ATTACHMENT 8

NOD1 ITEM 11: SITE A LANDFILL CLOSURE DOCUMENTS

TEXAS MUNICIPAL POWER AGENCY

RISK REDUCTION STANDARD NUMBER 3
CLOSURE PLAN FOR THE SITE A LANDFILL
TNRCC REGISTRATION NO. 32271

November 1996

RMT/Jones & Neuse, Inc.

TEXAS MUNICIPAL POWER AGENCY
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NOVEMBER 1996

RMT®/JONES & NEUSE, INC.

RMT/JONES & NEUSE, INC. – AUSTIN, TX
912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 200 - 78746-5210
512/327-9840 - 512/327-6163 FAX

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RMT/Jones and Neuse, Inc. **MEMORANDUM**

DATE: **December 16, 1996**

TO: **David Wadsack**
Texas Municipal Power Agency - Carlos

FROM: **Kathleen Kerr**
RMT/Jones and Neuse, Inc. - Austin

SUBJECT: **Risk Reduction Closure Plan for the Ash Landfill**

Enclosed please find the following items:

- one copy of the document entitled "Risk Reduction Standard Number 3 Closure Plan for the Site A Landfill"; and

- draft submittal letter to the Texas Natural Resource Conservation Commission.

If you have any questions or comments about the documents, or need additional information, please contact me at 512-327-9840.

cc: Mike Dick, RMT/JN Austin

December 10, 1996

DRAFT

Mr. Richard D. Clarke, Program Manager
Closure Team - Corrective Action Section
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Re: Texas Municipal Power Agency, Risk Reduction Standard Number 3 Closure Plan for the Site A Landfill, TNRCC Registration No. 32271

Dear Mr. Clarke:

Enclosed please find two copies of the final closure and post-closure care plan for the Site A Landfill which is located at the Texas Municipal Power Agency facility in Carlos, Texas. This closure plan has been submitted in accordance with 30 Texas Administrative Code §335.8(d) of the Texas Natural Resource Conservation Commission's (TNRCC's) rules (Demonstration of Conformance with Risk Reduction Standards). This closure and post-closure plan addresses maintenance of the landfill cap and ground-water detection monitoring at the landfill. A permit application for management of landfill leachate has been separately submitted to the Permitting Section of the TNRCC's Watershed Management Division.

If you have any questions or comments concerning this document, please feel free to contact me at 409-873-2013.

Sincerely,
TEXAS MUNCIPAL POWER AGENCY

David T. Wadsack
Mining Engineer

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EXECUTIVE SUMMARY

The Texas Municipal Power Authority (TMPA) Gibbons Creek Station coal-fired electric generating plant is located approximately 2.5 miles north of the intersection of FM 244 and State Highway 30 in Grimes County, Texas. TMPA is a governmental organization which was established to construct and operate electric power generation and transmission facilities to supply the Texas cities Bryan, Denton, Garland, and Greenville with electrical power.

TMPA has developed this Risk Reduction Standard Number 3 (Standard Number 3) closure plan for the Site A landfill which was utilized for the disposal of bottom ash, fly ash, and stabilized flue gas desulfurization sludge generated at Gibbons Creek Station. The closure plan for the landfill is organized into the following sections:

- **Section 1 - Remedial Investigation Report.** This section summarizes the available data concerning the wastes disposed in the landfill, ground-water detection monitoring, and operation of the landfill. A discussion of regional and site-specific geology and hydrogeology is included in this section. The current status of the site is described.

- **Section 2 - Baseline Risk Assessment.** Chemical analyses of the wastes disposed in the landfill and soils adjacent to the landfill, and ground-water monitoring data was used to identify the inorganic constituents of concern for the risk assessment. The potential constituents identified included cadmium, lead and nickel. The risk assessment evaluated the potential for exposure and risks under current or future conditions. The results of the risk assessment indicate that there are no completed human exposure pathways to waste or waste constituents.

- **Section 3 - Corrective Measures Study.** The closure remedy recommended for the landfill is (1) semiannual inspections of the landfill cap, (2) operation of the existing groundwater detection monitoring program, (3) continued operation of the leachate collection system, (4) an engineering study of settlement the landfill cap, and (5) institutional controls. The closure remedy was evaluated for its ability to reduce risk by eliminating or controlling release mechanisms and potential future exposure. The closure alternative has been developed to achieve long-term effectiveness and cost effectiveness, and incorporates site-specific concerns as determined in the risk reduction evaluation.

The Standard Number 3 closure plan for the landfill was developed in accordance with the Texas Natural Resource Conservation Commission's (TNRCC's) Risk Reduction Rules. A permit application for management of the leachate collection system has been separately submitted to the TNRCC.

Section 1

REMEDIAL INVESTIGATION REPORT

This remedial investigation report summarizes the available data an investigations which have been conducted at the Site A landfill (landfill), an inactive nonhazardous industrial solid waste landfill which is located at TMPA. The location of the landfill is illustrated in the figure included as item no. 1 in Appendix A. The landfill received wastes generated at Gibbons Creek Station from approximately 1983 until 1989.

1.1 Description of Landfill and History of Operations

The landfill, Unit Number 01 on the facility's Notice of Registration, was in service from 1983 until approximately 1989. Prior to full operation of the landfill, from December 1982 through April 1983, TMPA conducted an Ash Landfill Demonstration Project. The landfill is currently inactive, and the waste material disposed in the unit is covered with a soil cap, consisting of approximately two feet of clay soil and one foot of topsoil and vegetative cover. Settlement of the soil cap has been observed.

Site A is a 173.078-acre tract of land, with the surface area of the above-grade landfill at Site A approximately 142 acres (see Figure 1). As-built engineering drawings and elevations for the unit are not available. The dimensions of the unit are approximately 1,400 feet by 4,400 feet, with a depth of 15 feet. The inactive landfill consists of a total of five disposal cells or areas in the main portion of the landfill, and the landfill demonstration plot which is a separate cell. One of the landfill cells originally planned was not constructed. Each cell is lined with approximately 3 feet of compacted clay with a permeability of 1×10^{-7} cm/sec. The nonhazardous industrial solid waste disposed in the landfill is contained in soil berms with a minimum width of 10 feet. The disposal capacity of the landfill is estimated as 3.4 million cubic yards. An engineering drawing of the landfill (Ash Disposal Plan) is included as item no. 2 in Appendix A.

During operation of the landfill, twelve sedimentation ponds were constructed around the perimeter for the collection of stormwater from active disposal cells and leachate from the landfill. These ponds are lined with three feet of compacted clay with a permeability of 1×10^{-7} cm/sec. These sedimentation ponds are currently active, and are now utilized to collect landfill leachate. These ponds are connected by piping and manifolds which allow water to drain and collect in Ponds 1 and 2. The stormwater and leachate which collects in the sedimentation ponds is not discharged, but is allowed to evaporate. TMPA is in the process of preparing an application for a TNRCC permit for wetlands treatment of this water.

During the period of operation, the following Class 2 (nonhazardous) industrial solid wastes were transported to the landfill for disposal: (1) bottom ash; (2) fly ash; and (3) stabilized flue gas desulfurization (FGD) sludge. The FCD sludge was stabilized with fly ash. The typical concentrations of inorganic constituents in these wastes is listed in Table 1. As part of the Ash Landfill Demonstration Project which was conducted from December 1982 through April 1983, leach tests were performed on the waste proposed for disposal in the landfill. Analyses were also performed on runoff water and ground-water. These analytical results were reported to the Texas Department of Water Resources, a predecessor agency to the TNRCC. Leach tests results conducted on TMPA's fly ash and FGD sludge are included in Tables 2 and 3. Analytical data for runoff from the demonstration site (sedimentation pond 3a) is included in Table 4.

1.2 Site Topography and Drainage

The site (see Figure 1) is located in the Brazos River Basin within Grimes County. The topography of the site is gently rolling with slopes averaging 1 percent. Area surface waters include Gibbons Creek, Gibbons Creek Reservoir, and Carlos Lake. Stormwater from the TMPA site in the immediate area of the landfill drains approximately one-half mile east to Gibbons Creek Reservoir. Stormwater in the area south of the landfill drains to Big Branch, an intermittent creek, which flows to Carlos Lake. Waters from Gibbons Creek Reservoir and Carlos Lake flow southeast into Gibbons Creek, a tributary of the Navasota River (Segment 1209 of the Brazos River Basin), which drains into the Brazos River (Segment 1202).

1.3 Regional Geology and Hydrogeology and Area Soils

The regional geology and hydrogeology and soils in the area of the TMPA site are described in this section of the report. Boring logs and soil profiles for Site A are included as item nos. 3 through 6 in Appendix A.

Regional Geology. The TMPA landfill site is located within the Texas Gulf Coast region and is defined by lenticular sedimentary deposits of late Eocene to recent clays, silts and sands. The beds of sediment parallel the current Texas Gulf Coast, striking from north-south in the southern part of the region to northeast-southwest in the eastern part. In vertical section, the geologic formations occur as gently dipping truncated wedges, approximately 120 to 150 feet per mile near subject site that thicken towards the coast (TWDB 1963).

Regionally, faults have been mapped within the sedimentary beds throughout the Texas Gulf Coast region, especially as growth faults (faults that occur contemporaneously with deposition), but rarely show significant surface expressions. There are also normal strike faults that are related to the gradual subsidence associated with the Houston Embayment and the corresponding San Marcos Arch (UTA 1982). Other sources of structural deformation are associated with the salt domes found within the region. No faults or structures associated with faulting have been mapped at the TMPA landfill site.

According to the University of Texas at Austin Bureau of Economic Geology Geologic Atlas, Austin Sheet, the TMPA landfill is located on outcrops of the Caddell and Wellborn Formations. Stratigraphically, the Jackson Group is comprised of the Caddell, Wellborn, Manning, and Whitsett Formations and lies between the Claiborne Group (older early Eocene age) and the Frio Formation (younger or Oligocene age). The Jackson Group ranges in thickness from 800 to 1,300 feet, thickening downdip.

The Caddell Formation is 50 to 150 feet thick and is characterized by interbedded light-brown mud and a few fine- to medium-grained quartz sand lenses. The lignitic clays and cross-bedded sandstones suggest fluvial or deltatic deposition. The sand locally exhibits iron-oxide stains. The Wellborn Formation contains interlayered medium-grained quartz sand and dark-brown mud or shale. Wellborn strata are 150 feet thick or more, and many of the sands are silica cemented in the upper sections. The Manning Formation is approximately 250 feet thick and is chocolate-brown mud, lignite and channel sands. The Manning is currently being mined for lignite southwest of the subject site. The Whitsett Formation ranges from 60 to 130 feet and is described as a light-colored, cross-bedded quartz sand that is fine to medium-grained and tuffaceous.

More recent studies have proposed that the Wellborn and Manning Formations be combined as one formation, namely the Manning Formation. Within the new Manning, several subgroups were developed specifically for the Gibbons Creek area. The Bedias, Carlos, Tuttle, and Yuma Members are sandstone units originally defined from subsurface outcrops. The Keith, Rock, Lake, Gibbons Creek, and Singleton Members are new units defined by their lignite beds.

The subject site straddles the contact between the Manning Clay and Wellborn Sandstone Formations. Soil borings drilled within the Manning Formation in the vicinity of the waste disposal area show interbedded sand and clay units. The sands are dense fine to medium-grained silty-sand mixtures that contain some iron-staining. The clays range from low to high plasticity, depending on the amount of silt, sand and gravel content present in the clay.

Regional Hydrogeology. The Jackson Group is not an aquifer of major importance in the region. In general, water wells that penetrate sand beds in the Jackson yield only small to moderate quantities of water (TWDB 1963). The hydrogeology in the vicinity of the subject site is divided into the Caddell Formation which contains discontinuous sand bodies near the contact with the Bedias sands (e.g. monitor well MW-10 is constructed in this formation). The Middle Wellborn shales serve as an aquitard to ground-water flow. The Middle Wellborn sands are laterally discontinuous, but ground water and meteoric waters are hydrologically connected with the Gibbons Creek Reservoir.

Because of the lenticular nature of the Wellborn and Manning Formations, in addition to the variability in the lithologic horizon that is screened, a ground-water potentiometric surface cannot be accurately developed. However, the ground-water potentiometric surface probably mimics the topography and, in general, flows towards the Gibbons Creek Reservoir.

Area Soils. According to the U.S. Department of Agriculture, Soil Conservation Service Map (USDA 1979), the subject facility is developed on the Falba-Arriola-Arol soil type. Falba soils have brown fine sandy loam surfaces of about seven inches thick over grayish brown acid clayey subsoils that grade into tuffaceous materials. Arriola soils have a pale brown fine sandy loam surface about nine inches thick over red and mottled brown and yellow strongly acid clayey subsoils that grade to tuffaceous material. Arol soils have dark grayish brown fine sandy loam surface about six inches in thickness.

1.4 Ground-Water Detection Monitoring

Ground-water detection monitoring at the landfill was initiated in 1983. The ground-water monitoring system currently consists of seven wells (MW-2 through MW-6, MW-10 and MW-13). The locations of these wells are shown in Figure 1. Monitor wells MW-10, MW-12, and MW-13 were constructed in 1987. Monitor wells MW-1, MW-8, MW-9, MW-11, MW-12, MW-14, and

MW-15 have been abandoned. Well MW-7 is not a detection monitoring well since it is completed within the waste fly ash disposed in the landfill demonstration cell. The well is utilized to collect leachate samples generated in the fly ash. Monitor wells were installed in accordance with the operating manual for the landfill. The available monitor well logs are included as item no. 7 in Appendix A.

Description of Monitoring System. The landfill extends across the outcrop of two formations, and due to the discontinuous and lenticular nature of the sand layers, the wells do not screen the same horizon or lithology. As a result, the piezometric heads in the wells cannot be used to construct a simple piezometric surface map, and the ground-water flow gradients and exact flow directions cannot be determined. In an areal sense, the general direction of ground-water flow should be downdip, to the southeast. This pattern is observed consistently for all Gulf Coast region deposits. Locally, ground-water flow will follow topography and adjacent drainage features. For this facility, this would result in an easterly to southeasterly flow. With these assumed flow directions, well MW-2 would be the most upgradient monitor well in the system. The monitoring system can be described as follows:

- **Upgradient Well.** MW-2 is the most upgradient monitor well in the system. This well is also located far enough from the landfill to not be impacted by potential releases.

- **Supplemental Well.** Monitor well MW-3 will be considered a supplemental well for the purposes of ground-water monitoring. Although well MW-3 could be geographically upgradient of the majority of the landfill, its close proximity to it increases the potential of being impacted by surface water runoff, and releases or direct infiltration from the stormwater/leachate sedimentation ponds.

- **Downgradient Wells.** The other monitor wells (MW-4 through MW-6, MW-10 and MW-13) can be considered generally downgradient of the landfill.

The groundwater monitoring system described above was utilized to assess the available ground-water analytical data.

Analytical Data. Ground-water samples were analyzed for the following inorganic constituents from 1987 to the present: (1) arsenic; (2) barium; (3) cadmium; (4) chromium; (5) copper; (6) lead; (7) mercury; (8) nickel; (9) silver; and (10) zinc. Monitoring was conducted on a quarterly basis. The results of the individual analyses of ground-water samples for metals are included as item no. 1 in Appendix B.

The mean concentrations of constituents detected in ground-water samples are shown in Table 5. This table only includes the data for the wells included in the detection monitoring system. The mean concentrations which exceeded the federal Maximum Contaminant Level (MCL) for drinking water are highlighted. As shown in Appendix B and Table 5, every monitor well has had at least one sample exceed the MCL for one or more constituents. In addition, the MCLs were exceeded for constituents in upgradient, supplemental and downgradient wells. Most commonly, the metals which exceeded the MCLs were cadmium, chromium, lead, and nickel. Although arsenic was a constituent of concern because of its high concentration in the ash, it exceeded the MCL in only one well (leachate well MW-7) for only one sampling event (see Appendix B). As noted previously, this well is located within the landfill demonstration cell, and water samples from this well are actually landfill leachate.

Evaluation of the analytical results indicated that the sporadic elevated metals concentrations are natural and/or artifacts of the sampling and analysis procedures rather than a result of releases from the landfill. This evaluation can be described as follows:

- The upgradient monitoring well (MW-2) was reported to have concentrations of constituents exceeding MCL's. As shown in Figure 1, this well is upgradient of the landfill and far enough removed from it to not have been impacted by releases.

- In the analytical data for downgradient monitoring wells (MW-4 through MW-6, MW-10 and MW-13) there is no areal or temporal pattern in the high or low concentrations of constituents relative to the different downgradient areas, or to the timing of when different landfill cells become active.

- TMPA reported problems with turbidity in the water samples. If the samples were not filtered prior to acidification or analysis, the turbidity caused by sediments would result in erroneously high reported concentrations of inorganics.

The naturally-occurring high metals content of the predominantly clay formations being monitored are a likely source for the reportedly high levels of inorganic constituents in ground-water samples.

1.5 Sedimentation Ponds

Twelve sedimentation ponds have been constructed around the perimeter of the landfill and are currently utilized for the collection of leachate from the landfill. TMPA has prepared an application for a TNRCC permit to allow for continued operation of the sedimentation ponds and wetlands treatment of the leachate water.

In 1990, composite samples of landfill leachate (surface water) in the sedimentation ponds were analyzed for inorganic constituents. The results of these analyses are included as item no. 2 in Appendix B, and a statistical summary of the data is included in Table 6. The analytical results for well MW-7 are also representative of the levels of inorganics in landfill leachate. Samples of soil or sediment from the ponds have not been collected.

1.8 Summary of Site Conditions

The current conditions at TMPA's landfill can be summarized as follows:

- The sporadic detection of inorganic constituents above the MCL in upgradient and downgradient monitoring wells appears to be natural and/or artifacts of the sampling and analysis procedures rather than a result of releases from the landfill.

- The leachate from the landfill has levels of inorganic constituents in excess of MCLs and/or TNRCC Water Quality Standards. It appears that sediments in the leachate collection ponds include landfill ash and liners may have been impacted, but there has been no sampling of these soils and sediments.

- The wastes in the landfill are currently covered with a clay soil cap and topsoil. Continued dewatering of the disposed waste has resulted in settling of the landfill cap.

1.9 Sources

Conversion Systems, Inc., *Report of Subsurface Investigation of Waste Disposal Areas, Gibbons Creek Generating Station* (April 1982).

Conversion Systems, Inc., *Solid Waste Management Manual for Gibbons Creek Steam Electric Station, Carlos, Grimes County Texas, Site A Landfill* (September 1982).

Texas Water Development Board, 1963, Bulletin 6305, *Reconnaissance Investigation of the Ground-Water Resources of the Gulf Coast Region, Texas* (June 1963).

University of Texas at Austin, 1982, Bureau of Economic Geology, *Report of Investigations No. 129, Environmental Geology of the Yegua-Jackson Lignite Belt, Southeast Texas.*

U.S. Department of Agriculture, 1979, *Soil Conservation Service General Soil Map, Grimes County.*

U.S.Geological Survey 1991, *Water Resources Data, Texas, Water Year 1991, Volume 2. San Jacinto River Basin, Brazos River Basin, San Bernard River Basin and Intervening Coastal Basins,* USGS Report TX-91-2.

Section 2
BASELINE RISK ASSESSMENT

A Baseline Risk Assessment (BLRA) was conducted for TMPA's landfill in accordance with Risk Reduction Standard Number 3 of the TNRCC's Risk Reduction Rules (30 Texas Administrative Code (TAC) Chapter 335, Subchapter S). The BLRA assessed the potential for human exposure to releases of waste or waste constituents under current conditions, and under potential future conditions in the absence of any additional remedial action at the landfill. The BLRA included the following steps:

- **Data Evaluation (Section 2.1).** The analytical data presented in the RI report, which included analyses of inorganics in wastes, leachate, and surface water was screened using the EPA-recommended procedures for data evaluation. The constituents of concern in waste, pond sediments, leachate and for potential cross-media impacts to groundwater and surface water were identified. Other constituents in the waste and leachate were identified to be at levels within background ranges or the TNRCC's Risk Reduction Standard Number 2.

- **Exposure Assessment (Section 2.2).** Since the TMPA site will be used for industrial activities into the foreseeable future and the landfill site itself will not be used, the potential present and future conditions for exposure of workers and trespassers were identified under an industrial land-use scenario. Using standard EPA protocol, Reasonable Maximum Exposure (RME) scenarios were developed and calculations of intake were performed for worker exposure under current conditions and worker and trespasser exposure under potential future conditions.

- **Toxicity Assessment (Section 2.3).** The available EPA information concerning the noncarcinogenic and carcinogenic (when appropriate) toxic effects were evaluated for each of the constituents of concern.

- **Risk Characterization (Section 2.4).** The potential current and future risks to human health and the environment are characterized in this section.

These risk assessment steps are discussed in Sections 2.1 through 2.4 of the report. The potential for cross media impacts was evaluated in Section 2.6 and Appendix C.

2.1 Data Evaluation

Chemical analyses of wastes in the landfill, and surface water/leachate samples were used to identify the specific constituents of concern for the BLRA. Following the data evaluation procedures developed by the EPA for risk assessments (EPA 1989), site-specific data was utilized to identify these specific inorganic constituents in a step-wise process. Constituents were identified both for the BLRA and an evaluation of the potential for cross-media impacts to groundwater and surface water. The data evaluation is described in the following paragraphs and Table 7:

- **Step 1 - Identify Specific Chemicals.** Analytical data presented in Tables 1 through 6 were considered to be representative of wastes, surface water and leachate at the Site A landfill. Since sampling of sediments in the ponds has not been performed, the chemical analysis of the waste material was used to represent pond sediment for the data evaluation. Specific constituents which were detected during the course of these investigations are listed in Table 7.

- **Step 2 - Determine Ranges and Frequency of Detection.** The 95% Upper Confidence Limit (UCL) was utilized to represent the concentrations for each constituent in waste or leachate. When the UCL was not available, the highest detected level was used in the screening process. The frequency of detection for each constituent was also determined; however, the list of constituents was not reduced based on frequency of detection.

  Step 3 - Comparison to Background Levels. The UCLs of inorganic constituents in waste samples were compared to the typical range of background levels for inorganic constituents in soils. These "typical background levels" used to evaluate the data represent the levels of constituents in soils (the mean ± one standard deviation) in the western United States (Shacklette and Boerngen, 1984). The levels of the metals barium, cadmium, mercury, selenium, silver and zinc in waste appear to be within typical background ranges for these metals in soils. The levels of arsenic, chromium, copper, lead, nickel, and selenium appear to above background. These metals were included in the toxicity screen (Step 4). The UCLs for constituents in leachate samples were compared to the mean of the constituent levels detected in the background detection monitoring well. Levels of arsenic, chromium, mercury, and zinc in the leachate appeared to be above the average levels detected in the upgradient monitoring well. Arsenic, chromium, copper, lead, nickel, and selenium appear to above background.

- **Step 4 - Toxicity Screening/Comparison to TNRCC Medium-Specific Concentrations.** The UCLs for the inorganic constituents detected in waste above background levels were evaluated for toxicity by comparison to the TNRCC's SAI-MSC health-based levels found in Appendix II of the Risk Reduction Rules (30 TAC §335.568 - Examples of Medium-Specific Concentrations, Standards and Criteria for Health-Based Closure/Remediation). Screening levels for copper and zinc in soils were obtained from EPA guidance (EPA 1996). Arsenic concentrations (21.68 mg/kg) were determined to be above the TNRCC industrial SAI-MSC of 3.27 mg/kg. All other inorganic constituents (cadmium, chromium, copper, lead, and selenium) detected in waste samples were several orders of magnitude below the SAI-MSCs. The level of lead in waste 49.38 mg/kg was well below both the industrial and residential SAI-MSCs for lead. The UCLs for the constituents detected in leachate were compared to the TNRCC's GW-MSC health-based levels found in Appendix II of the Risk Reduction Rules (30 TAC §335.568 - Examples of Medium-Specific Concentrations, Standards and Criteria for Health-Based Closure/Remediation). Screening levels for copper and zinc in drinking water were obtained from EPA guidance (EPA 1996). The levels of arsenic, cadmium, and mercury were above the GWP-MSCs for drinking water. The level of lead in leachate (0.02 mg/L) was slightly above the action level of 0.015 mg/L for drinking water, but below the average level of lead detected in samples from the upgradient monitoring well and this constituent was not included in the risk assessment.

- **Step 5 - Identify Constituents for the Risk Assessment.** Arsenic was identified as the constituent of concern in waste and pond sediment. Arsenic, cadmium, and mercury were identified as constituents of concern in leachate. Other inorganic constituents in the waste were at or below typical background levels for soils, or at levels one or more orders of magnitude below the industrial SAI-MSCs.

- **Step 6. Identify Constituents of Concern For Cross-Media Impacts.** The site data for the levels of inorganics in wastes and the levels of inorganics in surface water/leachate from the Sedimentation Ponds was compared to the TNRCC's default GWP-MSCs and GW-MSCs, respectively, to identify those constituents of concern for cross media impacts to groundwater from landfill leachate. The constituents identified were arsenic, cadmium, nickel, selenium, and mercury.

The constituents of concern in waste and leachate are evaluated in the BLRA contained in Sections 2.2 through 2.4 and Section 2.6 of this report. The potential for cross-media impacts is evaluated in Section 2.5 of this report.

2.2 Exposure Assessment

The exposure assessment has identified the potential present and future scenarios for human exposure to waste and waste constituents at the TMPA landfill. This exposure assessment follows a conservative approach, the accepted protocol for baseline risk assessments, and meets the requirement for Standard Number 3 closures and remediations in the Risk Reduction Rules (30 TAC §335.553(b)(2)). Examination of future exposure scenarios using this methodology will identify areas of concern which should be addressed in a corrective measures study. The exposure evaluation included the following steps:

- **Step 1. Site Analysis.** Potential exposure points, receptors, and the relevant and significant pathways of human exposure were identified in this step.

- **Step 2. Development of Reasonable Maximum Exposure Scenarios.** Reasonable Maximum Exposure Scenarios were developed for the potential (future) exposure pathways which were identified for this site.

- **Step 3. Estimating Intake.** Using the constituent levels from the data evaluation step of the BLRA, the potential chemical intake was estimated.

- **Step 4. Site Model.** A site model was developed to summarize the exposure assessment and the current understanding of conditions at the landfill.

A detailed discussion of each of the steps in the exposure evaluation and a summary of site conditions (the site exposure model) are included in the following sections of the report.

2.2.1 Site and Exposure Pathway Analysis.

The potential points on-site and off-site points for current and future human exposure to waste or waste constituents from the landfill were evaluated. Due to the limited use of the property both currently and in the future, the analysis was conducted for (1) worker exposure scenarios on site for both current and future conditions and (2) trespasser exposure scenarios on site for future conditions.

- ***Evaluation of Area Land Use.*** Land use within a one-half mile radius of the landfill is used for industrial, recreational and rural purposes. State Highway 244 bounds the property on the west, and Hogg Creek and Gibbons Creek Reservoir bound the property on the north and east. Rural residences are located to the north and west. The TMPA Gibbons Creek Station coal-fired electric generating plant is located directly to the south of the landfill.

- ***Wastes Disposed On Site.*** The waste disposed on site is covered with a clay soil cap. Although the cap has settled due to dewatering of the waste, there are no areas where waste is currently known to be exposed to the surface.

- ***Leachate Collection Ponds.*** The sediments in the leachate collection ponds include ash from the landfill. These sediments are currently covered with water and are not known to be exposed to the surface. There are no known releases of ash from the ponds.

- ***Surface Soils on Site.*** There are no known releases of waste or waste constituents from the landfill or sedimentation ponds, and on-site soils were considered to be unimpacted.

- ***Surface Water.*** As described in the remedial investigation report, there are several surface waters located within a one-half mile radius of the landfill. These surface waters were considered to be unimpacted by releases of waste constituents and/or leachate from the landfill. Gibbons Creek Reservoir, located approximately 1,500 feet to the east, and Carlos Lake, located approximately 8,000 feet to the south, are used for recreational purposes. These surface waters are not utilized as public water supplies. Gibbons Creek Reservoir is used as a drinking water source for workers by TMPA.

- ***Ground Water.*** As described in the remedial investigation report, evaluation of the analytical results from the ground-water detection monitoring system indicated that the sporadic elevated metals concentrations in groundwater samples are natural and/or artifacts of the sampling and analysis procedures rather than a result of releases from the landfill. There are no known downgradient water wells in the area between the landfill and Hogg Creek and Gibbons Creek Reservoir.

- ***On-Site Activities, Receptors and Exposure Points.*** TMPA workers may be present in the Site A landfill area to perform the following activities: (1) maintenance and inspections of the landfill cap and sedimentation ponds; (2) inspections of the ground-water monitoring system; (3) collection of ground-water samples and measurements of water level elevations; and (4) construction. Direct contact with leachate or surface water in the sedimentation ponds should be minimal since workers wear protective equipment (gloves, steel-toed boots). In the future there is a potential for contact with exposed waste at the landfill.

- ***Off-Site Activities, Receptors and Exposure Points.*** Rural residential areas are located in areas adjacent to the TMPA facility, but residents are not present on the site. Access to the site is currently prevented by perimeter fencing and gates. In the future, there is a potential for trespassers to come in contact with exposed waste and leachate at the landfill.

Based on the site conditions, an exposure pathway analysis was conducted in order to identify any completed exposure pathways and to determine the potential for exposure to waste and waste constituents currently and in the future. As shown in Figure 3, all reasonable pathways of human exposure were considered in the analysis and development of the reasonable maximum exposure scenario. Workers and trespassers were identified as the types of individuals who could potentially be exposed to this site. The significant current and future exposure pathways which "may potentially occur" and which will be quantitatively evaluated in the risk assessment include the following:

CURRENT CONDITIONS

1. ***Worker - Dermal.*** Workers' potential exposure to constituents in leachate in the Sedimentation Ponds via dermal contact;

FUTURE CONDITIONS

2. ***Worker - Incidental Ingestion.*** Worker exposure to constituents in exposed waste and pond sediments via incidental ingestion;

3. ***Worker - Inhalation of Dust.*** Worker exposure to constituents in exposed ash and pond sediments via inhalation of particulates;

4. ***Worker - Dermal.*** Workers' potential exposure to constituents in leachate in the Sedimentation Ponds via dermal contact;

5. ***Trespasser - Incidental Ingestion.*** Trespasser exposure to constituents in exposed ash and pond sediments via incidental ingestion;

6. ***Trespasser - Inhalation of Dust.*** Trespasser exposure to constituents in exposed ash and pond sediments via inhalation of waste particulates; and

7. ***Trespasser - Dermal.*** Workers' potential exposure to constituents in leachate in the Sedimentation Ponds via dermal contact.

The worker exposure pathway numbered as (1) is potentially present at the site under current conditions, and the worker and trespasser exposure pathways (2) through (7) could potentially be present in the future. As discussed above, exposure to landfill wastes and pond sediments is considered only under potential future conditions.

2.2.2 Reasonable Maximum Exposure Scenarios

Exposure scenarios were developed for each of the pathways identified above to represent the reasonable maximum exposure (RME) under current and future conditions. The intake variables used in the RMEs are an estimate of the highest exposure that is likely to occur at this site. The default exposure factors (used for most variables) and the development of site-specific parameters are described in the paragraphs which follow:

Pathways 1 and 4. Worker - Dermal exposure under current and future conditions to constituents in leachate in the Sedimentation Ponds.

- ***Exposure Frequency and Time.*** The exposure frequency (EF) of 30 days per year was used for worker exposure to leachate in the ponds under current and future conditions. This estimate for exposure is based on the frequency at which workers are known to perform activities at the site including inspections of the landfill and the ground-water monitoring wells, and collecting ground-water samples, and other times when individuals could be in the area performing other work-related activities. An Exposure Time (ET) of 8 hours/event was assumed. The EF and ET are conservative in that it assumes one worker will perform all of these functions.

- ***Exposure Duration.*** The default exposure duration (ED) of 25 years was utilized for adult workers. This ED is conservative and assumes that the same workers will be exposed for a period of 25 years. (EPA 1989).

- ***Skin Surface Area.*** A skin surface area (SA) of 3,800 cm^2 was estimated for adult workers. This estimate assumes that the hands, forearms and head are exposed. The SA was obtained using the 95% UCL for the area of these body parts for male workers (EPA, 1992). The SA used in this risk assessment is higher than the EPA's "typical case" for adults where the exposed skin surface is limited to the head and hands (2,000 cm^2). This overestimates exposure since workers should wear protective equipment such as gloves when performing sampling activities at the sedimentation ponds.

- ***Body Weight.*** The default average adult body weight (BW) of 70 kg was used in the risk assessment (EPA, 1989).

Pathways 2 and 3. Worker - Incidental ingestion under future conditions of constituents in exposed waste and pond sediments, and Inhalation of dust under future conditions containing constituents in exposed waste and pond sediments.

- ***Exposure Frequency and Time.*** The EF of 30 days per year was used for worker exposure to exposed wastes and sediments under future conditions. This estimate for exposure is based on the frequency at which workers are known to perform activities at the site including inspections of the landfill and the ground-water monitoring wells, and collecting ground-water samples, and other times when individuals could be in the area performing other work-related activities. An ET of 8 hours/event was used. The EF and ET are conservative in that it assumes one worker will perform all of these functions.

- ***Exposure Duration.*** The default ED of 25 years was utilized for adult workers. This ED is conservative and assumes that the same workers will be exposed for a period of 25 years. (EPA 1989).

- ***Ingestion Rates.*** The default incidental ingestion rate (IR_s) of 50 mg/day for soils was used for adult workers (EPA 1989). This IR was applied to the incidental ingestion of any exposed wastes or sediments.

- ***Inhalation Rates.*** The default inhalation rate (IR_a) of 2.5 m^3/hour (or 20 m^3 per 8-hour workday) was used for adult workers (EPA 1989). This rate represents the potential inhalation of contaminants by workers performing vigorous activity during a typical 8-hour working day.

- ***Body Weight.*** The default average adult BW of 70 kg was used in the risk assessment (EPA, 1989).

- ***Particulates.*** The concentration of dust that could be generated from the landfill or sediments in outside air was estimated using the annual mean concentration for dust in the United States (75 $\mu g/m^3$), which is also equal to the ambient air quality standard. The concentration of the contaminant arsenic in outside dust was estimated to be equal to the concentration of arsenic in the waste, and 100% of this dust was assumed to be contaminated. The fraction of respirable particles in the dust was estimated to be 73%.

Pathways 5 and 6. Trespasser - Incidental ingestion under future conditions of constituents in exposed waste and pond sediments, and Inhalation of dust under future conditions containing constituents in exposed waste and pond sediments.

- ***Exposure Frequency and Time.*** An EF of 65 days per year was used for a trespasser's exposure to exposed wastes and sediments under future conditions. This estimate was based on a trespasser (12 - 18 year old) visiting the site 1 day/week during 9 months of the year (39 events) and 2 days/week during 3 months of the year (26 events). An ET of 4 hours/event was used for exposure to waste, waste particulates, and sediments.

- ***Exposure Duration.*** The ED of 7 years was developed for trespassers. This assumes trespassers are between the ages of 12 and 18 years old.

- ***Inhalation Rates.*** An IR_a of 2.29 m^3/hour was developed for trespassers. This estimate is based on a the average inhalation rate for teenage individuals, and assumes that trespassers will be engaged in resting, moderate and heavy activity.

- ***Body Weight.*** An average body weight of 50.6 kg was used for trespassers. This trespasser BW is based on the average body weights of male and female children aged 12 to 18, which have been reported to range from 50.6 to 61.2 kg (EPA 1989a). The use of the lower average body weight (50.6 kg) for this age group is conservative and should overestimate chemical exposure and risk.

- ***Ingestion Rates.*** An IR_s of 100 mg/day was used for trespassers in the risk assessment. This estimate was based on EPA guidance which indicates that soil ingestion for individuals 5 - 18 years of age can be estimated to be from 1 to 100 mg/day based on the tendency of the individual to ingest soil (EPA 1989a and 1991a). The IR_s used in this risk assessment (100 mg/day) is conservative since it is representative of a child with a high tendency to ingest soil (EPA 1989a).

- ***Particulates.*** The concentration of dust that could be generated from the landfill or sediments in outside air was estimated using the annual mean concentration for dust in the United States (75 $\mu g/m^3$), which is also equal to the ambient air quality standard. The concentration of the contaminant arsenic in outside dust was estimated to be equal to the concentration of arsenic in the waste, and 100% of this dust was assumed to be contaminated. The fraction of respirable particles in the dust was estimated to be 73%.

Pathway 7. Trespasser - Dermal exposure under future conditions to constituents in leachate in the Sedimentation Ponds.

- ***Exposure Frequency and Time.*** An EF of 65 days per year was used for a trespasser's exposure to leachate in the ponds under future conditions. This estimate was based on a trespasser (12-18 year old) visiting the site 1 day/week during 9 months of the year (39 events) and 2 days/week during 3 months of the year (26 events). An exposure time of 2.6 hours/event was used for contact with surface water.

- ***Exposure Duration.*** The ED of 7 years was developed for trespassers. This assumes trespassers are between the ages of 12 and 18 years old.

- ***Skin Surface Area.*** A skin SA was estimated as 5,225 cm^2 for trespassers based on the reported 95% UCL for skin area and assuming that 25% of the skin (arms, hands and feet) will be exposed to surface waters. The 95% UCL for the skin surface area of male individuals aged 12 to 18 years has been estimated to range from 17,600 to 20,900 cm^2 (EPA, 1992). If 25% of the skin area is assumed to be exposed, the 95% UCL for skin SA would range from 4,440 to 5,225 cm^2. The SA used in this risk assessment is conservative, since the largest skin SA (20,900 cm^2) for males in this age group was used.

- ***Body Weight.*** An average body weight of 50.6 kg was used for trespassers. This trespasser BW is based on the average body weights of male and female children aged 12 to 18, which have been reported to range from 50.6 to 61.2 kg (EPA 1989a). The use of the lower average body weight (50.6 kg) for this age group is conservative and should overestimate chemical exposure and risk.

The default and site-specific exposure parameters were utilized in conjunction with the 95% UCL exposure concentrations in order to estimate the RME.

2.2.3 Estimation of Chemical Intake

Estimations of exposure to constituents under current and future conditions followed standard EPA protocol for risk assessment (EPA, 1989). The computer software used to perform the calculations was Risk*Assistant™ for Windows. The following procedure was used:

- ***Constituents.*** As described in Section 2.1 of this report, the constituents of concern for current and future conditions for the BLRA were determined to be arsenic (waste and sediments) and arsenic, cadmium, and mercury (leachate).

- ***Concentrations of Constituents.*** The 95% UCL was utilized to represent the RME concentration. The exposure point concentrations used are in Table 8.

- ***Potential Exposure Pathways - Current Conditions.*** Pathway 1 was evaluated for current conditions. Arsenic, cadmium, and mercury in the leachate were evaluated for dermal absorption.

- ***Potential Exposure Pathways - Future Conditions***. Pathways 2 through 7 were evaluated for future conditions. Arsenic in the waste was evaluated for ingestion and particulate inhalation. Dermal absorption from soils was not evaluated. Arsenic, cadmium, and mercury in the leachate were evaluated for dermal absorption.

- ***Intake Equations***. The RME factors used and chemical intake equations for soil ingestion, dermal contact and inhalation under current and future conditions are included in Table 9. Computer software developed by the Hampshire Research Institute and the EPA (Risk*Assistant™ for Windows) was used to calculate intake for this BLRA. The average daily air concentration term for arsenic calculated by Risk*Assistant (0.000001 mg/m^3) was converted to intake using standard risk assessment equations from EPA in order to assess noncarcinogenic risks (EPA 1989). The lifetime average daily air concentration for arsenic calculated by Risk*Assistant was not converted to intake since a Unit Risk Factor (URF) is available to assess arsenic carcinogenic risks.

The default and site-specific exposure parameters were utilized in conjunction with the 95% UCL exposure concentrations to estimate the RME. The RME in milligrams of chemical per kilogram body weight per day (mg/kg-day) estimated for dermal absorption from leachate, ingestion of soils impacted with waste, and the inhalation of waste particulates by workers and trespassers are summarized in Table 9. Printouts of the intake calculations (from Risk*Assistant™) are contained in Appendix C.

2.2.4 Summary of Exposure Assessment and Site Exposure Model

The preliminary site exposure model, which was developed for the TMPA landfill is illustrated in Figure 2. The model identifies potential sources for environmental impacts, release mechanisms and migration pathways, and potential receptors. The potential current and future exposure pathways (7 total) and potential mechanisms for cross-media impacts evaluated in this risk assessment are summarized in the site model.

2.3 Toxicity Assessment

This toxicity assessment summarizes the available scientific information concerning the toxicity of the constituents identified to be of concern at the landfill. The primary information for this analysis was obtained from the following sources:

- EPA Integrated Risk Information System (IRIS);
- EPA guidance documents including the Health Effects Summary Tables (HEAST);
- EPA Region III guidance, Risk-Based Concentration (RBC) Table - April 1996; and
- The TNRCC's proposed guidance for the Texas Risk Reduction Program.

The data obtained from these sources were reviewed in order to identify toxicity criteria for the risk assessment. Constituents were examined for both non-cancer and, when appropriate, cancer health effects.

2.3.1 Noncarcinogenic Effects

The constituents and component chemical groups were evaluated for noncarcinogenic effects. The standard toxicological measure for non-cancer health effects is the Reference Dose (RfD). The RfD is the level of daily exposure to a constituent to which humans, including the most sensitive population, could be exposed to for a lifetime without appreciable risk of adverse health effects. As described in EPA guidance (EPA 1989), the reference dose is typically derived from studies with laboratory animals which identify the dose at which no toxic effect was observed (the No Observed Adverse Effect Level or NOAEL) or the lowest dose at which toxic effects are observed (the Lowest Observed Adverse Effect Level or LOAEL).

Oral RfDs are available for all inorganics evaluated in this BLRA. When an inhalation RfD was unavailable for a constituent or chemical group, the oral RfD was used to evaluate toxicity. An adjusted oral RfD was used for the component chemical groups to evaluate the dermal pathway.

2.3.2 Carcinogenic Effects

The constituents arsenic, and cadmium were evaluated for carcinogenic effects. The Cancer Slope Factor (CSF) is the standard toxicological measure for cancer effects, and describes the relationship between dose and cancer risk. The CSF is actually the upper 95 percent confidence limit of the slope of the dose-response curve derived from computer modeling of toxicological data using the non-threshold Linearized Multistage Model. Although other models are available, this model is preferred by the EPA.

Oral and inhalation CSFs were available for arsenic and cadmium (see Table 12). When an inhalation CSF was unavailable for a constituent or chemical group, the oral CSF was used to evaluate toxicity. An adjusted oral CSF was used for the component chemical groups to evaluate the dermal pathway.

2.3.4 Toxicological Profiles

Toxicological profiles were reviewed for each of the specific constituents. These profiles provide a limited review of the scientific data for each chemical included in the risk assessment and present the toxicity criteria that will be used to characterize the risk. Integrated Risk Information System (IRIS) data sheets and other information are included in Appendix C.

2.3.5 Toxicity Criteria, Applicable Regulatory Guidelines and Criteria

The applicable toxicity criteria, regulatory guidelines and standards used in the risk assessment for the landfill are summarized in Table 10. The toxicity criteria include RfDs and CSFs. These criteria were combined with the calculated ingestion, dermal, and inhalation intake for workers and trespassers to estimate risks under current and future site conditions.

