effective date October 9, 1993, dictates that landfills which ceased operation before October 9, 1993, and have no approved closure plan by NYSDEC, must comply with the requirements of the previous version of the regulation. Application of this regulation specifies that the closure of the ETE site must be in accordance with the 6 NYCRR Part 360 Regulation effective December 31, 1988.

A low permeability landfill cap can be constructed over the ETE Sanitation and Landfill site to create a physical barrier that: 1) prevents exposure to solid waste via direct contact, 2) reduces leachate generation and future impacts to underlying groundwater quality, and 3) controls gas emissions from the landfill.

The ROD and 6 NYCRR Part 360 Regulations, Section 360-2.15(b), specify the following components for the Final Cover (starting from the bottom):

- Gas Venting Layer Section 360-2.13(p)
- Low Permeability Layer Section 360-2.13(q), Soil Layer; or Section 360-2.13(r), Geomembrane Layer
- Barrier Protection Layer Section 360-2.13(r)(iii)
- Topsoil Layer Section 360-2.13(s)

The cap system will consist of the following from bottom to top:

- Rough grading layer
- Gas venting layer
- 40-mil LLDPE geomembrane
- Geosynthetic drainage system (composite drainage net)
- 18-inch soil barrier protection layer
- 6-inch topsoil layer

- Vegetative cover

A description of each layer, its respective function, and applicablity to the ETE site are provided below. Sheet D-1 includes the typical details of the Modified 6NYCRR Part 360 cap (herein referred to as the modified Part 360 cap).

2.2.1 Site Regrading and Waste Collection

The topography of the existing landfill will be regraded to achieve uniform slopes. The purpose of this grading plan is to minimize infiltration above the cap and to reduce runoff velocities with the potential for development of preferential flow pathcs, which causes erosion. Slopes on top of the landfill will be a minimum of 4% slope, slopes on the side of the landfill will be a maximum of 33%.

Regrading of the site will provide several benefits including:

- permanent dewatering of the South Pond;
- excavation and consolidation of waste currently in the South Pond;
- removal of contaminated soil from the North Pond; and
- excavation of contaminated soil located in an area between the landfill and the North Pond.

2.2.1.1 South Pond

The South Pond is about 3.5 acres in size and is currently about 12 feet deep. Along theedge of the South Pond waste has been placed within the pond. Following dewatering of the South Pond, waste and sediment from South Pond would be excavated and placed on top of the landfill. This will reduce the footprint of the landfill.

A drainage channel will be installed to permanently drain the South Pond. The drainage channel will lower the groundwater table, thereby reducing the amount of leachate that is generated. The channel will utilize a "V" shape with 3:1 grass-lined side slopes. The channel is designed with a 2% slope. A benefit of the drainage channel is that it will intercept surface water and groundwater flowing from the west to northeast along the western edge of the landfill. This will further reduce the generation of leachate. Soil excavated to construct the drainage channel will be used for the construction of the cap system.

2.2.1.2 North Pond

The existing North Pond is approximately one-half acre in surface area and is approximately two to four feet deep. Due to the presence of inorganic contamination, approximately four feet of sediment would be excavated from North Pond and consolidated on top of the landfill as part of the North Pond expansion.

The North Pond would be expanded within the existing property lines. This expansion will partially compensate for the loss of the South Pond and provide additional stormwater storage capacity. This final size was selected to avoid disturbing the eastern area of the pond and limit the amount of clearing and grading on the west side while providing sufficient storage to control the post-closure rates of runoff. The expansion would be designed to maintain the existing surface water elevation (El. 1,638 feet). The bottom depth of the existing pond (4 feet deep, El. 1,634 feet) would be increased by approximately 4 feet as a result of sediment excavation. Sheets D-2 and D-3 provide information regarding the modified North Pond.

2.2.1.3 Area Between Landfill and North Pond

There is an area approximately 150 feet by 350 feet located between the northern limits of the landfill and the North Pond that appears to be contaminated. This soil will be excavation and consolidated on top of the landfill.

2.2.1.4 Summary

The entire landfill would receive a minimum cover of 6 inches of fill material, which will underlie the gas venting layer, as described below. Fiil material would likely be required to increase the slope of the southern half of the landfill to a 4 percent minimum slope. Following completion of rough grading, the landfill would generally slope from south to north, and have a high spot near South Pond. Sheets C-2 and C-3 provide elevations of the excavation and rough grading of the landfill. Sheet C-6, C-7, and C-8 provide cross sections of the regraded landfill.

The regrading described above is expected to generate approximately 42,800 cubic yards of soil. The fill needs to achieve the rough grade described here is 21,500 cubic yards. The 21,300 cubic yards of excess earthen materials from channel construction would be stockpiled and provide the soil needed to construct the protective soil layer for final cap.

2.2.2 Gas Venting Layer

The purpose of the gas venting layer is to facilitate movement of gases from the landfill interior to the venting points described in Section 2.3.3. The gas venting layer is located above the rough grade and immediately below the low permeability layer.

The 6 NYCRR Part 360 Regulations allow the use of either soil or geosynthetics that meet the minimum coefficient of permeability of 1 x 10-3cm/sec. If soil is used, the thickness of the layer must be a minimum of 12 inches, have a maximum of five (5) percent (by weight) passing the No. 200 sieve, and be bounded on its upper and lower surfaces by a filter layer.

Use of a geotextile fabric or composite drainage net (CDN) gas venting layer was considered for this application. The CDN would consist of geonet and geotextile filter fabric. Geonet is porous synthetic product, typically constructed of High Density

Polyethylene (HDPE), that is commonly used for subsurface drainage applications. At a minimum, six inches of rough grading material would be placed between the geocomposite gas venting layer and existing grade to protect the liner from potential damage by sharp objects.

The main advantage of constructing the drainage layer using geotextile fabric is that it requires less space than the sand layer and is slightly less expensive.

Based on the amount of landfill gas generated (Appendix B-4) and the properties of the geosynthetics (Appendix B-5), it is recommended that an 8 oz. geotextile be utilized for the gas venting layer.

2.2.3 Low Permeability Liner

The purpose of the low permeability layer is to prevent leachate generation caused by infiltration of rain water and to prevent uncontrolled movement of landfill gases to the ground surface.

The 6 NYCRR Part 360 regulations allow for the use of two alternative impermeable layers for landfill covers. The first alternative allows for the use of 18 inches of low permeability soil (1 x 10-7 cm/sec permeability) and the second alternative allows for the use of 40-mil thick geomembrane.

The natural clays that can be mined locally and meet the low permeability requirement, also classified as "fat" clays, are generally difficult to work with. Optimum moisture conditions are usually required to compact the material and achieve the required in-place impermeability. Optimum conditions dictate that there is no rain or freezing or hot weather during the work activity. Rain will cause the material to become very wet and impossible to work with or to compact; freezing will make the material hard, and therefore, compaction will not be possible; and hot weather will cause the moisture to evaporate, therefore jeopardizing compaction. Also, at the end of each day the active construction phase must be finished and compacted to avoid possible damage from climatic changes during the evening hours. In the event that an active phase has to remain open, the area usually is covered with plastic to protect the material. The complex installation procedure and higher cost eliminates this material from the options to be used for capping. Additionally, cost for this material can vary greatly depending on the location of the clay deposit in relation to the site, costing from $15 to $45 per cubic yard.

The bentonite-enhanced soils involve mixing of native soils with a percentage of bentonite to achieve the required impermeability. The ratio of materials can be determined in bench scale studies and the same ratios can be used during construction at an on-site mixing plant. This type of soil is significantly less affected by climatic changes and, with the exception of heavy rains or freezing weather, the installation can be accomplished without significant delays. The cost of this material including installation ranges from $35 to $45 per cubic yard depending on the source of the native soils. The lower limit ($35) will involve use of on-site loamy soils and the upper limit ($45) is for transported native soils. Assuming use of on-site soils, the cost per square yard of surface area for an 18-inch thick layer will be $17.50. Although this cost is lower than the clay cost it is still more expensive than geomembranes, for which analysis is provided below. Based upon budgetary cost estimates and experience at other landfills, the cost of the construction of an 18-inch thick low permeability layer is typically more than twice that of a geomembrane.

There are a number of geomembranes that can be used for landfill capping. Traditionally, in landfill engineering the most commonly used ones are Polyethylene (PE) and Polyvinyl Chloride (PVC). The polyethylene type membranes are available in different grades such as High Density (HDPE) and Linear Low Density (LLDPE).

The higher density polyethylenes provide a significant advantage with respect to chemical compatibility. HDPE is resistant to most chemicals and is normally used for landfill and containment liners. Due to the stiffness and comparatively lower elongation properties of the material, HDPE is usually used in areas with uniform bedding and low settling expectations. For the same reasons (rigid nature) HDPE is more difficult to work with: along the side slopes and will not readily conform with the contouring of the topography.

LLDPE and PVC are the two materials most commonly used for capping landfills, where chemical compatibility is less of an issue as it is with containment liners, due to their elastic nature, ability to conform to the contouring of the topography, and ability to withstand uneven settlement.

Based on the above, a 40-mil LLDPE geomembrane liner has been considered for this application.

2.2.4 Barrier Protection Layer and Composite Drainage Net

The purpose of the barrier protection layer is to protect the drainage layer and geomembrane from frost action, root penetration, and physical damage. It also serves a secondary purpose by acting as a lateral drainage layer above the low permeability layer. Lateral drainage is generally essential to maintaining the slope stability of the landfill cap.

The protection layer is located above the low permeability layer. The ROD specifies a minimum 12 inch barrier protection layer. For this application a 18-inch barrier layer is specified.

An analysis was performed to determine if native soil used in the protective layer is adequate to provide drainage of rainfall on the cap system, or if an additional drainage layer is required. The results (Appendix B- 2) indicate that native soil alone does not provide adequate drainage. Use of a composite drainage net does provide for appropriate lateral drainage and has been added to the cap system.

2.2.5 Vegetative Layer

Above the barrier protection layer, a minimum 6-inch layer of topsoil is necessary to maintain vegetative growth over the landfill.

Erosion control netting will be provided on slopes greater than 4H:1V. This includes the north, east and south slope of the landfill and the drainage channel. Areas to receive erosion control matting are shown on Sheets C-4 and C-5.

Upon completing placement of the topsoil layer, the entire landfill would be hydroseeded to establish vegetation cover and avoid erosion of the cover layers. The seed mixture used for the hydroseeding consists of varieties of grass suitable for the local climatic conditions, Section 02930 of the specifications contains information on the seed mixture.

The grass will be mowed on an annual basis.

2.2.6 Slope Stability Analysis

2.2.6.1 Landfill Mass

Slope stability analysis was performed to determine if the MSW would be stable once final grading is complete. Both static and seismic conditions were evaluated. The computer program STABLG by Geosoft was used to model the slope. The computer program analyzes the slope geometry, design soil conditions, and groundwater conditions and calculates a factor of safety. In this analysis, the Janbu method was used to calculate the factor of safety against sliding. Information is contained in Appendix B-3.

The minimum acceptable factor of safety against slope failure is generally considered to be 1.5 for static loading conditions and 1.3 for seismic loading conditions.

For the seismic loading conditions, an assumed maximum horizontal acceleration of 0.15g was used. This acceleration represents the maximum horizontal acceleration at the site with 90 percent probability of not being exceeded in 250 years.

Using Janbu's method, the static factor of safety was calculated as 1.97 and the seismic factor of safety was calculated at 1.25. The static factor of safety is greater than the recommended minimum value of 1.5, thus the MSW is considered stable for the static case.

Although the calculated seismic factor of safety was less than the recommended minimum value of 1.3, the MSW is considered acceptable for the seismic conditions and no deformation analysis was performed for the following reasons:

- A deformation analysis performed on a slope with a calculated seismic slope stability of greater than 1.0 will result in negligible deformation;

- Negligible deformation under a seismic loading condition is considered acceptable.

2.2.6.2 Cover System

The maximum slope angle of the landfill cap is three horizontal to one vertical (3H:1V) from crest to toe of the side slope. The top of the landfill will have a minimum slope of 4 percent. No intermediate side slope benches are proposed.

A two-part wedge analysis was used to determine the factor of safety against sliding for the cap system on both the side slopes and on top of the landfill. In landfill cap systems containing several components, the two components with the lowest interface friction angles is used in the analysis. The two-part wedge analysis calculates factor of safety as the ratio of the resisting forces to the driving forces. The minimum acceptable factor of safety against sliding is generally considered to be 1.5 for the static conditions and 1.3 for the seismic condition.

For the proposed cap system, the critical sliding surface is between the top of the drainage net and the soil protection layer or between the geotextile fabric and the rough grade soil layer (similar interface conditions). The geomembrane is textured where placed along the side slopes and it is smooth where placed on the top of the landfill. Therefore, design friction angles of 26 degrees on the side slopes and 10 degrees on the landfill top were used in the analysis.

Static factors of safety of 1.70 for the side slopes and 21.1 on the top of the landfill were calculated. Seismic factors of safety of 1.12 for the side slopes and 4.4 on the top of the landfill were calculated.

2.3 Landfill Gas Control

2.3.1 Estimate of Gas Generation

An estimate of the amount of landfill generated is contained in Appendix B-4.

2.3.2 Passive Vents

Nine passive vents will be installed to vent landfill gas generated. Sheet D-1 contains details of the gas vents.

2.4 Stormwater Management

There are two ponds on the site, identified as the South Pond and North Pond. The selected closure method will:

- Install a low permeability membrane and earthen cover over the landfill;
- Breach and drain the South Pond and convey the runoff to the North Pond; and
- Enlarge the North Pond to control the rate of runoff from the site and provide additional aquatic habitat.

2.4.1 Hydrology

The three primary drainage areas at the landfill site are listed below and shown on the attached drainage area and soils map, Figure 2-2.

- Drainage to the South Pond
- Drainage to the North Pond
- Drainage to the East

The South Pond drainage area is 10.72 acres, 2.41 acres of which is the pond. The pond water surface area was assigned an SCS runoff CN of 98 for pre-closure conditions. The post-closure conditions SCS CN was reduced to 71 to represent this now exposed land surface. The runoff from the South Pond was assumed to flow over the natural divide at the southwest corner of the pond and run down the natural drainage area to the North Pond.

The North Pond local drainage area is 24.50 acres, 0.57 acres of which is pond area. The pond water surface area was assigned an SCS CN value of 98 as for the South Pond. The total drainage area to the North Pond is 35.22 acres comprised of the South and the North Pond drainage areas.

The drainage to the east consists of the runoff from the east side of the landfill and drains to the adjacent stream on the eastern property line. The post-closure runoff was assumed to less than that for existing conditions since the SCS CN value would either be the same or would be improved by the proposed earthen landfill cover. In addition, the size of this drainage area would be slightly reduced by installation of the landfill cover. The drainage area parameters are summarized in Table 2-1 and the onsite and offsite areas are illustrated in Figures 2-3 and 2-4.

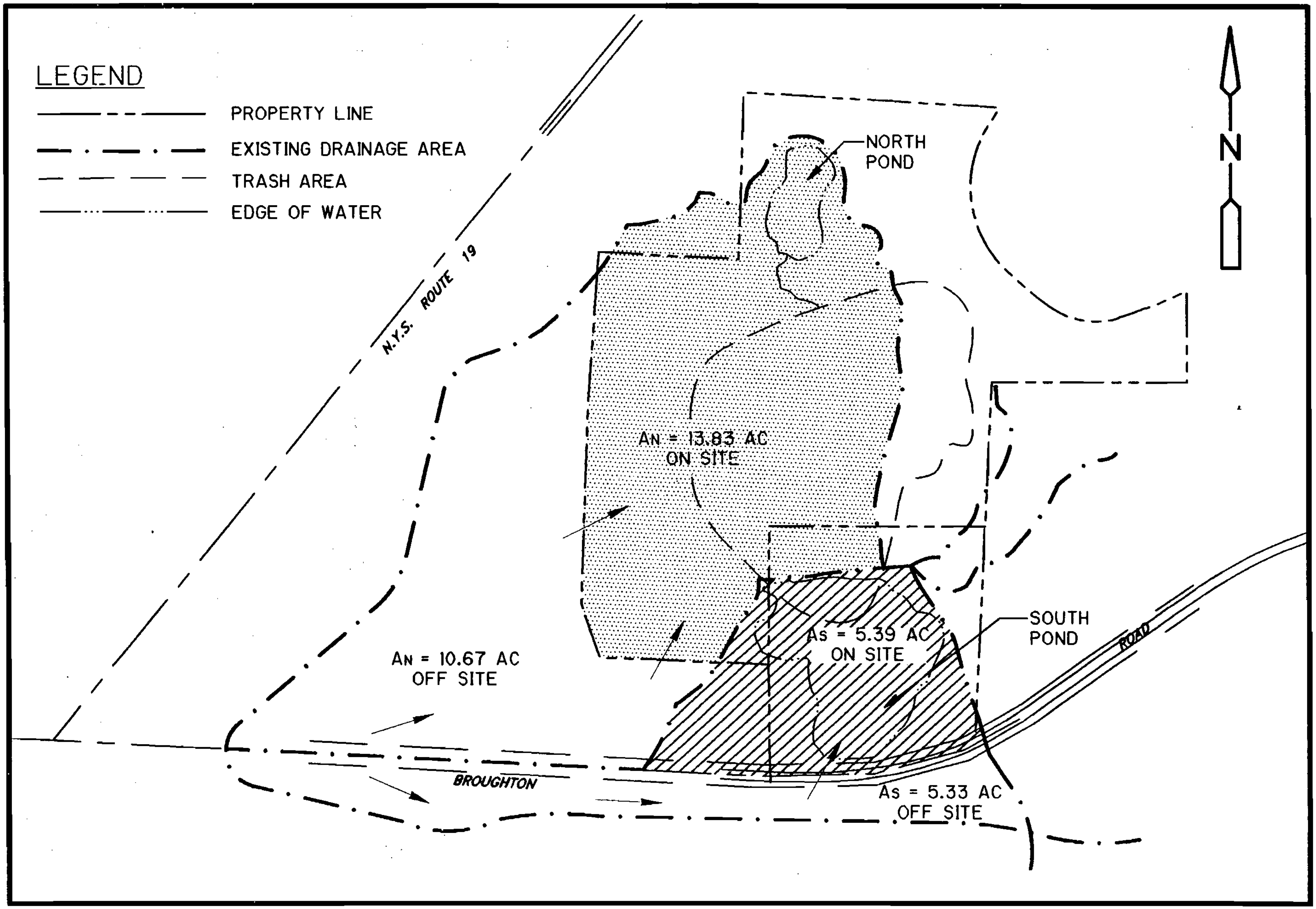
Runoff amounts were computed for the South and North Pond drainage areas for the 1, 2, 5, 10, 25, 50, and 100-year SCS 24-hour rainfall amounts utilizing TR-20 methodology and are included in Appendix B-6 (Pre-closure and Post-closure). The South Pond routing was eliminated for post-closure runoff conditions since this pond will be breached and drained. This significantly increased the rate of discharge from the South Pond drainage area. The total 100-year runoff to the North Pond increased from 61 cfs to 100 cfs due to the removal of the South Pond. The results of these studies are included in Table 2-2

2.4.2 Hydraulics

The existing pond outlets were modeled as channel sections flowing at critical depth to obtain stage discharge ratings. The final structure will be a triangular weir, as shown on Sheet D-2. This structure would be self-cleaning and not prone to plugging with leaves, limbs, or other floatable debris.

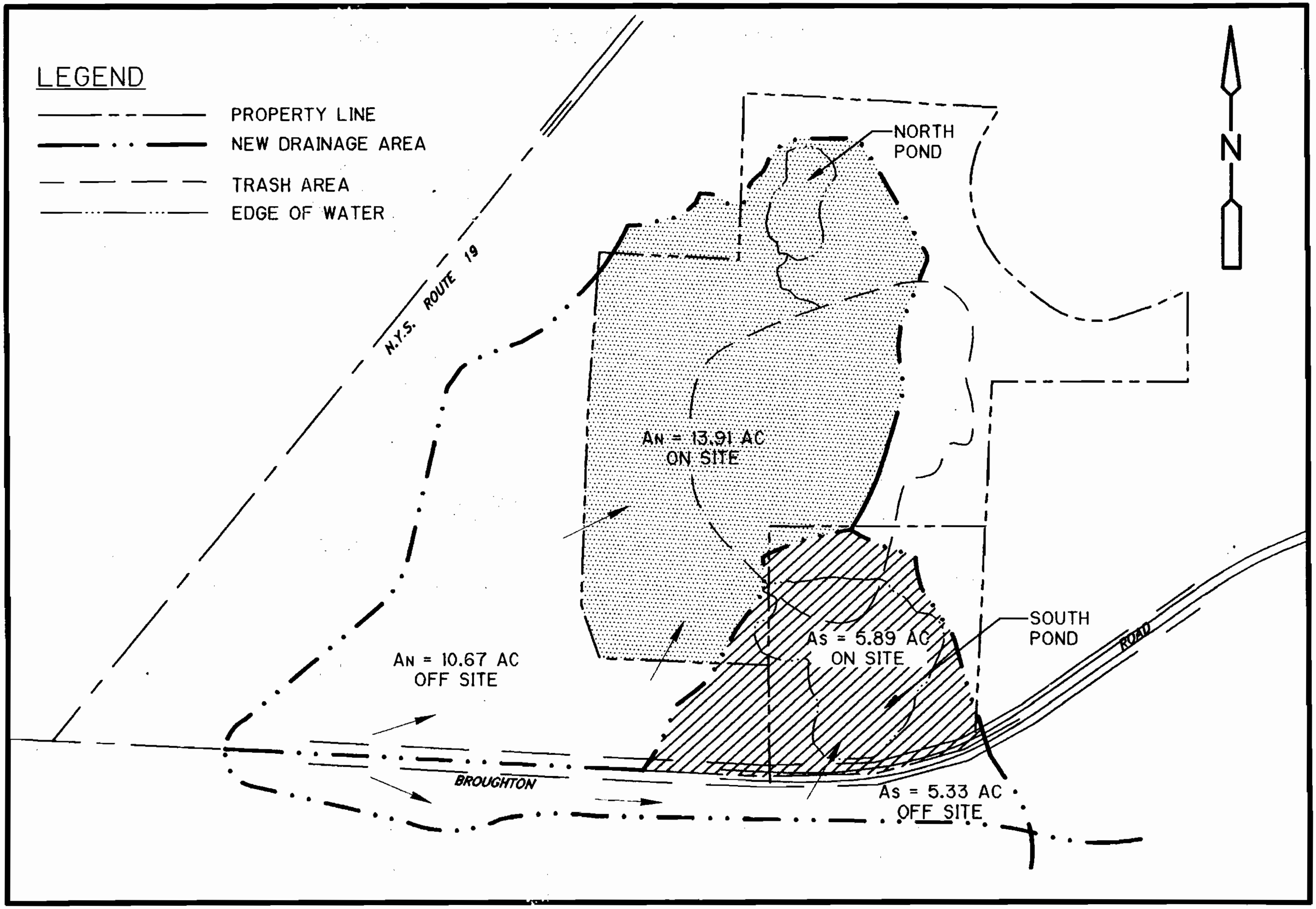
New York State Department of Environmental Conservation
ETE Sanitation and Landfill, Gainesville, NY
Table 2-1: Drainage Area Data
Pre- vs. Post- Landfill Closure

Item	*Pre-Closure*	*Post-Closure*
South Pond:		
Drainage Area (AC)		
Off Site	5.33	5.33
On Site	5.39	5.89
Total	10.72	11.22
SCS CN Value	80.00	74.00
Tc (Min.)	7.70	7.70
Pond Area (AC)	2.41	0.00
Normal Pond W.S. El. (FT)	1672.00 Wet	1660.00 Dry
North Pond: (Local)		
Drainage Area (AC)		
Off Site	10.67	10.67
On Site	13.83	13.91
Total Local	24.50	24.58
SCS CN Value	71.00	73.00
Tc	15.80	15.80
Pond Area (AC)	0.57	1.39
Normal Pond W.S. El. (FT)	1638.00	1638.00
South & North Ponds Combined:		
Drainage Area (AC)	35.22	35.80



New York State Department of Environmental Conservation
ETE Sanitation and Landfill
STORMWATER MANAGEMENT PRE-CONSTRUCTION DRAINAGE AREAS
Figure No. 2-3

CDM Camp Dresser & McKee



New York State Department of Environmental Conservation
ETE Sanitation and Landfill
STORMWATER MANAGEMENT POST-CONSTRUCTION DRAINAGE AREAS
Figure No. 2.[illegible]

CDM Camp Dresser & McKee

New York State Department of Environmental Conservation
ETE Sanitation and Landfill, Gainesville, NY
Table 2-2: North Pond
Pre- vs. Post- Landfill Closure Hydrology

Rainfall Event (YR)	*24-Hour Rainfall (IN)*	*Inflow*			*Outflow*		
		Pre-Close (CFS)	*Post-Close (CFS)*	*Change (CFS)*	*Pre-Close (CFS)*	*Post-Close (CFS)*	*Change (CFS)*
1	2.2	7.9	15.3	7.4	2.3	0.6	-1.7
2	2.5	12.4	22.9	10.5	3.5	1.1	-2.4
5	3.1	22.9	40.0	17.1	11.4	2.7	-8.7
10	3.6	32.7	55.7	23.1	18.8	5.0	-13.8
25	4.2	45.4	75.8	30.5	32.0	9.4	-22.6
50	4.6	54.3	89.8	35.5	41.4	13.5	-27.9
100	4.8	61.1	100.4	39.3	48.5	18.4	-30.1

The proposed channel for draining the South Pond is designed with a triangular cross section with 3 to 1 side slopes, as shown on Sheets C-9, C-10, C-11, and C-12. The channel from the South Pond will be at a 2-percent slope, which will produce velocity of 5.1 fps for the 100-year runoff (Appendix B-7). Erosion control (rip-rap) will be provided for the entire length of the channel. This channel will serve not only to drain the South Pond but will also intercept groundwater flow on the south and west sides of the landfill.

The North Pond will be excavated to remove contaminated sediments from the landfill. It will also be expanded to increase the water surface area from 0.57 acres to 1.39 acres. This final size was selected to avoid disturbing the eastern area of the pond and limit the amount of clearing and grading on the west side while providing sufficient storage to control the post-closure rates of runoff.

2.5 Access Roads

An access road will be constructed from Broughton Road onto the landfill and across the top of the landfill. The location of the access road is shown on Sheets C-4 and C-5. The details of construction of the access road are shown on Sheet D-1.

2.6 Project Schedule

Figure 2-5 provides a copy of the proposed project schedule.

2.7 Health and Safety Plan

The contractor is responsible (per Specification Section 01120 of the Contract Documents) for the development of a written Health and Safety Plan (HASP). The Contractor is responsible and liable for the health and safety of all on-site personnel and off-site community impacted by the remediation. All on-site workers shall comply with the requirements of the HASP.

The Contractor's HASP is required to comply with applicable federal and state regulations protecting human health and the environment from the hazards posed by activities during this site remediation. The Contractor is not allowed to initiate on-site work in contaminated areas until an approved HASP has been issued. The HASP should contain the following sections:

- Health and Safety Organization,
- Site Description and Hazard Assessment,
- Training,
- Medical Surveillance,
- Work Areas,

- Standard Operating Safety Procedures and Engineering Controls,
- Personal Protective Equipment,
- Personnel Hygiene and Decontamination,
- Equipment Decontamination,
- Air Monitoring,
- Emergency Equipment and First Aid Requirements,
- Emergency Response and Contingency Plan,
- Permit-Required Confined-Space Entry Procedures,
- Spill Containment Plan,
- Heat & Cold Stress,
- Record Keeping, and
- Community Protection Plan.

2.8 Operations and Maintenance Manual

The Engineer is responsible for updating and revising the draft Operations and Maintenance Manual that will serve as a tool to monitor and evaluate the performance and effectiveness of the selected remedial action. The performance and effectiveness is evaluated by monitoring contaminants of concern contained in groundwater. The manual is intended to provide detailed guidance and direction for the post-closure phase of the project. A copy of the draft manual is submitted under separate cover.

Inspection of the ETE Sanitation and Landfill site will be performed to ensure that post-closure requirements are met. The following activities will be included in the post-closure inspection program:

- The final cap will be inspected and maintained to remediate any effects of settlement, subsidence, and erosion.
- LFG venting and groundwater monitoring systems will be inspected and maintained to properly monitor the facility in accordance with the closure plan.
- Drainage structures will be inspected and maintained to prevent settlement and erosion, and to ensure proper drainage.

- Sedimentation ponds will be cleaned, as necessary, to remove silt that accumulates during the closure period. It is anticipated that yearly cleanings will occur until the site is stabilized. Cleanings will then be scheduled as needed.

- Permanent survey benchmarks will be protected and maintained.

To ensure that the above activities are conducted in their entirety, a scheduled site inspection will be performed. The site inspections will be performed by qualified personnel assigned to inspect the items and systems noted above. The inspections will be performed at least monthly until a full stand of vegetation has been provided over the closed area. Once vegetation has been established, inspections will be performed quarterly. Additional inspections may be performed after periods of extremely wet or dry weather and after major storm events. Where possible, the area should be mowed just before the inspection to allow better visual inspection of the surface area.

After a 2-year period has passed with little or no required landfill maintenance, the frequency of the inspections will be decreased to semi-annual. These semi-annual inspections should occur in the early spring and in the late summer. The semi-annual inspections will continue for the remainder of the post-closure care period, unless conditions noted between or during the semi-annual inspections indicate that more frequent inspections and maintenance are required.

If the inspection of the facility indicates that corrective action is required to repair or restore a component of the facility to a condition so it can fulfill its intended function, maintenance will be required. Information on maintenance performed will be documented and the information retained in a site file. The following information will be recorded.

- Type of maintenance performed

- Location of maintenance performed

- Maintenance personnel

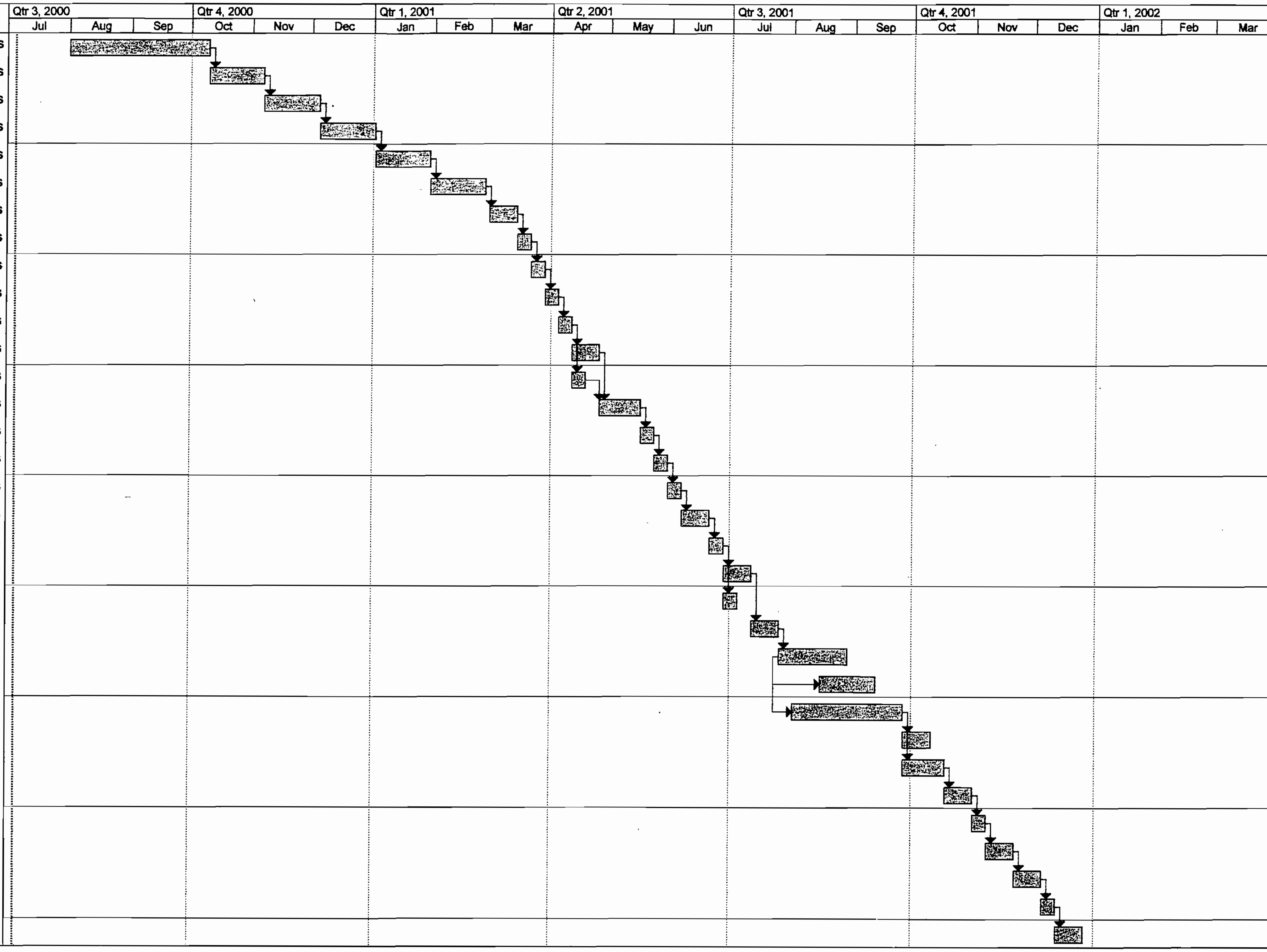
- Time and date of performed maintenance

- Method maintenance was performed

- Materials and equipment used for performing maintenance

ETE Sanitation and Landfill
Project Schedule

ID	Task Name	Duration
1	Bidding Process	50 days
2	Bid Review	20 days
3	Contract Award	20 days
4	Contractor Submittals/Workplan/HASP	20 days
5	Submittal Review	20 days
6	Mobilization	20 days
7	Silt Fence	10 days
8	North Pond diversion swale	5 days
9	Dewater North Pond	5 days
10	S&E control features	5 days
11	Clear and grub portion of landfill	5 days
12	Excavate North Pond	10 days
13	Excavate between North Pond and landfill	5 days
14	North Pond embankment and spillway	15 days
15	Final grade and seed North Pond	5 days
16	Remove North Pond diversion swale	5 days
17	Dewater South Pond	5 days
18	Excavate South Pond	10 days
19	Clear and grub remainder of landfill	5 days
20	Excavate West Channel to achieve rough grades	10 days
21	Construct East Drainage Channel	5 days
22	Install gas vents	10 days
23	Install Cap system	25 days
24	Install toe drain	20 days
25	Excavate West Channel to final grades	40 days
26	Install riprap	10 days
27	Install access roads	15 days
28	Install erosion control matting	10 days
29	Seed disturbed areas	5 days
30	Remove S&E control features	10 days
31	Clean site	10 days
32	Site inspection	5 days
33	Demobilization	10 days



Project: construction schedule
Date: Wed 7/5/00

Task | Split | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Split | Rolled Up Milestone | Rolled Up Progress | External Tasks | Project Summary

Appendix A
Pre-Design Investigation Report

The Pre-Design Investigation Report has been submitted under separate cover.

Appendix B
Engineering Design Calculations

Appendix B-1
Liner Puncture Analysis

Calculation Cover Sheet

Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	Liner Puncture Analysis
Performed By and Date:	John J. Wood, November 3, 1999
Checked By and Date:	
Purpose of Calculation:	Determine the maximum particle size allowed in soils adjacent to liner
Results :	The results of the analysis show the maximum particle size allowed adjacent to the liner is 4-inches
References:	National Seal Company, Product Information, 40-mil LLDPE

Liner Puncture Analysis

Determine the maximum particle size allowed in soils adjacent to liner.

Liner - 40-mil LLDPE

Soil thickness - 2.0 feet

Soil Weight - 120 pcf

1. Calculate vertical stress on liner

$$\sigma_v = 2.0\,ft \times 120 \frac{lbs}{ft^3} = 240 \frac{lbs}{ft^2} = 1.67\,psi$$

2. Maximum particle size is determined by equating the allowable puncture load on the liner to the product of the vertical stress and particle area.

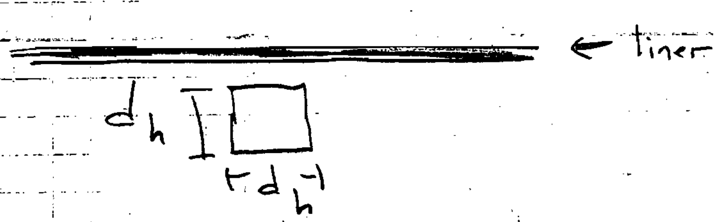
$$(P \geq \sigma_v \times Area)$$

Assume the particle is rectangular

$$A = \frac{P}{\sigma_v} = \frac{68\,lbs}{1.67\,psi}$$

$P = 68\#$ per National Seal for 40-mil LLDPE (attached)

$$A = 40.72\ in^2$$



CAMP DRESSER & McKEE	CLIENT NYSDEC	JOB NO.	COMPUTED BY J. Wood
	PROJECT ETE LF	DATE CHECKED	DATE
	DETAIL Liner Puncture	CHECKED BY	PAGE NO. 2/2

Solve for d_h

$$d_h = (A)^{1/2} = (40.72)^{1/2}$$

$$d_h = 6.38 \text{ inches}$$

3. Results – Maximum particle size is 6.38 inches, assuming no geotextiles used

Use Safety Factor 1.5

$$\text{Maximum Stone Size} = \frac{6.38}{1.5}$$

$$\text{Maximum Stone Size} = 4.25 \text{ inches}$$

DURA SEAL® LL GEOMEMBRANE

SPECIFICATIONS

40 mil (1.0 mm)

National Seal Company's DURA SEAL LL geomembranes are produced from virgin, first quality, high molecular weight resins and are manufactured specifically for containment in hydraulic structures. DURA SEAL LL geomembranes have been formulated to be resistant to chemicals, ultraviolet degradation, as well as leaching additives.

Refer to NSC's Manufacturing Quality Control Manual to determine test methods and frequencies used as a part of NSC's quality control program.

RESIN PROPERTIES	METHOD	UNITS	MINIMUM[1]	TYPICAL
Resin Density[2]	ASTM D 1505	g/cm^3	0.926	0.920

SHEET PROPERTIES	METHOD	UNITS	MINIMUM[1]	TYPICAL
Thickness	ASTM D 5199			
Average		mils	40.0	41.5
Individual (15 ft and 30.5 ft)		mils	38.0	40.3
Individual (23 ft)		mils	36.0	37.0
Density[2]	ASTM D 1505	g/cm^3	0.938	0.933
Carbon Black Content	ASTM D 4218	percent	2.0	2.3
Carbon Black Dispersion	ASTM D 5596	rating	Category 1 or 2	Category 1
Tensile Properties	ASTM D 638			
100% Secant Modulus		psi	1500	1570
		ppi	60	65
Stress at Break		psi	3800	5650
		ppi	152	234
Strain at Break	2.0" gage or extensometer	percent	850	1015
	2.5" gage length	percent	680	812
Dimensional Stability[2]	ASTM D 1204, mod.	percent	3.2	1.1
Tear Resistance	ASTM D 1004	ppi	630	725
		lbs	25	30
Puncture Resistance	ASTM D 4833	ppi	1700	2050
		lbs	68	85

1 This value represents the minimum acceptable test value for a roll as tested according to NSC's Manufacturing Quality Control Manual. Individual test specimen values are not addressed in this specification except thickness.

2 Indicates Maximum Average Roll Value

http://www.nationalseal.com

NSC

NATIONAL SEAL COMPANY
1245 Corporate Blvd. • Suite 300
Aurora, IL 60504
(630) 898-1161 • (800) 323-3820
Fax (630) 898-3461

Appendix B-2
HELP Model

Calculation Cover Sheet

Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	HELP Model for Drainage Layer
Performed By and Date:	Mike Brincheck, October 24, 1999
Checked By and Date:	John Wood, November 1, 1999
Purpose of Calculation:	Determine if native soil layer is adequate to provide drainage of rainfall on the cap system, or if an additional drainage layer is required.
Results:	Results indicate that native soil does not provide adequate drainage. Use of a composite drainage net does provide for appropriate lateral drainage.
References:	Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.03, developed by the Environmental Laboratory USAE Waterways Experiment Station

HELP Model

The purpose of this calculation is to determine if native soil produced from the excavation of the western drainage channel would provide adequate drainage on top of the synthetic liner. The use of a Composite Drainage Net (CDN) was also modeled to determine if a CDN would provide adequate drainage. The following table summarizes the input parameters.

Parameter	*Soil Layer*	*Soil Layer and CDN*
Location	Buffalo, NY	Buffalo, NY
Layer 1	Topsoil 6-inches	Topsoil 6-inches
Layer 2	Barrier Soil 18-inches	Barrier Soil 18-inches
Layer 3	Geomembrane 40-mil	CDN - 0.2 inches
Layer 4		Geomembrane40-mil
Slope	4%	4%
Slope Length	450 feet	450 feet

Results

The results indicate that soil alone will not provide adequate drainage since the head on the geomembrane is 24 inches, fully saturating the soil. This means the soil layer is fully saturated. The CDN does provide adequate drainage for this project and is recommended for use. The following table summarizes the results on a per acre bases. The output from the HELP Model is attached.

Parameter	*Soil Layer(cubic feet)*	*Soil Layer and CDN (cubic feet)*
Average Annual		
Precipitation	133,544	133,544
Runoff	38,868	28,606
Evapotranspiration	94,745	89,184
Drainage from top of FML	104	15,621
Leakage through FML	4	0
Average Head on Liner	8.77 inches	0.002 inches
Peak Daily		
Precipitation	7,768	7,768
Runoff	12,011	11,684
Evapotranspiration	0	0
Drainage from top of FML	2	2,083
Leakage through FML	0.03	0.0001
Head on Liner	24.0 inches	0.11 inches

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.03  (31 DECEMBER 1994)                  **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                USAE WATERWAYS EXPERIMENT STATION                         **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                 **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     D:\HELPMO~1\BUF4.D4
TEMPERATURE DATA FILE:       D:\HELPMO~1\BUF7.D7
SOLAR RADIATION DATA FILE:   D:\HELPMO~1\BUF13.D13
EVAPOTRANSPIRATION DATA:     D:\HELPMO~1\BUF11.D11
SOIL AND DESIGN DATA FILE:   D:\HELPMO~1\BCLI.D10
OUTPUT DATA FILE:            D:\HELPMO~1\bcliout.OUT


TIME:  17:38     DATE:  10/24/1999


******************************************************************************

     TITLE:  Head Check on Liner System for Closed Landfill

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
          THICKNESS                     =      6.00   INCHES
          POROSITY                      =      0.3980 VOL/VOL
          FIELD CAPACITY                =      0.2440 VOL/VOL
          WILTING POINT                 =      0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT    =      0.3866 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 15

THICKNESS	=	18.00 INCHES
POROSITY	=	0.4750 VOL/VOL
FIELD CAPACITY	=	0.3780 VOL/VOL
WILTING POINT	=	0.2650 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4667 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000003000E-04 CM/SEC
SLOPE	=	4.00 PERCENT
DRAINAGE LENGTH	=	450.0 FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	80.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	8.821	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.038	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.526	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	10.720	INCHES

TOTAL INITIAL WATER = 10.720 INCHES
TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
BUFFALO NEW YORK

MAXIMUM LEAF AREA INDEX	= 2.00
START OF GROWING SEASON (JULIAN DATE)	= 126
END OF GROWING SEASON (JULIAN DATE)	= 285
AVERAGE ANNUAL WIND SPEED	= 12.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	= 76.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	= 68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	= 72.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	= 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BUFFALO NEW YORK

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.02	2.40	2.97	3.06	2.89	2.72
2.96	4.16	3.37	2.93	3.62	3.42

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BUFFALO NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR BUFFALO NEW YORK

STATION LATITUDE = 42.93 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.44	2.02	4.28	2.94	3.27	2.62
	2.70	3.84	2.92	5.27	6.60	3.68
RUNOFF	1.919	1.200	3.321	0.599	0.000	0.000
	0.000	0.000	0.000	0.061	4.757	3.090
EVAPOTRANSPIRATION	0.743	0.957	1.518	2.347	3.455	3.439
	4.763	3.558	2.429	2.162	1.449	0.765
LATERAL DRAINAGE COLLECTED	0.0007	0.0007	0.0007	0.0012	0.0019	0.0018
FROM LAYER 2	0.0012	0.0007	0.0007	0.0038	0.0163	0.0119
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
LAYER 3	0.0001	0.0000	0.0000	0.0001	0.0002	0.0002

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	3.991	3.984	3.976	8.215	14.429	13.965
LAYER 3	7.847	3.994	3.999	10.456	23.502	16.998
STD. DEVIATION OF DAILY	0.002	0.003	0.003	4.140	0.690	1.177
HEAD ON LAYER 3	3.426	0.002	0.001	7.711	0.775	9.499

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.32	3.62	3.57	1.88	3.58	1.26
	3.27	7.84	2.04	2.24	1.83	3.85
RUNOFF	0.506	2.596	5.476	0.086	0.014	0.000
	0.000	0.053	0.000	0.000	0.000	0.999
EVAPOTRANSPIRATION	0.540	0.447	1.587	1.698	4.657	1.452
	4.443	5.109	3.687	1.895	1.202	0.511

LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007	0.0007	0.0007	0.0017	0.0047	0.0018
	0.0011	0.0050	0.0027	0.0015	0.0014	0.0068
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.991	3.984	3.976	11.069	18.336	13.968
	7.646	12.385	15.357	11.011	10.175	13.678
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002	0.003	0.003	4.808	1.668	0.675
	3.304	7.673	2.411	0.763	0.167	8.545

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	5.13	2.64	1.93	2.02	2.49	1.99
	2.42	4.71	3.23	2.45	2.35	2.34
RUNOFF	5.809	2.005	1.034	1.081	0.007	0.000
	0.000	0.000	0.000	0.000	0.000	0.937
EVAPOTRANSPIRATION	0.438	0.656	1.389	1.983	2.481	3.344
	4.081	3.345	2.921	2.176	1.190	0.454
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007	0.0007	0.0007	0.0009	0.0027	0.0018
	0.0009	0.0007	0.0007	0.0008	0.0009	0.0011
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.991	3.983	3.976	5.426	14.870	13.821
	5.604	3.995	3.999	4.150	5.924	6.818

STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002 2.214	0.002 0.003	0.002 0.002	2.914 0.236	2.565 1.669	1.391 4.041

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.69 4.76	1.19 1.07	1.47 5.39	2.98 3.07	4.44 5.03	2.76 3.92
RUNOFF	2.842 0.008	0.832 0.000	0.548 0.000	1.658 0.000	0.000 2.675	0.000 3.153
EVAPOTRANSPIRATION	0.563 6.500	0.926 0.865	1.336 3.286	1.703 2.009	4.859 1.140	3.667 0.660
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0008 0.0009	0.0007 0.0007	0.0007 0.0007	0.0007 0.0015	0.0016 0.0103	0.0014 0.0074
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000 0.0001	0.0000 0.0000	0.0000 0.0000	0.0000 0.0001	0.0001 0.0002	0.0001 0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.990 4.969	3.982 3.995	3.974 3.988	4.032 10.867	11.905 20.122	10.858 11.809
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002 1.538	0.002 0.002	0.002 0.000	0.357 4.550	2.731 4.146	0.843 9.700

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	2.92	0.96	3.53	5.18	1.88	4.20
	3.43	3.51	5.99	2.21	1.76	2.42
RUNOFF	2.533	0.210	2.457	3.524	0.528	0.040
	0.000	0.000	0.206	0.000	0.000	1.008
EVAPOTRANSPIRATION	0.567	0.749	1.475	2.433	1.868	4.609
	5.649	2.189	3.542	2.226	1.303	0.792
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007	0.0007	0.0007	0.0007	0.0015	0.0047
	0.0010	0.0007	0.0049	0.0021	0.0104	0.0149
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002
	0.0001	0.0000	0.0001	0.0002	0.0002	0.0002

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.989	3.982	3.974	3.966	11.246	16.712
	6.718	3.994	13.575	15.095	20.997	21.998
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002	0.002	0.002	0.001	4.484	3.431
	3.028	0.002	6.758	1.425	1.734	4.387

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.96	1.95	2.30	1.73	3.63	2.71
	4.57	5.03	6.67	2.03	2.52	2.40
RUNOFF	0.000	3.937	1.576	0.204	0.030	0.000
	0.088	0.000	0.838	0.008	0.238	0.255
EVAPOTRANSPIRATION	0.498	0.725	1.649	1.560	3.741	4.518
	5.349	4.040	4.120	1.863	1.124	0.724
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007	0.0007	0.0007	0.0013	0.0032	0.0019
	0.0008	0.0007	0.0041	0.0019	0.0054	0.0102
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
	0.0001	0.0000	0.0001	0.0002	0.0002	0.0002

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.994 4.808	3.986 3.996	3.978 10.524	9.871 14.492	17.045 18.340	14.264 15.035
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002 1.691	0.002 0.002	0.002 7.861	4.842 1.858	1.623 2.277	1.955 9.893

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.82 1.45	3.01 5.38	2.78 2.99	3.89 2.57	2.16 7.08	3.04 3.29
RUNOFF	3.421 0.000	2.773 0.002	1.946 0.000	1.816 0.000	0.000 3.006	0.000 2.476
EVAPOTRANSPIRATION	0.600 3.565	0.621 3.189	1.933 4.058	1.511 2.052	2.453 1.213	4.405 0.749
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007 0.0011	0.0007 0.0007	0.0007 0.0010	0.0011 0.0009	0.0023 0.0075	0.0017 0.0169
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000 0.0001	0.0000 0.0000	0.0000 0.0001	0.0001 0.0001	0.0002 0.0002	0.0001 0.0002

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.991 7.281	3.983 3.998	3.975 6.798	7.528 5.038	16.563 15.499	13.626 22.758
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002 3.311	0.002 0.002	0.003 2.010	4.235 1.174	0.902 8.421	0.640 4.395

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	4.33	2.60	3.30	2.10	2.73	1.80
	1.41	4.03	2.79	3.46	3.40	2.52
RUNOFF	3.863	2.032	2.228	0.430	0.063	0.000
	0.000	0.000	0.000	0.005	0.341	1.974
EVAPOTRANSPIRATION	0.683	0.928	1.581	2.133	2.370	3.644
	2.872	3.242	2.379	2.053	1.135	0.523
LATERAL DRAINAGE COLLECTED	0.0008	0.0007	0.0007	0.0012	0.0036	0.0018
FROM LAYER 2	0.0009	0.0007	0.0007	0.0012	0.0033	0.0092
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
LAYER 3	0.0001	0.0000	0.0000	0.0001	0.0001	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	3.994	3.986	3.978	8.087	16.026	14.577
LAYER 3	5.190	3.994	3.997	8.106	14.460	13.798
STD. DEVIATION OF DAILY	0.002	0.001	0.003	5.174	2.600	1.901
HEAD ON LAYER 3	1.970	0.004	0.002	4.188	3.355	10.003

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.34	2.48	2.71	4.22	1.94	3.90
	3.80	1.24	2.09	2.03	5.12	2.54
RUNOFF	1.530	0.951	3.226	1.035	0.000	0.007
	0.014	0.000	0.000	0.000	0.025	1.815

EVAPOTRANSPIRATION	0.620	0.621	1.512	3.406	2.236	4.626
	5.888	1.249	2.232	1.599	1.073	0.526
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007	0.0007	0.0007	0.0022	0.0023	0.0022
	0.0017	0.0007	0.0007	0.0007	0.0010	0.0102
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000	0.0000	0.0000	0.0001	0.0002	0.0002
	0.0001	0.0000	0.0000	0.0000	0.0001	0.0002

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 3	3.990	3.982	3.975	10.999	15.848	15.086
	10.239	3.994	3.986	3.978	5.344	15.020
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002	0.002	0.002	6.730	1.612	1.962
	5.153	0.002	0.002	0.002	4.186	9.896

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.61	3.66	3.05	1.19	2.15	1.21
	1.63	2.92	2.41	1.44	2.82	3.62
RUNOFF	1.326	2.876	1.247	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	1.699
EVAPOTRANSPIRATION	0.694	0.578	1.806	2.540	1.612	3.396
	2.753	2.878	2.269	1.551	0.763	0.588
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0007	0.0007	0.0014	0.0058	0.0021	0.0020
	0.0009	0.0007	0.0007	0.0007	0.0007	0.0008
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0000	0.0000	0.0001	0.0002	0.0002	0.0001
	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	3.991	3.983	6.027	18.645	14.669	13.849

LAYER 3	5.107	3.996	3.991	3.995	3.989	4.031
STD. DEVIATION OF DAILY HEAD ON LAYER 3	0.002	0.002	5.067	2.550	1.242	2.528
	1.953	0.001	0.002	0.004	0.003	0.166

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.16	2.41	2.89	2.81	2.83	2.55
	2.94	3.96	3.65	2.68	3.85	3.06
STD. DEVIATIONS	1.02	0.91	0.84	1.27	0.86	1.01
	1.23	2.00	1.70	1.07	1.96	0.67
RUNOFF						
TOTALS	2.375	1.941	2.306	1.043	0.064	0.005
	0.011	0.006	0.104	0.007	1.104	1.741
STD. DEVIATIONS	1.716	1.143	1.432	1.076	0.164	0.013
	0.028	0.017	0.266	0.019	1.726	0.964
EVAPOTRANSPIRATION						
TOTALS	0.595	0.721	1.579	2.131	2.973	3.710
	4.586	2.966	3.092	1.959	1.159	0.629
STD. DEVIATIONS	0.094	0.170	0.181	0.581	1.141	0.954
	1.279	1.262	0.744	0.233	0.176	0.124
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.0008	0.0007	0.0008	0.0017	0.0026	0.0021
	0.0011	0.0012	0.0017	0.0015	0.0057	0.0089
STD. DEVIATIONS	0.0000	0.0000	0.0002	0.0015	0.0010	0.0009
	0.0003	0.0013	0.0016	0.0009	0.0053	0.0052
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0001	0.0002	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ACROSS LAYER 3

AVERAGES	3.9912	3.9834	4.1809	8.7837	15.0937	14.0726
	6.5409	4.8341	7.0213	8.7187	13.8352	14.1944
STD. DEVIATIONS	0.0008	0.0021	0.6488	4.3207	2.2001	1.4512
	1.7454	2.6533	4.4693	4.3006	7.0926	5.8434

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES		CU. FEET	PERCENT
PRECIPITATION	36.79	(4.289)	133544.1	100.00
RUNOFF	10.707	(2.8292)	38868.00	29.105
EVAPOTRANSPIRATION	26.101	(2.4286)	94745.05	70.947
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.02870	(0.00978)	104.193	0.07802
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00109	(0.00018)	3.961	0 00297
AVERAGE HEAD ACROSS TOP OF LAYER 3	8.771	(1.422)		
CHANGE IN WATER STORAGE	-0.049	(1.0141)	-177.14	-0.133

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	2.14	7768.200
RUNOFF	3.309	12011.1426
DRAINAGE COLLECTED FROM LAYER 2	0.00059	2.12499
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000008	0.02963
AVERAGE HEAD ACROSS LAYER 3	24.000	
SNOW WATER	3.71	13466.0420

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4519
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2165

****

****

FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	2.0955	0.3492
2	7.5889	0.4216
3	0.0000	0.0000
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.03  (31 DECEMBER 1994)                  **
**                DEVELOPED BY ENVIRONMENTAL LABORATORY                     **
**                  USAE WATERWAYS EXPERIMENT STATION                       **
**           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     D:\HELPMO~1\BUF4.D4
TEMPERATURE DATA FILE:       D:\HELPMO~1\BUF7.D7
SOLAR RADIATION DATA FILE:   D:\HELPMO~1\BUF13.D13
EVAPOTRANSPIRATION DATA:     D:\HELPMO~1\BUF11.D11
SOIL AND DESIGN DATA FILE:   D:\HELPMO~1\BCLI1.D10
OUTPUT DATA FILE:            D:\HELPMO~1\bcliout1.OUT


TIME:  17:55     DATE:  10/24/1999


******************************************************************************

     TITLE:  Head Check on Liner System for Closed Landfill

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                 LAYER  1
                                 --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER  10
          THICKNESS                  =       6.00   INCHES
          POROSITY                   =       0.3980 VOL/VOL
          FIELD CAPACITY             =       0.2440 VOL/VOL
          WILTING POINT              =       0.1360 VOL/VOL
          INITIAL SOIL WATER CONTENT =       0.3466 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =   0.119999997000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 15

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4750	VOL/VOL
FIELD CAPACITY	=	0.3780	VOL/VOL
WILTING POINT	=	0.2650	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4098	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.170000003000E-04	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0149	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	4.00	PERCENT
DRAINAGE LENGTH	=	450.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.399999993000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE #10 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 4.% AND A SLOPE LENGTH OF 450. FEET.