2.4 Risk Characterization

The final step of the BLRA combined the estimated chemical intakes (RME) calculated in the exposure assessment with the toxicity factors to characterize the potential current and future risk to human health. The risk characterization for the current and future site conditions is contained in Table 11.

Current Conditions. The risk assessment of current conditions on site was accomplished through an analysis of the worker exposure to leachate at the landfill. Excess cancer risk for workers' potential exposure to constituents by incidental soil ingestion, dermal contact with leachate was estimated as 3×10^{-5} for the upper bound excess lifetime cancer risk. This estimated excess cancer risk is within Texas' and EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for an upper bound excess lifetime cancer risk (one excess cancer case per 10,000 to one excess cancer case per 1,000,000 population). Noncarcinogenic risks for worker exposure under current site conditions were estimated as 0.2. These levels are below Texas' and EPA's acceptable cumulative hazard index (HI) of 1. The risk characterization for current conditions at the landfill has estimated that any excess human health risks to workers which could be attributed to exposure to leachate or exposed waste are within an acceptable risk range for carcinogenic and noncarcinogenic substances.

Future Conditions. The risk assessment of potential future conditions on site was accomplished through an analysis of the pathways for worker and trespasser exposure to leachate and exposed waste at the landfill.

- ***Workers.*** Excess cancer risk for workers' potential exposure to constituents in leachate by dermal contact, and exposed waste by incidental ingestion and inhalation of waste particulates was estimated as 3×10^{-5} for the upper bound excess lifetime cancer risk. The estimated excess lifetime cancer risk is within Texas' and EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for excess cancer risk (one excess cancer case per 10,000 population to one excess cancer case per 1,000,000 population). Noncancer risks for workers under future conditions were estimated to have a hazard index of 0.2, which is below Texas' and EPA's acceptable cumulative HI of 1.

- ***Trespassers.*** Excess cancer risk for trespassers potential exposure to constituents in leachate by dermal contact and exposed waste by incidental ingestion and inhalation of waste particulates was estimated as 1×10^{-5} for an upper bound excess lifetime cancer risk. The estimated excess cancer risk is within Texas's and EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for an upper bound excess lifetime cancer risk (one excess cancer case per 10,000 to one excess cancer case per 1,000,000 population). Noncancer risks for trespassers were estimated to have a hazard index of 0.4, which is below the EPA's acceptable cumulative HI of 1.

The risk characterization for potential future conditions at the landfill has estimated that any excess human health risks for workers and trespassers which could be attributed to exposure to leachate and exposed waste are within an acceptable risk range for carcinogens and noncarcinogens.

2.5 Potential for Cross-Media Impacts

The potential for soil-to-groundwater cross-media impacts from the constituents in wastes in the landfill and sediments in the leachate collection ponds was evaluated. The TNRCC's GWP MSCs and EPA Soil Screening Levels for the metals of concern were used to make this determination (EPA 1994). The calculation of EPA Soil Screening Levels is included in Appendix C. As shown in Table 12, these screening levels were compared to the site data to identify any metals which have the potential to impact groundwater. Levels of metals in the waste were below the EPA screening levels. A site-specific study of the TMPA landfill has indicated that metals such as selenium are immobile and will not leach from the (Hall 1986). Leach data for the waste also indicates that cross-media impacts are not a major concern at this site (see Tables 2,3 and 4).

2.6 Summary of the Risk Assessment and Discussion of Uncertainty

This baseline risk assessment was performed for the Site A landfill, as part of the development of a corrective measures study for the TMPA facility under Standard Number 3 of the Risk Reduction Rules. The risk assessment quantitatively evaluated the potential for human health effects due to direct exposure to leachate and exposed wastes under current and potential future conditions. This risk assessment followed the established protocol for human health risk assessments and included a data evaluation, exposure assessment, toxicity assessment and risk characterization. The conclusions from each step are summarized in the following paragraphs:

- The data evaluation indicated the constituents in the waste and leachate which are of concern. The constituents evaluated in the risk assessment include arsenic, cadmium, and mercury.

- Analytical data for the waste and leachate was used to calculate the 95% UCLs for each constituent and estimate the RME for the different exposure scenarios at the site. The RME is intended to represent the highest exposure that could reasonably occur at the site.

- Risks were calculated for workers potential exposure to leachate. The waste in the landfill is currently capped, which prevents exposure including the generation of wind-blown dusts. The potential pathway for workers' exposure under current conditions is dermal exposure to leachate.

- Risk estimates for resident and trespasser exposure to leachate under current conditions were not included in the baseline risk assessment since the site is secure, which prevents access by these groups.

- The health risks estimated for the current worker exposure scenario was found to be within the TNRCC's and EPA's acceptable risk range for carcinogens and noncarcinogens.

- Risks were calculated for worker and trespasser exposure to leachate and exposed waste under potential future site conditions. The potential scenarios evaluated were dermal contact with leachate and incidental ingestion and inhalation of waste particulates.

- The excess carcinogenic health risks estimated for worker and trespasser exposure under potential future conditions were found to be within the TNRCC's and EPA's acceptable risk range for carcinogens and noncarcinogens.

This baseline risk assessment for the Site A landfill has followed the protocol for the application of such assessments to closures under Risk Reduction Standard 3, and meets the requirements for baseline risk assessments as stated in 30 TAC §335.553 - Required Information.

Uncertainties are associated with each step in an environmental risk assessment and can lead to both an overestimation and underestimation of risk. These uncertainties can be attributed both to the natural variability within the population regarding certain parameters used in the risk assessment (ingestion rates) as well as the need for additional information in the risk assessment process (toxicity factors). The EPA approach toward uncertainty in the risk assessment process has been to select the most conservative values and variables in order to ensure that human health risk would not be underestimated. This approach is exemplified in EPA's standard protocol for exposure assessments which calls for the estimation of the "reasonable maximum exposure" for individuals. Some of the uncertainties which are unique to the human health risk assessment for the TMPA landfill are listed in the following paragraphs:

- **Exposure Assessment/Exposure Factors.** Site-specific variables were developed for workers and trespassers in the exposure assessment, including the exposure frequency (EF). The exposure frequency for workers (30 day/year) overestimates the time that one worker will be sampling or in the area of the landfill. Trespassers are not expected to be able to enter the facility in the future, and the exposure frequency for trespassers (65 days/year) should also overestimate the risk to this group.

- **Risk Characterization/Low Dose Cancer Risk Assessment.** Scientific opinion regarding low dose cancer risk assessment is largely in favor of the hypothesis that there is a safe level of environmental exposure to carcinogens (Hrudey and Krewski, 1995). This scientific opinion is based in part on evidence that (1) cancer development involves a number of stages, (2) some carcinogens require metabolic activation, (3) there are documented saturating activation mechanisms for certain carcinogens, and (4) there are cellular detoxification mechanisms. However, the EPA's adopted policy toward quantitative cancer risk assessment is based on the hypothesis that (1) the dose-response curve derived for carcinogens at the maximum tolerated dose is linear, and can be extrapolated from high to low doses, and (2) there is no threshold for carcinogenic effects. Although it is not possible at this stage to determine whether there is a threshold for carcinogenesis, the application of the EPA's default approach toward cancer risk assessment should overestimate risks.

As outlined above, the uncertainties in the various steps in the exposure assessment and toxicity assessment steps of the risk assessment will lead to an overestimation of carcinogenic and noncarcinogenic health risks to workers under both present and future conditions, and to trespassers under future conditions to the landfill addressed in this baseline risk assessment.

2.7 Sources

EPA 1989, Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), EPA/540/1-89/002.

EPA 1989a, Exposure Factors Handbook, EPA/600/8-89/043.

EPA 1991, Human Health Evaluation Manual, Part B: Development of Risk-Based Preliminary Remediation Goals, OSWER Directive 9285.7-01B.

EPA 1991a, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance, Standard Default Exposure Factors, Interim Final, OSWER Directive 9285.6-03.

EPA 1992, Dermal Exposure Assessment: Principles and Applications Interim Report, EPA/600/8-91/011b.

EPA 1994, Technical Background Document for Soil Screening Guidance (EPA 540/R-94/106).

EPA 1996, Integrated Risk Information System (IRIS) Database.

EPA 1996, Risk-Based Concentration Table, EPA memorandum from Roy L. Smith - April 1996

Hall, Steven Douglas (1986), Potential for Selenium Migration at a Lignite Power Plant Solid Waste Disposal Facility, Thesis Texas A&M University.

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Section 3

CORRECTIVE MEASURES STUDY

3.1 Introduction

This corrective measures study (CMS) was conducted in order to evaluate the effectiveness of potential remedies which could be applied towards the final closure of the on-site landfill and associated leachate sedimentation ponds located at the TMPA Gibbons Creek Station. The effectiveness of the remedy was measured by its ability to achieve the requirements outlined in 30 TAC 335.561 - Attainment of Risk Reduction Standard Number 3. This report describes proposed remedies which have been selected for the closure of the nonhazardous industrial solid waste landfill, and the ability of the remedy to meet the closure and post-closure criteria for Risk Reduction Standard No. 3.

3.1.1 Site Description

The nonhazardous industrial waste landfill addressed in this closure plan is approximately 142 acres in area and is approximately 15 feet deep. The location of the inactive landfill is illustrated in the figures in Appendix A. A description of the landfill, including a history of operations and summary of wastes disposed, is included in Section 1 of this report. Environmental investigations at the site have found no evidence that releases of wastes have occurred from the landfill. The landfill is capped and leachate from the landfill is currently collected in several sedimentation ponds. TMPA has submitted a permit application to the TNRCC for continued operation of these ponds and treatment of the leachate.

3.1.2 Summary of Constituents of Concern

The selection of the constituents of concern for the corrective measures study was based on the waste information which is summarized in the Remedial Investigation Report (Section 1) and on the Risk Assessment (Section 2). The potential constituents, previously identified in Section 2, included arsenic, cadmium, lead, selenium, nickel, and mercury. The results of the risk assessment indicate that there are no completed human exposure pathways to waste or waste constituents.

3.2 Objective and Criteria for Corrective Action and Identification of Remedies

The objective of the CMS is to develop and evaluate remedial alternatives for closure of the on-site landfill. The final remedial action alternative should be chosen based on its ability to reduce the toxicity or risk posed by the waste constituents, and to effectively control or eliminate the potential migration of contaminants from the landfill. The general remedial action objectives for the closure of the landfill and associated sedimentation pond are as follows:

- To eliminate, or minimize to the maximum extent practicable, the potential for human exposure (workers and trespassers) to hazardous constituents through contact with waste;

- To eliminate, or minimize to the maximum extent practicable, the potential for human exposure to hazardous constituents (workers and trespassers) during implementation of the remedy;

- To prevent migration of hazardous constituents from the landfill;

- To eliminate or minimize to the maximum extent practicable, the potential for impacted ground water; and

- To comply with the requirements of the Risk Reduction Rules and any other appropriate requirements established by the TNRCC and EPA.

These general objectives were previously identified in the Baseline Risk Assessment. The closure of the landfill must also meet the following risk reduction goals:

- Long-term effectiveness and permanence. The factors considered in the evaluation included the potential for future exposure to constituents remaining in place, the magnitude of risks remaining, the type of post-closure care required, and the long-term reliability of the engineering and institutional controls.

- Reductions in toxicity, mobility and volume. The factors considered in the evaluation include the amount, if any, of constituents to be treated and controlled, the degree of expected reduction in mobility, and reversibility of the method.

- Short-term effectiveness. The short-term risks posed to the community, workers, and the environment during implementation of the remedy were considered.

- Implementability. The degree of difficulty of implementing the remedy and operational reliability were considered.

The proposed corrective measures for the final closure of the on-site landfill include an evaluation of the current procedures for mitigation of the existing cover system settlement and erosion problems, continued ground-water detection monitoring, an evaluation of the ground-water detection monitoring system, continued operation of the leachate collection system, and institutional controls.

3.3 Proposed Remedies for Final Closure of the Landfill

The following remedies are proposed for final closure of the Site A landfill:

- ***Cover System - Post Closure Care.*** The waste is currently contained by the cover system at the inactive landfill which consists of compacted clay and vegetative cover. The procedures in TMPA's previously developed landfill closure plan have been implemented to inspect, repair, and maintain the integrity and effectiveness of the final cover as landfill cells became inactive (see Appendix D). As part of the corrective measures for the landfill, an engineering study will be conducted to reevaluate these procedures. This remedy meets the objective for reduction of mobility and elimination of exposure.

- ***Detection Monitoring - Post Closure Care.*** Potential ground-water impacts are monitored through the ground-water detection monitoring system. As part of corrective action at the landfill, the detection monitoring system, including sampling quality assurance and quality control will be reevaluated. This remedy meets the objective for elimination of exposure.

- ***Institutional Controls.*** The site has been deed recorded as a landfill. Other controls such as fencing and gates will be maintained during the post closure period. This remedy meets the objective for elimination of exposure.

These proposed procedures meet the risk reduction goals for closure, including long-term effectiveness and permanence, reduction in toxicity, mobility and volume, and implementability. There are no known short-term risks posed by implementation of these procedures.

TABLES

Table 1

Typical Range of Concentrations of Total Inorganics in Fly Ash, Bottom Ash and Scrubber Sludge Wastes

CONSTITUENT	Fly Ash[1] (mg/kg)	Bottom Ash[1] (mg/kg)	FGD/Scrubber Sludge[2] (mg/kg)	Statistical Summary			
				n	x	SD	95% UCL
arsenic	13 - 56	0.7 - 14.1	0.0011 - 2	10	11.98	16.92	21.68
barium	--	--	0.03 - 10.2	2	5.11	7.19	--
cadmium	0.21 - 0.32	0.025 - 0.07	0.05	10	0.136	0.125	0.0208
chromium	21.5 - 38	18.5 - 34.5	0.002 - 2.6	10	22.36	12.63	29.59
copper	25 - 57	25 - 49.5	0.014	9	32.13	16.14	42.13
lead	45.5 - 82	16.5 - 31	0.015 - 1.5	10	33.75	27.28	49.38
mercury	0.1[4]	--	0.00046 - 0.04	2	0.0227	0.03	--
nickel	23 - 32	21 - 40.1	0.066	2	27.76	12.7	35.57
selenium	--	--	2.5	9	1.24	1.14	1.95
silver	--	--	0.003 - 0.5	2	0.25	0.35	--
zinc	54.5 - 132	25.5 - 32.5	0.065	9	49.22	38.7	73.21

Notes:

1. Range of analytical data for fly ash and botome ashcollected on March 2 , 9 and 29, 1990 and April 27, 1994.
2. Range of analytical dara for scubber sludge colectd on December 19, 1988 and August 4, 1989.
3. From lignite sample reported by Adriano et al., (1980) Journal of Environmental Quality Vol 9(3): 333.

n number of waste samples analyzed
x mean of the sample data
SD Standard Deviation for the sample data
UCL Upper Confidence Limit
-- Not available

Table 2

EP Toxicity Test Results for TMPA Fly Ash and Stabilized FGD Sludge

CONSTITUENT	Fly Ash Dec. 3, 1982 (mg/L)	Fly Ash May 31, 1983 (mg/L)	Stabilized FGD Sludge May 31, 1983 (mg/L)
antimony	<0.5	--	--
arsenic	0.002	0.0037	0.036
barium	0.14	0.2	0.2
beryllium	<0.005	--	--
cadmium	0.004	0.001	0.005
chromium	0.005	0.013	0.016
copper	<0.05	--	--
iron	<0.01	--	--
lead	<0.005	<0.005	<0.005
manganese	2.2	--	--
mercury	<0.0002	0.0001	0.0001
nickel	<0.02	--	--
selenium	<0.02	0.016	0.18
silver	<0.005	<0.00065	<0.0005
thallium	<0.01	--	--
zinc	0.13	--	--

Note:

-- Data not available

Table 3

Seven-Day Distilled Water Leachate Test Results for Fly Ash, Bottom Sludge and Fly Ash Stabilized FGD Sludge

CONSTITUENT	Fly Ash	Bottom Ash	Fly Ash-Stabilized FGD Sludge			
	Nov. 11, 1988[1] (mg/L)	June 27, 1988[2] (mg/L)	Jan. 1, 1983 (mg/L)	Jan. 31, 1983 (mg/L)	March 4, 1983 (mg/L)	April 21, 1983 (mg/L)
arsenic	0.003 - 0.0144	0.001 - 0.004	<0.01	<0.005[3]	0.025	0.046[3]
barium	0.066 - 0.1	0.01 - 0.059	0.6	<1	1	1.5
boron	--	--	0.14[3]	1.9	4	6.2[3]
cadmium	0.0015 - 0.0096	0.008 - 0.02	<0.002	<0.01	0.001	<0.01
calcium	--	--	11.6[3]	--	--	5,900[3]
chloride	1.17 - 1.86	26.7 - 37.3	--	--	--	13.5[3]
chromium	<0.001 - 0.007	0.0003 - 0.001	--	0.046	<0.03	<0.02[3]
copper	--	0.001 - 0.054	--	--	--	--
fluoride	1.48 - 3.13	0.31 - 0.38	--	--	--	--
iron	< 0.01 - 2.26	0.018 - 0.037	0.03[3]	0.88	0.017	0.33[3]
lead	<0.005 - 0.012	0.004 - 0.007	<0.1	<0.04	<0.025	<0.06[3]
magnesium	--	--	2.7[3]	--	--	20[3]
manganese	0.62 - 1.43	0.004 - 0.02	0.17[3]	<0.1	0.77	0.15[3]
mercury	<0.0005	0.0005 - 0.0019	<0.0001	<0.005	0.007	0.001[3]
nitrate	<0.01 - 0.03	0.16 - 1.9	--	--	--	--
pH	--	6.41 - 7.22	--	7.4	7.5	7.6
selenium	0.0008 - 0.0512	0.001 - 0.005	<0.038[3]	<0.005	0.007	0.001[3]
silver	<0.002	0.00003 - 0.00015	<0.01	<0.04	0.013	0.023
sodium	--	--	2.1	--	--	--
sulfate	393 - 546	79 - 86	19.2[3]	280	1,700	894[3]
sulfite	--	--	--	--	0.5	1.1[3]
TDS	626 - 822	54 - 208	--	--	--	
zinc	< 0.01 - 0.1	0.002 - 0.005	<0.01	<0.025	<0.02	<0.004[3]

Notes:

1. Range of data for ten fly ash samples.
2. Range of data for 2bottom ash samples and duplicates. A total of 20 samples were analyzed for pH, TDS, arsenic and manganese.
3. Mean of three (Jan. 1, 1983) or four (April 21, 1983) replicate extractions from the same sample. Other parameter results for these dates were identical for all extractions.

-- Data not available

Table 4

Analytical Data for Runoff from the Site A Ash Landfill Demonstration Site

CONSTITUENT	Pond 3A Runoff	
	Feb. 2, 1983 (mg/L)	March 4, 1983 (mg/L)
arsenic	--	0.006
barium	--	--
boron	--	<0.05
cadmium	--	0.005
chlorides	--	13.3
chromium	--	<0.03
conductivity	--	151
iron	3.3	1.98
lead	--	<0.01
manganese	<0.15	<0.05
mercury	--	<0.01
pH	6.7	6.7
selenium	<0.01	0.001
silver	--	0.024
sulfate	--	26
sulfite	--	0.75
TDS	--	211
TSS	130	10
zinc	--	<0.06

Note:

-- Data not available

Table 5

Summary of Statistical Evaluation of Ground-Water Monitoring Data for TMPA Site A Landfill

CONSTITUENT[1] (mg/L)	Upgradient Well	Supp. Well	Downgradient Well					MCL[2]
	LHMW-2	LHMW-3	LHMW-4	LHMW-5	LHMW-6	LHMW-10	LHMW-13	
arsenic	0.0001	0.0048	0.0012	0.00038	0.00033	0.00025	0.0078	0.05
barium	0.238	0.63	1.043	0.127	0.201	0.261	0.222	2
cadmium	0.032	0.047	0.049	0.0042	0.0081	0.087	0.052	0.005
chromium	0.027	0.046	0.041	0.025	0.03	0.019	0.031	0.1
copper	0.029	0.046	0.061	0.026	0.022	0.026	0.051	1.3[3]
lead	0.57	0.119	0.067	0.00067	0.022	0.0027	0.0047	0.015[3]
mercury	0	0.00061	0	0	0	0.0055	0.00015	0.002
nickel	0.205	0.526	0.192	0.034	0.039	0.338	0.595	0.1
silver	0.02	0.028	0.073	0.026	0.023	0.042	0.117	0.1[4]
zinc	0.251	1.317	0.286	0.046	0.018	0.313	0.39	5[4]

Notes:

1. The constituent level is the mean of concentrations detected during the ground-water detection monitoring period.
2. Federal Maximum Contaminant Level (MCL) for drinking water unless noted.
3. Action level for copper and lead in drinking water.
4. Secondary Maximum Contaminant Level (SMCL) for silver and zinc.

0.1 (shaded) Mean concentration above the federal Maximum Contaminant Level for drinking water.

Table 6

Summary of the Statistical Evaluation for Leachate (Surface Water)

Analytical Data for the Site A Landfill

CONSTITUENT (mg/L)	Surface Water						Leachate[1]
	No. of Detects	Max. Level Detected	Min. Level Detected	Mean	Standard Deviation	95% UCL	LHMW-7
arsenic	70/72	2.38	ND	0.2859	0.4753	0.3793	0.183
barium	18/20	1.04	ND	0.166	0.2492	0.2492	0.346
cadmium	8/20	0.038	ND	0.0062	0.01	0.01	0.034
chromium	12/20	0.077	ND	0.228	0.0328	0.0328	0.071
copper	16/20	0.043	ND	0.181	0.235	0.0235	0.011
lead	14/20	0.11	ND	0.0322	0.047	0.047	0.02
mercury	14/20	0.0099	ND	0.0025	0.0034	0.0034	0
nickel	13/20	0.334	ND	0.0423	0.0711	0.0711	0.007
silver	10/20	0.103	ND	0.0122	0.02	0.02	0.00033
zinc	18/20	3.16	ND	0.2704	0.5368	0.5368	0.015

Notes:

1. Date for these water samples is the mean concentration reported during the detection monitoring period. See Appendix B.for results of individual samples.
2. TNRCC Water Quality Criteria for Aquatic Life Protection, Fresh Chronic Criteria unless noted. See 31 Texas Administrative Code (TAC) §307.6(c) - specific numerical criteria. Hardness was estimated based on USGS data for the Brazos River - Lake Limestone (USGS 1991).
3. TNRCC Water Quality Criteria for human health protection/fresh water fish for barium and silver. See 31 Texas Administrative Code §307.6(d) - specific numerical criteria

ND Not Detected
-- Not available
UCL Upper Confidence Limit

Table 7
Data Evaluation for the TMPA Site A Landfill

STEP 1	STEP 2			STEP 3	STEP 4	STEP 5	STEP 4	STEP 6
Constituent	Number Detected	Range of Levels (mg/kg)	95% UCL (mg/kg)	Range of Background[1] (mg/kg)	RRS No. 2[2] SAI-MSC (mg/kg)	Constituent for Direct Contact[3]	RRS No. 2[4] GWP-MSC (md/kg)	Constituent for Cross Media Impact[5]
Landfill Waste and Pond Sediment								
arsenic	10/10	0.0011 - 56	21.68	2.8 - 10.9	3.27	x	0.5	x
barium	2/2	0.025 - 10.2	10.2[6]	337 - 998	137,000		200	
cadmium	10/10	0.0003 - 0.32	0.0208	0.1 - 0.5	1,020		0.5	
chromium	10/10	0.0024 - 38	29.59	19 - 90	5,110		10	
copper	9/9	0.0143 - 57	42.13	10 - 43	82,000[7]		130	
lead	10/10	0.015 - 82	49.38	9 - 31	1,000		1.5	x
mercury	2/2	0.0005 - 0.045	0.045[6]	0.02 - 0.11	613		0.2	x
nickel	2/2	0.066 - 40.1	35.57	7 - 32	20,400		10	x
selenium	9/9	0.07 - 3.26	1.95	0.09 - 0.56	10,200		10	x
silver	2/2	0.003 - 0.5	0.5[6]	0.1 - 0.5	10,200		10	
zinc	9/9	0.065 - 132	73.21	31 - 98	610,000[7]		500	
Constituent	**Number Detected**	**Range of Levels (mg/L)**	**95% UCL (mg/L)**	**Leachage LHMW-7**	**Mean of LHMW-2[8] (mg/L)**	**Constituent for Direct Contact[3]**	**RRS No. 2[4] GW-MSC (mg/L)**	**Constituent for Concern for Cross Media Impact[5]**
Surface Water/Leachate								
arsenic	70/72	ND - 2.38	0.3793	0.183	0.0001	x	0.05	x
barium	18/20	ND - 1.04	0.2492	0.346	0.238		2	
cadmium	8/20	ND - 0.038	0.01	0.034	0.032	x	0.005	x
chromium	12/20	ND - 0.077	0.0328	0.071	0.027		0.1	
copper	16/20	ND - 0.043	0.0235	0.011	0.029		1.3	
lead	14/20	ND - 0.11	0.047	0.02	0.57		0.015	x
mercury	14/20	ND - 0.0099	0.0034	0	0	x	0.002	x
nickel	13/20	ND - 0.334	0.0711	0.007	0.205		0.1	
silver	10/20	ND - 0.103	0.02	0.00033	0.02		0.1	
zinc	18/20	ND - 3.16	0.5368	0.015	0.251		5	

Notes:
1. Range of typical background levels in soils in the western United States from Schacklette and Boerngen , 1984.
2. The Risk Reduction Standard Number 2 Soil-Air-Ingestion (SAI) Medium Specific Concentration (MSC)was used to screen constituents for the BLRA unless noted. See 30 TAC Chapter 335 Subchapter S
3. Constituents of concern for direct contact are above the background range and the TNRCC's SAI-MSC. Potential for cumulative effects were considered.
4. The default Risk Reduction Standard Number 2 Ground-Water Protection (GWP) MSC was used to screen constituents for potential cross media impacts
5. Constituents of concern for direct contact are above the background range and the default TNRCC GWP-MSC. Leachable levels were also considered in the evaluation includedin Section 2.6.
6. Highest detected level.
7. Obtained from EPA Region III Guidance on Soil Screening Levels (April 1996).
8. Mean level of constituent in monitoring well LHMW-2.

x Constituent was evaluated either in the BLRA, evaluation of cross-media impact, or both

Table 8

Exposure Point Concentrations Used in the Risk Assessment

Constituent	WASTE or SEDIMENT 96% UCL (mg/kg)	SURFACE WATER 95% UCL (mg/L)
Arsenic	21.68	0.3793
Cadmium	--	0.01
Lead	--	0.047
Mercury	--	0.0034

Table 9

Calculated Intake for Exposure Assessment

CONSTITUENT	AVERAGE DAILY INTAKE (mg/kg/d)			LIFETIME AVERAGE DAILY INTAKE (mg/kg/d)		
	Leachate	Exposed Waste		Leachate	Exposed Waste	
	Dermal	Incidential Ingestion	Dust Inhalation	Dermal	Incidential Ingestion	Dust Inhalation (mg/m^3)
Worker - Current Conditions						
arsenic	0.000014	--	--	0.000005	--	--
cadmium	0.00000036	--	--	0.00000013	--	--
mercury	0.00000012	--	--	0.000000043	--	--
Worker - Future Conditions						
arsenic	0.000014	0.000001	0.000000029(1)	0.000005	0.00000045	0.000000035(3)
cadmium	0.00000036	--	--	0.00000013	--	--
mercury	0.00000012	--	--	0.000000043	--	--
Trespasser - Future Conditions						
arsenic	0.000016	0.000007	0.000000018(2)	0.000002	0.00000069	0.000000004(3)
cadmium	0.00000043	--	--	0.000000043	--	--
mercury	0.00000015	--	--	0.000000015	--	--

Notes:

1. For workers, the air concentration term from Risk*Assistant™ was converted to an Average Daily Dose using the formula Intake (mg/kg/day) = (CA*IR*ET*EF**ED)/(BW*AT). Calculations are shown in Appendix C.
2. For trespassers, the air concentration term from Risk*Assistant™ was converted to an Average Daily Dose using the formula Intake (mg/kg/day) = (CA*IR*ET*EF**ED)/(BW*AT). Calculations are shown in Appendix C.
3. The Lifetime Average Daily Dose for dust inhalation was not converted to an Intake in mg/kg/day since a unit risk factor is available to assess risks.

Table 10

Toxicity Factors Used in the Risk Assessment

all superscript

Constituent[1]	oral CPS (kg-d/mg)	dermal CPS[2] (kg-d/mg)	inhalation CPS (kg-d/mg)	oral RfD (mg/kg/d)	dermal RfD[2] (mg/kg/d)	inhalation RfD (mg/kg/d)
arsenic	0.86	4.3	1.51	0.0003	0.00006	0.0003[3]
cadmium	6.3	31.5	6.3[3]	0.0005	0.0001	0.0005
mercury	NA	NA	NA	0.0003	0.00006	0.0000857

(2)

Notes:

1. Toxicity factors were obtained from the EPA Integrated Risk Information System (IRIS) data base. The CPS for arsenic was obtained from the May 1996 guidance document fro [for] the TNRCC's Texas Risk Reduction Program.
2. Adjusted CPS and RFD were used to assess dermal exposure.
3. An inhalation RfD was not available and the oral RfD was used.
4. An inhalation CPS was not available and athe oral RfD was used.

-- Not available for lead

NA Not applicable. Mercury is not classified as a carcinogen by the EPA.

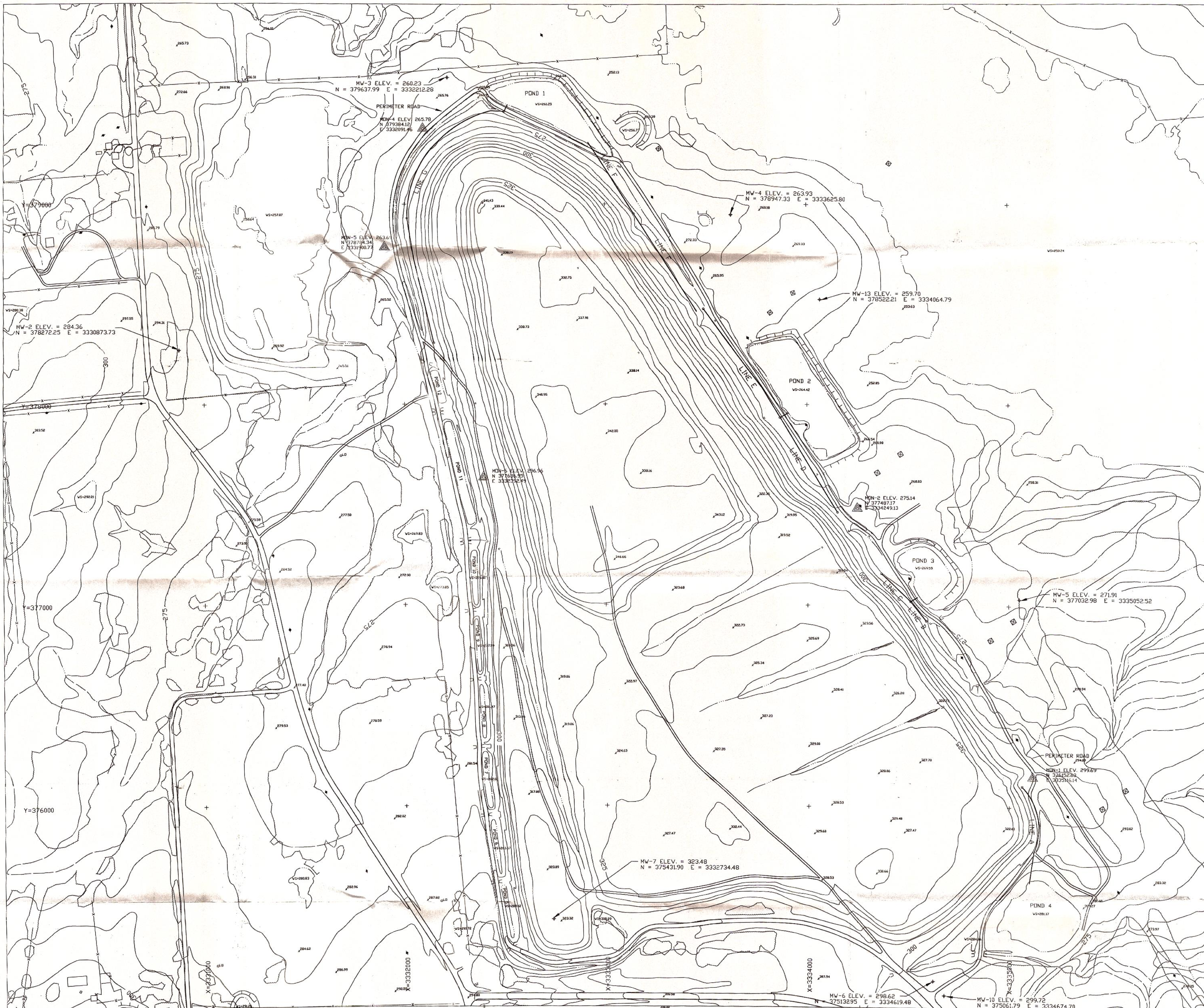
Table 11
Risk Estimates for Current and Future Conditions

NONCARCINOGENIC RISK									
CONSTITUENT	Leachate - Dermal			Exp.Waste - Incid. Ingestion			Dust - Inhalation		
	(mg/kg/d)	dermal RfD	HQ	(mg/kg/d)	RfDo	HQ	(mg/kg/d)	RfDi	HQ
1. Worker - Current Conditions									
arsenic	0.000014	0.00006	0.233333						
cadmium	3.6E-07	0.0001	0.0036						
mercury	1.2E-07	0.00006	0.002						
	Pathway HQ		0.2						
	TOTAL HI								0.2
2. Worker - Future									
arsenic	0.000014	0.00006	0.233333	0.000001	0.0003	0.00333333	0.000000023	0.0003	0.00007667
cadmium	3.6E-07	0.0001	0.0036						
mercury	1.2E-07	0.00006	0.002						
	Pathway HQ		0.2			0.00333333			0.00008
	TOTAL HI								0.2
3. Trespasser - Future									
arsenic	0.000016	0.00006	0.266667	0.000007	0.0003	0.11666667	0.000000032	0.0003	0.0001
cadmium	4.3E-07	0.0001	0.0043						
mercury	1.5E-07	0.00006	0.0025						
	Pathway HQ		0.3			0.1			0.0001
	TOTAL HI								0.4
CARCINOGENIC RISK									
	Leachate - Dermal			Exp. Waste - Incid. Ingestion			Dust Conc.		
CONSTITUENT	(mg/kg/d)	dermal CPS	Riski	(mg/kg/d)	CPSo	Riski	(mg/m3)	URFi	Riski
1. Worker - Current Conditions									
arsenic	0.000005	4.3	2.15E-05						
cadmium	1.3E-07	31.5	4.10E-05						
	Pathway Risk		3E-05						
	TOTAL RISK								3E-05
2. Worker - Future									
arsenic	0.000005	4.3	2.15E-05	0.00000045	0.86	3.87E-07	0.00003500	4.3	8.14E-06
cadmium	1.3E-07	31.5	4.10E-05						
	Pathway Risk		3E-05			4E-08			8E-06
	TOTAL RISK								3E-05
3. Trespasser - Future									
arsenic	0.000002	4.3	8.61E-06	0.00000069	0.86	5.93E-07	0.00000400	4.3	9.30E-07
cadmium	4.3E-08	31.5	1.35E-06						
	Pathway Risk		1E-05			6E-06			9E-07
	TOTAL RISK								1E-05

Table 12

Evaluation of Potential for Soil-to-Groundwater Cross Media Impact

CONSTITUENT	95% UCL - Waste (mg/kg)	Default GWP-MSC (mg/kg)	EPA SSL (mg/kg)
arsenic	21.68	0.5	146
cadmium	0.0208	0.5	60.1
mercury	0.045	0.2	29.04
nickel	35.57	10	212
selenium	1.95	10	26



GRAPHIC SCALE

200' 0 200' 400' 600' 800'

DATE OF PHOTOGRAPHY 3-14-1995

SCALE 1"=200'

N

TEXAS MUNICIPAL POWER AGENCY

AREA A

FIGURE 1

Tobin Surveys, Inc.
San Antonio, Texas

BORING LOCATIONS

Boring	Northing	Easting	Depth	Groundwater	Boring	Northing	Easting	Depth	Groundwater
1	377814.5600	3331765.620	25.0'	12.4'	18	369436.5600	3333891.710	39.0'	-
2	378880.3600	3332128.430	40.0'	-	19	369449.8100	3334404.380	24.5'	2.0'
3	378761.7700	3333010.980	25.0'	-	20	368623.1800	3334223.860	39.5'	7.0'
4	378178.0300	3332684.850	40.5'	28.0'	21	388430.2700	3333765.820	24.5'	10.0'
5	377596.3000	3333205.670	40.'0	5.5'	22	368185.1600	3334750.070	24.0'	-
6	376931.7000	3333051.500	25.0'	11.5'	23	367812.4200	3334179.870	41.0'	18.0'
7	376686.4100	3333663.030	38.5'	16.0'	24	367103.5400	3334413.570	40.0'	-
8	376313.4200	3334180.480	25.0'	-	25	374205.3600	3337979.140	40.0'	7.0'
9	375721.1800	3334014.250	40.0'	-	26	373349.5000	3337690.500	40.0'	-
10	374612.9100	3333671.340	40.0'	-					
11	374190.7000	3332792.920	25.0'	13.5'	A-1	373111.6900	3337742.130	10.5'	-
12	374701.1300	3334408.490	25.0'	19.0'	A-2	373593.5000	3337742.130	10.5'	-
13	374177.3700	3333813.560	40.0'	-	A-3	373550.1900	3337426.920	10.5'	-
14	373362.0500	3334781.620	24.0'	-	A-4	373618.8800	3337130.670	9.1'	-
15	373080.2100	3332969.130	40.0'	-	A-5	373509.4100	3336848.090	10.5'	-
16	371603.2000	3333568.290	39.0'	-	A-6	373366.2700	3336474.640	10.5'	-
17	370290.6400	3333764.930	39.0'	29.5'	A-7	373201.9800	3336178.610	10.5'	-

LEGEND

234.1 + ELEVATION OF LOW POINT OF POWER LINE SAG

PERIMETER OF DISPOSAL AREAS

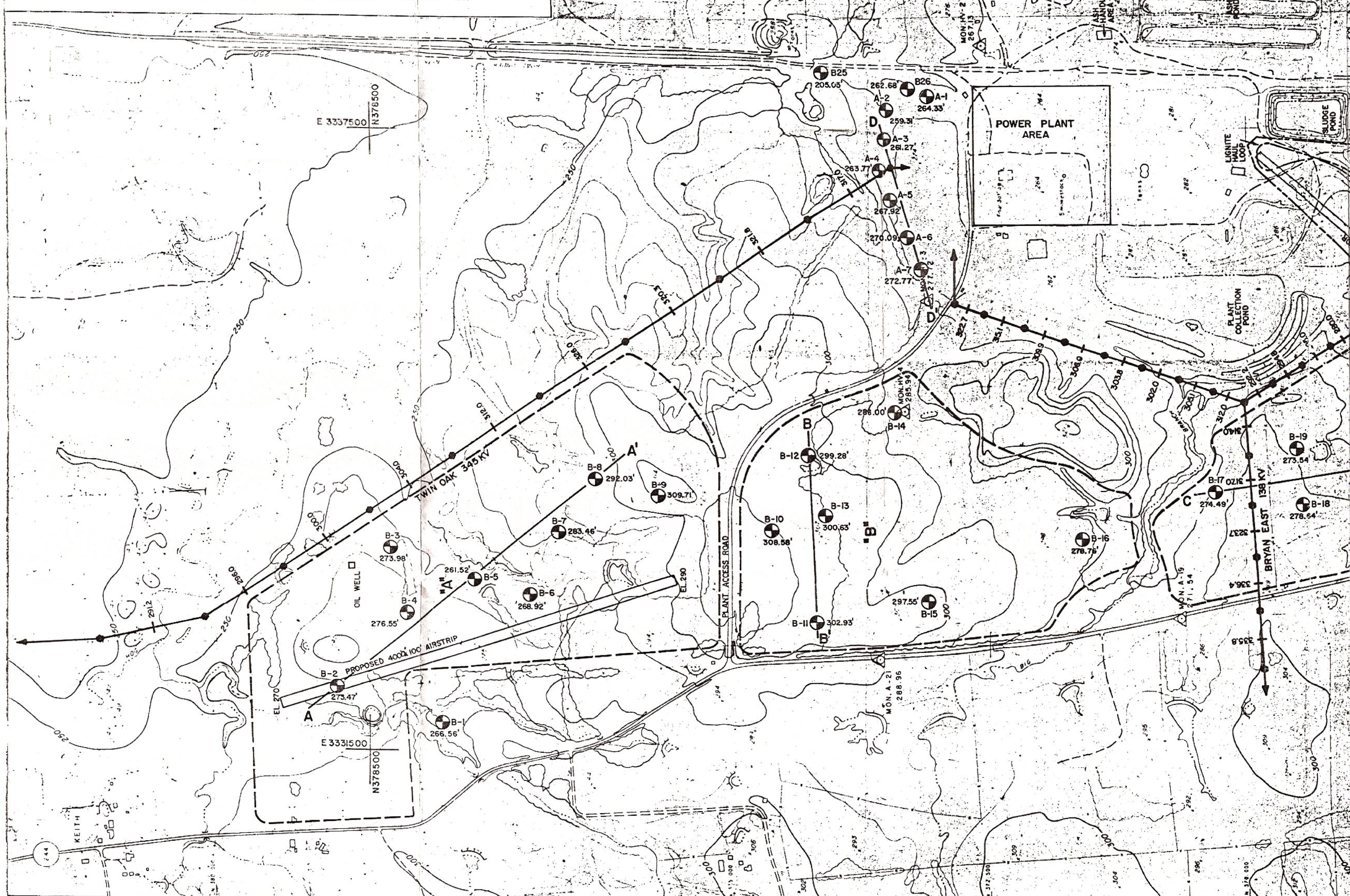
PERMIT BOUNDRY

SCALE 1" = 500 feet Date of Photograph 10/8/79
Date of Compilation: 7/28/80 Contour Interval 10 feet
GRID BASED ON TEXAS STATE PLANE COORDINATE SYSTEM CENTRAL ZONE

ELEVATIONS BASED ON 1929 MEAN SEA LEVEL DATUM
PHOTOGRAPHIC IMAGE BY ORTHOPHOTOGRAPHY

TEST BORING LOCATION & ELEVATION SURVEYED BY

GEORGE W. MUERY SERVICES, INC.
7073 SAN PEDRO AVENUE
SAN ANTONIO, TEXAS 78216



TEXAS MUNICIPAL POWER AUTHORITY

GRIMES COUNTY, TEXAS

TEST BORING LOCATION PLAN
SOLID WASTE DISPOSAL AREA

Valley Forge Laboratories Inc. Devon, Pa.

SCALE 0 250' 500' 1000'

FIGURE 15565-1

FIGURES

Appendix A

BORING LOGS AND GEOLOGIC CROSS SECTIONS

Appendix A

List of Contents

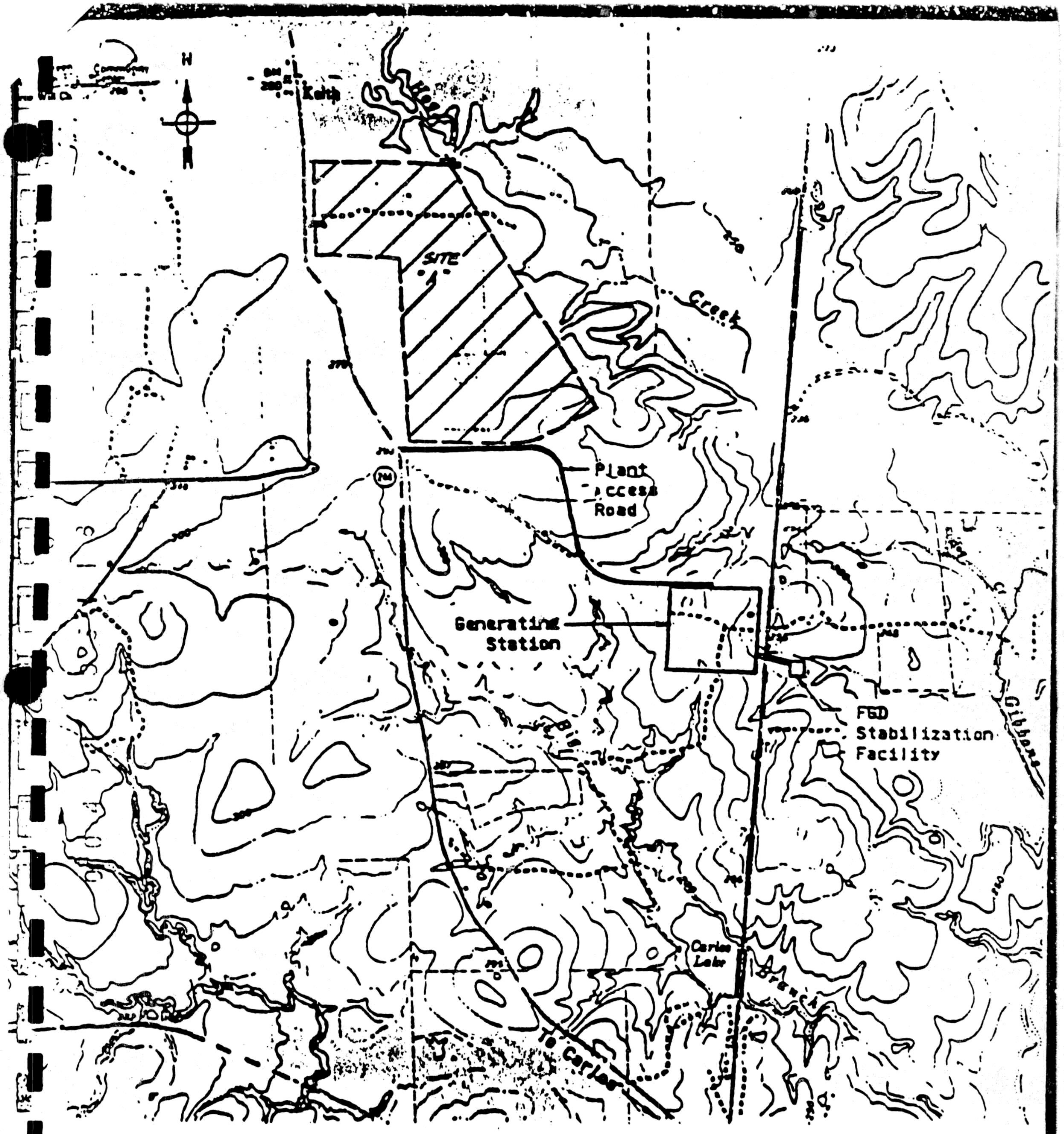


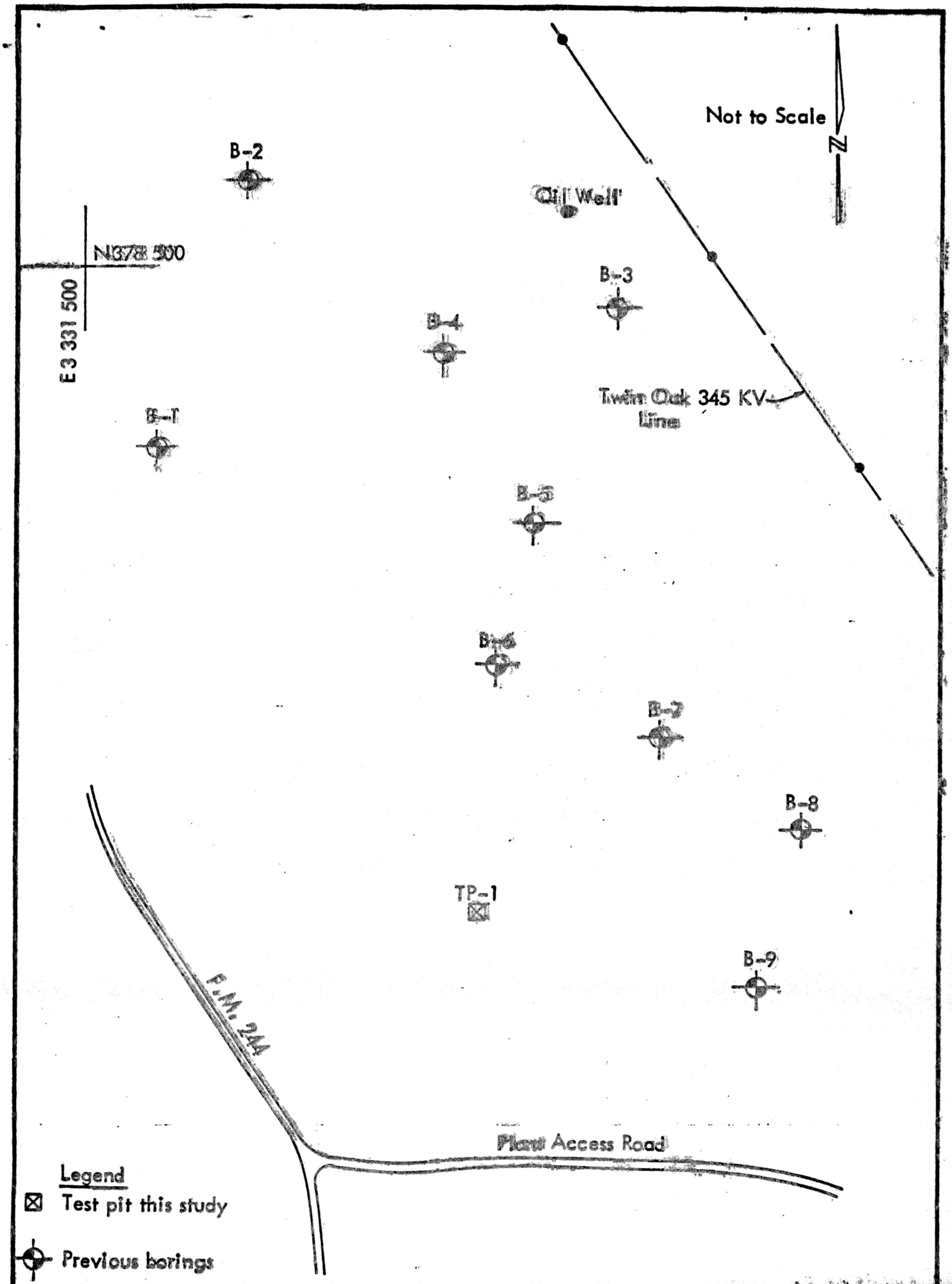
FIGURE 1

SITE LOCATION MAP

Scale: 1 inch = 2000 feet

PROPOSED LANDFILL SITE

Reference: Reproduced from U.S.G.S. 7.5 Minute Series Map Carlos and Keith Quadrangles, TX



PLAN OF BORINGS

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

BORING LOGS

LOG OF BORING NO. TP-1

INDUSTRIAL WASTE DISPOSAL PLAN
GIBBONS CREEK STEAM ELECTRIC STATION
GRIMES COUNTY, TEXAS
LOCATION: N376000; E3333000

SOIL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT %	SHEAR STRENGTH IN TONS/SQ FT.	UNIT DRY WT. LBS./CU. FT.
8" top soil, w/roots					
Brown clay	95	31	29		
-2" siltstone seam at 3.0'					
-gray and tan, w/some sand	50	23	19		
-brown	80	42	54		
-w/iron stains					
(CH)	85	39	40		

COMPLETION DEPTH: 9.0'
DATE: 8/4/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-1
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
	Stiff dark brown silty clay						
		69.4	48	15			
5	-w/some iron stains						
	-w/seams of increasing clay						
10	-hard and brown, iron stained, w/silty fine sand laminations						
	-water at 12.0'						
15	-gray, w/no iron stains, decreasing silt						
	(CL-CH)						
20	Hard gray clay						
25	(CH)						
30							
35							

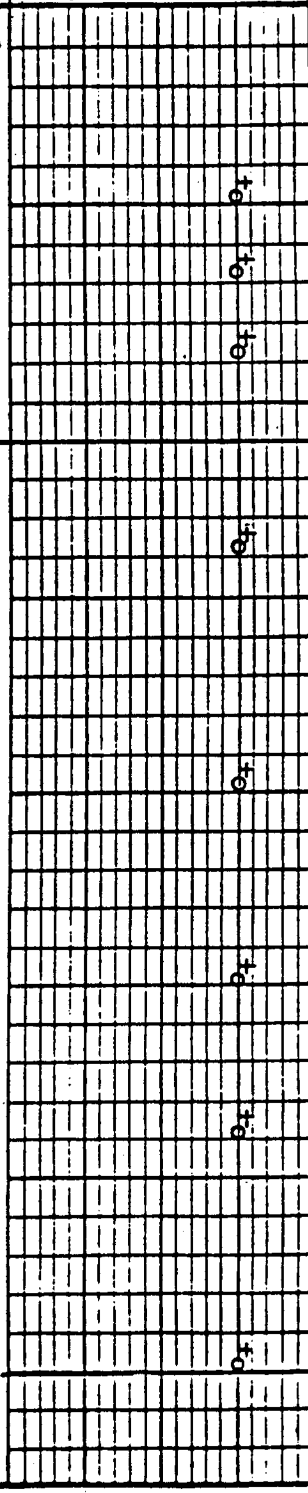
COMPLETION DEPTH: 25.0'
DATE: 1/20/82

LOG OF BORING NO. B-2
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Hard light brown silty clay						
5			-tan and gray, w/iron stains and silt laminations						
			-increasing iron and silt laminations						
10			(CL)						
			Hard gray clay						
			-crossbedded, w/continuing iron and silt laminations						
15									
20			-w/selenite crystals and decreasing laminations						
			-dark gray						
25									
30									
35									

(Continued)



NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-2 (Cont'd.)

WASTE DISPOSAL PONDS

GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
40			(CH)						
45									
50									
55									
60									
65									
70									

COMPLETION DEPTH: 40.0'

DATE: 1/26/82

LOG OF BORING NO. B-3
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0–8	Very stiff brown silty clay -crossbedded -w/increasing silty fine sand seams (CL)	25 24 23	89.3 76.3 71.1	53 56 52	10 19 22			
8–16	Dense tan silty fine sand, w/numerous iron stains (SM)	32						
16–25	Hard light brown clay, w/iron stained laminations -w/sand laminations (CH)							

COMPLETION DEPTH: 25.0'
DATE: 1/20/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-4
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION:

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0–5	Stiff brown silty clay							
			85.6	83	26			
	-very stiff		84.5	77	29			
	(CL)							
5–18	Dense gray and tan silty fine sand, w/iron stains and occasional silty clay seams							
	-w/iron stains and nodules at 8.0'							
	-continuous iron stains and clay seams	60						
	(SM)							
18–29	Hard brown silty clay, w/iron stained laminations							
	-gray and laminated							
	(CL-CH)							
29–35	Hard gray clay, decreasing silt							

(Continued)

LOG OF BORING NO. B-4 (Contd.)

WASTE DISPOSAL PONDS

GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT. LBS./CU. FT.
				54						
40			(CH)							
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 40.5'

DATE: 1/20/82

DEPTH TO WATER: Dry at completion

DATE:

LOG OF BORING NO. B-5

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0–17	Very stiff brown clay, w/occasional silty fine sand pockets and iron stains -increasing iron stains -water at 9.5' -w/selenite crystals -gray, w/increasing silt (CH)							
17–21	Very dense gray sand, w/numerous clay laminations -increasing clay laminations (SP)	69						
21–35	Hard gray silty clay, w/silt laminations -crossbedded -w/silty fine sand laminations							

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-5 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
40			(CL-CH)						
45									
50									
55									
60									
65									
70									

COMPLETION DEPTH: 40.0'
DATE: 1/26/82

LOG OF BORING NO. B-6
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings, Plate 1

DEPTH. FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
	Hard brown clay							
			99.1	92	37			
5	-w/occasional crossbedding							
10	-brown and gray, w/occasional iron stains							
	-w/occasional silty fine sand laminations, iron stains							
15	-increasing silt							
20								
	(CH)							
25	Dense gray sand (SP)	64						
30								
35								

COMPLETION DEPTH: 25.0'
DATE: 1/25/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-7
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 1

DEPTH. FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
	Dense tan silty fine sand, w/numerous iron stains							
		50/3'	54.2	53	36			
5								
	-w/occasional thin clay laminations and iron stains	33						
	-laminated							
10								
	(SM)							
	Dense gray clayey fine sand -w/lignitic laminations							
15		82						
		50/2.5"						
20								
	-no laminations							
25								
		50/6" seat						
30								
	(SC)							
	Hard bluish-gray siltstone							
35								

(Continued)

LOG OF BORING NO. B-7 (Contd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT. LBS./CU. FT.
40								
45								
50								
55								
60								
65								
70								

COMPLETION DEPTH: 38.5'

DATE: 1/25/82

LOG OF BORING NO. B-8

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Dense tan silty fine sand, w/clay seams						
5			-w/increasing clay seams	88.4	78	29			
			(SM)						
10			Very stiff light brown clay					o	
15			-fissured, w/iron stains at 15.0'					o	
20			-w/occasional silty fine sand laminations and iron stains					o	
25			-hard, w/continuous occasional silty fine sand laminations and iron stains (CH)					o	
30									
35									

COMPLETION DEPTH: 25.0'
DATE: 1/25/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-9
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
	Dense light gray silty fine sand, w/iron stains and cemented layers							
		50/6"	74.4	54	37			
5								
	-w/clay seam at 7.4'	48						
10	-continuous iron stains							
15	-w/clay seams							
20	-no iron stains -less clay seams							
	(SM)							
25	Very stiff brown clay, w/iron stained silty fine sand laminations							
30	-gray, slickensided at 29.0-30.0'							
35	-hard, bluish-gray and slickensided							

(Continued)

LOG OF BORING NO. B-9 (Contd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
			(CH)					
40								
45								
50								
55								
60								
65								
70								

COMPLETION DEPTH: 40.0'

DATE: 1/23/82

LOG OF BORING NO. B-10
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
	Gray silty clay (CL)							
	Hard light gray siltstone, poorly cemented							
5	Medium dense light gray silty fine sand		86.6	54	20			
10	-w/occasional clay seams and iron stains (SM)							
15	Very stiff light brown clay, w/silty fine sand laminations and iron stains							
20	-hard							
25	-gray, w/decreasing silt laminations and continuous iron stains							
30								
35	-very stiff							

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-10 (Contd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
40			(CH)					
45								
50								
55								
60								
65								
70								

COMPLETION DEPTH: 40.0'
DATE: 1/22/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

LOG OF BORING NO. B-11
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Stiff tan silty clay						
5									
10			-w/silty fine sand laminations -hard						
15			-w/iron stains						
20			-tan and light brown -continuing iron stains and silty fine sand laminations -very stiff at 20.0'						
25			(CL)						
30									
35									

COMPLETION DEPTH: 25.0'
DATE: 2/3/82

LOG OF BORING NO. B-12

WASTE DISPOSAL PONDS

GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
			Hard light tan sandy clay							
5			-w/increasing silt (CL)							
			Dense light tan silty fine sand	42						
10			-light gray	45						
			-cemented, w/some clay	50/5"						
15			-w/iron stained laminations							
20			-w/continuous iron stains and clay seams							
			-increasing clay (SM)							
			Very stiff light gray silty clay							
25			(CL)							
30										
35										

COMPLETION DEPTH: 25.0'

DATE: 1/21/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-13
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0–8	Very stiff tan silty clay -w/silty fine sand (CL)	25						
5								
8–15	Dense tan silty fine sand (SM)	77 70						
10								
15								
15–35	Hard tan and light brown silty clay -w/iron stains and silty fine sand seams	26 31						
20								
25								
30								
35								

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-13 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			-w/silty fine sand laminations							
			(CL)	40						
40										
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 40.0'
DATE: 2/2/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

LOG OF BORING NO. B-14
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings, Plate 1

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0–4	Hard brown silty clay, w/some sand (CL)						+ (about 1.5)	
5	Light tan siltstone, w/iron stains and cemented, rock seam from 4.0-5.0'	50/6" seat						
10	Dense light tan silty fine sand	39	16.2	NP	NP			
	-w/hard siltstone seams							
15	-very dense, laminated, w/iron stains	58						
20	-w/cemented siltstone seam	50/1" seat						
	-w/occasional clay seams (SM)	50/5" seat						

COMPLETION DEPTH: 24.0'

DATE: 1/23/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-15

WASTE DISPOSAL PONDS

GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
	Loose tan sand (SP)							
	Tan clayey fine sand (SC)		68.6	59	20			
5	Dense tan silty fine sand	32						
	-very dense, w/iron stains, thin seams	100						
10								
		50/5" seat						
15								
	-continuing iron stains -increasing clay seams at 19.5'	63						
20								
25	-increasing clay							
	-gray							
30	-bluish-gray							
35								

(Continued)

LOG OF BORING NO. B-15 (Cont'd.)

WASTE DISPOSAL PONDS

GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			(SM)						
			Hard bluish-green clay (CH)						
40									
45									
50									
55									
60									
65									
70									

COMPLETION DEPTH: 40.0'

DATE: 1/28/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

LOG OF BORING NO. B-16
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0–3	Sandy clay (CL)							
3–22	Dense tan silty fine sand	33						
5								
	-w/light iron stains	52						
10		68						
15		50/6" seat						
20	(SM)	50/5"						
22–35	Hard gray silty clay, w/numerous silty fine sand seams	86/9"						
25								
30		79						
	-continuing silty fine sand laminations							
35								

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-16 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT. LBS./CU. FT.
			(CL)						
40									
45									
50									
55									
60									
65									
70									

COMPLETION DEPTH: 39.0'
DATE: 2/3/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

LOG OF BORING NO. B-17

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %
0	Very stiff tan and light gray silty clay					
7	-w/iron stains			66	24	
10	-increasing silt		80.6	61	24	
15	-hard, continuing iron stain, decreasing silt					
22	-gray (CL)					
23	Dense gray clayey fine sand, w/numerous gray sand seams	50/6" seat				
29	-cemented silty fine sand seams (SC)	50/4" seat				
31	Dense gray sand					
34		50/5"				

SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5) — UNIT DRY WT. LBS./CU. FT.

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-17 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT. LBS./CU. FT.
			(SP)	50/5" seat						
40										
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 39.0'
DATE: 1/26/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS

LOG OF BORING NO. B-18
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0–5	Hard light brown sandy clay (CL)							
5	Hard tan and light gray silty clay, w/fine sand and occasional iron stains							
10	-increasing iron							
15	-w/increasing silt laminations							
	-cemented, w/increasing clay at 17.5-18.9' (CL)							
20	Very dense tan silty fine sand, w/iron stains (SM)	80						
	Hard light brown silty clay -w/iron stains							
25	-light brown, shaley							
30	-w/numerous silty fine sand and fine sand laminations	71						
35		55						

(Continued)

LOG OF BORING NO. B-18 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			-crossbedded						
			(CL)						
40									
45									
50									
55									
60									
65									
70									

COMPLETION DEPTH: 39.0'
DATE: 1/27/82

LOG OF BORING NO. B-19

WASTE DISPOSAL PONDS

GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0–11			Very stiff light brown sandy clay -hard tan, increasing silt and silty fine sand (CL)							
11–24.5			Dense tan silty fine sand, w/numerous hard layers -w/iron stains -w/iron stained laminations -increasing clay at 24.0' (SM)	35						

COMPLETION DEPTH: 24.5'

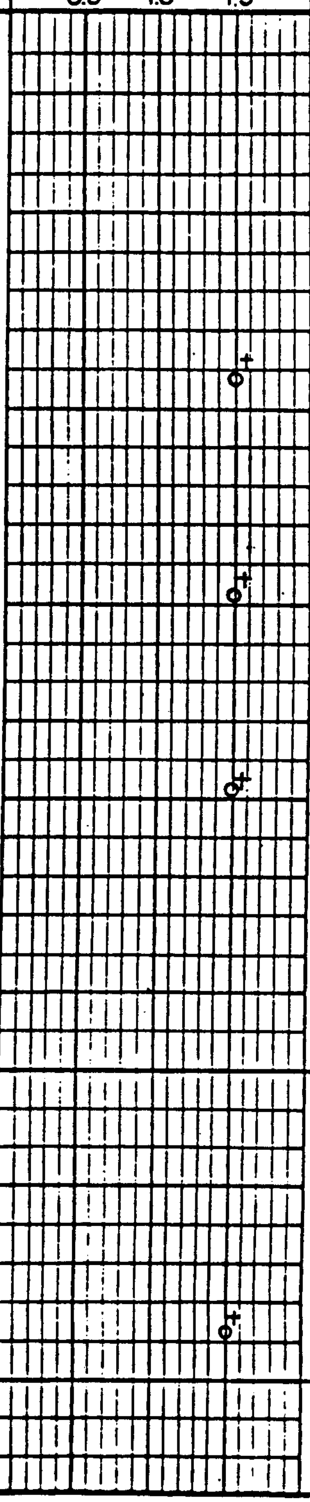
DATE: 1/28/82

LOG OF BORING NO. B-20
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LBS./CU. FT.
0–27	Dense tan and gray silty fine sand, w/occasional hard layers and numerous iron stains						
~4		48	38	41	22		
~7		68					
~15	-increasing clay						
~17	-gray						
~19	-occasional clay seams, no iron						
~27	(SM)						
27–35	Hard gray silty clay, w/increasing clay laminations and seams	50/6"					
30	-numerous silty fine sand laminations at 30.0'						

SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)



(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-20 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
40			(CL)	50/4"						
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 39.5'
DATE: 1/27/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

LOG OF BORING NO. B-21
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT.	UNIT DRY WT. LBS./CU. FT.
0–5	Brown sand -w/iron stains at 4.2' (SP)		32	21	NP			
5–17	Very dense tan silty fine sand, w/iron stains and w/clay	66 82/8'	36.2	46	22			
	-continuing iron stains -w/water bearing sand (SM)							
17–24.5	Hard gray silty clay, w/fine sand seams -continuing sand seams (CL)							

COMPLETION DEPTH: 24.5'
DATE: 1/27/82

DEPTH TO WATER:
DATE:

NFS/NATIONAL SOIL SERVICES

LOG OF BORING NO. B-22

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0–9	Dense tan silty fine sand, w/some clay							
		38						
5								
	-increasing fine sand (SM)	50/4" seat						
9–14	Medium dense tan fine sand	21						
10	-.5' dark brown organic lignite (SP)							
14–18	Hard light brown silty clay							
15	-water at 18.0' (CL)							
18–24	Hard brown lignite	50/5"						
20								
		50/4" seat						

COMPLETION DEPTH: 24.0'

DATE: 2/1/82

LOG OF BORING
WASTE DISPOSAL
GIBBONS CREEK STEAM ELE
(...d.)

TYPE BORING: Undisturbed Sample LOCATIO

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.		SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT. LBS./CU. FT.
			Dense tan silty fine sand w/zones of increasing clay and clay laminations	71	7		
5			(SM)				
			Hard tan and brown silty clay, w/iron stains		72		
10			-very stiff, w/increasing silt and fine sand				
15			-iron stained laminations				
20			-w/silt pockets -lignitic clay at 21.0-23.5'				
			(CL)				
25			Soft dark brown lignite				
30				50/4" seat			
35							

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-23 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			Hard bluish-green silty clay, w/numerous silty fine sand laminations (CL)	50/5"						
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 41.0'
DATE: 1/28/82

LOG OF BORING NO. B-24

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0	Hard tan and light brown silty clay, w/fine sand and iron stains						
5		73.4	41	18			
10	-very stiff, w/increasing clay, containing iron						
15	-increasing silty fine sand laminations -hard at 15.0'						
20							
25	-w/clay laminations						
30	-no iron stains -w/lignitic laminations						
35							

(Continued)

LOG OF BORING NO. B-24 (Cont'd.)

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
				56						
40			(CL)							
45										
50										
55										
60										
65										
70										

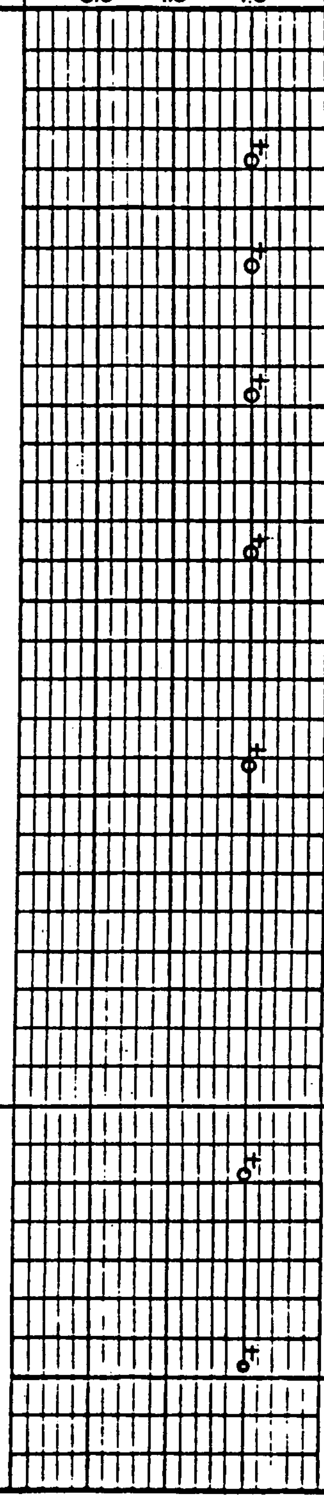
COMPLETION DEPTH: 40.0'

DATE: 1/29/82

LOG OF BORING NO. B-25
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0			Hard tan silty clay						
5			-w/silty fine sand laminations						
10			-light brown, w/iron stains -water at 11.0'						
15									
20			-gray -w/some fine sand						
25			-w/increasing sand seams (CL)						
30			Hard bluish-green clay -w/increasing clay and decreasing silty fine sand						
35									



(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-25 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			(CH)						
45									
50									
55									
60									
65									
70									

COMPLETION DEPTH: 40.0'
DATE: 2/4/82

LOG OF BORING NO. B-26
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. 0.5 1.0 1.5	UNIT DRY WT. LBS./CU. FT.
			Very stiff tan silty clay, w/numerous silty fine sand laminations							
5				29						
			-decreasing sand							
10			-hard brown, w/iron stains and crossbedding	44						
15										
20			-water at 20.0'							
			-w/sand seams							
25			-increasing sand and iron stains	62						
			(CL)							
			Hard grayish-blue silty clay -w/occasional iron stained seams	71						
30										
			-decreasing iron stains							
35										

(Continued)

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. B-26 (Cont'd.)
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
40			(CL-CH)	50/4"						
45										
50										
55										
60										
65										
70										

COMPLETION DEPTH: 40.0'
DATE: 2/4/82

NATIONAL SOIL SERVICES, INC.
CONSULTING ENGINEERS.

LOG OF BORING NO. A-1
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
	Dense tan silty fine sand							
		59						
5	-w/iron stains	39						
	-decreasing silt (SM)							
	Dense tan fine sand (SP)	46						
10								
15								
20								
25								
30								
35								

COMPLETION DEPTH: 10.5'

DATE: 2/5/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. A-2

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH, FT.	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
0–5	Firm brown and gray silty clay (Fill) (CL)		56	44	19		⊙ (approx. 0.5)	
5–9	Medium dense gray silty sand (SM)	25						
9–10.5	Dense tan and brown silty fine sand, w/numerous clay seams (SM)	33						

COMPLETION DEPTH: 10.5'
DATE: 2/5/82

LOG OF BORING NO. A-3
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
			Dense tan silty fine sand							
			-w/iron stains	35	45	50	25			
5										
				39						
			-w/clay seams	70						
10			(SM)							
15										
20										
25										
30										
35										

COMPLETION DEPTH: 10.5'

DATE: 2/5/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. A-4

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
			Dense tan silty fine sand							
		X		57						
5			-w/iron stains							
		X		40						
			(SM)	50/1" seat						
10										
15										
20										
25										
30										
35										

COMPLETION DEPTH: 9.1'
DATE: 2/5/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. A-5

WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: Undisturbed Sample LOCATION: See Plan of Borings

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5, 1.0, 1.5)	UNIT DRY WT. LBS./CU. FT.
			Dense tan silty fine sand							
5										
			-w/numerous iron stains and occasional light brown clay seams	40						
10			(SM)	51						
15										
20										
25										
30										
35										

COMPLETION DEPTH: 10.5'
DATE: 2/5/82

LOG OF BORING NO. A-6
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

TYPE BORING: LOCATION:

DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0–8			Very stiff light brown silty clay, w/weathered calcareous nodules -gray (CL)						○ (~1.3), ○ (~1.0)	
8–10.5			Dense tan silty fine sand, w/iron stained laminations (SM)	41						

COMPLETION DEPTH: 10.5'
DATE: 2/5/82

NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

LOG OF BORING NO. A-7
WASTE DISPOSAL PONDS
GIBBONS CREEK STEAM ELECTRIC STATION

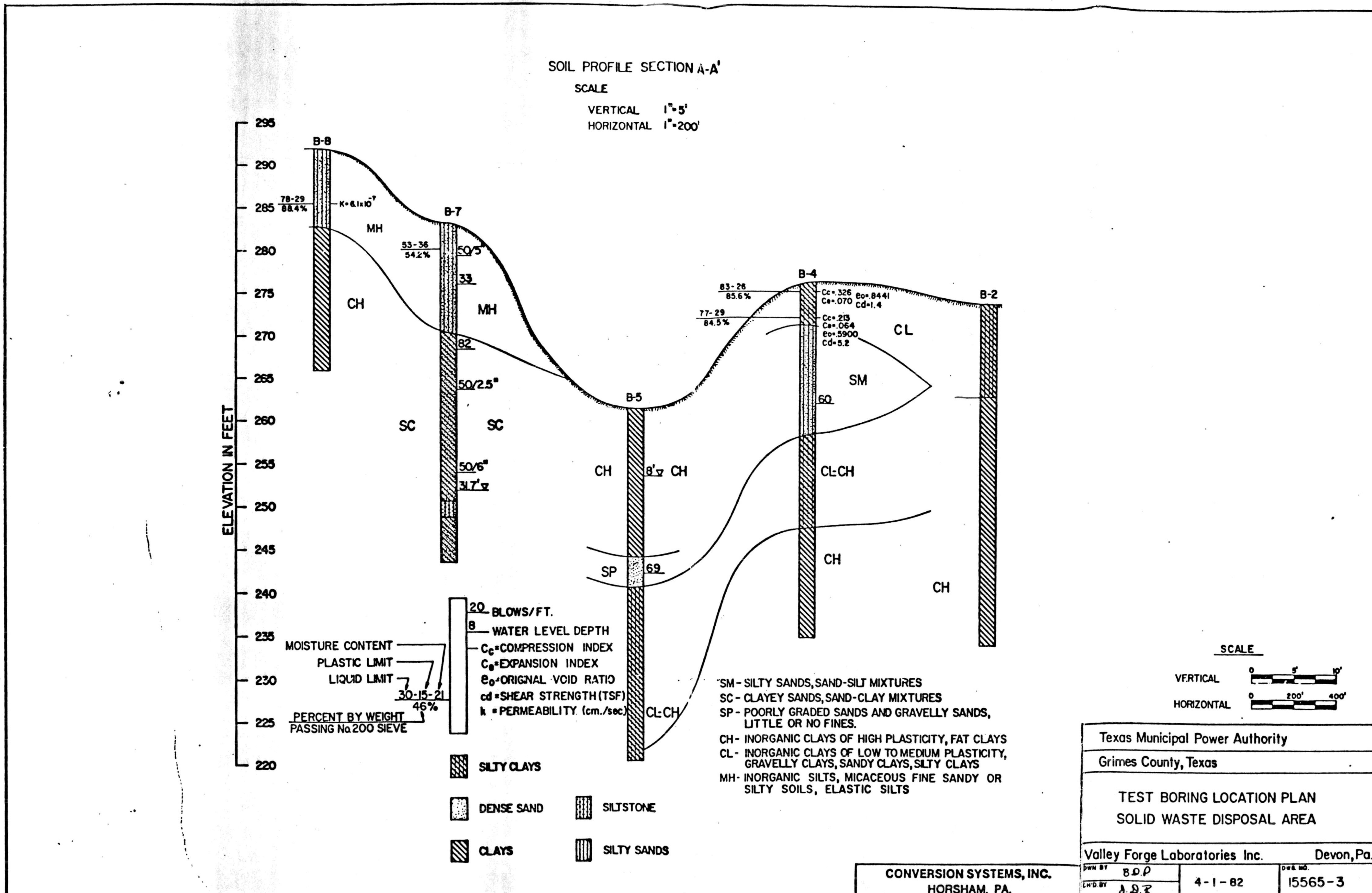
TYPE BORING: Undisturbed Sample   LOCATION: See Plan of Borings

DEPTH. FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS PER FT.	% PASSING NO. 200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH IN TONS/SQ FT. (0.5 1.0 1.5)	UNIT DRY WT. LBS./CU. FT.
0–5			Very stiff light brown silty clay (Fill) (CL)		78.4	70	25			
5–10.5			Dense tan silty fine sand, cemented, w/iron stains (SM)	50/2" seat; 42						

COMPLETION DEPTH: 10.5'

DATE: 2/5/82

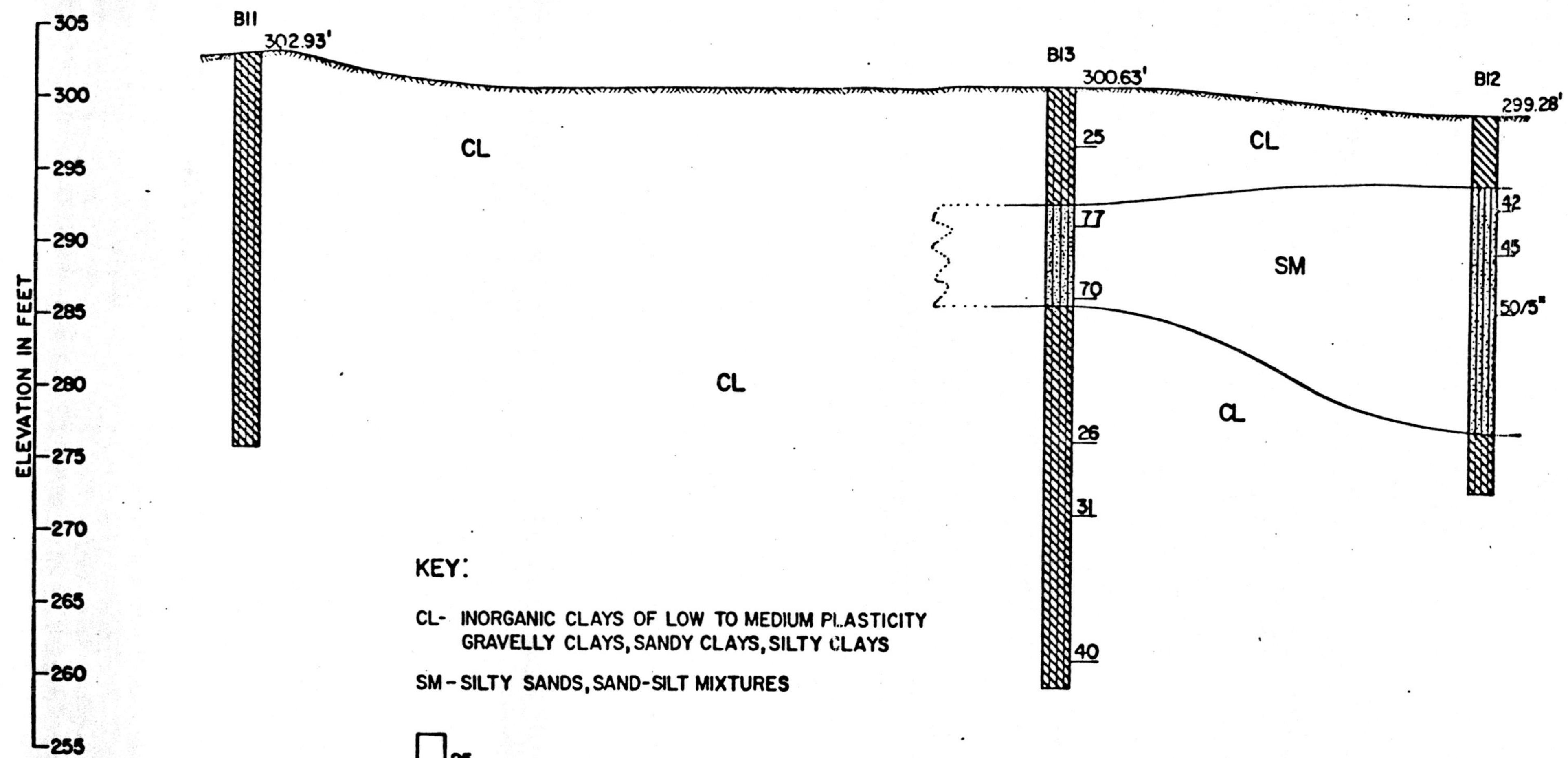
NFS/NATIONAL SOIL SERVICES
CONSULTING ENGINEERS


SOIL PROFILE SECTION A-A'
SCALE
VERTICAL 1"=5'
HORIZONTAL 1"=200'
ELEVATION IN FEET
295
290
285
280
275
270
265
260
255
250
245
240
235
230
225
220
B-8
78-29
88.4%
K=6.1x10^-7
MH
CH
B-7
53-36
54.2%
50/5"
33
MH
82
50/2.5"
SC
SC
50/6"
31.7'
B-5
CH
8' CH
SP
69
CL-CH
B-4
83-26
85.6%
Cc=.326
Ce=.070
Eo=.8441
Cd=1.4
77-29
84.5%
Cc=.213
Ce=.064
Eo=.5900
Cd=5.2
CL
SM
60
CL-CH
CH
CH
B-2
20 BLOWS/FT.
8 WATER LEVEL DEPTH
Cc=COMPRESSION INDEX
Ce=EXPANSION INDEX
eo=ORIGNAL VOID RATIO
cd=SHEAR STRENGTH (TSF)
k =PERMEABILITY (cm./sec)
MOISTURE CONTENT
PLASTIC LIMIT
LIQUID LIMIT
30-15-21
46%
PERCENT BY WEIGHT PASSING No. 200 SIEVE
SILTY CLAYS
DENSE SAND
CLAYS
SILTSTONE
SILTY SANDS
SM - SILTY SANDS, SAND-SILT MIXTURES
SC - CLAYEY SANDS, SAND-CLAY MIXTURES
SP - POORLY GRADED SANDS AND GRAVELLY SANDS, LITTLE OR NO FINES.
CH - INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS
MH - INORGANIC SILTS, MICACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
SCALE
VERTICAL 0 5' 10'
HORIZONTAL 0 200' 400'
Texas Municipal Power Authority
Grimes County, Texas
TEST BORING LOCATION PLAN
SOLID WASTE DISPOSAL AREA
Valley Forge Laboratories Inc. Devon, Pa.
DWN BY B.D.P.
CH'D BY J.D.R.
4-1-82
DWG NO. 15565-3
CONVERSION SYSTEMS, INC.
HORSHAM, PA.

SOIL PROFILES B–B'

SCALE:

VERTICAL 1" = 5'
HORIZONTAL 1" = 100'



KEY:

CL- INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS

SM - SILTY SANDS, SAND-SILT MIXTURES

25 BLOWS/FT.

FINE SANDS

CLAYS

SCALE

VERTICAL 0 5' 10'

HORIZONTAL 0 100' 200'

Texas Municipal Power Authority

Grimes County, Texas

TEST BORING LOCATION PLAN
SOLID WASTE DISPOSAL AREA

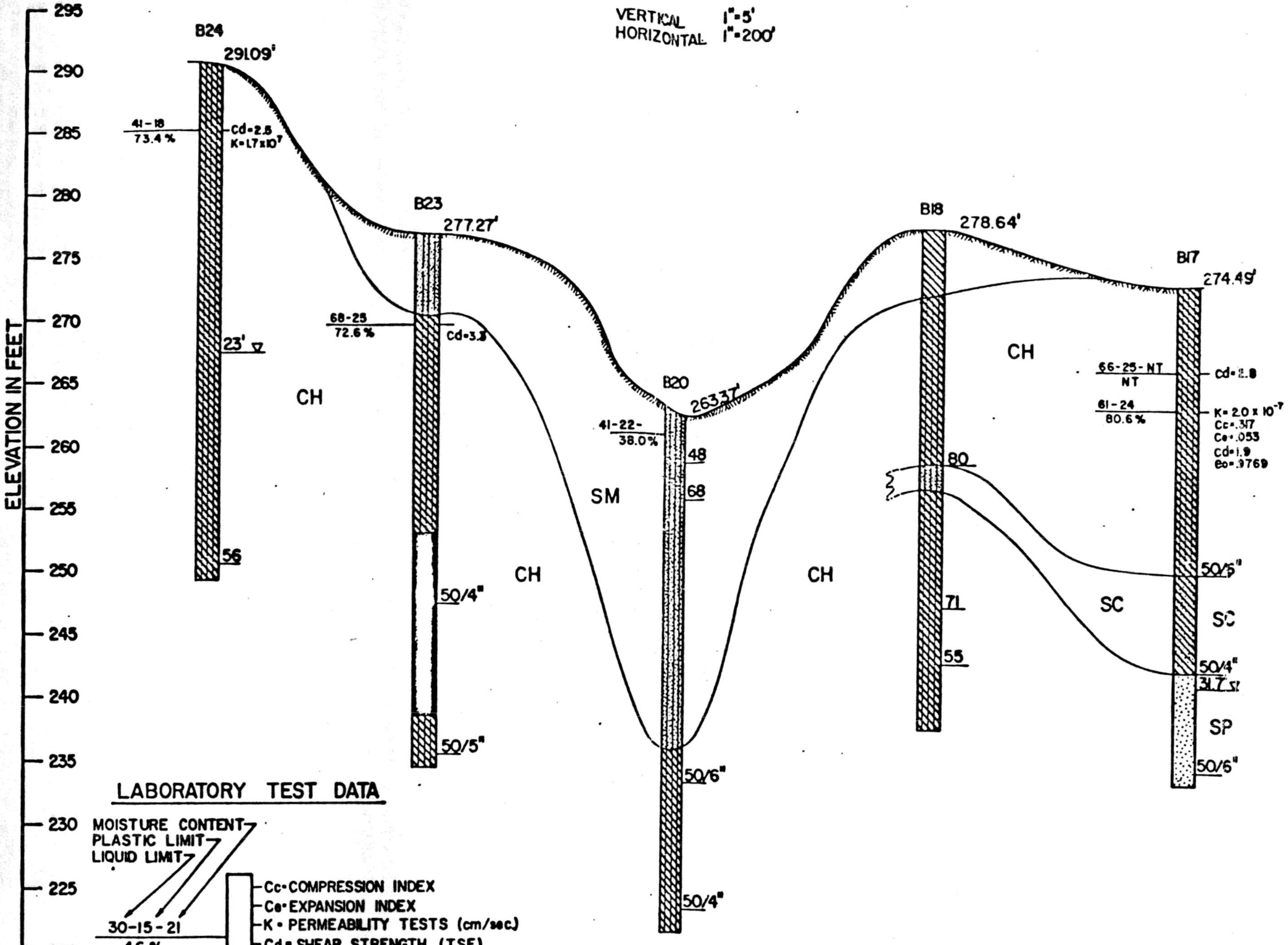
Valley Forge Laboratories Inc. Devon, Pa.