SCS RUNOFF CURVE NUMBER	=	80.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	7.940	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.038	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	4.526	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	9.458	INCHES
TOTAL INITIAL WATER	=	9.458	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM BUFFALO NEW YORK

MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	126
END OF GROWING SEASON (JULIAN DATE)	=	285
AVERAGE ANNUAL WIND SPEED	=	12.10 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	76.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	72.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR BUFFALO NEW YORK

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.02	2.40	2.97	3.06	2.89	2.72
2.96	4.16	3.37	2.93	3.62	3.42

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR BUFFALO NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR BUFFALO NEW YORK

STATION LATITUDE = 42.93 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.44	2.02	4.28	2.94	3.27	2.62
	2.70	3.84	2.92	5.27	6.60	3.68
RUNOFF	1.721	0.982	3.211	0.576	0.000	0.000
	0.000	0.000	0.000	0.051	0.042	0.683
EVAPOTRANSPIRATION	0.742	0.957	1.517	2.843	3.454	3.439
	3.477	3.429	2.468	2.194	1.478	0.772
LATERAL DRAINAGE COLLECTED	0.0042	0.0000	0.0000	0.1080	0.1107	0.0430
FROM LAYER 3	0.1815	0.0008	0.0614	1.4068	3.9430	2.6870
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.001	0.001	0.000
LAYER 4	0.001	0.000	0.000	0.009	0.026	0.017
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.001	0.000	0.000
HEAD ON LAYER 4	0.002	0.000	0.001	0.015	0.021	0.022

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.32	3.62	3.57	1.88	3.58	1.26
	3.27	7.84	2.04	2.24	1.83	3.85
RUNOFF	0.340	2.444	5.284	0.078	0.000	0.000
	0.000	0.036	0.000	0.000	0.000	0.770
EVAPOTRANSPIRATION	0.540	0.447	1.595	2.125	4.370	1.607
	2.690	5.300	3.296	1.335	1.082	0.476
LATERAL DRAINAGE COLLECTED	0.0042	0.0000	0.0000	0.1593	0.6592	0.0692
FROM LAYER 3	0.1628	1.2763	0.9595	0.0001	0.0010	0.4244
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.001	0.004	0.000
LAYER 4	0.001	0.008	0.006	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.001	0.004	0.001
HEAD ON LAYER 4	0.002	0.009	0.005	0.000	0.000	0.003

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	5.13	2.64	1.93	2.02	2.49	1.99
	2.42	4.71	3.23	2.45	2.35	2.34
RUNOFF	5.210	1.789	0.969	1.028	0.001	0.000
	0.000	0.000	0.000	0.000	0.000	0.907
EVAPOTRANSPIRATION	0.438	0.648	1.360	2.144	2.467	3.220
	2.508	3.349	2.938	2.205	1.217	0.456

LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0089	0.4319	0.5748
	0.1376	0.0000	0.0020	0.0167	0.0657	0.3867
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 4	0.000	0.000	0.000	0.000	0.003	0.004
	0.001	0.000	0.000	0.000	0.000	0.002
STD. DEVIATION OF DAILY HEAD ON LAYER 4	0.000	0.000	0.000	0.000	0.004	0.003
	0.002	0.000	0.000	0.000	0.001	0.003

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.69	1.19	1.47	2.98	4.44	2.76
	4.76	1.07	5.39	3.07	5.03	3.92
RUNOFF	2.791	0.793	0.530	1.557	0.000	0.000
	0.008	0.000	0.000	0.000	1.020	2.684
EVAPOTRANSPIRATION	0.564	0.930	1.341	1.831	4.875	3.666
	5.459	0.947	3.203	2.048	1.170	0.664
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.0000	0.0003	0.3192	0.1773
	0.1016	0.0474	0.0000	0.5959	2.3452	0.6129
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 4	0.000	0.000	0.000	0.000	0.002	0.001
	0.001	0.000	0.000	0.004	0.016	0.004
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.002	0.001

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
HEAD ON LAYER 4	0.001	0.001	0.000	0.004	0.021	0.004

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.92	0.96	3.53	5.18	1.88	4.20
	3.43	3.51	5.99	2.21	1.76	2.42
RUNOFF	1.902	0.122	2.217	3.406	0.460	0.001
	0.000	0.000	0.173	0.000	0.000	0.062
EVAPOTRANSPIRATION	0.569	0.751	1.481	2.698	2.181	4.605
	3.589	2.476	3.646	2.277	1.360	0.805
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.0000	0.0000	0.0138	0.9751
FROM LAYER 3	0.0804	0.0000	1.1374	0.6140	0.0532	0.1168
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.006
LAYER 4	0.001	0.000	0.008	0.004	0.000	0.001
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.007
HEAD ON LAYER 4	0.001	0.000	0.012	0.004	0.000	0.002

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	2.96	1.95	2.30	1.73	3.63	2.71
	4.57	5.03	6.67	2.03	2.52	2.40
RUNOFF	0.000	3.470	1.311	0.151	0.009	0.000
	0.104	0.000	0.559	0.000	0.001	0.000
EVAPOTRANSPIRATION	0.498	0.727	1.662	2.000	3.727	3.950
	3.701	4.263	4.222	1.515	1.025	0.705
LATERAL DRAINAGE COLLECTED	0.0931	0.0000	0.0000	0.0823	0.3200	0.4606
FROM LAYER 3	0.0115	0.0567	1.6114	0.8234	0.0000	0.5162
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.000	0.000	0.001	0.002	0.003
LAYER 4	0.000	0.000	0.011	0.005	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.000	0.000	0.001	0.003	0.002
HEAD ON LAYER 4	0.000	0.001	0.023	0.006	0.000	0.003

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.82	3.01	2.78	3.89	2.16	3.04
	1.45	5.38	2.99	2.57	7.08	3.29
RUNOFF	2.552	2.484	1.823	1.779	0.000	0.000
	0.000	0.006	0.000	0.000	0.671	0.002
EVAPOTRANSPIRATION	0.591	0.613	1.877	1.922	2.433	4.291
	2.396	3.211	4.057	1.632	1.146	0.733
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.0000	0.0176	0.2543	0.0974
FROM LAYER 3	0.0845	0.0011	0.6233	0.1086	2.9086	2.9906
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 4	0.000	0.000	0.000	0.000	0.002	0.001
	0.001	0.000	0.004	0.001	0.019	0.019
STD. DEVIATION OF DAILY HEAD ON LAYER 4	0.000	0.000	0.000	0.000	0.001	0.001
	0.001	0.000	0.007	0.001	0.032	0.015

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	4.33	2.60	3.30	2.10	2.73	1.80
	1.41	4.03	2.79	3.46	3.40	2.52
RUNOFF	2.887	1.932	2.195	0.371	0.031	0.000
	0.000	0.000	0.000	0.012	0.000	0.366
EVAPOTRANSPIRATION	0.672	0.909	1.558	2.274	2.597	3.072
	1.440	3.210	2.325	2.142	1.184	0.528
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.1175	0.0000	0.0000	0.0801	0.6960	0.7248
	0.0000	0.0037	0.0000	0.5222	0.4213	2.4200
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 4	0.001	0.000	0.000	0.001	0.004	0.005
	0.000	0.000	0.000	0.003	0.003	0.016
STD. DEVIATION OF DAILY HEAD ON LAYER 4	0.001	0.000	0.000	0.001	0.006	0.004
	0.000	0.000	0.000	0.004	0.003	0.019

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.34	2.48	2.71	4.22	1.94	3.90
	3.80	1.24	2.09	2.03	5.12	2.54
RUNOFF	1.186	0.803	2.786	0.921	0.000	0.000
	0.004	0.000	0.000	0.000	0.029	0.153
EVAPOTRANSPIRATION	0.623	0.621	1.524	3.665	2.242	4.651
	4.055	1.238	2.219	1.668	1.112	0.525
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.0000	0.2872	0.2551	0.2991
FROM LAYER 3	0.3194	0.0000	0.0000	0.0000	0.1760	2.5227
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.002	0.002	0.002
LAYER 4	0.002	0.000	0.000	0.000	0.001	0.016
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.003	0.001	0.001
HEAD ON LAYER 4	0.003	0.000	0.000	0.000	0.005	0.021

****

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.61	3.66	3.05	1.19	2.15	1.21
	1.63	2.92	2.41	1.44	2.82	3.62
RUNOFF	0.887	2.643	1.124	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	1.701
EVAPOTRANSPIRATION	0.694	0.578	1.804	2.449	1.646	2.368

	1.413	2.952	2.115	1.595	0.815	0.587
LATERAL DRAINAGE COLLECTED FROM LAYER 3	0.0000	0.0000	0.1199	1.6884	0.2231	0.0000
	0.0008	0.0106	0.0000	0.0073	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON LAYER 4	0.000	0.000	0.001	0.011	0.001	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY HEAD ON LAYER 4	0.000	0.000	0.004	0.013	0.002	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.16	2.41	2.89	2.81	2.83	2.55
	2.94	3.96	3.65	2.68	3.85	3.06
STD. DEVIATIONS	1.02	0.91	0.84	1.27	0.86	1.01
	1.23	2.00	1.70	1.07	1.96	0.67
RUNOFF						
TOTALS	1.948	1.746	2.145	0.987	0.050	0.000
	0.012	0.004	0.073	0.006	0.176	0.733
STD. DEVIATIONS	1.518	1.047	1.384	1.047	0.144	0.000
	0.033	0.011	0.179	0.016	0.363	0.867
EVAPOTRANSPIRATION						
TOTALS	0.593	0.718	1.572	2.395	2.999	3.487
	3.073	3.038	3.049	1.861	1.159	0.625
STD. DEVIATIONS	0.092	0.169	0.172	0.553	1.053	0.973
	1.240	1.285	0.765	0.345	0.180	0.127

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.0219	0.0000	0.0120	0.2432	0.3283	0.3421
	0.1080	0.1397	0.4395	0.4095	0.9914	1.2677
STD. DEVIATIONS	0.0444	0.0000	0.0379	0.5156	0.2170	0.3309
	0.0988	0.3999	0.6029	0.4711	1.4868	1.2156

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ACROSS LAYER 4

AVERAGES	0.0001	0.0000	0.0001	0.0016	0.0021	0.0023
	0.0007	0.0009	0.0029	0.0026	0.0066	0.0081
STD. DEVIATIONS	0.0003	0.0000	0.0002	0.0034	0.0014	0.0022
	0.0006	0.0026	0.0040	0.0030	0.0099	0.0078

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	36.79 (4.289)	133544.1	100.00
RUNOFF	7.880 (1.5514)	28606.05	21.421
EVAPOTRANSPIRATION	24.569 (2.6977)	89184.37	66.783
LATERAL DRAINAGE COLLECTED FROM LAYER 3	4.30336 (2.13047)	15621.202	11.69741
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000 (0.00000)	0.007	0.00001
AVERAGE HEAD ACROSS TOP OF LAYER 4	0.002 (0.001)		
CHANGE IN WATER STORAGE	0.036 (0.6204)	132.42	0.099

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	2.14	7768.200
RUNOFF	3.219	11684.1807
DRAINAGE COLLECTED FROM LAYER 3	0.57382	2082.97119
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00014
AVERAGE HEAD ACROSS LAYER 4	0.114	
SNOW WATER	3.71	13466.0420

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4461
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2116

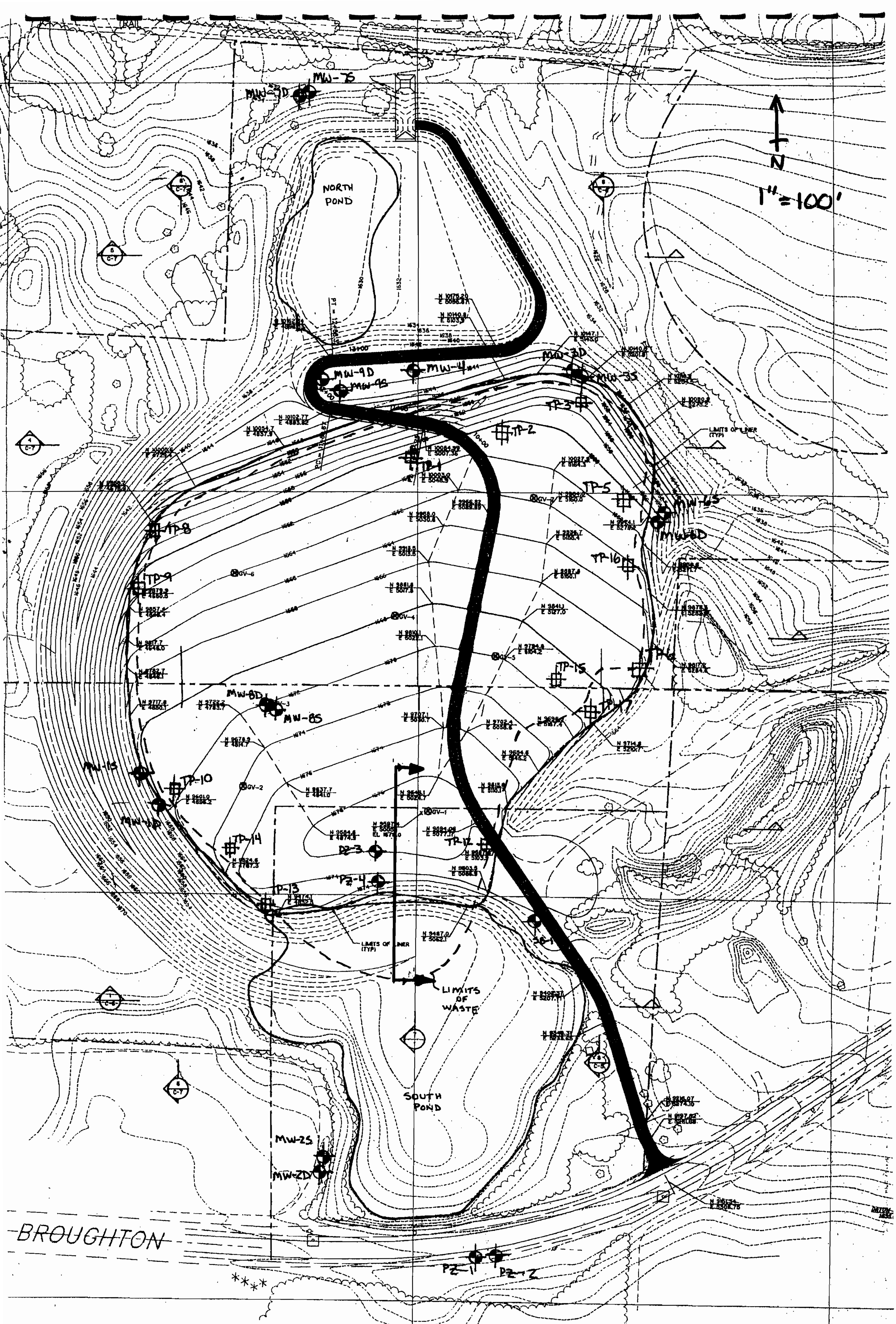
****

****

FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	2.0980	0.3497
2	7.1752	0.3986
3	0.0020	0.0100
4	0.0000	0.0000
SNOW WATER	0.000	

****
****



FROM CDM DRAWINGS C-4 FINAL CONTOURS-NORTH AND C-5 FINAL CONTOURS-SOUTH

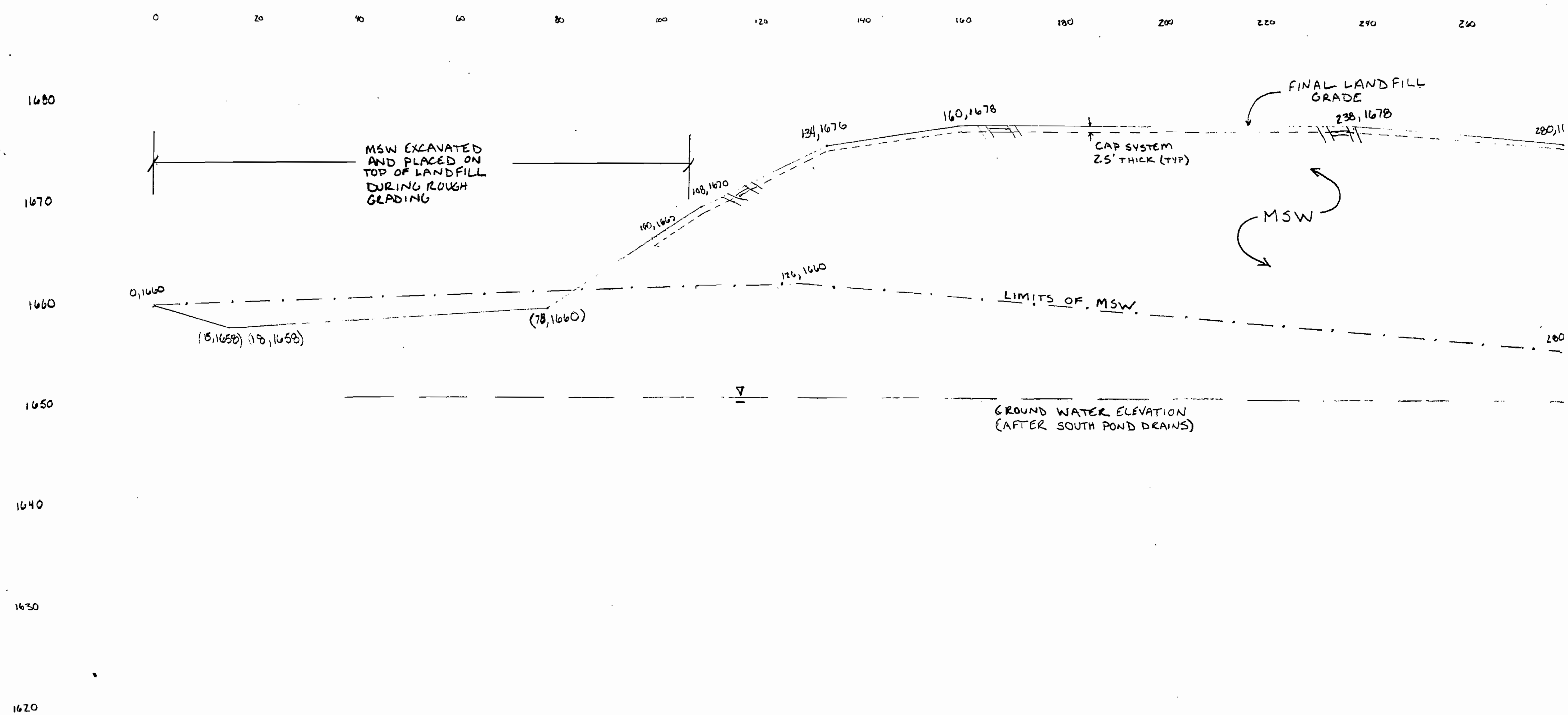
CDM Camp Dresser & McKee Inc.

environmental services

CLIENT New York State D.E.C JOB NO. 26526 COMPUTED BY LMS

PROJECT ETE Remedial Design DATE CHECKED ______ DATE 4/5/00

DETAIL Critical Cross Section CHECKED BY ______ PAGE NO. ______



Appendix B-3
Stability Analysis

Calculation Cover Sheet

Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	Stability Analysis
Performed By and Date:	Kathy Murtaug, April 2000
Checked By and Date:	John Wood, April 2000
Purpose of Calculation:	Deterime if: 1) landfill mass is stable 2) cover system is stable
Results :	The results indicate that both the landfill mass and cover system are stable. The calculated factors of safety are acceptable.
References:	See attached

CDM Jessberger

Memorandum

To: *John Wood*

From: *Lisa M. Santonastaso*
Kathleen M. Murtagh, P.E. KMM

Date: *April 17, 2000*

Subject: *Slope Stability Analysis*
ETE Sanitation and Landfill
Wyoming County, New York

The following memorandum presents the results of the geotechnical analysis of the ETE Sanitation and Landfill located in Wyoming County, NY.

Purpose and Scope

The purpose of this study was to review the existing conditions at the landfill and perform a slope stability analysis of the proposed landfill cap system. Specifically, the work performed included the following:

- Review the available information on existing conditions, proposed conditions, and subsurface conditions.
- Perform both static and seismic slope stability analyses of the proposed landfill cap system and landfill mass.
- Prepare a memorandum presenting the results from our analysis.

Existing Conditions

The ETE Sanitation and Landfill is located on Broughton Rd in the Gainsville, NY in Wyoming County. The landfill encompasses approximately 20 acres and is surrounded by a woodland buffer. To the south of the landfill, Broughton Rd runs east to west. To the west, Route 19 runs north to south. North Pond and South Pond are to the north and south of the landfill, respectively. The waste disposal area accounts for approximately 7 of the 20 acres.

Existing grades across the site vary considerably from approximately El. 1630 to El. 1680 ft. In general, the site grade rises from the north to the south.

Available Subsurface Information

The landfill was owned and operated by the ETE Corporation from 1972 to 1979 and accepted municipal and industrial waste (MSW) from surrounding towns in Wyoming County. Subsurface soil investigations at the site included the excavation of test pits and test borings drilled for the installation of monitoring wells and piezometers.

Seventeen (TP-1 through TP-17) test pits were excavated around the landfill perimeter to determine the horizontal extent of the waste. Excavation depths varied from approximately 2 to 7 ft. below existing ground surface. The landfill waste thickness encountered in the test pits varied from 0 ft to greater than 7 ft thick.

Test borings were drilled at various locations around the perimeter of the landfill and within the footprint of the landfill. The test borings were drilled to depths varying from 10 to 80 ft. below existing ground surface. These borings indicate that the landfill waste thickness varies from approximately 2 ft around the perimeter to approximately 14 ft. within the landfill footprint. The soil underlying the waste consisted of stratified sand and silt layers with clay lenses. Monitoring wells (MW-1 through MW-4 and MW-6 through MW-9) and piezometers (PZ-1 through PZ-4) were installed in the completed boreholes.

The results of the test pit and test boring explorations indicate that the landfill waste may extend under South Pond.

Logs of the test pits, peizometers and MW-6 through MW-9 are included in the Final Remedial Investigation Report, prepared by CDM, and dated September 1998.

Proposed Remediation of the Landfill

The remediation alternative chosen includes the following:

- Drain the South Pond,
- Consolidate waste which includes removing waste from within the South Pond,
- Install landfill cap system,
- Install gas vents,
- Relocate and expand North Pond, and
- Implement environmental monitoring plan.

Draining of South Pond, consolidation of wastes, and installation of the cap were factors considered to effect the slope stability analysis.

Slope Stability Analysis

The slope stability analysis performed for the ETE Sanitation and Landfill included the mass slope stability of the waste and the slope stability of the final cover system.

Slope Stability of the MSW

Slope stability analysis was performed to determine if the MSW would be stable once final grading is complete. Both static and seismic conditions were evaluated. The computer program STABLG by Geosoft was used to model the slope. The computer program analyzes the slope geometry, design soil conditions, and groundwater conditions and calculates a factor of safety. In this analysis, the Janbu method was used to calculate the factor of safety against sliding. However, factor of safety for the Bishop method was calculated for comparison.

The minimum acceptable factor of safety against slope failure is generally considered to be 1.5 for static loading conditions and 1.3 for seismic loading conditions.

For the Seismic loading conditions an assumed maximum horizontal acceleration of 0.15g was used. This acceleration represents the maximum horizontal acceleration at the site with 90 percent probability of not being exceeded in 250 years (Ref: Algermissen 1990).

Using Janbu's method, the static factor of safety was calculated as 1.97 and the seismic factor of safety was calculated as 1.25. The static factor of safety is greater than the recommended minimum value of 1.5, thus the MSW is considered stable for the static case.

Although the calculated seismic factor of safety was less than the recommended minimum value of 1.3, the MSW is considered acceptable for the seismic conditions and no deformation analysis was performed for the following reasons:

- A deformation analysis performed on a slope with a calculated seismic slope stability of greater than 1.0 will result in negligible deformation,
- Negligible deformation under a seismic loading condition is considered acceptable.

Calculations of the slope stability of the MSW are attached.

Stability of the Final Cap System

The proposed final landfill cap system includes the following components in order of occurrence from finished grade down to the waste mass:

- 6-inch topsoil layer,
- 18-inch soil protection layer,

- Geosynthetic drainage system (composite drainage net),
- 40-mil LLDPE geomembrane,
- 16.0 oz geotextile fabric, and
- Rough grading layer (on-site soils), thickness as needed to reach proposed grades.

The maximum slope angle of the landfill cap is three horizontal to one vertical (3H:1V) from crest to toe of the side slope. The top of the landfill will have a minimum slope of 5 percent. No intermediate side slope benches are proposed.

A two-part wedge analysis was used to determine the factor of safety against sliding for the cap system on both the side slopes and on top of the landfill. In landfill cap systems containing several components, the two components with the lowest interface friction angles is used in the analysis. The two-part wedge analysis calculates factor of safety as the ratio of the resisting forces to the driving forces. The minimum acceptable factor of safety against sliding is generally considered to be 1.5 for the static conditions and 1.3 for the seismic condition.

For the proposed cap system, the critical sliding surface is between the top of the drainage net and the soil protection layer or between the geotextile fabric and the rough grade soil layer (similar interface conditions). The geomembrane is textured where placed along the side slopes and it is smooth where placed on the top of the landfill. Therefore, a design friction angle is 26° on the side slopes and 10° on the landfill top were used in the analysis.

Static factors of safety of 1.70 for the side slopes and 21.1 on the top of the landfill were calculated. Seismic factors of safety of 1.12 for the side slopes and 4.4 on the top of the landfill were calculated.

The cap system interface friction angles should be measured for the actual LLDPE, composite drainage net, and soils to be used in the cap prior to construction to demonstrate that the minimum required friction angle is achieved for each interface. Interface friction angle testing should be in accordance with ASTM D 5321 "Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method." Normal stresses for the testing should represent anticipated field conditions.

The two-part wedge analysis calculations for the cap system is attached.

Drainage Net Analysis

The compatibility of the proposed drainage net to the soil protection layer was performed to determine the properties of the geotextile fabric that is used as the top layer of the drainage net. The geotextile fabric must have an opening size that is compatible with the proposed soil such that the openings are not too large which would allow soil to enter into the fabric and cause clogging of the fabric. Based on our analysis, a top layer of geotextile with an apparent opening size (AOS) that is greater than No. 50 sieve is required.

Calculations for the drainage net are attached.

I. MSW Slope Stability

CAMP DRESSER & McKEE CLIENT NY DEC JOB NO. 26526 COMPUTED BY LMS
PROJECT ETE LANDFILL DATE CHECKED 4/17/00 DATE 4-3-00
DETAIL SLOPE STABILITY CHECKED BY KMM PAGE NO.

MASS SLOPE STABILITY ANALYSIS

PROBLEM: DETERMINE THE FACTOR OF SAFETY AGAINST SLOPE FAILURE FOR THE FINAL GRADING OF THE LANDFILL UNDER STATIC AND SEISMIC CONDITIONS. THE MINIMUM ACCEPTABLE FACTOR OF SAFETY FOR STATIC IS 1.5 AND SEISMIC IS 1.3. IF THE SEISMIC F.S. IS LESS THAN 1.0 A DEFORMATION ANALYSIS WILL BE PERFORMED.

REFERENCES CDM DOCUMENTS:
- 30% SUBMITTAL DRAWINGS (JAN. 2000)
- PRELIMINARY DESIGN REPORT (30% SUBMISSION) (NOV. 1999)
- FINAL REMEDIATION INVESTIGATION REPORT (SEPT. 1998)
- PRELIMINARY SITE ASSESSMENT (FEB. 1994)
- FINAL FEASABILITY STUDY REPORT (MARCH 1999).

REFERENCE DOCUMENTS:
- BORING LOGS AND TEST PIT LOGS FROM SEPT. 1998 REPORT.
- ALGERMISSEN, S.T. et. al., "MAPS - HORIZONTAL ACCELERATION (90% PROBABILITY OF NOT BEING EXCEEDED IN 250 YEARS)," MISCELLANEOUS FIELD STUDIES, MAP MF-2120, UNITED STATES GEOLOGICAL SURVEY, 1990.
- COMPUTER MODEL STABL/G DEVELOPED BY GEO SOFT.

ASSUMPTIONS:
- THE CROSS SECTION ATTACHED WAS DETERMINED TO BE THE MOST CRITICAL CROSS SECTION BECAUSE IT EXTENDS THROUGH THE SECTION OF THE LANDFILL W/THE STEEPEST SLOPES AND THE SECTION WITH THE THICKEST MUNICIPAL SOLID WASTE.

- SOIL PROPERTIES:

CAP: γ = 125 PCF ϕ = 30° C = 0 ~ 2.5 FT THICK

MSW*: γ = 40 - 80 PCF ϕ = 10° - 30° C = 100 PSF - 300 PSF ~ 15 FT THIC

UNDERLYING SOILS: γ = 120 PCF ϕ = 30° C = 0 ~ ASSUME INFINITE THICKNESS

* MSW PROPERTIES BASED ON FASSETT, J.B. ET AL. "GEOTECHNICAL PROPERTIES OF MUNICIPAL SOLID WASTES AND THEIR USE IN LANDFILL DESIGN"

- GROUND WATER ELEVATIONS:
  → EXISTING GROUNDWATER ELEVATIONS @ EL. 1670 WITHIN LANDFILL.
  → DRAINING SOUTH POND WILL BRING GROUND WATER ELEVATIONS BELOW THE MSW TO APPROX. EL. 1651. (REF. FINAL FEASABILITY STUDY. MARCH 1999)
- HORIZONTAL EARTHQUAKE LOADING COEF = 0.15 (REF. ALGERMISSEN)
- FAILURE MODES
→ ASSUME CIRCULAR FAILURE OCCURS WITHIN LANDFILL MASS AND IS MODELED USING JANBU'S METHOD.

LIMITED PARAMETRIC STUDY TO DETERMINE MSW PROPERTIES:

- NO TESTS WERE PERFORMED TO DETERMINE THE PROPERTIES OF THE WASTE AT THE SITE.
- BASED ON EVALUATION PERFORMED BY OTHERS (REF FASSET, et al.) PROPERTIES OF MSW TYPICALLY RANGE BETWEEN:

  $\gamma = 40$ TO 80 pcf

  $\phi = 10°$ TO $30°$

  C = 100 TO 300 PSF
- A LIMITED PARAMETRIC STUDY WAS PERFORMED TO DETERMINE THE SENSITIVITY OF THE SLOPE STABILITY ANALYSIS ON THE PROPERTIES OF THE MSW.

- OF VARYING PROPERTIES OF MSW (WITHIN THE LIMITS ABOVE) HAD A VERY SMALL (<5%) EFFECT ON THE RESULTING MIN. F.S. THERFORE, THE PROPERTIES OF MSW USED IN THE ANALYSES WERE AS FOLLOWS:

  $\gamma = 60$ pcf

  $\phi = 20°$

  C = 200 PSF

SUMMARY OF RESULTS:

USING JANBU'S METHOD:

CONDITION	MINIMUM FACTOR OF SAFETY	
STATIC	1.965	>1.5 ✓ OK
SEISMIC	1.249	< 1.3 (SEE NOTE)

USING BISHOP'S METHOD: (AS A CHECK)

CONDITION	MINIMUM FACTOR OF SAFETY	
STATIC	1.947	> 1.5 ✓ OK
SEISMIC	1.238	< 1.5 (SEE NOTE)

NOTE:

ALTHOUGH THE SEISMIC SLOPE STABILITY ANALYSIS RESULTED IN A F.S. WHICH IS LESS THAN THE MINIMUM VALUE (1.3), THE LANDFILL IS CONSIDERED ACCEPTABLE AND NO DEFORMATION ANALYSIS WAS PERFORMED FOR THE FOLLOWING REASONS:

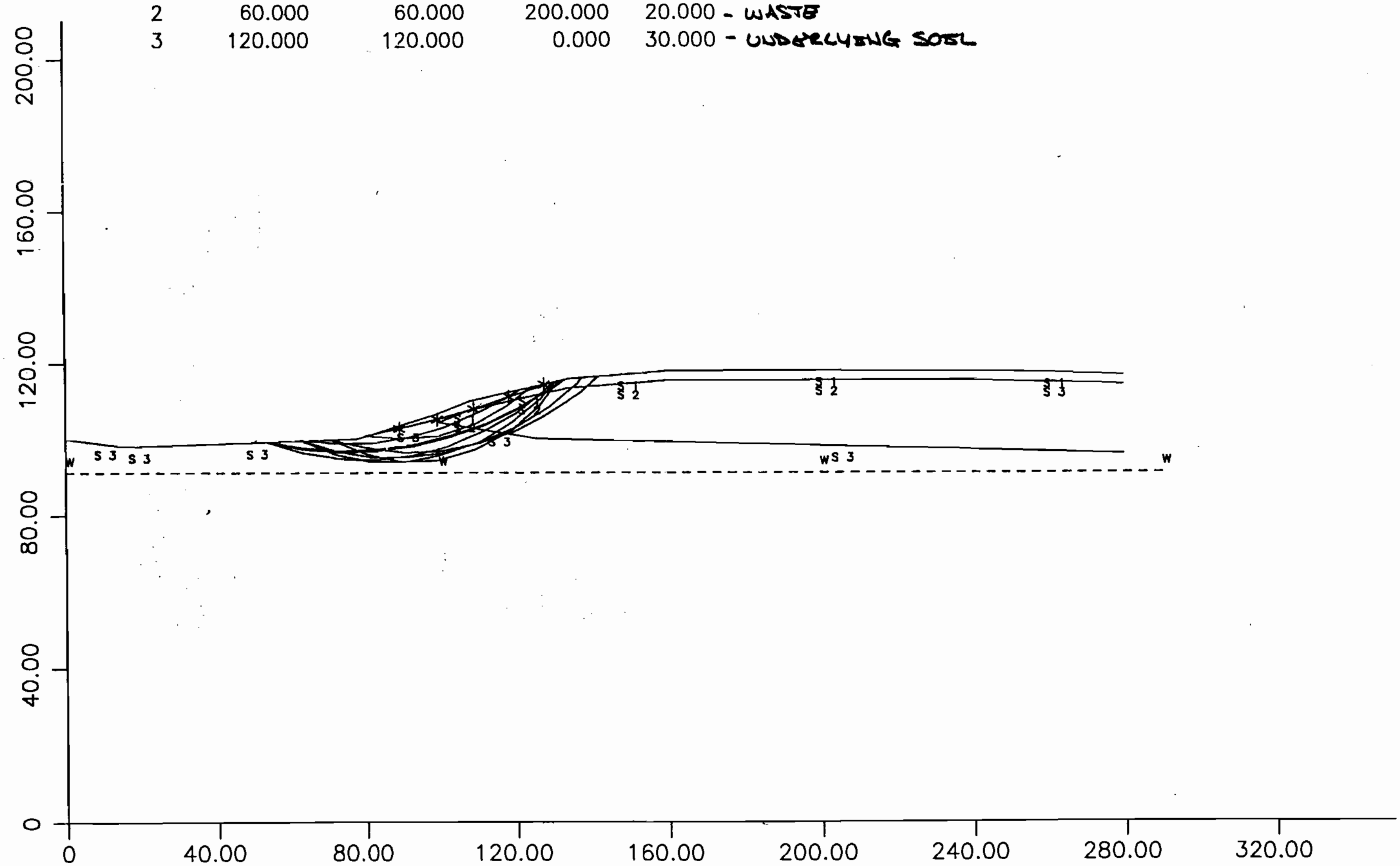
- A DEFORMATION ANALYSIS CONDUCTED ON A SLOPE WITH A CALCULATED SEISMIC SLOPE STABILITY OF < 1.0 WILL RESULT NO DEFORMATION
- NO DEFORMATION UNDER A SEISMIC LOADING CONDITION IS CONSIDERED ACCEPTABLE.

JANBU METHOD

ETE Landfill — Janbu failure

Minimum Factor of Safety 1.965

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	125.000	125.000	0.000	30.000 - CAP
2	60.000	60.000	200.000	20.000 - WASTE
3	120.000	120.000	0.000	30.000 - UNDERLYING SOIL



** STABL/G **

Slope Stability Program
Portions of this program (c) 1992
by
GEOSOFT
1442 Lincoln Avenue, Suite 146
Orange, CA 92665
U.S.A.

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 04-10-2000
Input Data Filename: ETEJ.STB
Output Filename: ETEJ.OUT
Plotted Output Filename: ETEJ.PL1

PROBLEM DESCRIPTION ETE Landfill - Janbu failure

BOUNDARY COORDINATES

9 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	15.00	98.00	3
2	15.00	98.00	18.00	98.00	3
3	18.00	98.00	78.00	100.00	3
4	78.00	100.00	100.00	107.00	3
5	100.00	107.00	108.00	110.00	1
6	108.00	110.00	134.00	116.00	1
7	134.00	116.00	160.00	118.00	1
8	160.00	118.00	238.00	118.00	1
9	238.00	118.00	280.00	117.00	1
10	100.00	104.50	108.00	107.50	2
11	108.00	107.50	134.00	113.50	2
12	134.00	113.50	160.00	115.50	2
13	160.00	115.50	238.00	115.50	2
14	238.00	115.50	280.00	114.50	3
15	100.00	104.50	126.00	100.00	3
16	126.00	100.00	280.00	96.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	.0	30.0	.00	.0	0
2	60.0	60.0	200.0	20.0	.00	.0	0
3	120.0	120.0	.0	30.0	.00	.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	91.00
2	100.00	91.00
3	200.00	91.00
4	290.00	91.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

Janbus Empirical Coef. is being used for the case of c & phi both > 0
100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 120.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.78	102.73
3	99.47	105.19
4	109.07	108.00
5	118.56	111.16
6	127.46	114.49

*** 1.965 ***

Individual data on the 7 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	9.8	594.4	.0	.0	.0	.0	.0	.0	.0
2	9.7	1544.6	.0	.0	.0	.0	.0	.0	.0
3	.5	104.5	.0	.0	.0	.0	.0	.0	.0
4	8.0	1984.9	.0	.0	.0	.0	.0	.0	.0
5	1.1	304.8	.0	.0	.0	.0	.0	.0	.0
6	9.5	2090.5	.0	.0	.0	.0	.0	.0	.0
7	8.9	710.6	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	72.19	98.63
3	82.18	98.99
4	92.06	100.53
5	101.69	103.24
6	110.92	107.08
7	119.63	112.00
8	120.99	113.00

Etej

*** 2.539 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.97	99.82
3	99.90	100.95
4	109.43	103.98
5	118.19	108.80
6	124.04	113.70

*** 2.573 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.19	97.47
3	73.16	96.77
4	83.16	97.09
5	93.07	98.43
6	102.79	100.77
7	112.22	104.09
8	121.26	108.36
9	129.83	113.53
10	132.72	115.70

*** 2.909 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.15	97.25
3	73.11	96.39

4	83.11	96.62j
5	93.02	97.93
6	102.74	100.30
7	112.14	103.71
8	121.11	108.11
9	129.56	113.46
10	132.23	115.59

*** 2.936 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	99.77
2	80.83	97.42
3	90.79	96.47
4	100.77	96.93
5	110.60	98.82
6	120.05	102.07
7	128.95	106.63
8	137.11	112.41
9	141.51	116.58

*** 2.966 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.80	96.61
3	81.69	95.12
4	91.69	95.05
5	101.60	96.38
6	111.23	99.10
7	120.37	103.15
8	128.85	108.45
9	136.50	114.89
10	137.75	116.29

*** 3.008 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.58	95.95
3	81.42	94.14
4	91.42	94.09
5	101.27	95.81
6	110.66	99.24
7	119.30	104.27
8	126.92	110.75
9	130.59	115.21

*** 3.032 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	99.77
2	80.32	95.88
3	90.17	94.12
4	100.16	94.58
5	109.80	97.24
6	118.61	101.97
7	126.16	108.52
8	131.17	115.35

*** 3.065 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	62.89	96.24
3	72.76	94.64
4	82.76	94.41
5	92.70	95.55
6	102.38	98.04
7	111.63	101.84
8	120.27	106.87
9	128.14	113.04
10	130.14	115.11

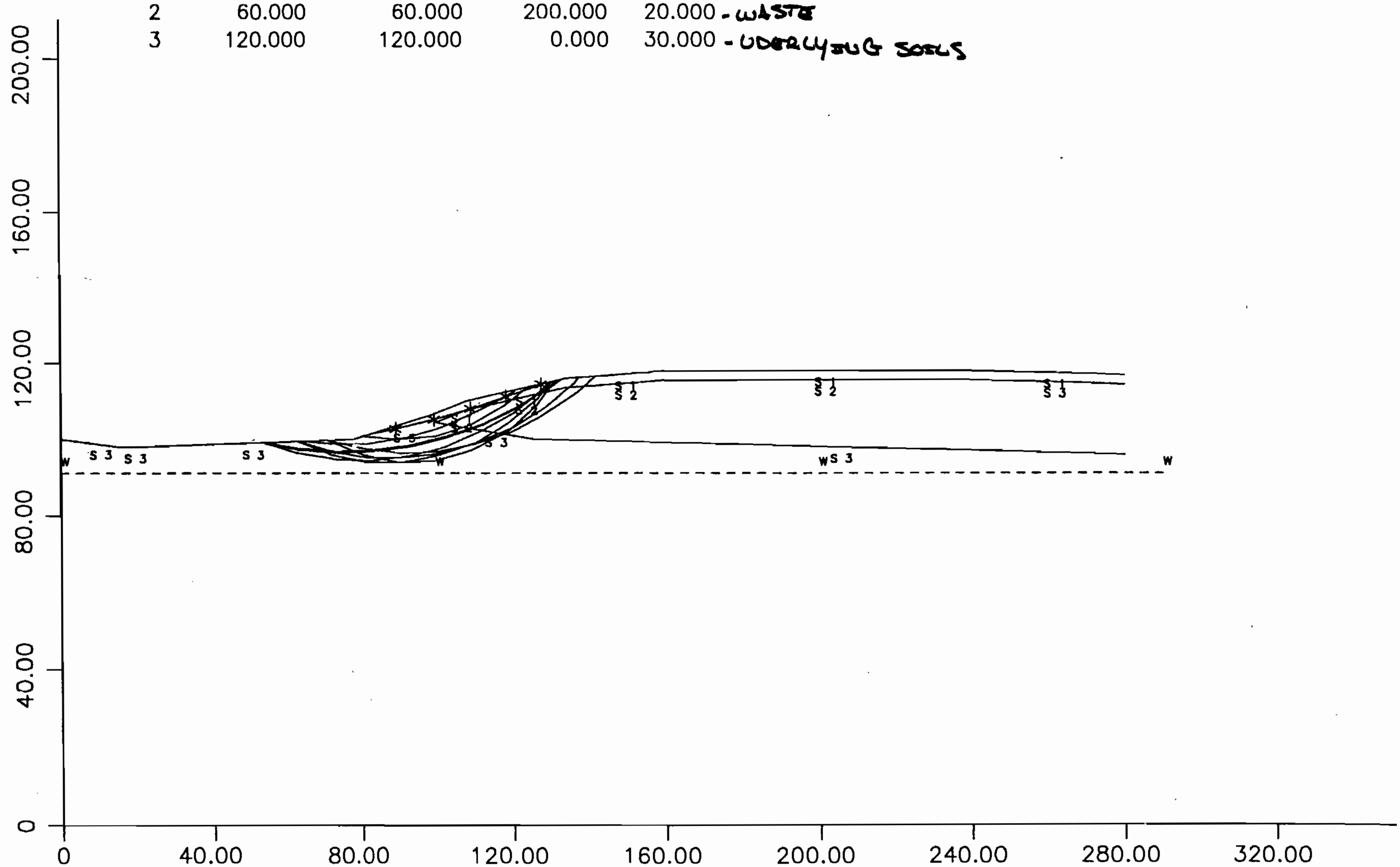
Etej

*** 3.099 ***

ETE Landfill – Janbu failure (seismic)

Minimum Factor of Safety 1.249

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	125.000	125.000	0.000	30.000 - CAP
2	60.000	60.000	200.000	20.000 - WASTE
3	120.000	120.000	0.000	30.000 - UNDERLYING SOILS



** STABL/G **

Slope Stability Program
Portions of this program (c) 1992
by
GEOSOFT
1442 Lincoln Avenue, Suite 146
Orange, CA 92665
U.S.A.

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 04-10-2000
Input Data Filename: ETEJS.STB
Output Filename: ETEJS.OUT
Plotted Output Filename: ETEJS.PL1

PROBLEM DESCRIPTION ETE Landfill - Janbu failure (seismic)

BOUNDARY COORDINATES

9 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	15.00	98.00	3
2	15.00	98.00	18.00	98.00	3
3	18.00	98.00	78.00	100.00	3
4	78.00	100.00	100.00	107.00	3
5	100.00	107.00	108.00	110.00	1
6	108.00	110.00	134.00	116.00	1
7	134.00	116.00	160.00	118.00	1
8	160.00	118.00	238.00	118.00	1
9	238.00	118.00	280.00	117.00	1
10	100.00	104.50	108.00	107.50	2
11	108.00	107.50	134.00	113.50	2
12	134.00	113.50	160.00	115.50	2
13	160.00	115.50	238.00	115.50	2
14	238.00	115.50	280.00	114.50	3
15	100.00	104.50	126.00	100.00	3
16	126.00	100.00	280.00	96.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	.0	30.0	.00	.0	0
2	60.0	60.0	200.0	20.0	.00	.0	0
3	120.0	120.0	.0	30.0	.00	.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	91.00
2	100.00	91.00
3	200.00	91.00
4	290.00	91.00

A Horizontal Earthquake Loading Coefficient
Of .150 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

Janbus Empirical Coef. is being used for the case of c & phi both > 0
100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 120.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.78	102.73
3	99.47	105.19
4	109.07	108.00
5	118.56	111.16
6	127.46	114.49

*** 1.249 ***

Individual data on the 7 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	9.8	594.4	.0	.0	.0	.0	89.2	.0	.0
2	9.7	1544.6	.0	.0	.0	.0	231.7	.0	.0
3	.5	104.5	.0	.0	.0	.0	15.7	.0	.0
4	8.0	1984.9	.0	.0	.0	.0	297.7	.0	.0
5	1.1	304.8	.0	.0	.0	.0	45.7	.0	.0
6	9.5	2090.5	.0	.0	.0	.0	313.6	.0	.0
7	8.9	710.6	.0	.0	.0	.0	106.6	.0	.0

Failure Surface Specified By 8 Coordinate Points

Point X-Surf Y-Surf

No.	(ft)	(ft)ejs
1	62.22	99.47
2	72.19	98.63
3	82.18	98.99
4	92.06	100.53
5	101.69	103.24
6	110.92	107.08
7	119.63	112.00
8	120.99	113.00

*** 1.609 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.97	99.82
3	99.90	100.95
4	109.43	103.98
5	118.19	108.80
6	124.04	113.70

*** 1.640 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.19	97.47
3	73.16	96.77
4	83.16	97.09
5	93.07	98.43
6	102.79	100.77
7	112.22	104.09
8	121.20	108.36
9	129.83	113.53
10	132.72	115.70

*** 1.741 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.15	97.25
3	73.11	96.39
4	83.11	96.62
5	93.02	97.93
6	102.74	100.30
7	112.14	103.71
8	121.11	108.11
9	129.56	113.46
10	132.23	115.59

*** 1.748 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	99.77
2	80.83	97.42
3	90.79	96.47
4	100.77	96.93
5	110.60	98.82
6	120.05	102.07
7	128.95	106.63
8	137.11	112.41
9	141.51	116.58

*** 1.764 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.80	96.61
3	81.69	95.12
4	91.69	95.05
5	101.60	96.38
6	111.23	99.10
7	120.37	103.15

8	128.85	108.45js
9	136.50	114.89
10	137.75	116.29

*** 1.780 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.58	95.95
3	81.42	94.14
4	91.42	94.09
5	101.27	95.81
6	110.66	99.24
7	119.30	104.27
8	126.92	110.75
9	130.59	115.21

*** 1.804 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	62.89	96.24
3	72.76	94.64
4	82.76	94.41
5	92.70	95.55
6	102.38	98.04
7	111.63	101.84
8	120.27	106.87
9	128.14	113.04
10	130.14	115.11

*** 1.810 ***

Failure Surface Specified By 8 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)ejs
1	71.11	99.77
2	80.32	95.88
3	90.17	94.12
4	100.16	94.58
5	109.80	97.24
6	118.61	101.97
7	126.16	108.52
8	131.17	115.35

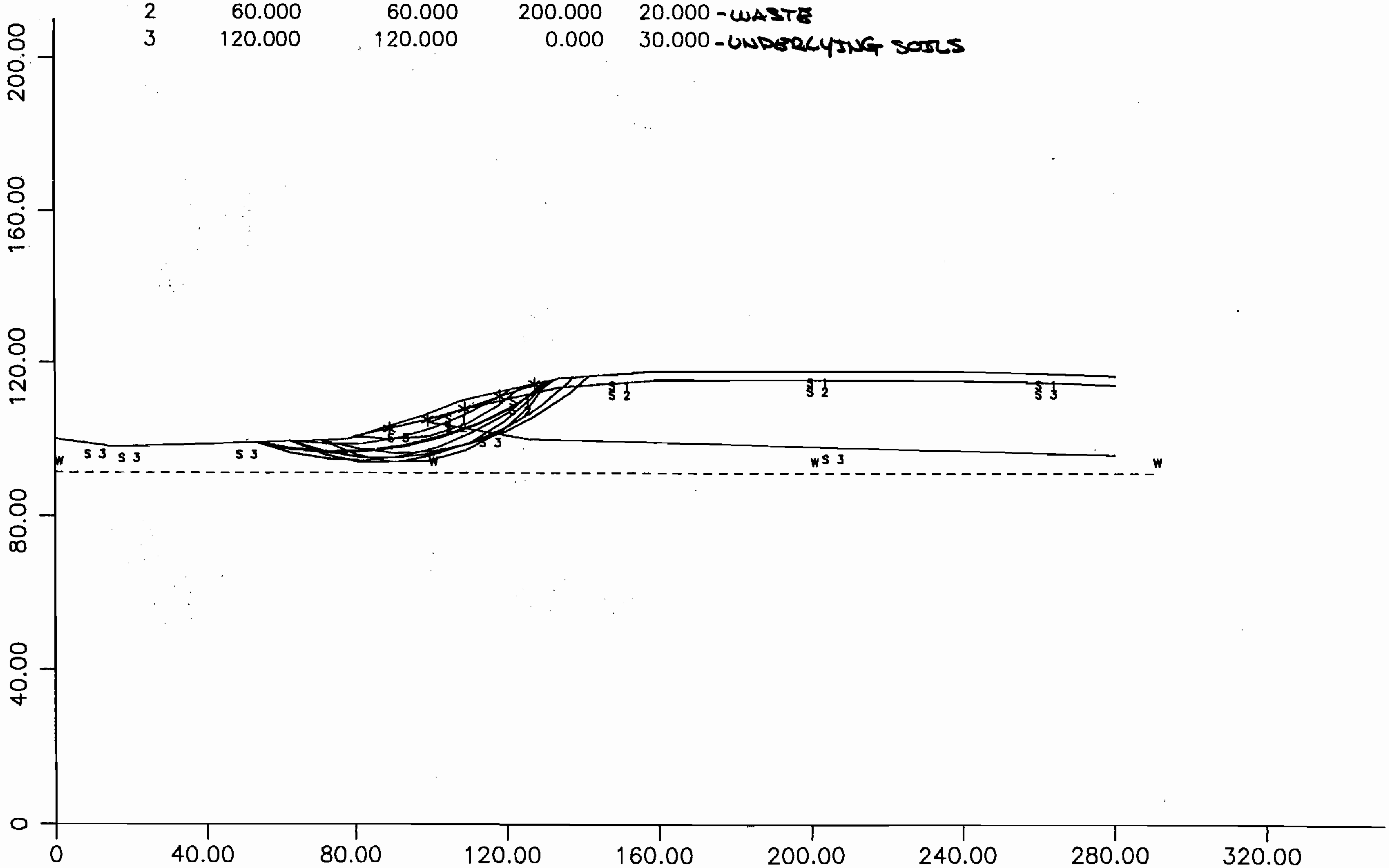
*** 1.839 ***

BISHOP METHOD

ETE Landfill — Bishop Failure

Minimum Factor of Safety 1.947

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	125.000	125.000	0.000	30.000 - CAP
2	60.000	60.000	200.000	20.000 - WASTE
3	120.000	120.000	0.000	30.000 - UNDERLYING SOILS



** STABL/G **

Slope Stability Program
Portions of this program (c) 1992
by
GEOSOFT
1442 Lincoln Avenue, Suite 146
Orange, CA 92665
U.S.A.

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 04-10-2000
Input Data Filename: ETEB.STB
Output Filename: ETEB.OUT
Plotted Output Filename: ETEB.PL1

PROBLEM DESCRIPTION ETE Landfill - Bishop Failure

BOUNDARY COORDINATES

9 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	15.00	98.00	3
2	15.00	98.00	18.00	98.00	3
3	18.00	98.00	78.00	100.00	3
4	78.00	100.00	100.00	107.00	3
5	100.00	107.00	108.00	110.00	1
6	108.00	110.00	134.00	116.00	1
7	134.00	116.00	160.00	118.00	1
8	160.00	118.00	238.00	118.00	1
9	238.00	118.00	280.00	117.00	1
10	100.00	104.50	108.00	107.50	2
11	108.00	107.50	134.00	113.50	2
12	134.00	113.50	160.00	115.50	2
13	160.00	115.50	238.00	115.50	2
14	238.00	115.50	280.00	114.50	3
15	100.00	104.50	126.00	100.00	3
16	126.00	100.00	280.00	96.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	.0	30.0	.00	.0	0
2	60.0	60.0	200.0	20.0	.00	.0	0
3	120.0	120.0	.0	30.0	.00	.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	91.00
2	100.00	91.00
3	200.00	91.00
4	290.00	91.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 120.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.78	102.73
3	99.47	105.19
4	109.07	108.00
5	118.56	111.16
6	127.46	114.49

Circle Center At X = 27.9 ; Y = 367.1 and Radius, 271.5

*** 1.947 ***

Individual data on the 7 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	9.8	594.4	.0	.0	.0	.0	.0	.0	.0
2	9.7	1544.6	.0	.0	.0	.0	.0	.0	.0
3	.5	104.5	.0	.0	.0	.0	.0	.0	.0
4	8.0	1984.9	.0	.0	.0	.0	.0	.0	.0
5	1.1	304.8	.0	.0	.0	.0	.0	.0	.0
6	9.5	2090.5	.0	.0	.0	.0	.0	.0	.0
7	8.9	710.6	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	72.19	98.63
3	82.18	98.99
4	92.06	100.53
5	101.69	103.24
6	110.92	107.08
7	119.63	112.00

8	120.99	113.00b

Circle Center At X = 74.2 ; Y = 181.7 and Radius, 83.1

*** 2.485 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.97	99.82
3	99.90	100.95
4	109.43	103.98
5	118.19	108.80
6	124.04	113.70

Circle Center At X = 89.2 ; Y = 150.4 and Radius, 50.6

*** 2.557 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.19	97.47
3	73.16	96.77
4	83.16	97.09
5	93.07	98.43
6	102.79	100.77
7	112.22	104.09
8	121.26	108.36
9	129.83	113.53
10	132.72	115.70

Circle Center At X = 75.0 ; Y = 194.1 and Radius, 97.3

*** 2.862 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Eteb Y-Surf (ft)
1	53.33	99.18
2	63.15	97.25
3	73.11	96.39
4	83.11	96.62
5	93.02	97.93
6	102.74	100.30
7	112.14	103.71
8	121.11	108.11
9	129.56	113.46
10	132.23	115.59

Circle Center At X = 76.0 ; Y = 188.1 and Radius, 91.7

*** 2.895 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	99.77
2	80.83	97.42
3	90.79	96.47
4	100.77	96.93
5	110.60	98.82
6	120.05	102.07
7	128.95	106.63
8	137.11	112.41
9	141.51	116.58

Circle Center At X = 92.5 ; Y = 166.8 and Radius, 70.4

*** 2.974 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.80	96.61
3	81.69	95.12
4	91.69	95.05
5	101.60	96.38
6	111.23	99.10

7	120.37	103.15b
8	128.85	108.45
9	136.50	114.89
10	137.75	116.29

Circle Center At X = 87.2 ; Y = 165.3 and Radius, 70.4

*** 3.017 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.58	95.95
3	81.42	94.14
4	91.42	94.09
5	101.27	95.81
6	110.66	99.24
7	119.30	104.27
8	126.92	110.75
9	130.59	115.21

Circle Center At X = 86.7 ; Y = 150.3 and Radius, 56.4

*** 3.084 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	62.89	96.24
3	72.76	94.64
4	82.76	94.41
5	92.70	95.55
6	102.38	98.04
7	111.63	101.84
8	120.27	106.87
9	128.14	113.04
10	130.14	115.11

Circle Center At X = 79.4 ; Y = 166.6 and Radius, 72.3

*** 3.097 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	99.77
2	80.32	95.88
3	90.17	94.12
4	100.16	94.58
5	109.80	97.24
6	118.61	101.97
7	126.16	108.52
8	131.17	115.35

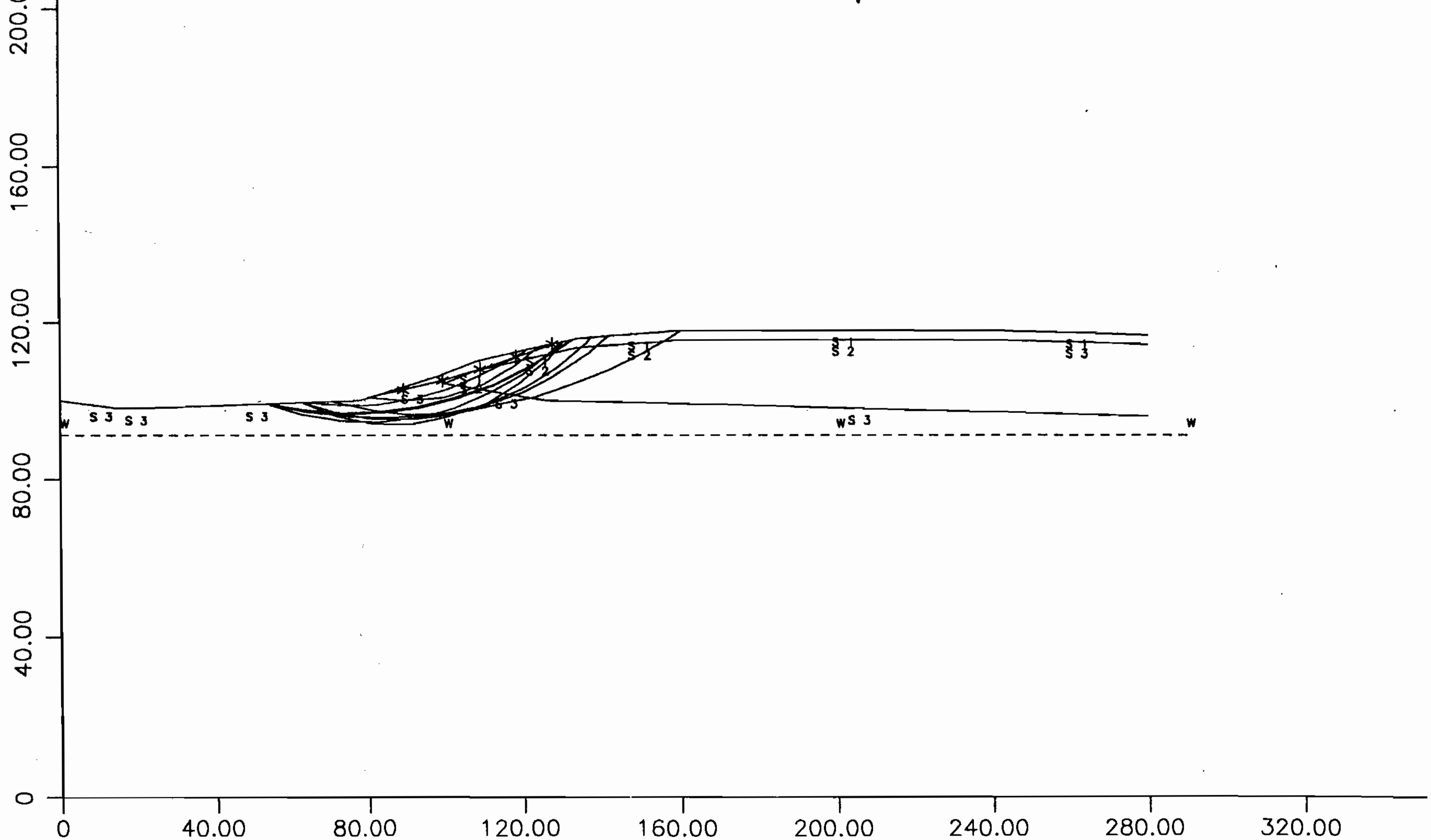
Circle Center At X = 93.1 ; Y = 138.7 and Radius, 44.7

*** 3.200 ***

ETE Landfill – Bishop Failure (seismic)

Minimum Factor of Safety 1.238

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	125.000	125.000	0.000	30.000-CAP
2	60.000	60.000	200.000	20.000-WASTE
3	120.000	120.000	0.000	30.000-UNDERLYING SOILS



** STABL/G **

Slope Stability Program
Portions of this program (c) 1992
by
GEOSOFT
1442 Lincoln Avenue, Suite 146
Orange, CA 92665
U.S.A.

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	04-10-2000
Input Data Filename:	ETEBS.STB
Output Filename:	ETEBS.OUT
Plotted Output Filename:	ETEBS.PL1

PROBLEM DESCRIPTION ETE Landfill - Bishop Failure (seismic)

BOUNDARY COORDINATES

9 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	100.00	15.00	98.00	3
2	15.00	98.00	18.00	98.00	3
3	18.00	98.00	78.00	100.00	3
4	78.00	100.00	100.00	107.00	3
5	100.00	107.00	108.00	110.00	1
6	108.00	110.00	134.00	116.00	1
7	134.00	116.00	160.00	118.00	1
8	160.00	118.00	238.00	118.00	1
9	238.00	118.00	280.00	117.00	1
10	100.00	104.50	108.00	107.50	2
11	108.00	107.50	134.00	113.50	2
12	134.00	113.50	160.00	115.50	2
13	160.00	115.50	238.00	115.50	2
14	238.00	115.50	280.00	114.50	3
15	100.00	104.50	126.00	100.00	3
16	126.00	100.00	280.00	96.00	3

ISOTROPIC SOIL PARAMETERS

3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	.0	30.0	.00	.0	0
2	60.0	60.0	200.0	20.0	.00	.0	0
3	120.0	120.0	.0	30.0	.00	.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	91.00
2	100.00	91.00
3	200.00	91.00
4	290.00	91.00

A Horizontal Earthquake Loading Coefficient
Of .150 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 120.00 ft.

and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.78	102.73
3	99.47	105.19
4	109.07	108.00
5	118.56	111.16
6	127.46	114.49

Circle Center At X = 27.9 ; Y = 367.1 and Radius, 271.5

*** 1.238 ***

Individual data on the 7 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	9.8	594.4	.0	.0	.0	.0	89.2	.0	.0
2	9.7	1544.6	.0	.0	.0	.0	231.7	.0	.0
3	.5	104.5	.0	.0	.0	.0	15.7	.0	.0
4	8.0	1984.9	.0	.0	.0	.0	297.7	.0	.0
5	1.1	304.8	.0	.0	.0	.0	45.7	.0	.0
6	9.5	2090.5	.0	.0	.0	.0	313.6	.0	.0
7	8.9	710.6	.0	.0	.0	.0	106.6	.0	.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surfbs (ft)
1	62.22	99.47
2	72.19	98.63
3	82.18	98.99
4	92.06	100.53
5	101.69	103.24
6	110.92	107.08
7	119.63	112.00
8	120.99	113.00

Circle Center At X = 74.2 ; Y = 181.7 and Radius, 83.1

*** 1.574 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	100.64
2	89.97	99.82
3	99.90	100.95
4	109.43	103.98
5	118.19	108.80
6	124.04	113.70

Circle Center At X = 89.2 ; Y = 150.4 and Radius, 50.6

*** 1.633 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.19	97.47
3	73.16	96.77
4	83.16	97.09
5	93.07	98.43
6	102.79	100.77
7	112.22	104.09
8	121.26	108.36
9	129.83	113.53
10	132.72	115.70

Circle Center At X = 75.0 ; Y = 194.1 and Radius, 97.3

*** 1.710 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.15	97.25
3	73.11	96.39
4	83.11	96.62
5	93.02	97.93
6	102.74	100.30
7	112.14	103.71
8	121.11	108.11
9	129.56	113.46
10	132.23	115.59

Circle Center At X = 76.0 ; Y = 188.1 and Radius, 91.7

*** 1.721 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.11	99.77
2	80.83	97.42
3	90.79	96.47
4	100.77	96.93
5	110.60	98.82
6	120.05	102.07
7	128.95	106.63
8	137.11	112.41
9	141.51	116.58

Circle Center At X = 92.5 ; Y = 166.8 and Radius, 70.4

*** 1.775 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Etebs Y-Surf (ft)
1	62.22	99.47
2	71.80	96.61
3	81.69	95.12
4	91.69	95.05
5	101.60	96.38
6	111.23	99.10
7	120.37	103.15
8	128.85	108.45
9	136.50	114.89
10	137.75	116.29

Circle Center At X = 87.2 ; Y = 165.3 and Radius, 70.4

*** 1.788 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	62.89	96.24
3	72.76	94.64
4	82.76	94.41
5	92.70	95.55
6	102.38	98.04
7	111.63	101.84
8	120.27	106.87
9	128.14	113.04
10	130.14	115.11

Circle Center At X = 79.4 ; Y = 166.6 and Radius, 72.3

*** 1.805 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.22	99.47
2	71.58	95.95
3	81.42	94.14
4	91.42	94.09
5	101.27	95.81

6	110.66	99.24bs
7	119.30	104.27
8	126.92	110.75
9	130.59	115.21

Circle Center At X = 86.7 ; Y = 150.3 and Radius, 56.4

*** 1.836 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	99.18
2	63.16	97.32
3	73.09	96.17
4	83.08	95.72
5	93.08	95.98
6	103.03	96.94
7	112.90	98.60
8	122.61	100.95
9	132.14	103.99
10	141.43	107.69
11	150.44	112.03
12	159.12	117.01
13	160.60	118.00

Circle Center At X = 84.5 ; Y = 237.3 and Radius, 141.5

*** 1.853 ***

K. Murtagh

GEOTECHNICAL PROPERTIES OF MUNICIPAL SOLID WASTES AND THEIR USE IN LANDFILL DESIGN

SOURCE

by

Jeffrey B. Fassett[1], Gerald A. Leonards[2] and Pedro C. Repetto[3]

INTRODUCTION

Modern landfills are complex structures that require careful design to ensure adequate long-term performance, so that human health and the environment are not exposed to undue risks. The main containment features of modern landfills are comprised of the liner system, the final cover system, and the surface water management system; the main operational features are the leachate collection and removal system, and the gas management system.

The design and permitting of landfills requires performing comprehensive geotechnical analyses to demonstrate that all the landfill systems have been designed to be consistent with long term performance requirements. Correct selection of geotechnical properties of waste materials for use in these analyses is of paramount importance, as the safety and cost of landfills are sensitive to variations in these properties. Unfortunately, the geotechnical properties of waste materials can vary within broad ranges, change significantly with time, and are not easily amenable to direct measurement, due to heterogeneity and hard inclusions. Furthermore, published data is limited and the conditions under which the properties were measured or back-calculated are often unclear.

In addition to their impact on the assessment of landfill performance, the unit weight and compressibility of waste materials have an important influence on the economic evaluation of landfill projects, since the waste stream is generally measured as gate weight whereas landfill capacity is measured by volume (in-place, compacted, including covers). Therefore, selection of these geotechnical properties impacts issues such as financing, tipping fee, cell life, and construction scheduling.

This paper is based on a research project recently completed at Purdue University (Fassett, 1993). A general discussion of the geotechnical properties required for the analysis for the design of landfills is presented first, followed by the results of an extensive compilation of the geotechnical properties of municipal solid waste (MSW). Emphasis is placed on unit weight, static and dynamic shear strength, compressibility, shear modulus and damping coefficient. Although the review was comprehensive and provides useful guidelines, it was found that major gaps exist in the characterization of these properties on the basis of past records; moreover, much of the available data is not applicable to landfills constructed according to modern practice. Accordingly, needed research to fill these gaps is identified, with emphasis on features that are most urgently needed.

---

[1] Senior Engineer, Golder Associates Inc., Amherst, New York

[2] Professor of Civil Engineering, Purdue University, West Lafayette, Indiana

[3] Principal, Golder Associates Inc., Mt. Laurel, New Jersey

TABLE II - UNIT WEIGHT DATA

REFERENCE	LOCATION	WASTE TYPE	WASTE AGE	PLACEMENT METHOD	MOISTURE CONTENT (%)	UNIT WEIGHT TOTAL (pcf)	UNIT WEIGHT DRY (pcf)	TEST METHOD	RELIABILITY	COM
Cambell, 1982	London	MSW		Thin layers; Cat 816		63		Full-Scale Field Test	Fair	Do not have details on measurement technique.
	"	MSW		5 ft lifts Cat 816		41		"	"	
	Northhampton	MSW		6.5 ft lifts L61D Loader		41		"	"	
	"	MSW		'Minimal'		29		"	"	
	Sussex	MSW		Pulverised 'Minimal'		43		"	"	
	Northhampton	MSW		5 ft lifts Cat 816		49		"	"	
	"	MSW		"		49		"	"	
	"	MSW		Thin layers; Cat 816		59		"	"	
	"	MSW		5 ft lifts Cat 955 Dozer		42		"	"	
Earth Technolgy, 1988	Los Angeles, CA	MSW			30.8 55.3	80.8 82.8	61.8 53.3	Plastic Tubes	Good	Depth about 50 ft.
Franklin & Assoc., 1990	U.S.	MSW				30		Estimate	Poor	Estimate based on component densities & relative vol.
Galante et al., 1991	S.E. PA	79% MSW 16% Sludge 5% Misc.	Fresh	Cat 826; 8-10 ft lifts		63-70		Lined Test Pits	Very Good	
Ham, et al., 1978	Madison, WI	MSW	Fresh	Cat 950B 4 ft lifts	38.2	41	30	Surveyed	Good	Density values are for waste only; no daily cover included.
Landva et al., 1984	Calgary					78-91		Test Pits	Good	Testing done in 1983-84.
	Edmonton					64-81		"	"	
	"					57-69		"	"	
	Mississauga					66-85		"	"	
	Red Deer					73-82		"	"	
	Vancouver					64-77		"	"	
	Waterloo					66-62		"	"	
	Winnipeg					54-73		"	"	
Merz & Stone, 1962	Pomona, CA	Soil:MSW (by vol.)								
	Cell 1	0:1	Fresh	(i) 1 18 ft lift; wetted to refusal	167.1	58.6 (Refuse only)	22	Surveyed	Good	
	Cell 2	1:6	Fresh	(ii) 4 4 ft lifts; Stand. Compact'n	51.9	45.3	29.8	Surveyed	Good	Compaction is sub-standard today
	Cell 3	1:4.6	Fresh	(iii) same as (ii) but no H2O added	32.5	38.6	29.1	Surveyed	Good	
	Cell 4	0:1	Fresh	(iv) 1 18 ft lift; min compaction	79.5	22.7 (Refuse only)	12.65	Surveyed	Good	

5

2

TABLE II - UNIT WEIGHT DATA

REFERENCE	LOCATION	WASTE TYPE	WASTE AGE	PLACEMENT METHOD	MOISTURE CONTENT (%)	UNIT WEIGHT TOTAL (pcf)	UNIT WEIGHT DRY (pcf)	TEST METHOD	RELIABILITY	COMMENTS
	Cell 5	1:4.1	Fresh, mixed with soil	(v) 1 18 ft lift; Stand. compact'n	41.7	46.5	32.9	Surveyed	Good	
Natarajan & Rao, 1977	Bombay, India	MSW				Ave=84 S.D=15	Ave=50 S.D=23	'Undisturbed' Samples	Good	6 Samples
Oweis & Khera, 1986	NJ	MSW	Fresh			42		Based on pore press. in subs	Fair	
		MSW	'Older'			62		Same	Poor	Ave over 100 ft depth
						70-80		Volume Estimates	Poor	
Pacey, 1982	Mt. View, CA	MSW	Fresh		51	46	32	Full-Scale Field Test	Good	Six 100 x 100 ft, 50 ft deep Test Cells.
			"		47	47	32	"	"	
			"		43	44	31	"	"	
			"		35	43	32	"	"	
			"		41	43	30	"	"	
			"		35	44	33	"	"	
Pfeffer, 1992		MSW	Fresh	1-1.5 ft lifts D-9 Dozer	23.6	45	34	Full-Scale Field Test	Good	Test reported in 1969; do not know how dry unit weight was calculated.
					35.4	44	28	"	"	
					53.2	49	22	"	"	
Richardson & Reynolds, 1991	Central Maine	MSW	1-2 yrs			Ave=96		12 Test Pits	Good	
Sargunan et al., 1986	Madras, India	MSW	10-50	Uncompacted	30-46	34-43		'In-situ Tests'(?)	Fair	
Schumaker, 1972 (From Oweis & Khera, 1986)				Poor		18.5			Fair	Do not have details on measurement technique.
				Moderate		29.8-37			"	
				Good		99.6			"	
Sharma et al., 1990	Richmond, CA	MSW & Liquids	?-40			46		Surveyed	Fair	MSW to daily cover ratio = 6:1
Siegel et al., 1990	S CA	MSW	6-40 yrs		10-45		60-108	13 cm Acrylic Tubes	Fair	Samples depths = 15-82 ft Soil content = 20 to 95%
Stone, 1975		MSW	Fresh	Stand. Compact'n	29-46	35-46	26-34	Surveyed	Fair	
		No soil		no Soil added						
Stone & Friedland, 1969	U.S.					Ave=45 S.D.=16		National survey	Poor	Results of survey of 103 U.S. Operators.

Sheet 2 of 2

STRENGTH PROPERTIES

The static and seismic stability of landfills is now a major concern for designers. However, information regarding the strength properties of waste is limited. Among the papers collected summarizing strength data on MSW are: Fang et al. (1977), Landva et al. (1984), Oweis & Khera (1986, and 1990), Singh and Murphy (1990), Belfiore et al. (1990), Gifford et al. (1990), Landva & Clark (1990), Siegel et al., (1990), Jessberger & Kockel (1991), Richardson & Reynolds (1991), Mitchell & Mitchell (1992), Mitchell et al. (1992), and Howland & Landva (1992).

Like soils, the strength of MSW appears to increase with increasing normal load. However, due to its high organic content and fibrous nature, MSW behaves more like a fibrous peat than a typical soil (Howland & Landva, 1992). Factors believed to affect the strength properties of MSW include:

- the organic and fiber content;
- the age of the waste, and the extent to which it has decomposed; and
- the era of placement (i.e. the compaction effort, composition, and the amount of daily soil cover).

The strength of MSW is also a function of the direction of shear. In direct shear testing parallel to the bedding plane (i.e. parallel to the lift surface), the shear strength is at a minimum (Landva et al., 1984).

According to Howland & Landva (1992), the strength of MSW is primarily frictional in nature. However, Mitchell & Mitchell (1992) point out that, while the cohesive nature of refuse has not yet been adequately characterized (they believe it is probably not 'true cohesion' but may be the result of interlocking or overlapping of the waste particles), it is reasonable to include a cohesive component in MSW shear strength evaluations. This interpretation is supported by the fact that fairly high vertical cuts in landfills have been observed to remain stable for long periods of time.

Estimates of MSW strength have been made using three approaches (Singh and Murphy, 1990; Howland & Landva, 1992):

- direct laboratory and field testing;
- back-calculation from failures and load tests; and
- indirect in-situ testing.

Laboratory testing has included direct shear testing of reconstituted or totally disturbed samples, triaxial testing on samples obtained using Shelby tubes and drive samplers (Singh and Murphy, 1990; Jessberger & Kockel, 1991), and unconfined compression and tensile testing of bailed waste (Fang et al., 1977). Direct field testing was conducted at a landfill in central Maine (after a failure had occurred) using a 16 ft^2 concrete shear box constructed at the site. Six direct shear tests were performed in the trash using large concrete blocks to vary the normal force on the waste (Richardson & Reynolds, 1991).

Back-calculations of failures and load tests have been performed at several sites. Many slope stability studies performed by consultants for landfill owners have used strength parameters obtained from a field load test conducted on a landfill in Monterey Park, California (Singh and Murphy, 1990). Additional data has been obtained from the failure of the Global Landfill in New Jersey (Dvirnoff & Munion, 1986).

As reported by Singh and Murphy (1990), back-calculated strength data has also been obtained from observing the satisfactory performance of many landfills in southern California during earthquakes. Since the landfill slopes survived the events, back-calculated values of c and ϕ obtained by assuming a factor of safety equal to 1.0, represent minimum available strength and therefore were assumed to be conservative.

Earth Technology (1989) evaluated the shear strength of MSW at Puente Hills Landfill in southern California using in-situ techniques such as blowcounts from standard penetration testing (SPT) or California drive samplers, as well as with vane shear testing. Cone penetration tests (CPT) on landfills have also been used to determine strength as well as compressibility of waste (Hinkle, 1990; Oakley, 1990; Jessberger & Kockel, 1991).

When strength values are obtained by direct measurements (i.e. direct shear tests), the data can be presented in terms of shear strength versus normal stress. However, back-calculated values of shear strength from failures and load tests are often reported as cohesion (c) and friction angle (ϕ) pairs that satisfy equilibrium. This is the result of using one known (the factor of safety = 1.0) to determine two unknowns (c and ϕ).

The data summarized by Singh and Murphy (1990) are presented separately as pairs of c and ϕ determined from laboratory tests, from back-calculations, and from in-situ testing. All of the results are then presented on a single figure, reproduced here as Figure 5.

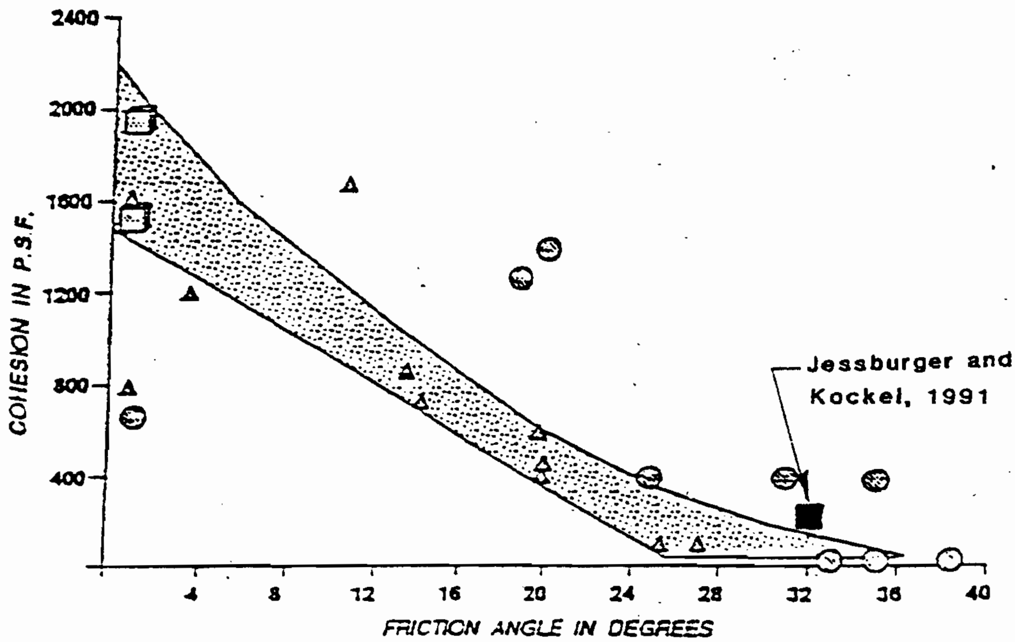


FIGURE 5. Summary of MSW Strength Data (after Singh and Murphy, 1990)

The shaded zone is the range of strength parameters Singh recommends for use in stability analyses. Jessberger and Kockel (1991) suggested using ϕ = 32°, c = 200 psf for stability analysis of typical MSW landfills.

Using a different approach, Howland and Landva (1992), presented strength data from five case studies by plotting shear strength

5

versus average normal stress. This was done by plotting back-calculated pairs of c and ϕ against normal stress (see Figure 6) which resulted in sets of lines having y-intercepts equal to c and slopes equal to $\tan(\phi)$. The average normal stress along the failure surface was assumed to be the normal stress at which the c-ϕ lines intersected one another (point B). The back-calculated value of c resulting when ϕ is set to zero is the average shear mobilized along the failure surface (point A on Figure 6). The average normal stress thus determined was checked by estimating the location of the failure surface and calculating the average normal stress based on the reported unit weight of the waste and any applied loads. In general, the two values of average normal stress were in agreement.

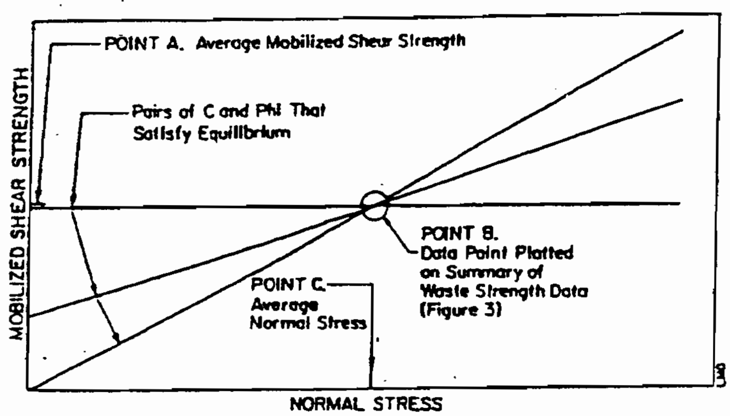


FIGURE 6. Method of Analyzing an Individual MSW Strength Case History (after Howland & Landva, 1992)

The MSW strength data determined as described above are summarized in Figure 7. Included on Figure 7 is a line defining the strength envelope used by the authors in their design. This line, defined by $c = 200$ psf and $\phi = 23°$, represents the lower bound of the data. The values suggested by Jessberger and Kockel (1991) are shown by the broken line in Figure 7.

Discussion of Shear Strength Data

The application of vane shear testing is not recommended for MSW because fairly homogeneous material is required for useful results (Jessberger & Kockel, 1991). For instance, the vane shear data obtained by Earth Technology varied from 1700 psf to 5000 psf. The wide range of values was believed to be the result of the vane shear device encountering pieces of asphalt and wood. Strength values obtained with penetration testing are also questionable for the same reason. Furthermore, there are no published correlations between refuse strength and blow counts (Mitchell & Mitchell, 1992).

Howland & Landva found that the results of back-analyses indicate a lower waste strength than the results of direct measurements. They speculated that this difference might be due to the peat-like fibrosity having a bigger effect on the small-scale direct measurements as opposed to the larger-scale associated with back-calculated values. Mitchell & Mitchell point out that, since back-calculated values are often obtained from slopes which did not fail, the resulting values of the Mohr-Coulomb strength parameters are conservative by an unknown amount. Singh and Murphy (1990) recommended that strength parameters chosen for use in stability studies should be "interpreted judgmentally in favor of least

II. Cap Stability

Cap System Slope Stability Analysis:

Problem: DETERMINE FACTOR OF SAFETY AGAINST SLIDING OF THE CAP SYSTEM ON SIDE SLOPES AND ON TOP OF LANDFILL

METHOD: A TWO PART WEDGE ANALYSIS METHOD IS USED.

ASSUMPTIONS:

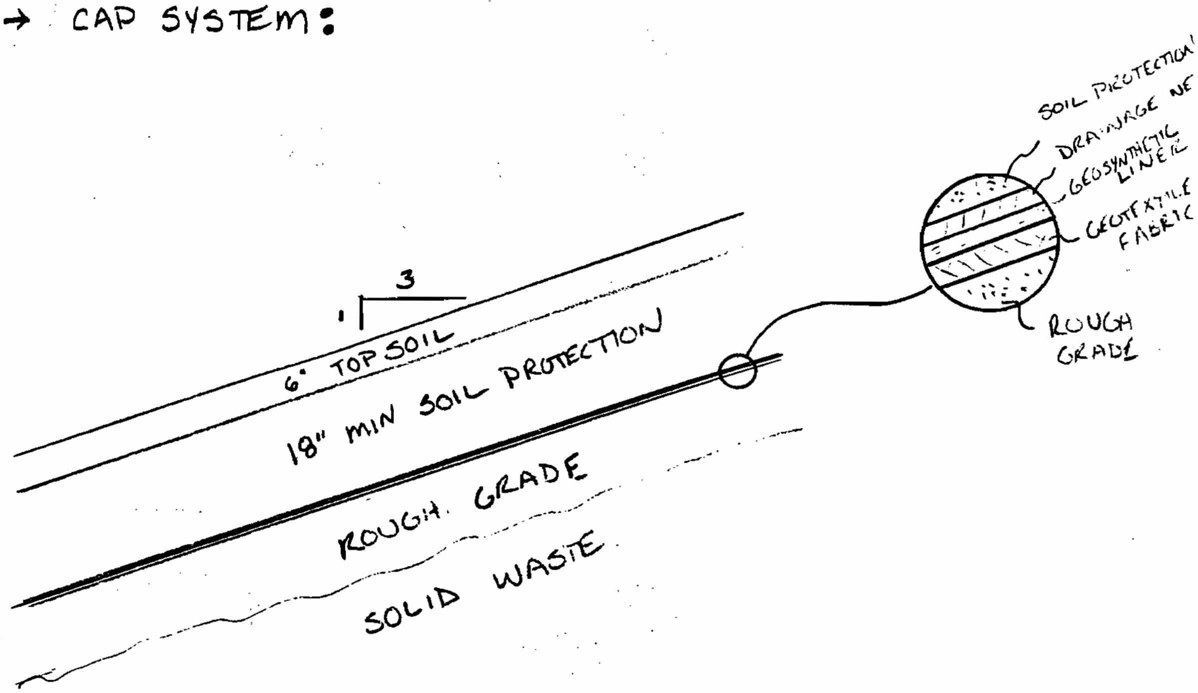
→ THE CAP HAS A UNIFORM 3H:1V SLOPE FOR A HORIZONTAL LENGTH OF 60 FT. ON THE SIDES AND A 4% SLOPE ON THE TOP.

→ slope is fully drained

→ MINIMUM FACTOR OF SAFETY - 1.5 (STATIC) AND 1.3 (SEISMIC)

→ MAXIMUM HORIZONTAL ACCELERATION = 0.15 g

→ CAP SYSTEM:



→ PROPERTIES OF CAP SYSTEM:

SOIL PROTECTION – γ = 125 PCF
ϕ = 30°

DRAINAGE NET – GEONET CORE WITH GEOTEXTILE HEAT BONDED TO BOTH SIDES

GEOSYNTHETIC LINER – TEXTURED ON 3:1 side slopes AND SMOOTH ON TOP OF LANDFILL

GEOTEXTILE FABRIC – non-woven filter fabric

ROUGH GRADE – γ = 120 PCF
ϕ = 30°

→ Cap Components Interfaces to be Evaluated:

1. SOIL PROTECTION TO TOP OF DRAINAGE NET – δ = 26°
2. BOTTOM OF DRAINAGE NET TO GEOSYNTHETIC LINER – δ = 10° SMOOTH
   δ = 33° TEXTURE
3. GEOSYNTHETIC LINER TO GEOTEXTILE – δ = 10° SMOOTH
   δ = 33° TEXTURED
4. GEOTEXTILE TO ROUGH GRADE – δ = 26°
   ↑ interface friction angle

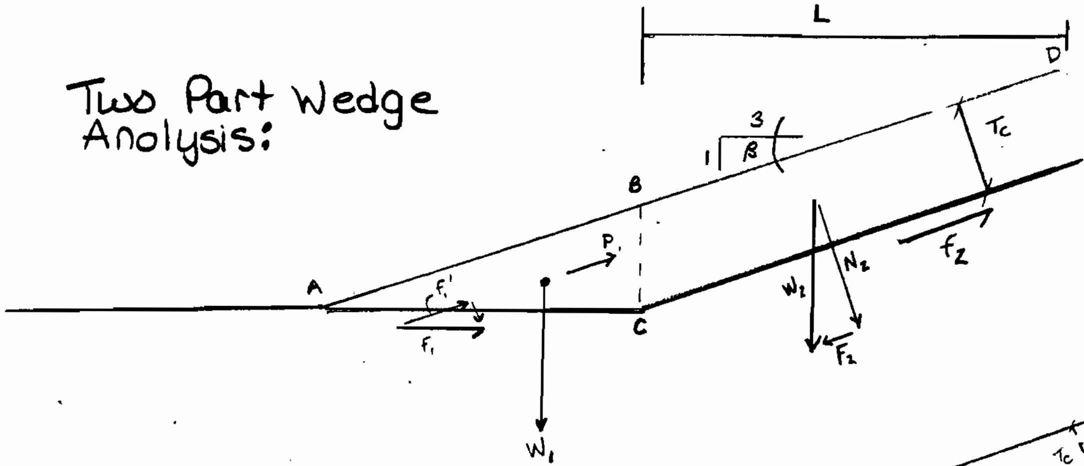
→ VALUES FOR INTERFACE FRICTION ANGLES ESTIMATED USING MITCHELL, J.K. ET. AL. (1990). "KETTLEMAN HILLS WASTE LANDFILL SLOPE FAILURE I: LINER-SYSTEM PROPERTIES." JOURNAL OF GEOTECHNICAL ENGINEERING, ASCE, VOL. 116 (4), 647-690.

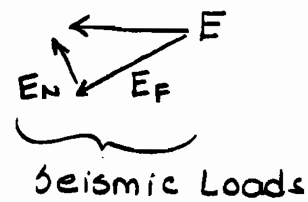
→ CRITICAL INTERFACE IS BETWEEN THE top OF THE DRAINAGE NET AND THE soil protection layer OR BETWEEN THE geotextile and the rough grade soil. layer.

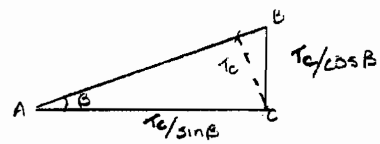
CAMP DRESSER & McKEE

CLIENT GAINESVILLE, NY — JOB NO. 26526 — COMPUTED BY LMS
PROJECT ETF LANDFILL — DATE CHECKED 4-17-00 — DATE 3-29-00
DETAIL CAP SLOPE STABILITY — CHECKED BY KMM — PAGE NO.

Two Part Wedge Analysis:

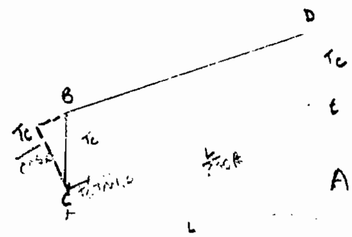






$$W_1 = \frac{1}{2}\cdot \gamma_c \cdot \frac{T_c}{\sin\beta}\cdot\frac{T_c}{\cos\beta}$$

$$W_2 = \gamma_c T_c^2\left[\frac{L}{T_c \cos\beta} - \frac{\tan\beta}{2}\right]$$



$$A = \frac{T_c \cdot L}{\cos\beta} - \frac{T_c^2 \tan\beta}{2}$$

$$N_2 = W_2 \cos\beta$$

$$F_2 = W_2 \sin\beta$$

$$f_2 = (N_2 - E_N)\tan\phi_{crit}$$

$$f_1 = W_1 \cdot \tan\phi_{soil}$$

$$f'_1 = f_1 \cdot \cos\beta$$

$$E = W_2 \cdot a_h$$
$$E_N = E \cdot \sin\beta$$
$$E_F = E \cdot \cos\beta$$

$$P = \frac{1}{2}\left[\frac{\cos\phi_s}{1-\sqrt{\sin\phi_s(\sin\phi_s+\cos\phi_s\tan(-\beta))}}\right]^2 \cdot \gamma\left(\frac{T_c}{\cos\beta}\right)^2 = \frac{1}{2}K_P\,\gamma_{CAP}\left(\frac{T_c}{\cos\beta}\right)^2$$

$$FS = \frac{f_2 + f'_1 + P}{F_2 + E_P}$$

WHERE:

- W_1 = WEIGHT OF SOIL @ TOE
- W_2 = WEIGHT OF SOIL ON SLOPE (NOT INCLUDING BUTRESS)
- γ_c = UNIT WEIGHT OF SOIL COVER
- T_c = THICKNESS OF SOIL COVER
- β = SLOPE ANGLE
- F_2 = WEIGHT OF SOIL IN DIRECTION OF THE SLOPE
- f_2 = FRICTIONAL RESISTANCE OF CRITICAL INTERFACE ON SLOPE
- ϕ_{CRIT} = FRICTION ANGLE OF CRITICAL INTERFACE.
- f_1 = FRICTONAL RESISTANCE @ CRITICAL INTERFACE ON BUTTRESS
- f'_1 = f_1 IN DIRECTION OF SLOPE
- P = TOE BUTTRESS FORCE.
- F.S. = FACTOR OF SAFETY
- E = Earthquake Loads
- a_h = horizontal accelleration coef.

CAMP DRESSER & McKEE	CLIENT Gainsville NY	JOB NO. 26526	COMPUTED BY KMM
	PROJECT ETE Landfill	DATE CHECKED	DATE 4-17-00
	DETAIL Shelf Cap	CHECKED BY	PAGE NO.

See attached spread sheet for Calculations

CLIENT:	Gainsville, NY	**JOB NO:**	26526	**COMP BY:**	KMM
PROJECT:	ETE Landfill	**DATE CHK:**		**DATE:**	4/17/00
DETAIL:	Shelf Cap Slope Stability	**CHECK BY:**		**PAGE NO:**	
FILE NAME:	c:\projects\...\cap.xls				

		Side Slopes		Top	
		Static	**Seismic**	**Static**	**Seismic**
Tc =	ft	2.5	2.5	2.5	2.5
hw =	ft	0	0	0	0
Gama cap =	pcf	125	125	125	125
Phi soil =	deg	30	30	30	30
	radians	0.524	0.524	0.524	0.524
Phi HDPE/soil =	deg	26	26	26	26
	radians	0.454	0.454	0.454	0.454
L =	ft	60	60	60	60
Beta =	deg	18.4	18.4	2.3	2.3
	radians	0.321	0.321	0.040	0.040
Kp =		1.65	1.65	2.80	2.80
ah =	g	0	0.15	0	0.15
W1 =	lb/ft	1304	1304	9741	9741
W2 =	lb/ft	19760	19760	18765	18765
W2' =	lb/ft	19760	19760	18765	18765
F2 =	lb/ft	6237	6237	753	753
N2 =	lb/ft	18750	18750	18750	18750
N2' =	lb/ft	18750	18750	18750	18750
f2 =	lb/ft	9145	8689	9145	9090
f2' =	lb/ft	8778	8778	6402	6402
E =	lb/ft	0	2964	0	2815
Ef =	lb/ft	0	2813	0	2813
En =	lb/ft	0	936	0	113
f1 =	lb/ft	753	753	5624	5624
f1' =	lb/ft	714	714	5620	5620
Pp =	lb/ft	715	715	1095	1095
FS =		1.70 ✓	1.12	21.1 ✓	4.4 ✓

Say ok since deformation analysis will calculate deformations to be negligible sine FS>1.0.

III. Drainage Net

CAMP DRESSER & McKEE | CLIENT NEW YORK STATE DEC | JOB NO. 26526 | COMPUTED BY LMS
PROJECT ETE LANDFILL | DATE CHECKED KMM | DATE 4/6/00
DETAIL DRAINAGE NET/SOIL PROTECTION COMPATIBILITY | CHECKED BY 4-17-00 | PAGE NO.

DRAINAGE NET

PROBLEM: CHECK THE COMPATIBILITY OF THE DRAINAGE NET AND THE SOIL PROTECTION. IF GEOTEXTILE OPENINGS ARE TOO LARGE, FABRIC MAY BECOME CLOGGED

REFERENCES:
- 30% SUBMITTAL DRAWINGS (JAN. 2000)
- PRELIMINARY DESIGN REPORT - 30% SUBMISSION (NOV. 1999)
- PRELIMINARY SITE ASSESSMENT - (FEB. 1994)
- GRAIN SIZE DATA FROM PRELIMINARY SITE ASSESSMENT
- KOERNER, R. M., DESIGNING WITH GEOSYNTHETICS, UPPER SADDLE RIVER, NEW JERSEY: PRENTICE HALL, 1998. (PG. 85-86)

ASSUMPTIONS:
- DRAINAGE NET IS COMPOSED OF A GEONET CORE WITH GEOTEXTILE HEAT BONDED TO BOTH SIDES
- GEOTEXTILE VOIDS MUST BE SMALL ENOUGH TO RETAIN SOIL USED IN THE SOIL PROTECTION LAYER
- ONSITE SOILS WILL BE USED IN THE SOIL PROTECTION LAYER.
- SOIL PROPERTIES:
  ASSUME > 50% PASSING No. 200 SIEVE

CONCLUSIONS:

ACCORDING TO KOERNER (1998):

- FOR SOIL $\leq$ 50% PASSING THE #200 SIEVE
  $O_{95} < 0.60$ mm $\rightarrow$ AOS OF FABRIC $\geq$ NO. 30 SIEVE

- FOR SOIL > 50% PASSING THE #200 SIEVE
  $O_{95} < 0.30$ mm $\rightarrow$ AOS OF FABRIC $\geq$ No. 50 SIEVE

WHERE O_{95} IS THE 95% OPENING SIZE OF THE GEOTEXTILE AND IN U.S. THE AOS IS THE TEST METHOD TO DETERMINE THE O_{95}. AOS = APPARENT OPENING SIZE.

→ FOR THIS CAP SYSTEM, THE AOS OF THE GEOTEXTILE SHOULD BE GREATER THAN OR EQUAL TO A NO. 50 SIEVE.