DWN BY B.D.P.
CHK'D BY J.B.R.
4-1-82

CONVERSION SYSTEMS, INC.
HORSHAM, PA.

SOIL PROFILES C-C'

SCALE:
VERTICAL 1"=5'
HORIZONTAL 1"=200'



LABORATORY TEST DATA

- MOISTURE CONTENT
- PLASTIC LIMIT
- LIQUID LIMIT

30-15-21
46%

PERCENT BY WEIGHT PASSING No.200 SIEVE

- Cc=COMPRESSION INDEX
- Ce=EXPANSION INDEX
- K=PERMEABILITY TESTS (cm/sec)
- Cd=SHEAR STRENGTH (TSF)
- ▽ WATER LEVEL
- 10 BLOW/FT

- FINE SANDS
- CLAYS
- LIGNITE

SC-CLAYEY SANDS, SAND-CLAY MIXTURES
SP-POORLY GRADED SANDS AND GRAVELLY SANDS
CH-INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
CL-INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS
SM-SILTY SANDS, SAND-SILT MIXTURES
NT-NO TEST PEFORMED

SCALE
VERTICAL 0 5' 10'
HORIZONTAL 0 200' 400'

Texas Municipal Power Authority	
Grimes County, Texas	
TEST BORING LOCATION PLAN SOLID WASTE DISPOSAL AREA	
Valley Forge Laboratories Inc.	Devon, Pa.

CONVERSION SYSTEMS, INC.
HORSHAM, PA.

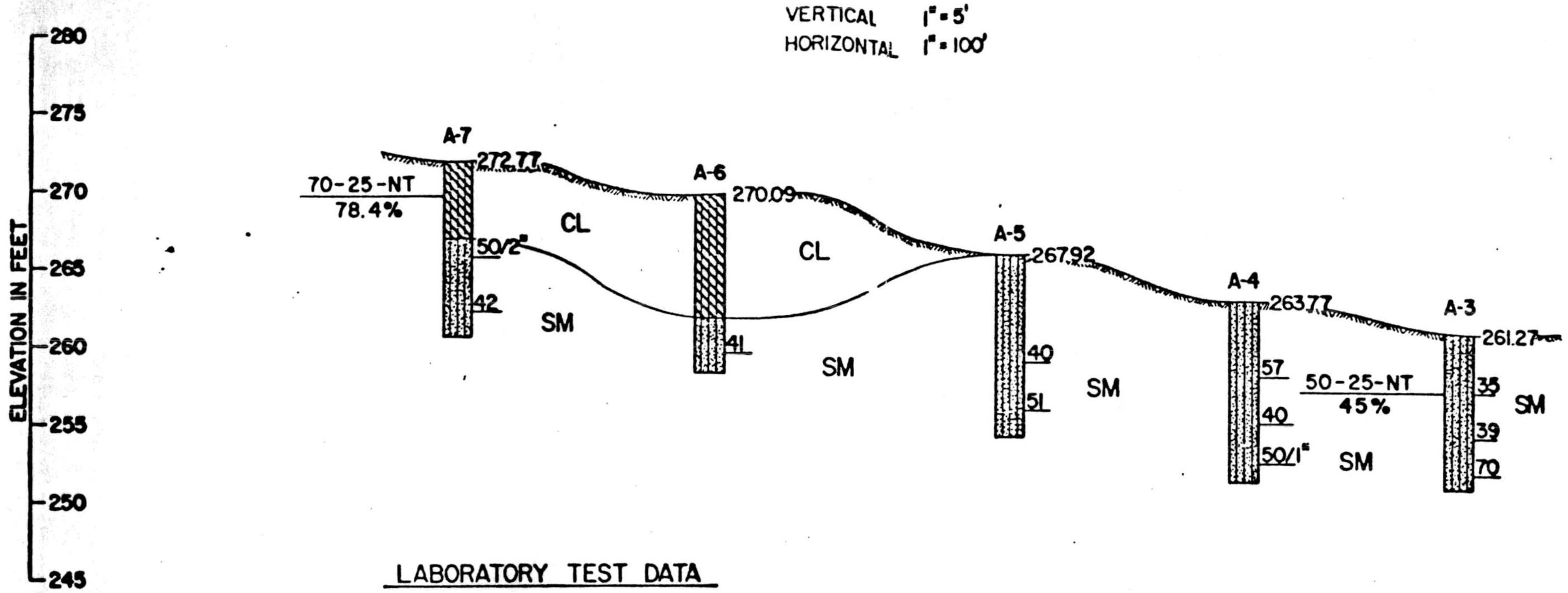
DWN BY BDA	4-2-82	DWG NO. 15565-5
CH'D BY JDR		

SOIL PROFILES SECTION D-D'

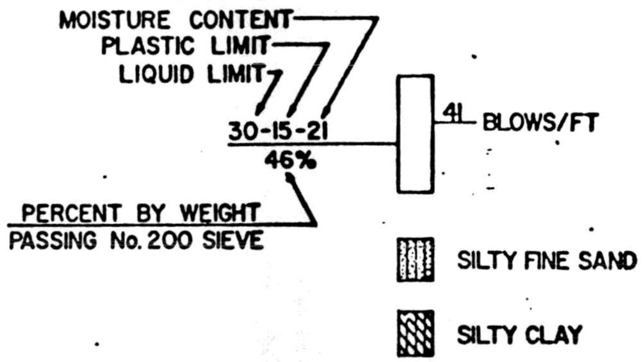
SCALE:

VERTICAL 1" = 5'

HORIZONTAL 1" = 100'



LABORATORY TEST DATA

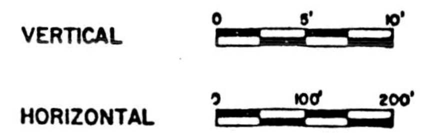


SM- SILTY SANDS, SAND-SILT MIXTURES

CL- INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS

NT- NO TEST PERFORMED

SCALE



CONVERSION SYSTEMS, INC.
HORSHAM, PA.

Texas Municipal Power Authority		
Grimes County, Texas		
TEST BORING LOCATION PLAN SOLID WASTE DISPOSAL AREA		
Valley Forge Laboratories Inc.		Devon, Pa.
DWN BY B.P.P. CHK'D BY JDR	4-1-82	DWG NO 15565-6

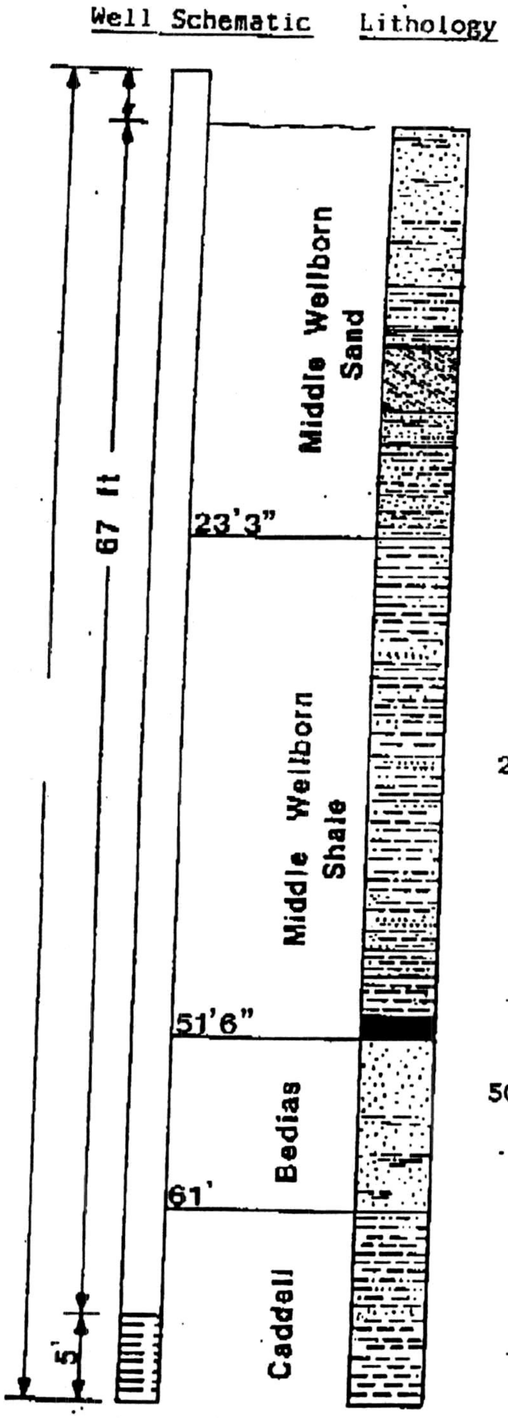
MONITORING WELL MW-10

Ground elevation at well: 292.33 ft.

Well depth from top of casing: 73.24 ft.

Height of casing: 1.24 ft.

Well screen interval: 220.33 ft. to 225.33 ft.

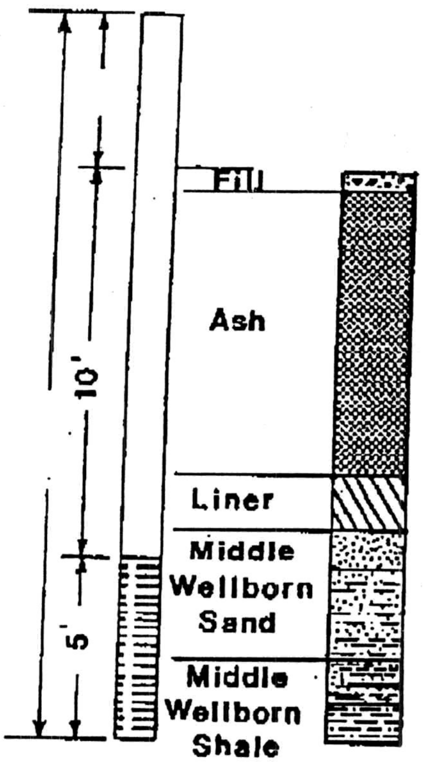


Interval	Description
0' - 9'	Fine to V. fine grained sands and silty-clayey; silty sands; Cream and tan in color; Stringers of gravel present; Clean sands at 9 ft; Fe-oxidation present throughout.
9' - 11'6"	Clayey sand; Fine to V. fine grained; Tan and brown in color; Orthoquartzite stringers, .5" thick at 9'6"; Fe-oxidation present.
11'6" - 12'6"	Sandy clay; reddish brown; Fe-oxidation present.
12'6" - 16'3"	Laminated clays and sands; Fine to V. fine grained; Soft; Inclination of 20°; Fe-oxidation present.
16'3" - 18'	Clayey sands, hard, Fine to V. fine grained; Fe-oxidation present.
18'- 23'3"	Clayey silty sands, Fine to V. fine grained; Clean sand, 4" thick, at 19'3"; Fining downward; Fe-oxidation present.
23'3" - 46'6"	Clay to silty clay; Blue-green to gray; Hard; Horizontally laminated; Few light gray sandy stringers randomly present; Hydrogen Sulfide odor strong.
46'6" - 48'	Sandy clay; Blue-green; Hard; Cemented sand stringers, .25", present.
48' - 50'2"	Clay, Blue-green to dark gray; V. hard; cemented shales fractured by coring.
50'2" - 51'6"	Lignite; Black; V. hard interbedded lignites and shales, fractured by coring.
51'6" - 61'	Sandstone; Fine grained; Blue-green to light gray; soft at 52' increasing in hardness with depth.
61' - 72'	Clay; Blue-green; Med. hard.

MONITORING WELL MW-11

Ground elevation at well:	298.95 ft.
Well depth from top of casing:	18.88 ft.
Height of casing:	3.88 ft.
Well screen interval:	289.95 ft. to 284.95 ft.

Well Schematic   Lithology

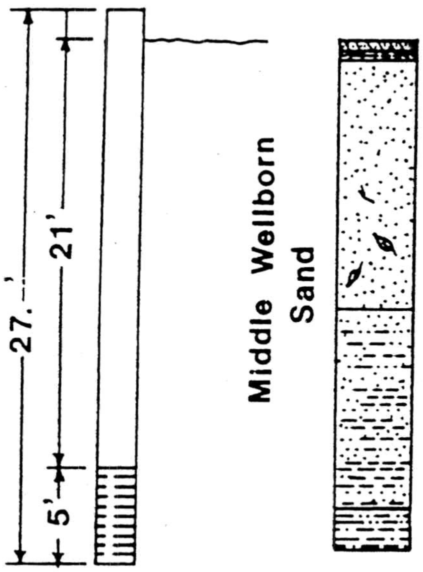


Interval	Description
0' - 6"	Fill clays and Topsoil; Brown.
6" - 8'6"	Ash.
8'6" - 10'	Clay liner; Hard; Mottled brown.
10' - 11'3"	Fine to V. fine grained sands; Cream and tan in color.
11'3" - 13'8"	Clayey-silty sands, Fine to V. fine grained; Fining downward; Fe-oxidation present.
13'8" - 15'	Clayey sand; Fine to V. fine grained; Tan and brown in color; Orthoquartzite fragments; Fe-oxidation present.
15' - 16'	Clay to silty clay; Tan to gray; Hard; Horizontally laminated; Few light gray fine grained sandy stringers randomly present.

MONITORING WELL MW-12

Ground elevation at well:	279.78 ft.
Well depth from top of casing:	27.13 ft.
Height of casing:	1.13 ft.
Well screen interval:	258.78 ft to 253.78 ft.

Well Schematic   Lithology



Interval	Description
0' - 6"	Loamy topsoil; Dark Brown.
6" - 1'	Gravelly sand with silt and clay; Fe-oxidation.
1' - 13'10"	Fine to V. fine grained sands and clayey-silty sands; Cream and tan in color; 4' of core loss; organics, leaf imprints present; Fe-oxidation present throughout.
13'10" - 24'	Silty sand with clay; Fine to V. fine grained, fining with depth; Tan and brown in color; Fe-oxidation present.
24'	Oxidation limit
24' - 26'	Silty-sandy clay; Fine grained; Blue-green, fines increasing downward.

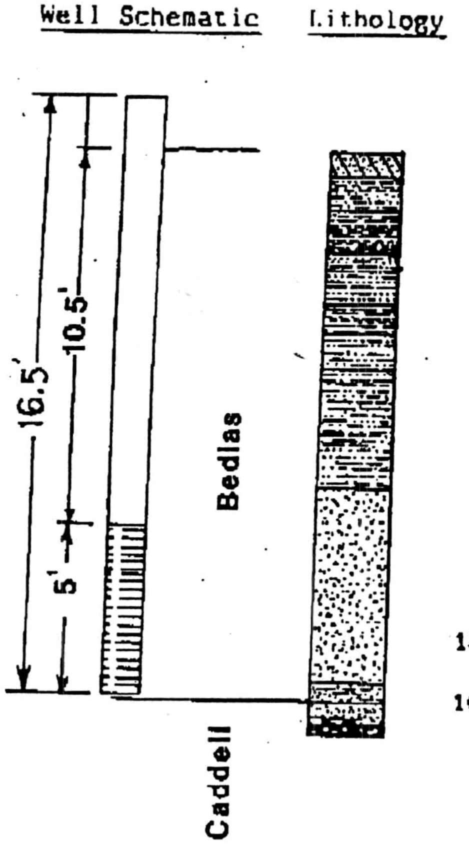
MONITORING WELL MW-13

Ground elevation at well: 259.02 ft.

Well depth from top of casing: 16.49 ft.

Height of casing: 0.99 ft.

Well screen interval: 248.52 ft to 243.52 ft.

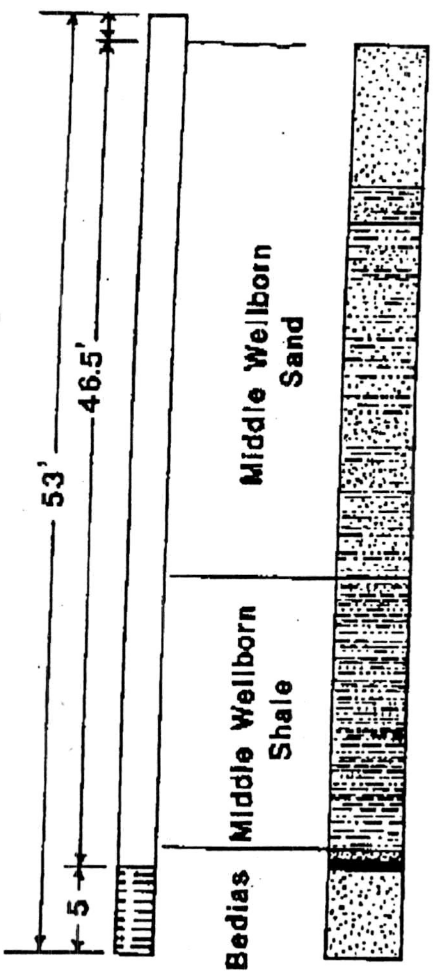


Interval	Description
0' - 8"	Loamy topsoil; Dark brown.
8" - 1'8"	Interbedded fine sands and clays; Fe-oxidation.
1'8" - 2'10"	Clay, interlaminated, 1" laminae; Alternating bands of brown, and orange; Fe-oxidation.
2'10" - 4'4"	Interlaminated clayey sand and silty clay; Fe-oxidation.
4'4" - 5'3"	Interbedded clays; Fe-oxidation.
5'3" - 6'2"	Silty sand with clay; Fe-oxidation.
6'2" - 9'6"	Sandy silt with clay; Fe-oxidation.
9'6" - 15'	Sand; Fine grained; Gray; 5.5' core loss.
15' - 15'6"	Silty clay; Tan.
15'6"	Oxidation limit.
15'6" - 16'4"	Sand; Fine to V. fine with clay; Blue-green; Hard.
16'4" - 16'6"	Clay; M. hard; Blue-green.

MONITORING WELL MW-14

Ground elevation at well:	302.14 ft.
Well depth from top of casing:	52.88ft.
Height of casing:	1.38 ft.
Well screen interval:	255.64 ft. to 250.64 ft.

Well Schematic   Lithology



Interval	Description
0' - 8'	Fine to V. fine grained sands and clayey silty sands; Cream and tan in color; Stringers of gravel present; Fe-oxidation present throughout.
8' - 10'	Clayey sand; Fine to V. fine grained; Tan and brown in color; Orthoquartzite fragments; Fe-oxidation present.
10' - 30'	Clayey silty sands, Fine to V. fine grained; Fining downward; Fe-oxidation present.
30' - 45'6"	Clay to silty clay; Blue-green to gray; Hard; Horizontally laminated; Few light gray sandy stringers randomly present; Hydrogen Sulfide odor.
45'6" - 46'	Sandstone; Fine grained; V. hard; Blue-green to dark gray; V. hard; Mollusk and Small gastropod shells present.
46' - 46'6"	Lignite; Black; V. hard interbedded lignites, fractured by coring.
46'6" - 51'6"	Sandstone; Fine grained; Blue-green to light gray; soft increasing in hardness with depth.

MONITORING WELL MW-15

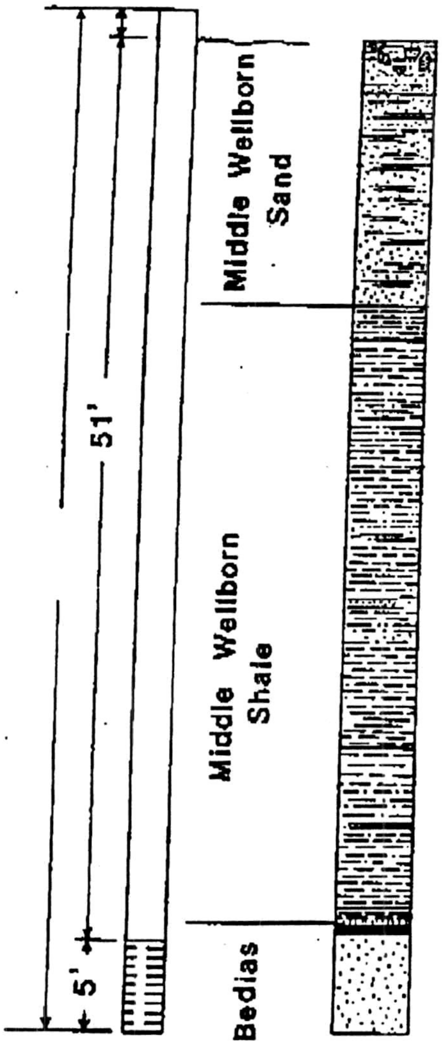
Ground elevation at well: 304.03 ft.

Well depth from top of casing: 57.08 ft.

Height of casing: 1.08 ft.

Well screen interval: 253.03 ft. to 248.03 ft.

Well Schematic | Lithology



Interval	Description
0' - 3'	Fine to V. fine grained sands and clayey silty sands; Cream and tan in color; Angular fragments (1" to 6") of well cemented sandstone; Fe-oxidation present throughout.
3' - 15'	Clayey sand; Fine to V. fine grained; Tan and brown in color; Fe-oxidized, Orthoquartzite stringers, 1/8" thick throughout.
15' - 17'	Sandy clay; reddish brown; Fe-oxidation present.
17' - 40'	Clay to silty clay; Tan; Hard; Horizontally laminated; Few light gray sandy stringers randomly present.
40'	Oxidation limit.
40' - 49'	Clay to Silty clay; Blue-green; Hard; Cemented sand stringers.
49' - 50'	Clay, Blue-green to dark gray; V. hard; cemented sands.
50' - 50'6"	Lignite; Black; V. hard interbedded lignites and shales, fractured by coring.
50'6" - 56'	Sand; Fine grained; Blue-green to light gray; soft.

(4 Inch Wells Unless Noted)	Elevation (MSL)	Ft. from Ground	Casing,	Information (1)	Interval Ft.	Information (2)	Casing Diam., in.	
MW1	297.56	111.99	1.51	8/22/85	20	9/82	4	
MW2	290.13	54.83	1.67	8/22/85	40	9/82	4	
MW3	260.65	26.25	1.38	"	17	"	4	
MW4	263.71	35.93	1.78	"	23	"	4	
MW5	270.27	38.48	1.47	"	27	"	4	
MW6	291.31	72.25	1.63	"	45	"	4	
T2	272.47	36.03	1.80	"	19	"	4	
T3	303	22.06	0.98	"			4	
T5	273.90	20.1	1.95	"			4	
MW7		28 (well core)					2	
MW8		23 "					4	

1 S. Hall, Geol. Dept. TAMU, field work

2 CSI Solid Waste Mgt. Manual Site "A" Landfill GCSES

TMPA Form A-42 (Nov.'80) (Overprinting on this form is NOT au...ized.)

Appendix A

Well Locations

Well No.	Location	Elevation (ft.)
MW-1	N = 375152.15 E = 3332458.56	302.13
MW-2	N = 378272.25 E = 3330873.73	284.36
MW-3	N= 379637.99 E = 333221228	260.23
MW-4	N = 378947.33 E = 3333625.80	263.93
MW-5	N = 377032.98 E = 3335052.52	271.91
MW-6	N= 375132.95 E = 3334619.48	298.62
MW-7	N = 375431.90 E = 3332734.48	323.48
MW-10	N = 375061.79 E = 3334674.70	299.72
MW-11	N= 376109.59 E = 3335047.26	299.61
MW-13	N = 378522.21 E = 3334064.79	259.70
MW-14	N = 375221.20 E = 3333866.54	310.94
MW-15	N = 374664.07 E = 3333519.89	312.50

Appendix B

REMEDIAL INVESTIGATION

Appendix B

List of Contents

1. Waste Data
2. Groundwater Data
3. Surface Water Data

Total Metals (mg/kg)

Waste Code	Description	Date	As	Ba	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	Se
001	Fly Ash												
		03/02/90	13.0000		0.320	21.500	25.000	45.500		23.0000		65.000	1.68
		03/09/90	56.0000		0.290	38.000	31.900	82.000		29.7000		132.000	3.26
		03/29/90	13.6		0.21	24.5	57	45.5		32		54.5	1.83
		04/27/90	17.8		0.29	26	30	70.5		25		76.5	1.05
002	Bottom Ash												
		03/02/90	0.7000		0.060	18.500	49.500	24.500		21.0000		32.500	0.16
		03/09/90	1.4500		0.070	33.000	37.300	20.500		40.1000		31.500	0.07
		03/29/90	1.18		0.025	25	33.5	16.5		39		25.5	0.29
		04/27/90	14.1		0.05	34.5	25	31		40		25.5	0.33
003	Scrubber Sludge												
		08/04/89	0.0011	0.03	0.000	0.002	0.014	0.015	0.00046	0.0660	0.0003	0.065	
		12/19/88	2.0000	10.20	0.050	2.600		1.500	0.04500		0.5000		2.5
		NUMBER	10.0000	2.0000	10.0000	10.0000	9.0000	10.0000	2.0000	9.0000	2.0000	9.0000	9.0000
		MAX	56.0000	10.2000	0.3200	38.0000	57.0000	82.0000	0.0450	40.1000	0.5000	132.0000	3.2600
		MIN	0.0011	0.0250	0.0003	0.0024	0.0143	0.0150	0.0005	0.0660	0.0003	0.0650	0.0700
		MEAN	11.9831	5.1125	0.1365	22.3602	32.1349	33.7515	0.0227	27.7629	0.2501	49.2294	1.2411
		ST DEV	16.9235	7.1948	0.1258	12.6313	16.1498	27.2827	0.0315	12.7137	0.3534	38.7438	1.1463
		UCL	21.6804	ERR	0.2086	29.5981	ERR	49.3846	ERR	ERR	ERR	ERR	ERR
		SAI-Ind	3.27	137000.00	1020.00	5110.00		1000.00	612.00	20400.00	10200.00		10200.00

GROUND WATER DATA (mg/L)

		As	Ba	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
LHMW-1	07/27/83							0.00030	0.1400	0.0050	0.091
	10/31/85	0.007	0.6	0	0	0	0.16	0	0	0	0
	11/14/85	0	2.2	0.01	0.04	0.03	0.06	0	0.04	0	0.92
	10/17/86	0	0.3	0.01	0.05	0.12	0.12	0	0	0	1.2
	04/26/88	0.0000	0.02	0.034	0.027	0.092	0.002	0.00000	1.2800	0.1520	1.180
	10/20/88	0.0000	0.04	0.008	0.112	0.110	0.002	0.00000	0.0480	0.0250	0.346
	11/09/89	0.0000	0.64	0.105	0.050	0.155	0.001	0.00000	0.1500	0.0920	2.690
	10/25/90	0.0000	0.60	0.079	0.040	0.126	0.001	0.00000	0.3640	0.1030	1.700
LHMW-2	06/30/83	0.0010	0.00	0.000	0.000	0.007	0.003	0.00000	0.0050	0.0020	0.008
	11/14/85	0	0.6	0.01	0.04	0.02	0.04	0	0.08	0	0.26
	12/13/85	0	0.2	0.02	0.07	0	0	0	0.3	0	0.18
	06/29/87	0.0000	0.00	0.000	0.040	0.010	0.090	0.00000	0.0200	0.0000	0.190
	08/20/87	0.0000	0.60	0.008	0.020	0.000	0.075	0.00000	0.2420	0.0310	0.210
	11/27/87	0.0000	0.10	0.153	0.010	0.032	0.000	0.00000	0.0390	0.0000	0.273
	02/04/88	0.0000	0.20	0.005	0.010	0.078	0.001	0.00000	0.0540	0.0000	0.075
	04/26/88	0.0000	0.60	0.153	0.050	0.120	6.050	0.00000	1.2800	0.1520	1.200
	10/20/88	0.0000	0.05	0.002	0.027	0.012	0.000	0.00000	0.0240	0.0010	0.076
	06/09/94	0	0.03	0.002	0	0.006	0	0	0.009	0.018	0.04
	06/27/95			0.000	0.030	0.040	0.014	0.00000			
LHMW-3	06/30/83	0.0000	0.10	0.005	0.000	0.047	0.003	0.00000	0.1460	0.0050	0.015
	07/27/83	0.0000	0.10	0.000	0.000	0.020					
	01/06/84	0.0000	0.00	0.000	0.000	0.028	0.000			0.0000	
	02/14/84	0.0000	0.00	0.020	0.000	0.020	0.720	0.00000	0.1900	0.0000	0.290
	03/06/84						0.700	0.00000	0.3200	0.0000	0.340
	04/27/84	0.0010	1.60	0.000	0.000	0.000	0.000	0.00000	0.1300	0.0000	0.400
	06/18/84	0.0000	0.50	0.000	0.000	0.000	0.000	0.00000	0.2200	0.0000	0.390
	07/30/84	0.0000	2.50	0.000	0.000	0.000	0.000	0.00000	0.2200	0.0000	0.500
	09/27/84	0.0000	0.00	0.030	0.000	0.000	0.050	0.00000	0.1700	0.0000	0.520
	10/31/84	0.0000	2.60	0.030	0.020	0.000	0.320	0.00000	0.2700	0.0000	0.390
	11/28/84	0.0000	4.00	0.000	0.000	0.000	0.000	0.00000	0.1800	0.0000	0.300
	12/19/84	0.0000	2.80	0.000	0.000	0.000	0.000	0.00000	0.1800	0.0000	0.300
	01/22/85	0.0000	0.20	0.000	0.000	0.030	0.090	0.00000	0.3300	0.0000	0.570
	02/26/85	0.0000	1.00	0.020	0.090	0.000	0.120	0.00000	0.3900	0.0000	0.580
	03/18/85	0.0000	0.70	0.030	0.090	0.000	0.120	0.00000	0.4400	0.0000	0.800
	04/30/85	0.0000	1.40	0.000	0.000	0.000	0.260	0.00000	0.3300	0.0000	1.550
	05/29/85	0.0000	0.00	0.010	0.080	0.000	0.100	0.00000	0.4400	0.0040	0.650
	06/12/85	0.0000	0.00	0.000	0.000	0.800	0.140	0.00000	0.1500	0.0400	0.350
	07/30/85	0.0000	0.00	0.020	0.090	0.000	0.120	0.00000	0.4200	0.0000	0.840
	08/29/85	0.0000	0.00	0.020	0.030	0.000	0.120	0.00000	0.3800	0.0000	0.710
	09/24/85	0.0000	0.00	0.020	0.020	0.000	0.180	0.00000	0.4000	0.0000	0.000
	11/14/85	0.0000	3.00	0.020	0.040	0.030	0.110	0.00000	0.3300	0.0000	0.800
	12/13/85	0.0000	0.80	0.030	0.110	0.000	0.140	0.00000	0.5600	0.0000	1.000
	02/26/86	0.0000	0.50	0.020	0.040	0.000	0.160	0.00000	0.7200	0.0000	1.050
	03/13/86	0.0000	0.50	0.020	0.020	0.000	0.140	0.00000	0.7000	0.0000	0.990
	04/03/86	0.0000	0.50	0.040	0.020	0.040	0.170	0.03000	0.6500	0.0000	1.050
	05/07/86	0.0000	0.80	0.020	0.050	0.030	0.110	0.00000	0.5100	0.0000	1.020
	06/20/86	0.0000		0.030	0.120	0.000	0.170	0.00000	0.4500	0.0000	1.010
	07/24/86	0.0000	0.40	0.030	0.180	0.000	0.080	0.00000	0.6600	0.0000	1.200
	08/20/86	0.0000	0.40	0.030	0.090	0.050	0.150	0.00000	0.5700	0.0000	0.880
	10/17/86	0.0000	0.40	0.020	0.060	0.010	0.150	0.00000	0.5300	0.0000	1.020
	11/19/86	0.0000	0.40	0.030	0.050	0.030	0.340	0.00000	0.4900	0.0000	1.140
	12/17/86	0.0000	0.70	0.020	0.000	0.000	0.290	0.00000	1.1000	0.0000	0.970
	01/28/87	0.0000	0.40	0.030	0.220	0.020	0.240	0.00000	0.6200	0.0000	1.080
	06/29/87	0.0000	0.00	0.030	0.100	0.030	0.240	0.00000	0.5300	0.0000	1.200
	08/20/87	0.0000	1.60	0.028	0.060	0.021	0.386	0.00000	0.6830	0.0560	1.150
	11/27/87	0.0000	0.10	0.932	0.030	0.084	0.000	0.00000	0.8570	0.0000	1.390
	02/04/88	0.0220	0.00	0.019	0.040	0.161	0.003	0.00000	0.1380	0.0000	1.170
	04/26/88	0.0140	0.00	0.046	0.032	0.120	0.004	0.00000	1.3100	0.1690	1.520
	08/19/88	0.0310	0.14	0.020	0.054	0.048	0.000	0.00000	0.1010	0.0170	11.100
	10/20/88	0.0170	0.04	0.022	0.229	0.029	0.004	0.00000	0.5600	0.0300	0.960
	01/24/89	0.0000	0.02	0.079	0.080	0.008	0.001	0.00000	0.5600	0.0600	1.550
	05/31/89	0.0420	0.06	0.029	0.022	0.066	0.002	0.00000	0.6600	0.0500	11.900
	08/17/89	0.0250	0.12	0.120	0.020	0.066	0.000	0.00000	0.7310	0.0280	0.940
	11/09/89	0.0200	0.42	0.112	0.050	0.108	0.006	0.00000	0.1550	0.2090	1.270
	02/27/90	0.0150	0.33	0.102	0.047	0.099	0.004	0.00000	0.1510	0.1840	1.390
	06/22/90	0.0090	0.04	0.094	0.020	0.070	0.006	0.00000	2.2000	0.1380	1.350
	08/07/90	0.0110	0.90	0.079	0.030	0.065	0.005	0.00000	1.6700	0.1770	1.300
	10/25/90	0.0070	0.08	0.082	0.030	0.069	0.003	0.00000	1.5000	0.1640	1.340
	06/09/94	0.026	0.12	0.049	0.02	0.08	0	0	0.266	0.071	0.99
	06/27/95			0.007	0.030	0.030	0.000	0.00000			

LHMW-4	06/30/83	0.0020	0.10	0.002	0.000	0.004	0.003	0.00000	0.0120	0.0020	0.009
	10/31/84	0.0000	5.60	0.040	0.000	0.000	0.350	0.00000	0.1500	0.0000	0.060
	11/14/85	0.0000	1.60	0.020	0.030	0.040	0.100	0.00000	0.1200	0.0000	0.410
	10/17/86	0.0000	0.60	0.030	0.070	0.120	0.140	0.00000	0.2000	0.0000	0.480
	10/20/88	0.0000	0.04	0.020	0.147	0.119	0.002	0.00000	0.1150	0.0350	0.374
	11/09/89	0.0000	0.25	0.171	0.037	0.093	0.001	0.00000	0.2480	0.2020	0.370
	10/25/90	0.0000	0.06	0.120	0.050	0.101	0.001	0.00000	0.2930	0.1770	0.369
	06/09/94	0.0080	0.10	0.033	0.010	0.067	0.000	0.00000	0.4000	0.1750	0.220
	06/27/95			0.013	0.030	0.010	0.012	0.00000			
LHMW-5	06/30/83	0.0020	0.20	0.000	0.000	0.006	0.003	0.00000	0.0050	0.0030	0.006
	10/31/84	0.0010	0.10	0.000	0.000	0.000	0.000	0.00000	0.0000	0.0000	0.000
	11/14/85	0.0000	0.10	0.000	0.020	0.000	0.000	0.00000	0.0000	0.0000	0.020
	10/17/86	0.0000	0.00	0.000	0.030	0.000	0.000	0.00000	0.0000	0.0000	0.000
	10/20/88	0.0000	0.10	0.003	0.073	0.013	0.000	0.00000	0.0290	0.0010	0.041
	11/09/89	0.0000	0.35	0.015	0.030	0.090	0.003	0.00000	0.0850	0.0690	0.140
	10/25/90	0.0000	0.10	0.011	0.050	0.058	0.000	0.00000	0.1120	0.0540	0.122
	06/09/94	0.0000	0.07	0.009	0.010	0.058	0.000	0.00000	0.0440	0.0850	0.040
	06/27/95			0.000	0.020	0.010	0.000	0.00000			
LHMW-6	10/31/84	0.0020	0.00	0.010	0.000	0.000	0.090	0.00000	0.0000	0.0000	0.000
	11/14/85	0.0000	0.7	0	0.02	0	0.02	0.00000	0	0	0
	10/17/86	0.0000	0.1	0	0.02	0.	0.02	0.00000	0	0	0
	10/20/88	0.0000	0.06	0.003	0.073	0.007	0.000	0.00000	0.0190	0.0010	0.032
	11/09/89	0.0000	0.27	0.023	0.032	0.080	0.002	0.00000	0.0780	0.0800	0.040
	10/25/90	0.0000	0.08	0.013	0.040	0.049	0.001	0.00000	0.1390	0.0580	0.040
LHMW-7	12/13/85	0.0000	0.70	0.100	0.030	0.000	0.000	0.00000	0.0000	0.0000	0.000
	10/17/86	0.0000	0.30	0.000	0.090	0.000	0.060	0.00000	0.0000	0.0000	0.010
	10/20/88	0.5500	0.04	0.002	0.093	0.035	0.001	0.00000	0.0220	0.0010	0.037
LHMW-8	12/13/85	0.0000	1.70	0.020	0.100	0.000	0.090	0.00000	0.2700	0.0000	0.130
	02/26/86	0.0000	0.20	0.030	0.020	0.000	0.170	0.00000	0.4200	0.0000	0.700
	03/13/86	0.0000	0.60	0.020	0.020	0.000	0.120	0.00000	0.6600	0.0000	1.000
	05/07/86	0.0000	1.10	0.050	0.050	0.000	0.140	0.00000	0.3400	0.0000	0.740
	06/20/86	0.0000		0.030	0.170	0.000	0.170	0.00000	0.4500	0.0000	1.010
	07/24/86	0.0000	0.20	0.020	0.140	0.000	0.080	0.00000	0.2700	0.0000	1.000
	08/20/86	0.0000	0.40	0.030	0.110	0.030	0.140	0.00000	0.2100	0.0000	1.000
	10/17/86	0.0000	0.30	0.020	0.070	0.000	0.150	0.00000	0.4000	0.0000	1.100
	11/19/86	0.0000	0.50	0.030	0.050	0.020	0.270	0.00000	0.3300	0.0000	0.880
	01/28/87	0.0000	0.40	0.030	0.270	0.010	0.170	0.00000	0.3800	0.0000	0.960
	06/29/87	0.0000	0.00	0.030	0.130	0.020	0.220	0.00000	0.2700	0.0000	1.000
	08/20/87	0.0000	0.80	0.027	0.040	0.003	0.222	0.00000	0.7650	0.0340	0.907
	11/27/87	0.0000	0.10	0.425	0.020	0.053	0.000	0.00000	0.9690	0.0000	1.080
	02/04/88	0.0000	0.40	0.022	0.020	1.220	0.002	0.00000	1.5200	0.0000	0.937
	08/19/88	0.0360	0.12	0.022	0.061	0.110	0.000	0.00000	0.0360	0.0520	0.093
	10/20/88	0.0020	0.04	0.012	0.140	0.086	0.000	0.00000	0.1790	0.0020	0.530
	01/24/89	0.0000	0.01	0.070			0.001	0.00000	0.1840	0.0650	0.920
	05/31/89	0.0000	0.04	0.025	0.028	0.093	0.000	0.00000	0.3200	0.0460	0.880
	08/17/89	0.0000	0.10	0.156	0.020	0.061	0.000	0.00000	0.5890	0.0290	0.650
	11/09/89	0.0000	0.06	0.076	0.030	0.103	0.002	0.00000	0.2930	0.1300	0.670
	02/27/90	0.0000	0.06	0.063	0.030	0.100					
	06/21/90	0.0020	0.07	0.058	0.020	0.056	0.001	0.00000	2.4000	0.2510	0.580
	08/07/90	0.0000	0.60	0.059	0.030	0.070	0.000	0.00000	1.8300	0.2040	0.740
	10/25/90	0.0010	0.07	0.055	0.020	0.067	0.000	0.00000	2.0500	0.2200	0.650
LHMW-10	06/29/87	0.0000	0.00	0.000	0.000	0.000	0.000	0.05000	0.8000	0.0000	0.480
	08/20/87	0.0000	0.00	0.000	0.000	0.000					
	11/27/87	0.0000	0.10	0.672	0.030	0.033	0.000	0.00000		0.0000	
	02/04/88	0.0000	0.50	0.018	0.020	0.051	0.001	0.00000	1.4300	0.0000	0.541
	10/20/88	0.0000	0.04	0.006	0.022	0.027	0.008	0.00000	0.0230	0.0010	0.056
	11/09/89	0.0000	1.10	0.038	0.015	0.051	0.003	0.00000	0.0460	0.0690	0.340
	02/27/90						0.001	0.00000	0.2400	0.1450	0.730
	10/25/90	0.0000	0.10	0.026	0.020	0.044	0.004	0.00000	0.0970	0.0550	0.293
	06/09/94	0.0020	0.25	0.028	0.000	0.008	0.000	0.00000	0.0700	0.0680	0.070
	06/27/95			0.000	0.070	0.020	0.008	0.00000			

LHMW-12	06/29/87	0.0000	0.00	0.000	0.000	0.000	6.050	0.00000	0.0200	0.0000	0.040
LHMW-13	06/29/87	0.0000	0.10	0.020	0.050	0.020	0.180	0.00000	0.2300	0.0000	0.990
	08/20/87	0.0000	0.90	0.024	0.030	0.010	0.335	0.00000	0.9230	0.0260	0.588
	11/27/87						0.000		1.1500		0.667
	04/27/88	0.0000	0.00	0.062	0.034	0.090	0.007	0.00000	1.1200	0.1480	1.220
	08/19/88	0.0370	0.14	0.024	0.056	0.080	0.000	0.00000	0.0230	0.0450	0.054
	10/20/88	0.0000	0.04	0.006	0.107	0.017	0.000	0.00000	0.2070	0.0010	0.615
	01/24/89	0.0100	0.01	0.095	0.045	0.012	0.000	0.00000	0.1610	0.0730	0.500
	05/31/89	0.0000	0.05	0.029	0.009	0.020	0.000	0.00000	0.0470	0.0480	0.120
	08/17/89	0.0000	0.09	0.160	0.010	0.020	0.000	0.00000	0.0610	0.0300	0.100
	11/09/89	0.0000	0.15	0.049	0.032	0.109	0.002	0.00000	0.2420	0.1300	0.430
	02/27/90	0.0000	0.17	0.052	0.036	0.107	0.001	0.00000	0.2240	0.1330	0.460
	06/21/90	0.0010	0.04	0.050	0.010	0.050	0.002	0.00000	1.8800	0.2340	0.490
	08/07/90	0.0000	0.06	0.051	0.020	0.069	0.001	0.00000	1.7600	0.1920	0.470
	10/25/90	0.0000	0.05	0.048	0.020	0.063	0.001	0.00000	1.8100	0.2120	0.490
	NUMBER	137.0000	135.0000	142.0000	141.0000	141.0000	142.0000	141.0000	136.0000	137.0000	136.0000
	MAX	0.5500	5.6000	0.9320	0.2700	1.2200	6.0500	0.0500	2.4000	0.2510	11.9000
	MIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MEAN	0.0066	0.4476	0.0456	0.0437	0.0513	0.1545	0.0006	0.4347	0.0406	0.7690
	ST DEV	0.0474	0.7918	0.1044	0.0475	0.1248	0.7171	0.0049	0.5147	0.0658	1.4035
	UTL	0.1009	2.0233	0.2533	0.1383	0.2997	1.5815	0.0103	1.4590	0.1717	3.5621
	UCL	0.0133	0.5606	0.0601	0.0503	0.0687	0.2543	0.0013	0.5078	0.0500	0.9686
	MCL-GW	0.0500	2.00	0.005	0.100	1.000	0.015	0.00200	0.1000	0.1830	5.000