Appendix B-4
Gas Generation Estimate

Calculation Cover Sheet

Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	Estimate of LFG Generation
Performed By and Date:	Darwish El Hajji
Checked By and Date:	John Wood, April 2000
Purpose of Calculation:	Determine the amount of LFG generated
Results :	attached calculations present information on the amount The ~~results indicate that ____ scfm~~ of landfill gas that will be generated.
References:	

Source: Operating Parameters: .\LANDFILL.000

==
Model Parameters
==
Lo : 124.91 m^3 / Mg
k : 0.0400 1/yr
NMOC : 595.00 ppmv
Methane : 50.0000 % volume
Carbon Dioxide : 50.0000 % volume

==
Landfill Parameters
==
Year Opened : 1972   Current Year : 2000   Year Closed: 2001
Capacity : 37800 Mg
Average Acceptance Rate Required from
Current Year to Closure Year : 4724.00 Mg/year

==
Model Results
==

Year	Refuse In Place (Mg)	Methane Emission Rate (Mg/yr)	Methane Emission Rate (Cubic m/yr)
1973	4.724E+03	1.575E+01	2.360E+04
1974	9.448E+03	3.087E+01	4.628E+04
1975	1.417E+04	4.541E+01	6.807E+04
1976	1.890E+04	5.938E+01	8.900E+04
1977	2.362E+04	7.279E+01	1.091E+05
1978	2.834E+04	8.569E+01	1.284E+05
1979	3.307E+04	9.807E+01	1.470E+05
1980	3.779E+04	1.100E+02	1.648E+05
1981	3.779E+04	1.057E+02	1.584E+05
1982	3.779E+04	1.015E+02	1.522E+05
1983	3.779E+04	9.754E+01	1.462E+05
1984	3.779E+04	9.371E+01	1.405E+05
1985	3.779E+04	9.004E+01	1.350E+05
1986	3.779E+04	8.651E+01	1.297E+05
1987	3.779E+04	8.312E+01	1.246E+05
1988	3.779E+04	7.986E+01	1.197E+05
1989	3.779E+04	7.673E+01	1.150E+05
1990	3.779E+04	7.372E+01	1.105E+05
1991	3.779E+04	7.083E+01	1.062E+05
1992	3.779E+04	6.805E+01	1.020E+05
1993	3.779E+04	6.538E+01	9.800E+04
1994	3.779E+04	6.282E+01	9.416E+04
1995	3.779E+04	6.035E+01	9.047E+04
1996	3.779E+04	5.799E+01	8.692E+04
1997	3.779E+04	5.571E+01	8.351E+04
1998	3.779E+04	5.353E+01	8.024E+04
1999	3.779E+04	5.143E+01	7.709E+04
2000	3.779E+04	4.941E+01	7.407E+04
2001	3.780E+04	4.750E+01	7.120E+04
2002	3.780E+04	4.564E+01	6.841E+04
2003	3.780E+04	4.385E+01	6.573E+04
2004	3.780E+04	4.213E+01	6.315E+04
2005	3.780E+04	4.048E+01	6.068E+04
2006	3.780E+04	3.889E+01	5.830E+04
2007	3.780E+04	3.737E+01	5.601E+04
2008	3.780E+04	3.590E+01	5.381E+04
2009	3.780E+04	3.449E+01	5.170E+04
2010	3.780E+04	3.314E+01	4.968E+04

2011	3.780E+04	3.184E+01	4.773E+04
2012	3.780E+04	3.059E+01	4.586E+04
2013	3.780E+04	2.939E+01	4.406E+04
2014	3.780E+04	2.824E+01	4.233E+04
2015	3.780E+04	2.713E+01	4.067E+04
2016	3.780E+04	2.607E+01	3.908E+04
2017	3.780E+04	2.505E+01	3.754E+04
2018	3.780E+04	2.407E+01	3.607E+04
2019	3.780E+04	2.312E+01	3.466E+04
2020	3.780E+04	2.222E+01	3.330E+04
2021	3.780E+04	2.134E+01	3.199E+04
2022	3.780E+04	2.051E+01	3.074E+04
2023	3.780E+04	1.970E+01	2.953E+04
2024	3.780E+04	1.893E+01	2.838E+04
2025	3.780E+04	1.819E+01	2.726E+04
2026	3.780E+04	1.748E+01	2.619E+04
2027	3.780E+04	1.679E+01	2.517E+04
2028	3.780E+04	1.613E+01	2.418E+04
2029	3.780E+04	1.550E+01	2.323E+04
2030	3.780E+04	1.489E+01	2.232E+04
2031	3.780E+04	1.431E+01	2.145E+04
2032	3.780E+04	1.375E+01	2.061E+04
2033	3.780E+04	1.321E+01	1.980E+04
2034	3.780E+04	1.269E+01	1.902E+04
2035	3.780E+04	1.219E+01	1.828E+04
2036	3.780E+04	1.171E+01	1.756E+04
2037	3.780E+04	1.125E+01	1.687E+04
2038	3.780E+04	1.081E+01	1.621E+04
2039	3.780E+04	1.039E+01	1.557E+04
2040	3.780E+04	9.982E+00	1.496E+04
2041	3.780E+04	9.591E+00	1.438E+04
2042	3.780E+04	9.215E+00	1.381E+04
2043	3.780E+04	8.853E+00	1.327E+04
2044	3.780E+04	8.506E+00	1.275E+04
2045	3.780E+04	8.173E+00	1.225E+04
2046	3.780E+04	7.852E+00	1.177E+04
2047	3.780E+04	7.544E+00	1.131E+04
2048	3.780E+04	7.249E+00	1.086E+04
2049	3.780E+04	6.964E+00	1.044E+04
2050	3.780E+04	6.691E+00	1.003E+04
2051	3.780E+04	6.429E+00	9.636E+03
2052	3.780E+04	6.177E+00	9.258E+03
2053	3.780E+04	5.935E+00	8.895E+03
2054	3.780E+04	5.702E+00	8.547E+03
2055	3.780E+04	5.478E+00	8.212E+03
2056	3.780E+04	5.263E+00	7.890E+03
2057	3.780E+04	5.057E+00	7.580E+03
2058	3.780E+04	4.859E+00	7.283E+03
2059	3.780E+04	4.668E+00	6.997E+03
2060	3.780E+04	4.485E+00	6.723E+03
2061	3.780E+04	4.309E+00	6.459E+03
2062	3.780E+04	4.140E+00	6.206E+03
2063	3.780E+04	3.978E+00	5.963E+03
2064	3.780E+04	3.822E+00	5.729E+03
2065	3.780E+04	3.672E+00	5.504E+03
2066	3.780E+04	3.528E+00	5.289E+03
2067	3.780E+04	3.390E+00	5.081E+03
2068	3.780E+04	3.257E+00	4.882E+03
2069	3.780E+04	3.129E+00	4.690E+03
2070	3.780E+04	3.007E+00	4.507E+03
2071	3.780E+04	2.889E+00	4.330E+03
2072	3.780E+04	2.775E+00	4.160E+03
2073	3.780E+04	2.667E+00	3.997E+03

2074	3.780E+04	2.562E+00	3.840E+03
2075	3.780E+04	2.462E+00	3.690E+03
2076	3.780E+04	2.365E+00	3.545E+03
2077	3.780E+04	2.272E+00	3.406E+03
2078	3.780E+04	2.183E+00	3.272E+03
2079	3.780E+04	2.098E+00	3.144E+03
2080	3.780E+04	2.015E+00	3.021E+03
2081	3.780E+04	1.936E+00	2.902E+03
2082	3.780E+04	1.860E+00	2.789E+03
2083	3.780E+04	1.787E+00	2.679E+03
2084	3.780E+04	1.717E+00	2.574E+03
2085	3.780E+04	1.650E+00	2.473E+03
2086	3.780E+04	1.585E+00	2.376E+03
2087	3.780E+04	1.523E+00	2.283E+03
2088	3.780E+04	1.463E+00	2.194E+03
2089	3.780E+04	1.406E+00	2.108E+03
2090	3.780E+04	1.351E+00	2.025E+03
2091	3.780E+04	1.298E+00	1.946E+03
2092	3.780E+04	1.247E+00	1.869E+03
2093	3.780E+04	1.198E+00	1.796E+03
2094	3.780E+04	1.151E+00	1.726E+03
2095	3.780E+04	1.106E+00	1.658E+03
2096	3.780E+04	1.063E+00	1.593E+03
2097	3.780E+04	1.021E+00	1.530E+03
2098	3.780E+04	9.810E-01	1.470E+03
2099	3.780E+04	9.425E-01	1.413E+03
2100	3.780E+04	9.056E-01	1.357E+03
2101	3.780E+04	8.700E-01	1.304E+03
2102	3.780E+04	8.359E-01	1.253E+03
2103	3.780E+04	8.032E-01	1.204E+03
2104	3.780E+04	7.717E-01	1.157E+03
2105	3.780E+04	7.414E-01	1.111E+03
2106	3.780E+04	7.123E-01	1.068E+03
2107	3.780E+04	6.844E-01	1.026E+03
2108	3.780E+04	6.576E-01	9.856E+02
2109	3.780E+04	6.318E-01	9.470E+02
2110	3.780E+04	6.070E-01	9.099E+02
2111	3.780E+04	5.832E-01	8.742E+02
2112	3.780E+04	5.603E-01	8.399E+02
2113	3.780E+04	5.384E-01	8.070E+02
2114	3.780E+04	5.173E-01	7.753E+02
2115	3.780E+04	4.970E-01	7.449E+02
2116	3.780E+04	4.775E-01	7.157E+02
2117	3.780E+04	4.588E-01	6.877E+02
2118	3.780E+04	4.408E-01	6.607E+02
2119	3.780E+04	4.235E-01	6.348E+02
2120	3.780E+04	4.069E-01	6.099E+02
2121	3.780E+04	3.909E-01	5.860E+02
2122	3.780E+04	3.756E-01	5.630E+02
2123	3.780E+04	3.609E-01	5.409E+02
2124	3.780E+04	3.467E-01	5.197E+02
2125	3.780E+04	3.331E-01	4.993E+02
2126	3.780E+04	3.201E-01	4.798E+02
2127	3.780E+04	3.075E-01	4.610E+02
2128	3.780E+04	2.955E-01	4.429E+02
2129	3.780E+04	2.839E-01	4.255E+02
2130	3.780E+04	2.727E-01	4.088E+02
2131	3.780E+04	2.621E-01	3.928E+02
2132	3.780E+04	2.518E-01	3.774E+02
2133	3.780E+04	2.419E-01	3.626E+02
2134	3.780E+04	2.324E-01	3.484E+02
2135	3.780E+04	2.233E-01	3.347E+02
2136	3.780E+04	2.146E-01	3.216E+02

2137	3.780E+04	2.061E-01	3.090E+02
2138	3.780E+04	1.981E-01	2.969E+02
2139	3.780E+04	1.903E-01	2.852E+02
2140	3.780E+04	1.828E-01	2.740E+02
2141	3.780E+04	1.757E-01	2.633E+02
2142	3.780E+04	1.688E-01	2.530E+02
2143	3.780E+04	1.622E-01	2.431E+02
2144	3.780E+04	1.558E-01	2.335E+02
2145	3.780E+04	1.497E-01	2.244E+02
2146	3.780E+04	1.438E-01	2.156E+02
2147	3.780E+04	1.382E-01	2.071E+02
2148	3.780E+04	1.328E-01	1.990E+02
2149	3.780E+04	1.276E-01	1.912E+02
2150	3.780E+04	1.226E-01	1.837E+02
2151	3.780E+04	1.177E-01	1.765E+02
2152	3.780E+04	1.131E-01	1.696E+02
2153	3.780E+04	1.087E-01	1.629E+02
2154	3.780E+04	1.044E-01	1.565E+02
2155	3.780E+04	1.003E-01	1.504E+02
2156	3.780E+04	9.640E-02	1.445E+02
2157	3.780E+04	9.262E-02	1.388E+02
2158	3.780E+04	8.899E-02	1.334E+02
2159	3.780E+04	8.550E-02	1.282E+02
2160	3.780E+04	8.215E-02	1.231E+02
2161	3.780E+04	7.893E-02	1.183E+02
2162	3.780E+04	7.583E-02	1.137E+02
2163	3.780E+04	7.286E-02	1.092E+02
2164	3.780E+04	7.000E-02	1.049E+02
2165	3.780E+04	6.726E-02	1.008E+02
2166	3.780E+04	6.462E-02	9.686E+01
2167	3.780E+04	6.209E-02	9.306E+01
2168	3.780E+04	5.965E-02	8.942E+01
2169	3.780E+04	5.731E-02	8.591E+01
2170	3.780E+04	5.507E-02	8.254E+01
2171	3.780E+04	5.291E-02	7.930E+01
2172	3.780E+04	5.083E-02	7.619E+01
2173	3.780E+04	4.884E-02	7.321E+01
2174	3.780E+04	4.692E-02	7.034E+01
2175	3.780E+04	4.509E-02	6.758E+01
2176	3.780E+04	4.332E-02	6.493E+01
2177	3.780E+04	4.162E-02	6.238E+01
2178	3.780E+04	3.999E-02	5.994E+01
2179	3.780E+04	3.842E-02	5.759E+01
2180	3.780E+04	3.691E-02	5.533E+01
2181	3.780E+04	3.547E-02	5.316E+01
2182	3.780E+04	3.407E-02	5.107E+01
2183	3.780E+04	3.274E-02	4.907E+01
2184	3.780E+04	3.145E-02	4.715E+01
2185	3.780E+04	3.022E-02	4.530E+01
2186	3.780E+04	2.904E-02	4.352E+01
2187	3.780E+04	2.790E-02	4.182E+01
2188	3.780E+04	2.680E-02	4.018E+01
2189	3.780E+04	2.575E-02	3.860E+01
2190	3.780E+04	2.474E-02	3.709E+01
2191	3.780E+04	2.377E-02	3.563E+01
2192	3.780E+04	2.284E-02	3.424E+01
2193	3.780E+04	2.195E-02	3.289E+01
2194	3.780E+04	2.108E-02	3.160E+01
2195	3.780E+04	2.026E-02	3.037E+01
2196	3.780E+04	1.946E-02	2.917E+01
2197	3.780E+04	1.870E-02	2.803E+01
2198	3.780E+04	1.797E-02	2.693E+01
2199	3.780E+04	1.726E-02	2.588E+01

2200	3.780E+04	1.659E-02	2.486E+01

Appendix B-5
Transmission of LFG in Vent Layer

Calculation Cover Sheet

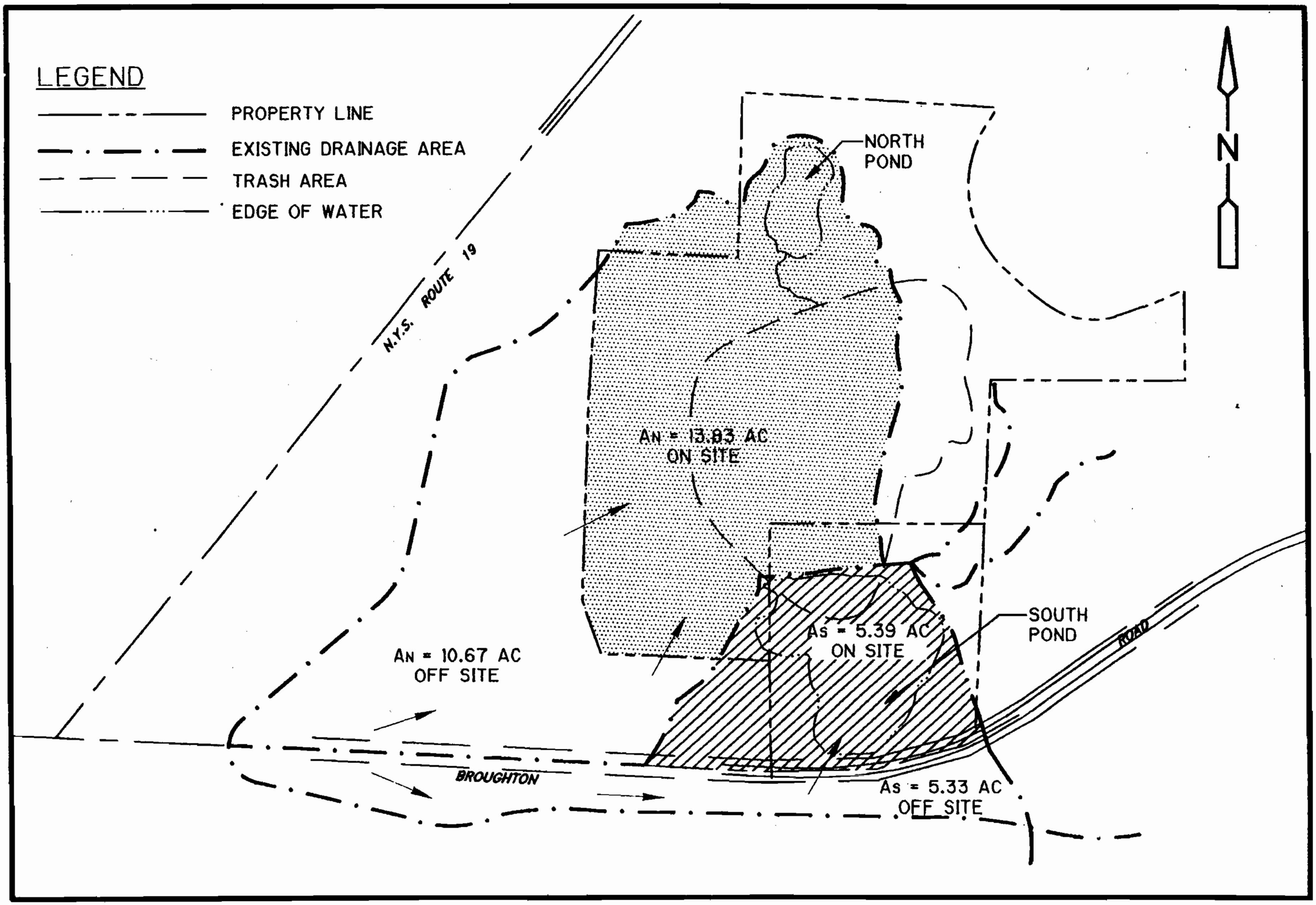
Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	Transmissivity of Vent Layer
Performed By and Date:	Darwish El Hajji
Checked By and Date:	John Wood, April 18, 2000
Purpose of Calculation:	Determine the amount of landfill gas the geotextile can transmit.
Results :	The results indicate that an 8 oz. geotextile is appropriate for use as a gas venting layer.
References:	

Appendix B-6
Stormwater Management System

Calculation Cover Sheet

Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	Stormwater Analysis
Performed By and Date:	Dale Zeiders, October 1999 and January 2000
Checked By and Date:	John Wood, March 2000
Purpose of Calculation:	Determine the pre and post landfill closure runoff to the South Pond and North Pond.
Results:	Established 1, 2, 5, 10, 25, 50, and 100-year runoff. Evaluated enlarged North Pond and develop scenario for North Pond outlet to limit post-development runoff to those existing for pre-development conditions
References:	1. New York, "Guidelines for Urban Erosion and Sediment Control", April 1997. 2. InteliSolve, "Hydraflow", Version 6.01, 1999

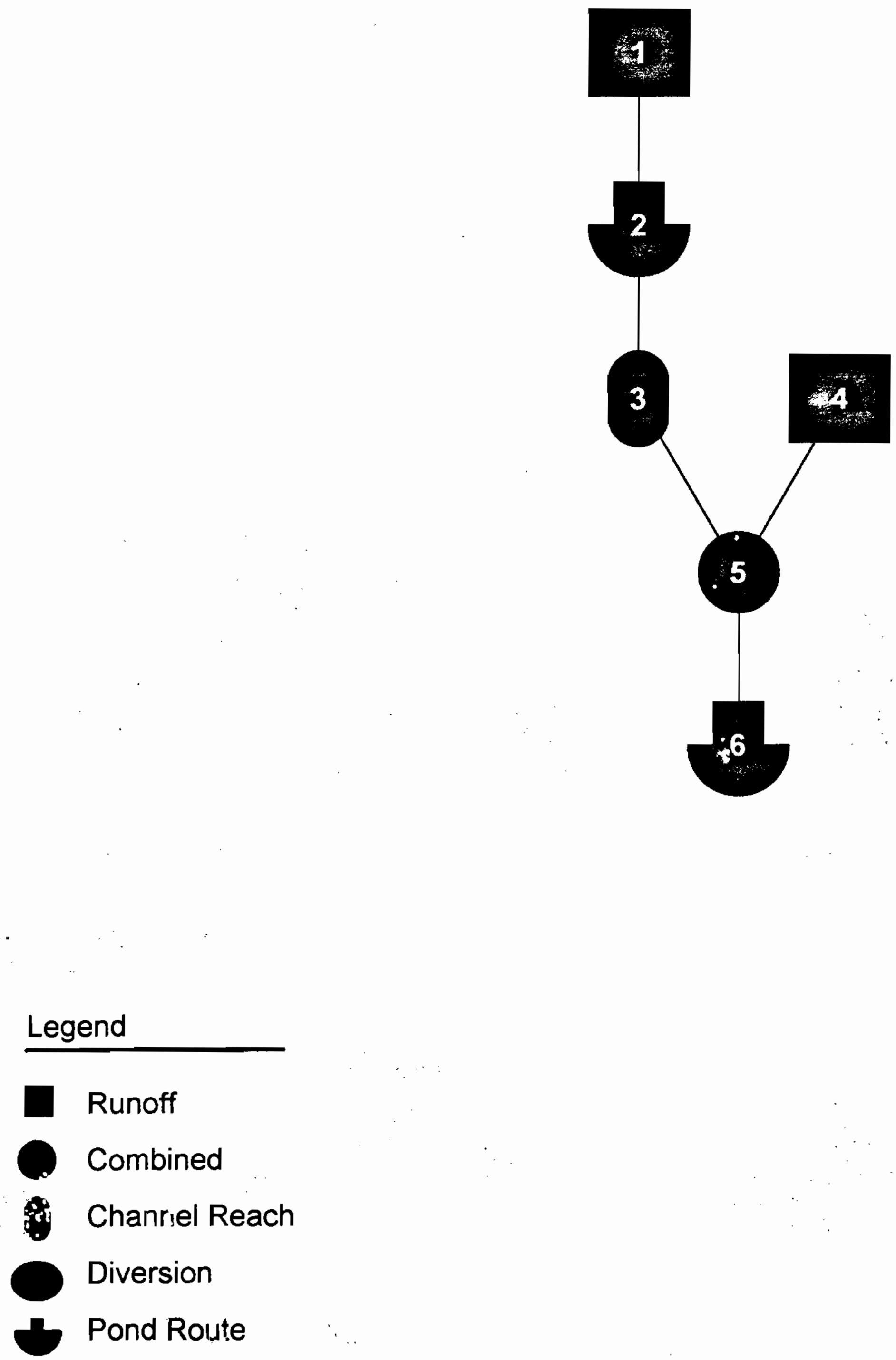
Appendix B-6a
Existing Conditions
(1, 2, 5, 10, 25, 50, and 100-year Storms)



New York State Department of Environmental Conservation
ETE Sanitation and Landfill
STORMWATER MANAGEMENT PRE-CONSTRUCTION DRAINAGE AREAS
Figure No. 2-3

CDM Camp Dresser & McKee

Existing 100-year Storm



Project: ETE00EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	45.26	3	717	102,360	100	----	——	——	Ex. S. Pond In
2	Reservoir	4.31	3	750	102,360	100	1	1672.47	49,952	Ex. S. Pond Out
3	Reach	4.31	3	753	102,244	100	2	——	——	S. to N. Pond Ch.
4	SCS Runoff	57.43	3	726	187,207	100	——	——	——	Ex. N. Pond In
5	Combine	61.10	3	726	289,451	100	3 + 4	——	——	Ex. N. Pond In
6	Reservoir	48.48	3	732	289,450	100	5	1639.30	41,710	Ex. N. Pond Out

Proj. file: ETE00EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

TR55 Tc Worksheet

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 100 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Worksheet 2: Runoff curve number and runoff

Project NYSDEC ETE LANDFILL By dlz Date 9 Oct 99

Location GAINESVILLE, WYOMING CO. Checked ______ Date ______

Circle one: Present Developed SOUTH POND

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area ☒ acres ☐ mi^2 ☐ %	Product of CN x area
BATH-VALOIS GRAVELLY LOAM 8-15% "C"	WOODS, GOOD CONDITION OPEN SPACE, GOOD CONDITION ROAD	70 74 98			1.07 1.40 0.35	74.9 103.6 34.3
MARDIN-CHANNERY SILT LOAM 3-8% "C"	WOODS, GOOD CONDITION OPEN SPACE, GOOD CONDITION ROAD	70 74 98			0.80 1.32 0.39	56.0 97.7 38.2
	OFFSITE TOTAL (South of road)				5.33	
BATH-VALOIS GRAVELLY LOAM 8-15% "C"	WOODS, FAIR CONDITION BRUSH, WEEDS, GRASS, FAIR CONDITION ROAD	73 70 98			0.35 2.25 0.22	25.6 157.5 21.6
BATH-VALOIS GRAVELLY LOAM 15-25% "C"	BRUSH, WEED, GRASS, FAIR CONDITION POND	70 98			0.16 2.41	11.2 236.2
	ONSITE TOTAL (North of road)				5.39	

1/ Use only one CN source per line. Totals = 10.72 856.8

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{856.8}{10.72} = 79.9$; Use CN = $\boxed{80}$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency .... yr			
Rainfall, P (24-hour) .... in			
Runoff, Q .... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)			

Hydrograph Plot

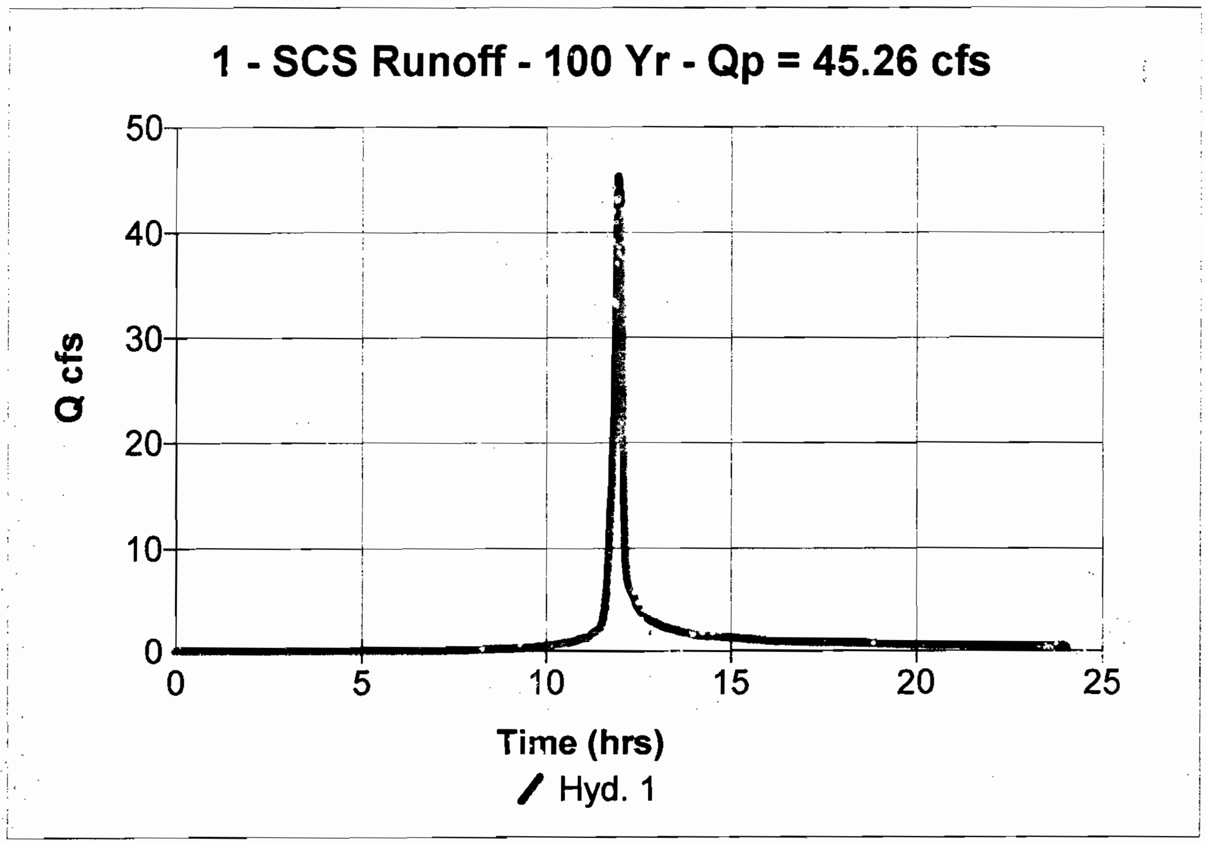
English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 45.26 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 102,360 cuft



Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 45.26 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 102,360 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.85	25.26
11.90	35.94
11.95	45.26 <<
12.00	43.54
12.05	30.52

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

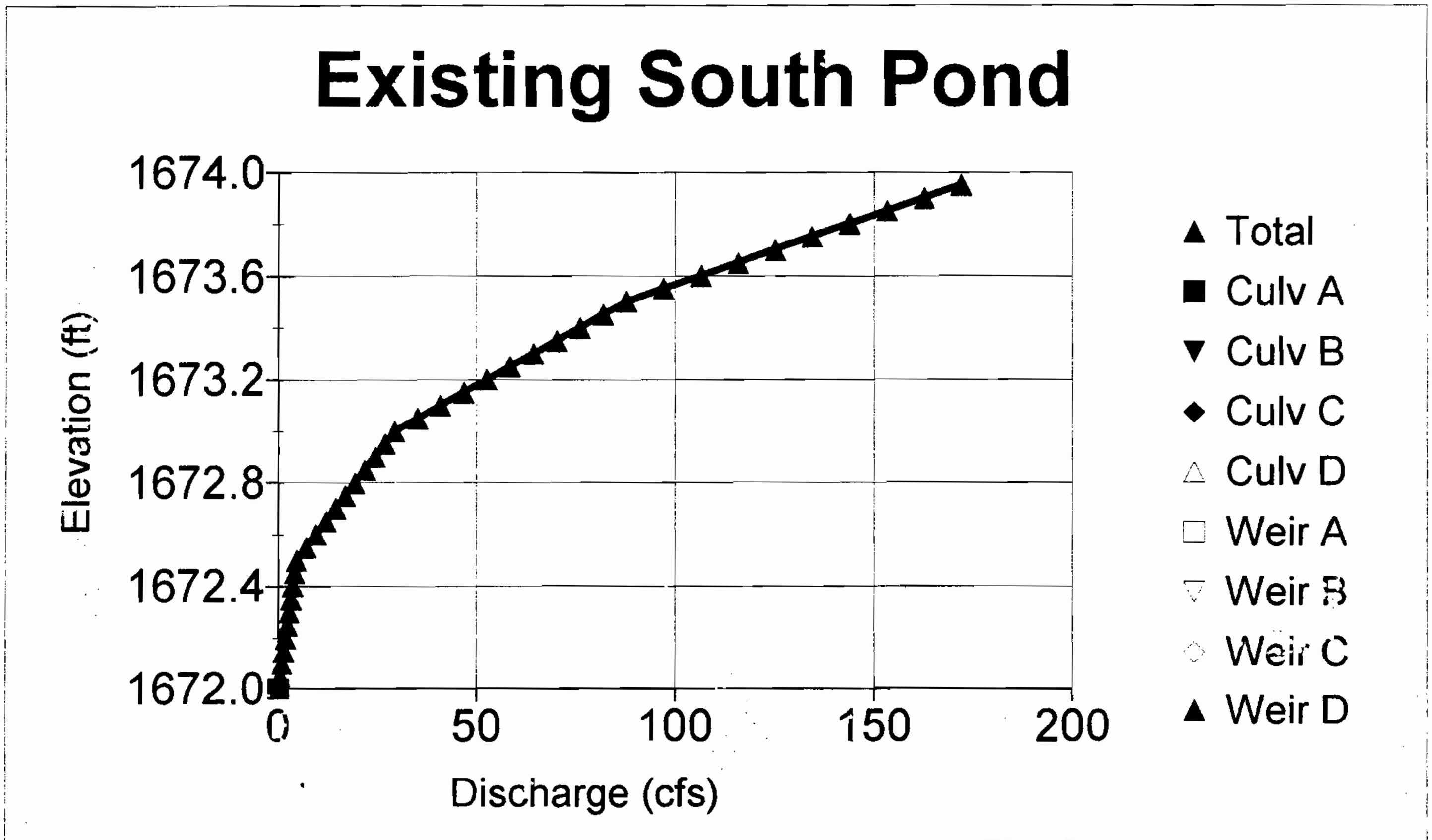
	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

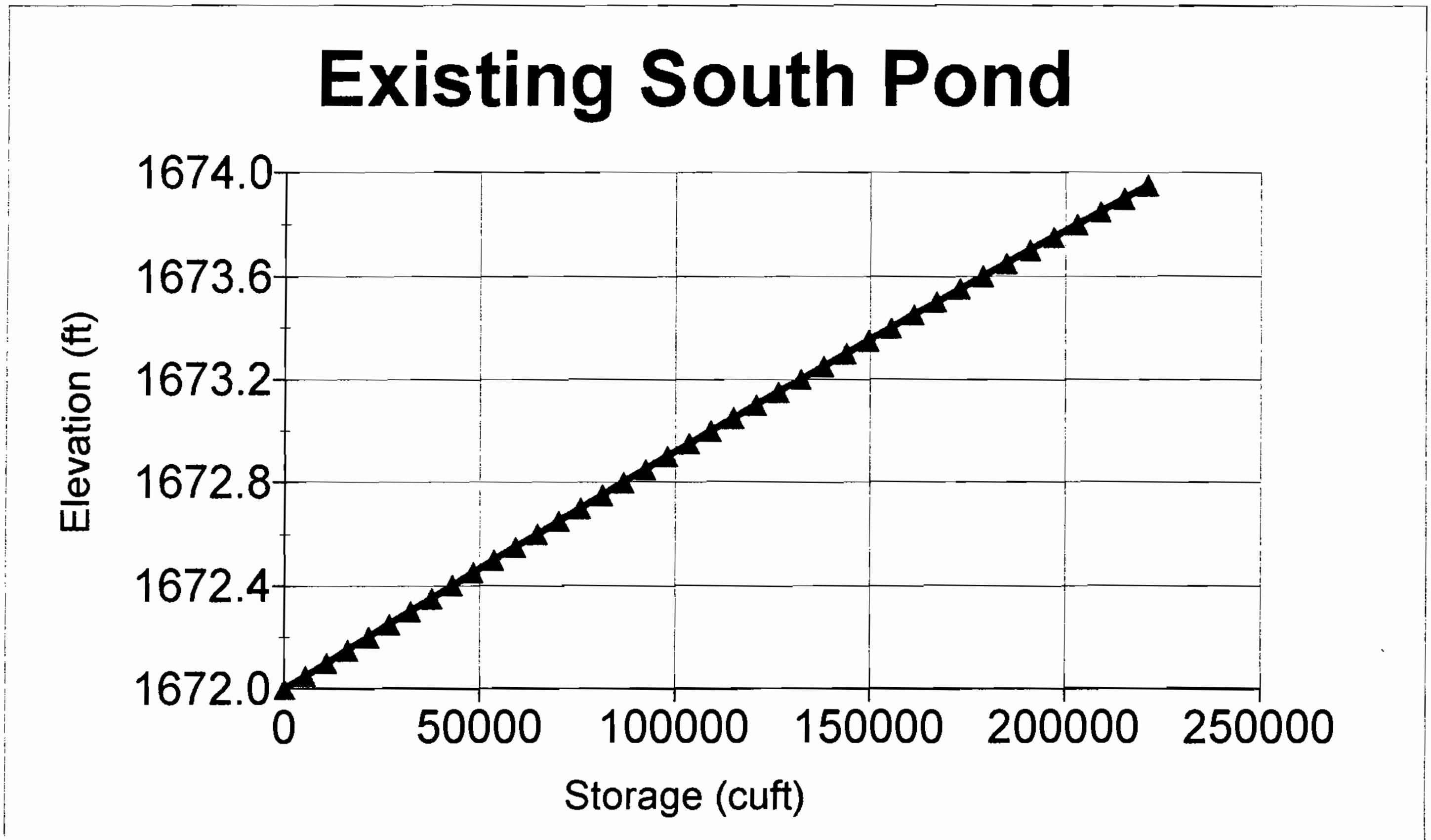
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.62
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33


Existing South Pond
Elevation (ft)
1674.0
1673.6
1673.2
1672.8
1672.4
1672.0
0
50
100
150
200
Discharge (cfs)
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D

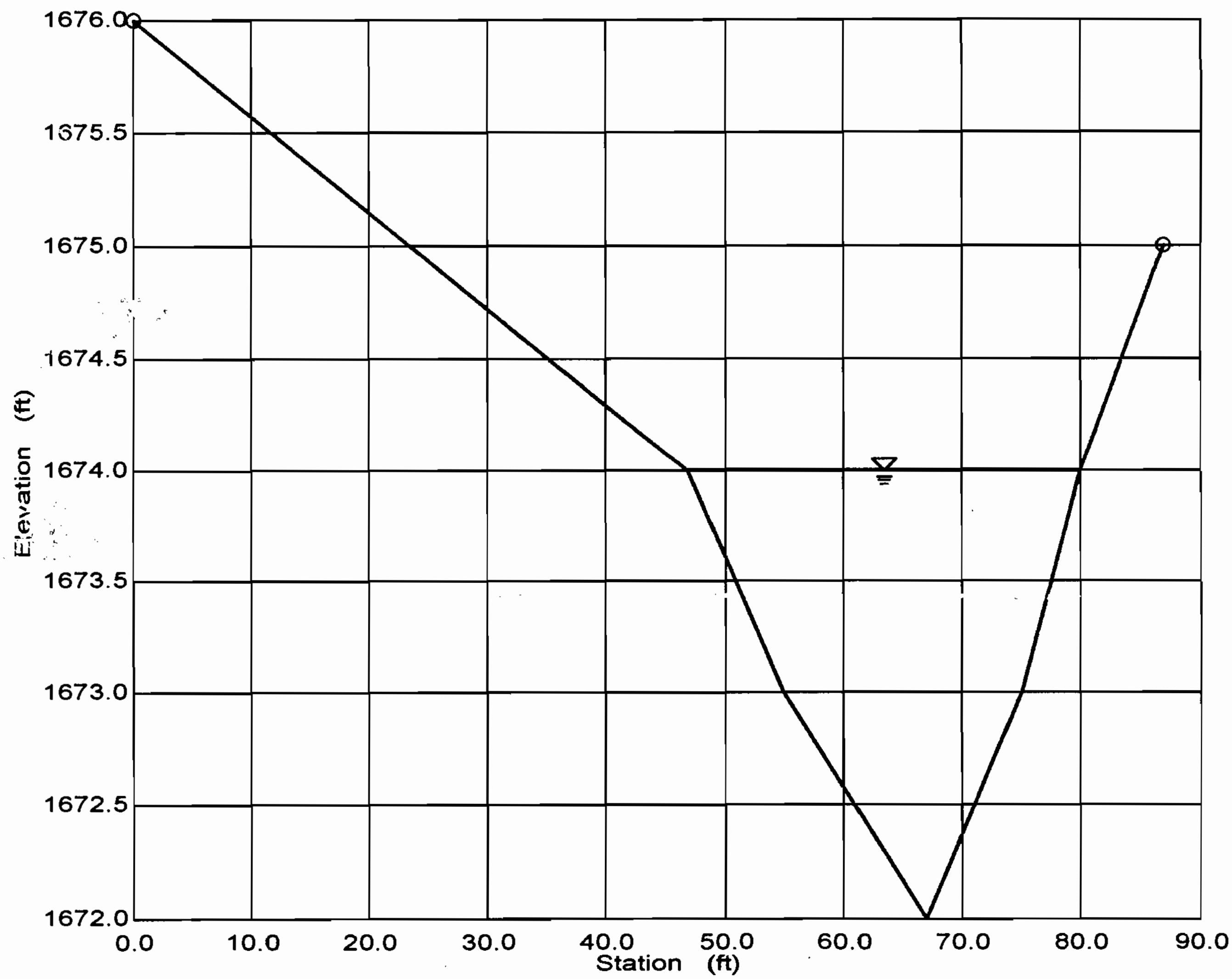


Existing South Pond
1674.0
1673.6
1673.2
1672.8
1672.4
1672.0
Elevation (ft)
0
50000
100000
150000
200000
250000
Storage (cuft)

NYSDEC - ETE Landfill - Gainesville
Cross Section for Irregular Channel

Project Description	
Project File	p:\0897-ete\stormwat\exsp-out.fm2
Worksheet	Existing South Pond Outlet Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.045	
Channel Slope	0.020000	ft/ft
Water Surface Elevation	1,674.00	ft
Discharge	181.33	cfs



NYSDEC - ETE Landfill - Gainesville
Worksheet for Irregular Channel

Project Description	
Project File	p:\0897-ete\stormwat\exsp-out.fm2
Worksheet	Existing South Pond Outlet Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data

Channel Slope	0.020000	ft/ft
Water Surface Elevation	1,674.00	ft

Elevation range: 1,672.00 ft to 1,676.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1,676.00	0.00	87.00	0.045
47.00	1,674.00			
55.00	1,673.00			
67.00	1,672.00			
75.00	1,673.00			
80.00	1,674.00			
87.00	1,675.00			

Results

Wtd. Mannings Coefficient	0.045	
Discharge	181.33	cfs
Flow Area	36.50	ft²
Wetted Perimeter	33.27	ft
Top Width	33.00	ft
Height	2.00	ft
Critical Depth	1,673.85	ft
Critical Slope	0.029618	ft/ft
Velocity	4.97	ft/s
Velocity Head	0.38	ft
Specific Energy	1,674.38	ft
Froude Number	0.83	

Flow is subcritical.

Existing South Pond Outlet
Rating Table for Irregular Channel

Project Description	
Project File	p:\0897-ete\stormwat\exsp-out.fm2
Worksheet	Existing South Pond Outlet Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Channel Slope	0.020000 ft/ft

Input Data	Minimum	Maximum	Increment
Water Surface Elevation	1,672.00	1,674.00	0.10 ft

Rating Table

Water Surface Elevation (ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
1,672.00	0.045	0.00	0.00
1,672.10	0.045	0.06	0.63
1,672.20	0.045	0.40	1.00
1,672.30	0.045	1.18	1.31
1,672.40	0.045	2.55	1.59
1,672.50	0.045	4.62	1.85
1,672.60	0.045	7.51	2.09
1,672.70	0.045	11.33	2.31
1,672.80	0.045	16.17	2.53
1,672.90	0.045	22.14	2.73
1,673.00	0.045	29.32	2.93
1,673.10	0.045	38.43	3.18
1,673.20	0.045	48.79	3.42
1,673.30	0.045	60.45	3.64
1,673.40	0.045	73.43	3.86
1,673.50	0.045	87.78	4.06
1,673.60	0.045	103.53	4.25
1,673.70	0.045	120.72	4.44
1,673.80	0.045	139.39	4.62
1,673.90	0.045	159.58	4.80
1,674.00	0.045	181.33	4.97

Hydrograph Plot

English

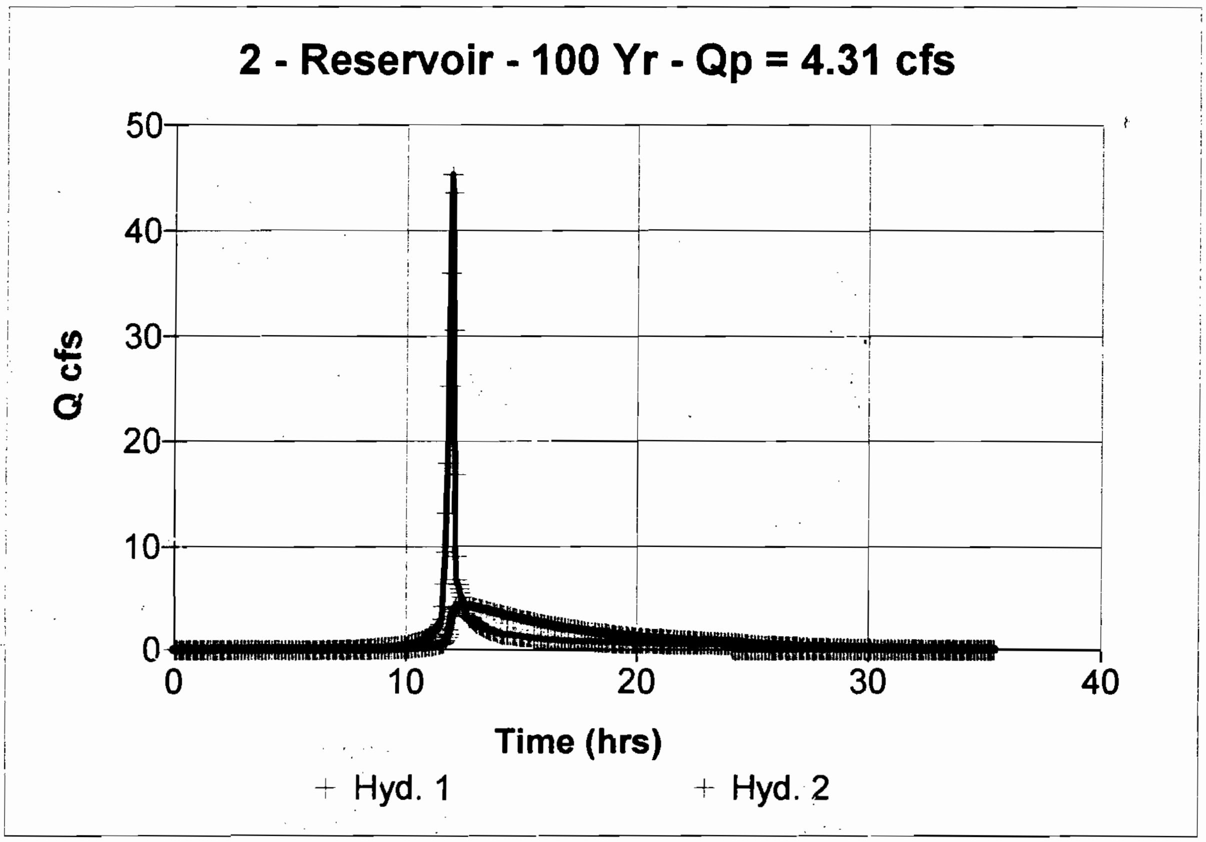
Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 4.31 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.47 ft	Max. Storage	= 49,952 cuft

Storage Indication method used.

Total Volume = 102,360 cuft



Hydrograph Report

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 4.31 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.47 ft	Max. Storage	= 49,952 cuft

Storage Indication method used.

Total Volume = 102,360 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
11.95	45.26 <<	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.52
12.00	43.54	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.16
12.05	30.52	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.68
12.10	16.82	1672.43	-----	-----	-----	-----	-----	-----	-----	-----	3.99
12.15	9.12	1672.45	-----	-----	-----	-----	-----	-----	-----	-----	4.13
12.20	6.84	1672.45	-----	-----	-----	-----	-----	-----	-----	-----	4.19
12.25	6.42	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.23
12.30	6.00	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.26
12.35	5.58	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.28
12.40	5.15	1672.47	-----	-----	-----	-----	-----	-----	-----	-----	4.30
12.45	4.71	1672.47	-----	-----	-----	-----	-----	-----	-----	-----	4.31
12.50	4.27	1672.47 <<	-----	-----	-----	-----	-----	-----	-----	-----	4.31 <<
12.55	3.86	1672.47	-----	-----	-----	-----	-----	-----	-----	-----	4.31
12.60	3.56	1672.47	-----	-----	-----	-----	-----	-----	-----	-----	4.30
12.65	3.37	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.29
12.70	3.25	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.27
12.75	3.15	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.25
12.80	3.05	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.24
12.85	2.95	1672.46	-----	-----	-----	-----	-----	-----	-----	-----	4.22
12.90	2.85	1672.45	-----	-----	-----	-----	-----	-----	-----	-----	4.20
12.95	2.75	1672.45	-----	-----	-----	-----	-----	-----	-----	-----	4.18
13.00	2.65	1672.45	-----	-----	-----	-----	-----	-----	-----	-----	4.15
13.05	2.55	1672.45	-----	-----	-----	-----	-----	-----	-----	-----	4.13
13.10	2.47	1672.44	-----	-----	-----	-----	-----	-----	-----	-----	4.10
13.15	2.40	1672.44	-----	-----	-----	-----	-----	-----	-----	-----	4.08
13.20	2.35	1672.44	-----	-----	-----	-----	-----	-----	-----	-----	4.05
13.25	2.29	1672.44	-----	-----	-----	-----	-----	-----	-----	-----	4.02
13.30	2.24	1672.43	-----	-----	-----	-----	-----	-----	-----	-----	4.00
13.35	2.18	1672.43	-----	-----	-----	-----	-----	-----	-----	-----	3.97
13.40	2.13	1672.43	-----	-----	-----	-----	-----	-----	-----	-----	3.94
13.45	2.07	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.91
13.50	2.02	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.89
13.55	1.96	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.86
13.60	1.92	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.83
13.65	1.87	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.80
13.70	1.83	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.77

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.75	1.79	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.74
13.80	1.75	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.71
13.85	1.71	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.68
13.90	1.67	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.65
13.95	1.63	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.61
14.00	1.59	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.58
14.05	1.56	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.55
14.10	1.53	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.52
14.15	1.51	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.49
14.20	1.49	1672.37	-----	-----	-----	-----	-----	-----	-----	-----	3.46
14.25	1.48	1672.37	-----	-----	-----	-----	-----	-----	-----	-----	3.43
14.30	1.46	1672.37	-----	-----	-----	-----	-----	-----	-----	-----	3.40
14.35	1.45	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.37
14.40	1.44	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.34
14.45	1.42	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.31
14.50	1.41	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.28
14.55	1.40	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.25
14.60	1.38	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.22
14.65	1.37	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.19
14.70	1.35	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.17
14.75	1.34	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.14
14.80	1.33	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.11
14.85	1.31	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.08
14.90	1.30	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.06
14.95	1.29	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.03
15.00	1.27	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	3.00
15.05	1.26	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.97
15.10	1.24	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.95
15.15	1.23	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.92
15.20	1.22	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.90
15.25	1.20	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.87
15.30	1.19	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.84
15.35	1.17	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.82
15.40	1.16	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.79
15.45	1.15	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.77
15.50	1.13	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.74
15.55	1.12	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.72
15.60	1.10	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.69
15.65	1.09	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.67
15.70	1.07	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.64
15.75	1.06	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.62
15.80	1.05	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.60
15.85	1.03	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.57
15.90	1.02	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.55
15.95	1.00	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.52
16.00	0.99	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.50
16.05	0.98	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.48
16.10	0.97	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.45
16.15	0.96	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.43

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.20	0.95	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.41
16.25	0.95	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.39
16.30	0.94	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.36
16.35	0.94	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.34
16.40	0.93	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.32
16.45	0.93	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.30
16.50	0.92	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.28
16.55	0.92	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.26
16.60	0.91	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.24
16.65	0.91	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.21
16.70	0.90	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.19
16.75	0.90	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.17

...End

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 4.31 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 9.32 ft/s	Routing coeff.	= 0.9647

Modified Att-Kin routing method used.

Total Volume = 102,244 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	3.16	2.49
12.05	3.68	3.14
12.10	3.99	3.67
12.15	4.13	3.98
12.20	4.19	4.13
12.25	4.23	4.19
12.30	4.26	4.23
12.35	4.28	4.26
12.40	4.30	4.28
12.45	4.31	4.30
12.50	4.31 <<	4.31
12.55	4.31	4.31 <<
12.60	4.30	4.31
12.65	4.29	4.30
12.70	4.27	4.29
12.75	4.25	4.27
12.80	4.24	4.25
12.85	4.22	4.24
12.90	4.20	4.22
12.95	4.18	4.20
13.00	4.15	4.18
13.05	4.13	4.15
13.10	4.10	4.13
13.15	4.08	4.10
13.20	4.05	4.08
13.25	4.02	4.05
13.30	4.00	4.03
13.35	3.97	4.00
13.40	3.94	3.97
13.45	3.91	3.94
13.50	3.89	3.91
13.55	3.86	3.89

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.60	3.83	3.86
13.65	3.80	3.83
13.70	3.77	3.80
13.75	3.74	3.77
13.80	3.71	3.74
13.85	3.68	3.71
13.90	3.65	3.68
13.95	3.61	3.65
14.00	3.58	3.62
14.05	3.55	3.58
14.10	3.52	3.55
14.15	3.49	3.52
14.20	3.46	3.49
14.25	3.43	3.46
14.30	3.40	3.43
14.35	3.37	3.40
14.40	3.34	3.37
14.45	3.31	3.34
14.50	3.28	3.31
14.55	3.25	3.28
14.60	3.22	3.25
14.65	3.19	3.22
14.70	3.17	3.20
14.75	3.14	3.17
14.80	3.11	3.14
14.85	3.08	3.11
14.90	3.06	3.08
14.95	3.03	3.06
15.00	3.00	3.03
15.05	2.97	3.00
15.10	2.95	2.98
15.15	2.92	2.95
15.20	2.90	2.92
15.25	2.87	2.90
15.30	2.84	2.87
15.35	2.82	2.84
15.40	2.79	2.82
15.45	2.77	2.79
15.50	2.74	2.77
15.55	2.72	2.74
15.60	2.69	2.72
15.65	2.67	2.69
15.70	2.64	2.67
15.75	2.62	2.64
15.80	2.60	2.62
15.85	2.57	2.60
15.90	2.55	2.57
15.95	2.52	2.55
16.00	2.50	2.52

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.05	2.48	2.50
16.10	2.45	2.48
16.15	2.43	2.45
16.20	2.41	2.43
16.25	2.39	2.41
16.30	2.36	2.39
16.35	2.34	2.36
16.40	2.32	2.34
16.45	2.30	2.32
16.50	2.28	2.30
16.55	2.26	2.28
16.60	2.24	2.26
16.65	2.21	2.24
16.70	2.19	2.22
16.75	2.17	2.20
16.80	2.16	2.18
16.85	2.14	2.16

...End

Hydrograph Plot

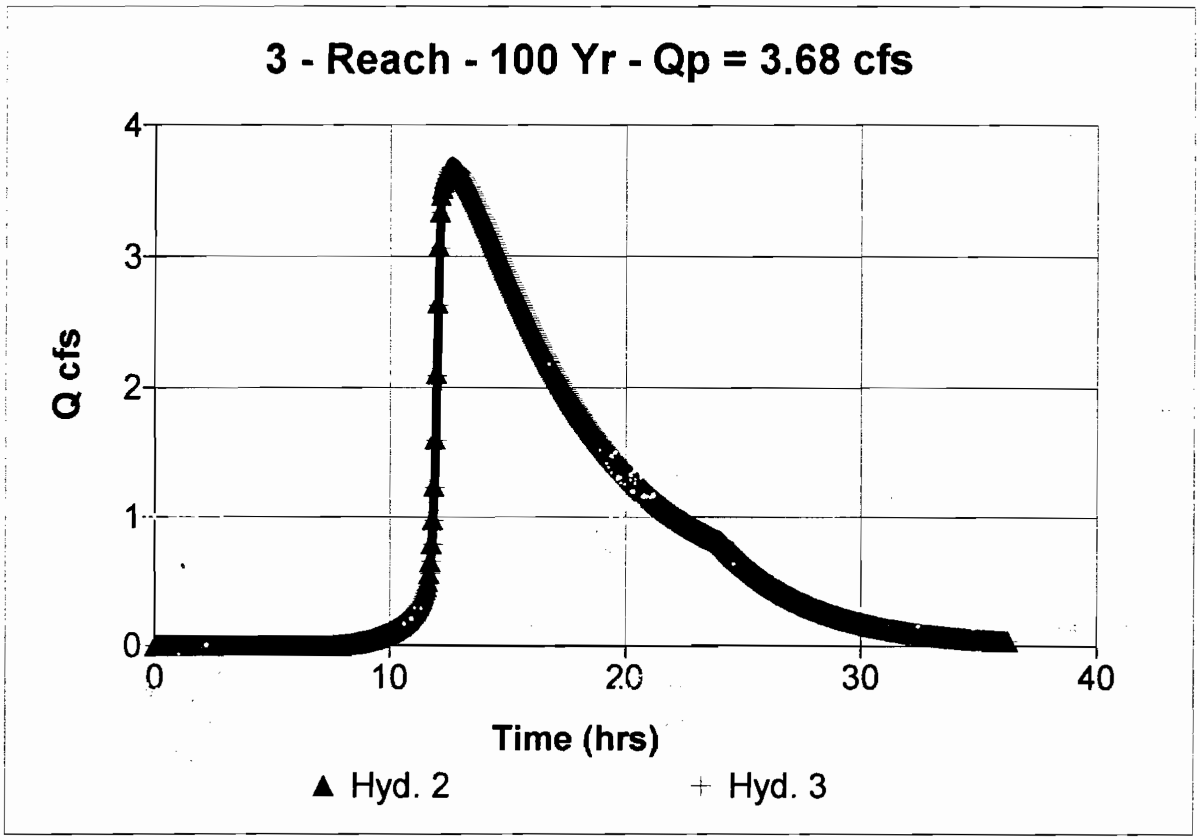
English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 3.68 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 9.32	Routing coeff.	= 0.9647

Modified Att-Kin routing method used. Total Volume = 102,219 cuft



TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 100 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flcw

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Worksheet 2: Runoff curve number and runoff

Project NYSDEC - ETE LANDFILL By [illegible] Date 3 Oct 90

Location GAINESVILLE, WYOMING Co. Checked ______ Date ______

Circle one: Present Developed NORTH POND

1. Runoff curve number (CN)

	Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Fig. 2-3	CN [1/] Fig. 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
A = 10.67 Ac	ALDEN MUCKY SILT LOAM 0-3% "D"	WOODS, GOOD CONDITION BRUSH, WEEDS, GRASS - GOOD CONDITION	77 73			0.29 2.46	22.3 179.6
OFFSITE	BATH-VALOIS GRAVELLY LOAM 8-15% "C"	OPEN SPACE, GOOD CONDITION ROAD	74 98			1.32 0.09	97.7 8.8
OFFSITE	MARDIN-CHANNERY SILT LOAM 3-8% "C"	BRUSH, WEEDS, GRASS - GOOD CONDITION ROAD	65 98			6.14 0.37	399.1 36.3
ONSITE A = 13.83 Ac	ALDEN MUCKY SILT LOAM 0-3% "D"	WOODS, GOOD CONDITION	77			2.14	164.8
ONSITE	BATH-VALOIS GRAVELLY LOAM	WOODS, GOOD CONDITION BRUSH, WEEDS, GRASS - FAIR CONDITION POND	70 70 98			2.92 8.20 0.57	204.4 574.0 55.9
					Totals =	24.50	1,742.9

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1,742.9}{24.50} =$ 71.1 ; Use CN = 71

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency .... yr			
Rainfall, P (24-hour) .... in			
Runoff, Q .... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)			

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 57.43 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 187,207 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.90	28.76
11.95	40.35
12.00	50.87
12.05	57.27
12.10	57.43 <<
12.15	51.73
12.20	43.91
12.25	36.10

...End

Hydrograph Plot

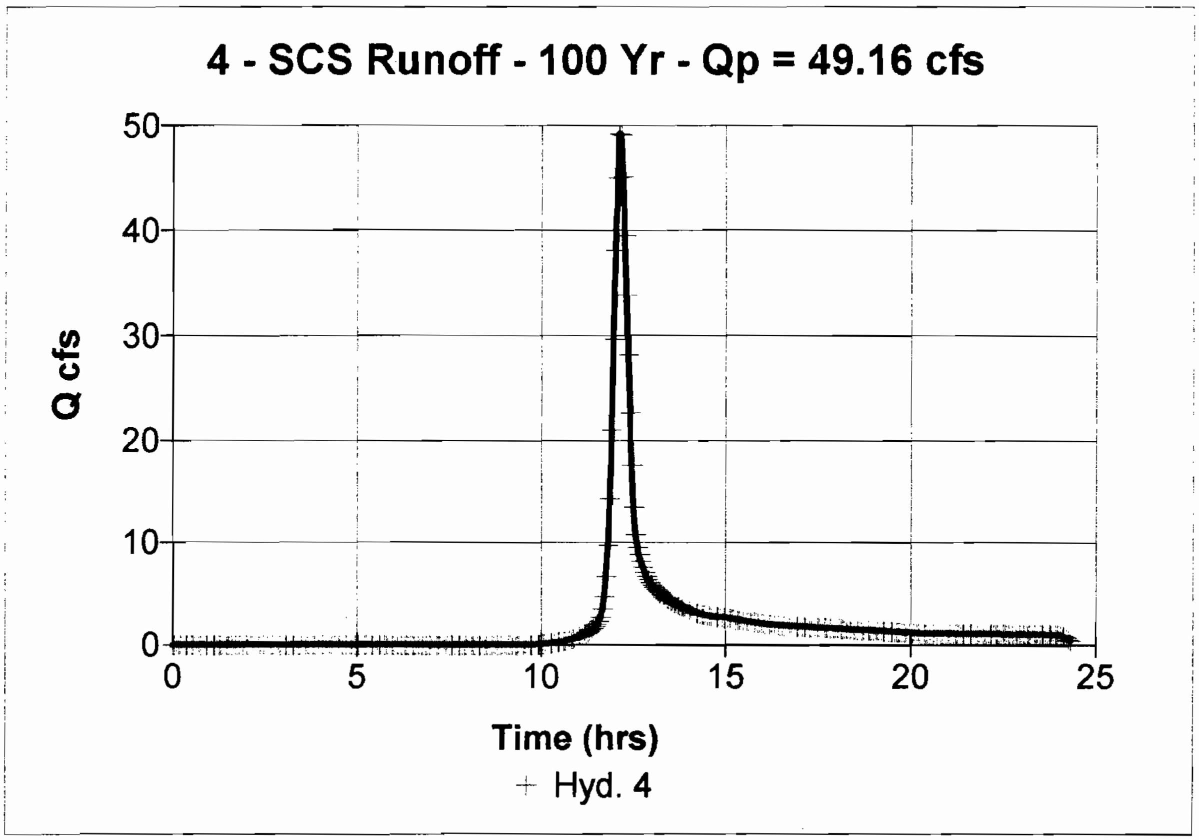
English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 49.16 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 176,996 cuft



Hydrograph Plot

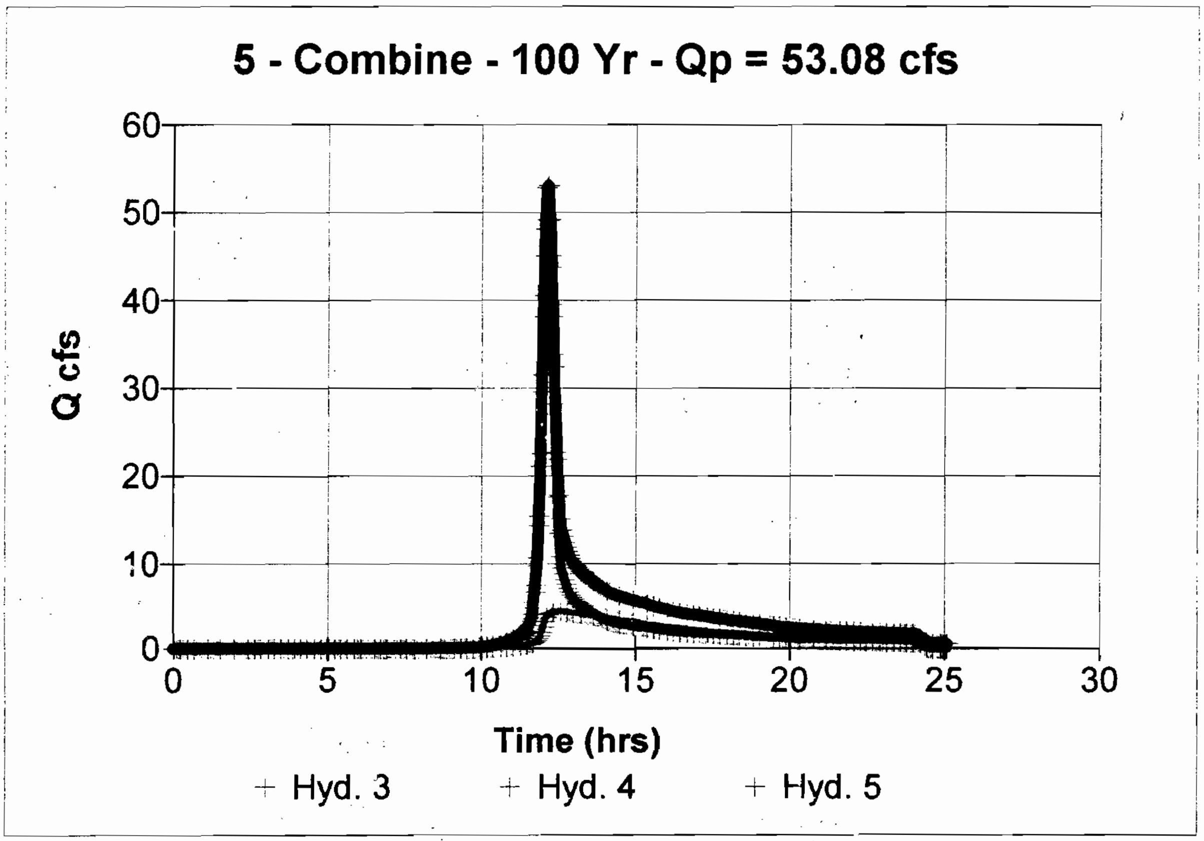
English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 53.08 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 3	2nd inflow hyd. No.	= 4

Total Volume = 279,239 cuft



Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type = Combine
Storm frequency = 100 yrs
1st inflow hyd. No. = 3

Peak discharge = 61.10 cfs
Time interval = 3 min
2nd inflow hyd. No. = 4

Total Volume = 289,451 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
11.95	1.90		40.35		42.26
12.00	2.49		50.87		53.36
12.05	3.14		57.27		60.41
12.10	3.67		57.43 <<		61.10 <<
12.15	3.98		51.73		55.71
12.20	4.13		43.91		48.03
12.25	4.19		36.10		40.29
12.30	4.23		28.53		32.76

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

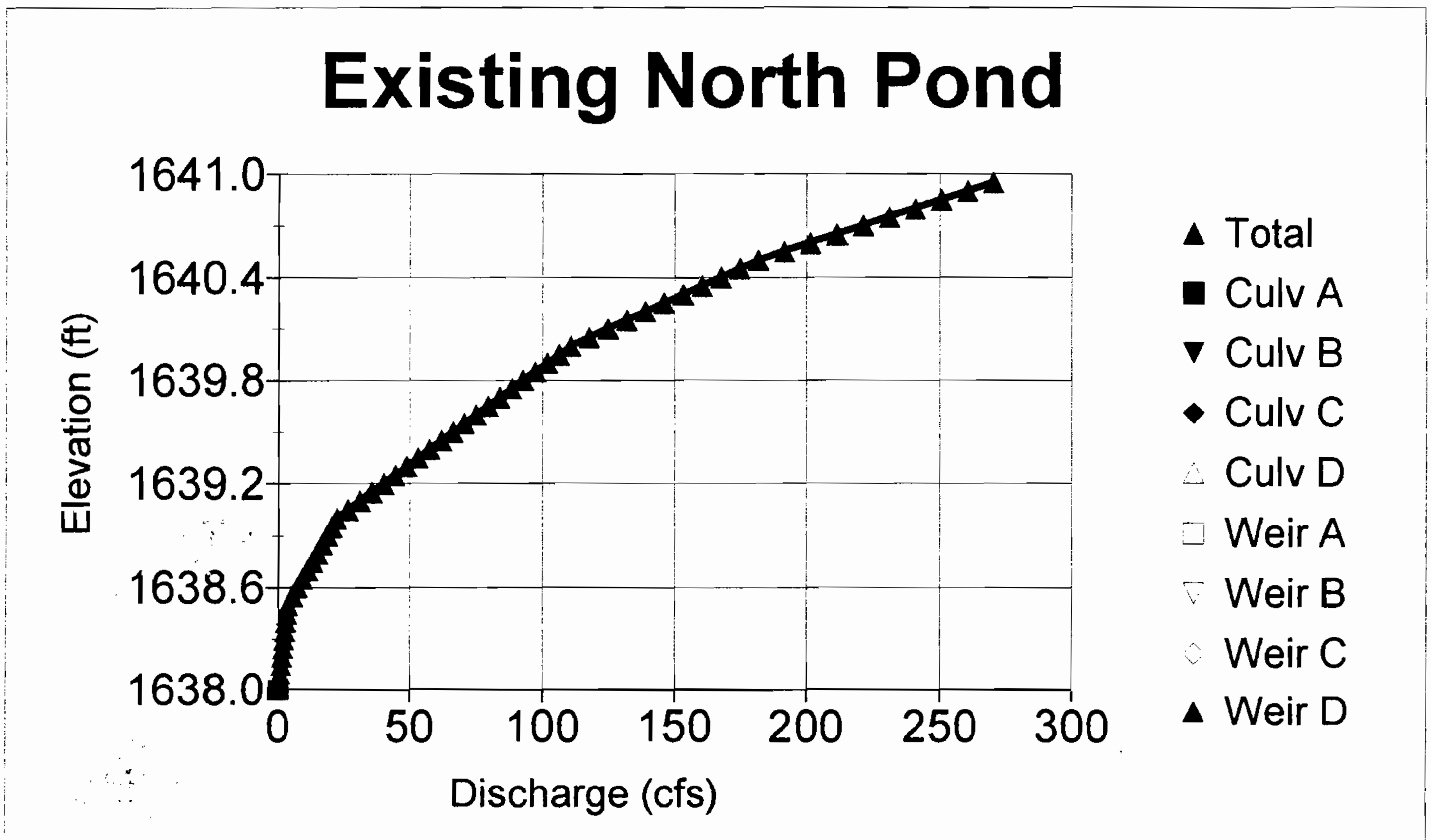
	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

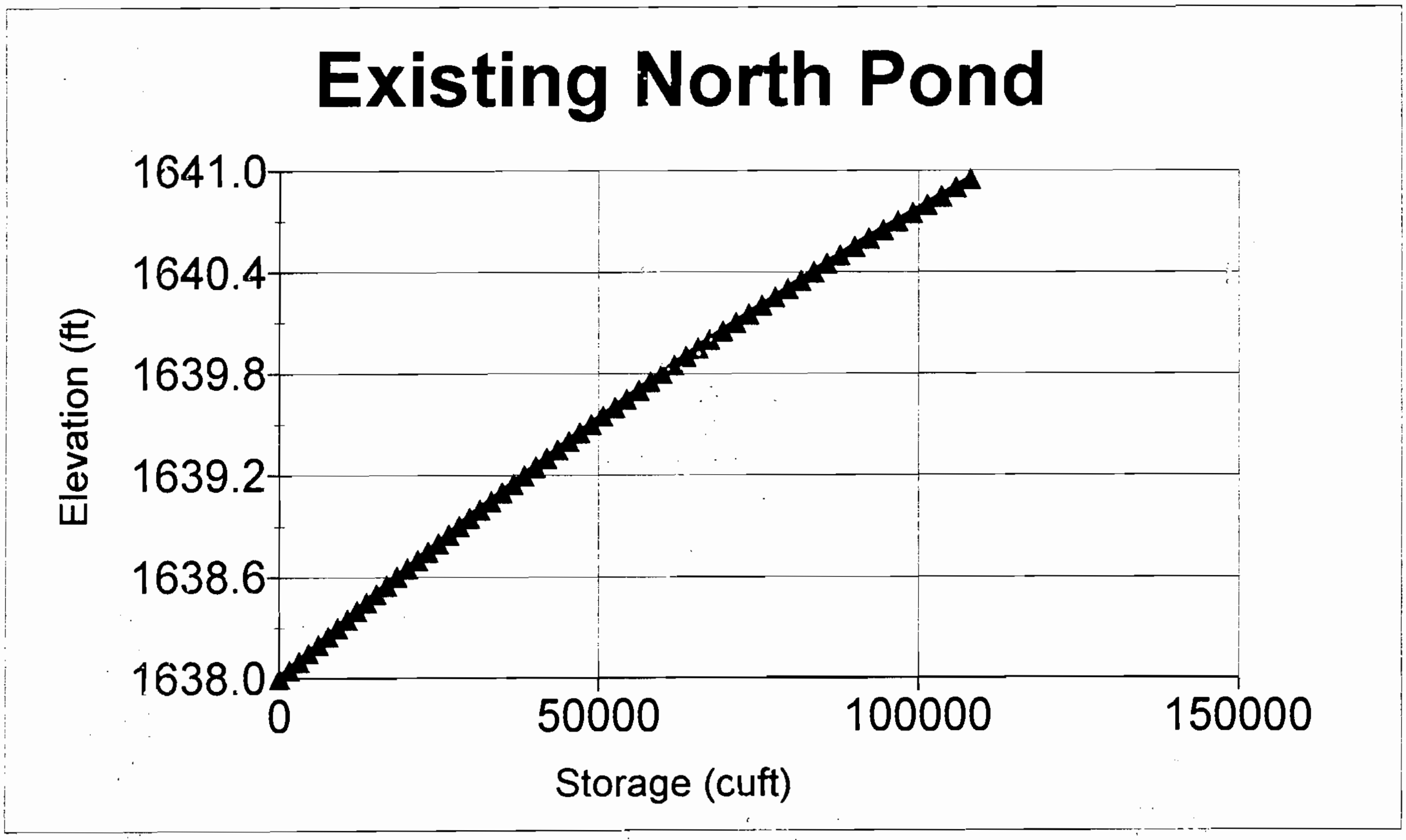
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

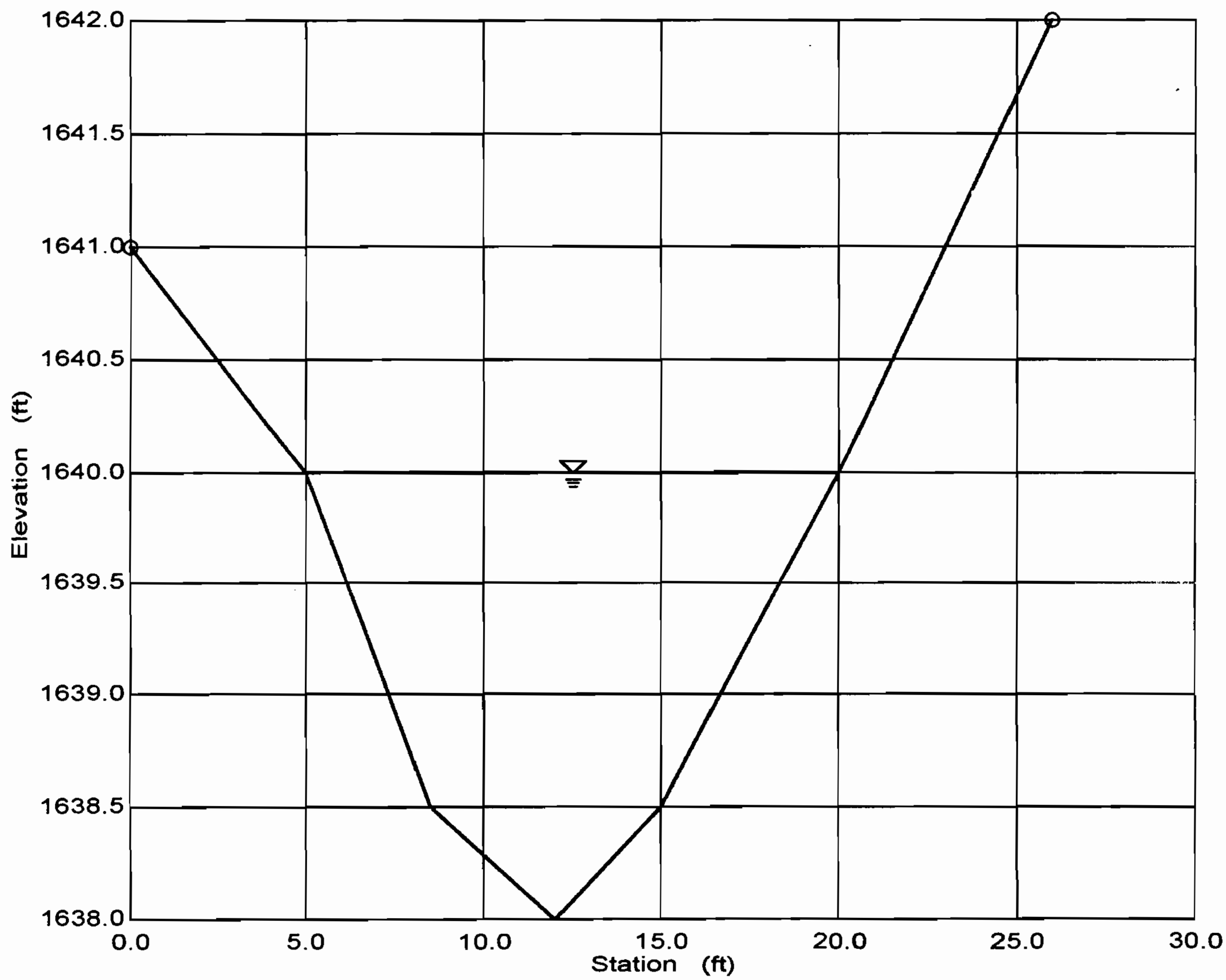

Existing North Pond
Elevation (ft)
1641.0
1640.4
1639.8
1639.2
1638.6
1638.0
0
50
100
150
200
250
300
Discharge (cfs)
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D


Existing North Pond
Elevation (ft)
1641.0
1640.4
1639.8
1639.2
1638.6
1638.0
0
50000
100000
150000
Storage (cuft)

NYSDEC - ETE Landfill - Gainesville
Cross Section for Irregular Channel

Project Description	
Project File	p:\0897-ete\stormwat\exnp-out.fm2
Worksheet	Existing North Pond Outlet Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.045	
Channel Slope	0.030000	ft/ft
Water Surface Elevation	1,640.00	ft
Discharge	110.62	cfs



NYSDEC - ETE Landfill - Gainesville
Worksheet for Irregular Channel

Project Description	
Project File	p:\0897-ete\stormwat\exnp-out.fm2
Worksheet	Existing North Pond Outlet Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data

Channel Slope	0.030000	ft/ft
Water Surface Elevation	1,640.00	ft

Elevation range: 1,638.00 ft to 1,642.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1,641.00	0.00	26.00	0.045
5.00	1,640.00			
8.50	1,638.50			
12.00	1,638.00			
15.00	1,638.50			
20.00	1,640.00			
26.00	1,642.00			

Results

Wtd. Mannings Coefficient	0.045	
Discharge	110.62	cfs
Flow Area	17.75	ft²
Wetted Perimeter	15.60	ft
Top Width	15.00	ft
Height	2.00	ft
Critical Depth	1,640.01	ft
Critical Slope	0.029376	ft/ft
Velocity	6.23	ft/s
Velocity Head	0.60	ft
Specific Energy	1,640.60	ft
Froude Number	1.01	

Flow is supercritical.

Table
Rating Table for Irregular Channel

Project Description	
Project File	p:\0897-ete\stormwat\exnp-out.fm2
Worksheet	Existing North Pond Outlet Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Channel Slope	0.030000 ft/ft

Input Data	Minimum	Maximum	Increment
Water Surface Elevation	1,638.00	1,641.00	0.10 ft

Rating Table

Water Surface Elevation (ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
1,638.00	0.045	0.00	0.00
1,638.10	0.045	0.05	0.77
1,638.20	0.045	0.32	1.22
1,638.30	0.045	0.94	1.60
1,638.40	0.045	2.02	1.94
1,638.50	0.045	3.66	2.25
1,638.60	0.045	6.17	2.68
1,638.70	0.045	9.28	3.06
1,638.80	0.045	12.99	3.39
1,638.90	0.045	17.32	3.70
1,639.00	0.045	22.27	3.99
1,639.10	0.045	27.87	4.26
1,639.20	0.045	34.13	4.51
1,639.30	0.045	41.08	4.76
1,639.40	0.045	48.74	4.99
1,639.50	0.045	57.12	5.21
1,639.60	0.045	66.24	5.43
1,639.70	0.045	76.14	5.64
1,639.80	0.045	86.82	5.84
1,639.90	0.045	98.30	6.04
1,640.00	0.045	110.62	6.23
1,640.10	0.045	122.78	6.36
1,640.20	0.045	135.92	6.50
1,640.30	0.045	150.08	6.64
1,640.40	0.045	165.29	6.78

Table
Rating Table for Irregular Channel

Rating Table

Water Surface Elevation (ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
1,640.50	0.045	181.58	6.92
1,640.60	0.045	198.97	7.06
1,640.70	0.045	217.51	7.20
1,640.80	0.045	237.22	7.34
1,640.90	0.045	258.13	7.48
1,641.00	0.045	280.27	7.63

Hydrograph Plot

English

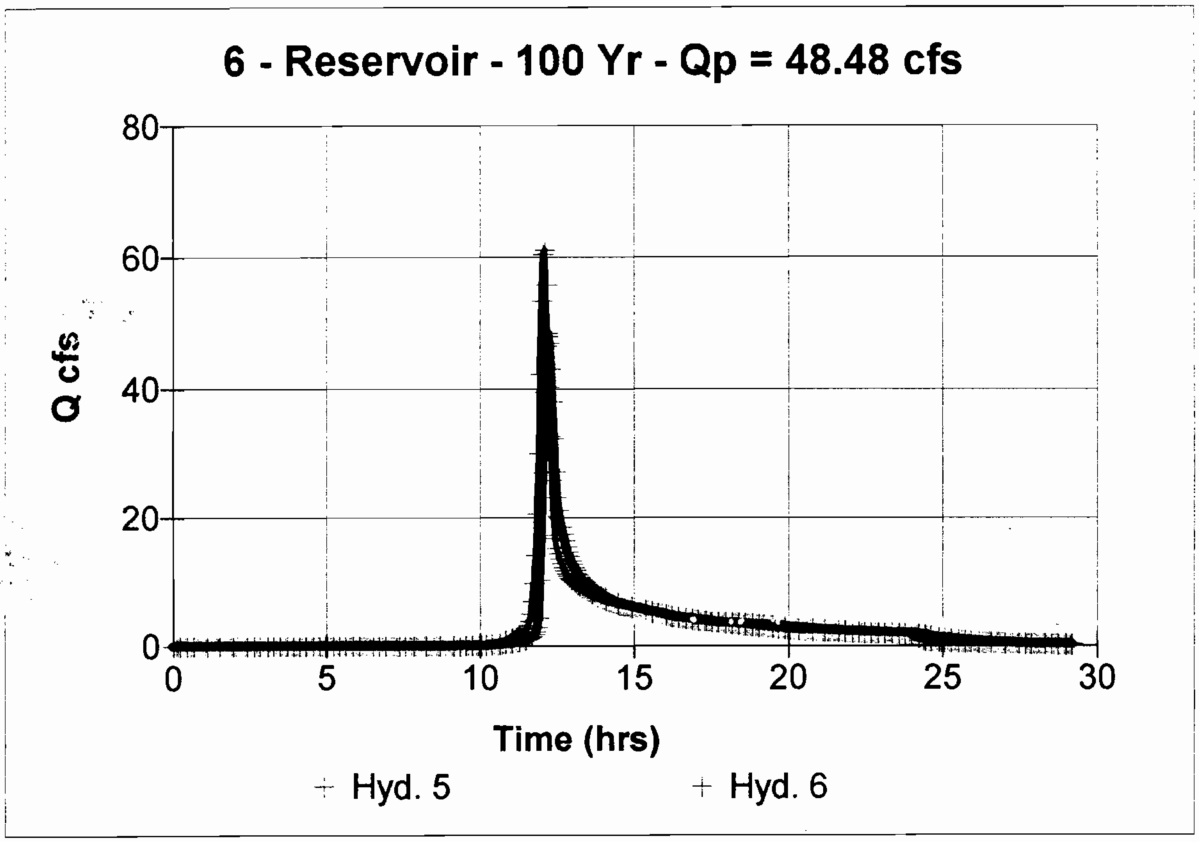
Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 48.48 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 5	Reservoir name	= Existing North
Max. Elevation	= 1639.30 ft	Max. Storage	= 41,710 cuft

Storage Indication method used.

Total Volume = 289,450 cuft



Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 48.48 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 5	Reservoir name	= Existing North
Max. Elevation	= 1639.30 ft	Max. Storage	= 41,710 cuft

Storage Indication method used.

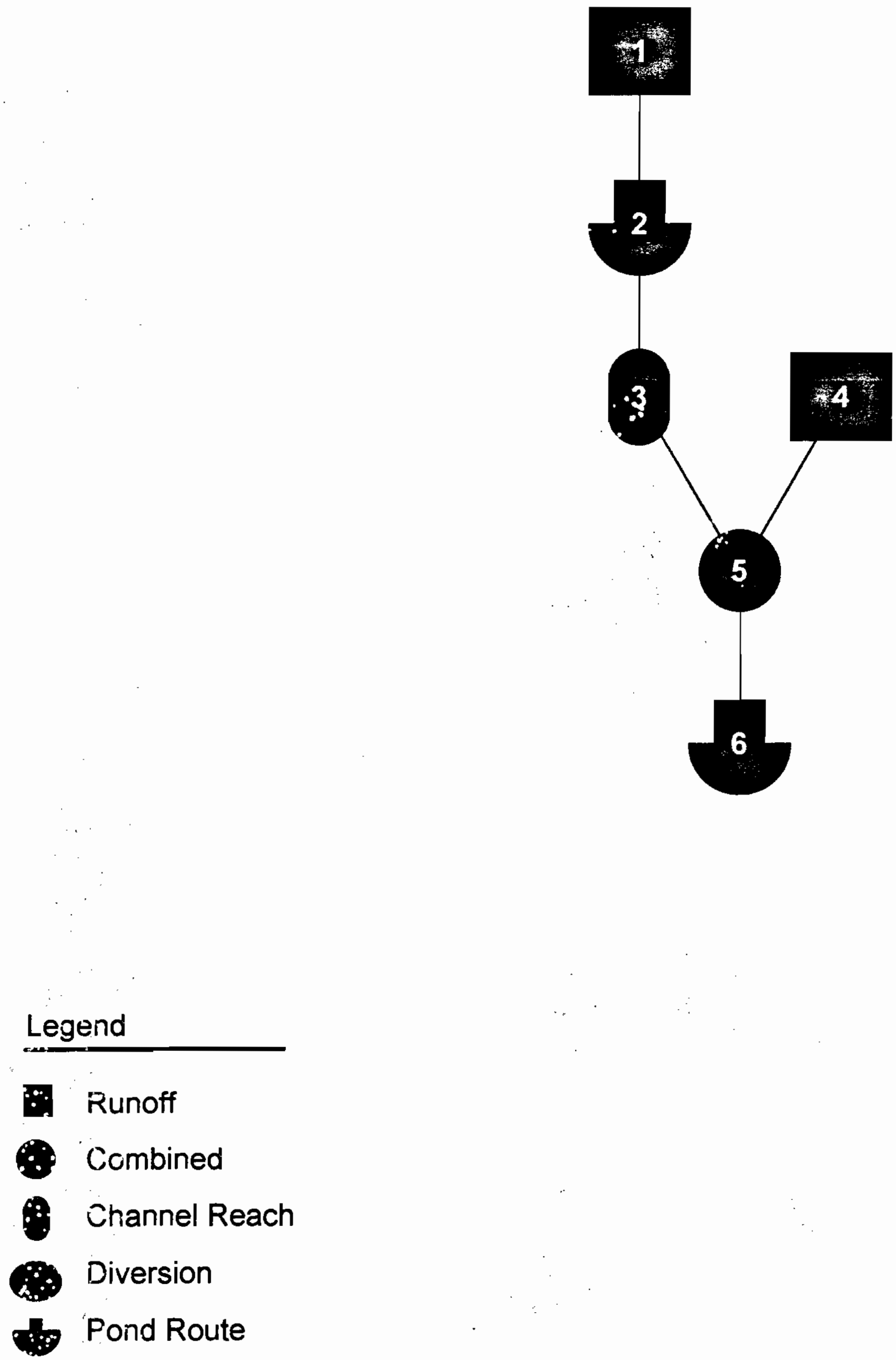
Total Volume = 289,450 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.05	60.41	1639.05	-----	-----	-----	-----	-----	-----	-----	-----	27.05
12.10	61.10 <<	1639.20	-----	-----	-----	-----	-----	-----	-----	-----	39.51
12.15	55.71	1639.28	-----	-----	-----	-----	-----	-----	-----	-----	46.50
12.20	48.03	1639.30 <<	-----	-----	-----	-----	-----	-----	-----	-----	48.48 <<
12.25	40.29	1639.28	-----	-----	-----	-----	-----	-----	-----	-----	46.89
12.30	32.76	1639.24	-----	-----	-----	-----	-----	-----	-----	-----	43.06
12.35	25.86	1639.18	-----	-----	-----	-----	-----	-----	-----	-----	37.97
12.40	20.25	1639.12	-----	-----	-----	-----	-----	-----	-----	-----	32.46
12.45	16.73	1639.06	-----	-----	-----	-----	-----	-----	-----	-----	27.29

...End

Existing 25-year Storm



Project: ETE25EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	35.70	3	717	80,553	25	----	----	----	Ex. S. Pond In
2	Reservoir	3.34	3	750	80,553	25	1	1672.36	38,669	Ex. S. Pond Out
3	Reach	3.34	3	753	80,438	25	2	----	----	S. to N. Pond Ch.
4	SCS Runoff	42.57	3	726	140,567	25	----	----	----	Ex. N. Pond In
5	Combine	45.35	3	726	221,005	25	3 + 4	----	----	Ex. N. Pond In
6	Reservoir	31.96	3	735	221,005	25	5	1639.11	35,152	Ex. N. Pond Out

Proj. file: ETE25EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 35.70 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 80,553 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.85	19.44
11.90	28.03
11.95	35.70 <<
12.00	34.62
12.05	24.40

...End

TR55 Tc Worksheet

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 25 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... = 7.7 min

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 3.34 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.36 ft	Max. Storage	= 38,669 cuft

Storage Indication method used. Total Volume = 80,553 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
11.95	35.70 <<	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.88
12.00	34.62	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.39
12.05	24.40	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.81
12.10	13.51	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.06
12.15	7.35	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.17
12.20	5.52	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.22
12.25	5.19	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.26
12.30	4.86	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.28
12.35	4.52	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.31
12.40	4.17	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.32
12.45	3.82	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.33
12.50	3.46	1672.36 <<	-----	-----	-----	-----	-----	-----	-----	-----	3.34 <<
12.55	3.14	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.34
12.60	2.89	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.33
12.65	2.74	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.32
12.70	2.64	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.31
12.75	2.56	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.30
12.80	2.48	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.29
12.85	2.40	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.28
12.90	2.32	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.26
12.95	2.24	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.25
13.00	2.16	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.23
13.05	2.08	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.22
13.10	2.01	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.20
13.15	1.96	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.18
13.20	1.91	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.16
13.25	1.87	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.14
13.30	1.82	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.12
13.35	1.78	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.10
13.40	1.74	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.08
13.45	1.69	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.06
13.50	1.65	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.04
13.55	1.60	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.01
13.60	1.56	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.99
13.65	1.53	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.97
13.70	1.50	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.95

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.75	1.46	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.92
13.80	1.43	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.90
13.85	1.40	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.88
13.90	1.37	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.86
13.95	1.33	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.83
14.00	1.30	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.81
14.05	1.27	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.79
14.10	1.25	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.76
14.15	1.23	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.74
14.20	1.22	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.72
14.25	1.21	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.69
14.30	1.20	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.67
14.35	1.19	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.65
14.40	1.18	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.62
14.45	1.16	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.60
14.50	1.15	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.58
14.55	1.14	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.56
14.60	1.13	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.54
14.65	1.12	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.51
14.70	1.11	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.49
14.75	1.10	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.47
14.80	1.09	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.45
14.85	1.08	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.43
14.90	1.06	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.41
14.95	1.05	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.39
15.00	1.04	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.37
15.05	1.03	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.35
15.10	1.02	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.33
15.15	1.01	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.31
15.20	1.00	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.29
15.25	0.98	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.27
15.30	0.97	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.25
15.35	0.96	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.23
15.40	0.95	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.21
15.45	0.94	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.19
15.50	0.93	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.17
15.55	0.92	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.15
15.60	0.90	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.13
15.65	0.89	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.11
15.70	0.88	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.09
15.75	0.87	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.07
15.80	0.86	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.05
15.85	0.85	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.04
15.90	0.84	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.02
15.95	0.82	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.00
16.00	0.81	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.98
16.05	0.80	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.96
16.10	0.79	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.94
16.15	0.79	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.93

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.20	0.78	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.91
16.25	0.78	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.89
16.30	0.77	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.87
16.35	0.77	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.86
16.40	0.77	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.84
16.45	0.76	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.82
16.50	0.76	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.81
16.55	0.75	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.79
16.60	0.75	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.78
16.65	0.75	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.76
16.70	0.74	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.74
16.75	0.74	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.73
16.80	0.73	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.71
16.85	0.73	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.70
16.90	0.73	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.68

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft.	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.62
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 3.34 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 8.60 ft/s	Routing coeff.	= 0.9249

Modified Att-Kin routing method used.

Total Volume = 80,438 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	2.39	1.84
12.05	2.81	2.35
12.10	3.06	2.78
12.15	3.17	3.04
12.20	3.22	3.16
12.25	3.26	3.22
12.30	3.28	3.25
12.35	3.31	3.28
12.40	3.32	3.30
12.45	3.33	3.32
12.50	3.34 <<	3.33
12.55	3.34	3.34 <<
12.60	3.33	3.34
12.65	3.32	3.33
12.70	3.31	3.32
12.75	3.30	3.31
12.80	3.29	3.30
12.85	3.28	3.29
12.90	3.26	3.28
12.95	3.25	3.26
13.00	3.23	3.25
13.05	3.22	3.23
13.10	3.20	3.22
13.15	3.18	3.20
13.20	3.16	3.18
13.25	3.14	3.16
13.30	3.12	3.14
13.35	3.10	3.12
13.40	3.08	3.10
13.45	3.06	3.08
13.50	3.04	3.06
13.55	3.01	3.04

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.60	2.99	3.02
13.65	2.97	2.99
13.70	2.95	2.97
13.75	2.92	2.95
13.80	2.90	2.93
13.85	2.88	2.90
13.90	2.86	2.88
13.95	2.83	2.86
14.00	2.81	2.83
14.05	2.79	2.81
14.10	2.76	2.79
14.15	2.74	2.76
14.20	2.72	2.74
14.25	2.69	2.72
14.30	2.67	2.69
14.35	2.65	2.67
14.40	2.62	2.65
14.45	2.60	2.63
14.50	2.58	2.60
14.55	2.56	2.58
14.60	2.54	2.56
14.65	2.51	2.54
14.70	2.49	2.52
14.75	2.47	2.49
14.80	2.45	2.47
14.85	2.43	2.45
14.90	2.41	2.43
14.95	2.39	2.41
15.00	2.37	2.39
15.05	2.35	2.37
15.10	2.33	2.35
15.15	2.31	2.33
15.20	2.29	2.31
15.25	2.27	2.29
15.30	2.25	2.27
15.35	2.23	2.25
15.40	2.21	2.23
15.45	2.19	2.21
15.50	2.17	2.19
15.55	2.15	2.17
15.60	2.13	2.15
15.65	2.11	2.13
15.70	2.09	2.11
15.75	2.07	2.09
15.80	2.05	2.07
15.85	2.04	2.06
15.90	2.02	2.04
15.95	2.00	2.02
16.00	1.98	2.00

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.05	1.96	1.98
16.10	1.94	1.96
16.15	1.93	1.95
16.20	1.91	1.93
16.25	1.89	1.91
16.30	1.87	1.89
16.35	1.86	1.88
16.40	1.84	1.86
16.45	1.82	1.84
16.50	1.81	1.83
16.55	1.79	1.81
16.60	1.78	1.79
16.65	1.76	1.78
16.70	1.74	1.76
16.75	1.73	1.75
16.80	1.71	1.73
16.85	1.70	1.71
16.90	1.68	1.70
16.95	1.67	1.68
17.00	1.65	1.67

...End

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 42.57 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 140,567 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	28.81
12.00	36.92
12.05	42.07
12.10	42.57 <<
12.15	38.59
12.20	32.94
12.25	27.25
12.30	21.68

...End

TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 25 yrs

Sheet Flow

Manning's n-value	= 0.130
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 2.50 in
Land slope	= 3.0 %
Travel Time	**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft
Watercourse slope	= 4.0 %
Surface description	= Unpaved
Average velocity	= 3.23 ft/s
Travel Time	**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft
Wetted perimeter	= 12.6 ft
Channel slope	= 4.0 %
Manning's n-value	= 0.045
Velocity	= 6.39 ft/s
Flow length	= 550.0 ft
Travel Time	**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type = Combine
Storm frequency = 25 yrs
1st inflow hyd. No. = 3

Peak discharge = 45.35 cfs
Time interval = 3 min
2nd inflow hyd. No. = 4

Total Volume = 221,005 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
11.95	1.38		28.81		30.20
12.00	1.84		36.92		38.77
12.05	2.35		42.07		44.42
12.10	2.78		42.57 <<		45.35 <<
12.15	3.04		38.59		41.63
12.20	3.16		32.94		36.10
12.25	3.22		27.25		30.47
12.30	3.25		21.68		24.94

...End

Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 31.96 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyd. No.	= 5	Reservoir name	= Existing North
Max. Elevation	= 1639.11 ft	Max. Storage	= 35,152 cuft

Storage Indication method used. Total Volume = 221,005 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.10	45.35 <<	1638.94	-----	-----	-----	-----	-----	-----	-----	-----	20.13
12.15	41.63	1639.05	-----	-----	-----	-----	-----	-----	-----	-----	26.68
12.20	36.10	1639.10	-----	-----	-----	-----	-----	-----	-----	-----	31.18
12.25	30.47	1639.11 <<	-----	-----	-----	-----	-----	-----	-----	-----	31.96 <<
12.30	24.94	1639.09	-----	-----	-----	-----	-----	-----	-----	-----	30.39
12.35	19.81	1639.06	-----	-----	-----	-----	-----	-----	-----	-----	27.42
12.40	15.60	1639.02	-----	-----	-----	-----	-----	-----	-----	-----	23.83
12.45	12.93	1638.97	-----	-----	-----	-----	-----	-----	-----	-----	21.27
12.50	11.77	1638.93	-----	-----	-----	-----	-----	-----	-----	-----	19.60
12.55	11.14	1638.89	-----	-----	-----	-----	-----	-----	-----	-----	18.08
12.60	10.53	1638.85	-----	-----	-----	-----	-----	-----	-----	-----	16.73

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

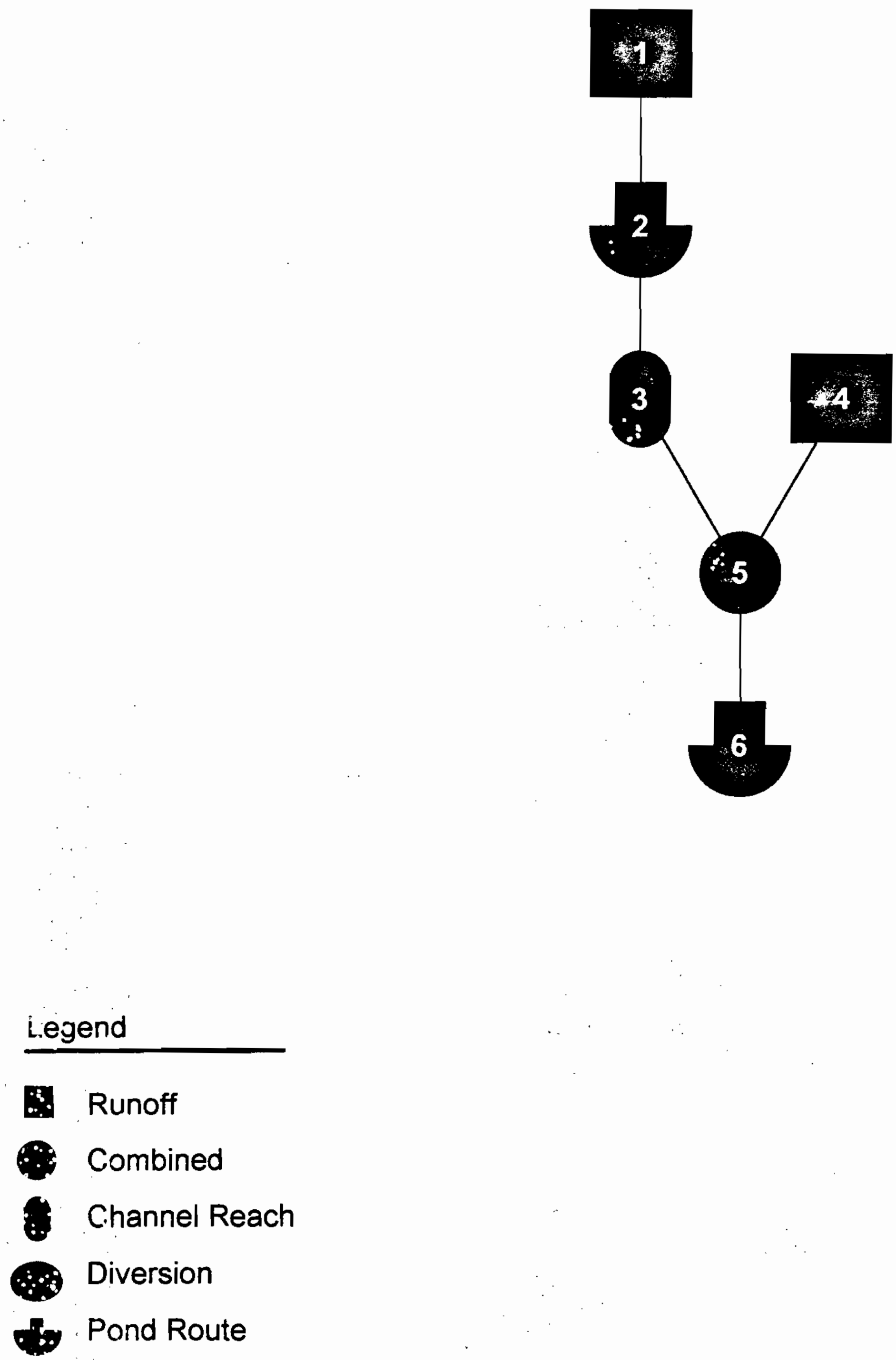
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

Existing 50-year Storm



Project: ETE50EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	41.14	3	717	92,917	50	——	——	——	Ex. S. Pond In
2	Reservoir	3.89	3	750	92,917	50	1	1672.42	45,063	Ex. S. Pond Out
3	Reach	3.89	3	753	92,802	50	2	——	——	S. to N. Pond Ch.
4	SCS Runoff	50.96	3	726	166,836	50	——	——	——	Ex. N. Pond In
5	Combine	54.24	3	726	259,638	50	3 + 4	——	——	Ex. N. Pond In
6	Reservoir	41.39	3	732	259,638	50	5	1639.22	38,895	Ex. N. Pond Out

Proj. file: ETE50EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 41.14 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 4.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 92,917 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.85	22.74
11.90	32.52
11.95	41.14 <<
12.00	39.70
12.05	27.88

...End

TR55 Tc Worksheet

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 50 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 3.89 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.42 ft	Max. Storage	= 45,063 cuft

Storage Indication method used.

Total Volume = 92,917 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
11.95	41.14 <<	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.24
12.00	39.70	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.83
12.05	27.88	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.31
12.10	15.40	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.59
12.15	8.36	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.72
12.20	6.27	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.77
12.25	5.90	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.81
12.30	5.51	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.84
12.35	5.12	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.86
12.40	4.73	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.88
12.45	4.33	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.89
12.50	3.93	1672.42 <<	-----	-----	-----	-----	-----	-----	-----	-----	3.89 <<
12.55	3.55	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.89
12.60	3.27	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.88
12.65	3.10	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.87
12.70	2.99	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.86
12.75	2.90	1672.42	-----	-----	-----	-----	-----	-----	-----	-----	3.84
12.80	2.81	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.83
12.85	2.71	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.81
12.90	2.62	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.79
12.95	2.53	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.77
13.00	2.44	1672.41	-----	-----	-----	-----	-----	-----	-----	-----	3.75
13.05	2.35	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.73
13.10	2.27	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.71
13.15	2.21	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.69
13.20	2.16	1672.40	-----	-----	-----	-----	-----	-----	-----	-----	3.67
13.25	2.11	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.64
13.30	2.06	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.62
13.35	2.01	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.59
13.40	1.96	1672.39	-----	-----	-----	-----	-----	-----	-----	-----	3.57
13.45	1.91	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.54
13.50	1.86	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.52
13.55	1.81	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.49
13.60	1.76	1672.38	-----	-----	-----	-----	-----	-----	-----	-----	3.47
13.65	1.72	1672.37	-----	-----	-----	-----	-----	-----	-----	-----	3.44
13.70	1.69	1672.37	-----	-----	-----	-----	-----	-----	-----	-----	3.41

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.75	1.65	1672.37	-----	-----	-----	-----	-----	-----	-----	-----	3.39
13.80	1.62	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.36
13.85	1.58	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.33
13.90	1.54	1672.36	-----	-----	-----	-----	-----	-----	-----	-----	3.30
13.95	1.51	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.28
14.00	1.47	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.25
14.05	1.43	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.22
14.10	1.41	1672.35	-----	-----	-----	-----	-----	-----	-----	-----	3.19
14.15	1.39	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.17
14.20	1.37	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.14
14.25	1.36	1672.34	-----	-----	-----	-----	-----	-----	-----	-----	3.11
14.30	1.35	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.08
14.35	1.34	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.06
14.40	1.32	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.03
14.45	1.31	1672.33	-----	-----	-----	-----	-----	-----	-----	-----	3.00
14.50	1.30	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.98
14.55	1.29	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.95
14.60	1.27	1672.32	-----	-----	-----	-----	-----	-----	-----	-----	2.93
14.65	1.26	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.90
14.70	1.25	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.88
14.75	1.24	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.85
14.80	1.22	1672.31	-----	-----	-----	-----	-----	-----	-----	-----	2.83
14.85	1.21	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.80
14.90	1.20	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.78
14.95	1.19	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.75
15.00	1.17	1672.30	-----	-----	-----	-----	-----	-----	-----	-----	2.73
15.05	1.16	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.70
15.10	1.15	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.68
15.15	1.13	1672.29	-----	-----	-----	-----	-----	-----	-----	-----	2.66
15.20	1.12	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.63
15.25	1.11	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.61
15.30	1.10	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.59
15.35	1.08	1672.28	-----	-----	-----	-----	-----	-----	-----	-----	2.56
15.40	1.07	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.54
15.45	1.06	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.52
15.50	1.04	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.49
15.55	1.03	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.47
15.60	1.02	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.45
15.65	1.00	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.43
15.70	0.99	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.41
15.75	0.98	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.38
15.80	0.97	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.36
15.85	0.95	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.34
15.90	0.94	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.32
15.95	0.93	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.30
16.00	0.91	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.28
16.05	0.90	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.25
16.10	0.89	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.23
16.15	0.88	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.21

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.20	0.88	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.19
16.25	0.87	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.17
16.30	0.87	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.15
16.35	0.87	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.13
16.40	0.86	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.11
16.45	0.86	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.09
16.50	0.85	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.07
16.55	0.85	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.06
16.60	0.84	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.04
16.65	0.84	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.02
16.70	0.83	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.00
16.75	0.83	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.98
16.80	0.82	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.96
16.85	0.82	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.95

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.62
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 3.89 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 9.02 ft/s	Routing coeff.	= 0.9486

Modified Att-Kin routing method used. Total Volume = 92,802 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	2.83	2.21
12.05	3.31	2.80
12.10	3.59	3.28
12.15	3.72	3.57
12.20	3.77	3.71
12.25	3.81	3.77
12.30	3.84	3.80
12.35	3.86	3.83
12.40	3.88	3.86
12.45	3.89	3.87
12.50	3.89 <<	3.88
12.55	3.89	3.89 <<
12.60	3.88	3.89
12.65	3.87	3.88
12.70	3.86	3.87
12.75	3.84	3.86
12.80	3.83	3.84
12.85	3.81	3.83
12.90	3.79	3.81
12.95	3.77	3.79
13.00	3.75	3.77
13.05	3.73	3.76
13.10	3.71	3.73
13.15	3.69	3.71
13.20	3.67	3.69
13.25	3.64	3.67
13.30	3.62	3.64
13.35	3.59	3.62
13.40	3.57	3.59
13.45	3.54	3.57
13.50	3.52	3.54
13.55	3.49	3.52

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.60	3.47	3.49
13.65	3.44	3.47
13.70	3.41	3.44
13.75	3.39	3.41
13.80	3.36	3.39
13.85	3.33	3.36
13.90	3.30	3.33
13.95	3.28	3.31
14.00	3.25	3.28
14.05	3.22	3.25
14.10	3.19	3.22
14.15	3.17	3.20
14.20	3.14	3.17
14.25	3.11	3.14
14.30	3.08	3.11
14.35	3.06	3.09
14.40	3.03	3.06
14.45	3.00	3.03
14.50	2.98	3.01
14.55	2.95	2.98
14.60	2.93	2.95
14.65	2.90	2.93
14.70	2.88	2.90
14.75	2.85	2.88
14.80	2.83	2.85
14.85	2.80	2.83
14.90	2.78	2.80
14.95	2.75	2.78
15.00	2.73	2.75
15.05	2.70	2.73
15.10	2.68	2.70
15.15	2.66	2.68
15.20	2.63	2.66
15.25	2.61	2.63
15.30	2.59	2.61
15.35	2.56	2.59
15.40	2.54	2.56
15.45	2.52	2.54
15.50	2.49	2.52
15.55	2.47	2.50
15.60	2.45	2.47
15.65	2.43	2.45
15.70	2.41	2.43
15.75	2.38	2.41
15.80	2.36	2.38
15.85	2.34	2.36
15.90	2.32	2.34
15.95	2.30	2.32
16.00	2.28	2.30

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.05	2.25	2.28
16.10	2.23	2.26
16.15	2.21	2.23
16.20	2.19	2.21
16.25	2.17	2.19
16.30	2.15	2.17
16.35	2.13	2.15
16.40	2.11	2.13
16.45	2.09	2.11
16.50	2.07	2.09
16.55	2.06	2.08
16.60	2.04	2.06
16.65	2.02	2.04
16.70	2.00	2.02
16.75	1.98	2.00
16.80	1.96	1.98
16.85	1.95	1.97
16.90	1.93	1.95

...End

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 50.96 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 166,836 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	35.30
12.00	44.78
12.05	50.65
12.10	50.96 <<
12.15	46.02
12.20	39.14
12.25	32.26
12.30	25.56

...End

TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 50 yrs

Sheet Flow		
Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**
Shallow Concentrated Flow		
Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**
Channel Flow		
Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**
Total Travel Time, Tc		**= 15.8 min**

Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type = Combine
Storm frequency = 50 yrs
1st inflow hyd. No. = 3

Peak discharge = 54.24 cfs
Time interval = 3 min
2nd inflow hyd. No. = 4

Total Volume = 259,638 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
11.95	1.68		35.30		36.98
12.00	2.21		44.78		46.99
12.05	2.80		50.65		53.44
12.10	3.28		50.96 <<		54.24 <<
12.15	3.57		46.02		49.59
12.20	3.71		39.14		42.85
12.25	3.77		32.26		36.03
12.30	3.80		25.56		29.37

...End

Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	=	Reservoir	Peak discharge	=	41.39 cfs
Storm frequency	=	50 yrs	Time interval	=	3 min
Inflow hyd. No.	=	5	Reservoir name	=	Existing North
Max. Elevation	=	1639.22 ft	Max. Storage	=	38,895 cuft

Storage Indication method used.