SURFACE WATER DATA (mg/L)

	As	Ba	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
11/30/84	0.1080	0.25	0.000	0.024	0.026	0.069	0.00400	0.0000	0.0090	0.027
01/09/85	0.2760	0.10	0.015	0.000	0.006	0.105	0.00400	0.0000	0.0160	0.045
02/05/85	0.0800	1.04	0.009	0.000	0.036	0.060	0.00200	0.3340	0.0170	0.262
03/04/85	0.0450	0.08	0.000	0.016	0.009	0.039	0.00190	0.0120	0.0000	0.055
04/01/85	0.0070	0.13	0.000	0.055	0.010	0.044	0.00140	0.0630	0.0140	0.379
05/03/85	0.0000	0.16	0.038	0.000	0.024	0.002	0.00000	0.0580	0.0000	0.298
06/03/85	0.0030	0.12	0.000	0.065	0.026	0.000	0.00000	0.0160	0.0340	3.160
06/28/85	0.4900	0.13	0.000	0.077	0.029	0.099	0.00250	0.0000	0.0200	0.065
08/01/85	0.9800	0.20	0.000	0.054	0.043	0.110	0.00630	0.0250	0.0190	0.054
10/11/85	0.0280	0.11	0.022	0.000	0.000	0.003	0.00460	0.0000	0.0000	0.033
11/01/85	0.1600	0.12	0.000	0.000	0.000	0.000	0.00150	0.0030	0.0050	0.067
05/02/86	0.0970	0.13	0.000	0.025	0.017	0.000	0.00380	0.0000	0.0000	0.353
05/30/86	0.1295						0.00990		0.0000	
06/30/86	0.1380						0.00000			
07/31/86	0.1629									
09/03/86	0.1651								0.0061	
10/01/86	0.2227	0.14	0.009	0.000	0.018	0.046	0.00000	0.0479	0.0150	0.055
10/31/86	0.1600									
11/26/86	0.0791									
12/31/86	0.0683									
01/29/87	0.0844									
02/27/87	0.0812									
04/01/87	0.1160									
04/27/87	0.3520	0.14	0.015	0.062	0.042	0.030	0.00360	0.0510	0.0130	0.106
06/02/87	0.0180									
06/30/87	0.1190									
07/30/87	0.3160									
08/27/87	0.2020								0.0000	
10/19/87	0.0200	0.23	0.013	0.008	0.026	0.027	0.00200	0.0760	0.1030	0.000
10/27/87	0.0830									
12/02/87	0.0400									
01/04/88	0.0330									
01/28/88	0.1000									
03/13/88	0.0280									
03/31/88	0.1910									
04/28/88	0.0220									
06/07/88	0.0400									
07/12/88	0.0290									
07/29/88	0.0250									
08/26/88	0.0470									
09/28/88	0.1190	0.00	0.000	0.030	0.010	0.000	0.00000	0.0700	0.0000	0.260
10/28/88	0.2040									
12/05/88	0.2000									
	0.2000									
01/04/89	0.6120									
02/08/89	0.2900									
02/21/89	0.2710									
03/31/89	0.1810									
04/28/89	0.0310									
05/30/89	0.0520	0.00	0.000	0.020	0.000	0.000	0.00400	0.0000	0.0000	0.000
06/30/89	0.2140									
07/31/89	0.1440									
09/11/89	0.3600									
10/02/89	0.4760	0.02	0.000	0.000	0.030	0.000	0.00300	0.0800	0.0000	0.073
10/25/89	0.2480									
11/29/89	0.1760									
01/02/90	0.3400									
02/07/90	0.2220									
03/12/90	0.4000									
03/28/90	0.5040									
05/07/90	0.0154	0.12	0.000	0.000	0.000	0.000	0.00040	0.0000	0.0000	0.056
05/31/90	2.3400									
07/09/90	2.0390									
07/27/90	1.4400									
09/11/90	0.7990									
10/29/90	2.3800									
03/26/93	0.3730									
05/21/93	0.1630									
09/03/93	0.0800									
	0.1770									
12/27/93	0.0000	0.10	0.002	0.020	0.010	0.010	0.00000	0.0100	0.0100	0.060
03/29/94	0.1890									

NUMBER	72.0000	20.0000	20.0000	20.0000	20.0000	20.0000	22.0000	20.0000	23.0000	20.0000
MAX	2.3800	1.0400	0.0380	0.0770	0.0430	0.1100	0.0099	0.3340	0.1030	3.1600
MIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MEAN	0.2859	0.1660	0.0062	0.0228	0.0181	0.0322	0.0025	0.0423	0.0122	0.2704
ST DEV	0.4753	0.2156	0.0101	0.0259	0.0140	0.0383	0.0025	0.0748	0.0218	0.6906
UCL	0.3793	0.2492	0.0101	0.0328	0.0235	0.0470	0.0034	0.0711	0.0200	0.5368

Appendix C

RISK ASSESSMENT

Appendix C

List of Contents

1. EPA Integrated Risk Information System Datasheets
2. Summary of Intake Calculations
3. Risk*Assistant Reports
4. Risk Calculations
5. Ground-Water Protection Screening Levels for Inorganic Compounds

0278
Arsenic, inorganic; CASRN 7440-38-2 (07/01/96)

Health risk assessment information on a chemical is included in IRIS only after a comprehensive review of chronic toxicity data by work groups composed of U.S. EPA scientists from several Program Offices. The summaries presented in Sections I and II represent a consensus reached in the review process. The other sections contain U.S. EPA information which is specific to a particular EPA program and has been subject to review procedures prescribed by that Program Office. The regulatory actions in Section IV may not be based on the most current risk assessment, or may be based on a current, but unreviewed, risk assessment, and may take into account factors other than health effects (e.g., treatment technology). When considering the use of regulatory action data for a particular situation, note the date of the regulatory action, the date of the most recent risk assessment relating to that action, and whether technological factors were considered. Background information and explanations of the methods used to derive the values given in IRIS are provided in the five Background Documents in Service Code 5, which correspond to Sections I through V of the chemical files.

STATUS OF DATA FOR Arsenic, inorganic

File On-Line 02/10/88

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	on-line	02/01/93
Inhalation RfC Assessment (I.B.)	no data	
Carcinogenicity Assessment (II.)	on-line	07/01/95
Drinking Water Health Advisories (III.A.)	no data	
U.S. EPA Regulatory Actions (IV.)	on-line	01/01/92

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_I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

__I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2
Last Revised -- 02/01/93

The Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis, but may not exist for other toxic effects such as carcinogenicity. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to Background Document 1 in Service Code 5 for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of compounds which are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file when a review of that evaluation is completed.

NOTE: There was not a clear consensus among Agency scientists on the oral RfD. Applying the Agency's RfD methodology, strong scientific arguments can be made for various values within a factor of 2 or 3 of the currently recommended RfD value, i.e., 0.1 to 0.8 ug/kg/day. It should be noted, however, that the RfD methodology, by definition, yields a number with inherent uncertainty spanning perhaps an order of magnitude. New data that possibly impact on the recommended RfD for arsenic will be evaluated by the Work Group as it becomes available. Risk managers should recognize the considerable flexibility afforded them in formulating regulatory decisions when uncertainty and lack of clear consensus are taken into account.

___I.A.1. ORAL RfD SUMMARY

Critical Effect	Experimental Doses*	UF	MF	RfD
Hyperpigmentation, keratosis and possible vascular complications Human chronic oral exposure Tseng, 1977; Tseng et al., 1968	NOAEL: 0.009 mg/L converted to 0.0008 mg/kg-day LOAEL: 0.17 mg/L converted to 0.014 mg/kg-day	3	1	3E-4 mg/kg-day

*Conversion Factors: NOAEL was based on an arithmetic mean of 0.009 mg/L in a range of arsenic concentration of 0.001 to 0.017 mg/L. This NOAEL also included estimation of arsenic from food. Since experimental data were missing, arsenic concentrations in sweet potatoes and rice were estimated as 0.002 mg/day. Other assumptions included consumption of 4.5 L water/day and 55 kg bw (Abernathy et al., 1989). NOAEL = [(0.009 mg/L x 4.5 L/day) + 0.002 mg/day] / 55 kg = 0.0008 mg/kg-day. The LOAEL dose was estimated using the same assumptions as the NOAEL starting with an arithmetic mean water concentration from Tseng (1977) of 0.17 mg/L. LOAEL = [(0.17 mg/L x 4.5 L/day) + 0.002 mg/day] / 55 kg = 0.014 mg/kg-day.

___I.A.2. PRINCIPAL AND SUPPORTING STUDIES (ORAL RfD)

Tseng, W.P. 1977. Effects and dose-response relationships of skin cancer and blackfoot disease with arsenic. Environ. Health Perspect. 19: 109-119.

Tseng, W.P., H.M. Chu, S.W. How, J.M. Fong, C.S. Lin and S. Yeh. 1968. Prevalence of skin cancer in an endemic area of chronic arsenicism in Taiwan. J. Natl. Cancer Inst. 40: 453-463.

The data reported in Tseng (1977) show an increased incidence of blackfoot disease that increases with age and dose. Blackfoot disease is a significant adverse effect. The prevalences (males and females combined) at the low dose are 4.6 per 1000 for the 20-39 year group, 10.5 per 1000 for the 40-59 year group, and 20.3 per 1000 for the >60 year group. Moreover, the prevalence of blackfoot disease in each age group increases with increasing dose. However, a recent report indicates that it may not be strictly due to arsenic exposure (Lu, 1990). The data in Tseng et al. (1968) also show increased incidences of hyperpigmentation and keratosis with age. The overall prevalences of hyperpigmentation and keratosis in the exposed groups are 184 and 71 per 1000, respectively. The text states that the incidence increases with dose, but data for the individual doses are not shown. These data show that the skin lesions are the more sensitive endpoint. The low dose in the Tseng (1977) study is considered a LOAEL.

The control group described in Tseng et al. (1968; Table 3) shows no evidence of skin lesions and presumably blackfoot disease, although this latter point is not explicitly stated. This group is considered a NOAEL.

The arithmetic mean of the arsenic concentration in the wells used by the individuals in the NOAEL group is 9 ug/L (range: 1-17 ug/L) (Abernathy et al., 1989). The arithmetic mean of the arsenic concentration in the wells used by the individuals in the LOAEL group is 170 ug/L (Tseng, 1977; Figure 4). Using estimates provided by Abernathy et al. (1989), the NOAEL and LOAEL doses for both food and water are as follows: LOAEL - [170 ug/L x 4.5 L/day + 2 ug/day (contribution of food)] x (1/55 kg) = 14 ug/kg/day; NOAEL - [9 ug/L x 4.5 L/day + 2 ug/day (contribution of food)] x (1/55 kg) = 0.8 ug/kg/day.

Although the control group contained 2552 individuals, only 957 (approximately 38%) were older than 20, and only 431 (approximately 17%) were older than 40. The incidence of skin lesions increases sharply in individuals above 20; the incidence of blackfoot disease increases sharply in individuals above 40 (Tseng, 1968; Figures 5, 6 and 7). This study is less powerful than it appears at first glance. However, it is certainly the most powerful study available on arsenic exposure to people.

This study shows an increase in skin lesions, 22% (64/296) at the high dose vs. 2.2% (7/318) at the low dose. The average arsenic concentration in the wells at the high dose is 410 ug/L and at the low dose is 5 ug/L (Cebrian et al., 1983; Figure 2 and Table 1) or 7 ug/L (cited in the abstract). The average water consumption is 3.5 L/day for males and 2.5 L/day for females. There were about an equal number of males and females in the study. For the dose estimates given below we therefore assume an average of 3 L/day. No data are given on the arsenic exposure from food or the body weight of the participants (we therefore assume 55 kg). The paper states that exposure times are directly related to chronological age in 75% of the cases. Approximately 35% of the participants in the study are more than 20 years old (Figure 1).

Exposure estimates (water only) are: high dose - 410 ug/L x 3 L/day x (1/55 kg) = 22 ug/kg/day; low dose - 5-7 ug/L x 3 L/day x (1/55 kg) = 0.3-0.4 ug/kg/day.

The high-dose group shows a clear increase in skin lesions and is therefore designated a LOAEL. There is some question whether the low dose is a NOAEL or a LOAEL since there is no way of knowing what the incidence of skin lesions would be in a group where the exposure to arsenic is zero. The 2.2% incidence of skin lesions in the low-dose group is higher than that reported in the Tseng et al. (1968) control group, but the dose is lower (0.4 vs. 0.8 ug/kg/day).

The Southwick et al. (1983) study shows a marginally increased incidence of a variety of skin lesions (palmar and plantar keratosis, diffuse palmar or plantar hyperkeratosis, diffuse pigmentation, and arterial insufficiency) in the individuals exposed to arsenic. The incidences are 2.9% (3/105) in the control group and 6.3% (9/144) in the exposed group. There is a slight, but not statistically significant increase in the percent of exposed individuals that have abnormal nerve conduction (8/67 vs. 13/83, or 12% vs. 16% (Southwick et al., 1983; Table 8). The investigators excluded all individuals older than 47 from the nerve conduction portion of the study. These are the individuals most likely to have the longest exposure to arsenic.

Although neither the increased incidence of skin lesions nor the increase in abnormal nerve conduction is statistically significant, these effects may be biologically significant because the same abnormalities occur at higher doses in other studies. The number of subjects in this study was insufficient to establish statistical significance.

Table 3 (Southwick et al., 1983) shows the annual arsenic exposure from drinking water. No data are given on arsenic exposure from food or the body weight (assume 70 kg). Exposure times are not clearly defined, but are >5 years, and dose groups are ranges of exposure.

Exposure estimates (water only) are: dosed group - 152.4 mg/year x 1 year/365 days x (1/70) kg = 6 ug/kg/day; control group - 24.2 mg/year x year/365 days x (1/70) kg = 0.9 ug/kg/day.

Again because there are no data for a group not exposed to arsenic, there is some question if the control group is a NOAEL or a LOAEL. The incidence of skin lesions in this group is about the same as in the low-dose group from the Cebrian et al. (1983) study; the incidence of abnormal nerve conduction in the control group is higher than that from the low-dose group in the Hindmarsh et al. (1977) study described below. The control dose is comparable to the dose to the control group in the Tseng et al. (1968) and Hindmarsh et al. (1977) studies. The dosed group may or may not be a LOAEL, since it is does not report statisically significant effects when compared to the control.

This study shows an increased incidence of abnormal clinical findings and abnormal electromyographic findings with increasing dose of arsenic (Hindmarsh et al., 1977; Tables III and VI). However, the sample size is extremely small. Percentages of abnormal clinical signs possibly attributed to As were 10, 16, and 40% at the low, mid and high doses, respectively. Abnormal EMG were 0, 17 and 53% in the same three groups.

The exact doses are not given in the Hindmarsh et al. (1977) paper; however, some well data are reported in Table V. The arithmetic mean of the arsenic concentration in the high-dose and mid-dose wells is 680 and 70 ug/L, respectively. Figure 1 (Hindmarsh et al., 1977) shows that the average arsenic concentration of the low-dose wells is about 25 ug/L. No data are given on arsenic exposure from food. We assume daily water consumption of 2 liters and body weight of 70 kg. Exposure times are not clearly stated.

Exposure estimates (water only) are: low - 25 ug/L x 2 L/day x (1/70) kg = 0.7 ug/kg/day; mid - 70 ug/L x 2 L/day x (1/70) kg = 2 ug/kg/day; high - 680 ug/L x 2 L/day x (1/70) kg = 19 ug/kg/day.

The low dose is a no-effect level for abnormal EMG findings. However, because there is no information on the background incidence of abnormal clinical findings in a population with zero exposure to arsenic, there is no way of knowing if the low dose is a no-effect level or another marginal effect level for abnormal clinical findings. The low dose is comparable to the dose received by the control group in the Tseng (1977) and Southwick et al. (1983) studies.

The responses at the mid dose do not show a statistically significant increase but are part of a statistically significant trend and are biologically significant. This dose is an equivocal NOAEL/LOAEL. The high dose is a clear LOAEL for both responses.

As discussed previously there is no way of knowing whether the low doses in the Cebrian et al. (1983), Southwick et al. (1983) and Hindmarsh et al. (1977) studies are NOAELs for skin lesions and/or abnormal nerve conduction. However, because the next higher dose in the Southwick and Hindmarsh studies only shows marginal effects at doses 3-7 times higher, the Agency feels comfortable in assigning the low doses in these studies as NOAELs.

The Tseng (1977) and Tseng et al. (1968) studies are therefore considered superior for the purposes of developing an RfD and show a NOAEL for a sensitive endpoint. Even discounting the people <20 years of age, the control group consisted of 957 people that had a lengthy exposure to arsenic with no evidence of skin lesions.

The following is a summary of the defined doses in mg/kg-day from the principal and supporting studies:

1) Tseng (1977): NOAEL = 8E-4; LOAEL = 1.4E-2

2) Cebrian et al. (1983): NOAEL = 4E-4; LOAEL = 2.2E-2

3) Southwick et al. (1983): NOAEL = 9E-4; LOAEL = none (equivocal effects at 6E-3)

4) Hindmarsh et al., 1977: NOAEL = 7E-4; LOAEL = 1.9E-2 (equivocal effects at 2E-3)

___I.A.3. UNCERTAINTY AND MODIFYING FACTORS (ORAL RfD)

UF -- The UF of 3 is to account for both the lack of data to preclude reproductive toxicity as a critical effect and to account for some uncertainty in whether the NOAEL of the critical study accounts for all sensitive individuals.

MF -- None

___I.A.4. ADDITIONAL STUDIES / COMMENTS (ORAL RfD)

Ferm and Carpenter (1968) produced malformations in 15-day hamster fetuses via intravenous injections of sodium arsenate into pregnant dams on day 8 of gestation at dose levels of 15, 17.5, or 20 mg/kg bw. Exencephaly, encephaloceles, skeletal defects and genitourinary systems defects were produced. These and other terata were produced in mice and rats all at levels around 20 mg/kg bw. Minimal effects or no effects on fetal development have been observed in studies on chronic oral exposure of pregnant rats or mice to relatively low levels of arsenic via drinking water (Schroeder and Mitchner, 1971). Nadeenko et al. (1978) reported that intubation of rats with arsenic solution at a dose level of 25 ug/kg/day for a period of 7 months, including pregnancy, produced no significant embryotoxic effects and only infrequent slight expansion of ventricles of the cerebrum, renal pelves and urinary bladder. Hood et al. (1977) reported that very high single oral doses of arsenate solutions (120 mg/kg) to pregnant mice were necessary to cause prenatal fetal toxicity, while multiple doses of 60 mg/kg on 3 days had little effect.

Extensive human pharmacokinetic, metabolic, enzymic and long-term information is known about arsenic and its metabolism. Valentine et al. (1987) established that human blood arsenic levels did not increase until daily water ingestion of arsenic exceeded approximately 250 ug/day (approximately 120 ug of arsenic/L. Methylated species of arsenic are successively 1 order of magnitude less toxic and less teratogenic (Marcus and Rispin, 1988). Some evidence suggests that inorganic arsenic is an essential nutrient in goats, chicks, minipigs and rats (NRC, 1989). No comparable data are available for humans.

___I.A.5. CONFIDENCE IN THE ORAL RfD

Study -- Medium
Data Base -- Medium
RfD -- Medium

Confidence in the chosen study is considered medium. An extremely large number of people were included in the assessment (>40,000) but the doses were not well-characterized and other contaminants were present. The supporting human toxicity data base is extensive but somewhat flawed. Problems exist with all of the epidemiological studies. For example, the Tseng studies do not look at potential exposure from food or other source. A similar criticism can be made of the Cebrian et al. (1983) study. The U.S. studies are too small in number to resolve several issues. However, the data base does support the choice of NOAEL. It garners medium confidence. Medium confidence in the RfD follows.

___I.A.6. EPA DOCUMENTATION AND REVIEW OF THE ORAL RfD

Source Document -- This assessment is not presented in any existing U.S. EPA document.

This analysis has been reviewed by EPA's Risk Assessment Council on 11/15/90. This assessment was discussed by the Risk Assessment Council of EPA on 11/15/90 and verified through a series of meetings during the 1st, 2nd and 3rd quarters of FY91.

Other EPA Documentation -- U.S. EPA, 1984, 1988

Agency Work Group Review -- 03/24/88, 05/25/88, 03/21/89, 09/19/89, 08/22/90, 09/20/90

Verification Date -- 11/15/90

___I.A.7. EPA CONTACTS (ORAL RfD)

Charles Abernathy / OST -- (202)260-5374

__I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2

Not available at this time.

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_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2
Last Revised -- 07/01/95

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- based on sufficient evidence from human data. An increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also, increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) and an increased incidence of skin cancer were observed in populations consuming drinking water high in inorganic arsenic.

___II.A.2. HUMAN CARCINOGENICITY DATA

Sufficient. Studies of smelter worker populations (Tacoma, WA; Magma, UT; Anaconda, MT; Ronnskar, Sweden; Saganoseki-Machii, Japan) have all found an association between occupational arsenic exposure and lung cancer mortality (Enterline and Marsh, 1982; Lee-Feldstein, 1983; Axelson et al., 1978; Tokudome and Kuratsune, 1976; Rencher et al., 1977). Both proportionate mortality and cohort studies of pesticide manufacturing workers have shown an excess of lung cancer deaths among exposed persons (Ott et al., 1974; Mabuchi et al., 1979). One study of a population residing near a pesticide manufacturing plant revealed that these residents were also at an excess risk of lung cancer (Matanoski et al., 1981). Case reports of arsenical pesticide applicators have also corroborated an association between arsenic exposure and lung cancer (Roth, 1958).

A cross-sectional study of 40,000 Taiwanese exposed to arsenic in drinking water found significant excess skin cancer prevalence by comparison to 7500 residents of Taiwan and Matsu who consumed relatively arsenic-free water (Tseng et al., 1968; Tseng, 1977). Although this study demonstrated an association between arsenic exposure and development of skin cancer, it has several weaknesses and uncertainties, including poor nutritional status of the exposed populations, their genetic susceptibility, and their exposure to inorganic arsenic from non-water sources, that limit the study's usefulness in risk estimation. Dietary inorganic arsenic was not considered nor was the potential confounding by contaminants other than arsenic in drinking water. There may have been bias of examiners in the original study since no skin cancer or preneoplastic lesions were seen in 7500 controls; prevalence rates rather than mortality rates are the endpoint; and furthermore there is concern of the applicability of extrapolating data from Taiwanese to the U.S. population because of different background rates of cancer, possibly genetically determined, and differences in diet other than arsenic (e.g., low protein and fat and high carbohydrate) (U.S. EPA, 1988).

A prevalence study of skin lesions was conducted in two towns in Mexico, one with 296 persons exposed to drinking water with 0.4 mg/L arsenic and a similar group with exposure at 0.005 mg/L. The more exposed group had an increased incidence of palmar keratosis, skin hyperpigmentation and hypopigmentation, and four skin cancers (histologically unconfirmed) (Cebrian et al. (1983). The association between skin cancer and arsenic is weak because of the small number of cases, small cohort size, and short duration follow-up; also there was no unexposed group in either town. No excess skin cancer incidence has been observed in U.S. residents consuming relatively high levels of arsenic in drinking water but the numbers of exposed persons were low (Morton et al., 1976; Southwick et al., 1981). Therapeutic use of Fowler's solution (potassium arsenite) has also been associated with development of skin cancer and hyperkeratosis (Sommers and McManus, 1953; Fierz, 1965); several case reports implicate exposure to Fowler's solution in skin cancer development (U.S. EPA, 1988).

Several follow-up studies of the Taiwanese population exposed to inorganic arsenic in drinking water showed an increase in fatal internal organ cancers as well as an increase in skin cancer. Chen et al. (1985) found that the standard mortality ratios (SMR) and cumulative mortality rates for cancers of the bladder, kidney, skin, lung and liver were significantly greater in the Blackfoot disease endemic area of Taiwan when compared with the age adjusted rates for the general population of Taiwan. Blackfoot disease (BFD, an endemic peripheral artery disease) and these cancers were all associated with high levels of arsenic in drinking water. In the endemic area, SMRs were greater in villages that used only artesian well water (high in arsenic) compared with villages that partially or completely used surface well water (low in arsenic). However, dose-response data were not developed (Chen et al. 1985).

A retrospective case-control study showed a significant association between duration of consuming high-arsenic well water and cancers of the liver, lung and bladder (Chen et al., 1986). In this study, cancer deaths in the Blackfoot disease endemic area between January 1980 and December 1982 were chosen for the case group. About 90% of the 86 lung cancers and 95 bladder cancers in the registry were histologically or cytologically confirmed and over 70% of the liver cancers were confirmed by biopsy or à-fetoprotein presence with a positive liver x-ray image. Only confirmed cancer cases were included in the study. A control group of 400 persons living in the same area was frequency-matched with cases by age and sex. Standardized questionnaires of the cases (by proxy) and controls determined the history of artesian well water use, socioeconomic variables, disease history, dietary habits, and lifestyle. For the cancer cases, the age-sex adjusted odds ratios were increased for bladder (3.90), lung (3.39), and liver (2.67) cancer for persons who had used artesian well water for 40 or more years when compared with controls who had never used artesian well water. Similarly, in a 15-year study of a cohort of 789 patients of Blackfoot disease, an increased mortality from cancers of the liver, lung, bladder and kidney was seen among BFD patients when compared with the general population in the endemic area or when compared with the general population of Taiwan. Multiple logistic regression analysis to adjust for other risk factors including cigarette smoking did not markedly affect the exposure-response relationships or odds ratios (Chen et al., 1988).

A significant dose-response relationship was found between arsenic levels in artesian well water in 42 villages in the southwestern Taiwan and age-adjusted mortality rates from cancers at all sites, cancers of the bladder, kidney, skin, lung, liver and prostate (Wu et al., 1989). An ecological study of cancer mortality rates and arsenic levels in drinking water in 314 townships in Taiwan also corroborated the association between arsenic levels and mortality from the internal cancers (Chen and Wang, 1990).

Chen et al.(1992) conducted a recent analysis of cancer mortality data from the arsenic-exposed population to compare risk of various internal cancers and compare risk between males and females. The study area and population have been described by Wu et al. (1989). It is limited to 42 southwestern coastal villages where residents have used water high in arsenic from deep artesian wells for more than 70 years. Arsenic levels in drinking water ranged from 0.010 to 1.752 ppm. The study population had 898,806 person-years of observation and 202 liver cancer, 304 lung cancer, 202 bladder cancer and 64 kidney cancer deaths. The study population was stratified into four groups according to median arsenic level in well water (<0.10 ppm, 0.10-0.29 ppm, 0.30-0.59 ppm and 60+ ppm), and also stratified into four age groups (<30 years, 30-49 years, 50-69 years and 70+ years). Mortality rates were found to increase significantly with age for all cancers and significant dose-response relationships were observed between arsenic level and mortality from cancer of the liver, lung, bladder and kidney in most age groups of both males and females. The data generated by Chen et al. (1992) provide evidence for an association of the levels of arsenic in drinking water and duration of exposure with the rate of mortality from cancers of the liver, lung, bladder, and kidney. Dose-response relationships are clearly shown by the tabulated data (Tables II-V of Chen et al., 1992). Previous studies summarized in U.S. EPA (1988) showed a similar association in the same Taiwanese population with the prevalence of skin cancers (which are often non-fatal). Bates et al. (1992) and Smith et al. (1992) have recently reviewed and evaluated the evidence for arsenic ingestion and internal cancers.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. There has not been consistent demonstration of carcinogenicity in test animals for various chemical forms of arsenic administered by different routes to several species (IARC, 1980). Furst (1983) has cited or reviewed animal carcinogenicity testing studies of nine inorganic arsenic compounds in over nine strains of mice, five strains of rats, in dogs, rabbits, swine and chickens. Testing was by the oral, dermal, inhalation, and parenteral routes. All oxidation states of arsenic were tested. No study demonstrated that inorganic arsenic was carcinogenic in animals. Dimethylarsonic acid (DMA), the end metabolite predominant in humans and animals, has been tested for carcinogenicity in two strains of mice and was not found positive (Innes et al., 1969); however, this was a screening study and no data were provided. The meaning of non-positive data for carcinogenicity of inorganic arsenic is uncertain, the mechanism of action in causing human cancer is not known, and rodents may not be a good model for arsenic carcinogenicity testing. There are some data to indicate that arsenic may produce animal lung tumors if retention time in the lung can be increased (Pershagen et al., 1982, 1984).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

A retrospective cohort mortality study was conducted on 478 British patients treated between 1945-1969 with Fowler's solution (potassium arsenite). The mean duration of treatment was 8.9 months and the average total oral consumption of arsenic was about 1890 mg (daily dose x duration). In 1980, 139 deaths had occurred. No excess deaths from internal cancers were seen after this 20-year follow-up. Three bladder cancer deaths were observed (1.19 expected, SMR 2.5) (Cuzick et al., 1982). A recent follow-up (Cuzick et al., 1992) indicated no increased mortality from all cancers but a significant excess from bladder cancer (5 cases observed/1.6 expected; SMR of 3.07). A subset of the original cohort (143 persons) had been examined by a dermatologist in 1970 for signs of arsenicism (palmar keratosis). In 1990, there were 80 deaths in the subcohort and 11 deaths from internal cancers. All 11 subjects had skin signs (keratosis-10, hyperpigmentation-5 and skin cancer-3). A case-control study of the prevalence of palmar keratoses in 69 bladder cancer patients, 66 lung cancer patients and 218 hospital controls (Cuzick et al., 1984), indicated an association between skin keratosis (as an indicator of arsenic exposure) and lung and bladder cancer. Above the age of 50, 87% of bladder cancer patients and 71% of lung cancer patients but only 36% of controls had one or more keratoses. Several case reports implicate internal cancers with arsenic ingestion or specifically with use of Fowler's solution but the associations are tentative (U.S. EPA, 1988).

Sodium arsenate has been shown to transform Syrian hamster embryo cells (Dipaolo and Casto, 1979) and to produce sister chromatid-exchange in DON cells, CHO cells, and human peripheral lymphocytes exposed in vitro (Wan et al., 1982; Ohno et al., 1982; Larramendy et al., 1981; Andersen, 1983; Crossen, 1983). Jacobson-Kram and Montalbano (1985) have reviewed the mutagenicity of inorganic arsenic and concluded that inorganic arsenic is inactive or very weak for induction of gene mutations in vitro but it is clastogenic with trivalent arsenic being an order of magnitude more potent than pentavalent arsenic.

Both the pentavalent and trivalent forms of inorganic arsenic are found in drinking water. In both animals and humans, arsenate (As+5) is reduced to arsenite (As+3) and the trivalent form is methylated to give the metabolites mononomethylarsinic acid (MMA) and dimethylarsonic acid (DMA) (Vahter and Marafante, 1988). The genotoxicity of arsenate (As+5) and arsenite (As+3) and the two methylated metabolites, MMA and DMA were compared in the thymidine kinase forward mutation assay in mouse lymphoma cells (Harrington-Brock et al. 1993; Moore et al., 1995, in press). Sodium arsenite (+3) and sodium arsenate (+5) were mutagenic at concentration of 1-2 ug/mL and 10-14 ug/mL, respectively, whereas MMA and DMA were significantly less potent, requiring 2.5-5 mg/mL and 10 mg/mL, respectively, to induce a genotoxic response. Based on small colony size the mutations induced were judged chromosomal rather than point mutations. The authors have previously shown that for chemicals having clastogenic activity (i.e., cause chromosomal mutations), the mutated cells grow more slowly than cells with single gene mutations and this results in small colony size. In the mouse lymphoma assay, chromosomal abberations were seen at approximately the same arsenic levels as TK forward mutations. Arsenate, arsenite and MMA were considered clastogenic but the abberation response with DMA was insufficient to consider it a clastogen. Since arsenic exerts its genotoxicity by causing chromosomal mutations, it has been suggested by the above authors that it may act in a latter stage of carcinogenesis as a progressor, rather than as a classical initiator or promotor (Moore et al., 1994). A finding which supports this process is that arsenate (8-16 uM) and arsenite (3 uM) have been shown to induce 2-10 fold amplification of the dihydrofolate reductase gene in culture in methotrexate resistant 3T6 mouse cells (Lee et al., 1988). Although the mechanism of induction in rodent cells is not known, gene amplification of oncogenes is observed in many human tumors. Inorganic arsenic has not been shown to mutate bacterial strains, it produces preferential killing of repair deficient strains (Rossman, 1981). Sodium arsenite (As+3) induces DNA-strand breaks which are associated with DNA-protein crosslinks in cultured human fibroblasts at 3 mM but not 10 mM (Dong and Luo, 1993) and it appears that arsenite inhibits the DNA repair process by inhibiting both excision and ligation (Jha et al., 1992; Lee-Chen et al., 1993).

The inhibitory effect of arsenite on strand-break rejoining during DNA repair was found to be reduced by adding glutathione to cell cultures (Huang et al., 1993). The cytotoxic effects of sodium arsenite in Chinese hamster ovary cells also has also found to correlate with the intracellular glutathione levels (Lee et al., 1989).

In vivo studies in rodents have shown that oral exposure of rats to arsenate (As+5) for 2-3 weeks resulted in major chromosomal abnormalities in bone marrow (Datta et al., 1986) and exposure of mice to As (+3) in drinking water for 4 weeks (250 mg As/L as arsenic trioxide) caused chromosomal aberrations in bone marrow cells but not spermatogonia (Poma et al., 1987); micronuclei in bone marrow cells were also induced by intraperitoneal dosing of mice with arsenate (DeKnudt et al., 1986; Tinwell et al., 1991). Chromosomal aberrations and sister chromatid exchange have been seen in patients exposed to arsenic from treatment with Fowler's solution (Burgdorf et al., 1977) and subjects exposed occupationally (Beckman et al., 1977) but no increase in either endpoint was seen in lymphocytes of subjects exposed to arsenic in drinking water (Vig et al., 1984).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 1.5E+0 per (mg/kg)/day

Drinking Water Unit Risk -- 5E-5 per (ug/L)

Extrapolation Method -- Time- and dose-related formulation of the multistage model (U.S. EPA, 1988)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	2E+0 ug/L
E-5 (1 in 100,000)	2E-1 ug/L
E-6 (1 in 100,000)	2E-2 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

The Risk Assessment Forum has completed a reassessment of the carcinogenicity risk associated with ingestion of inorganic arsenic (U.S. EPA, 1988). The data provided in Tseng et al., 1968 and Tseng, 1977 on about 40,000 persons exposed to arsenic in drinking water and 7500 relatively unexposed controls were used to develop dose-response data. The number of persons at risk over three dose intervals and four exposure durations, for males and females separately, were estimated from the reported prevalence rates as percentages. It was assumed that the Taiwanese persons had a constant exposure from birth, and that males consumed 3.5 L drinking water/day and females consumed 2.0 L/day. Doses were converted to equivalent doses for U.S. males and females based on differences in body weights and differences in water consumption and it was assumed that skin cancer risk in the U.S. population would be similar to the Taiwanese population. The multistage model with time was used to predict dose-specific and age-specific skin cancer prevalance rates associated with ingestion of inorganic arsenic; both linear and quadratic model fitting of the data were conducted. The maximum likelihood estimate (MLE) of skin cancer risk for a 70 kg person drinking 2 L of water per day ranged from 1E-3 to 2E-3 for an arsenic intake of 1 ug/kg/day. Expressed as a single value, the cancer unit risk for drinking water is 5E-5 per (ug/L). Details of the assessment are in U.S. EPA (1988).

Dose response data have not been developed for internal cancers for the Taiwanese population. The data of Chen et al. (1992) are considered inadequate at present.

__II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

None.

__II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

This assessment is based on prevalence of skin cancer rather than mortality because the types of skin cancer studied are not normally fatal. However, competing mortality from Blackfoot disease in the endemic area of Taiwan would cause the risk of skin cancer to be underestimated. Other sources of inorganic arsenic, in particular those in food sources have not been considered because of lack of reliable information. There is also uncertainty on the amount of water consumed/day by Taiwanese males (3.5 L or 4.5 L) and the temporal variability of arsenic concentrations in specific wells was not known. The concentrations of arsenic in the wells was measured in the early 1960s and varied between 0.01 and 1.82 ppm. For many villages 2 to 5 analyses were conducted on well water and for other villages only one analysis was performed; ranges of values were not provided. Since tap water was supplied to many areas after 1966, the arsenic-containing wells were only used in dry periods. Because of the study design, particular wells used by those developing skin cancer could not be identified and arsenic intake could not be assigned except by village. Several uncertainties in exposure measurement reliability existed and subsequent analysis of drinking water found fluorescent substances in water that are possible confounders or caused synergistic effects. Uncertainties have been discussed in detail in U.S. EPA (1988). Uncertainties in exposure measurement can affect the outcome of dose-response estimation.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

__II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 4.3E-3 per (ug/cu.m)

Extrapolation Method -- absolute-risk linear model

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	2E-2 per (ug/cu.m)
E-5 (1 in 100,000)	2E-3 per (ug/cu.m)
E-6 (1 in 1,000,000)	2E-4 per (ug/cu.m)

__II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- lung cancer
Test Animals -- human, male
Route -- inhalation, occupational exposure
Reference -- Brown and Chu, 1983a,b,c; Lee-Feldstein, 1983; Higgins, 1982; Enterline and Marsh, 1982

Ambient Unit Risk Estimates (per (ug/cu.m)

Exposure Source	Study	Unit Risk	Geometric Mean Unit Risk	Final Estimates Unit Risk
Anaconda smelter	Brown and Chu, 1983a,b,c	1.25E-3		
	Lee-Feldstein, 1983	2.80E-3	2.56E-3	
	Higgins, 1982; Higgins et al., 1982; Welch et al., 1982	4.90E-3		4.29E-3
ASARCO smelter	Enterline and Marsh, 1982	7.6E-3	6.81E-3	7.19E-3

__II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

A geometric mean was obtained for data sets obtained with distinct exposed populations (U.S. EPA, 1984). The final estimate is the geometric mean of those two values. It was assumed that the increase in age-specific mortality rate of lung cancer was a function only of cumulative exposures.

The unit risk should not be used if the air concentration exceeds 2 ug/cu.m, since above this concentration the unit risk may not be appropriate.

__II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

Overall a large study population was observed. Exposure assessments included air measurements for the Anaconda smelter and both air measurements and urinary arsenic for the ASARCO smelter. Observed lung cancer incidence was significantly increased over expected values. The range of the estimates derived from data from two different exposure areas was within a factor of 6.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

__II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984, 1988, 1993

A draft of the 1984 Health Assessment Document for Inorganic Arsenic was independently reviewed in public session by the Environmental Health Committee of the U.S. EPA Science Advisory Board on September 22-23, 1983. A draft of the 1988 Special Report on Ingested Inorganic Arsenic; Skin Cancer; Nutritional Essentiality was externally peer reviewed at a two-day workshop of scientific experts on December 2-3, 1986. A draft of the Drinking Water Criteria Document for Arsenic was reviewed by the Drinking Water Committee of the U.S. EPA Science Advisory Board on March 10, 1993. The comments from these reviews were evaluated and considered in the revision and finalization of these reports.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 01/13/88, 12/07/89, 02/03/94

Verification Date -- 02/03/94

__II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Herman Gibb / NCEA -- (202)260-7315

Charles Abernathy / OST -- (202)260-5374

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_III. HEALTH HAZARD ASSESSMENTS FOR VARIED EXPOSURE DURATIONS

__III.A. DRINKING WATER HEALTH ADVISORIES

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2

Not available at this time.

__III.B. OTHER ASSESSMENTS

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2

Content to be determined.

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_IV. U.S. EPA REGULATORY ACTIONS

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2
Last Revised -- 01/01/92

EPA risk assessments may be updated as new data are published and as assessment methodologies evolve. Regulatory actions are frequently not updated at the same time. Compare the dates for the regulatory actions in this section with the verification dates for the risk assessments in sections I and II, as this may explain inconsistencies. Also note that some regulatory actions consider factors not related to health risk, such as technical or economic feasibility. Such considerations are indicated for each action. In addition, not all of the regulatory actions listed in this section involve enforceable federal standards. Please direct any questions you may have concerning these regulatory actions to the U.S. EPA contact listed for that particular action. Users are strongly urged to read the background information on each regulatory action in Background Document 4 in Service Code 5.

__IV.A. CLEAN AIR ACT (CAA)

No data available

__IV.B. SAFE DRINKING WATER ACT (SDWA)

___IV.B.1. MAXIMUM CONTAMINANT LEVEL GOAL (MCLG) for Drinking Water

Value (status) -- 0.05 mg/L (Proposed, 1985)

Considers technological or economic feasibility? -- NO

Discussion -- An MCLG of 0.05 mg/L for arsenic is proposed based on the current MCL of 0.05 mg/L. Even though arsenic is potentially carcinogenic in humans by inhalation and ingestion, its potential essential nutrient value was considered in determination of an MCLG. The basis for this evaluation is nutritional requirements by NAS (NAS, 1983, Vol. 5, Drinking Water and Health, National Academy of Sciences Press, Washington, DC.)

Reference -- 50 FR 46936 (11/13/85)

EPA Contact -- Health and Ecological Criteria Division / OST /
(202) 260-7571 / FTS 260-7571; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.2. MAXIMUM CONTAMINANT LEVEL (MCL) for Drinking Water

Value (status) -- 0.05 mg/L (Interim, 1980)

Considers technological or economic feasibility? -- YES

Discussion -- As an interim measure the U.S. EPA is using the value previously derived by the Public Health Service.

Monitoring requirements -- Ground water systems every three years; surface water systems annually.

Analytical methodology -- Atomic absorption/furnace technique (EPA 206.2; SM 304); atomic absorption/gaseous hydride (EPA 206.3; SM 303E; ASTM D-2972-78B)

Best available technology -- No data available.