Total Volume = 259,638 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.10	54.24 <<	1639.10	-----	-----	-----	-----	-----	-----	-----	-----	30.73
12.15	49.59	1639.19	-----	-----	-----	-----	-----	-----	-----	-----	38.56
12.20	42.85	1639.22 <<	-----	-----	-----	-----	-----	-----	-----	-----	41.39 <<
12.25	36.03	1639.21	-----	-----	-----	-----	-----	-----	-----	-----	40.67
12.30	29.37	1639.18	-----	-----	-----	-----	-----	-----	-----	-----	37.72
12.35	23.24	1639.13	-----	-----	-----	-----	-----	-----	-----	-----	33.50
12.40	18.23	1639.07	-----	-----	-----	-----	-----	-----	-----	-----	28.78
12.45	15.08	1639.02	-----	-----	-----	-----	-----	-----	-----	-----	24.30
12.50	13.71	1638.98	-----	-----	-----	-----	-----	-----	-----	-----	21.45

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

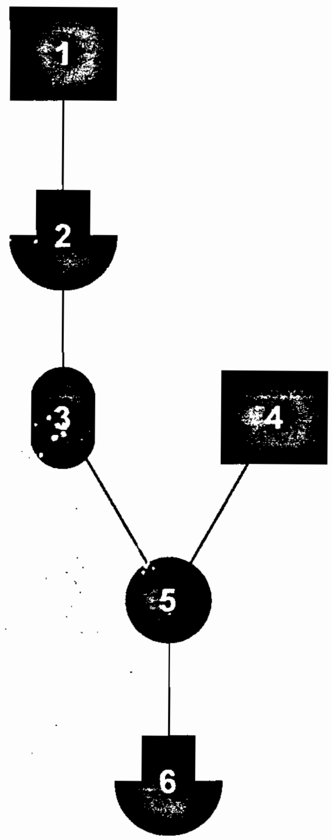
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

Existing 10-year Storm



Legend

- Runoff
- Combined
- Channel Reach
- Diversion
- Pond Route

Project: ETE10EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	27.71	3	717	62,605	10	—	——	——	Ex. S. Pond In
2	Reservoir	2.54	3	753	62,605	10	1	1672.28	29,437	Ex. S. Pond Out
3	Reach	2.54	3	756	62,489	10	2	——	——	S. to N. Pond Ch.
4	SCS Runoff	30.61	3	726	103,440	10	—	——	——	Ex. N. Pond In
5	Combine	32.66	3	726	165,929	10	3 + 4	——	——	Ex. N. Pond In
6	Reservoir	18.81	3	738	165,928	10	5	1638.91	28,284	Ex. N. Pond Out

Proj. file: ETE10EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 27.71 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 62,605 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.85	14.65
11.90	21.47
11.95	27.71 <<
12.00	27.13
12.05	19.24

...End

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 10 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 2.54 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.28 ft	Max. Storage	= 29,437 cuft

Storage Indication method used. Total Volume = 62,605 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
11.95	27.71 <<	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.37
12.00	27.13	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.77
12.05	19.24	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.10
12.10	10.72	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.30
12.15	5.86	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.39
12.20	4.41	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.44
12.25	4.15	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.46
12.30	3.88	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.49
12.35	3.61	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.51
12.40	3.34	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.52
12.45	3.06	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.53
12.50	2.78	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.54
12.55	2.52	1672.28 <<	-----	-----	-----	-----	-----	-----	-----	-----	2.54 <<
12.60	2.32	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.54
12.65	2.20	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.53
12.70	2.12	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.53
12.75	2.06	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.52
12.80	1.99	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.51
12.85	1.93	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.51
12.90	1.87	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.50
12.95	1.80	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.49
13.00	1.74	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.48
13.05	1.67	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.46
13.10	1.62	1672.27	-----	-----	-----	-----	-----	-----	-----	-----	2.45
13.15	1.58	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.44
13.20	1.54	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.42
13.25	1.51	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.41
13.30	1.47	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.40
13.35	1.44	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.38
13.40	1.40	1672.26	-----	-----	-----	-----	-----	-----	-----	-----	2.37
13.45	1.37	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.35
13.50	1.33	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.34
13.55	1.29	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.32
13.60	1.26	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.30
13.65	1.24	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.29
13.70	1.21	1672.25	-----	-----	-----	-----	-----	-----	-----	-----	2.27

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.75	1.18	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.25
13.80	1.16	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.24
13.85	1.13	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.22
13.90	1.11	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.20
13.95	1.08	1672.24	-----	-----	-----	-----	-----	-----	-----	-----	2.19
14.00	1.05	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.17
14.05	1.03	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.15
14.10	1.01	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.13
14.15	1.00	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.12
14.20	0.99	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.10
14.25	0.98	1672.23	-----	-----	-----	-----	-----	-----	-----	-----	2.08
14.30	0.97	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.07
14.35	0.96	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.05
14.40	0.95	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.03
14.45	0.94	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.02
14.50	0.93	1672.22	-----	-----	-----	-----	-----	-----	-----	-----	2.00
14.55	0.93	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.98
14.60	0.92	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.97
14.65	0.91	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.95
14.70	0.90	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.93
14.75	0.89	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.92
14.80	0.88	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.90
14.85	0.87	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.89
14.90	0.86	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.87
14.95	0.85	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.85
15.00	0.85	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.84
15.05	0.84	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.82
15.10	0.83	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.81
15.15	0.82	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.79
15.20	0.81	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.78
15.25	0.80	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.76
15.30	0.79	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.75
15.35	0.78	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.73
15.40	0.77	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.72
15.45	0.76	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.70
15.50	0.75	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.69
15.55	0.74	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.67
15.60	0.74	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.66
15.65	0.73	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.65
15.70	0.72	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.63
15.75	0.71	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.62
15.80	0.70	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.60
15.85	0.69	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.59
15.90	0.68	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.58
15.95	0.67	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.56
16.00	0.66	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.55
16.05	0.65	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.53
16.10	0.64	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.52
16.15	0.64	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.51

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.20	0.64	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.49
16.25	0.63	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.48
16.30	0.63	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.47
16.35	0.63	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.45
16.40	0.62	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.44
16.45	0.62	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.43
16.50	0.62	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.42
16.55	0.61	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.40
16.60	0.61	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.39
16.65	0.61	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.38
16.70	0.60	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.37
16.75	0.60	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.36
16.80	0.60	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.34
16.85	0.59	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.33
16.90	0.59	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.32
16.95	0.59	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.31
17.00	0.58	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.30
17.05	0.58	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.29
17.10	0.58	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.28

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.32
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 2.54 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 7.91 ft/s	Routing coeff.	= 0.8833

Modified Att-Kin routing method used.

Total Volume = 62,489 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	1.77	1.32
12.05	2.10	1.72
12.10	2.30	2.06
12.15	2.39	2.27
12.20	2.44	2.38
12.25	2.46	2.43
12.30	2.49	2.46
12.35	2.51	2.48
12.40	2.52	2.50
12.45	2.53	2.52
12.50	2.54	2.53
12.55	2.54 <<	2.54
12.60	2.54	2.54 <<
12.65	2.53	2.54
12.70	2.53	2.53
12.75	2.52	2.53
12.80	2.51	2.52
12.85	2.51	2.52
12.90	2.50	2.51
12.95	2.49	2.50
13.00	2.48	2.49
13.05	2.46	2.48
13.10	2.45	2.46
13.15	2.44	2.45
13.20	2.42	2.44
13.25	2.41	2.43
13.30	2.40	2.41
13.35	2.38	2.40
13.40	2.37	2.38
13.45	2.35	2.37
13.50	2.34	2.35
13.55	2.32	2.34

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.60	2.30	2.32
13.65	2.29	2.31
13.70	2.27	2.29
13.75	2.25	2.27
13.80	2.24	2.26
13.85	2.22	2.24
13.90	2.20	2.22
13.95	2.19	2.21
14.00	2.17	2.19
14.05	2.15	2.17
14.10	2.13	2.15
14.15	2.12	2.14
14.20	2.10	2.12
14.25	2.08	2.10
14.30	2.07	2.09
14.35	2.05	2.07
14.40	2.03	2.05
14.45	2.02	2.03
14.50	2.00	2.02
14.55	1.98	2.00
14.60	1.97	1.98
14.65	1.95	1.97
14.70	1.93	1.95
14.75	1.92	1.94
14.80	1.90	1.92
14.85	1.89	1.90
14.90	1.87	1.89
14.95	1.85	1.87
15.00	1.84	1.86
15.05	1.82	1.84
15.10	1.81	1.83
15.15	1.79	1.81
15.20	1.78	1.80
15.25	1.76	1.78
15.30	1.75	1.77
15.35	1.73	1.75
15.40	1.72	1.74
15.45	1.70	1.72
15.50	1.69	1.71
15.55	1.67	1.69
15.60	1.66	1.68
15.65	1.65	1.66
15.70	1.63	1.65
15.75	1.62	1.63
15.80	1.60	1.62
15.85	1.59	1.61
15.90	1.58	1.59
15.95	1.56	1.58
16.00	1.55	1.56

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.05	1.53	1.55
16.10	1.52	1.54
16.15	1.51	1.52
16.20	1.49	1.51
16.25	1.48	1.50
16.30	1.47	1.48
16.35	1.45	1.47
16.40	1.44	1.46
16.45	1.43	1.44
16.50	1.42	1.43
16.55	1.40	1.42
16.60	1.39	1.41
16.65	1.38	1.39
16.70	1.37	1.38
16.75	1.36	1.37
16.80	1.34	1.36
16.85	1.33	1.35
16.90	1.32	1.33
16.95	1.31	1.32
17.00	1.30	1.31
17.05	1.29	1.30
17.10	1.28	1.29
17.15	1.27	1.28

...End

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 30.61 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 103,440 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	19.70
12.00	25.82
12.05	29.90
12.10	30.61 <<
12.15	27.98
12.20	24.06
12.25	20.05
12.30	16.09

...End

TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 10 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... = 15.8 min

Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 32.66 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 3	2nd inflow hyd. No.	= 4

Total Volume = 165,929 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
11.95	0.97		19.70		20.67
12.00	1.32		25.82		27.15
12.05	1.72		29.90		31.62
12.10	2.06		30.61 <<		32.66 <<
12.15	2.27		27.98		30.25
12.20	2.38		24.06		26.44
12.25	2.43		20.05		22.48
12.30	2.46		16.09		18.55

...End

Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 18.81 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyd. No.	= 5	Reservoir name	= Existing North
Max. Elevation	= 1638.91 ft	Max. Storage	= 28,284 cuft

Storage Indication method used.

Total Volume = 165,928 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.10	32.66 <<	1638.68	-----	-----	-----	-----	-----	-----	-----	-----	10.51
12.15	30.25	1638.79	-----	-----	-----	-----	-----	-----	-----	-----	14.43
12.20	26.44	1638.86	-----	-----	-----	-----	-----	-----	-----	-----	17.03
12.25	22.48	1638.90	-----	-----	-----	-----	-----	-----	-----	-----	18.42
12.30	18.55	1638.91 <<	-----	-----	-----	-----	-----	-----	-----	-----	18.81 <<
12.35	14.86	1638.90	-----	-----	-----	-----	-----	-----	-----	-----	18.42
12.40	11.78	1638.87	-----	-----	-----	-----	-----	-----	-----	-----	17.46
12.45	9.80	1638.84	-----	-----	-----	-----	-----	-----	-----	-----	16.22
12.50	8.94	1638.80	-----	-----	-----	-----	-----	-----	-----	-----	14.94
12.55	8.47	1638.77	-----	-----	-----	-----	-----	-----	-----	-----	13.77
12.60	8.02	1638.74	-----	-----	-----	-----	-----	-----	-----	-----	12.74
12.65	7.60	1638.72	-----	-----	-----	-----	-----	-----	-----	-----	11.82
12.70	7.24	1638.70	-----	-----	-----	-----	-----	-----	-----	-----	11.00
12.75	6.94	1638.68	-----	-----	-----	-----	-----	-----	-----	-----	10.27
12.80	6.60	1638.66	-----	-----	-----	-----	-----	-----	-----	-----	9.62

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

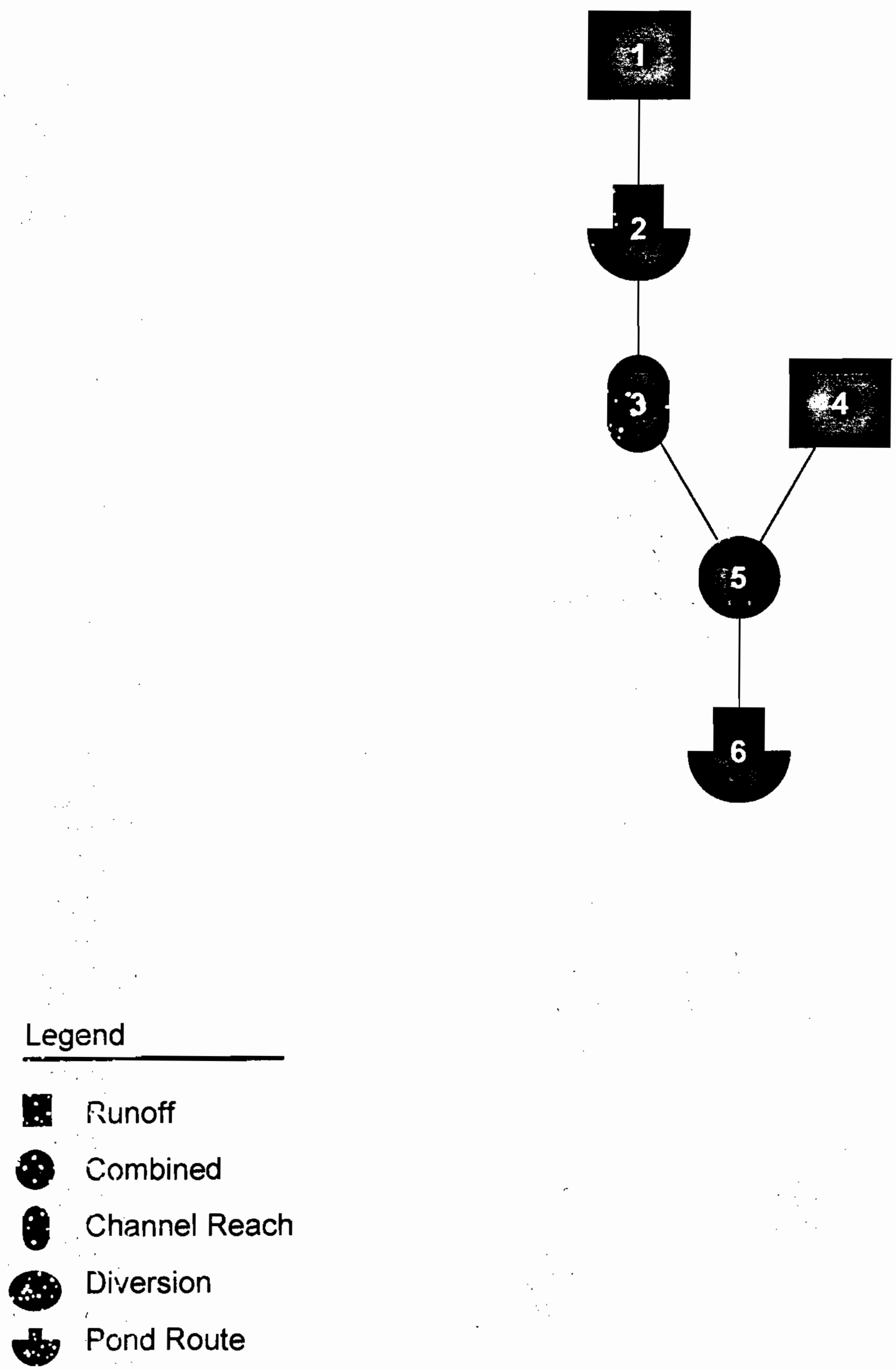
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

Existing 5-year Storm



Project: ETE05EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	21.28	3	717	48,356	5	—	—	—	Ex. S. Pond In
2	Reservoir	1.91	3	756	48,356	5	1	1672.21	22,164	Ex. S. Pond Out
3	Reach	1.91	3	759	48,239	5	2	—	—	S. to N. Pond Ch.
4	SCS Runoff	21.38	3	726	75,078	5	—	—	—	Ex. N. Pond In
5	Combine	22.88	3	726	123,317	5	3 + 4	—	—	Ex. N. Pond In
6	Reservoir	11.35	3	741	123,317	5	5	1638.71	21,768	Ex. N. Pond Out

Proj. file: ETE05EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 21.28 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 48,356 cuft

Hydrograph Discharge Table

Time -- Outflow (hrs	cfs)
11.85	10.86
11.90	16.23
11.95	21.28 <<
12.00	21.06
12.05	15.05

...End

TR55 Tc Worksheet

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 5 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 1.91 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.21 ft	Max. Storage	= 22,164 cuft

Storage Indication method used.

Total Volume = 48,356 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
11.95	21.28 <<	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.98
12.00	21.06	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.29
12.05	15.05	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.55
12.10	8.44	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.71
12.15	4.63	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.78
12.20	3.49	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.82
12.25	3.29	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.84
12.30	3.09	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.86
12.35	2.87	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.88
12.40	2.66	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.89
12.45	2.44	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.90
12.50	2.22	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.91
12.55	2.01	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.91
12.60	1.85	1672.21 <<	-----	-----	-----	-----	-----	-----	-----	-----	1.91 <<
12.65	1.76	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.91
12.70	1.69	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.91
12.75	1.65	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.90
12.80	1.60	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.90
12.85	1.55	1672.21	-----	-----	-----	-----	-----	-----	-----	-----	1.90
12.90	1.49	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.89
12.95	1.44	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.88
13.00	1.39	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.88
13.05	1.34	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.87
13.10	1.30	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.86
13.15	1.27	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.85
13.20	1.24	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.84
13.25	1.21	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.83
13.30	1.18	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.82
13.35	1.15	1672.20	-----	-----	-----	-----	-----	-----	-----	-----	1.81
13.40	1.13	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.80
13.45	1.10	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.79
13.50	1.07	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.78
13.55	1.04	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.77
13.60	1.02	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.76
13.65	0.99	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.75
13.70	0.97	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.73

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.75	0.95	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.72
13.80	0.93	1672.19	-----	-----	-----	-----	-----	-----	-----	-----	1.71
13.85	0.91	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.70
13.90	0.89	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.69
13.95	0.87	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.67
14.00	0.85	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.66
14.05	0.83	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.65
14.10	0.81	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.64
14.15	0.80	1672.18	-----	-----	-----	-----	-----	-----	-----	-----	1.62
14.20	0.80	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.61
14.25	0.79	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.60
14.30	0.78	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.58
14.35	0.77	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.57
14.40	0.77	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.56
14.45	0.76	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.55
14.50	0.75	1672.17	-----	-----	-----	-----	-----	-----	-----	-----	1.54
14.55	0.75	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.52
14.60	0.74	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.51
14.65	0.73	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.50
14.70	0.73	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.49
14.75	0.72	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.48
14.80	0.71	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.46
14.85	0.70	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.45
14.90	0.70	1672.16	-----	-----	-----	-----	-----	-----	-----	-----	1.44
14.95	0.69	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.43
15.00	0.68	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.42
15.05	0.68	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.41
15.10	0.67	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.40
15.15	0.66	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.38
15.20	0.65	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.37
15.25	0.65	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.36
15.30	0.64	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.35
15.35	0.63	1672.15	-----	-----	-----	-----	-----	-----	-----	-----	1.34
15.40	0.62	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.33
15.45	0.62	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.32
15.50	0.61	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.31
15.55	0.60	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.30
15.60	0.59	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.29
15.65	0.59	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.27
15.70	0.58	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.26
15.75	0.57	1672.14	-----	-----	-----	-----	-----	-----	-----	-----	1.25
15.80	0.56	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.24
15.85	0.56	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.23
15.90	0.55	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.22
15.95	0.54	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.21
16.00	0.53	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.20
16.05	0.53	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.19
16.10	0.52	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.18
16.15	0.52	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.17

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.20	0.52	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.16
16.25	0.51	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.15
16.30	0.51	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.14
16.35	0.51	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.13
16.40	0.50	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.12
16.45	0.50	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.11
16.50	0.50	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.10
16.55	0.50	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.09
16.60	0.49	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.08
16.65	0.49	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.07
16.70	0.49	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.07
16.75	0.49	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.06
16.80	0.48	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.05
16.85	0.48	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.04
16.90	0.48	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.03
16.95	0.48	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.02
17.00	0.47	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.01
17.05	0.47	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.00
17.10	0.47	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.00
17.15	0.47	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.99
17.20	0.46	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.98
17.25	0.46	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.97
17.30	0.46	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.96
17.35	0.46	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.96

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.62
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 1.91 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 7.26 ft/s	Routing coeff.	= 0.8411

Modified Att-Kin routing method used.

Total Volume = 48,239 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.05	1.55	1.23
12.10	1.71	1.50
12.15	1.78	1.67
12.20	1.82	1.76
12.25	1.84	1.81
12.30	1.86	1.84
12.35	1.88	1.86
12.40	1.89	1.88
12.45	1.90	1.89
12.50	1.91	1.90
12.55	1.91	1.91
12.60	1.91 <<	1.91
12.65	1.91	1.91 <<
12.70	1.91	1.91
12.75	1.90	1.91
12.80	1.90	1.91
12.85	1.90	1.90
12.90	1.89	1.90
12.95	1.88	1.89
13.00	1.88	1.88
13.05	1.87	1.88
13.10	1.86	1.87
13.15	1.85	1.86
13.20	1.84	1.85
13.25	1.83	1.84
13.30	1.82	1.83
13.35	1.81	1.82
13.40	1.80	1.81
13.45	1.79	1.80
13.50	1.78	1.79
13.55	1.77	1.78
13.60	1.76	1.77

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.65	1.75	1.76
13.70	1.73	1.75
13.75	1.72	1.74
13.80	1.71	1.72
13.85	1.70	1.71
13.90	1.69	1.70
13.95	1.67	1.69
14.00	1.66	1.68
14.05	1.65	1.66
14.10	1.64	1.65
14.15	1.62	1.64
14.20	1.61	1.62
14.25	1.60	1.61
14.30	1.58	1.60
14.35	1.57	1.59
14.40	1.56	1.57
14.45	1.55	1.56
14.50	1.54	1.55
14.55	1.52	1.54
14.60	1.51	1.53
14.65	1.50	1.51
14.70	1.49	1.50
14.75	1.48	1.49
14.80	1.46	1.48
14.85	1.45	1.47
14.90	1.44	1.45
14.95	1.43	1.44
15.00	1.42	1.43
15.05	1.41	1.42
15.10	1.40	1.41
15.15	1.38	1.40
15.20	1.37	1.39
15.25	1.36	1.37
15.30	1.35	1.36
15.35	1.34	1.35
15.40	1.33	1.34
15.45	1.32	1.33
15.50	1.31	1.32
15.55	1.30	1.31
15.60	1.29	1.30
15.65	1.27	1.29
15.70	1.26	1.28
15.75	1.25	1.27
15.80	1.24	1.26
15.85	1.23	1.24
15.90	1.22	1.23
15.95	1.21	1.22
16.00	1.20	1.21
16.05	1.19	1.20

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.10	1.18	1.19
16.15	1.17	1.18
16.20	1.16	1.17
16.25	1.15	1.16
16.30	1.14	1.15
16.35	1.13	1.14
16.40	1.12	1.13
16.45	1.11	1.12
16.50	1.10	1.11
16.55	1.09	1.10
16.60	1.08	1.09
16.65	1.07	1.09
16.70	1.07	1.08
16.75	1.06	1.07
16.80	1.05	1.06
16.85	1.04	1.05
16.90	1.03	1.04
16.95	1.02	1.03
17.00	1.01	1.02
17.05	1.00	1.01
17.10	1.00	1.01
17.15	0.99	1.00
17.20	0.98	0.99
17.25	0.97	0.98
17.30	0.96	0.97
17.35	0.96	0.97
17.40	0.95	0.96

...End

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 21.38 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 75,078 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	12.81
12.00	17.36
12.05	20.55
12.10	21.38 <<
12.15	19.76
12.20	17.15
12.25	14.44
12.30	11.70

...End

TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 5 yrs

Sheet Flow

Manning's n-value	= 0.130
Flow length	= 100.0 ft
Two-year 24-hr precip.	= 2.50 in
Land slope	= 3.0 %

Travel Time .... = 8.4 min

Shallow Concentrated Flow

Flow length	= 1150 ft
Watercourse slope	= 4.0 %
Surface description	= Unpaved
Average velocity	= 3.23 ft/s

Travel Time .... = 5.9 min

Channel Flow

Cross section flow area	= 12.0 sqft
Wetted perimeter	= 12.6 ft
Channel slope	= 4.0 %
Manning's n-value	= 0.045
Velocity	= 6.39 ft/s
Flow length	= 550.0 ft

Travel Time .... = 1.4 min

Total Travel Time, Tc .... = 15.8 min

Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 22.88 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 3	2nd inflow hyd. No.	= 4

Total Volume = 123,317 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
11.95	0.67		12.81		13.47
12.00	0.93		17.36		18.29
12.05	1.23		20.55		21.79
12.10	1.50		21.38 <<		22.88 <<
12.15	1.67		19.76		21.43
12.20	1.76		17.15		18.92
12.25	1.81		14.44		16.25
12.30	1.84		11.70		13.54

...End

Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 11.35 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Inflow hyd. No.	= 5	Reservoir name	= Existing North
Max. Elevation	= 1638.71 ft	Max. Storage	= 21,768 cuft

Storage Indication method used.

Total Volume = 123,317 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.15	21.43	1638.56	-----	-----	-----	-----	-----	-----	-----	-----	5.94
12.20	18.92	1638.63	-----	-----	-----	-----	-----	-----	-----	-----	8.60
12.25	16.25	1638.68	-----	-----	-----	-----	-----	-----	-----	-----	10.28
12.30	13.54	1638.70	-----	-----	-----	-----	-----	-----	-----	-----	11.14
12.35	10.95	1638.71 <<	-----	-----	-----	-----	-----	-----	-----	-----	11.35 <<
12.40	8.76	1638.70	-----	-----	-----	-----	-----	-----	-----	-----	11.07
12.45	7.33	1638.68	-----	-----	-----	-----	-----	-----	-----	-----	10.50
12.50	6.70	1638.67	-----	-----	-----	-----	-----	-----	-----	-----	9.85
12.55	6.36	1638.65	-----	-----	-----	-----	-----	-----	-----	-----	9.23
12.60	6.03	1638.63	-----	-----	-----	-----	-----	-----	-----	-----	8.66
12.65	5.72	1638.62	-----	-----	-----	-----	-----	-----	-----	-----	8.14
12.70	5.45	1638.61	-----	-----	-----	-----	-----	-----	-----	-----	7.66
12.75	5.23	1638.60	-----	-----	-----	-----	-----	-----	-----	-----	7.23
12.80	5.05	1638.59	-----	-----	-----	-----	-----	-----	-----	-----	6.84
12.85	4.90	1638.58	-----	-----	-----	-----	-----	-----	-----	-----	6.49
12.90	4.78	1638.57	-----	-----	-----	-----	-----	-----	-----	-----	6.18
12.95	4.68	1638.56	-----	-----	-----	-----	-----	-----	-----	-----	5.91

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

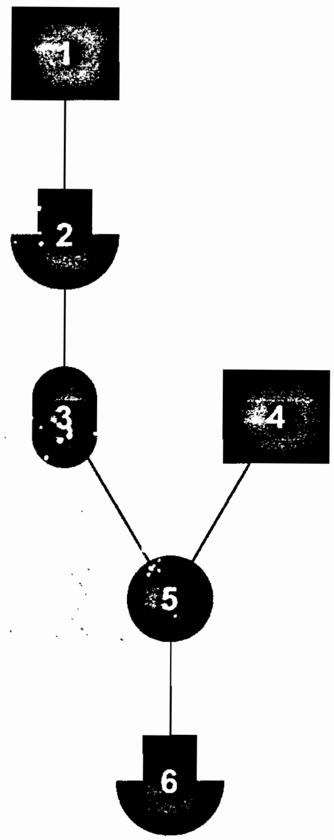
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

Existing 2-year Storm



Legend

- Runoff
- Combined
- Channel Reach
- Diversion
- Pond Route

Project: ETE02EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.13	3	720	32,428	2	—	—	—	Ex. S. Pond In
2	Reservoir	1.22	3	759	32,428	2	1	1672.13	14,170	Ex. S. Pond Out
3	Reach	1.22	3	765	32,312	2	2	—	—	S. to N. Pond Ch.
4	SCS Runoff	11.50	3	726	45,046	2	—	—	—	Ex. N. Pond In
5	Combine	12.40	3	726	77,359	2	3 + 4	—	—	Ex. N. Pond In
6	Reservoir	3.48	3	762	77,359	2	5	1638.48	14,333	Ex. N. Pond Out

Proj. file: ETE02EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 14.13 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 32,428 cuft

Hydrograph Discharge Table

Time -- Outflow (hrs	cfs)
11.90	10.36
11.95	14.00
12.00	14.13 <<
12.05	10.23

...End

TR55 Tc Worksheet

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 2 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 1.22 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.13 ft	Max. Storage	= 14,170 cuft

Storage Indication method used. Total Volume = 32,428 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.00	14.13 <<	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.77
12.05	10.23	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.95
12.10	5.80	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.06
12.15	3.21	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.11
12.20	2.43	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.14
12.25	2.30	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.16
12.30	2.16	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.17
12.35	2.01	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.19
12.40	1.87	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.20
12.45	1.71	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.21
12.50	1.56	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.55	1.41	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.60	1.31	1672.13 <<	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.65	1.24	1672.13 <<	-----	-----	-----	-----	-----	-----	-----	-----	1.22 <<
12.70	1.20	1672.13 <<	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.75	1.16	1672.13 <<	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.80	1.13	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.85	1.09	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.90	1.06	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.22
12.95	1.02	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.21
13.00	0.99	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.21
13.05	0.95	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.21
13.10	0.92	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.20
13.15	0.90	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.20
13.20	0.88	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.19
13.25	0.86	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.19
13.30	0.84	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.18
13.35	0.82	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.18
13.40	0.80	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.17
13.45	0.78	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.17
13.50	0.76	1672.13	-----	-----	-----	-----	-----	-----	-----	-----	1.16
13.55	0.74	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.15
13.60	0.72	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.15
13.65	0.71	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.14
13.70	0.69	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.13
13.75	0.68	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.13

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.80	0.67	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.12
13.85	0.65	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.11
13.90	0.64	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.11
13.95	0.62	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.10
14.00	0.61	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.09
14.05	0.59	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.08
14.10	0.58	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.08
14.15	0.58	1672.12	-----	-----	-----	-----	-----	-----	-----	-----	1.07
14.20	0.57	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.06
14.25	0.57	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.05
14.30	0.56	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.05
14.35	0.56	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.04
14.40	0.55	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.03
14.45	0.55	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.02
14.50	0.54	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.02
14.55	0.54	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.01
14.60	0.53	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	1.00
14.65	0.53	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.99
14.70	0.52	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.99
14.75	0.52	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.98
14.80	0.51	1672.11	-----	-----	-----	-----	-----	-----	-----	-----	0.97
14.85	0.51	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.97
14.90	0.50	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.96
14.95	0.50	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.95
15.00	0.49	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.94
15.05	0.49	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.94
15.10	0.48	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.93
15.15	0.48	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.92
15.20	0.47	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.92
15.25	0.47	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
15.30	0.46	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
15.35	0.46	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
15.40	0.45	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.89
15.45	0.44	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.88
15.50	0.44	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.88
15.55	0.43	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.87
15.60	0.43	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.86
15.65	0.42	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.85
15.70	0.42	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.85
15.75	0.41	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.84
15.80	0.41	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.83
15.85	0.40	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.83
15.90	0.40	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.82
15.95	0.39	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.82
16.00	0.39	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.81
16.05	0.38	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.80
16.10	0.38	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.80
16.15	0.37	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.79
16.20	0.37	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.78

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.25	0.37	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.78
16.30	0.37	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.77
16.35	0.37	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.76
16.40	0.37	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.76
16.45	0.36	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.75
16.50	0.36	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.75
16.55	0.36	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.74
16.60	0.36	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.73
16.65	0.36	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.73
16.70	0.35	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.72
16.75	0.35	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.72
16.80	0.35	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.71
16.85	0.35	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.71
16.90	0.35	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.70
16.95	0.35	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.69
17.00	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.69
17.05	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.68
17.10	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.68
17.15	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.67
17.20	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.67
17.25	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.66
17.30	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.66
17.35	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.65
17.40	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.65
17.45	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.64
17.50	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.64
17.55	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.63
17.60	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.63
17.65	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.62
17.70	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.62
17.75	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.61

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.62
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 1.22 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 6.35 ft/s	Routing coeff.	= 0.7770

Modified Att-Kin routing method used.

Total Volume = 32,312 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.05	0.95	0.72
12.10	1.06	0.90
12.15	1.11	1.02
12.20	1.14	1.09
12.25	1.16	1.13
12.30	1.17	1.15
12.35	1.19	1.17
12.40	1.20	1.18
12.45	1.21	1.20
12.50	1.22	1.21
12.55	1.22	1.21
12.60	1.22	1.22
12.65	1.22 <<	1.22
12.70	1.22	1.22
12.75	1.22	1.22 <<
12.80	1.22	1.22
12.85	1.22	1.22
12.90	1.22	1.22
12.95	1.21	1.22
13.00	1.21	1.22
13.05	1.21	1.21
13.10	1.20	1.21
13.15	1.20	1.20
13.20	1.19	1.20
13.25	1.19	1.20
13.30	1.18	1.19
13.35	1.18	1.19
13.40	1.17	1.18
13.45	1.17	1.17
13.50	1.16	1.17
13.55	1.15	1.16
13.60	1.15	1.16

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.65	1.14	1.15
13.70	1.13	1.14
13.75	1.13	1.14
13.80	1.12	1.13
13.85	1.11	1.12
13.90	1.11	1.12
13.95	1.10	1.11
14.00	1.09	1.10
14.05	1.08	1.09
14.10	1.08	1.09
14.15	1.07	1.08
14.20	1.06	1.07
14.25	1.05	1.06
14.30	1.05	1.06
14.35	1.04	1.05
14.40	1.03	1.04
14.45	1.02	1.03
14.50	1.02	1.03
14.55	1.01	1.02
14.60	1.00	1.01
14.65	0.99	1.00
14.70	0.99	1.00
14.75	0.98	0.99
14.80	0.97	0.98
14.85	0.97	0.97
14.90	0.96	0.97
14.95	0.95	0.96
15.00	0.94	0.95
15.05	0.94	0.95
15.10	0.93	0.94
15.15	0.92	0.93
15.20	0.92	0.92
15.25	0.91	0.92
15.30	0.90	0.91
15.35	0.90	0.90
15.40	0.89	0.90
15.45	0.88	0.89
15.50	0.88	0.88
15.55	0.87	0.88
15.60	0.86	0.87
15.65	0.85	0.86
15.70	0.85	0.86
15.75	0.84	0.85
15.80	0.83	0.84
15.85	0.83	0.84
15.90	0.82	0.83
15.95	0.82	0.82
16.00	0.81	0.82
16.05	0.80	0.81

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.10	0.80	0.80
16.15	0.79	0.80
16.20	0.78	0.79
16.25	0.78	0.78
16.30	0.77	0.78
16.35	0.76	0.77
16.40	0.76	0.77
16.45	0.75	0.76
16.50	0.75	0.75
16.55	0.74	0.75
16.60	0.73	0.74
16.65	0.73	0.74
16.70	0.72	0.73
16.75	0.72	0.72
16.80	0.71	0.72
16.85	0.71	0.71
16.90	0.70	0.71
16.95	0.69	0.70
17.00	0.69	0.70
17.05	0.68	0.69
17.10	0.68	0.69
17.15	0.67	0.68
17.20	0.67	0.67
17.25	0.66	0.67
17.30	0.66	0.66
17.35	0.65	0.66
17.40	0.65	0.65
17.45	0.64	0.65
17.50	0.64	0.64
17.55	0.63	0.64
17.60	0.63	0.63
17.65	0.62	0.63
17.70	0.62	0.62
17.75	0.61	0.62
17.80	0.61	0.62

...End

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 11.50 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 45,046 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	5.76
12.00	8.51
12.05	10.65
12.10	11.50 <<
12.15	10.91
12.20	9.68
12.25	8.33
12.30	6.91

...End

TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 2 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 12.40 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 3	2nd inflow hyd. No.	= 4

Total Volume = 77,359 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	0.52		8.51		9.03
12.05	0.72		10.65		11.37
12.10	0.90		11.50 <<		12.40 <<
12.15	1.02		10.91		11.93
12.20	1.09		9.68		10.77
12.25	1.13		8.33		9.46
12.30	1.15		6.91		8.06
12.35	1.17		5.49		6.66

...End

Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	=	Reservoir	Peak discharge	=	3.48 cfs
Storm frequency	=	2 yrs	Time interval	=	3 min
Inflow hyd. No.	=	5	Reservoir name	=	Existing North
Max. Elevation	=	1638.48 ft	Max. Storage	=	14,333 cuft

Storage Indication method used. Total Volume = 77,359 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.15	11.93	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	2.01
12.20	10.77	1638.33	-----	-----	-----	-----	-----	-----	-----	-----	2.41
12.25	9.46	1638.37	-----	-----	-----	-----	-----	-----	-----	-----	2.74
12.30	8.06	1638.41	-----	-----	-----	-----	-----	-----	-----	-----	3.00
12.35	6.66	1638.44	-----	-----	-----	-----	-----	-----	-----	-----	3.18
12.40	5.42	1638.45	-----	-----	-----	-----	-----	-----	-----	-----	3.31
12.45	4.58	1638.46	-----	-----	-----	-----	-----	-----	-----	-----	3.38
12.50	4.21	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.42
12.55	4.01	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.45
12.60	3.81	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.47
12.65	3.62	1638.48	-----	-----	-----	-----	-----	-----	-----	-----	3.48
12.70	3.46	1638.48 <<	-----	-----	-----	-----	-----	-----	-----	-----	3.48 <<
12.75	3.33	1638.48	-----	-----	-----	-----	-----	-----	-----	-----	3.48
12.80	3.22	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.47
12.85	3.13	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.46
12.90	3.06	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.44
12.95	3.00	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.43
13.00	2.94	1638.47	-----	-----	-----	-----	-----	-----	-----	-----	3.41
13.05	2.89	1638.46	-----	-----	-----	-----	-----	-----	-----	-----	3.38
13.10	2.83	1638.46	-----	-----	-----	-----	-----	-----	-----	-----	3.36
13.15	2.78	1638.46	-----	-----	-----	-----	-----	-----	-----	-----	3.34
13.20	2.73	1638.45	-----	-----	-----	-----	-----	-----	-----	-----	3.31
13.25	2.69	1638.45	-----	-----	-----	-----	-----	-----	-----	-----	3.29
13.30	2.65	1638.45	-----	-----	-----	-----	-----	-----	-----	-----	3.26
13.35	2.61	1638.44	-----	-----	-----	-----	-----	-----	-----	-----	3.23
13.40	2.57	1638.44	-----	-----	-----	-----	-----	-----	-----	-----	3.21
13.45	2.53	1638.43	-----	-----	-----	-----	-----	-----	-----	-----	3.18
13.50	2.50	1638.43	-----	-----	-----	-----	-----	-----	-----	-----	3.15
13.55	2.46	1638.43	-----	-----	-----	-----	-----	-----	-----	-----	3.12
13.60	2.43	1638.42	-----	-----	-----	-----	-----	-----	-----	-----	3.09
13.65	2.39	1638.42	-----	-----	-----	-----	-----	-----	-----	-----	3.06
13.70	2.36	1638.41	-----	-----	-----	-----	-----	-----	-----	-----	3.03
13.75	2.32	1638.41	-----	-----	-----	-----	-----	-----	-----	-----	3.00
13.80	2.29	1638.41	-----	-----	-----	-----	-----	-----	-----	-----	2.97
13.85	2.26	1638.40	-----	-----	-----	-----	-----	-----	-----	-----	2.94
13.90	2.23	1638.40	-----	-----	-----	-----	-----	-----	-----	-----	2.91

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.95	2.20	1638.39	-----	-----	-----	-----	-----	-----	-----	-----	2.88
14.00	2.17	1638.39	-----	-----	-----	-----	-----	-----	-----	-----	2.85
14.05	2.14	1638.39	-----	-----	-----	-----	-----	-----	-----	-----	2.82
14.10	2.11	1638.38	-----	-----	-----	-----	-----	-----	-----	-----	2.79
14.15	2.08	1638.38	-----	-----	-----	-----	-----	-----	-----	-----	2.76
14.20	2.06	1638.37	-----	-----	-----	-----	-----	-----	-----	-----	2.74
14.25	2.04	1638.37	-----	-----	-----	-----	-----	-----	-----	-----	2.71
14.30	2.02	1638.37	-----	-----	-----	-----	-----	-----	-----	-----	2.68
14.35	2.00	1638.36	-----	-----	-----	-----	-----	-----	-----	-----	2.65
14.40	1.98	1638.36	-----	-----	-----	-----	-----	-----	-----	-----	2.62
14.45	1.97	1638.35	-----	-----	-----	-----	-----	-----	-----	-----	2.59
14.50	1.95	1638.35	-----	-----	-----	-----	-----	-----	-----	-----	2.57
14.55	1.94	1638.35	-----	-----	-----	-----	-----	-----	-----	-----	2.54
14.60	1.92	1638.34	-----	-----	-----	-----	-----	-----	-----	-----	2.51
14.65	1.91	1638.34	-----	-----	-----	-----	-----	-----	-----	-----	2.49
14.70	1.89	1638.34	-----	-----	-----	-----	-----	-----	-----	-----	2.46
14.75	1.88	1638.33	-----	-----	-----	-----	-----	-----	-----	-----	2.44
14.80	1.87	1638.33	-----	-----	-----	-----	-----	-----	-----	-----	2.41
14.85	1.85	1638.33	-----	-----	-----	-----	-----	-----	-----	-----	2.39
14.90	1.84	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.37
14.95	1.82	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.34
15.00	1.81	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.32
15.05	1.79	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.30
15.10	1.78	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.28
15.15	1.76	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.25
15.20	1.75	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.23
15.25	1.73	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.21
15.30	1.72	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.19
15.35	1.70	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.17
15.40	1.69	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.15
15.45	1.67	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.13
15.50	1.66	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.11
15.55	1.64	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.09
15.60	1.63	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.07
15.65	1.61	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.05
15.70	1.60	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.03
15.75	1.58	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.01
15.80	1.57	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.99
15.85	1.55	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.98
15.90	1.53	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.96
15.95	1.52	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.94
16.00	1.50	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.92
16.05	1.49	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.90
16.10	1.47	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.88
16.15	1.46	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.87
16.20	1.45	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.85
16.25	1.43	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.83
16.30	1.42	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.81
16.35	1.41	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.80

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.40	1.40	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.78
16.45	1.39	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.76
16.50	1.39	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.75

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

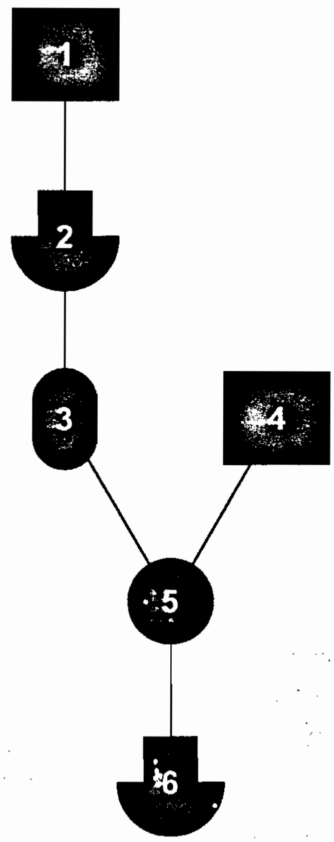
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

Existing 1-year Storm



Legend

- Runoff
- Combined
- Channel Reach
- Diversion
- Pond Route

Project: ETE01EEE.gpw	IDF: Sample.IDF	6 hyd's	10-15-1999

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	10.88	3	720	25,103	1	—	—	—	Ex. S. Pond In
2	Reservoir	0.91	3	768	25,103	1	1	1672.10	10,587	Ex. S. Pond Out
3	Reach	0.91	3	771	24,986	1	2	—	—	S. to N. Pond Ch.
4	SCS Runoff	7.28	3	726	32,088	1	—	—	—	Ex. N. Pond In
5	Combine	7.91	3	726	57,075	1	3 + 4	—	—	Ex. N. Pond In
6	Reservoir	2.33	3	771	57,075	1	5	1638.32	9,573	Ex. N. Pond Out

Proj. file: ETE01EEE.gpw	IDF file: Sample.IDF	Run date: 10-15-1999

Hydrograph Report

English

Hyd. No. 1

Ex. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 10.88 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Drainage area	= 10.72 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.749543 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 25,103 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.90	7.67
11.95	10.61
12.00	10.88 <<
12.05	7.96

...End

TR55 Tc Worksheet

Hyd. No. 1

Ex. S. Pond In
Storm frequency = 1 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.84 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... = 7.7 min

Hydrograph Report

English

Hyd. No. 2

Ex. S. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 0.91 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Reservoir name	= Existing South
Max. Elevation	= 1672.10 ft	Max. Storage	= 10,587 cuft

Storage Indication method used. Total Volume = 25,103 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.00	10.88 <<	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.55
12.05	7.96	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.69
12.10	4.55	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.77
12.15	2.54	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.81
12.20	1.93	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.84
12.25	1.82	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.85
12.30	1.71	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.87
12.35	1.60	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.88
12.40	1.48	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.89
12.45	1.36	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
12.50	1.24	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
12.55	1.13	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.60	1.04	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.65	0.99	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.70	0.96	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.75	0.93	1672.10 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.80	0.90	1672.10 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.91 <<
12.85	0.88	1672.10 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.90	0.85	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
12.95	0.82	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
13.00	0.79	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
13.05	0.76	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
13.10	0.74	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.91
13.15	0.72	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
13.20	0.71	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
13.25	0.69	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.90
13.30	0.68	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.89
13.35	0.66	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.89
13.40	0.64	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.89
13.45	0.63	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.88
13.50	0.61	1672.10	-----	-----	-----	-----	-----	-----	-----	-----	0.88
13.55	0.60	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.87
13.60	0.58	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.87
13.65	0.57	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.87
13.70	0.56	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.86
13.75	0.55	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.86

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.80	0.54	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.85
13.85	0.53	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.85
13.90	0.51	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.84
13.95	0.50	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.84
14.00	0.49	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.83
14.05	0.48	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.83
14.10	0.47	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.82
14.15	0.46	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.81
14.20	0.46	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.81
14.25	0.46	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.80
14.30	0.45	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.80
14.35	0.45	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.79
14.40	0.45	1672.09	-----	-----	-----	-----	-----	-----	-----	-----	0.79
14.45	0.44	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.78
14.50	0.44	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.78
14.55	0.43	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.77
14.60	0.43	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.77
14.65	0.43	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.76
14.70	0.42	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.76
14.75	0.42	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.75
14.80	0.41	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.75
14.85	0.41	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.74
14.90	0.41	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.74
14.95	0.40	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.73
15.00	0.40	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.73
15.05	0.39	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.72
15.10	0.39	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.72
15.15	0.39	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.71
15.20	0.38	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.71
15.25	0.38	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.70
15.30	0.37	1672.08	-----	-----	-----	-----	-----	-----	-----	-----	0.70
15.35	0.37	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.69
15.40	0.37	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.69
15.45	0.36	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.68
15.50	0.36	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.68
15.55	0.35	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.67
15.60	0.35	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.67
15.65	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.66
15.70	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.66
15.75	0.34	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.65
15.80	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.65
15.85	0.33	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.64
15.90	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.64
15.95	0.32	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.63
16.00	0.31	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.63
16.05	0.31	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.62
16.10	0.31	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.62
16.15	0.30	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.61
16.20	0.30	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.61

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.25	0.30	1672.07	-----	-----	-----	-----	-----	-----	-----	-----	0.60
16.30	0.30	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.60
16.35	0.30	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.59
16.40	0.30	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.59
16.45	0.30	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.58
16.50	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.58
16.55	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.58
16.60	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.57
16.65	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.57
16.70	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.56
16.75	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.56
16.80	0.29	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.55
16.85	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.55
16.90	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.55
16.95	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.54
17.00	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.54
17.05	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.53
17.10	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.53
17.15	0.28	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.53
17.20	0.27	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.52
17.25	0.27	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.52
17.30	0.27	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.51
17.35	0.27	1672.06	-----	-----	-----	-----	-----	-----	-----	-----	0.51
17.40	0.27	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.51
17.45	0.27	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.50
17.50	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.50
17.55	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.50
17.60	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.49
17.65	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.49
17.70	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.49
17.75	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.48
17.80	0.26	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.48
17.85	0.25	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.47
17.90	0.25	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.47
17.95	0.25	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.47
18.00	0.25	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.46
18.05	0.25	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.46
18.10	0.25	1672.05	-----	-----	-----	-----	-----	-----	-----	-----	0.46

...End

Reservoir Report

English

Reservoir No. 1 - Existing South Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1672.00	104,925	0	0
0.50	1672.50	109,200	53,531	53,531
1.00	1673.00	113,500	55,675	109,206
1.50	1673.50	118,000	57,875	167,081
2.00	1674.00	122,000	60,000	227,081

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1672.00	---	---	---	---	---	---	---	---	0.00
0.50	53,531	1672.50	---	---	---	---	---	---	---	---	4.62
1.00	109,206	1673.00	---	---	---	---	---	---	---	---	29.32
1.50	167,081	1673.50	---	---	---	---	---	---	---	---	87.78
2.00	227,081	1674.00	---	---	---	---	---	---	---	---	181.33

Hydrograph Report

English

Hyd. No. 3

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 0.91 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Inflow hyd. No.	= 2	Section type	= Triangular
Reach length	= 1200.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 5.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.117	Rating curve m	= 1.333
Ave. velocity	= 5.83 ft/s	Routing coeff.	= 0.7368

Modified Att-Kin routing method used.