Reference -- 45 FR 57332 (08/27/80); 50 FR 46936 (11/13/85)

EPA Contact -- Drinking Water Standards Division / OGWDW /
(202) 260-7575 / FTS 260-7575; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.3. SECONDARY MAXIMUM CONTAMINANT LEVEL (SMCL) for Drinking Water

No data available

___IV.B.4. REQUIRED MONITORING OF "UNREGULATED" CONTAMINANTS

No data available

__IV.C. CLEAN WATER ACT (CWA)

___IV.C.1. AMBIENT WATER QUALITY CRITERIA, Human Health

Water and Fish Consumption -- 2.2E-3 ug/L

Fish Consumption Only -- 1.75E-2 ug/L

Considers technological or economic feasibility? -- NO

Discussion -- For the maximum protection from the potential carcinogenic properties of this chemical, the ambient water concentration should be zero. However, zero may not be attainable at this time, so the recommended criteria represents a E-6 estimated incremental increase of cancer risk over a lifetime.

Reference -- 45 FR 79318 (11/28/80)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.C.2. AMBIENT WATER QUALITY CRITERIA, Aquatic Organisms

Freshwater:

Acute -- 3.6E+2 ug/L (Arsenic III)
Chronic -- 1.9E+2 ug/L (Arsenic III)

Marine:

Acute -- 6.9E+1 ug/L (Arsenic III)
Chronic -- 3.6E+1 ug/L (Arsenic III)

Considers technological or economic feasibility? -- NO

Discussion -- The criteria given are for Arsenic III. Much less data are available on the effects of Arsenic V to aquatic organisms, but the toxicity seems to be less. A complete discussion may be found in the referenced notice.

Reference -- 50 FR 30784 (07/29/85)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.D. FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

__IV.D.1. PESTICIDE ACTIVE INGREDIENT, Registration Standard

Status -- Issued (1988)

Reference -- Arsenic, Chromium and Chromated Arsenical Compounds Pesticide Registration Standard. June, 1988. [NTIS# PB89-102842]

EPA Contact -- Registration Branch / OPP

(703)557-7760 / FTS 557-7760

___IV.D.2. PESTICIDE ACTIVE INGREDIENT, Special Review

Action -- Final regulatory decision - PD4 (1988)

Considers technological or economic feasibility? -- NO

Summary of regulatory action -- Cancellation of specified non-wood uses. Registrant of lead arsenate voluntarily canceled 09/87. Registrant of calcium arsenate voluntarily canceled 02/14/89. Use of sodium arsenate as ant bait canceled on 07/26/89. Criterion of concern: oncogenicity, mutagenicity and teratogenicity. Previous actions: 1) Voluntary cancellation of sodium arsenite (1978). Voluntary cancellation of two products. Criterion of concern: oncogenicity, mutagenicity and teratogenicity; 2) PD4 (1984). Requires label changes for wood use including a restricted use classification. Criterion of concern: oncogenicity, mutagenicity and teratogenicity; 3) Voluntary cancellation of copper arsenate (1977). Criterion of concern: oncogenicity.

Reference -- 53 FR 24787 (06/30/88); 43 FR 48267 (10/18/78); 42 FR 18422 (04/07/77); 49 FR 28666 (07/13/84) [NTIS# PB84-241538]; 49 FR 43772 (10/31/84); 50 FR 4269 (01/30/85)

EPA Contact -- Special Review Branch / OPP
(703)557-7400 / FTS 557-7400

__IV.E. TOXIC SUBSTANCES CONTROL ACT (TSCA)

No data available

__IV.F. RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

___IV.F.1. RCRA APPENDIX IX, for Ground Water Monitoring

Status -- Listed

Reference -- 52 FR 25942 (07/09/87)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

__IV.G. SUPERFUND (CERCLA)

___IV.G.1. REPORTABLE QUANTITY (RQ) for Release into the Environment

Value (status) -- 1 pound (Final, 1989)

Considers technological or economic feasibility? -- NO

Discussion -- The 1-pound RQ for arsenic is based on its potential carcinogenicity. Available data indicate a hazard ranking of high based on a potency factor of 142.31/mg/kg/day and a weight-of-evidence group A, which corresponds to an RQ of 1 pound. Evidence found in "Water-Related Environmental Fate of 129 Priority Pollutants" (EPA 440/4-79-029a) also indicates that this material, or a constituent of this material, is bioaccumulated to toxic levels in the tissue of aquatic and marine organisms, and has the potential to concentrate in the food chain. Reporting of releases of massive forms of this hazardous substance is not required if the diameter of the pieces released exceeds 100 micrometers (0.004 inches).

Reference -- 54 FR 33418 (08/14/89)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

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_VI. BIBLIOGRAPHY

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2
Last Revised -- 07/01/95

__VI.A. ORAL RfD REFERENCES

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__VI.B. INHALATION RfD REFERENCES

None

__VI.C. CARCINOGENICITY ASSESSMENT REFERENCES

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__VI.D. DRINKING WATER HA REFERENCES

None

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_VII. REVISION HISTORY

Substance Name -- Arsenic, inorganic
CASRN -- 7440-38-2

Date	Section	Description
06/30/88	II.B.	Revised last paragraph
06/30/88	II.C.1.	Inhalation slope factor changed
06/30/88	II.C.3.	Paragraph 2 added
09/07/88	II.B.	Major text changes
12/01/88	II.A.2.	Mabuchi et al. citation year corrected
12/01/88	II.A.3.	Pershagen et al. citation year corrected
09/01/89	II.C.2.	Citations added to anacondor smelter
09/01/89	VI.	Bibliography on-line
06/01/90	II.A.2.	2nd & 3rd paragraph - Text revised
06/01/90	II.A.4.	Text corrected
06/01/90	II.C.1.	Inhalation slope factor removed (format change)
06/01/90	IV.F.1.	EPA contact changed
06/01/90	VI.C.	References added
12/01/90	II.B.	Changed slope factor to "unit risk", 2nd para, 1st sen
02/01/91	II.C.3.	Text edited
09/01/91	I.A.	Oral RfD summary now on-line
09/01/91	I.A.	Oral RfD bibliography added
10/01/91	I.A.1.	Conversion factor text clarified
10/01/91	IV.B.1.	MCLG noted as pending change
01/01/92	IV.	Regulatory actions updated
08/01/92	II.	Note added to indicate text in oral quant. estimate
10/01/92	VI.C.	Missing reference added to bibliography
02/01/93	I.A.4.	Citations added to second paragraph
02/01/93	VI.A.	References added to bibliography
03/01/93	VI.A.	Corrections to references
03/01/94	II.D.2.	Work group review date added
06/01/94	II.	Carcinogen assessment noted as pending change
01/01/95	II.	Pending change note revised
01/01/95	II.B.	Dates and document no. added to oral quant. estimate
06/01/95	II.	Carcinogenicity assessment replaced
06/01/95	VI.C.	Carcinogenicity references replaced
07/01/95	II.D.1.	Documentation year corrected; review statement revised
07/01/95	VI.C.	U.S. EPA, 1994 corrected to 1993

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SYNONYMS

Substance Name -- Arsenic, inorganic

0141
Cadmium; CASRN 7440-43-9 (07/01/96)

Health risk assessment information on a chemical is included in IRIS only after a comprehensive review of chronic toxicity data by work groups composed of U.S. EPA scientists from several Program Offices. The summaries presented in Sections I and II represent a consensus reached in the review process. The other sections contain U.S. EPA information which is specific to a particular EPA program and has been subject to review procedures prescribed by that Program Office. The regulatory actions in Section IV may not be based on the most current risk assessment, or may be based on a current, but unreviewed, risk assessment, and may take into account factors other than health effects (e.g., treatment technology). When considering the use of regulatory action data for a particular situation, note the date of the regulatory action, the date of the most recent risk assessment relating to that action, and whether technological factors were considered. Background information and explanations of the methods used to derive the values given in IRIS are provided in the five Background Documents in Service Code 5, which correspond to Sections I through V of the chemical files.

STATUS OF DATA FOR Cadmium

File On-Line 03/31/87

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	on-line	02/01/94
Inhalation RfC Assessment (I.B.)	pending	
Carcinogenicity Assessment (II.)	on-line	06/01/92
Drinking Water Health Advisories (III.A.)	no data	
U.S. EPA Regulatory Actions (IV.)	on-line	04/01/92

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_I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

__I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Cadmium
CASRN -- 7440-43-9
Last Revised -- 02/01/94

The Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis, but may not exist for other toxic effects such as carcinogenicity. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to Background Document 1 in Service Code 5 for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of compounds which are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file when a review of that evaluation is completed.

___I.A.1. ORAL RfD SUMMARY

Critical Effect	Experimental Doses*	UF	MF	RfD
Significant proteinuria	NOAEL (water): 0.005 mg/kg/day	10	1	5E-4 mg/kg/day (water)
Human studies involving chronic exposures	NOAEL (food): 0.01 mg/kg/day	10	1	1E-3 mg/kg/day (food)
U.S. EPA, 1985				

*Conversion Factors: See text for discussion

___I.A.2. PRINCIPAL AND SUPPORTING STUDIES (ORAL RfD)

U.S. EPA. 1985. Drinking Water Criteria Document on Cadmium. Office of Drinking Water, Washington, DC. (Final draft)

A concentration of 200 ug cadmium (Cd)/gm wet human renal cortex is the highest renal level not associated with significant proteinuria (U.S. EPA, 1985). A toxicokinetic model is available to determine the level of chronic human oral exposure (NOAEL) which results in 200 ug Cd/gm wet human renal cortex; the model assumes that 0.01% day of the Cd body burden is eliminated per day (U.S. EPA, 1985). Assuming 2.5% absorption of Cd from food or 5% from water, the toxicokinetic model predicts that the NOAEL for chronic Cd exposure is 0.005 and 0.01 mg Cd/kg/day from water and food, respectively (i.e., levels which would result in 200 ug Cd/gm wet weight human renal cortex). Thus, based on an estimated NOAEL of 0.005 mg Cd/kg/day for Cd in drinking water and ian UF of 10, an RfD of 0.0005 mg Cd/kg/day (water) was calculated; an equivalent RfD for Cd in food is 0.001 mg Cd/kg/day (see Section VI.A. for references).

___I.A.3. UNCERTAINTY AND MODIFYING FACTORS (ORAL RfD)

UF -- This uncertainty factor is used to account for intrahuman variability to the toxicity of this chemical in the absence of specific data on sensitive individuals.

MF -- None

___I.A.4. ADDITIONAL COMMENTS (ORAL RfD)

Cd is unusual in relation to most, if not all, of the substances for which an oral RfD has been determined in that a vast quantity of both human and animal toxicity data are available. The RfD is based on the highest level of Cd in the human renal cortex (i.e., the critical level) not associated with significant proteinuria (i.e., the critical effect). A toxicokinetic model has been used to determine the highest level of exposure associated with the lack of a critical effect. Since the fraction of ingested Cd that is absorbed appears to vary with the source (e.g., food vs. drinking water), it is necessary to allow for this difference in absorption when using the toxicokinetic model to determine an RfD.

___I.A.5. CONFIDENCE IN THE ORAL RfD

Study -- Not applicable
Data Base -- High
RfD -- High

The choice of NOAEL does not reflect the information from any single study. Rather, it reflects the data obtained from many studies on the toxicity of cadmium in both humans and animals. These data also permit calculation of pharmacokinetic parameters of cadmium absorption, distribution, metabolism and elimination. All of this information considered together gives high confidence in the data base. High confidence in either RfD follows as well.

___I.A.6. EPA DOCUMENTATION AND REVIEW OF THE ORAL RfD

Source Document -- U.S. EPA, 1985

Other EPA Documentation -- None

Agency Work Group Review -- 05/15/86, 08/19/86, 09/17/87, 12/15/87, 01/20/88, 05/25/88

Verification Date -- 05/25/88

___I.A.7. EPA CONTACTS (ORAL RfD)

Ken Bailey / OST -- (202)260-5535

Yogi Patel / OST -- (202)260-5849

__I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- Cadmium
CASRN -- 7440-43-9

A risk assessment for this substance/agent is under review by an EPA work group.

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_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Cadmium
CASRN -- 7440-43-9
Last Revised -- 06/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B1; probable human carcinogen

Basis -- Limited evidence from occupational epidemiologic studies of cadmium is consistent across investigators and study populations. There is sufficient evidence of carcinogenicity in rats and mice by inhalation and intramuscular and subcutaneous injection. Seven studies in rats and mice wherein cadmium salts (acetate, sulfate, chloride) were administered orally have shown no evidence of carcinogenic response.

__II.A.2. HUMAN CARCINOGENICITY DATA

Limited. A 2-fold excess risk of lung cancer was observed in cadmium smelter workers. The cohort consisted of 602 white males who had been employed in production work a minimum of 6 months during the years 1940-1969. The population was followed to the end of 1978. Urine cadmium data available for 261 workers employed after 1960 suggested a highly exposed population. The authors were able to ascertain that the increased lung cancer risk was probably not due to the presence of arsenic or to smoking (Thun et al., 1985). An evaluation by the Carcinogen Assessment Group of these possible confounding factors has indicated that the assumptions and methods used in accounting for them appear to be valid. As the SMRs observed were low and there is a lack of clear cut evidence of a causal relationship of the cadmium exposure only, this study is considered to supply limited evidence of human carcinogenicity.

An excess lung cancer risk was also observed in three other studies which were, however, compromised by the presence of other carcinogens (arsenic, smoking) in the exposure or by a small population (Varner, 1983; Sorahan and Waterhouse, 1983; Armstrong and Kazantzis, 1983).

Four studies of workers exposed to cadmium dust or fumes provided evidence of a statistically significant positive association with prostate cancer (Kipling and Waterhouse, 1967; Lemen et al., 1976; Holden, 1980; Sorahan and Waterhouse, 1983), but the total number of cases was small in each study. The Thun et al. (1985) study is an update of an earlier study (Lemen et al., 1976) and does not show excess prostate cancer risk in these workers. Studies of human ingestion of cadmium are inadequate to assess carcinogenicity.

__II.A.3. ANIMAL CARCINOGENICITY DATA

Exposure of Wistar rats by inhalation to cadmium as cadmium chloride at concentrations of 12.5, 25 and 50 ug/cu.m for 18 months, with an additional 13-month observation period, resulted in significant increases in lung tumors (Takenaka et al., 1983). Intratracheal instillation of cadmium oxide did not produce lung tumors in Fischer 344 rats but rather mammary tumors in males and tumors at multiple sites in males (Sanders and Mahaffey, 1984). Injection site tumors and distant site tumors (for example, testicular) have been reported by a number of authors as a consequence of intramuscular or subcutaneous administration of cadmium metal and chloride, sulfate, oxide and sulfide compounds of cadmium to rats and mice (U.S. EPA, 1985). Seven studies in rats and mice where cadmium salts (acetate, sulfate, chloride) were administered orally have shown no evidence of a carcinogenic response.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Results of mutagenicity tests in bacteria and yeast have been inconclusive. Positive responses have been obtained in mutation assays in Chinese hamster cells (Dom and V79 lines) and in mouse lymphoma cells (Casto, 1976; Ochi and Ohsawa, 1983; Oberly et al., 1982).

Conflicting results have been obtained in assays of chromosomal aberrations in human lymphocytes treated in vitro or obtained from exposed workers. Cadmium treatment in vivo or in vitro appears to interfere with spindle formation and to result in aneuploidy in germ cells of mice and hamsters (Shimada et al., 1976; Watanabe et al., 1979; Gilliavod and Leonard, 1975).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available. There are no positive studies of orally ingested cadmium suitable for quantitation.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

___II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 1.8E-3 per (ug/cu.m)

Extrapolation Method -- Two stage; only first affected by exposure; extra risk

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	6E-2 ug/cu.m
E-5 (1 in 100,000)	6E-3 ug/cu.m
E-6 (1 in 1,000,000)	6E-4 ug/cu.m

___II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- lung, trachea, bronchus cancer deaths
Test Animals -- human/white male
Route -- inhalation, exposure in the workplace
Reference -- Thun et al., 1985

Cumulative Exposure (mg/day/cu.m)	Median Observation	24 hour/ ug/cu.m Equivalent	No. of Expected Lung, Trachea and Bronchus Cancers Assuming No Cadmium Effect	Observed No. of Deaths (lung, trachea, bronchus cancers)
less than or equal to 584	280	168	3.77	2
585-2920	1210	727	4.61	7
greater than or equal to 2921	4200	2522	2.50	7

The 24-hour equivalent = median observation x IE+3 x 8/24 x 1/365 x 240/365.

___II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk should not be used if the air concentration exceeds 6 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The data were derived from a relatively large cohort. Effects of arsenic and smoking were accounted for in the quantitative analysis for cadmium effects.

An inhalation unit risk for cadmium based on the Takenaka et al. (1983) analysis is 9.2E-2 per (ug/cu.m). While this estimate is higher than that derived from human data [1.8E-3 per (ug/cu.m)] and thus more conservative, it was felt that the use of available human data was more reliable because of species variations in response and the type of exposure (cadmium salt vs. cadmium fume and cadmium oxide).

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

Source Document -- U.S. EPA, 1985

The Addendum to the Cadmium Health Assessment has received both Agency and external review.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 11/12/86

Verification Date -- 11/12/86

__II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William E. Pepelko / NCEA -- (202)260-5904

David Bayliss / NCEA -- (202)260-5726

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_III. HEALTH HAZARD ASSESSMENTS FOR VARIED EXPOSURE DURATIONS

__III.A. DRINKING WATER HEALTH ADVISORIES

Substance Name -- Cadmium
CASRN -- 7440-43-9

Not available at this time.

__III.B. OTHER ASSESSMENTS

Substance Name -- Cadmium
CASRN -- 7440-43-9

Content to be determined.

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_IV. U.S. EPA REGULATORY ACTIONS

Substance Name -- Cadmium
CASRN -- 7440-43-9

Last Revised -- 04/01/92

EPA risk assessments may be updated as new data are published and as assessment methodologies evolve. Regulatory actions are frequently not updated at the same time. Compare the dates for the regulatory actions in this section with the verification dates for the risk assessments in sections I and II, as this may explain inconsistencies. Also note that some regulatory actions consider factors not related to health risk, such as technical or economic feasibility. Such considerations are indicated for each action. In addition, not all of the regulatory actions listed in this section involve enforceable federal standards. Please direct any questions you may have concerning these regulatory actions to the U.S. EPA contact listed for that particular action. Users are strongly urged to read the background information on each regulatory action in Background Document 4 in Service Code 5.

__IV.A. CLEAN AIR ACT (CAA)

No data available

__IV.B. SAFE DRINKING WATER ACT (SDWA)

___IV.B.1. MAXIMUM CONTAMINANT LEVEL GOAL (MCLG) for Drinking Water

Value (status) -- 0.005 mg/L (Final, 1991)

Considers technological or economic feasibility? -- NO

Discussion -- Cadmium has been classed as a Category III contaminant with an MCLG of 0.005 mg/L based upon reports of renal toxicity in humans. The MCLG is based upon a DWEL of 0.018 mg/L and an assumed drinking water contribution (plus aquatic organisms) of 25 percent. An uncertainty factor of 10 was also applied.

Reference -- 56 FR 3526 (01/30/91)

EPA Contact -- Health and Ecological Criteria Division / OST /
(202) 260-7571 / FTS 260-7571; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.2. MAXIMUM CONTAMINANT LEVEL (MCL) for Drinking Water

Value (status) -- 0.005 mg/L (Final, 1991)

Considers technological or economic feasibility? -- YES

Discussion -- EPA has promulgated an MCL equal to the established MCLG of 0.005 mg/L.

Monitoring requirements -- Ground water systems monitored every three years; surface water systems monitored annually; systems out of compliance must begin monitoring quarterly until system is reliably and consistently below MCL.

Analytical methodology -- Atomic absorption/ furnace technique (EPA 213.2; SM 304); inductively coupled plasma (200.7): PQL= 0.002 mg/L.

Best available technology -- Coagulation/filtration; ion exchange; lime softening;
and reverse osmosis.

Reference -- 56 FR 3526 (01/30/91)

EPA Contact -- Drinking Water Standards Division / OGWDW /
(202) 260-7575 / FTS 260-7575; or Safe Drinking Water Hotline / (800) 426-4791

__IV.B.3. SECONDARY MAXIMUM CONTAMINANT LEVEL (SMCL) for Drinking Water

No data available

__IV.B.4. REQUIRED MONITORING OF "UNREGULATED" CONTAMINANTS

No data available

_IV.C. CLEAN WATER ACT (CWA)

__IV.C.1. AMBIENT WATER QUALITY CRITERIA, Human Health

Water and Fish Consumption: 1E+1 ug/L

Fish Consumption Only: None

Considers technological or economic feasibility? -- NO

Discussion -- The criteria is the same as the existing standard for drinking water.

Reference -- 45 FR 79318 (11/28/80)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.C.2. AMBIENT WATER QUALITY CRITERIA, Aquatic Organisms

Freshwater:

Acute -- 3.9E+0 ug/L (1-hour average)
Chronic -- 1.1E+0 ug/L (4-day average)

Marine:

Acute -- 4.3E+1 ug/L (1-hour average)
Chronic -- 9.3E+0 ug/L (4-day average)

Considers technological or economic feasibility? -- NO

Discussion -- Criteria were derived from a minimum data base consisting of acute and chronic tests on a variety of species. The freshwater criteria are hardness dependent. Values given here are calculated at a hardness of 100 mg/L CaCO3. A complete discussion can be found in the referenced notice.

Reference -- 50 FR 30784 (07/29/85)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.D. FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

__IV.D.1. PESTICIDE ACTIVE INGREDIENT, Registration Standard

Status -- Voluntary Cancellation [cadmium chloride] (1990)

Reference -- 55 FR 31227 (08/01/90)

EPA Contact -- Registration Branch / OPP
(703)557-7760 / FTS 557-7760

__IV.D.2. PESTICIDE ACTIVE INGREDIENT, Special Review

Action -- Termination of Special Review (1991)

Considers technological or economic feasibility? -- YES

Summary of regulatory action -- All uses of cadmium pesticides cancelled. Criterion of concern: oncogenicity, mutagenicity, teratogenicity, and fetotoxicity.

Reference -- 56 FR 14522 (04/10/91)

EPA Contact -- Special Review Branch / OPP
(703)557-7400 / FTS 557-7400

__IV.E. TOXIC SUBSTANCES CONTROL ACT (TSCA)

No data available

__IV.F. RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

___IV.F.1. RCRA APPENDIX IX, for Ground Water Monitoring

Status -- Listed

Reference -- 52 FR 25942 (07/09/87)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

__IV.G. SUPERFUND (CERCLA)

___IV.G.1. REPORTABLE QUANTITY (RQ) for Release into the Environment

Value (status) -- 10 pounds (Final, 1989)

Considers technological or economic feasibility? -- NO

Discussion -- The RQ for cadmium is 10 pounds, based on potential carcinogenicity. Available data indicate a hazard ranking of medium, based on a potency factor of 57.87/mg/kg/day and weight-of-evidence group B1, which corresponds to an RQ of 10 pounds. Cadmium has also been found to bioaccumulate in the tissues of aquatic and marine organisms, and has the potential to concentrate in the food chain. Reporting of releases of massive forms of this hazardous substance is not required if the diameter of the pieces released exceeds 100 micrometers (0.004 inches).

Reference -- 54 FR 33418 (08/14/89)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

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_VI. BIBLIOGRAPHY

Substance Name -- Cadmium
CASRN -- 7440-43-9
Last Revised -- 10/01/89

__VI.A. ORAL RfD REFERENCES

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U.S. EPA. 1985. Drinking Water Criteria Document on Cadmium. Office of Drinking Water, Washington, DC. (Final draft)

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WHO (World Health Organization). 1984. Guidelines for drinking water quality -- recommendations. Vol. 1. Geneva, Switzerland.

__VI.B. INHALATION RfD REFERENCES

None

__VI.C. CARCINOGENICITY ASSESSMENT REFERENCES

Armstrong, B.G. and G. Kazantzis. 1983. The mortality of cadmium workers.

Lancet. June 25, 1983: 1425-1427.

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Gilliavod, N. and A. Leonard. 1975. Mutagenicity tests with cadmium in the mouse. Toxicology. 5: 43-47.

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Kipling, M.D. and J.A.H. Waterhouse. 1967. Cadmium and prostatic carcinoma. Lancet. 1: 730.

Lemen, R.A., J.S. Lee, J.K. Wagoner and H.P. Blejer. 1976. Cancer mortality among cadmium production workers. Ann. N.Y. Acad. Sci. 271: 273.

Oberly, T., C.E. Piper and D.S. McDonald. 1982. Mutagenicty of metal salts in the L5178 Y mouse lymphoma assay. J. Toxicol. Environ. Health. 9: 367-376.

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U.S. EPA. 1985. Updated Mutagenicity and Carcinogenicity Assessment of Cadmium. Addendum to the Health Assessment Document for Cadmium (EPA 600/B-B1-023). EPA 600/B-83-025F.

Varner, M.O. 1983. Updated epidemiologic study of cadmium smelter workers. Presented at the Fourth International Cadmium Conference. Unpublished.

Watanabe, T., T. Shimada and A. Endo. 1979. Mutagenic effects of cadmium on mammalian oocyte chromosomes. Mutat. Res. 67: 349-356.

_VI.D. DRINKING WATER HA REFERENCES

None

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_VII. REVISION HISTORY

Substance Name -- Cadmium
CASRN -- 7440-43-9

Date	Section	Description
05/21/87	II.C.	Slope factor corrected
03/01/88	II.A.1.	Text added
03/01/88	II.C.3.	Text revised
03/01/88	II.C.4.	Confidence statement revised
03/01/88	II.D.3.	Secondary contact changed
01/01/89	IV.C.1.	Water quality human health criteria added
01/01/89	IV.C.2.	Corrected marine acute criterion
08/01/89	VI.	Bibliography on-line
10/01/89	I.A.	Oral RfD summary on-line
10/01/89	VI.A.	Oral RfD references added
12/01/89	I.B.	Inhalation RfD now under review
06/01/90	IV.A.1.	Area code for EPA contact corrected
06/01/90	IV.F.1.	EPA contact changed
08/01/90	II.A.1.	Basis statement revised
08/01/90	II.A.2.	Text revised, paragraph 1
08/01/90	II.B.	Text revised
01/01/91	II.	Text edited
01/01/91	II.C.1.	Inhalation slope factor removed (global change)
03/01/91	II.A.1.	Text revised
03/01/91	II.B.	Text revised
01/01/92	IV.	Regulatory actions updated
04/01/92	IV.A.1.	CAA regulatory action withdrawn
05/01/92	II.C.2.	Number correction in data table
06/01/92	II.A.2.	Text revised, paragraph 1
06/01/92	II.A.3.	Text clarified
02/01/94	I.A.7.	Secondary contact changed

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SYNONYMS

Substance Name -- Cadmium
CASRN -- 7440-43-9
Last Revised -- 03/31/87

7440-43-9
C.I. 77180
Cadmium
KADMIUM

0370
Mercury, elemental; CASRN 7439-97-6 (07/01/96)

Health risk assessment information on a chemical is included in IRIS only after a comprehensive review of chronic toxicity data by work groups composed of U.S. EPA scientists from several Program Offices. The summaries presented in Sections I and II represent a consensus reached in the review process. The other sections contain U.S. EPA information which is specific to a particular EPA program and has been subject to review procedures prescribed by that Program Office. The regulatory actions in Section IV may not be based on the most current risk assessment, or may be based on a current, but unreviewed, risk assessment, and may take into account factors other than health effects (e.g., treatment technology). When considering the use of regulatory action data for a particular situation, note the date of the regulatory action, the date of the most recent risk assessment relating to that action, and whether technological factors were considered. Background information and explanations of the methods used to derive the values given in IRIS are provided in the five Background Documents in Service Code 5, which correspond to Sections I through V of the chemical files.

STATUS OF DATA FOR Mercury, elemental

File On-Line 09/07/88

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	no data	
Inhalation RfC Assessment (I.B.)	on-line	06/01/95
Carcinogenicity Assessment (II.)	on-line	05/01/95
Drinking Water Health Advisories (III.A.)	no data	
U.S. EPA Regulatory Actions (IV.)	on-line	01/01/92

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_I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

__I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6

Not available at this time.

__I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6
Last Revised -- 06/01/95

The inhalation Reference Concentration (RfC) is analogous to the oral RfD and is likewise based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis, but may not exist for other toxic effects such as carcinogenicity. The inhalation RfC considers toxic effects for both the respiratory system (portal-of-entry) and for effects peripheral to the respiratory system (extrarespiratory effects). It is appropriately expressed in units of mg/cu.m. In general, the RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Inhalation RfCs are derived according to the Interim Methods for Development of Inhalation Reference Doses (EPA/600/8-88/066F August 1989) developed by U.S. EPA scientists and peer-reviewed. For more information on the interim nature of these methods and future plans see the INFOMORE Section of IRIS. RfCs can also be derived for the noncarcinogenic health effects of compounds which are carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file when a review of that evaluation is completed.

___I.B.1. INHALATION RfC SUMMARY

Critical Effect	Exposures*	UF	MF	RfC
Hand tremor; increases in memory disturbances; slight subjective and objective evidence of autonomic dysfunction	NOAEL: None LOAEL: 0.025 mg/cu.m (converted to LOAEL [ADJ] of 0.009 mg/cu.m	30	1	3E-4 mg/cu.m
Human occupational inhalation studies				
Fawer et al., 1983; Piikivi and Tolonen, 1989; Piikivi and Hanninen, 1989; Piikivi, 1989; Ngim et al., 1992; Liang et al., 1993				

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*Conversion Factors and Assumptions: This is an extrarespiratory effect of a vapor (gas). The LOAEL is based on an 8-hour TWA occupational exposure. MVho = 10 cu.m/day, MVh = 20 cu.m/day. LOAEL(HEC) = LOAEL(ADJ) = 0.025 mg/cu.m x MVho/MVh x 5 days/7 days = 0.009 mg/cu.m. Air concentrations (TWA) were measured in the Fawer et al. (1983), Ngim et al. (1992), and Liang et al. (1993) studies. Air concentrations were extrapolated from blood levels based on the conversion factor of Roels et al. (1987) as described in the Additional Comments section for the studies of Piikivi and Tolonen (1989), Piikivi and Hanninen (1989), and Piikivi (1989).

___I.B.2. PRINCIPAL AND SUPPORTING STUDIES (INHALATION RfC)

Fawer, R.F., U. DeRibaupierre, M.P. Guillemin, M. Berode and M. Lobe. 1983. Measurement of hand tremor induced by industrial exposure to metallic mercury. J. Ind. Med. 40: 204-208.

Piikivi, L. and U. Tolonen. 1989. EEG findings in chlor-alkali workers subjected to low long term exposure to mercury vapor. Br. J. Ind. Med. 46: 370-375.

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Ngim, C.H., S.C. Foo, K.W. Boey and J. Jeyaratnam. 1992. Chronic neurobehavioral effects of elemental mercury in dentists. Br. J. Ind. Med. 49: 782-790.

Liang, Y-X., R-K. Sun, Y. Sun, Z-Q. Chen and L-H. Li. 1993. Psychological effects of low exposure to mercury vapor: Application of a computer-administered neurobehavioral evaluation system. Environ. Res. 60: 320-327.

Fawer et al. (1983) used a sensitive objective electronic measure of intention tremor (tremors that occur at the initiation of voluntary movements) in 26 male workers (mean age of 44 years) exposed to low levels of mercury vapor in various occupations: fluorescent tube manufacture (n=7), chloralkali plants (n=12), and acetaldehyde production (n=7). Controls (n=25; mean age of 44.6 years) came from the same factories but were not exposed occupationally. Personal air samples (two per subject) were used to characterize an average exposure concentration of 0.026 mg/cu.m. It should be noted that it is likely that the levels of mercury in the air varied during the period of exposure and historical data indicate that previous exposures may have been higher. Exposure measurements for the control cohort were not performed. The average duration of exposure was 15.3 years. The measures of tremor were significantly increased in the exposed compared to control cohorts, and were shown to correspond to exposure and not to chronologic age. These findings are consistent with neurophysiological impairments that might result from accumulation of mercury in the cerebellum and basal ganglia. Thus, the TWA of

0.026 mg/cu.m was designated a LOAEL. Using the TWA and adjusting for occupational ventilation rates and workweek, the resultant LOAEL(HEC) is 0.009 mg/cu.m.

Piikivi and Tolonen (1989) used EEGs to study the effects of long-term exposure to mercury vapor in 41 chloralkali workers exposed for a mean of 15.6 +/- 8.9 years as compared with matched referent controls. They found that the exposed workers, who had mean blood Hg levels of 12 ug/L and mean urine Hg levels of 20 ug/L, tended to have an increased number of EEG abnormalities when analyzed by visual inspection only. When the EEGs were analyzed by computer, however, the exposed workers were found to have significantly slower and attenuated brain activity as compared with the referents. These changes were observed in 15% of the exposed workers. The frequency of these changes correlated with cortical Hg content (measured in other studies); the changes were most prominent in the occipital cortex less prominent in the parietal cortex, and almost absent in the frontal cortex. The authors extrapolated an exposure level associated with these EEG changes of 0.025 mg/cu.m from blood levels based on the conversion factor calculated by Roels et al. (1987).

Piikivi and Hanninen (1989) studied the subjective symptoms and psychological performances on a computer-administered test battery in 60 chloralkali workers exposed to mercury vapor for a mean of 13.7 +/- 5.5 years as compared with matched referent controls. The exposed workers had mean blood Hg levels of 10 ug/L and mean urine Hg levels of 17 ug/L. A statistically significant increase in subjective measures of memory disturbance and sleep disorders was found in the exposed workers. The exposed workers also reported more anger, fatigue and confusion. No objective disturbances in perceptual motor, memory or learning abilities were found in the exposed workers. The authors extrapolated an exposure level associated with these subjective measures of memory disturbance of 0.025 mg/cu.m from blood levels based on the conversion factor calculated by Roels et al. (1987).

Both subjective and objective symptoms of autonomic dysfunction were investigated in 41 chloralkali workers exposed to mercury vapor for a mean of 15.6 +/- 8.9 years as compared with matched referent controls (Piikivi, 1989). The quantitative non-invasive test battery consisted of measurements of pulse rate variation in normal and deep breathing, in the Valsalva maneuver and in vertical tilt, as well as blood pressure responses during standing and isometric work. The exposed workers had mean blood levels of 11.6 ug/L and mean urine levels of 19.3 ug/L. The exposed workers complained of more subjective symptoms of autonomic dysfunction than the controls, but the only statistically significant difference was an increased reporting of palpitations in the exposed workers. The quantitative tests revealed a slight decrease in pulse rate variations, indicative of autonomic reflex dysfunction, in the exposed workers. The authors extrapolated an exposure level associated with these subjective and objective measures of autonomic dysfunction of 0.030 mg/cu.m from blood levels based on the conversion factor calculated by Roels et al. (1987).

Two more recent studies in other working populations corroborate the neurobehavioral toxicity of low-level mercury exposures observed in the Fawer et al. (1983), Piikivi and Tolonen (1989), Piikivi and Hanninen (1989), and Piikivi (1989) studies.

Ngim et al. (1992) assessed neurobehavioral performance in a cross-sectional study of 98 dentists (38 female, 60 male; mean age 32, range 24-49 years) exposed to TWA concentrations of 0.014 mg/cu.m (range 0.0007 to 0.042 mg/cu.m) versus 54 controls (27 female, 27 male; mean age 34, range 23-50 years) with no history of occupational exposure to mercury. Air concentrations were measured with personal sampling badges over typical working hours (8-10 hours) and converted to an 8-hour TWA. No details on the number of exposure samples or exposure histories were provided. Blood samples from the exposed cohort were also taken and the data supported the correspondence calculated by Roels et al. (1987). Based on extrapolation of the average blood mercury concentration (9.8 ug/L), the average exposure concentration would be estimated at 0.023 mg/cu.m. The average duration of practice of the exposed dentists was 5.5 years. Exposure measurements of the control cohort were not performed. The exposed and control groups were adequately matched for age, amount of fish consumption, and number of amalgam dental fillings. The performance of the dentists was significantly worse than controls on a number of neurobehavioural tests measuring motor speed (finger tapping), visual scaning, visumotor coordination and concentration, visual memmory, and visuomotor coordination speed. These neurobehavioral effects are consistent with central and peripheral neurotoxicity and the TWA is considered a LOAEL. Using the TWA and adjusting for occupational ventilation rates and the reported 6-day workweek, the resultant LOAEL(HEC) is 0.006 mg/cu.m.

Liang et al. (1993) investigated workers in a fluorescent lamp factory with a computer-adminstered neurobehavioral evaluation system and a mood inventory profile. The exposed cohort (mean age 34.2 years) consisted of 19 females and 69 males exposed to ninterruptedly for at least 2 years prior to the study. Exposure was monitored with area samplers and ranged from 0.008 to 0.085 mg/cu.m across worksites. No details on how the exposure profiles to account for time spent in different worksites were constructed. The average exposure was estimated at 0.033 mg/cu.m. (range 0.005 to 0.19 mg/cu.m). The average duration was of working was 15.8 years for the exposed cohort. Urinary excretion was also monitored and reported to average 0.025 mg/L. The control cohort (mean age 35.1 years) consisted of 24 females and 46 males recruited from an embroidery factory. The controls were matched for age, education, smoking and drinking habits. Exposure measurements for the control cohort were not performed. The exposed cohort performed significantly worse than the control on tests of finger tapping, mental arithmetic, two-digit searches, switiching attention, and visual reaction time. The effect on performance persisted after the confounding factor of chronological age was controlled. Based on these neurobehavioral effects, the TWA of 0.033 mg/cu.m is designated as LOAEL. Using the TWA and adjusting for occupational ventilation rates and workweek, the resultant LOAEL(HEC) is 0.012 mg/cu.m.

The above studies were taken together as evidence for a LOAEL based on neurobehavioral effects of low-level mercury exposures. The LOAEL(HEC) levels calculated on measured air concentration levels of the Ngim et al. (1992) and the Liang et al. (1993) studies bracket that calculated based on the air concentrations measured by Fawer et al. (1983) as a median HEC level. Extrapolations of blood levels, used as biological monitoring that accounts for variability in exposure levels, also converge at 0.025 mg/cu.m as a TWA which results in the same HEC level. Thus, the TWA level of 0.025 mg/cu.m was used to represent the exposure for the synthesis of the studies described above. Using this TWA and taking occupational ventilation rates and workweek into account results in a LOAEL(HEC) of 0.009 mg/cu.m.

___I.B.3. UNCERTAINTY AND MODIFYING FACTORS (INHALATION RfC)

UF -- An uncertainty factor of 10 was used for the protection of sensitive human subpopulations (including concern for acrodynia - see Additional Comments section) together with the use of a LOAEL. An uncertainty factor of 3 was used for lack of data base, particularly developmental and reproductive studies.

MF -- None

___I.B.4. ADDITIONAL COMMENTS (INHALATION RfC)

Probably the most widely recognized form of hypersensitivity to mercury poisoning is the uncommon syndrome known as acrodynia, also called erythredema polyneuropathy or pink disease (Warkany and Hubbard, 1953). Infantile acrodynia was first described in 1828, but adult cases have also since been reported. While acrodynia has generally been associated with short-term exposures and with urine levels of 50 ug/L or more, there are some cases in the literature in which mercury exposure was known to have occurred, but no significant (above background) levels in urine were reported. There could be many reasons for this, but the most likely is that urine levels are not a simple measure of body burden or of target tissue (i.e., brain levels); however, they are the best means available for assessing the extent of exposure. It was felt that the RfC level estimated for mercury vapor based on neurotoxicity of chronic exposure in workers is adequate to protect children from risk of acrodynia because such exposures of long duration would be expected to raise urine levels by only 0.12 ug/L against a background level of up to 20 ug/L (i.e., such exposures would not add significantly to the background level of mercury in those exposed).

Roels et al. (1987) investigated the relationships between the concentrations of metallic mercury in air and levels monitored in blood or urine in workers exposed during manufacturing of dry alkaline batteries. Breathing zone personal samples were used to characterize airborne mercury vapors. Total mercury in blood and urine samples were analyzed using atomic absorption. The investigation controlled for several key factors including the use of reliable personal air monitoring, quality control for blood and urine analyses, standardization of the urinary mercury concentration for creatinine concentration, and stability of exposure conditions (examined subjects were exposed to mercury vapor for at least 1 year). Strong correlations were found between the daily intensity of exposure to mercury vapor and the end of workshift levels in blood ($r=0.86$; $n=40$) or urine ($r=0.81$; $n=34$). These relationships indicated a conversion factor of 1:4.5 (air:blood) and 1:1.22 (air:urine as ug/g creatinine). These factors were used to extrapolate blood or urine levels associated with effects in the reported studies to airborne mercury levels.

Sensory and motor nerve conduction velocities were studied in 18 workers from a mercury cell chlorine plant (Levine et al., 1982). Time-integrated urine Hg levels were used as an indicator of mercury exposure. Using linearized regression analysis, the authors found that motor and sensory nerve conduction velocity changes (i.e., prolonged distal latencies correlated with the time-integrated urinary Hg levels in asymptomatic exposed workers) occurred when urinary Hg levels exceeded 25 ug/L. This study demonstrates that mercury exposure can be associated with preclinical evidence of peripheral neurotoxicity.

Singer et al. (1987) studied nerve conduction velocity of the median motor, median sensor and sural nerves in 16 workers exposed to various inorganic mercury compounds (e.g., mercuric oxides, mercurial chlorides, and phenyl mercuric acid) for an average of 7.3 +/- 7.1 years as compared with an unexposed control group using t-tests. They found a slowing of nerve conduction velocity in motor, but not sensory, nerves that correlated with increased blood and urine Hg levels and an increased number of neurologic symptoms. The mean mercury levels in the exposed workers were 1.4 and 10 ug/L for blood and urine, respectively. These urine levels are 2-fold less than those associated with peripheral neurotoxicity in other studies (e.g., Levine et al., 1982). There was considerable variability in the data presented by Singer et al. (1987), however, and the statistical analyses (t-test) were not as rigorous as those employed by Levine et al. (1982) (linearized regression analysis). Furthermore, the subjects in the Levine et al. (1982) study were asymptomatic at higher urinary levels than those reported to be associated with subjective neurological complaints in the workers studied by Singer et al. (1987). Therefore, these results are not considered to be as reliable as those reported by Levine et al. (1982).

Miller et al. (1975) investigated several subclinical parameters of neurological dysfunction in 142 workers exposed to inorganic mercury in either the chloralkali industry or a factory for the manufacture of magnetic materials. They reported a significant increase in average forearm tremor frequency in workers whose urinary Hg concentrations exceeded 50 ug/L as compared with unexposed controls. Also observed were eyelid fasciculation, hyperactive deep-tendon reflexes and dermatographia, but there was no correlation between the incidence of these findings and urinary Hg levels.

Roels et al. (1985) examined 131 male and 54 female workers occupationally exposed to mercury vapor for an average duration of 4.8 years. Urinary mercury (52 and 37 ug/g creatinine for males and females, respectively) and blood mercury levels (14 and 9 ug/L for males and females, respectively) were recorded, but atmospheric mercury concentration was not provided. Symptoms indicative of CNS disorders were reported but not related to mercury exposure. Minor renal tubular effects were detected in mercury-exposed males and females and attributed to current exposure intensity rather (urinary Hg >50 ug/g creatinine) than exposure duration. Male subjects with urinary mercury levels of >50 ug/g creatinine exhibited preclinical signs of hand tremor. It was noted that females did not exhibit this effect and that their urinary mercury never reached the level of 50 ug/g creatinine. A companion study (Roels et al., 1987) related air mercury (Hg-air)levels to blood mercury (Hg-blood) and urinary mercury (Hg-U) values in 10 workers in a chloralkali battery plant. Duration of exposure was not specified. A high correlation was reported for Hg-air and Hg-U for preshift exposure ($r=0.70$, $p<0.001$) and post-shift ($r=0.81$, $p<0.001$) measurements. Based on these data and the results of their earlier (1985) study, the investigators suggested that some mercury-induced effects may occur when Hg-U levels exceed 50 ug/g creatinine, and that this value corresponds to a mercury TWA of about 40 ug/cu.m.