Total Volume = 24,986 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.05	0.69	0.50
12.10	0.77	0.64
12.15	0.81	0.74
12.20	0.84	0.79
12.25	0.85	0.83
12.30	0.87	0.85
12.35	0.88	0.86
12.40	0.89	0.87
12.45	0.90	0.89
12.50	0.90	0.89
12.55	0.91	0.90
12.60	0.91	0.91
12.65	0.91	0.91
12.70	0.91	0.91
12.75	0.91	0.91
12.80	0.91 <<	0.91
12.85	0.91	0.91 <<
12.90	0.91	0.91
12.95	0.91	0.91
13.00	0.91	0.91
13.05	0.91	0.91
13.10	0.91	0.91
13.15	0.90	0.91
13.20	0.90	0.90
13.25	0.90	0.90
13.30	0.89	0.90
13.35	0.89	0.89
13.40	0.89	0.89
13.45	0.88	0.89
13.50	0.88	0.88
13.55	0.87	0.88
13.60	0.87	0.88

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
13.65	0.87	0.87
13.70	0.86	0.87
13.75	0.86	0.86
13.80	0.85	0.86
13.85	0.85	0.85
13.90	0.84	0.85
13.95	0.84	0.84
14.00	0.83	0.84
14.05	0.83	0.83
14.10	0.82	0.83
14.15	0.81	0.82
14.20	0.81	0.82
14.25	0.80	0.81
14.30	0.80	0.81
14.35	0.79	0.80
14.40	0.79	0.79
14.45	0.78	0.79
14.50	0.78	0.78
14.55	0.77	0.78
14.60	0.77	0.77
14.65	0.76	0.77
14.70	0.76	0.76
14.75	0.75	0.76
14.80	0.75	0.75
14.85	0.74	0.75
14.90	0.74	0.74
14.95	0.73	0.74
15.00	0.73	0.73
15.05	0.72	0.73
15.10	0.72	0.72
15.15	0.71	0.72
15.20	0.71	0.71
15.25	0.70	0.71
15.30	0.70	0.70
15.35	0.69	0.70
15.40	0.69	0.69
15.45	0.68	0.69
15.50	0.68	0.68
15.55	0.67	0.68
15.60	0.67	0.67
15.65	0.66	0.67
15.70	0.66	0.66
15.75	0.65	0.66
15.80	0.65	0.65
15.85	0.64	0.65
15.90	0.64	0.64
15.95	0.63	0.64
16.00	0.63	0.63
16.05	0.62	0.63

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
16.10	0.62	0.62
16.15	0.61	0.62
16.20	0.61	0.61
16.25	0.60	0.61
16.30	0.60	0.60
16.35	0.59	0.60
16.40	0.59	0.59
16.45	0.58	0.59
16.50	0.58	0.59
16.55	0.58	0.58
16.60	0.57	0.58
16.65	0.57	0.57
16.70	0.56	0.57
16.75	0.56	0.56
16.80	0.55	0.56
16.85	0.55	0.56
16.90	0.55	0.55
16.95	0.54	0.55
17.00	0.54	0.54
17.05	0.53	0.54
17.10	0.53	0.53
17.15	0.53	0.53
17.20	0.52	0.53
17.25	0.52	0.52
17.30	0.51	0.52
17.35	0.51	0.52
17.40	0.51	0.51
17.45	0.50	0.51
17.50	0.50	0.50
17.55	0.50	0.50
17.60	0.49	0.50
17.65	0.49	0.49
17.70	0.49	0.49
17.75	0.48	0.49
17.80	0.48	0.48
17.85	0.47	0.48
17.90	0.47	0.48
17.95	0.47	0.47
18.00	0.46	0.47
18.05	0.46	0.47
18.10	0.46	0.46
18.15	0.45	0.46

...End

Hydrograph Report

English

Hyd. No. 4

Ex. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 7.28 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Drainage area	= 24.50 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 32,088 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.00	4.95
12.05	6.51
12.10	7.28 <<
12.15	7.05
12.20	6.38
12.25	5.62
12.30	4.76
12.35	3.87

...End

TR55 Tc Worksheet

Hyd. No. 4

Ex. N. Pond In
Storm frequency = 1 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 5

Ex. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 7.91 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 3	2nd inflow hyd. No.	= 4

Total Volume = 57,075 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	0.35		4.95		5.30
12.05	0.50		6.51		7.01
12.10	0.64		7.28 <<		7.91 <<
12.15	0.74		7.05		7.79
12.20	0.79		6.38		7.18
12.25	0.83		5.62		6.44
12.30	0.85		4.76		5.61
12.35	0.86		3.87		4.73

...End

Hydrograph Report

English

Hyd. No. 6

Ex. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 2.33 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Inflow hyd. No.	= 5	Reservoir name	= Existing North
Max. Elevation	= 1638.32 ft	Max. Storage	= 9,573 cuft

Storage Indication method used.

Total Volume = 57,075 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.15	7.79	1638.16	-----	-----	-----	-----	-----	-----	-----	-----	1.19
12.20	7.18	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.46
12.25	6.44	1638.23	-----	-----	-----	-----	-----	-----	-----	-----	1.69
12.30	5.61	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.87
12.35	4.73	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.01
12.40	3.91	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.11
12.45	3.34	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.18
12.50	3.08	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.22
12.55	2.94	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.25
12.60	2.80	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.28
12.65	2.67	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.30
12.70	2.56	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.31
12.75	2.46	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.32
12.80	2.39	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.33
12.85	2.32	1638.32 <<	-----	-----	-----	-----	-----	-----	-----	-----	2.33 <<
12.90	2.27	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.33
12.95	2.23	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.32
13.00	2.19	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.32
13.05	2.15	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.31
13.10	2.11	1638.32	-----	-----	-----	-----	-----	-----	-----	-----	2.30
13.15	2.08	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.29
13.20	2.04	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.28
13.25	2.01	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.27
13.30	1.98	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.26
13.35	1.95	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.25
13.40	1.93	1638.31	-----	-----	-----	-----	-----	-----	-----	-----	2.24
13.45	1.90	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.22
13.50	1.88	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.21
13.55	1.85	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.19
13.60	1.83	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.18
13.65	1.80	1638.30	-----	-----	-----	-----	-----	-----	-----	-----	2.16
13.70	1.78	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.15
13.75	1.75	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.13
13.80	1.73	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.11
13.85	1.71	1638.29	-----	-----	-----	-----	-----	-----	-----	-----	2.10
13.90	1.69	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.08

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.95	1.66	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.06
14.00	1.64	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.04
14.05	1.62	1638.28	-----	-----	-----	-----	-----	-----	-----	-----	2.03
14.10	1.60	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	2.01
14.15	1.58	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.99
14.20	1.56	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.97
14.25	1.55	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.96
14.30	1.53	1638.27	-----	-----	-----	-----	-----	-----	-----	-----	1.94
14.35	1.52	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.92
14.40	1.51	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.90
14.45	1.50	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.89
14.50	1.49	1638.26	-----	-----	-----	-----	-----	-----	-----	-----	1.87
14.55	1.48	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.85
14.60	1.46	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.84
14.65	1.45	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.82
14.70	1.44	1638.25	-----	-----	-----	-----	-----	-----	-----	-----	1.80
14.75	1.43	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.79
14.80	1.42	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.77
14.85	1.41	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.76
14.90	1.40	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.74
14.95	1.39	1638.24	-----	-----	-----	-----	-----	-----	-----	-----	1.73
15.00	1.38	1638.23	-----	-----	-----	-----	-----	-----	-----	-----	1.71
15.05	1.37	1638.23	-----	-----	-----	-----	-----	-----	-----	-----	1.70
15.10	1.36	1638.23	-----	-----	-----	-----	-----	-----	-----	-----	1.68
15.15	1.35	1638.23	-----	-----	-----	-----	-----	-----	-----	-----	1.67
15.20	1.34	1638.23	-----	-----	-----	-----	-----	-----	-----	-----	1.66
15.25	1.33	1638.22	-----	-----	-----	-----	-----	-----	-----	-----	1.64
15.30	1.31	1638.22	-----	-----	-----	-----	-----	-----	-----	-----	1.63
15.35	1.30	1638.22	-----	-----	-----	-----	-----	-----	-----	-----	1.61
15.40	1.29	1638.22	-----	-----	-----	-----	-----	-----	-----	-----	1.60
15.45	1.28	1638.22	-----	-----	-----	-----	-----	-----	-----	-----	1.59
15.50	1.27	1638.22	-----	-----	-----	-----	-----	-----	-----	-----	1.57
15.55	1.26	1638.21	-----	-----	-----	-----	-----	-----	-----	-----	1.56
15.60	1.25	1638.21	-----	-----	-----	-----	-----	-----	-----	-----	1.55
15.65	1.24	1638.21	-----	-----	-----	-----	-----	-----	-----	-----	1.53
15.70	1.23	1638.21	-----	-----	-----	-----	-----	-----	-----	-----	1.52
15.75	1.21	1638.21	-----	-----	-----	-----	-----	-----	-----	-----	1.51
15.80	1.20	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.50
15.85	1.19	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.48
15.90	1.18	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.47
15.95	1.17	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.46
16.00	1.16	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.45
16.05	1.15	1638.20	-----	-----	-----	-----	-----	-----	-----	-----	1.43
16.10	1.14	1638.19	-----	-----	-----	-----	-----	-----	-----	-----	1.42
16.15	1.12	1638.19	-----	-----	-----	-----	-----	-----	-----	-----	1.41
16.20	1.12	1638.19	-----	-----	-----	-----	-----	-----	-----	-----	1.40
16.25	1.11	1638.19	-----	-----	-----	-----	-----	-----	-----	-----	1.38
16.30	1.10	1638.19	-----	-----	-----	-----	-----	-----	-----	-----	1.37
16.35	1.09	1638.19	-----	-----	-----	-----	-----	-----	-----	-----	1.36

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.40	1.08	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.35
16.45	1.08	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.34
16.50	1.07	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.32
16.55	1.06	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.31
16.60	1.06	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.30
16.65	1.05	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.29
16.70	1.04	1638.18	-----	-----	-----	-----	-----	-----	-----	-----	1.28
16.75	1.04	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.27
16.80	1.03	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.26
16.85	1.03	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.25
16.90	1.02	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.24
16.95	1.01	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.23
17.00	1.01	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.22
17.05	1.00	1638.17	-----	-----	-----	-----	-----	-----	-----	-----	1.21
17.10	0.99	1638.16	-----	-----	-----	-----	-----	-----	-----	-----	1.20
17.15	0.99	1638.16	-----	-----	-----	-----	-----	-----	-----	-----	1.19
17.20	0.98	1638.16	-----	-----	-----	-----	-----	-----	-----	-----	1.19
17.25	0.98	1638.16	-----	-----	-----	-----	-----	-----	-----	-----	1.18
17.30	0.97	1638.16	-----	-----	-----	-----	-----	-----	-----	-----	1.17

...End

Reservoir Report

English

Reservoir No. 2 - Existing North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1638.00	28,925	0	0
0.50	1638.50	31,300	15,056	15,056
1.00	1639.00	33,700	16,250	31,306
1.50	1639.50	36,100	17,450	48,756
2.00	1640.00	38,400	18,625	67,381
2.50	1640.50	43,100	20,375	87,756
3.00	1641.00	47,850	22,738	110,494

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.0C	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	3.00
Eqn. Exp.	= 0.00	0.00	0.00	1.50
Multi-Stage	= No	No	No	No

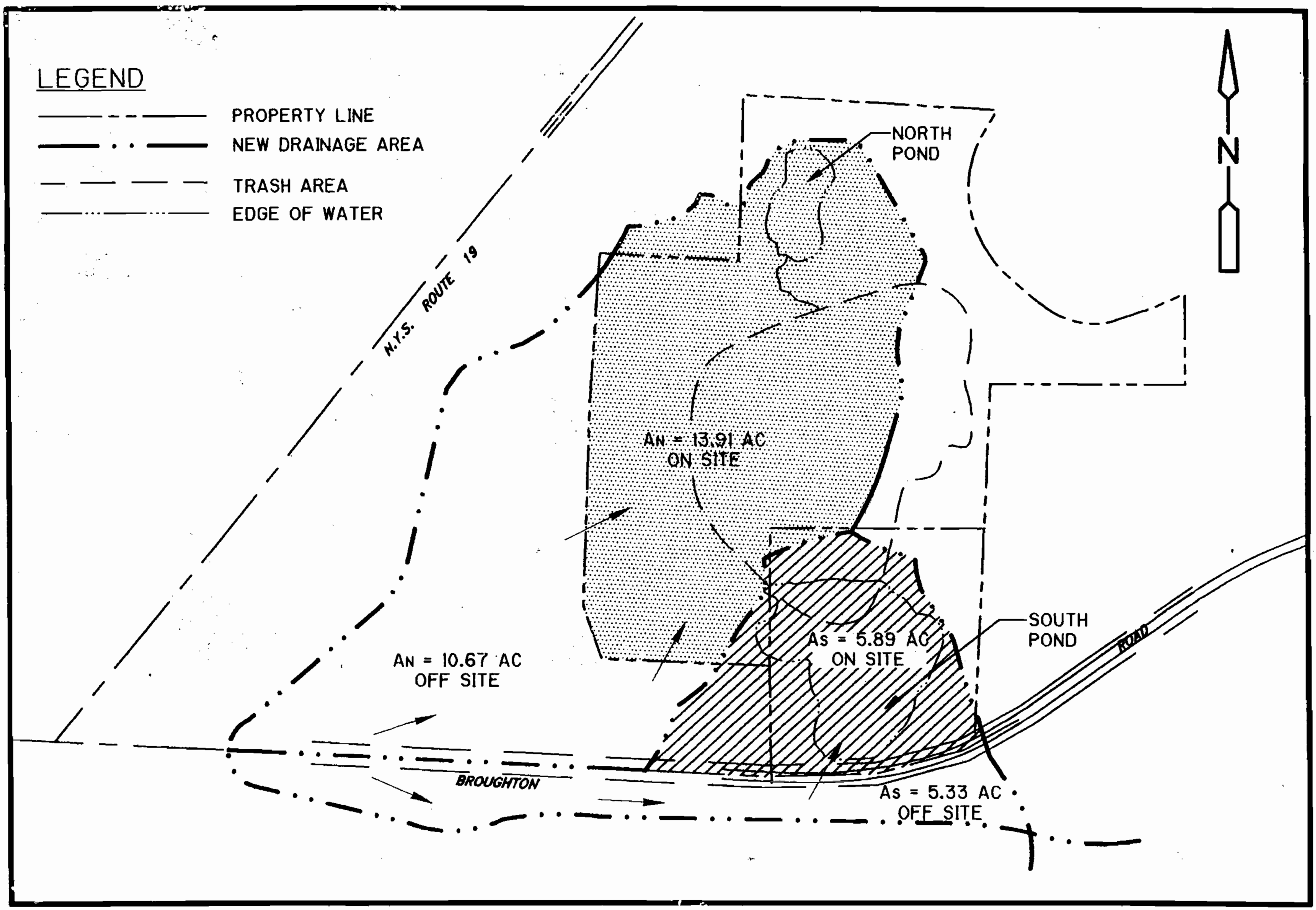
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1638.00	---	---	---	---	---	---	---	---	0.00
0.50	15,056	1638.50	---	---	---	---	---	---	---	---	3.66
1.00	31,306	1639.00	---	---	---	---	---	---	---	---	22.27
1.50	48,756	1639.50	---	---	---	---	---	---	---	---	66.24
2.00	67,381	1640.00	---	---	---	---	---	---	---	---	110.62
2.50	87,756	1640.50	---	---	---	---	---	---	---	---	181.58
3.00	110,494	1641.00	---	---	---	---	---	---	---	---	280.27

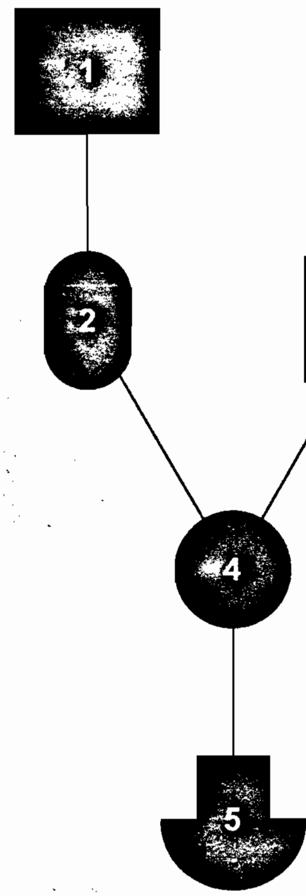
Appendix B-6b
Proposed Conditions
(1, 2, 5, 10, 25, 50, and 100-year Storms)



CDM Camp Dresser & McKee

New York State Department of Environmental Conservation
ETE Sanitation and Landfill
STORMWATER MANAGEMENT POST-CONSTRUCTION DRAINAGE AREAS
Figure No. 2-4

Proposed 100-year Storm



Legend

Runoff

Combined

Channel Reach

Diversion

Pond Route

Project: ETE0030F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	38.58	3	717	87,239	100	—	——	——	Prop. S. Pond In
2	Reach	38.55	3	720	87,239	100	1	——	——	S. to N. Pond Ch.
3	SCS Runoff	62.59	3	723	202,644	100	—	——	——	Prop. N. Pond In
4	Combine	100.44	3	723	289,883	100	2 + 3	——	——	Prop. N. Pond In
5	Reservoir	18.40	3	747	278,868	100	4	1639.15	130,885	Prop. N. Pond Out

Proj. file: ETE0030F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 38.58 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 87,239 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.90	29.80
11.95	38.58 <<
12.00	37.85

...End

Worksheet 2: Runoff curve number and runoff

Project NYSDEC - ETE LANDFILL By dlz Date 14 OCT 99

Location GAINESVILLE, WYOMING CO. Checked ____ Date ____

Circle one: Present Developed SOUTH POND

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area ☒acres ☐mi² ☐%	Product of CN x area
BATH-VALOIS GRAVELLY LOAM 8-15% "C"	WOODS, GOOD CONDITION OPEN SPACE, GOOD CONDITION ROAD	70 74 98			1.07 1.40 0.35	74.9 103.6 34.3
MARDIN-CHANNERY SILT-LOAM 3-8% "C"	WOODS, GOOD CONDITION OPEN SPACE, GOOD CONDITION ROAD	70 74 98			0.80 1.32 0.39	56.0 97.7 38.2
SUB-TOTAL	OFFSITE (SOUTH OF ROAD)				5.33	
BATH-VALOIS GRAVELLY LOAM 8-15% "C"	WOODS, FAIR CONDITION BRUSH, WEEDS, GRASS - FAIR CONDITION ROAD	73 70 98			0.27 2.25 0.22	19.7 157.5 21.6
BATH-VALOIS GRAVELLY LOAM "C"	MEADOW (DISTURBED AREA / FORMER SOUTH POND	71			3.15	223.7
SUB-TOTAL	ONSITE (NORTH OF ROAD)				5.89	
				Totals =	11.22	827.2

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{827.2}{11.22}$ = 73.73; Use CN = $\boxed{74}$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency .... yr			
Rainfall, P (24-hour) .... in			
Runoff, Q .... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)			

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 100 yrs

Sheet Flow		
Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**
Shallow Concentrated Flow		
Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**
Channel Flow		
Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**
Total Travel Time, Tc		**= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 38.55 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 10.33 ft/s	Routing coeff.	= 0.9959

Modified Att-Kin routing method used.

Total Volume = 87,239 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
11.95	38.58 <<	29.76
12.00	37.85	38.55 <<
12.05	26.89	37.85

...End

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 62.59 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 202,044 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.00	55.94
12.05	62.59 <<
12.10	62.46
12.15	56.07
12.20	47.44

...End

Worksheet 2: Runoff curve number and runoff

Project NYS DEC – ETE LANDFILL By dlj Date 14 OCT 92

Location GAINESVILLE, WYOMING Co. Checked ______ Date ______

Circle one: Present Developed NORTH POND

1. Runoff curve number (CN)

Site	Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Fig. 2-3	CN [1/] Fig. 2-4	Area ☒ acres ☐ mi^2 ☐ %	Product of CN x area
OFFSITE A = 10.67 AC	ALDEN MUCKY SILT LOAM 0-3% "D"	WOODS, GOOD CONDITION	77			0.29	22.3
		BRUSH, WEEDS, GRASS - GOOD CONDITION	73			2.46	179.6
	BATH - VALOIS GRAVELLY LOAM 8-15% "C"	OPEN SPACE GOOD CONDITION	74			1.32	97.7
		ROAD	98			0.09	8.8
	MARDIN - CHANNERY SILT LOAM, 3-8% "C"	BRUSH, WEEDS, GRASS - GOOD CONDITION	65			6.14	399.1
		ROAD	98			0.37	36.3
ONSITE A = 13.31	ALDEN MUCKY SILT LOAM 0-3% "D"	WOODS - GOOD CONDITION	77			2.02	155.5
		MEADOW (DISTURBED AREA)	78			0.12	9.4
	BATH-VALOIS GRAVELLY LOAM 8-15% "C"	WOODS - FAIR CONDITION	70			1.81	126.7
		BRUSH WEEDS GRASS – FAIR CONDITION	70			1.25	87.5
		POND	98			1.39	136.2
		MEADOW (DISTURBED AREA)	71			7.32	519.7
					Totals =	24.58	1,778.8

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1{,}778.8}{24.58} = 72.37$; Use CN = $\boxed{73}$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr			
Rainfall, P (24-hour)	in			
Runoff, Q .... (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)	in			

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 100 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 100.44 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 2	2nd inflow hyd. No.	= 3

Total Volume = 289,883 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	38.55 <<		55.94		94.48
12.05	37.85		62.59 <<		100.44 <<
12.10	26.93		62.46		89.39

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 18.40 cfs
Storm frequency	= 100 yrs	Time interval	= 3 min
Inflow hyd. No.	= 4	Reservoir name	= Proposed North
Max. Elevation	= 1639.15 ft	Max. Storage	= 130,885 cuft

Storage Indication method used.

Total Volume = 278,868 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.25	45.06	1639.01	-----	-----	-----	-----	14.34	0.08	-----	-----	14.42
12.30	36.43	1639.08	-----	-----	-----	-----	15.63	0.62	-----	-----	16.25
12.35	28.54	1639.12	-----	-----	-----	-----	16.46	1.10	-----	-----	17.56
12.40	22.07	1639.15	-----	-----	-----	-----	16.86	1.38	-----	-----	18.25
12.45	17.89	1639.15 <<	-----	-----	-----	-----	16.95	1.45	-----	-----	18.40 <<
12.50	15.85	1639.15	-----	-----	-----	-----	16.87	1.39	-----	-----	18.26
12.55	14.58	1639.14	-----	-----	-----	-----	16.71	1.28	-----	-----	17.99
12.60	13.36	1639.13	-----	-----	-----	-----	16.50	1.13	-----	-----	17.63
12.65	12.32	1639.11	-----	-----	-----	-----	16.25	0.95	-----	-----	17.21
12.70	11.48	1639.10	-----	-----	-----	-----	15.98	0.76	-----	-----	16.73
12.75	10.83	1639.09	-----	-----	-----	-----	15.70	0.65	-----	-----	16.35
12.80	10.30	1639.07	-----	-----	-----	-----	15.42	0.53	-----	-----	15.95
12.85	9.86	1639.05	-----	-----	-----	-----	15.13	0.41	-----	-----	15.54
12.90	9.48	1639.04	-----	-----	-----	-----	14.84	0.29	-----	-----	15.13
12.95	9.14	1639.02	-----	-----	-----	-----	14.55	0.17	-----	-----	14.73
13.00	8.83	1639.01	-----	-----	-----	-----	14.27	0.05	-----	-----	14.33
13.05	8.53	1638.99	-----	-----	-----	-----	14.00	-----	-----	-----	14.00

...End

Reservoir Report

English

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
0.10	5,920	1637.10	---	---	---	---	0.01	0.00	---	---	0.01
0.20	11,839	1637.20	---	---	---	---	0.04	0.00	---	---	0.04
0.30	17,759	1637.30	---	---	---	---	0.12	0.00	---	---	0.12
0.40	23,678	1637.40	---	---	---	---	0.25	0.00	---	---	0.25
0.50	29,598	1637.50	---	---	---	---	0.44	0.00	---	---	0.44
0.60	35,517	1637.60	---	---	---	---	0.70	0.00	---	---	0.70
0.70	41,437	1637.70	---	---	---	---	1.02	0.00	---	---	1.02
0.80	47,356	1637.80	---	---	---	---	1.43	0.00	---	---	1.43
0.90	53,276	1637.90	---	---	---	---	1.92	0.00	---	---	1.92
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50

Continues on next page...

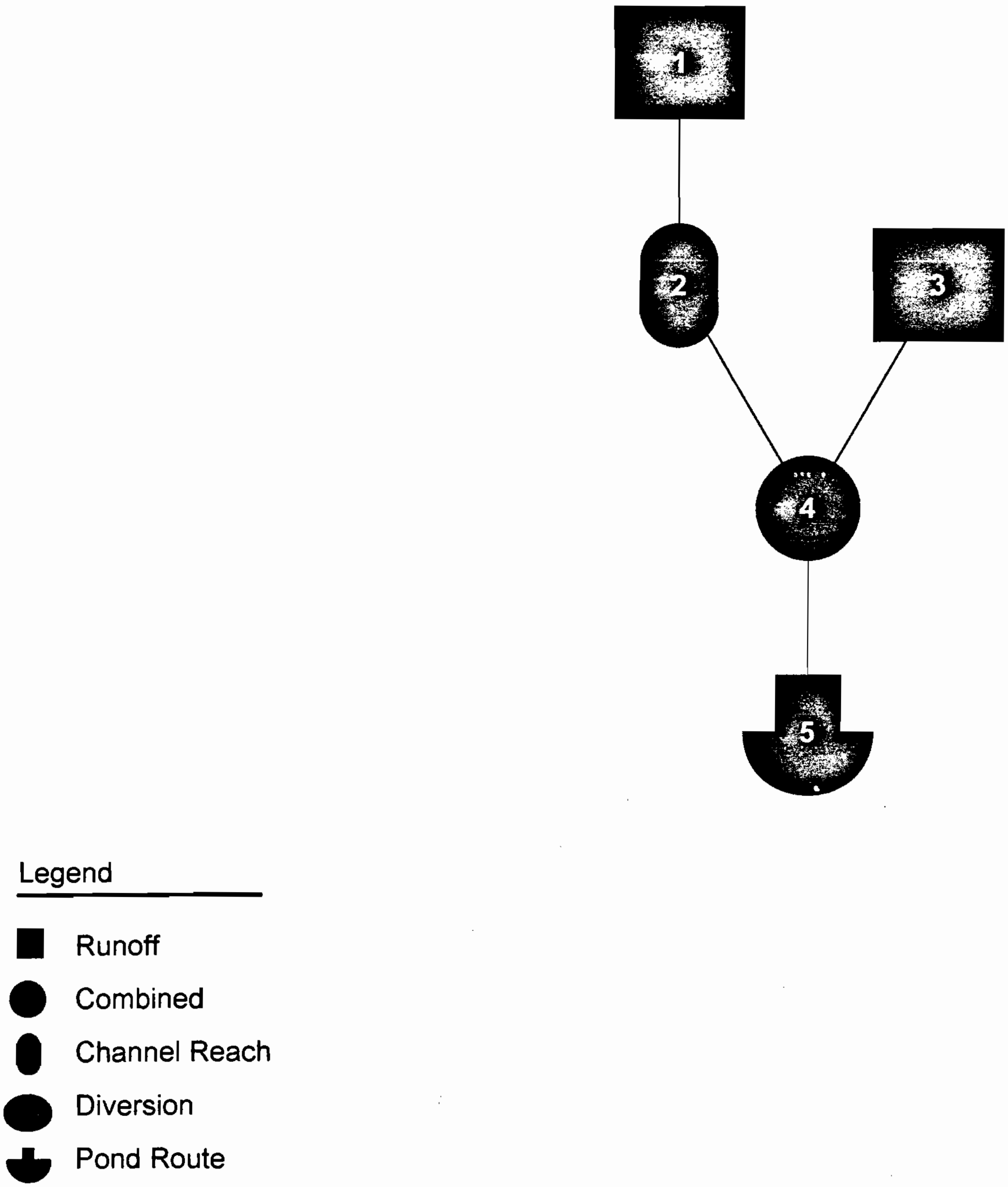
Proposed North Pond

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
1.10	65,394	1638.10	---	---	---	---	3.17	0.00	---	---	3.17
1.20	71,594	1638.20	---	---	---	---	3.94	0.00	---	---	3.94
1.30	77,793	1638.30	---	---	---	---	4.82	0.00	---	---	4.82
1.40	83,992	1638.40	---	---	---	---	5.80	0.00	---	---	5.80
1.50	90,191	1638.50	---	---	---	---	6.89	0.00	---	---	6.89
1.60	96,391	1638.60	---	---	---	---	8.09	0.00	---	---	8.09
1.70	102,590	1638.70	---	---	---	---	9.42	0.00	---	---	9.42
1.80	108,789	1638.80	---	---	---	---	10.86	0.00	---	---	10.86
1.90	114,988	1638.90	---	---	---	---	12.44	0.00	---	---	12.44
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
2.10	127,669	1639.10	---	---	---	---	15.98	0.76	---	---	16.73
2.20	134,151	1639.20	---	---	---	---	17.95	2.15	---	---	20.09
2.30	140,633	1639.30	---	---	---	---	20.06	3.94	---	---	24.00
2.40	147,115	1639.40	---	---	---	---	22.31	6.07	---	---	28.38
2.50	153,596	1639.50	---	---	---	---	24.70	8.48	---	---	33.18
2.60	160,078	1639.60	---	---	---	---	27.25	11.15	---	---	38.40
2.70	166,560	1639.70	---	---	---	---	29.94	14.05	---	---	43.99
2.80	173,042	1639.80	---	---	---	---	32.79	17.17	---	---	49.96
2.90	179,523	1639.90	---	---	---	---	35.80	20.48	---	---	56.28
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

...End

Proposed 50-year Storm



Project: ETE5030F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	34.53	3	717	78,259	50	—	—	—	Prop. S. Pond In
2	Reach	34.35	3	720	78,258	50	1	—	—	S. to N. Pond Ch.
3	SCS Runoff	55.76	3	726	181,397	50	—	—	—	Prop. N. Pond In
4	Combine	89.75	3	723	259,655	50	2 + 3	—	—	Prop. N. Pond In
5	Reservoir	13.49	3	753	248,673	50	4	1638.96	118,832	Prop. N. Pond Out

Proj. file: ETE5030F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 34.53 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 4.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 78,259 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.90	26.50
11.95	34.53 <<
12.00	34.03

...End

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 50 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 34.35 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 9.96 ft/s	Routing coeff.	= 0.9778

Modified Att-Kin routing method used.

Total Volume = 78,258 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
11.95	34.53 <<	26.31
12.00	34.03	34.35 <<
12.05	24.25	34.04

...End

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 55.76 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 181,397 cuft

Hydrograph Discharge Table

Time -- Outflow (hrs	cfs)
12.00	49.60
12.05	55.71
12.10	55.76 <<
12.15	50.16
12.20	42.52

...End

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 50 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... = 15.8 min

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 89.75 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 2	2nd inflow hyd. No.	= 3

Total Volume = 259,655 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	34.35 <<		49.60		83.95
12.05	34.04		55.71		89.75 <<
12.10	24.47		55.76 <<		80.23

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 13.49 cfs
Storm frequency	= 50 yrs	Time interval	= 3 min
Inflow hyd. No.	= 4	Reservoir name	= Proposed North
Max. Elevation	= 1638.96 ft	Max. Storage	= 118,832 cuft

Storage Indication method used.

Total Volume = 248,673 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.25	40.57	1638.79	-----	-----	-----	-----	10.71	-----	-----	-----	10.71
12.30	32.85	1638.86	-----	-----	-----	-----	11.85	-----	-----	-----	11.85
12.35	25.79	1638.91	-----	-----	-----	-----	12.65	-----	-----	-----	12.65
12.40	19.99	1638.94	-----	-----	-----	-----	13.14	-----	-----	-----	13.15
12.45	16.22	1638.96	-----	-----	-----	-----	13.39	-----	-----	-----	13.39
12.50	14.39	1638.96	-----	-----	-----	-----	13.48	-----	-----	-----	13.48
12.55	13.23	1638.96 <<	-----	-----	-----	-----	13.49	-----	-----	-----	13.49 <<
12.60	12.14	1638.96	-----	-----	-----	-----	13.45	-----	-----	-----	13.45
12.65	11.19	1638.95	-----	-----	-----	-----	13.37	-----	-----	-----	13.37
12.70	10.43	1638.95	-----	-----	-----	-----	13.24	-----	-----	-----	13.24
12.75	9.84	1638.94	-----	-----	-----	-----	13.10	-----	-----	-----	13.09
12.80	9.36	1638.93	-----	-----	-----	-----	12.92	-----	-----	-----	12.93
12.85	8.96	1638.92	-----	-----	-----	-----	12.74	-----	-----	-----	12.74
12.90	8.62	1638.91	-----	-----	-----	-----	12.55	-----	-----	-----	12.55
12.95	8.31	1638.90	-----	-----	-----	-----	12.36	-----	-----	-----	12.36
13.00	8.03	1638.88	-----	-----	-----	-----	12.17	-----	-----	-----	12.17
13.05	7.76	1638.87	-----	-----	-----	-----	11.98	-----	-----	-----	11.98
13.10	7.50	1638.86	-----	-----	-----	-----	11.79	-----	-----	-----	11.79
13.15	7.25	1638.85	-----	-----	-----	-----	11.59	-----	-----	-----	11.59
13.20	7.04	1638.83	-----	-----	-----	-----	11.39	-----	-----	-----	11.39
13.25	6.85	1638.82	-----	-----	-----	-----	11.19	-----	-----	-----	11.19
13.30	6.67	1638.81	-----	-----	-----	-----	11.00	-----	-----	-----	11.00
13.35	6.50	1638.80	-----	-----	-----	-----	10.80	-----	-----	-----	10.80
13.40	6.34	1638.78	-----	-----	-----	-----	10.62	-----	-----	-----	10.62
13.45	6.19	1638.77	-----	-----	-----	-----	10.45	-----	-----	-----	10.45
13.50	6.04	1638.76	-----	-----	-----	-----	10.27	-----	-----	-----	10.27

...End

Reservoir Report

English

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

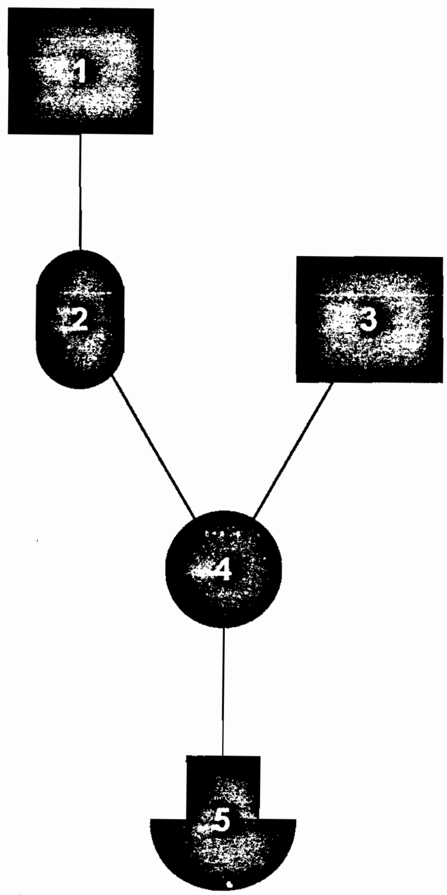
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

Proposed 25-year Storm



Legend

- Runoff
- Combined
- Channel Reach
- Diversion
- Pond Route

Project: ETE2530F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	29.25	3	717	66,614	25	—	——	——	Prop. S. Pond In
2	Reach	29.03	3	723	66,614	25	1	——	——	S. to N. Pond Ch.
3	SCS Runoff	47.04	3	726	153,896	25	—	——	——	Prop. N. Pond In
4	Combine	75.80	3	723	220,510	25	2 + 3	——	——	Prop. N. Pond In
5	Reservoir	9.37	3	762	209,578	25	4	1638.70	102,346	Prop. N. Pond Out

Proj. file: ETE2530F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 29.25 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 66,614 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.90	22.21
11.95	29.25 <<
12.00	29.04

...End

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 25 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 29.03 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 9.44 ft/s	Routing coeff.	= 0.9510

Modified Att-Kin routing method used.

Total Volume = 66,614 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
11.95	29.25 <<	21.84
12.00	29.04	28.89
12.05	20.79	29.03 <<

...End

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 47.04 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 153,896 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.00	41.38
12.05	46.77
12.10	47.04 <<
12.15	42.46
12.20	36.11

...End

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 25 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc		**= 15.8 min**

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 75.80 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 2	2nd inflow hyd. No.	= 3

Total Volume = 220,510 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	28.89		41.38		70.27
12.05	29.03 <<		46.77		75.80 <<
12.10	21.19		47.04 <<		68.23

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 9.37 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Inflow hyd. No.	= 4	Reservoir name	= Proposed North
Max. Elevation	= 1638.70 ft	Max. Storage	= 102,346 cuft

Storage Indication method used. Total Volume = 209,578 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.30	28.15	1638.57	-----	-----	-----	-----	7.70	-----	-----	-----	7.70
12.35	22.18	1638.62	-----	-----	-----	-----	8.32	-----	-----	-----	8.32
12.40	17.25	1638.65	-----	-----	-----	-----	8.75	-----	-----	-----	8.75
12.45	14.03	1638.67	-----	-----	-----	-----	9.01	-----	-----	-----	9.01
12.50	12.45	1638.68	-----	-----	-----	-----	9.17	-----	-----	-----	9.17
12.55	11.46	1638.69	-----	-----	-----	-----	9.27	-----	-----	-----	9.27
12.60	10.52	1638.69	-----	-----	-----	-----	9.34	-----	-----	-----	9.34
12.65	9.70	1638.70 <<	-----	-----	-----	-----	9.37	-----	-----	-----	9.37
12.70	9.04	1638.70 <<	-----	-----	-----	-----	9.37	-----	-----	-----	9.37 <<
12.75	8.54	1638.69	-----	-----	-----	-----	9.34	-----	-----	-----	9.34
12.80	8.12	1638.69	-----	-----	-----	-----	9.31	-----	-----	-----	9.31
12.85	7.78	1638.69	-----	-----	-----	-----	9.25	-----	-----	-----	9.25
12.90	7.48	1638.68	-----	-----	-----	-----	9.19	-----	-----	-----	9.19
12.95	7.22	1638.68	-----	-----	-----	-----	9.12	-----	-----	-----	9.12
13.00	6.98	1638.67	-----	-----	-----	-----	9.05	-----	-----	-----	9.05
13.05	6.74	1638.67	-----	-----	-----	-----	8.97	-----	-----	-----	8.96
13.10	6.52	1638.66	-----	-----	-----	-----	8.88	-----	-----	-----	8.88
13.15	6.31	1638.65	-----	-----	-----	-----	8.78	-----	-----	-----	8.78
13.20	6.12	1638.64	-----	-----	-----	-----	8.69	-----	-----	-----	8.69
13.25	5.95	1638.64	-----	-----	-----	-----	8.59	-----	-----	-----	8.59
13.30	5.80	1638.63	-----	-----	-----	-----	8.48	-----	-----	-----	8.48
13.35	5.66	1638.62	-----	-----	-----	-----	8.38	-----	-----	-----	8.38
13.40	5.52	1638.61	-----	-----	-----	-----	8.27	-----	-----	-----	8.28
13.45	5.39	1638.61	-----	-----	-----	-----	8.17	-----	-----	-----	8.17
13.50	5.26	1638.60	-----	-----	-----	-----	8.06	-----	-----	-----	8.06
13.55	5.13	1638.59	-----	-----	-----	-----	7.97	-----	-----	-----	7.97
13.60	5.00	1638.58	-----	-----	-----	-----	7.87	-----	-----	-----	7.87
13.65	4.88	1638.57	-----	-----	-----	-----	7.76	-----	-----	-----	7.76
13.70	4.76	1638.56	-----	-----	-----	-----	7.66	-----	-----	-----	7.66
13.75	4.66	1638.56	-----	-----	-----	-----	7.56	-----	-----	-----	7.56
13.80	4.55	1638.55	-----	-----	-----	-----	7.46	-----	-----	-----	7.46
13.85	4.45	1638.54	-----	-----	-----	-----	7.36	-----	-----	-----	7.36
13.90	4.35	1638.53	-----	-----	-----	-----	7.26	-----	-----	-----	7.26
13.95	4.26	1638.52	-----	-----	-----	-----	7.15	-----	-----	-----	7.15
14.00	4.16	1638.51	-----	-----	-----	-----	7.05	-----	-----	-----	7.05

...End

Reservoir Report

English

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

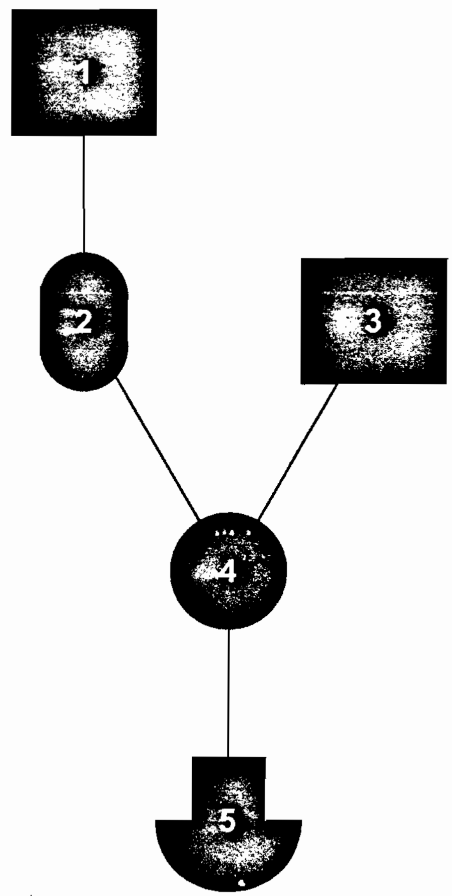
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

Proposed 10-year Storm



Legend

- Runoff
- Combined
- Channel Reach
- Diversion
- Pond Route

Project: ETE1030F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	21.80	3	720	49,997	10	—	——	——	Prop. S. Pond In
2	Reach	21.73	3	723	49,996	10	1	——	——	S. to N. Pond Ch.
3	SCS Runoff	34.52	3	726	114,772	10	—	——	——	Prop. N. Pond In
4	Combine	55.72	3	723	164,768	10	2 + 3	——	——	Prop. N. Pond In
5	Reservoir	4.99	3	789	153,933	10	4	1638.32	78,893	Prop. N. Pond Out

Proj. file: ETE1030F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 21.80 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 49,997 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	21.65
12.00	21.80 <<

...End

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 10 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 21.73 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 8.58 ft/s	Routing coeff.	= 0.9035

Modified Att-Kin routing method used.

Total Volume = 49,996 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	21.80 <<	21.06
12.05	15.76	21.73 <<
12.10	8.92	16.34

...End

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 34.52 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 114,772 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.00	29.68
12.05	33.99
12.10	34.52 <<
12.15	31.38
12.20	26.85

...End

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 10 yrs

Sheet Flow		
Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**
Shallow Concentrated Flow		
Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**
Channel Flow		
Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**
Total Travel Time, Tc		**= 15.8 min**

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type = Combine
Storm frequency = 10 yrs
1st inflow hyd. No. = 2

Peak discharge = 55.72 cfs
Time interval = 3 min
2nd inflow hyd. No. = 3

Total Volume = 164,768 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	21.06		29.68		50.73
12.05	21.73 <<		33.99		55.72 <<
12.10	16.34		34.52 <<		50.85

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 4.99 cfs
Storm frequency	= 10 yrs	Time interval	= 3 min
Inflow hyd. No.	= 4	Reservoir name	= Proposed North
Max. Elevation	= 1638.32 ft	Max. Storage	= 78,893 cuft

Storage Indication method used.

Total Volume = 153,933 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.35	16.92	1638.18	-----	-----	-----	-----	3.80	-----	-----	-----	3.80
12.40	13.24	1638.21	-----	-----	-----	-----	4.06	-----	-----	-----	4.06
12.45	10.81	1638.24	-----	-----	-----	-----	4.26	-----	-----	-----	4.26
12.50	9.62	1638.25	-----	-----	-----	-----	4.41	-----	-----	-----	4.41
12.55	8.86	1638.27	-----	-----	-----	-----	4.53	-----	-----	-----	4.53
12.60	8.14	1638.28	-----	-----	-----	-----	4.63	-----	-----	-----	4.63
12.65	7.51	1638.29	-----	-----	-----	-----	4.71	-----	-----	-----	4.71
12.70	7.01	1638.30	-----	-----	-----	-----	4.77	-----	-----	-----	4.78
12.75	6.62	1638.30	-----	-----	-----	-----	4.83	-----	-----	-----	4.83
12.80	6.30	1638.31	-----	-----	-----	-----	4.87	-----	-----	-----	4.87
12.85	6.04	1638.31	-----	-----	-----	-----	4.91	-----	-----	-----	4.91
12.90	5.81	1638.31	-----	-----	-----	-----	4.94	-----	-----	-----	4.94
12.95	5.61	1638.31	-----	-----	-----	-----	4.96	-----	-----	-----	4.96
13.00	5.43	1638.32	-----	-----	-----	-----	4.98	-----	-----	-----	4.98
13.05	5.25	1638.32	-----	-----	-----	-----	4.99	-----	-----	-----	4.99
13.10	5.07	1638.32 <<	-----	-----	-----	-----	4.99	-----	-----	-----	4.99
13.15	4.91	1638.32 <<	-----	-----	-----	-----	4.99	-----	-----	-----	4.99 <<
13.20	4.77	1638.32	-----	-----	-----	-----	4.99	-----	-----	-----	4.99
13.25	4.64	1638.32	-----	-----	-----	-----	4.98	-----	-----	-----	4.98
13.30	4.52	1638.32	-----	-----	-----	-----	4.97	-----	-----	-----	4.97
13.35	4.41	1638.31	-----	-----	-----	-----	4.95	-----	-----	-----	4.95
13.40	4.31	1638.31	-----	-----	-----	-----	4.94	-----	-----	-----	4.94
13.45	4.21	1638.31	-----	-----	-----	-----	4.92	-----	-----	-----	4.92
13.50	4.10	1638.31	-----	-----	-----	-----	4.90	-----	-----	-----	4.90
13.55	4.00	1638.31	-----	-----	-----	-----	4.87	-----	-----	-----	4.87
13.60	3.91	1638.30	-----	-----	-----	-----	4.85	-----	-----	-----	4.85
13.65	3.81	1638.30	-----	-----	-----	-----	4.82	-----	-----	-----	4.82
13.70	3.72	1638.30	-----	-----	-----	-----	4.79	-----	-----	-----	4.79
13.75	3.64	1638.29	-----	-----	-----	-----	4.76	-----	-----	-----	4.76
13.80	3.56	1638.29	-----	-----	-----	-----	4.74	-----	-----	-----	4.74
13.85	3.49	1638.29	-----	-----	-----	-----	4.71	-----	-----	-----	4.71
13.90	3.41	1638.28	-----	-----	-----	-----	4.67	-----	-----	-----	4.67
13.95	3.33	1638.28	-----	-----	-----	-----	4.64	-----	-----	-----	4.64
14.00	3.26	1638.28	-----	-----	-----	-----	4.61	-----	-----	-----	4.61
14.05	3.19	1638.27	-----	-----	-----	-----	4.57	-----	-----	-----	4.57
14.10	3.12	1638.27	-----	-----	-----	-----	4.54	-----	-----	-----	4.54

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
14.15	3.06	1638.26	-----	-----	-----	-----	4.50	-----	-----	-----	4.50
14.20	3.00	1638.26	-----	-----	-----	-----	4.46	-----	-----	-----	4.46
14.25	2.96	1638.26	-----	-----	-----	-----	4.43	-----	-----	-----	4.43
14.30	2.93	1638.25	-----	-----	-----	-----	4.39	-----	-----	-----	4.39
14.35	2.89	1638.25	-----	-----	-----	-----	4.35	-----	-----	-----	4.35
14.40	2.87	1638.24	-----	-----	-----	-----	4.32	-----	-----	-----	4.32
14.45	2.84	1638.24	-----	-----	-----	-----	4.28	-----	-----	-----	4.28
14.50	2.81	1638.23	-----	-----	-----	-----	4.24	-----	-----	-----	4.24
14.55	2.79	1638.23	-----	-----	-----	-----	4.21	-----	-----	-----	4.21
14.60	2.77	1638.23	-----	-----	-----	-----	4.17	-----	-----	-----	4.17
14.65	2.74	1638.22	-----	-----	-----	-----	4.14	-----	-----	-----	4.14
14.70	2.72	1638.22	-----	-----	-----	-----	4.10	-----	-----	-----	4.10
14.75	2.69	1638.21	-----	-----	-----	-----	4.07	-----	-----	-----	4.07
14.80	2.67	1638.21	-----	-----	-----	-----	4.03	-----	-----	-----	4.03
14.85	2.64	1638.21	-----	-----	-----	-----	4.00	-----	-----	-----	4.00
14.90	2.61	1638.20	-----	-----	-----	-----	3.96	-----	-----	-----	3.96
14.95	2.59	1638.20	-----	-----	-----	-----	3.93	-----	-----	-----	3.93
15.00	2.56	1638.19	-----	-----	-----	-----	3.90	-----	-----	-----	3.90
15.05	2.54	1638.19	-----	-----	-----	-----	3.87	-----	-----	-----	3.87
15.10	2.51	1638.19	-----	-----	-----	-----	3.84	-----	-----	-----	3.84
15.15	2.49	1638.18	-----	-----	-----	-----	3.81	-----	-----	-----	3.81
15.20	2.46	1638.18	-----	-----	-----	-----	3.78	-----	-----	-----	3.78
15.25	2.43	1638.18	-----	-----	-----	-----	3.75	-----	-----	-----	3.75

...End

Reservoir Report

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

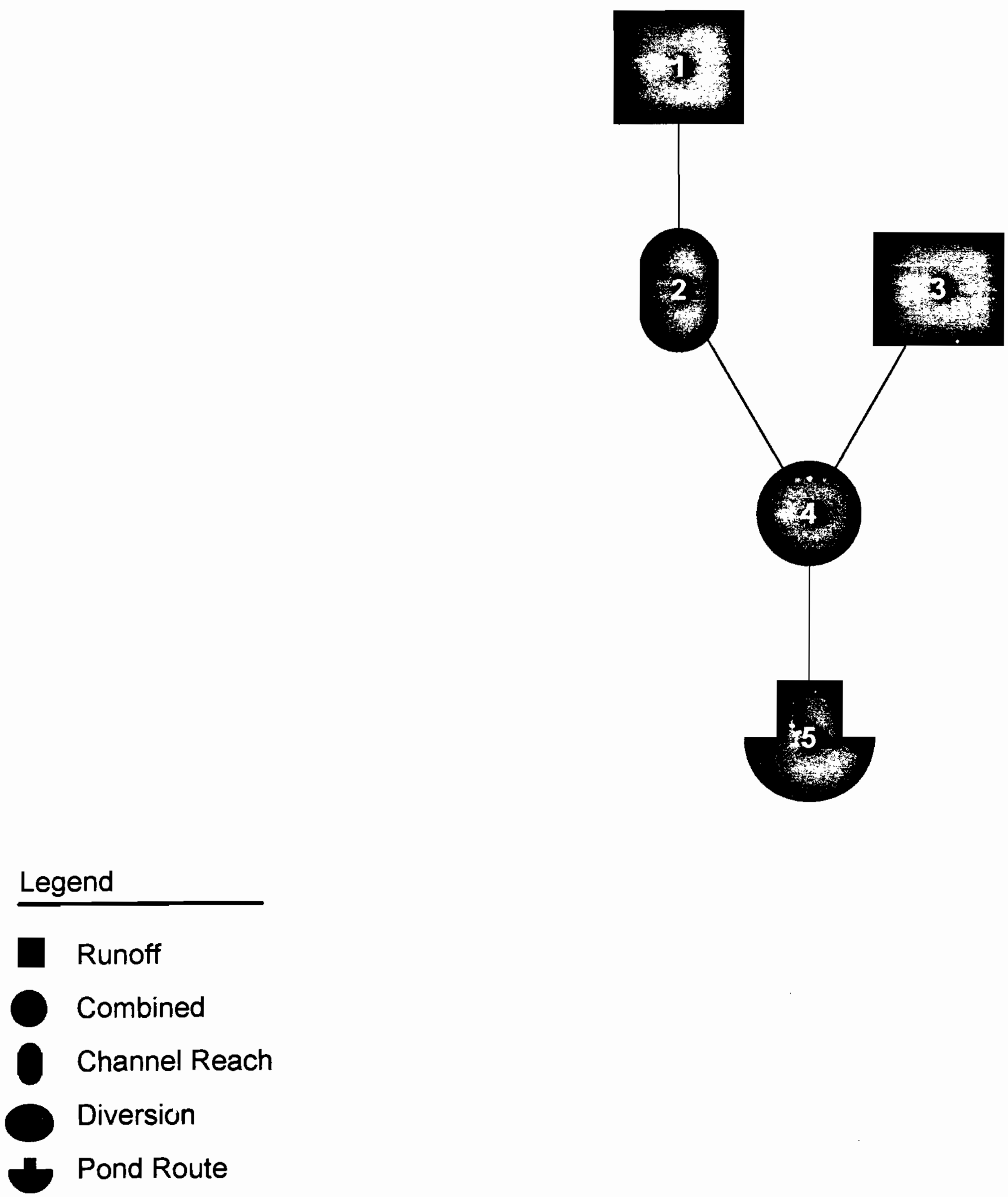
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

Proposed 5-year Storm



Project: ETE0530F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	16.09	3	720	37,125	5	—	—	—	Prop. S. Pond In
2	Reach	15.93	3	723	37,124	5	1	—	—	S. to N. Pond Ch.
3	SCS Runoff	24.77	3	726	84,602	5	—	—	—	Prop. N. Pond In
4	Combine	40.01	3	723	121,726	5	2 + 3	—	—	Prop. N. Pond In
5	Reservoir	2.71	3	831	111,008	5	4	1638.03	61,101	Prop. N. Pond Out

Proj. file. ETE0530F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 16.09 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 37,125 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	15.70
12.00	16.09 <<

...End

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 5 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 15.93 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 7.77 ft/s	Routing coeff.	= 0.8546

Modified Att-Kin routing method used.