A survey of 567 workers at 21 chloralkali plants was conducted to ascertain the effects of mercury vapor inhalation (Smith et al., 1970). Mercury levels ranged from <0.01 to 0.27 mg/cu.m and chlorine concentrations ranged from 0.1 to 0.3 ppm at most of the working stations of these plants. Worker exposure to mercury levels (TWA) varied, with 10.2% of the workers being exposed to <0.01 mg/cu.m, 48.7% exposed to 0.01 to 0.05 mg/cu.m, 25.6% exposed to 0.06 to 0.10 mg/cu.m and 4.8% exposed to 0.24 to 0.27 mg/cu.m (approximately 85% were exposed to Hg levels less than or equal to 0.1 mg/cu.m). The duration of employment for the examined workers ranged from one year (13.3%) to >10 years (31%), with 55.7% of the workers being employed for 2 or 9 years. A group of 600 workers not exposed to chlorine served as a control group for assessment of chlorine effects, and a group of 382 workers not exposed to either chlorine or mercury vapor served as the reference control group. A strong positive correlation ($p<0.001$) was found between the mercury TWAs and the reporting of subjective neuropsychiatric symptoms (nervousness, insomnia), occurrence of objective tremors, and weight and appetite loss. A positive correlation ($p<0.001$) was also found between mercury exposure levels and urinary and blood mercury levels of test subjects. No adverse alterations in cardiorespiratory, gastrointestinal, renal or hepatic functions were attributed to the mercury vapor exposure. Additionally, biochemical (hematologic data, enzyme activities) and clinical measurements (EKG, chest X-rays) were no different between the mercury-exposed and non-exposed workers. No significant signs or symptoms were noted for individuals exposed to mercury vapor concentrations less than or equal to 0.1 mg/cu.m. This study provides data indicative of a NOAEL of 0.1 mg Hg/cu.m and a LOAEL of 0.18 mg Hg/cu.m. In a followup study conducted by Bunn et al. (1986), however, no significant differences in the frequency of objective or subjective findings such as weight loss and appetite loss were observed in workers exposed to mercury at levels that ranged between 50 and 100 ug/L. The study by Bunn et al. (1986) was limited, however, by the lack of information provided regarding several methodological questions such as quality assurance measures and control of possible confounding variables.

The mercury levels reported to be associated with preclinical and symptomatic neurological dysfunction are generally lower than those found to affect kidney function, as discussed below.

Piikivi and Ruokonen (1989) found no evidence of glomerular or tubular damage in 60 chloralkali workers exposed to mercury vapor for an average of 13.7 +/- 5.5 years as compared with their matched referent controls. Renal function was assessed by measuring urinary albumin and N-acetyl-beta-glucosaminidase (NAG) activity. The mean blood Hg level in the exposed workers was 14 ug/L and the mean urinary level was 17 ug/L. The authors extrapolated the NOAEL for kidney effects based on these results of 0.025 mg/cu.m from blood levels using the conversion factor calculated by Roels et al. (1987).

Stewart et al. (1977) studied urinary protein excretion in 21 laboratory workers exposed to 10-50 ug/cu.m of mercury. Their urinary level of mercury was about 35 ug/L. Increased proteinuria was found in the exposed workers as compared with unexposed controls. When preventive measure were instituted to limit exposure to mercury, proteinuria was no longer observed in the exposed technicians.

Lauwerys et al. (1983) found no change in several indices of renal function (e.g., proteinuria, albuminuria, urinary excretion of retinol-binding protein, aminoaciduria, creatinine in serum, beta-2-microglobulin in serum) in 62 workers exposed to mercury vapor for an average of 5.5 years. The mean urinary Hg excretion in the exposed workers was 56 ug/g creatinine, which corresponds to an exposure level of about 46 ug/cu.m according to a conversion factor of 1:1.22 (air:urine [ug/g creatinine]) (Roels et al., 1987). Despite the lack of observed renal effects, 8 workers were found to have an increased in serum anti-laminin antibodies, which can be indicative of immunological effects. In a followup study conducted by Bernard et al. (1987), however, there was no evidence of increased serum anti-laminin antibodies in 58 workers exposed to mercury vapor for an average of 7.9 years. These workers had a mean urinary Hg excretion of 72 ug/g creatinine, which corresponds to an exposure levels of about 0.059 mg/cu.m.

Stonard et al. (1983) studied renal function in 100 chloralkali workers exposed to inorganic mercury vapor for an average of 8 years. No changes in the following urinary parameters of renal function were observed at mean urinary Hg excretion rates of 67 ug/g creatinine: total protein, albumin, alpha-1-acid glycoprotein, beta-2-microglobulin, NAG, and gamma-glutamyl transferase. When urinary Hg excretion exceeded 100 ug/g creatinine, a small increase in the prevalence of higher activities of NAG and gamma-glutamyl transferase was observed.

The mercury levels reported to be associated with preclinical and symptomatic neurological dysfunction and kidney effects are lower than those found to pulmonary function, as discussed below.

McFarland and Reigel (1978) described the cases of 6 workers who were acutely exposed (4-8 hours) to calculated metallic mercury vapor levels of 1.1 to 44 mg/cu.m. These men exhibited a combination of chest pains, dyspnea, cough, hemoptysis, impairment of pulmonary function (reduced vital capacity), diffuse pulmonary infiltrates and evidence of interstitial pneumonitis. Although the respiratory symptoms resolved, all six cases exhibited chronic neurological dysfunction, presumably as a result of the acute, high-level exposure to mercury vapor.

Lilis et al. (1985) described the case of a 31-year-old male who was acutely exposed to high levels of mercury vapor in a gold-extracting facility. Upon admission to the hospital, the patient exhibited dyspnea, chest pain with deep inspiration, irregular infiltrates in the lungs and reduced pulmonary function (forced vital capacity [FVC]). The level of mercury to which he was exposed is not known, but a 24-hour urine collection contained 1900 ug Hg/L. Although the patient improved gradually over the next several days, 11 months after exposure he still showed signs of pulmonary function abnormalities (e.g., restriction and diffusion impairment).

Levin et al. (1988) described four cases of acute high-level mercury exposure during gold ore purification. The respiratory symptoms observed in these four cases ranged from minimal shortness of breath and cough to severe hypoxemia. The most severely affected patient exhibited mild interstitial lung disease both radiographically and on pulmonary function testing. One patient had a urinary Hg level of 245 ug/L upon hospital admission. The occurrence of long-term respiratory effects in these patients could not be evaluated since all but one refused follow-up treatment.

Ashe et al. (1953) reported that there was no histopathological evidence of respiratory damage in 24 rats exposed to 0.1 mg Hg/cu.m 7 hr/day, 5 days/week for 72 weeks. This is equivalent to a NOAEL[HEC] of 0.07 mg/cu.m.

Kishi et al. (1978) observed no histopathological changes in the lungs of rats exposed to 3 mg/cu.m of mercury vapor 3 hours/day, 5 days/week for 12-42 weeks.

Beliles et al. (1967) observed no histopathological changes in the lungs of pigeons exposed to 0.1 mg/cu.m of mercury vapor 6 hours/day, 5 days/week for 20 weeks.

Neurological signs and symptoms (i.e., tremors) were observed in 79 workers exposed to metallic mercury vapor whose urinary mercury levels exceeded 500 ug/L. Short-term memory deficits were reported in workers whose urine levels were less than 500 ug/L (Langolf et al., 1978).

Impaired performance in mechanical and visual memory tasks and psychomotor ability tests was reported by Forzi et al. (1978) in exposed workers whose urinary Hg levels exceeded 100 ug/L.

Decreased strength, decreased coordination, increased tremor, decreased sensation and increased prevalence of Babinski and snout reflexes were exhibited by 247 exposed workers whose urinary Hg levels exceeded 600 ug/L. Evidence of clinical neuropathy was observed at urinary Hg levels that exceeded 850 ug/L (Albers et al., 1988).

Preclinical psychomotor dysfunction was reported to occur at a higher incidence in 43 exposed workers (mean exposure duration of 5 years) whose mean urinary excretion of Hg was 50 ug/L. Workers in the same study whose mean urinary Hg excretion was 71 ug/L had a higher incidence of total proteinuria and albuminuria (Roels et al., 1982).

Postural and intention tremor was observed in 54 exposed workers (mean exposure duration of 7.7 years) whose mean urinary excretion of Hg was 63 ug/L (Roels et al., 1989).

Verbeck et al. (1986) observed an increase in tremor parameters with increasing urinary excretion of mercury in 21 workers exposed to mercury vapor for 0.5-19 years. The LOAEL for this effect was a mean urinary excretion of 35 ug/g creatinine.

Rosenman et al. (1986) evaluated routine clinical parameters (physical exams, blood chemistry, urinalysis), neuropsychological disorders, urinary NAG, motor nerve conduction velocities and occurrence of lenticular opacities in 42 workers of a chemical plant producing mercury compounds. A positive correlation ($p<0.05$ to $p<0.001$) was noted between urinary mercury (levels ranged from 100-250 ug/L) and the number of neuropsychological symptoms, and

NAG excretions and the decrease in motor nerve conduction velocities.

Evidence of renal dysfunction (e.g., increased plasma and urinary concentrations of beta-galactosidase, increased urinary excretion of high-molecular weight proteins and a slightly increased plasma beta-2-microglobulin concentration) was observed in 63 chloralkali workers. The incidence of these effects increased in workers whose urinary Hg excretion exceeded 50 ug/g creatinine (Buchet et al., 1980).

Increased urinary NAG levels were found in workers whose urinary Hg levels exceeded 50 ug/L (Langworth et al., 1992).

An increase in the concentration of urinary brush border proteins (BB-50) was observed in 20 workers whose mean urinary Hg excretion exceeded 50 ug/g creatinine (Mutti et al., 1985).

Foa et al. (1976) found that 15 out of 81 chloralkali workers exposed to 60-300 ug/cu.m mercury exhibited proteinuria.

An increased excretion of beta-glutamyl transpeptidase, indicative of renal dysfunction, was found in 509 infants dermally exposed to phenylmercury via contaminated diapers (Gotelli et al., 1985).

Berlin et al. (1969) exposed rats, rabbits and monkeys to 1 mg/cu.m of mercury vapor for 4 hours and measured the uptake and distribution of mercury in the brain as compared with animals injected intravenously with the same doses of mercury as mercuric salts. Mercury accumulated in the brain following inhalation exposure to metallic mercury vapor at levels that were 10 times higher than those observed following intravenous injection of the same dose of mercury as mercuric salts. These results demonstrate that mercury is taken up by the brain following inhalation of the vapor at higher levels than other forms of mercury and that this occurs in all species studied.

Limited animal studies concerning inhalation exposure to inorganic mercury are available. The results of a study conducted by Baranski and Szymczyk (1973) were reported in an English abstract. Adult female rats were exposed to metallic mercury vapor at 2.5 mg/cu.m for 3 weeks prior to fertilization and during gestation days 7-20. A decrease in the number of living fetuses was observed in the dams compared with unexposed controls, and all pups born to the exposed dams died by the sixth day after birth. However, no difference in the occurrence of developmental abnormalities was observed between exposed and control groups. The cause of death of the pups in the mercury-exposed group was unknown, although an unspecified percentage of the deaths was attributed by the authors to a failure of lactation in the dams. Death of pups was also observed in another experiment where dams were only exposed prior to fertilization (to 2.5 mg/cu.m), which supports the conclusion that the high mortality in the first experiment was due at least in part to poor health of the mothers. Without further information, this study must be considered inconclusive regarding developmental effects.

The only other study addressing the developmental toxicology of mercury is the one reported in abstract form by Steffek et al. (1987) and, as such, is included as a supporting study. Sprague-Dawley rats (number not specified) were exposed by inhalation to mercury vapor at concentrations of 0.1, 0.5 or

1.0 mg/cu.m throughout the period of gestation (days 1-20) or during the period of organogenesis (days 10-15). The authors indicated the exposure protocols to be chronic and acute exposure, respectively. At either exposure protocol, the lowest mercury level produced no detectable adverse effect. At 0.5 mg/cu.m, an increase in the number of resorptions (5/41) was noted for the acute group, and two of 115 fetuses exhibited gross cranial defects in the chronic group. At 1.0 mg/cu.m, the number of resorptions was increased in acute (7/71) and chronic (19/38) groups and a decrease in maternal and fetal weights also was detected in the chronic exposure group. No statistical analysis for these data was provided. A LOAEL of 0.5 mg/cu.m is provided based on these data.

Mishinova et al. (1980) investigated the course of pregnancy and parturition in 349 women exposed via inhalation to metallic mercury vapors (unspecified concentrations) in the workplace as compared to 215 unexposed women. The authors concluded that the rates of pregnancy and labor complication were high among women exposed to mercury and that the effects depended on "the length of service and concentration of mercury vapors." Lack of sufficient details preclude the evaluation of dose-response relationships.

In a questionnaire that assessed the fertility of male workers exposed to mercury vapor, Lauwerys et al. (1985) found no statistically significant change in the observed number of children born to the exposed group compared with a matched control group. The urinary excretion of mercury in the exposed workers ranged from 5.1 to 272.1 ug/g creatinine.

Another study found that exposure to metallic mercury vapor caused prolongation of estrus cycles in animals. Baranski and Szymczyk (1973) reported that female rats exposed via inhalation to mercury vapor at an average of 2.5 mg/cu.m, 6 hours/day, 5 days/week for 21 days experienced longer estrus cycles than unexposed animals. In addition, estrus cycles during mercury exposure were longer than normal estrus cycles in the same animals prior to exposure. Although the initial phase of the cycle was protracted, complete inhibition of the cycle did not occur. During the second and third weeks of exposure, these rats developed signs of mercury poisoning including restlessness, seizures and trembling of the entire body. The authors speculated that the effects on the estrus cycle were caused by the action of mercury on the CNS (i.e., damage to the hypothalamic regions involved in the control of estrus cycling).

Renal toxicity has been reported following oral exposure to inorganic mercury salts in animals, with the Brown-Norway rat appearing to be uniquely sensitive to this effect. These mercury-induced renal effects in the Brown-Norway rat are the basis for the oral RfD for mercurial mercury. Several investigators have produced autoimmune glomerulonephritis by administering HgCl2 to Brown-Norway rats (Druet et al., 1978).

The current OSHA standard for mercury vapor is 0.05 mg/cu.m. NIOSH recommends a TWA Threshold Limit Value of 0.05 mg/cu.m for mercury vapor.

___I.B.5. CONFIDENCE IN THE INHALATION RfC

Study -- Medium
Data Base -- Medium
RfC -- Medium

Due to the use of a sufficient number of human subjects, the inclusion of appropriate control groups, the exposure duration, the significance level of the reported results and the fact that exposure levels in a number of the studies had to be extrapolated from blood mercury levels, confidence in the key studies is medium. The LOAEL values derived from these studies can be corroborated by other human epidemiologic studies. The adverse effects reported in these studies are in accord with the well-documented effects of mercury poisoning. The lack of human or multispecies reproductive/ developmental studies precludes assigning a high confidence rating to the data base and inadequate quantification of exposure levels. Based on these considerations, the RfC for mercury is assigned a confidence rating of medium.

___I.B.6. EPA DOCUMENTATION AND REVIEW OF THE INHALATION RfC

Source Document -- U.S. EPA, 1995

This IRIS summary is included in The Mercury Study Report to Congress which was reviewed by OHEA and EPA's Mercury Work Group in November 1994. An interagency review by scientists from other federal agencies took place in January 1995. The report was also reviewed by a panel of non-federal external scientists in January 1995 who met in a public meeting on January 25-26. All reviewers comments have been carefully evaluated and considered in the revision and finalization of this IRIS summary. A record of these comments is summarized in the IRIS documentation files.

Other EPA Documentation -- None

Agency Work Group Review -- 11/16/89, 03/22/90, 04/19/90

Verification Date -- 04/19/90

___I.B.7. EPA CONTACTS (INHALATION RfC)

Annie M. Jarabek / NCEA -- (919)541-4847

William F. Sette / OPP -- (703)305-6375

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_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6
Last Revised -- 05/01/95

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6
Preparation Date -- 5/24/94

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on inadequate human and animal data. Epidemiologic studies failed to show a correlation between exposure to elemental mercury vapor and carcinogenicity; the findings in these studies were confounded by possible or known concurrent exposures to other chemicals, including human carcinogens, as well as lifestyle factors (e.g., smoking). Findings from genotoxicity tests are severely limited and provide equivocal evidence that mercury adversely affects the number or structure of chromosomes in human somatic cells.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. A number of epidemiological studies were conducted that examined mortality among elemental mercury vapor-exposed workers. Conflicting data regarding a correlation between mercury exposure and an increased incidence of cancer mortalities have been obtained. All of the studies have limitations that complicate interpretation of their results for associations between mercury exposure and induction of cancer; increased cancer rates were attributable to other concurrent exposures or lifestyle factors.

A retrospective cohort study examined mortality among 5663 white males who worked between 1953 and 1963 at a plant in Oak Ridge, Tennessee, where elemental mercury was used for lithium isotope separation (Cragle et al., 1984). The workers were divided into three cohorts: exposed workers who had been monitored on a quarterly basis for mercury levels in urine (n=2,133); workers exposed in the mercury process section for whom urinalysis monitoring data were not collected (n=270); and unexposed workers from other sections of the nuclear weapons production facility (n=3260). The study subjects worked at least 4 months during 1953-1958 (a period when mercury exposures were likely to be high); mortality data from death certificates were followed through the end of 1978. The mean age of the men at first employment at the facility was 33 years, and the average length of their employment was >16 years with a mean of 3.73 years of estimated mercury exposure. Air mercury levels were monitored beginning in 1955; during 1955 through the third quarter of 1956, air mercury levels were reportedly above 100 ug/cu.m in 30-80% of the samples. Thereafter, air mercury levels decreased to concentrations below 100 ug/cu.m. The mortality experience (i.e., the SMR) of each group was compared with the age-adjusted mortality experience of the U.S. white male population. Among exposed and monitored workers, no significant increases in mortality from cancer at any site were reported, even after the level or length of exposure was considered. A significantly lower mortality from all causes was observed. An excessive number of deaths was reportedly due to lung cancer in the exposed and monitored workers (42 observed, 31.36 expected), but also in the unexposed workers (71 observed, 52.93 expected). The SMR for each group was 1.34; the elevated incidence of lung cancer deaths was, therefore, attributed to some other factor at the plant and/or to lifestyle factors (e.g., smoking) common to both the exposed and unexposed groups. Study limitations include small cohort sizes for cancer mortality, which limited the statistical stability of many comparisons.

Barregard et al. (1990) studied mortality and cancer morbidity between 1958 and 1984 in 1190 workers from eight Swedish chloralkali plants that used the mercury cell process in the production of chlorine. The men included in the study had been monitored for urinary or blood mercury for more than one year between 1946 and 1984. Vital status and cause of death were ascertained from the National Population Register and the National Bureau of Statistics. The cancer incidence of the cohort was obtained from the Swedish Cancer Register. The observed total mortality and cancer incidences were compared with those of the general Swedish male population. Comparisons were not made between exposed and unexposed workers. Mean urinary mercury levels indicated a decrease in exposure between the 1950s and 1970s; the mean urinary mercury level was 200 ug/L during the 1950s, 150 ug/L during the 1960s and 50 ug/L in the 1970s. Mortality from all causes was not significantly increased in exposed workers. A significant increase in deaths from lung tumors was observed in exposed workers 10 years or more after first exposure (rate ratio, 2.0; 95% CI, 1.0-3.8). Nine of the 10 observed cases of lung cancer occurred among workers (457 of the 1190) possibly exposed to asbestos as well as to mercury. No dose response was observed with respect to mercury exposure and lung tumors. This study is limited because no quantitation was provided on smoking status, and results were confounded by exposure to asbestos.

Ahlbom et al. (1986) examined the cancer mortality during 1961-1979 of cohorts of Swedish dentists and dental nurses aged 20-64 and employed in 1960 (3454 male dentists, 1125 female dentists, 4662 female dental nurses). Observed incidences were compared with those expected based on cancer incidence during 1961-1979 among all Swedes employed during 1960 and the proportion of all Swedes employed as dentists and dental nurses. Data were stratified by sex, age (5-year age groups) and county. The incidence of glioblastomas among the dentists and dental nurses combined was significantly increased compared to survival rates (SMR, 2.1; 95% CI, 1.3-3.4); the individual groups had apparently elevated SMRs (2.0-2.5), but the 95% confidence intervals of these groups included unity. By contrast, physicians and nurses had SMRs of only 1.3 and 1.2, respectively. Exposure to mercury could not be established as the causative factor because exposure to other chemicals and X-rays was not ruled out.

Amandus and Costello (1991) examined the association between silicosis and lung cancer mortality between 1959 and 1975 in 9912 white male metal miners employed in the United States between 1959 and 1961. Mercury exposures were not monitored. Exposures to specific metals among the silicotic and nonsilicotic groups were analyzed separately. Lung cancer mortality in both silicotic and nonsilicotic groups was compared with rates in white males in the U.S. population. Both silicotic (n=11) and nonsilicotic mercury miners (n=263) had significantly increased lung cancer mortality (SMR, 14.03; 95% CI, 2.89-40.99 for silicotics. SMR, 2.66; 95% CI, 1.15-5.24 for nonsilicotics). The analysis did not focus on mercury miners, and confounders such as smoking and radon exposure were not analyzed with respect to mercury exposure. This study is also limited by the small sample size for non-silicotic mercury miners.

A case-control study of persons admitted to a hospital in Florence, Italy, with lung cancer between 1981-1983 was performed to evaluate occupational risk factors (Buiatti et al., 1985). Cases were matched with one or two controls (persons admitted to the hospital with diagnoses other than lung cancer or suicide) with respect to sex, age, date of admission and smoking status. Women who had "ever worked" as hat makers had a significantly increased risk of lung cancer. The duration of employment as a hat maker averaged 22.2 years, and latency averaged 47.8 years. Workers in the Italian hat industry were known to be occupationally exposed to mercury; however, the design of this study did not allow evaluation of the relationship between cumulative exposure and cancer incidence. In addition, interpretation of the results of this study is limited by the small sample size (only 6/376 cases reported this occupation) and by exposure of hat makers to other pollutants including arsenic, a known lung carcinogen.

Ellingsen et al. (1992) examined the total mortality and cancer incidence among 799 workers employed for more than 1 year in two Norwegian chloralkali plants. Mortality incidence between 1953 and 1988 and cancer incidence between 1953 and 1989 were examined. Mortality and cancer incidence were compared with that of the age-adjusted general male Norwegian population. No increase in total cancer incidence was reported, but lung cancer was significantly elevated in the workers (rate ratio, 1.66; 95% CI, 1.0-2.6). No causal relationship can be drawn from the study between mercury exposure and lung cancer because no correlation existed between cumulative mercury dose, years of employment or latency time. Also, the prevalence of smoking was 10 20% higher in the exposed workers, and many workers were also exposed to asbestos.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. Druckrey et al. (1957) administered 0.1 mL of metallic mercury to 39 male and female rats (BD III and BD IV strains) via intraperitoneal injection. Among the rats surviving longer than 22 months, 5/12 developed peritoneal sarcomas. The increase in the incidence of sarcomas was observed only in those tissues that had been in direct contact with the mercury. Although severe kidney damage was reported in all treated animals, no renal tumors or tumors at any site other than the peritoneal cavity were observed.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Cytogenetic monitoring studies of workers occupationally exposed to mercury by inhalation provide very limited evidence that mercury adversely affects the number or structure of chromosomes in human somatic cells. Popescu et al. (1979) compared four men exposed to elemental mercury vapor with an unexposed group and found a statistically significant increase in the incidence of chromosome aberrations in the WBCs from whole blood. Verschaeve et al. (1976) found an increase in aneuploidy after exposure to low concentrations of vapor, but results could not be repeated in later studies (Verschaeve et al., 1979). Mabille et al. (1984) did not find increases in structural chromosomal aberrations of lymphocytes of exposed workers. Similarly, Barregard et al. (1991) found no increase in the incidence or size of micronuclei and no correlation between micronuclei and blood or urinary mercury levels of chloralkali workers. A statistically significant correlation was observed between cumulative exposure to mercury and micronuclei induction in T lymphocytes in exposed workers, suggesting a genotoxic effect.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

Source document -- U.S. EPA, 1995

This IRIS summary is included in The Mercury Study Report to Congress which was reviewed by OHEA and EPA's Mercury Work Group in November 1994. An interagency review by scientists from other federal agencies took place in January 1995. The report was also reviewed by a panel of non-federal external scientists in January 1995 who met in a public meeting on January 25-26. All reviewers comments have been carefully evaluated and considered in the revision and finalization of this IRIS summary. A record of these comments is summarized in the IRIS documentation files.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 01/13/88, 03/03/94

Verification Date -- 03/03/94

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Rita Schoeny / NCEA -- (513)569-7544

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_III. HEALTH HAZARD ASSESSMENTS FOR VARIED EXPOSURE DURATIONS

__III.A. DRINKING WATER HEALTH ADVISORIES

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6

Not available at this time.

__III.B. OTHER ASSESSMENTS

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6

Content to be determined.

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_IV. U.S. EPA REGULATORY ACTIONS

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6
Last Revised -- 01/01/92

EPA risk assessments may be updated as new data are published and as assessment methodologies evolve. Regulatory actions are frequently not updated at the same time. Compare the dates for the regulatory actions in this section with the verification dates for the risk assessments in sections I and II, as this may explain inconsistencies. Also note that some regulatory actions consider factors not related to health risk, such as technical or economic feasibility. Such considerations are indicated for each action. In addition, not all of the regulatory actions listed in this section involve enforceable federal standards. Please direct any questions you may have concerning these regulatory actions to the U.S. EPA contact listed for that particular action. Users are strongly urged to read the background information on each regulatory action in Background Document 4 in Service Code 5.

__IV.A. CLEAN AIR ACT (CAA)

No data available

__IV.B. SAFE DRINKING WATER ACT (SDWA)

___IV.B.1. MAXIMUM CONTAMINANT LEVEL GOAL (MCLG) for Drinking Water

Value -- 0.002 mg/L (Final, 1991)

Considers technological or economic feasibility? -- NO

Discussion -- EPA has promulgated a MCLG of 0.002 mg/L based on potential adverse effects (renal toxicity) in three major studies. The MCLG is based upon a DWEL of 0.01 mg/L and an assumed drinking water contribution of 20 percent.

Reference -- 56 FR 3526 (01/30/91)

EPA Contact -- Health and Ecological Criteria Division / OST /
(202) 260-7571 / FTS 260-7571; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.2. MAXIMUM CONTAMINANT LEVEL (MCL) for Drinking Water

Value -- 0.002 mg/L (Final, 1991)

Considers technological or economic feasibility? -- YES

Discussion -- EPA has set an MCL equal to the MCLG of 0.002 mg/L.

Monitoring requirements -- Ground water systems monitored every three years; surface water systems monitored annually; systems out of compliance must begin monitoring quarterly until system is reliably and consistently below MCL.

Analytical methodology -- Manual cold vapor technique (EPA 245.1; ASTM D3223-80; SM 303F); automated cold vapor technique (EPA 245.2): PQL=0.0005 mg/L.

Best available technology -- Coagulation/filtration; Lime softening; Reverse osmosis; Granular activated carbon.

Reference -- 56 FR 3526 (01/30/91)

EPA Contact -- Drinking Water Standards Division / OGWDW /
(202) 260-7575 / FTS 260-7575; or Safe Drinking Water Hotline / (800) 426-4791

___IV.B.3. SECONDARY MAXIMUM CONTAMINANT LEVEL (SMCL) for Drinking Water

No data available

___IV.B.4. REQUIRED MONITORING OF "UNREGULATED" CONTAMINANTS

No data available

_IV.C. CLEAN WATER ACT (CWA)

___IV.C.1. AMBIENT WATER QUALITY CRITERIA, Human Health

Water and Fish Consumption: 1.44E-1 ug/L

Fish Consumption Only: 1.46E-1 ug/L

Considers technological or economic feasibility? -- NO

Discussion -- The WQC of 1.44E-1 ug/L is based on consumption of contaminated aquatic organisms and water. A WQC of 1.46E-1 ug/L has also been established based on consumption of contaminated aquatic organisms alone.

Reference -- 45 FR 79318 (11/28/80); 50 FR 30784 (07/29/85)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.C.2. AMBIENT WATER QUALITY CRITERIA, Aquatic Organisms

Freshwater:

Acute -- 2.4E+0 ug/L (1-hour average)
Chronic -- 1.2E-2 ug/L (4-day average)

Marine:

Acute -- 2.1E+0 ug/L (1-hour average)
Chronic -- 2.5E-2 ug/L (4-day average)

Considers technological or economic feasibility? -- NO

Discussion -- Criteria were derived from a minimum data base consisting of acute tests on a variety of species. Requirements and methods are covered in the reference to the Federal Register. The Agency recommends an exceedence frequency of no more than 3 years.

Reference -- 45 FR 79318 (11/28/80); 50 FR 30784 (07/29/85)

EPA Contact -- Criteria and Standards Division / OWRS
(202)260-1315 / FTS 260-1315

__IV.D. FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

No data available

__IV.E. TOXIC SUBSTANCES CONTROL ACT (TSCA)

No data available

__IV.F. RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

__IV.F.1. RCRA APPENDIX IX, for Ground Water Monitoring

Status -- Listed (total mercury)

Reference -- 52 FR 25942 (07/09/87)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

__IV.G. SUPERFUND (CERCLA)

__IV.G.1. REPORTABLE QUANTITY (RQ) for Release into the Environment

Value (status) -- 1 pound (Final, 1989)

Considers technological or economic feasibility? -- NO

Discussion -- The final RQ for mercury is based on aquatic toxicity. The available data indicate that the aquatic 96-Hour Median Threshold Limit is less than 0.1 ppm, which corresponds to an RQ of 1 pound.

Reference -- 54 FR 33418 (08/14/89)

EPA Contact -- RCRA/Superfund Hotline
(800)424-9346 / (202)260-3000 / FTS 260-3000

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_VI. BIBLIOGRAPHY

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6
Last Revised -- 06/01/95

__VI.A. ORAL RfD REFERENCES

None

__VI.B. INHALATION RfC REFERENCES

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__VI.D. DRINKING WATER HA REFERENCES

None

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_VII. REVISION HISTORY

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6

Date	Section	Description
09/07/88	II.	Carcinogen summary on-line
09/01/89	VI.	Bibliography on-line
12/01/89	I.B.	Inhalation RfD now under review
05/01/91	II.A.3.	Text edited
01/01/92	IV.	Regulatory Action section on-line
04/01/94	II.	Carcinogenicity assessment noted as pending change
04/01/94	II.D.2.	Work group review date added
05/01/95	All	Name changed from mercury (inorganic)
05/01/95	II.	Carcinogen assessment replaced
05/01/95	VI.C.	Carcinogen assessment references replaced
06/01/95	I.B.	Inhalation RfC summary on-line
06/01/95	VI.B.	Inhalation RfC references on-line

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SYNONYMS

Substance Name -- Mercury, elemental
CASRN -- 7439-97-6
Last Revised -- 05/01/95

7439-97-6
hydragyrum
Mercury
Mercury, elemental
Mercury, inorganic
Mercury, metallic
Mercury (organo) alkyl compounds
Caswell No. 546
COLLOIDAL MERCURY
EPA Pesticide Chemical Code 052301
KWIK [Dutch]
Liquid Silver

Mercure [French]
Mercurio [Italian]
Mercurio [Spanish]
Mercury compounds
Mercury vapor
NCI-C60399
Quecksilber [German]
Quicksilver

SUMMARY OF INTAKE CALCULATIONS FROM RISK*ASSISTANT

RECEPTOR	CONSTITUENT	AVG. DAILY INTAKE FOR PATHWAY: Leachate Dermal (mg/kg/d)	AVG. DAILY INTAKE FOR PATHWAY: Exposed Waste Incidential Ingestion (mg/kg/d)	AVG. DAILY INTAKE FOR PATHWAY: Dust Inhalation (mg/m3)	LIFETIME AVERAGE DAILY INTAKE: Leachate Dermal (mg/kg/d)	LIFETIME AVERAGE DAILY INTAKE: Exposed Waste Incidential Ingestion (mg/kg/d)	LIFETIME AVERAGE DAILY INTAKE: Dust Inhalation (mg/m3)
Worker - Current Conditions							
	arsenic	0.000014			0.000005		
	cadmium	0.00000036			0.00000013		
	mercury	0.00000012			0.000000043		
Worker - Future							
	arsenic	0.000014	0.000001	0.000000023	0.000005	0.00000045	0.00003500
	cadmium	0.00000036			0.00000013		
	mercury	0.00000012			0.000000043		
Trespasser - Future							
	arsenic	0.000016	0.000007	0.000000032	0.000002	0.00000069	0.00000400
	cadmium	0.00000043			0.000000043		
	mercury	0.00000015			0.000000015		

INTAKE CALCULATIONS FOR INHALATION - CONVERSION FROM AIR CONCENTRATION

	CA (mg/m3)	IR (m3/hr)	ET (hr/day)	EF (day/yr)	ED (yr)	BW (kg)	AT (ED*365d/yr)	ADI (mg/kg/d)
1 Worker - Average Daily Intake for Particulates								
	0.000001	2.5	8	30	25	70	9125	2.34834E-08
2 Trespasser - Average Daily Intake for Particulates								
	0.000001	2.29	4	65	7	50.6	2555	3.22378E-08

TERMS:

CA	Concentration in air from Risk*AssistantTM
IR	Inhalation Rate
ET	Exposure Time
EF	Exposure Frequency
ED	Exposure Duration
BW	Body Weight
ATnc	Averaging Time for noncarcinogenic effects = ED * 365 days/yr

Worker

R*A Custom Report

RISK*ASSISTANT for Windows Report

11/26/96
12:27

Approach

The procedures used by **RISK*ASSISTANT** to calculate exposures have been reviewed by the Office of Health and Environmental Assessment of the U.S. EPA. Default parameters for calculating exposures have been extracted from these U.S.EPA documents:

U.S.EPA, Office of Solid Waste and Emergency Response, *Risk Assessment Guidance for Superfund*,Volume I: Human Health Evaluation Manual,Supplemental Guidance: Standard Default Exposure Factors. Directive 9285.6-03; Interim Final. March 25, 1991.

J.Konz, K.Lisi, and E. Friebele, *Exposure Factors Handbook* U.S.EPA, Office of Health and Environmental Assessment, EPA/600/8-89/043; March 1989.

Contaminated Media in Analysis

The following table lists the environmental media considered in this analysis (out of a possible set of groundwater, surface water, air, soil, sediment, vegetables, fruits, meat, dairy, and fish).

Surface Water = Leachate
Soil = Ash

Chemical Concentrations in Contaminated Media

The concentration values presented in this table are expressed using the S.I. (Systeme Internationale, also called metric) units most commonly employed in risk assessment. They may differ from the units used in data entry.

CAS#	Chemical Name	GW ug/l	SW ug/l	Air ug/cu m	Soil mg/kg	Sed mg/kg	Veget ug/kg	Fruit ug/kg	Fish ug/kg	Dairy ug/kg	Meat ug/kg
7440-38-2	ARSENIC AND COMPOUNDS		379.300		21.680						
7440-43-9	CADMIUM AND COMPOUNDS		10								
7439-97-6	MERCURY		3.4								

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
GW = Groundwater, SW = Surface Water, Sed = Sediment, Veget = Vegetable.

The listed concentration in each medium for a chemical reflects the selection of sample values employed in aggregation, the aggregation method selected, and the approach used for dealing with qualified data. Where concentration data were entered directly, the assessor should be prepared to explain the values that were chosen.

Exposure Scenarios

In **RISK*ASSISTANT**,every exposure scenario is associated with a single contaminated medium. While some scenarios potentially apply to more than one medium, any individual assessment must assign a scenario to only one contaminated medium.

Surface Water = Leachate
Swimming = Dermal
Soil = Ash
Dust/Soil Outdoors

The dose and concentration estimates in this assessment, as well as any risk estimates that are derived from them, refer only to the specific exposures that have been described. This description consists of:

- Contaminant concentrations in one or more environmental media.
- For each contaminated medium, one or more scenarios describing how a person contacts that medium.
- Parameters that describe each scenario, both in general, and for each potential route of exposure (oral, inhalation, or dermal).

An assessment that incorporates other exposures, or that does not incorporate all of the exposures described in this analysis, will yield different results. This list presents the exposure scenarios evaluated for each contaminated medium considered in this assessment.

Exposure Parameters Used to Generate Exposure Estimates

The dose (or exposure concentration) values presented in this assessment reflect not only the concentrations of contaminants in various environmental media and the exposure pathways selected for analysis, but also the specific numerical parameters applied to each exposure scenario. The following tables summarize the exposure parameters used in this assessment.

Population: User Defined
General Population Parameters

Body Weight:	70.00	kg
Lifetime:	70.00	years
Exposure Period:	25	years

Scenario Specific Parameters

Scenario	General Parameters					
	Event Frequency			Event Duration		
Swimming	30	events	per year	8	hours	per event
Dust/Soil Outdoors	30	events	per year	8	hours	per event

Scenario	ORAL					INHALATION			DERMAL	
	Amount Ingested			Fraction Contamin.		Breathing Rate			Exposed Skin Area	
Swimming	0	ml	per hour	100	%				3800	sq.cm
Dust/Soil Outdoors	50	mg	per event	100	%	2.5	cu.m	per hour		

Cross-Media Transfer Equations Used to Generate Exposure Estimates

For some exposure scenarios a contaminant concentration specified in one environmental medium must be converted to a concentration in another medium, to which a person is exposed. (For example, in order to evaluate inhalation exposures while showering, contaminant concentrations in domestic water must be converted to concentrations in bathroom air.) The following equations were used in this assessment to predict such cross-media contaminant transfers in each of the indicated exposure scenarios.

INHALATION OF PARTICULATES OUTSIDE THE RESIDENCE - Soil or Sediment to respirable Particulates

REFERENCES: Wark, K. & Warner, C.F. *Air Pollution: Its Origin and Control,* Second Ed., New York: Harper & Row, 1981.
EQUATION: C(i) = D * R * f * C(s)

PARAMETERS		User Value	
	C(i) Inhaled Concentration of Contaminant	Calculated	
	C(s) Concentration in Soil	Chemical Specific	
R	=Respirable Fraction of Dust	73.00%	
f	=Proportion of Contaminated Dust	1.00%	
D	=Dust Concentration	75.00 ug	per cu.m

Concentrations in Media after Transfers

For some exposure scenarios a contaminant concentration specified in one environmental medium must be converted to a concentration in another medium, to which a person is exposed. For example, in order to evaluate inhalation exposures while showering, contaminant concentrations in domestic water must be converted to concentrations in bathroom air. The values presented in this table are concentrations of contaminants in exposure media that have been predicted for specific exposure scenarios from concentrations that were specified in other media.

Chemical Name / Contaminated Media / Scenario	GW ug/l	SW ug/l	Air ug/cu m	Soil mg/kg	Sed mg/kg	Veget ug/kg	Fruit ug/kg	Fish ug/kg	Dairy ug/kg	Meat ug/kg	Derm.Ab. mg/sq cm
						Calculated Concentrations					
7440-38-2 **ARSENIC AND COMPOUNDS**											
Surface Water											
Swimming											0.000003
Soil											
Dust/Soil Outdoors			0.000001								
7440-43-9 **CADMIUM AND COMPOUNDS**											
Surface Water											
Swimming											8.0e-008
7439-97-6 **MERCURY**											
Surface Water											
Swimming											2.7e-008

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
GW = Groundwater, SW = Surface Water, Sed = Sediment, Veget = Vegetable.
Derm.Ab. = Dermal Absorption Rate, (1) Indicates Outside Model Bounds, (2) Indicates Missing Data

The accuracy of these predicted concentrations depends upon the extent to which the cross-media transfer equations used to derive them are appropriate to the specific exposure under consideration, and upon the use of appropriate parameter values in those equations. The values reported for dermal absorption are not concentrations, but rather represent rates of contaminant absorption, stated as milligrams of contaminant absorbed per square centimeter of exposed skin for each exposure event.

Average Daily Dose or Exposure Concentration

When an exposure assessment will be used as part of a quantitative risk assessment, a numerical estimate of exposure must be calculated. The value employed for this estimate varies, according to the route of exposure.

When evaluating the risk of chronic non-cancer health effects from oral or dermal exposures, EPA employs the Average Daily Dose (ADD) received during the period of exposure. These are compared to Reference Doses (RfDs). When evaluating such effects from inhalation exposure, EPA employs contaminant concentrations, which are compared to Reference Concentrations (RfCs) for continuous exposure.

ADD = Average Daily Dose (during exposure period).
Units are milligrams of contaminant per kilogram of body weight per day.

Inh.Conc = Concentration of contaminant in inhaled air.
Units are milligrams of contaminant per cubic meter of air.

Medium	Route	Scenario / Chemical	ADD/Inhalation Concentration (mg/kg/d) or (mg/cu m)
Surface Water	Oral	Swimming	

	7440-38-2	ARSENIC AND COMPOUNDS	0
	7440-43-9	CADMIUM AND COMPOUNDS	0
	7439-97-6	MERCURY	0
	Dermal	**Swimming**	
	7440-38-2	ARSENIC AND COMPOUNDS	0.000014
	7440-43-9	CADMIUM AND COMPOUNDS	3.6e-007
	7439-97-6	MERCURY	1.2e-007
Soil	**Oral**	**Dust/Soil Outdoors**	
	7440-38-2	ARSENIC AND COMPOUNDS	0.000001
	7440-43-9	CADMIUM AND COMPOUNDS	
	7439-97-6	MERCURY	
	Inhalation	**Dust/Soil Outdoors**	
	7440-38-2	ARSENIC AND COMPOUNDS	0.000001
	7440-43-9	CADMIUM AND COMPOUNDS	
	7439-97-6	MERCURY	

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
ADD/LADD values are meaningful up to the second significant digit.

Lifetime Average Daily Dose or Adjusted Exposure Concentration

When evaluating carcinogenic risks from exposures that last less than a lifetime, the ADD or exposure concentration is adjusted to a dose or concentration that would yield an equivalent exposure if exposure continued for the entire lifetime.

For oral or dermal exposures, this yields the Lifetime Average Daily Dose (LADD):

LADD = ADD * (exposure period in years / lifetime in years)

For inhalation exposures, this yields the Adjusted Concentration:

Adjusted Concentration = Concentration * (exposure period / lifetime)

Typically (and in **RISK*ASSISTANT**), the adjusted concentration will also incorporate adjustments for differences between the actual exposure pattern and the assumed pattern of continuous lifetime exposure. For example, if exposure only occurred for one hour each day, the Adjusted Concentration would be only 1/24th of the concentration during that hour.

LADD =Lifetime Average Daily Dose.
Units are milligrams of contaminant per kilogram of body weight per day.

Adj.Inh.Conc =Adjusted Inhaled Concentration: Continuous concentration equivalent to exposure concentration; considering frequency and duration of exposure and inhalation rate.
Units are micrograms of contaminant per cubic meter.