Total Volume = 37,124 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	16.09 <<	14.97
12.05	11.77	15.93 <<

...*End*

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 24.77 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 84,602 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.00	20.66
12.05	24.08
12.10	24.77 <<
12.15	22.71

...End

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 5 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 40.01 cfs
Storm frequency	= 5 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 2	2nd inflow hyd. No.	= 3

Total Volume = 121,726 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	14.97		20.66		35.63
12.05	15.93 <<		24.08		40.01 <<
12.10	12.37		24.77 <<		37.14

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type = Reservoir
Storm frequency = 5 yrs
Inflow hyd. No. = 4
Max. Elevation = 1638.03 ft

Peak discharge = 2.71 cfs
Time interval = 3 min
Reservoir name = Proposed North
Max. Storage = 61,101 cuft

Storage Indication method used.

Total Volume = 111,008 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
12.65	5.75	1637.94	-----	-----	-----	-----	2.17	-----	-----	-----	2.17
12.70	5.37	1637.95	-----	-----	-----	-----	2.23	-----	-----	-----	2.23
12.75	5.07	1637.96	-----	-----	-----	-----	2.29	-----	-----	-----	2.29
12.80	4.84	1637.97	-----	-----	-----	-----	2.33	-----	-----	-----	2.33
12.85	4.64	1637.98	-----	-----	-----	-----	2.37	-----	-----	-----	2.37
12.90	4.47	1637.98	-----	-----	-----	-----	2.41	-----	-----	-----	2.41
12.95	4.32	1637.99	-----	-----	-----	-----	2.45	-----	-----	-----	2.45
13.00	4.18	1638.00	-----	-----	-----	-----	2.48	-----	-----	-----	2.48
13.05	4.04	1638.00	-----	-----	-----	-----	2.51	-----	-----	-----	2.51
13.10	3.91	1638.01	-----	-----	-----	-----	2.54	-----	-----	-----	2.54
13.15	3.79	1638.01	-----	-----	-----	-----	2.56	-----	-----	-----	2.56
13.20	3.68	1638.01	-----	-----	-----	-----	2.58	-----	-----	-----	2.58
13.25	3.58	1638.02	-----	-----	-----	-----	2.60	-----	-----	-----	2.60
13.30	3.49	1638.02	-----	-----	-----	-----	2.62	-----	-----	-----	2.62
13.35	3.41	1638.02	-----	-----	-----	-----	2.64	-----	-----	-----	2.64
13.40	3.33	1638.02	-----	-----	-----	-----	2.65	-----	-----	-----	2.65
13.45	3.25	1638.02	-----	-----	-----	-----	2.67	-----	-----	-----	2.66
13.50	3.17	1638.03	-----	-----	-----	-----	2.68	-----	-----	-----	2.68
13.55	3.10	1638.03	-----	-----	-----	-----	2.68	-----	-----	-----	2.68
13.60	3.02	1638.03	-----	-----	-----	-----	2.69	-----	-----	-----	2.69
13.65	2.95	1638.03	-----	-----	-----	-----	2.70	-----	-----	-----	2.70
13.70	2.89	1638.03	-----	-----	-----	-----	2.70	-----	-----	-----	2.70
13.75	2.82	1638.03	-----	-----	-----	-----	2.70	-----	-----	-----	2.70
13.80	2.76	1638.03	-----	-----	-----	-----	2.71	-----	-----	-----	2.71
13.85	2.70	1638.03 <<	-----	-----	-----	-----	2.71	-----	-----	-----	2.71 <<
13.90	2.64	1638.03	-----	-----	-----	-----	2.71	-----	-----	-----	2.71
13.95	2.59	1638.03	-----	-----	-----	-----	2.70	-----	-----	-----	2.70
14.00	2.53	1638.03	-----	-----	-----	-----	2.70	-----	-----	-----	2.70
14.05	2.47	1638.03	-----	-----	-----	-----	2.70	-----	-----	-----	2.70
14.10	2.42	1638.03	-----	-----	-----	-----	2.69	-----	-----	-----	2.69
14.15	2.37	1638.03	-----	-----	-----	-----	2.69	-----	-----	-----	2.69
14.20	2.33	1638.03	-----	-----	-----	-----	2.68	-----	-----	-----	2.68
14.25	2.30	1638.03	-----	-----	-----	-----	2.67	-----	-----	-----	2.67
14.30	2.27	1638.02	-----	-----	-----	-----	2.67	-----	-----	-----	2.67
14.35	2.25	1638.02	-----	-----	-----	-----	2.66	-----	-----	-----	2.66
14.40	2.23	1638.02	-----	-----	-----	-----	2.65	-----	-----	-----	2.65

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
14.45	2.21	1638.02	-----	-----	-----	-----	2.64	-----	-----	-----	2.64
14.50	2.19	1638.02	-----	-----	-----	-----	2.63	-----	-----	-----	2.63
14.55	2.17	1638.02	-----	-----	-----	-----	2.62	-----	-----	-----	2.62
14.60	2.15	1638.02	-----	-----	-----	-----	2.62	-----	-----	-----	2.62
14.65	2.13	1638.02	-----	-----	-----	-----	2.61	-----	-----	-----	2.61
14.70	2.11	1638.01	-----	-----	-----	-----	2.60	-----	-----	-----	2.60
14.75	2.10	1638.01	-----	-----	-----	-----	2.59	-----	-----	-----	2.59
14.80	2.08	1638.01	-----	-----	-----	-----	2.58	-----	-----	-----	2.58
14.85	2.06	1638.01	-----	-----	-----	-----	2.57	-----	-----	-----	2.57
14.90	2.04	1638.01	-----	-----	-----	-----	2.56	-----	-----	-----	2.56
14.95	2.02	1638.01	-----	-----	-----	-----	2.55	-----	-----	-----	2.55
15.00	2.00	1638.01	-----	-----	-----	-----	2.54	-----	-----	-----	2.54
15.05	1.98	1638.00	-----	-----	-----	-----	2.53	-----	-----	-----	2.53
15.10	1.96	1638.00	-----	-----	-----	-----	2.52	-----	-----	-----	2.52
15.15	1.94	1638.00	-----	-----	-----	-----	2.50	-----	-----	-----	2.51
15.20	1.92	1638.00	-----	-----	-----	-----	2.49	-----	-----	-----	2.49
15.25	1.90	1638.00	-----	-----	-----	-----	2.48	-----	-----	-----	2.48
15.30	1.88	1638.00	-----	-----	-----	-----	2.47	-----	-----	-----	2.47
15.35	1.86	1637.99	-----	-----	-----	-----	2.46	-----	-----	-----	2.46
15.40	1.84	1637.99	-----	-----	-----	-----	2.45	-----	-----	-----	2.45
15.45	1.82	1637.99	-----	-----	-----	-----	2.44	-----	-----	-----	2.44
15.50	1.80	1637.99	-----	-----	-----	-----	2.43	-----	-----	-----	2.43
15.55	1.78	1637.99	-----	-----	-----	-----	2.42	-----	-----	-----	2.42
15.60	1.76	1637.98	-----	-----	-----	-----	2.41	-----	-----	-----	2.41
15.65	1.74	1637.98	-----	-----	-----	-----	2.40	-----	-----	-----	2.40
15.70	1.72	1637.98	-----	-----	-----	-----	2.38	-----	-----	-----	2.38
15.75	1.70	1637.98	-----	-----	-----	-----	2.37	-----	-----	-----	2.37
15.80	1.67	1637.98	-----	-----	-----	-----	2.36	-----	-----	-----	2.36
15.85	1.65	1637.97	-----	-----	-----	-----	2.35	-----	-----	-----	2.35
15.90	1.63	1637.97	-----	-----	-----	-----	2.34	-----	-----	-----	2.34
15.95	1.61	1637.97	-----	-----	-----	-----	2.32	-----	-----	-----	2.32
16.00	1.59	1637.97	-----	-----	-----	-----	2.31	-----	-----	-----	2.31
16.05	1.57	1637.97	-----	-----	-----	-----	2.30	-----	-----	-----	2.30
16.10	1.55	1637.96	-----	-----	-----	-----	2.29	-----	-----	-----	2.29
16.15	1.53	1637.96	-----	-----	-----	-----	2.27	-----	-----	-----	2.27
16.20	1.52	1637.96	-----	-----	-----	-----	2.26	-----	-----	-----	2.26
16.25	1.50	1637.96	-----	-----	-----	-----	2.25	-----	-----	-----	2.25
16.30	1.49	1637.95	-----	-----	-----	-----	2.23	-----	-----	-----	2.23
16.35	1.49	1637.95	-----	-----	-----	-----	2.22	-----	-----	-----	2.22
16.40	1.48	1637.95	-----	-----	-----	-----	2.21	-----	-----	-----	2.21
16.45	1.47	1637.95	-----	-----	-----	-----	2.19	-----	-----	-----	2.19
16.50	1.46	1637.95	-----	-----	-----	-----	2.18	-----	-----	-----	2.18
16.55	1.46	1637.94	-----	-----	-----	-----	2.17	-----	-----	-----	2.17

...End

Reservoir Report

English

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

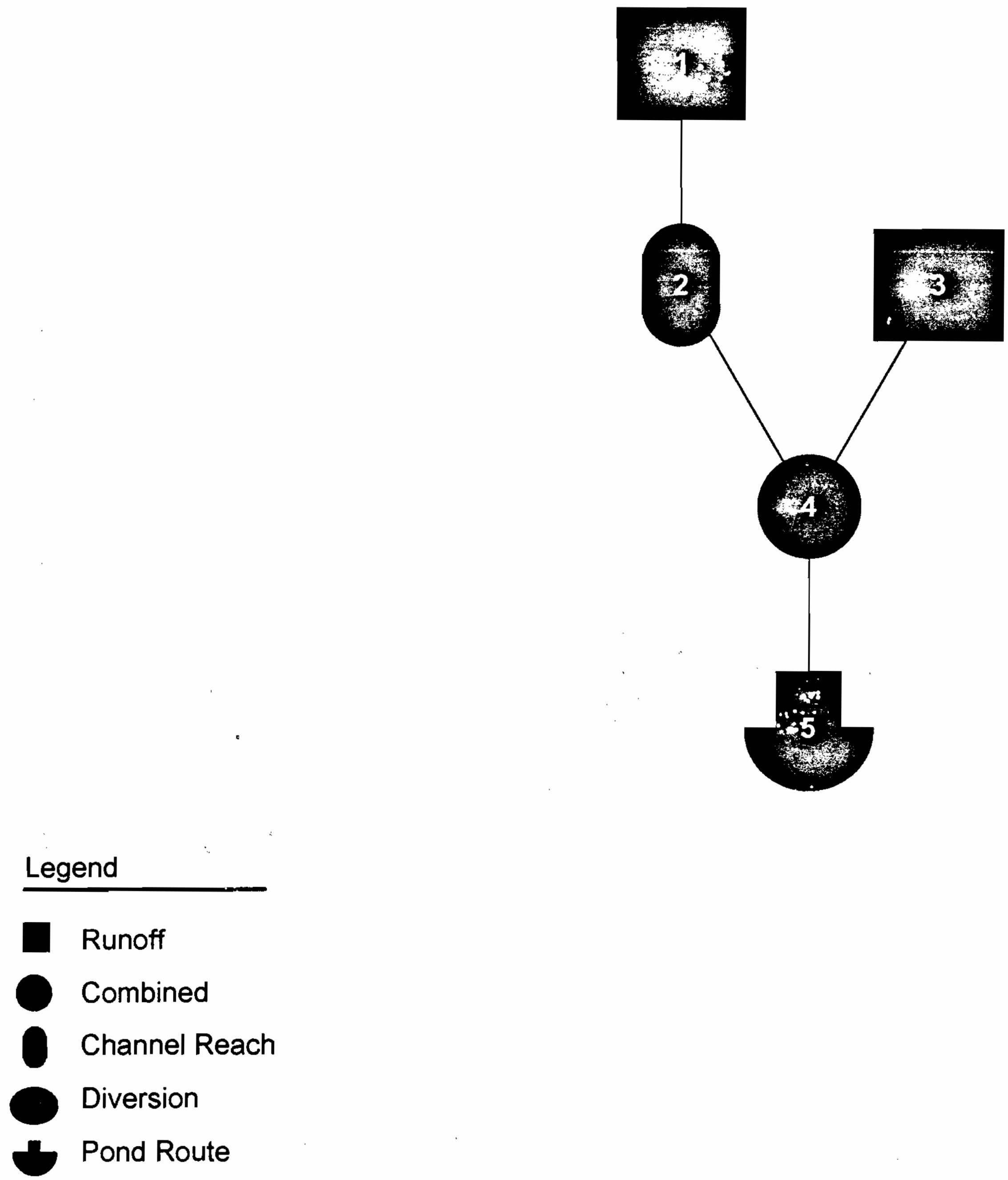
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

Proposed 2-year Storm



Project: ETE0230F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	9.79	3	720	23,225	2	—	—	—	Prop. S. Pond In
2	Reach	9.48	3	723	23,223	2	1	—	—	S. to N. Pond Ch.
3	SCS Runoff	14.18	3	726	52,229	2	—	—	—	Prop. N. Pond In
4	Combine	22.88	3	723	75,451	2	2 + 3	—	—	Prop. N. Pond In
5	Reservoir	1.09	3	960	64,977	2	4	1637.71	42,328	Prop. N. Pond Out

Proj. file: ETE0230F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 9.79 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 23,225 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	9.20
12.00	9.79 <<

...End

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 2 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

Hydrograph Report

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 9.48 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 6.65 ft/s	Routing coeff.	= 0.7791

Modified Att-Kin routing method used.

Total Volume = 23,223 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	9.79 <<	8.40
12.05	7.33	9.48 <<
12.10	4.27	7.81

...End

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 14.18 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 52,229 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.00	11.02
12.05	13.39
12.10	14.18 <<
12.15	13.26
12.20	11.63

...End

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 2 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 2 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 22.88 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 2	2nd inflow hyd. No.	= 3

Total Volume = 75,451 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	8.40		11.02		19.42
12.05	9.48 <<		13.39		22.88 <<
12.10	7.81		14.18 <<		21.99
12.15	5.05		13.26		18.32

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 1.09 cfs
Storm frequency	= 2 yrs	Time interval	= 3 min
Inflow hyd. No.	= 4	Reservoir name	= Proposed North
Max. Elevation	= 1637.71 ft	Max. Storage	= 42,328 cuft

Storage Indication method used. Total Volume = 64,977 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
13.40	2.21	1637.64	-----	-----	-----	-----	0.82	-----	-----	-----	0.82
13.45	2.16	1637.64	-----	-----	-----	-----	0.84	-----	-----	-----	0.84
13.50	2.12	1637.65	-----	-----	-----	-----	0.85	-----	-----	-----	0.85
13.55	2.07	1637.65	-----	-----	-----	-----	0.86	-----	-----	-----	0.86
13.60	2.02	1637.65	-----	-----	-----	-----	0.87	-----	-----	-----	0.87
13.65	1.97	1637.66	-----	-----	-----	-----	0.88	-----	-----	-----	0.88
13.70	1.93	1637.66	-----	-----	-----	-----	0.90	-----	-----	-----	0.90
13.75	1.89	1637.66	-----	-----	-----	-----	0.91	-----	-----	-----	0.91
13.80	1.85	1637.67	-----	-----	-----	-----	0.91	-----	-----	-----	0.91
13.85	1.81	1637.67	-----	-----	-----	-----	0.92	-----	-----	-----	0.92
13.90	1.77	1637.67	-----	-----	-----	-----	0.93	-----	-----	-----	0.93
13.95	1.73	1637.67	-----	-----	-----	-----	0.94	-----	-----	-----	0.94
14.00	1.70	1637.68	-----	-----	-----	-----	0.95	-----	-----	-----	0.95
14.05	1.66	1637.68	-----	-----	-----	-----	0.96	-----	-----	-----	0.96
14.10	1.62	1637.68	-----	-----	-----	-----	0.96	-----	-----	-----	0.96
14.15	1.59	1637.68	-----	-----	-----	-----	0.97	-----	-----	-----	0.97
14.20	1.57	1637.68	-----	-----	-----	-----	0.97	-----	-----	-----	0.97
14.25	1.55	1637.69	-----	-----	-----	-----	0.98	-----	-----	-----	0.98
14.30	1.53	1637.69	-----	-----	-----	-----	0.99	-----	-----	-----	0.99
14.35	1.51	1637.69	-----	-----	-----	-----	0.99	-----	-----	-----	0.99
14.40	1.50	1637.69	-----	-----	-----	-----	1.00	-----	-----	-----	1.00
14.45	1.49	1637.69	-----	-----	-----	-----	1.00	-----	-----	-----	1.00
14.50	1.48	1637.69	-----	-----	-----	-----	1.01	-----	-----	-----	1.01
14.55	1.46	1637.70	-----	-----	-----	-----	1.01	-----	-----	-----	1.01
14.60	1.45	1637.70	-----	-----	-----	-----	1.02	-----	-----	-----	1.02
14.65	1.44	1637.70	-----	-----	-----	-----	1.02	-----	-----	-----	1.02
14.70	1.43	1637.70	-----	-----	-----	-----	1.02	-----	-----	-----	1.02
14.75	1.41	1637.70	-----	-----	-----	-----	1.03	-----	-----	-----	1.03
14.80	1.40	1637.70	-----	-----	-----	-----	1.03	-----	-----	-----	1.03
14.85	1.39	1637.70	-----	-----	-----	-----	1.04	-----	-----	-----	1.04
14.90	1.38	1637.70	-----	-----	-----	-----	1.04	-----	-----	-----	1.04
14.95	1.36	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
15.00	1.35	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
15.05	1.34	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
15.10	1.33	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
15.15	1.31	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
15.20	1.30	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
15.25	1.29	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
15.30	1.27	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
15.35	1.26	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
15.40	1.25	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
15.45	1.23	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
15.50	1.22	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.55	1.21	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.60	1.19	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.65	1.18	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.70	1.17	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.75	1.15	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.80	1.14	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.85	1.12	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
15.90	1.11	1637.71 <<	-----	-----	-----	-----	1.09	-----	-----	-----	1.09
15.95	1.10	1637.71 <<	-----	-----	-----	-----	1.09	-----	-----	-----	1.09
16.00	1.08	1637.71 <<	-----	-----	-----	-----	1.09	-----	-----	-----	1.09 <<
16.05	1.07	1637.71 <<	-----	-----	-----	-----	1.09	-----	-----	-----	1.09
16.10	1.05	1637.71 <<	-----	-----	-----	-----	1.09	-----	-----	-----	1.09
16.15	1.04	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.20	1.03	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.25	1.03	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.30	1.02	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.35	1.01	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.40	1.01	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.45	1.00	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.50	1.00	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.55	0.99	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.60	0.99	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.65	0.98	1637.71	-----	-----	-----	-----	1.08	-----	-----	-----	1.08
16.70	0.98	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
16.75	0.98	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
16.80	0.97	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
16.85	0.97	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
16.90	0.96	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
16.95	0.96	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
17.00	0.95	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
17.05	0.95	1637.71	-----	-----	-----	-----	1.07	-----	-----	-----	1.07
17.10	0.94	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
17.15	0.94	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
17.20	0.93	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
17.25	0.93	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
17.30	0.92	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
17.35	0.92	1637.71	-----	-----	-----	-----	1.06	-----	-----	-----	1.06
17.40	0.91	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
17.45	0.91	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
17.50	0.90	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
17.55	0.90	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05
17.60	0.89	1637.71	-----	-----	-----	-----	1.05	-----	-----	-----	1.05

Continues on next page...

Reservoir Report

English

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

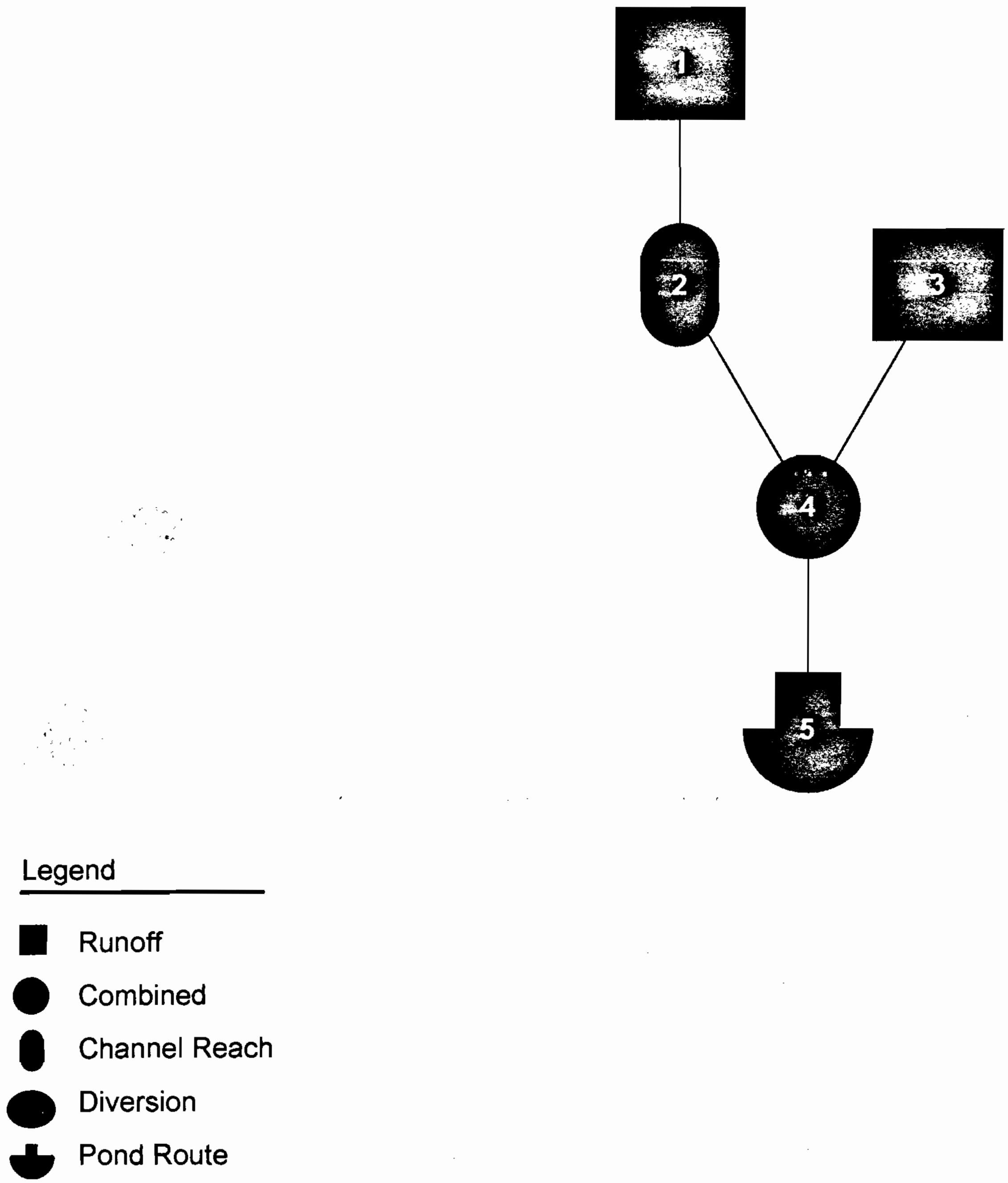
Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

Proposed 1-year Storm



Project: ETE0130F.gpw	IDF: Sample.IDF	5 hyd's	01-14-2000

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	6.95	3	720	17,084	1	—	—	—	Prop. S. Pond In
2	Reach	6.56	3	723	17,082	1	1	—	—	S. to N. Pond Ch.
3	SCS Runoff	9.50	3	726	38,033	1	—	—	—	Prop. N. Pond In
4	Combine	15.30	3	723	55,115	1	2 + 3	—	—	Prop. N. Pond In
5	Reservoir	0.63	3	1110	44,883	1	4	1637.57	33,927	Prop. N. Pond Out

Proj. file: ETE0130F.gpw	IDF file: Sample.IDF	Run date: 01-14-2000

Hydrograph Report

English

Hyd. No. 1

Prop. S. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 6.95 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Drainage area	= 11.22 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.7 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 17,084 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
11.95	6.30
12.00	6.95 <<
12.05	5.31

...End

TR55 Tc Worksheet

Hyd. No. 1

Prop. S. Pond In
Storm frequency = 1 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 5.0 %	
Travel Time		**= 6.9 min**

Shallow Concentrated Flow

Flow length	= 200 ft	
Watercourse slope	= 10.0 %	
Surface description	= Unpaved	
Average velocity	= 5.10 ft/s	
Travel Time		**= 0.7 min**

Channel Flow

Cross section flow area	= 3.0 sqft	
Wetted perimeter	= 6.3 ft	
Channel slope	= 7.0 %	
Manning's n-value	= 0.035	
Velocity	= 6.85 ft/s	
Flow length	= 100.0 ft	
Travel Time		**= 0.2 min**

Total Travel Time, Tc .... **= 7.7 min**

English

Hyd. No. 2

S. to N. Pond Ch.

Hydrograph type	= Reach	Peak discharge	= 6.56 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Inflow hyd. No.	= 1	Section type	= Triangular
Reach length	= 1250.0 ft	Channel slope	= 3.0 %
Manning's n	= 0.045	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 2.510	Rating curve m	= 1.333
Ave. velocity	= 6.00 ft/s	Routing coeff.	= 0.7310

Modified Att-Kin routing method used.

Total Volume = 17,082 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Outflow cfs
12.00	6.95 <<	5.51
12.05	5.31	6.56 <<
12.10	3.15	5.65

...End

Hydrograph Report

English

Hyd. No. 3

Prop. N. Pond In

Hydrograph type	= SCS Runoff	Peak discharge	= 9.50 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Drainage area	= 24.58 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.7796 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 38,033 cuft

Hydrograph Discharge Table

Time -- (hrs	Outflow cfs)
12.05	8.74
12.10	9.50 <<
12.15	9.05
12.20	8.06

...End

TR55 Tc Worksheet

Hyd. No. 3

Prop. N. Pond In
Storm frequency = 1 yrs

Sheet Flow

Manning's n-value	= 0.130	
Flow length	= 100.0 ft	
Two-year 24-hr precip.	= 2.50 in	
Land slope	= 3.0 %	
Travel Time		**= 8.4 min**

Shallow Concentrated Flow

Flow length	= 1150 ft	
Watercourse slope	= 4.0 %	
Surface description	= Unpaved	
Average velocity	= 3.23 ft/s	
Travel Time		**= 5.9 min**

Channel Flow

Cross section flow area	= 12.0 sqft	
Wetted perimeter	= 12.6 ft	
Channel slope	= 4.0 %	
Manning's n-value	= 0.045	
Velocity	= 6.39 ft/s	
Flow length	= 550.0 ft	
Travel Time		**= 1.4 min**

Total Travel Time, Tc .... **= 15.8 min**

Hydrograph Report

English

Hyd. No. 4

Prop. N. Pond In

Hydrograph type	= Combine	Peak discharge	= 15.30 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
1st inflow hyd. No.	= 2	2nd inflow hyd. No.	= 3

Total Volume = 55,115 cuft

Hydrograph Discharge Table

Time (hrs)	1st Inflow cfs	+	2nd Inflow cfs	=	Outflow cfs
12.00	5.51		6.91		12.43
12.05	6.56 <<		8.74		15.30 <<
12.10	5.65		9.50 <<		15.15
12.15	3.82		9.05		12.87

...End

Hydrograph Report

English

Hyd. No. 5

Prop. N. Pond Out

Hydrograph type	= Reservoir	Peak discharge	= 0.63 cfs
Storm frequency	= 1 yrs	Time interval	= 3 min
Inflow hyd. No.	= 4	Reservoir name	= Proposed North
Max. Elevation	= 1637.57 ft	Max. Storage	= 33,927 cuft

Storage Indication method used.

Total Volume = 44,883 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
14.45	1.15	1637.51	-----	-----	-----	-----	0.47	-----	-----	-----	0.47
14.50	1.14	1637.51	-----	-----	-----	-----	0.48	-----	-----	-----	0.48
14.55	1.13	1637.52	-----	-----	-----	-----	0.48	-----	-----	-----	0.48
14.60	1.12	1637.52	-----	-----	-----	-----	0.49	-----	-----	-----	0.49
14.65	1.11	1637.52	-----	-----	-----	-----	0.49	-----	-----	-----	0.49
14.70	1.10	1637.52	-----	-----	-----	-----	0.50	-----	-----	-----	0.50
14.75	1.09	1637.52	-----	-----	-----	-----	0.50	-----	-----	-----	0.50
14.80	1.08	1637.53	-----	-----	-----	-----	0.51	-----	-----	-----	0.51
14.85	1.08	1637.53	-----	-----	-----	-----	0.51	-----	-----	-----	0.51
14.90	1.07	1637.53	-----	-----	-----	-----	0.52	-----	-----	-----	0.52
14.95	1.06	1637.53	-----	-----	-----	-----	0.52	-----	-----	-----	0.52
15.00	1.05	1637.53	-----	-----	-----	-----	0.52	-----	-----	-----	0.52
15.05	1.04	1637.53	-----	-----	-----	-----	0.53	-----	-----	-----	0.53
15.10	1.03	1637.54	-----	-----	-----	-----	0.53	-----	-----	-----	0.53
15.15	1.02	1637.54	-----	-----	-----	-----	0.54	-----	-----	-----	0.54
15.20	1.01	1637.54	-----	-----	-----	-----	0.54	-----	-----	-----	0.54
15.25	1.00	1637.54	-----	-----	-----	-----	0.54	-----	-----	-----	0.54
15.30	0.99	1637.54	-----	-----	-----	-----	0.55	-----	-----	-----	0.55
15.35	0.98	1637.54	-----	-----	-----	-----	0.55	-----	-----	-----	0.55
15.40	0.97	1637.54	-----	-----	-----	-----	0.55	-----	-----	-----	0.55
15.45	0.96	1637.55	-----	-----	-----	-----	0.56	-----	-----	-----	0.56
15.50	0.95	1637.55	-----	-----	-----	-----	0.56	-----	-----	-----	0.56
15.55	0.94	1637.55	-----	-----	-----	-----	0.56	-----	-----	-----	0.56
15.60	0.93	1637.55	-----	-----	-----	-----	0.57	-----	-----	-----	0.57
15.65	0.92	1637.55	-----	-----	-----	-----	0.57	-----	-----	-----	0.57
15.70	0.91	1637.55	-----	-----	-----	-----	0.57	-----	-----	-----	0.57
15.75	0.90	1637.55	-----	-----	-----	-----	0.57	-----	-----	-----	0.57
15.80	0.89	1637.55	-----	-----	-----	-----	0.58	-----	-----	-----	0.58
15.85	0.87	1637.55	-----	-----	-----	-----	0.58	-----	-----	-----	0.58
15.90	0.86	1637.55	-----	-----	-----	-----	0.58	-----	-----	-----	0.58
15.95	0.85	1637.56	-----	-----	-----	-----	0.58	-----	-----	-----	0.58
16.00	0.84	1637.56	-----	-----	-----	-----	0.58	-----	-----	-----	0.59
16.05	0.83	1637.56	-----	-----	-----	-----	0.59	-----	-----	-----	0.59
16.10	0.82	1637.56	-----	-----	-----	-----	0.59	-----	-----	-----	0.59
16.15	0.81	1637.56	-----	-----	-----	-----	0.59	-----	-----	-----	0.59
16.20	0.80	1637.56	-----	-----	-----	-----	0.59	-----	-----	-----	0.59

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
16.25	0.80	1637.56	-----	-----	-----	-----	0.59	-----	-----	-----	0.59
16.30	0.79	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.35	0.79	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.40	0.79	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.45	0.78	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.50	0.78	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.55	0.77	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.60	0.77	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
16.65	0.77	1637.56	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
16.70	0.76	1637.56	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
16.75	0.76	1637.56	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
16.80	0.76	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
16.85	0.75	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
16.90	0.75	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
16.95	0.75	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
17.00	0.74	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
17.05	0.74	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
17.10	0.74	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.15	0.73	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.20	0.73	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.25	0.73	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.30	0.72	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.35	0.72	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.40	0.71	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.45	0.71	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.50	0.71	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.55	0.70	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.60	0.70	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.65	0.70	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.70	0.69	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.75	0.69	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.80	0.68	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
17.85	0.68	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
17.90	0.68	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
17.95	0.67	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.00	0.67	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.05	0.67	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.10	0.66	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.15	0.66	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.20	0.65	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.25	0.65	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.30	0.65	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.35	0.64	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.40	0.64	1637.57 <<	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.45	0.63	1637.57 <<	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.50	0.63	1637.57 <<	-----	-----	-----	-----	0.63	-----	-----	-----	0.63 <<
18.55	0.63	1637.57 <<	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.60	0.62	1637.57 <<	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.65	0.62	1637.57 <<	-----	-----	-----	-----	0.63	-----	-----	-----	0.63

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
18.70	0.61	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.75	0.61	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.80	0.61	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.85	0.60	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.90	0.60	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
18.95	0.59	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.00	0.59	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.05	0.59	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.10	0.58	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.15	0.58	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.20	0.57	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.25	0.57	1637.57	-----	-----	-----	-----	0.63	-----	-----	-----	0.63
19.30	0.56	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.35	0.56	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.40	0.56	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.45	0.55	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.50	0.55	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.55	0.54	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.60	0.54	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.65	0.54	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.70	0.53	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.75	0.53	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.80	0.52	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.85	0.52	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.90	0.51	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
19.95	0.51	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
20.00	0.50	1637.57	-----	-----	-----	-----	0.62	-----	-----	-----	0.62
20.05	0.50	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.10	0.50	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.15	0.49	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.20	0.49	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.25	0.49	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.30	0.49	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.35	0.49	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.40	0.48	1637.57	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.45	0.48	1637.56	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.50	0.48	1637.56	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.55	0.48	1637.56	-----	-----	-----	-----	0.61	-----	-----	-----	0.61
20.60	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.65	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.70	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.75	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.80	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.85	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.90	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
20.95	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
21.00	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
21.05	0.48	1637.56	-----	-----	-----	-----	0.60	-----	-----	-----	0.60
21.10	0.48	1637.56	-----	-----	-----	-----	0.59	-----	-----	-----	0.59

Continues on next page...

Reservoir Report

English

Reservoir No. 2 - Proposed North Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	1637.00	57,810	0	0
1.00	1638.00	60,580	59,195	59,195
2.00	1639.00	63,405	61,993	121,188
3.00	1640.00	66,230	64,818	186,005

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.0	8.0	0.0	0.0
Crest El. ft	= 1637.00	1639.00	0.00	0.00
Weir Coeff.	= 2.50	3.00	3.00	3.00
Eqn. Exp.	= 2.50	1.50	1.50	1.50
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	1637.00	---	---	---	---	0.00	0.00	---	---	0.00
1.00	59,195	1638.00	---	---	---	---	2.50	0.00	---	---	2.50
2.00	121,188	1639.00	---	---	---	---	14.14	0.00	---	---	14.14
3.00	186,005	1640.00	---	---	---	---	38.97	24.00	---	---	62.97

New York State Department of Environmental Conservation
ETE Sanitation and Landfill, Gainesville, NY
Table 2-3: Proposed North Pond
Storage vs. Elevation

Elevation (CF)	**Surface Area** (SF)	**Incremental Elevation** (FT)	**Incremental Volume** (CF)	**Pond Volume Above Pond Invert** (CF)	**Pond Volume Above Spillway Inv.** (CF)
1,630	15,655			0	
		1	18,166		
1,631	20,678			18,166	
		1	23,189		
1,632	25,700			41,355	
		1	29,523		
1,633	33,345			70,878	
		1	37,168		
1,634	40,990			108,045	
		1	44,503		
1,635	48,015			152,548	
		1	51,528		
1,636	55,040			204,075	
		1	56,425		
1,637	57,810			260,500	0
		1	59,195		
1,638	60,580			319,695	59,195
		1	61,993		
1,639	63,405			381,688	121,188
		1	64,818		
1,640	66,230			446,505	186,005

Gabion Spillway @ El. 1637 & Sta. 0+08
Worksheet for Triangular Channel

Project Description	
Project File	p:\0897-ete\stormwat\prnp-out.fm2
Worksheet	Prop. N. Pond Spillway Outlet Ch. - Top
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	25.00	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	18.40	cfs

Results	
Depth	0.71 ft
Flow Area	1.53 ft^2
Wetted Perimeter	4.52 ft
Top Width	4.28 ft
Critical Depth	1.19 ft
Critical Slope	1.68 %
Velocity	12.03 ft/s
Velocity Head	2.25 ft
Specific Energy	2.96 ft
Froude Number	3.55
Flow is supercritical.	

Gabion Spillway @ El. 1633.5 & Sta. 0+22
Worksheet for Triangular Channel

Project Description	
Project File	p:\0897-ete\stormwat\prnp-out.fm2
Worksheet	Prop. N. Pond Spillway Outlet Ch. - Mid.
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	25.00	%
Left Side Slope	7.50	H : V
Right Side Slope	7.50	H : V
Discharge	18.40	cfs

Results	
Depth	0.50 ft
Flow Area	1.88 ft^2
Wetted Perimeter	7.58 ft
Top Width	7.51 ft
Critical Depth	0.82 ft
Critical Slope	1.79 %
Velocity	9.78 ft/s
Velocity Head	1.49 ft
Specific Energy	1.99 ft
Froude Number	3.45
Flow is supercritical.	

Gabion Spillway @ El. 1630 & Sta. 0+36
Worksheet for Triangular Channel

Project Description	
Project File	p:\0897-ete\stormwat\prnp-out.fm2
Worksheet	Prop. N. Pond Spillway Outlet Ch. - Bot.
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	25.00	%
Left Side Slope	12.00	H : V
Right Side Slope	12.00	H : V
Discharge	18.40	cfs

Results	
Depth	0.42 ft
Flow Area	2.11 ft²
Wetted Perimeter	10.10 ft
Top Width	10.06 ft
Critical Depth	0.68 ft
Critical Slope	1.89 %
Velocity	8.72 ft/s
Velocity Head	1.18 ft
Specific Energy	1.60 ft
Froude Number	3.36
Flow is supercritical.	

ETE Landfill, Gainesville, NY
Worksheet for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\bypass-u.fm2
Worksheet	Ch. from S.to N. Pond @ 2% (Grass)
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	2.00	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	40.00	cfs

Results	
Depth	1.63 ft
Flow Area	7.92 ft^2
Wetted Perimeter	10.28 ft
Top Width	9.75 ft
Critical Depth	1.62 ft
Critical Slope	2.06 %
Velocity	5.05 ft/s
Velocity Head	0.40 ft
Specific Energy	2.02 ft
Froude Number	0.99
Flow is subcritical.	

ETE Landfill, Gainesville, NY
Worksheet for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\bypass-u.fm2
Worksheet	Ch. from S.to N. Pond @ 2% (Riprap)
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	2.00	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	40.00	cfs

Results	
Depth	1.79 ft
Flow Area	9.57 ft²
Wetted Perimeter	11.29 ft
Top Width	10.72 ft
Critical Depth	1.62 ft
Critical Slope	3.40 %
Velocity	4.18 ft/s
Velocity Head	0.27 ft
Specific Energy	2.06 ft
Froude Number	0.78
Flow is subcritical.	

Appendix B-7
Stormwater Channels

Calculation Cover Sheet

Project Title:	ETE Sanitation and Landfill - Remedial Design
Client:	New York State Department of Environmental Conservation
Project Number:	0897-26526
Calculation Title:	Stormwater Channel Analysis
Performed By and Date:	Dale Zeiders, October 1999
Checked By and Date:	John Wood, January 2000
Purpose of Calculation:	Design stormwater channel to drain the South Pond and convey flow around the landfill to the North Pond
Results:	Utilized a "V" channel with 3:1 grass-lined side slopes. Channel designed with a slope of 2%.
References:	1. New York, "Guidelines for Urban Erosion and Sediment Control", April 1997. 2. Haestad, "FlowMaster PE", 1996.

ETE Landfill, Gainesville, NY
Worksheet for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\bypass-u.fm2
Worksheet	Ch. from S.to N. Pond @ 2% (Riprap) - West Channel
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	2.00	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	40.00	cfs

- 100 Year

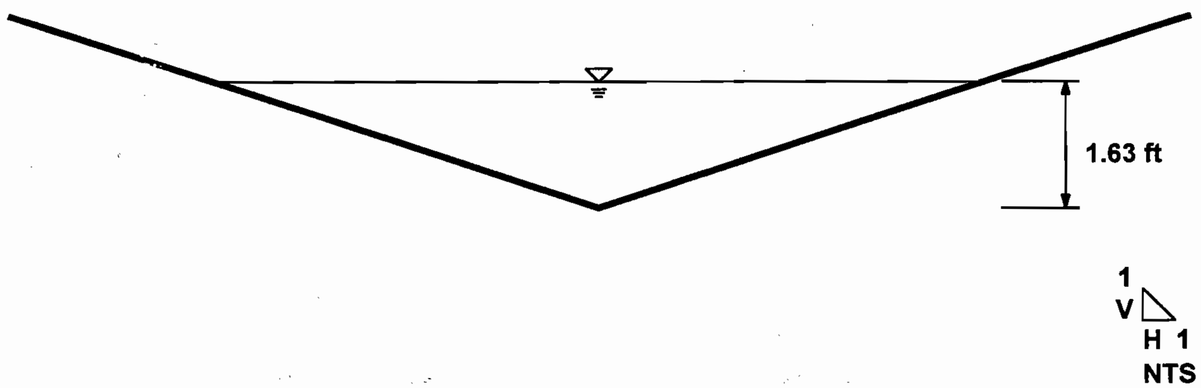
Results	
Depth	1.63 ft
Flow Area	7.92 ft²
Wetted Perimeter	10.28 ft
Top Width	9.75 ft
Critical Depth	1.62 ft
Critical Slope	2.06 %
Velocity	5.05 ft/s
Velocity Head	0.40 ft
Specific Energy	2.02 ft
Froude Number	0.99
Flow is subcritical.	

Use d_{50} = 3", Max. size = 6"
Placement thickness = 1.5 x 6" = 9"
Place over geotextile filter fabric.

S. to N. Pond - West Channel
Cross Section for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\bypass-u.fm2
Worksheet	Ch. from S.to N. Pond @ 2% (Riprap)
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.035	
Channel Slope	2.00	%
Depth	1.63	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	40.00	cfs



NYS DEC - ETE Landfill
Worksheet for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\e-ch-001.fm2
Worksheet	East Channel - On Top @ 1% (10+00 to 12+50)
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	1.00	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	8.00	cfs

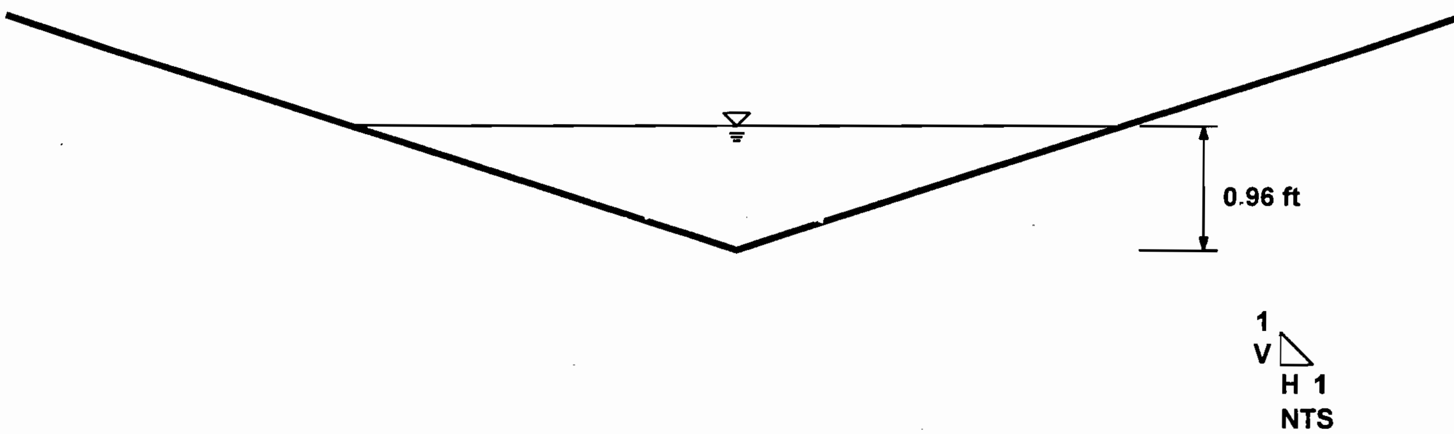
Results	
Depth	0.96 ft
Flow Area	2.74 ft²
Wetted Perimeter	6.04 ft
Top Width	5.73 ft
Critical Depth	0.85 ft
Critical Slope	1.87 %
Velocity	2.92 ft/s
Velocity Head	0.13 ft
Specific Energy	1.09 ft
Froude Number	0.75
Flow is subcritical.	

- Use Grass lined channel.
Cover with curlex erosion control mat.

East Channel - Upper Reach (1%)
Cross Section for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\e-ch-001.fm2
Worksheet	East Channel - On Top @ 1%
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.030	
Channel Slope	1.00	%
Depth	0.96	ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	8.00	cfs



NYS-DEC - ETE Landfill
Worksheet for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\e-ch-001.fm2
Worksheet	East Channel - Down 23% slope (Sta 12+50 to Stream @ 15+25)
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.230000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	8.00	cfs

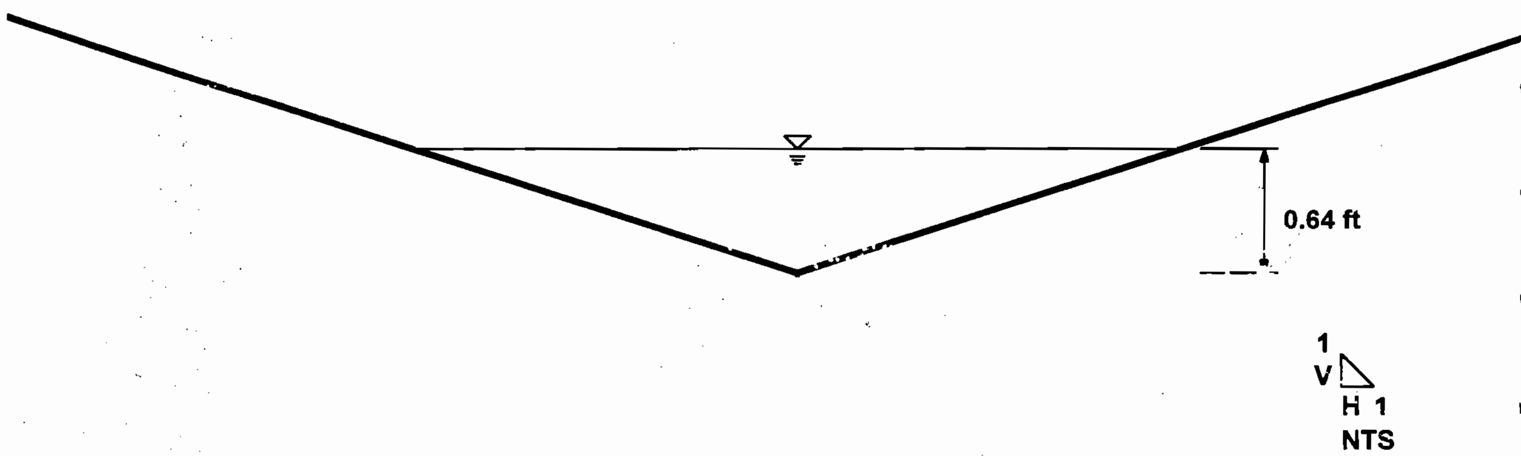
Results		
Depth	0.64	ft
Flow Area	1.24	ft^2
Wetted Perimeter	4.06	ft
Top Width	3.86	ft
Critical Depth	0.85	ft
Critical Slope	0.051994	ft/ft
Velocity	6.46	ft/s
Velocity Head	0.65	ft
Specific Energy	1.29	ft
Froude Number	2.01	
Flow is supercritical.		

- use d_{50} = 6"; Max Size = 12"
Placement thickness = 1.5 x 12" = 18"
Place over geotextile filter fabric.

East Channel - Lower Reach (23%)
Cross Section for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\e-ch-001.fm2
Worksheet	East Channel - Down 23% slope
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.050	
Channel Slope	0.230000	ft/ft
Depth	0.64	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	8.00	cfs



NYS DEC - ETE Landfill
Worksheet for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\bypass-u.fm2
Worksheet	Access Road Ditch on North of Landfill
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.100000 ft/ft	
Left Side Slope	3.000000 H : V	
Right Side Slope	3.000000 H : V	
Discharge	5.00	cfs

d_{50} = 3" ; Max Size = 6"; Placement thickness = 9".

Results		
Depth	0.58	ft
Flow Area	1.01	ft²
Wetted Perimeter	3.66	ft
Top Width	3.48	ft
Critical Depth	0.70	ft
Critical Slope	0.035428 ft/ft	
Velocity	4.97	ft/s
Velocity Head	0.38	ft
Specific Energy	0.96	ft
Froude Number	1.63	
Flow is supercritical.		

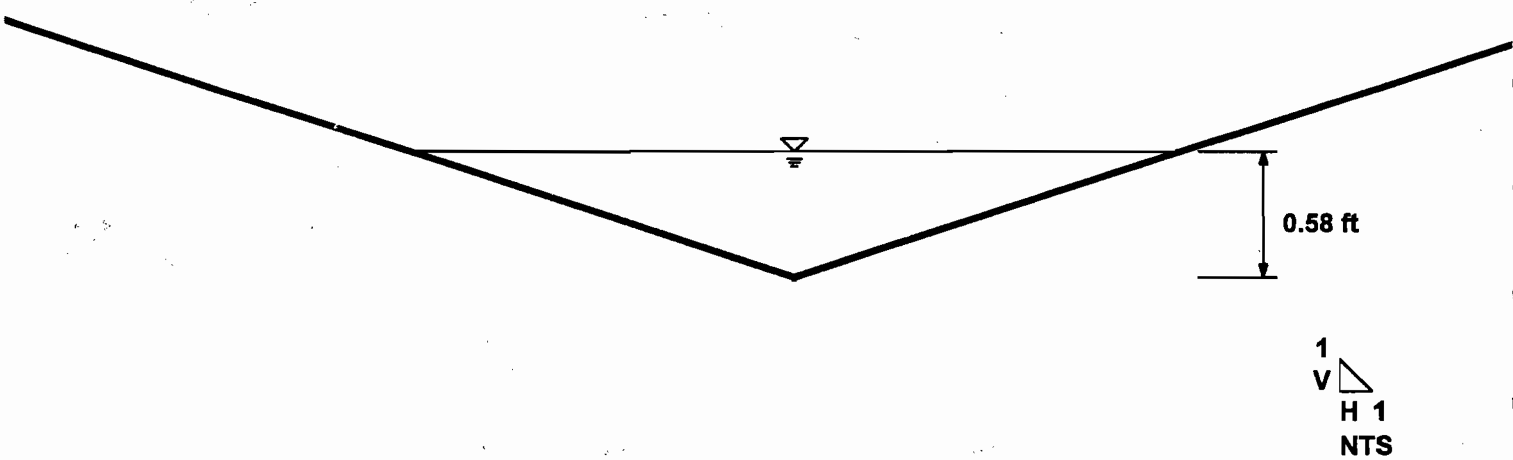
Max. permissible velocity = 6.5 fps ∴ OK

dh

Access Rd. Ditch on N. of Landfill
Cross Section for Triangular Channel

Project Description	
Project File	o:\projects\0897-ete\stormwat\bypass-u.fm2
Worksheet	Access Road Ditch on North of Landfill
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.040	
Channel Slope	0.100000	ft/ft
Depth	0.58	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	5.00	cfs



Appendix C
Technical Specifications are included in the Contract Documents