Medium	Route	Scenario Chemical	LADD/Adjusted Inhalation Concentration (mg/kg/d) or (ug/cu m)
Surface Water	**Oral**	**Swimming**	
	7440-38-2	ARSENIC AND COMPOUNDS	0
	7440-43-9	CADMIUM AND COMPOUNDS	0
	7439-97-6	MERCURY	0
	Dermal	**Swimming**	
	7440-38-2	ARSENIC AND COMPOUNDS	0.000005
	7440-43-9	CADMIUM AND COMPOUNDS	1.3e-007
	7439-97-6	MERCURY	4.3e-008
Soil	**Oral**	**Dust/Soil Outdoors**	
	7440-38-2	ARSENIC AND COMPOUNDS	4.5e-007
	7440-43-9	CADMIUM AND COMPOUNDS	
	7439-97-6	MERCURY	
	Inhalation	**Dust/Soil Outdoors**	
	7440-38-2	ARSENIC AND COMPOUNDS	0.000035
	7440-43-9	CADMIUM AND COMPOUNDS	
	7439-97-6	MERCURY	

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
ADD/LADD values are meaningful up to the second significant digit.

Trespasser

R*A Custom Report

11/26/96
12:33

Approach

The procedures used by **RISK*ASSISTANT** to calculate exposures have been reviewed by the Office of Health and Environmental Assessment of the U.S. EPA. Default parameters for calculating exposures have been extracted from these U.S.EPA documents:

U.S.EPA, Office of Solid Waste and Emergency Response, *Risk Assessment Guidance for Superfund*,Volume I: Human Health Evaluation Manual,Supplemental Guidance: Standard Default Exposure Factors. Directive 9285.6-03; Interim Final. March 25, 1991.

J.Konz, K.Lisi, and E. Friebele, *Exposure Factors Handbook* U.S.EPA, Office of Health and Environmental Assessment, EPA/600/8-89/043; March 1989.

Contaminated Media in Analysis

The following table lists the environmental media considered in this analysis (out of a possible set of groundwater, surface water, air, soil, sediment, vegetables, fruits, meat, dairy, and fish).

Surface Water = Leachate
Soil = Ash

Chemical Concentrations in Contaminated Media

The concentration values presented in this table are expressed using the S.I. (Systeme Internationale, also called metric) units most commonly employed in risk assessment. They may differ from the units used in data entry.

CAS#	Chemical Name	GW ug/l	SW ug/l	Air ug/cu m	Soil mg/kg	Sed mg/kg	Veget ug/kg	Fruit ug/kg	Fish ug/kg	Dairy ug/kg	Meat ug/kg
7440-38-2	ARSENIC AND COMPOUNDS		379.300		21.680						
7440-43-9	CADMIUM AND COMPOUNDS		10								
7439-97-6	MERCURY		3.4								

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
GW = Groundwater, SW = Surface Water, Sed = Sediment, Veget = Vegetable.

The listed concentration in each medium for a chemical reflects the selection of sample values employed in aggregation, the aggregation method selected, and the approach used for dealing with qualified data. Where concentration data were entered directly, the assessor should be prepared to explain the values that were chosen.

Exposure Scenarios

In **RISK*ASSISTANT**,every exposure scenario is associated with a single contaminated medium. While some scenarios potentially apply to more than one medium, any individual assessment must assign a scenario to only one contaminated medium.

Surface Water = Leachate
Swimming = Wading
Soil = Ash
Dust/Soil Outdoors

The dose and concentration estimates in this assessment, as well as any risk estimates that are derived from them, refer only to the specific exposures that have been described. This description consists of:

- Contaminant concentrations in one or more environmental media.
- For each contaminated medium, one or more scenarios describing how a person contacts that medium.
- Parameters that describe each scenario, both in general, and for each potential route of exposure (oral, inhalation, or dermal).

An assessment that incorporates other exposures, or that does not incorporate all of the exposures described in this analysis, will yield different results. This list presents the exposure scenarios evaluated for each contaminated medium considered in this assessment.

Exposure Parameters Used to Generate Exposure Estimates

The dose (or exposure concentration) values presented in this assessment reflect not only the concentrations of contaminants in various environmental media and the exposure pathways selected for analysis, but also the specific numerical parameters applied to each exposure scenario. The following tables summarize the exposure parameters used in this assessment.

Population: User Defined
General Population Parameters

Body Weight:	56.10	kg
Lifetime:	70.00	years
Exposure Period:	7	years

Scenario Specific Parameters

Scenario	General Parameters					
	Event Frequency			Event Duration		
Swimming	65	events	per year	2.6	hours	per event
Dust/Soil Outdoors	65	events	per year	4	hours	per event

Scenario	ORAL					INHALATION			DERMAL	
	Amount Ingested			Fraction Contamin.		Breathing Rate			Exposed Skin Area	
Swimming	0	ml	per hour	100	%				5225	sq.cm
Dust/Soil Outdoors	100	mg	per event	100	%	0.71	cu.m	per hour		

Cross-Media Transfer Equations Used to Generate Exposure Estimates

For some exposure scenarios a contaminant concentration specified in one environmental medium must be converted to a concentration in another medium, to which a person is exposed. (For example, in order to evaluate inhalation exposures while showering, contaminant concentrations in domestic water must be converted to concentrations in bathroom air.) The following equations were used in this assessment to predict such cross-media contaminant transfers in each of the indicated exposure scenarios.

INHALATION OF PARTICULATES OUTSIDE THE RESIDENCE - Soil or Sediment to respirable Particulates

REFERENCES: Wark, K. & Warner, C.F. *Air Pollution: Its Origin and Control,* Second Ed., New York: Harper & Row, 1981.
EQUATION: C(i) = D * R * f * C(s)

PARAMETERS		User Value	
	C(i) Inhaled Concentration of Contaminant	Calculated	
	C(s) Concentration in Soil	Chemical Specific	
R	=Respirable Fraction of Dust	73.00%	
f	=Proportion of Contaminated Dust	1.00%	
D	=Dust Concentration	75.00 ug	per cu.m

Concentrations in Media after Transfers

For some exposure scenarios a contaminant concentration specified in one environmental medium must be converted to a concentration in another medium, to which a person is exposed. For example, in order to evaluate inhalation exposures while showering, contaminant concentrations in domestic water must be converted to concentrations in bathroom air. The values presented in this table are concentrations of contaminants in exposure media that have been predicted for specific exposure scenarios from concentrations that were specified in other media.

Chemical Name Contaminated Media / Scenario	GW ug/l	SW ug/l	Air ug/cu m	Soil mg/kg	Sed mg/kg	Veget ug/kg	Fruit ug/kg	Fish ug/kg	Dairy ug/kg	Meat ug/kg	Derm.Ab. mg/sq cm
						Calculated Concentrations					
7440-38-2 **ARSENIC AND COMPOUNDS**											
Surface Water											
Swimming											0.000001
Soil											
Dust/Soil Outdoors			0.000001								
7440-43-9 **CADMIUM AND COMPOUNDS**											
Surface Water											
Swimming											2.6e-008
7439-97-6 **MERCURY**											
Surface Water											
Swimming											8.8e-009

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
GW = Groundwater, SW = Surface Water, Sed = Sediment, Veget = Vegetable.
Derm.Ab. = Dermal Absorption Rate, (1) Indicates Outside Model Bounds, (2) Indicates Missing Data

The accuracy of these predicted concentrations depends upon the extent to which the cross-media transfer equations used to derive them are appropriate to the specific exposure under consideration, and upon the use of appropriate parameter values in those equations. The values reported for dermal absorption are not concentrations, but rather represent rates of contaminant absorption, stated as milligrams of contaminant absorbed per square centimeter of exposed skin for each exposure event.

Average Daily Dose or Exposure Concentration

When an exposure assessment will be used as part of a quantitative risk assessment, a numerical estimate of exposure must be calculated. The value employed for this estimate varies, according to the route of exposure.

When evaluating the risk of chronic non-cancer health effects from oral or dermal exposures, EPA employs the Average Daily Dose (ADD) received during the period of exposure. These are compared to Reference Doses (RfDs). When evaluating such effects from inhalation exposure, EPA employs contaminant concentrations, which are compared to Reference Concentrations (RfCs) for continuous exposure.

ADD = Average Daily Dose (during exposure period).
Units are milligrams of contaminant per kilogram of body weight per day.

Inh.Conc = Concentration of contaminant in inhaled air.
Units are milligrams of contaminant per cubic meter of air.

Medium	Scenario	Route Chemical	ADD/Inhalation Concentration (mg/kg/d) or (mg/cu m)
Surface Water	**Swimming**	**Oral**	

		7440-38-2	ARSENIC AND COMPOUNDS	0
		7440-43-9	CADMIUM AND COMPOUNDS	0
		7439-97-6	MERCURY	0
		Dermal		
		7440-38-2	ARSENIC AND COMPOUNDS	0.000016
		7440-43-9	CADMIUM AND COMPOUNDS	4.3e-007
		7439-97-6	MERCURY	1.5e-007
Soil	**Dust/Soil Outdoors**	**Oral**		
		7440-38-2	ARSENIC AND COMPOUNDS	0.000007
		7440-43-9	CADMIUM AND COMPOUNDS	
		7439-97-6	MERCURY	
		Inhalation		
		7440-38-2	ARSENIC AND COMPOUNDS	0.000001
		7440-43-9	CADMIUM AND COMPOUNDS	
		7439-97-6	MERCURY	

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
ADD/LADD values are meaningful up to the second significant digit.

Lifetime Average Daily Dose or Adjusted Exposure Concentration

When evaluating carcinogenic risks from exposures that last less than a lifetime, the ADD or exposure concentration is adjusted to a dose or concentration that would yield an equivalent exposure if exposure continued for the entire lifetime.

For oral or dermal exposures, this yields the Lifetime Average Daily Dose (LADD):

LADD = ADD * (exposure period in years / lifetime in years)

For inhalation exposures, this yields the Adjusted Concentration:

Adjusted Concentration = Concentration * (exposure period / lifetime)

Typically (and in **RISK*ASSISTANT**), the adjusted concentration will also incorporate adjustments for differences between the actual exposure pattern and the assumed pattern of continuous lifetime exposure. For example, if exposure only occurred for one hour each day, the Adjusted Concentration would be only 1/24th of the concentration during that hour.

LADD =Lifetime Average Daily Dose.
Units are milligrams of contaminant per kilogram of body weight per day.

Adj.Inh.Conc =Adjusted Inhaled Concentration: Continuous concentration equivalent to exposure concentration; considering frequency and duration of exposure and inhalation rate.
Units are micrograms of contaminant per cubic meter.

Medium	**Scenario**	**Route**		**LADD/Adjusted Inhalation Concentration**
			Chemical	**(mg/kg/d) or (ug/cu m)**
Surface Water	**Swimming**	**Oral**		
		7440-38-2	ARSENIC AND COMPOUNDS	0
		7440-43-9	CADMIUM AND COMPOUNDS	0
		7439-97-6	MERCURY	0
		Dermal		
		7440-38-2	ARSENIC AND COMPOUNDS	0.000002
		7440-43-9	CADMIUM AND COMPOUNDS	4.3e-008
		7439-97-6	MERCURY	1.5e-008
Soil	**Dust/Soil Outdoors**	**Oral**		
		7440-38-2	ARSENIC AND COMPOUNDS	6.9e-007
		7440-43-9	CADMIUM AND COMPOUNDS	
		7439-97-6	MERCURY	
		Inhalation		
		7440-38-2	ARSENIC AND COMPOUNDS	0.000004
		7440-43-9	CADMIUM AND COMPOUNDS	
		7439-97-6	MERCURY	

NOTE: scientific notation is used for numbers less that 0.000001 and greater than 1000000.
For example:0.00000021 = 2.1e-7 = 2.1 / 10000000 and 21000000 = 2.1e7 = 2.1 * 10000000.
ADD/LADD values are meaningful up to the second significant digit.

RISK CALCULATIONS

1 Noncarcinogenic Risk

CONSTITUENT	Leachate - Dermal (mg/kg/d)	adj. RfD	HQ	Exp.Waste - Incidental Ingestion (mg/kg/d)	RfDo	HQ	Dust - Inhalation (mg/kg/d)	RfDi	HQ
Worker - Current Conditions									
arsenic	0.000014	0.00006	0.233333			0			0
cadmium	0.00000036	0.0001	0.0036			0			0
mercury	0.00000012	0.00006	0.002			0			0
	Pathway HQ		0.238933			0			0
	TOTAL HI								**0.24**
Worker - Future									
arsenic	0.000014	0.00006	0.233333	0.000001	0.0003	0.00333333	0.000000023	0.0003	0.00007667
cadmium	0.00000036	0.0001	0.0036			0.000000			0
mercury	0.00000012	0.00006	0.002			0.000000			0
	Pathway HQ		0.238933			0.00333333			0.000076667
	TOTAL HI								**0.24**
Trespasser - Future									
arsenic	0.000016	0.00006	0.266667	0.000007	0.0003	0.116666667	0.000000032	0.0003	0.000106667
cadmium	0.00000043	0.0001	0.0043			0			0
mercury	0.00000015	0.00006	0.0025			0			0
	Pathway HQ		0.273467			0.116666667			0.000106667
	TOTAL HI								**0.39**

2 Carcinogenic Risk

CONSTITUENT	Leachate - Dermal (mg/kg/d)	adj. CPS	Riski	Exp. Waste - Incidental Ingestion (mg/kg/d)	CPSo	Riski	Dust Conc. (mg/m3)	URFi	Riski
Worker - Current Conditions									
arsenic	0.000005	4.3	2.15E-05			0.00E+00			0.00E+00
cadmium	0.00000013	31.5	4.10E-06			0.00E+00			0.00E+00
	Pathway Risk		2.56E-05			0.00E+00			0.00E+00
	TOTAL RISK								**2.56E-05**
Worker - Future									
arsenic	0.000005	4.3	2.15E-05	0.00000045	0.86	3.87E-07	0.00003500	4.3	8.14E-06
cadmium	0.00000013	31.5	4.10E-06			0.00E+00			0.00E+00
	Pathway Risk		2.56E-05			3.87E-07			8.14E-06
	TOTAL RISK								**3.41E-05**
Trespasser - Future									
arsenic	0.000002	4.3	8.60E-06	0.00000069	0.86	5.93E-07	0.00000400	4.3	9.30E-07
cadmium	4.3E-08	31.5	1.35E-06			0			0.00E+00
	Pathway Risk		9.95E-06			5.93E-07			9.30E-07
	TOTAL RISK								**1.15E-05**

Ground-Water Protection Screening Levels for Inorganic Compounds

SSL (mg/kg) = Cw(Kd + (Ow + Oa)/pb)

PARAMETER	DEFINITION	UNITS	INORGANICS				
			arsenic	cadmium	mercury	nickel	selenium
Kd	soil-water partition coefficient	L/kg	29	120	145	21	5
Ow	water-filled soil porosity	cm3-H2O/cm3-soil	0.3	0.3	0.3	0.3	0.3
Oa	air-filled soil porosity	cm3-air/cm3-soil	0.13	0.13	0.13	0.13	0.13
H'	Henry's Law Constant	unitless	0	0	0	0	0
pb	dry bulk soil density	kg/L	1.5	1.5	1.5	1.5	1.5
Cw usable	target soil leachate concentration (MCL X 100 DAF)	mg/L	5	0.5	0.2	10	5
SSL	Soil Screening Level for protection of to useable groundwater	mg/kg	146	60.1	29.04	212	26

Note:
input parameters obtained from EPA Technical Background Document for Soil Screening Guidance (EPA/540/R-94/106)
Soil Screening Levels calculated for pH 6.8 soils according to EPA's Draft Soil Screening Guidance (December 30, 1994)

Appendix D

CORRECTIVE MEASURES

Appendix D

List of Contents

1. Modification of the Ground-Water Monitoring Program at the Gibbons Crerek Steam Electric Station
2. Part I Closure Plan

F.I.F

Calvin Woods, P.E., Consulting Engineer
303 Barton Street, Hearne, Texas 77859

MODIFICATION OF THE GROUND-WATER MONITORING PROGRAM AT THE GIBBONS CREEK STEAM ELECTRIC STATION (Ash Landfill Site and Ash Ponds)

INTRODUCTION

This report describes the location and construction of monitoring wells and piezometers at the Ash Landfill Site and the Ash Ponds at the Gibbons Creek Steam Electric Station (GCSES) operated by the Texas Municipal Power Agency (TMPA).

GROUND-WATER MONITOR WELL PLACEMENT--ASH LANDFILL AREA

PURPOSE:

The Gibbons Creek Steam Electric Station operation currently disposes its fly-ash, bottom-ash, and stabilized sludge within an above grade, clay lined landfill. This study was initiated to determine whether existing wells at the site were adequate for the monitoring of ground-water quality.

OBJECTIVES

1. Describe and classify the specific geologic units upon which the landfill is constructed.
2. Assess the suitability of existing groundwater wells for monitoring groundwater quality.
3. Recommend, as needed, the addition of ground-water monitor wells about the perimeter of the landfill which could be demonstrated to sample those geologic members subject to impact from the landfill. Documentation for these wells to include: elevation of screened interval, lithologic description of the units penetrated by the boring, and description of the geologic unit sampled by the monitor well.

LANDFILL SITE DESCRIPTION:

The ash landfill is located entirely within the Eocene age Jackson Group. Specifically the landfill is constructed upon the Wellborn and Caddell Formations of the Jackson Group. These units strike nearly parallel the present Gulf coast and dip 1/2 to 2 degrees to the south-southeast.

The Caddell Formation is interpreted to be prodelta shelf muds. Lignitic clays and crossbedded sandstones suggest fluvial or deltaic deposition of some of the upper beds of the Caddell Formation. Monitor well MW-10 was established to sample the ground-water quality in the upper portion of the Caddell Formation.

The Wellborn Formation is divided into five units. From oldest to youngest these include: the Bedias sandstone member, an unnamed shale member (referred to in this study as the lower Middle Wellborn shale), the Middle Wellborn sandstone member, and another unnamed shale member (referred to in this study as the upper Middle Wellborn shale).

Marine faunal content and lateral continuity indicate that the Bedias sandstone is probably of beach and littoral origin. The lower Middle Wellborn shale has been interpreted as marsh and lagoonal, due to the presence of finely disseminated lignite, low sand content, and petrified wood fragments. The Middle Wellborn sand has been interpreted as fluvial in origin due to the lack of marine fossils and discontinuity along strike. The upper Middle Wellborn shale is of nonmarine origin due to its high lignite content.

Existing wells were not throughly documented. Consequently, there was an unknown possibility that the existing wells were sampling across more than one formation.

RESULTS:

Initial information was gathered from a literature survey of existing engineering reports and geological references. Information obtained from the literature survey was then ground-truthed in the field by observing geologic outcrops and core samples collected from a single 72 foot boring. This boring was sited to provide samples from each of the geologic units expected to be of importance to this investigation. In order to determine the lithologic characteristics of these units a continuous core sample was obtained. Based on detailed description and analysis of core and cutting samples obtained at this location, subsequent borings could be rapidly and accurately drilled. [Lithologic information collected at this boring is presented in well description MW-10, Appendix B].

MONITOR WELL DRILLING AND CONSTRUCTION SPECIFICATIONS

Soil borings and core collection was performed by Andrews & Foster Drilling Co., Athens, TX. All wells were located, constructed and installed under the general direction of Calvin Woods, PE and the direct field supervision of Scott C. Armstrong, Geologist, Bryan, TX. TMPA surveying personnel determined the locations and elevations (x, y, and z coordinates) of all wells. Eight inch diameter borings were made to various depths, as indicated on well logs, using rotary rig methods. The borings were drilled using water and natural mud. Commercially slotted (0.020") well screen, formed of 5' x 4" I.D. schedule 40 PVC, with a slip cap on bottom was set at the desired depth followed by approximately two feet above ground level. Clemtex No. 2 blast sand (or equivalent) was tremied into place around the well screen. A two foot bentonite seal was tremied in place to isolate the sand pack from the cement grouting. Portland cement grouting was pumped in to fill annulus space to ground surface. A Sakrete @ cement cap was employed at the surface to provide stability to the upper casing (Fig 1). [Note: monitor well P2 installed on top of ash landfill, was constructed using 2" I.D. schedule 40 PVC, well casing, and employed a ten foot screen.] All wells were developed by mine personnel.

Monitor well MW-10 (the 72 foot holes used in geologic verification) is screened on the upper portion of the Caddell Formation. Monitor wells MW-11 and MW-12 were established to sample the ground-water quality in the Middle Wellborn sand. Ground water in the Bedias sandstone member is sampled by monitor wells MW-13, MW-14, and MW-15. The locations of these wells are presented in Figure 2. The schematic well diagrams and lithologic descriptions presented in Appendix A accurately present the results of this project. The Caddell Formation contains discontinous sand bodies near its contact with the Bedias sands therefore monitor well MW-10 samples waters contained in the Caddell Formation directly downdip of the ash landfill. The Middle Wellborn shales serve as aquitards to ground-water flow and therefore have not been isolated and sampled by any of the monitor wells. Although the Middle Wellborn sand is laterally discontinuous, meteoric and ground waters contained in this unit are hydrologically in contact with the Gibbons Creek Reservior. Consequently monitor wells MW-11 and MW-12 were designed to sample water from these units. Because the ash landfill lies directly over the recharge area of the Bedias sands, and since these sands are laterally continuous and extensive Monitor wells MW-13, MW-14, and MW-15 are designed to intercept and sample waters which flow within this unit. Boring records and well schematics for this study are presented in Appendix B.

A summary of Monitor well depths as well as recent water levels is presented in Tables 1 & 2.

Elevation of Screen Interval, Ash-Landfill Monitor Wells

Table 1

Well No.	Total Depth [measured from surface]	Elevation of Screened interval
*MW-10	72.0 FT	220.33 - 225.33 FT
*MW-11	15.0 FT	289.95 - 284.95 FT
*MW-12	26.0 FT	258.78 - 253.78 FT
*MW-13	15.5 FT	248.52 - 243.52 FT
*MW-14	51.5 FT	255.64 - 250.64 FT
*MW-15	56.0 FT	253.03 - 248.03 FT
*MW-P2	30.0 FT	** ---

Static Water Levels, Ash-Landfill Monitor Wells

Table 2

Elev.	Static water levels - Ash landfill site
MW-10	242.27 FT
MW-11	*
MW-12	254.41 FT
MW-13	251.81 FT
MW-14	*
MW-15	*
MW-P2	*

* dry hole

GIBBONS CREEK STEAM ELECTRIC STATION SITE GEOLOGY

Soil boring samples collected during the drilling phase of the study were compared to interpretations of the regional geology. The result of these comparisons provided a model of the stratigraphic framework within which to interpret ground-water conditions at the study site. The following paragraphs are a brief synthesis of geologic information pertinent to the Gibbons Creek power plant area.

The Gibbons Creek Lignite Mine area is located entirely within the deltaic Manning Formation of the Jackson Group. The Jackson Group, which is transitional Eocene in age (40 m. yrs.), outcrops in a band 8 to 10 mi wide and has a maximum thickness of 1600 ft. The upper Eocene fluvial and deltaic sediments of the Jackson Group represent a period of relative sea-level regression. These sediments strike generally parallel to the present-day Texas coast and dip .25 to 4 degrees to the southeast (20 to 360 ft/mi).

Pedrotti (1958) and Walton (1959) performed a detailed surface mapping study of the area of Grimes County between Carlos and Roans Prarie. The accepted stratigraphy of the Jackson Group in Central and East Texas was established from their work (Figure 7a). The mapping of the Wellborn, Manning, and Whittsett Formations employed sand outcrops (assumed to be laterally continuous) as the primary marker beds to locate formational contacts. Recent work by Eicher (1985), based on interpretation of subsurface electric log and core data obtained during the exploration phase of the Gibbons Creek Mine, determined that several of the accepted formatinal units did not conform to the established definition of a formation. Therefore significant changes to the accepted stratigraphy were proposed. Eicher (1985) redefined the Jackson Group on a local basis as follows: the Jackson Group consists of two formations, the lower formation which contains marine and prodelta muds and an upper formation which is made up of deltaic deposits. The lower formation is the Caddell Formation and above this is an upper Jackson Formation which includes the old Wellborn and Manning Formations. It was found that these units could not be differentiated in the absence of continuous sandstones used to mark the contacts. As a result the Wellborn and Manning Formations did not meet the definition of a formation. Furthermore it was suggested that Wellborn Formation be dropped and the Manning applied to all of the delta deposits of the Fayette Fluvial Delta Complex in the Gibbons Creek area as delineated by Fisher et. al. (1970).

This newly proposed Manning Formation was subdivided into eight members for local use within the Gibbons Creek area (Figure 7c). The Bedias, Carlos, Tuttle and Yuma Members are sandstone units originally defined from surface outcrops. The Keith, Rock Lake, Gibbons Creek and Singleton Members are new subsurface units defined by their lignite beds. Eicher (1985) determined that the Middle Wellborn Member as defined by Pedrotti (1958) and Walton (1959) did not constitute a unit, but was a collection of

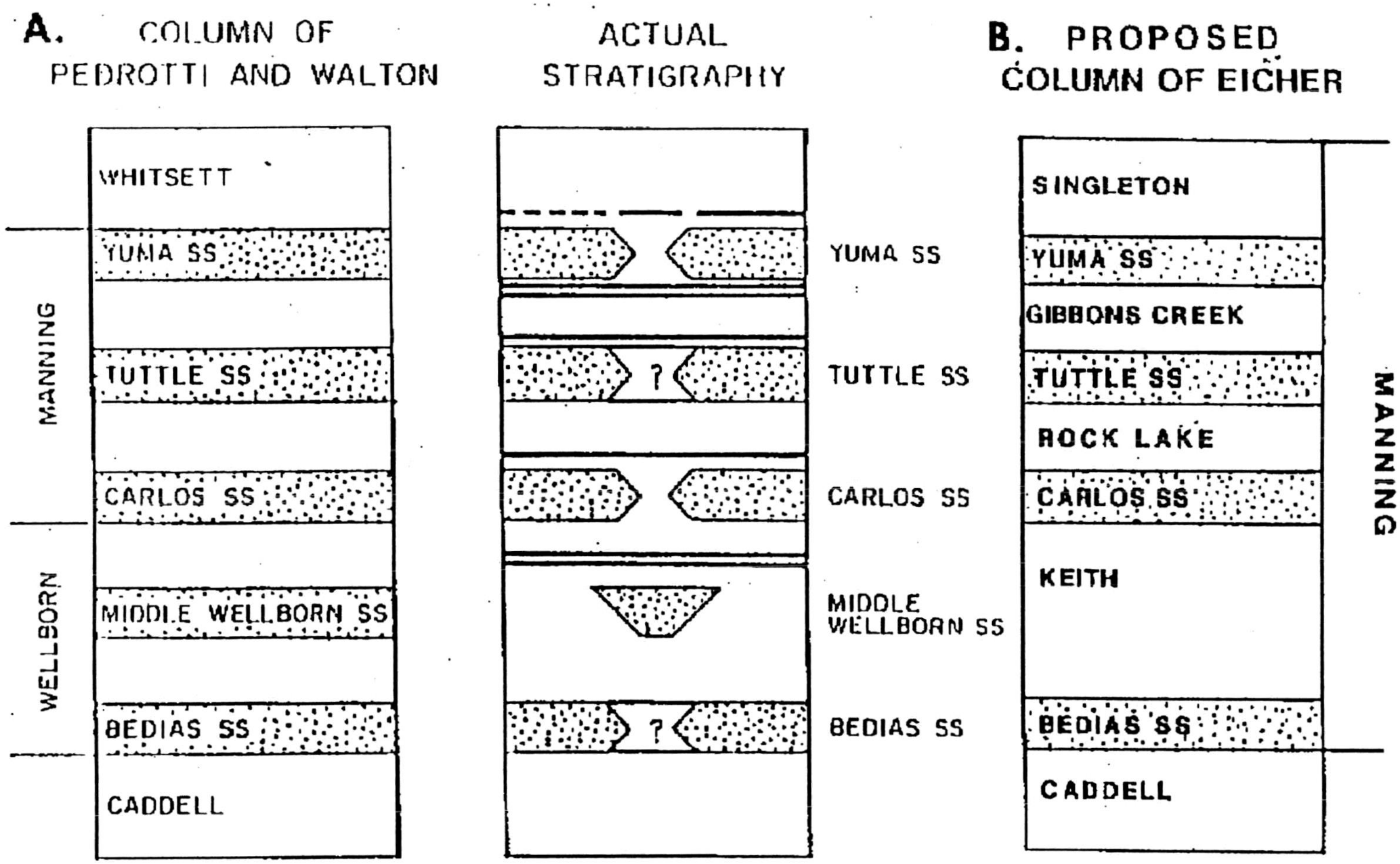


Figure 7. Comparison of the accepted stratigraphic column of Pedrotti (1958) and Walton (1959) (a) with actual stratigraphy, as interpreted from exploration logs (b) and Eicher's (1985) reinterpreted stratigraphic column. Bold lines in 1(b) indicate lignite bodies.

scattered crevasse splay and channel sands in approximately the same stratigraphic position.

LITHOLOGIC SYMBOL	MATERIAL
	ASH
	SAND
	SILT
	CLAY
	SANDY SILT
	SANDY CLAY
	SILTY SAND
	SILTY CLAY
	CLAYEY SAND
	CLAYEY SILT
	LIGNITE
	LOAMY TOPSOIL
	TOPSOIL & FILL
	CLAY LINER

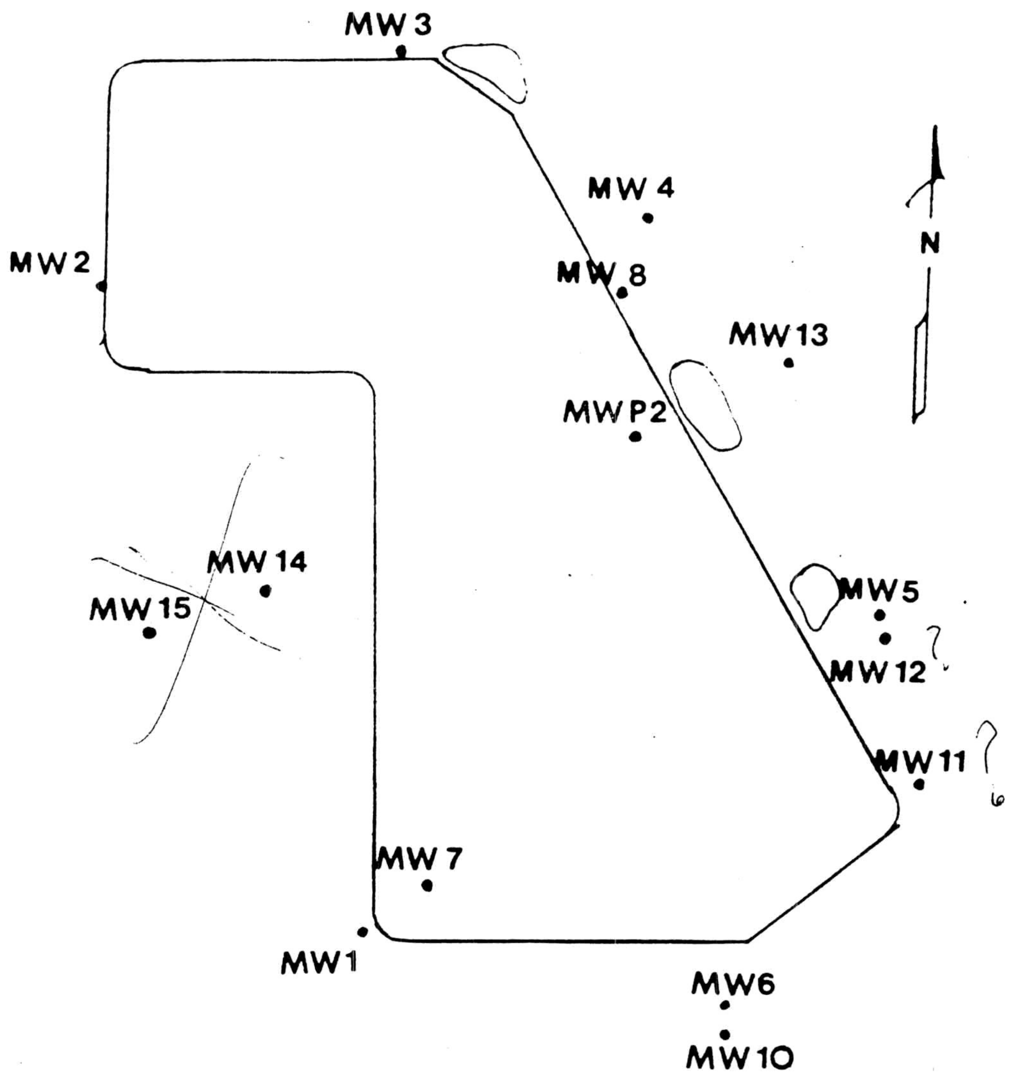
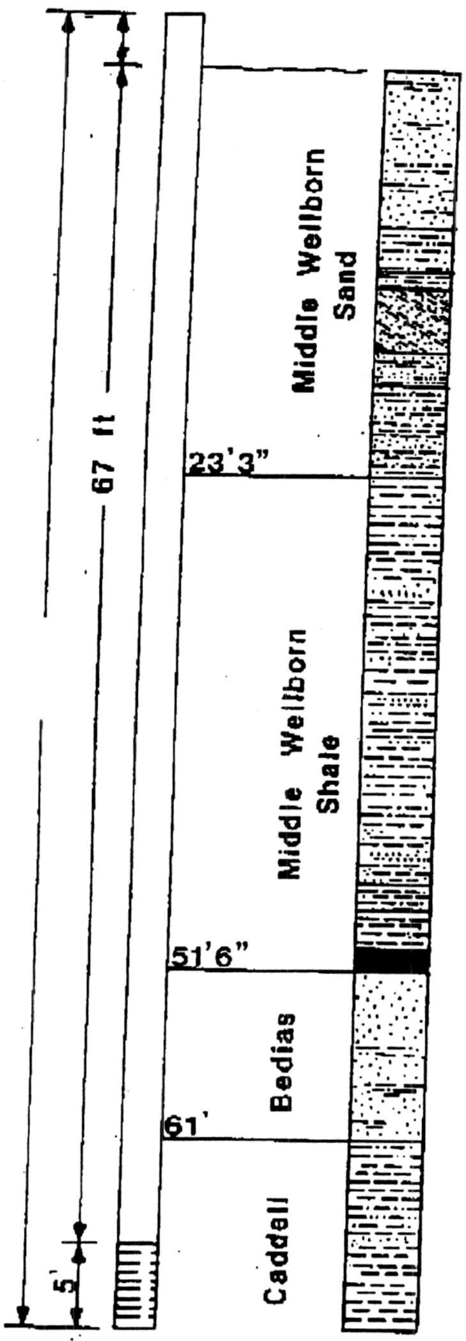


Figure 2. Location map for Ash-landfill Monitor Wells.
*not to scale.

MONITORING WELL MW-10

Ground elevation at well:	292.33 ft.
Well depth from top of casing:	73.24 ft.
Height of casing:	1.24 ft.
Well screen interval:	220.33 ft. to 225.33 ft.

Well Schematic   Lithology



Interval	Description
0' - 9'	Fine to V. fine grained sands and silty-clayey; silty sands; Cream and tan in color; Stringers of gravel present; Clean sands at 9 ft; Fe-oxidation present throughout.
9' - 11'6"	Clayey sand; Fine to V. fine grained; Tan and brown in color; Orthoquartzite stringers, .5" thick at 9'6"; Fe-oxidation present.
11'6" - 12'6"	Sandy clay; reddish brown; Fe-oxidation present.
12'6" - 16'3"	Laminated clays and sands; Fine to V. fine grained; Soft; Inclination of 20°; Fe-oxidation present.
16'3" - 18'	Clayey sands, hard, Fine to V. fine grained; Fe-oxidation present.
18' - 23'3"	Clayey silty sands, Fine to V. fine grained; Clean sand, 4" thick, at 19'3"; Fining downward; Fe-oxidation present.
23'3" - 46'6"	Clay to silty clay; Blue-green to gray; Hard; Horizontally laminated; Few light gray sandy stringers randomly present; Hydrogen Sulfide odor strong.
46'6" - 48'	Sandy clay; Blue-green; Hard; Cemented sand stringers, .25", present.
48' - 50'2"	Clay, Blue-green to dark gray; V. hard; cemented shales fractured by coring.
50'2" - 51'6"	Lignite; Black; V. hard interbedded lignites and shales, fractured by coring.
51'6" - 61'	Sandstone; Fine grained; Blue-green to light gray; soft at 52' increasing in hardness with depth.
61' - 72'	Clay; Blue-green; Med. hard.

MONITORING WELL MW-11

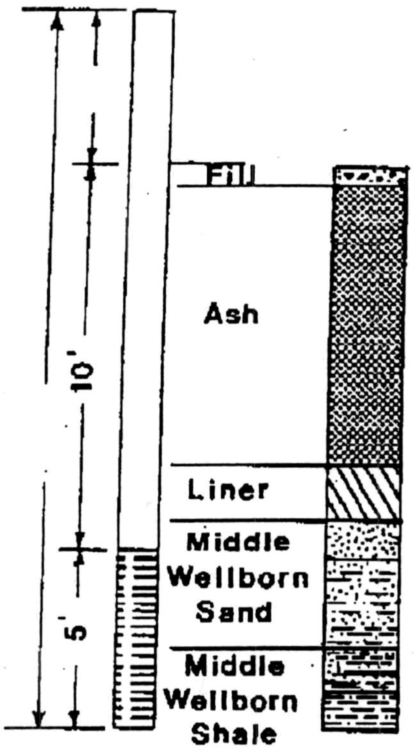
Ground elevation at well: 298.95 ft.

Well depth from top of casing: 18.88 ft.

Height of casing: 3.88 ft.

Well screen interval: 289.95 ft. to 284.95 ft.

Well Schematic Lithology



Interval	Description
0' - 6"	Fill clays and Topsoil; Brown.
6" - 8'6"	Ash.
8'6" - 10'	Clay liner; Hard; Mottled brown.
10' - 11'3"	Fine to V. fine grained sands; Cream and tan in color.
11'3" - 13'8"	Clayey-silty sands, Fine to V. fine grained; Fining downward; Fe-oxidation present.
13'8" - 15'	Clayey sand; Fine to V. fine grained; Tan and brown in color; Orthoquartzite fragments; Fe-oxidation present.
15' - 16'	Clay to silty clay; Tan to gray; Hard; Horizontally laminated; Few light gray fine grained sandy stringers randomly present.

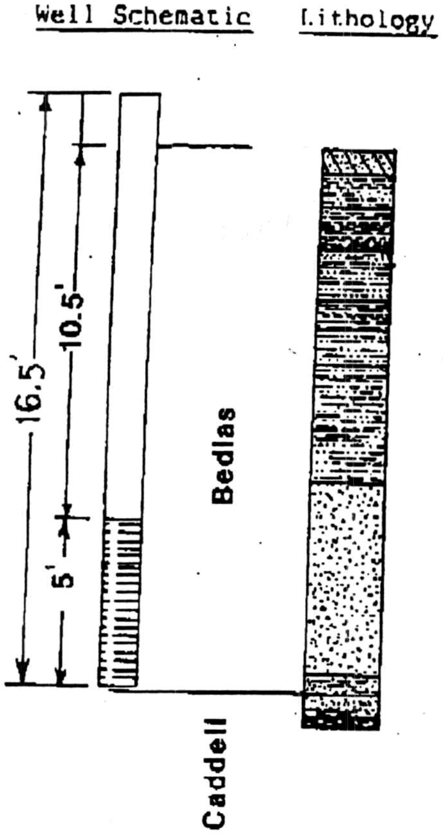
MONITORING WELL MW-13

Ground elevation at well: 259.02 ft.

Well depth from top of casing: 16.49 ft.

Height of casing: 0.99 ft.

Well screen interval: 248.52 ft to 243.52 ft.

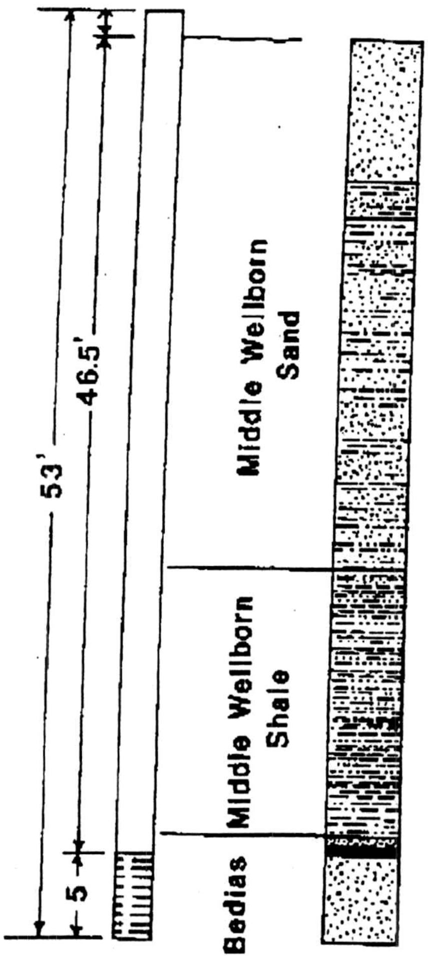


Interval	Description
0' - 8"	Loamy topsoil; Dark brown.
8" - 1'8"	Interbedded fine sands and clays; Fe-oxidation.
1'8" - 2'10"	Clay, interlaminated, 1" laminae; Alternating bands of brown, and orange; Fe-oxidation.
2'10" - 4'4"	Interlaminated clayey sand and silty clay; Fe-oxidation.
4'4" - 5'3"	Interbedded clays; Fe-oxidation.
5'3" - 6'2"	Silty sand with clay; Fe-oxidation.
6'2" - 9'6"	Sandy silt with clay; Fe-oxidation.
9'6" - 15'	Sand; Fine grained; Gray; 5.5' core loss.
15' - 15'6"	Silty clay; Tan.
15'6"	Oxidation limit.
15'6" - 16'4"	Sand; Fine to V. fine with clay; Blue-green; Hard.
16'4" - 16'6"	Clay; M. hard; Blue-green.

MONITORING WELL MW-14

Ground elevation at well:	302.14 ft.
Well depth from top of casing:	52.88ft.
Height of casing:	1.38 ft.
Well screen interval:	255.64 ft. to 250.64 ft.

Well Schematic　Lithology



Interval	Description
0' - 8'	Fine to V. fine grained sands and clayey silty sands; Cream and tan in color; Stringers of gravel present; Fe-oxidation present throughout.
8' - 10'	Clayey sand; Fine to V. fine grained; Tan and brown in color; Orthoquartzite fragments; Fe-oxidation present.
10' - 30'	Clayey silty sands, Fine to V. fine grained; Fining downward; Fe-oxidation present.
30' - 45'6"	Clay to silty clay; Blue-green to gray; Hard; Horizontally laminated; Few light gray sandy stringers randomly present; Hydrogen Sulfide odor.
45'6" - 46'	Sandstone; Fine grained; V. hard; Blue-green to dark gray; V. hard; Mollusk and Small gastropod shells present.
46' - 46'6"	Lignite; Black; V. hard interbedded lignites, fractured by coring.
46'6" - 51'6"	Sandstone; Fine grained; Blue-green to light gray; soft increasing in hardness with depth.

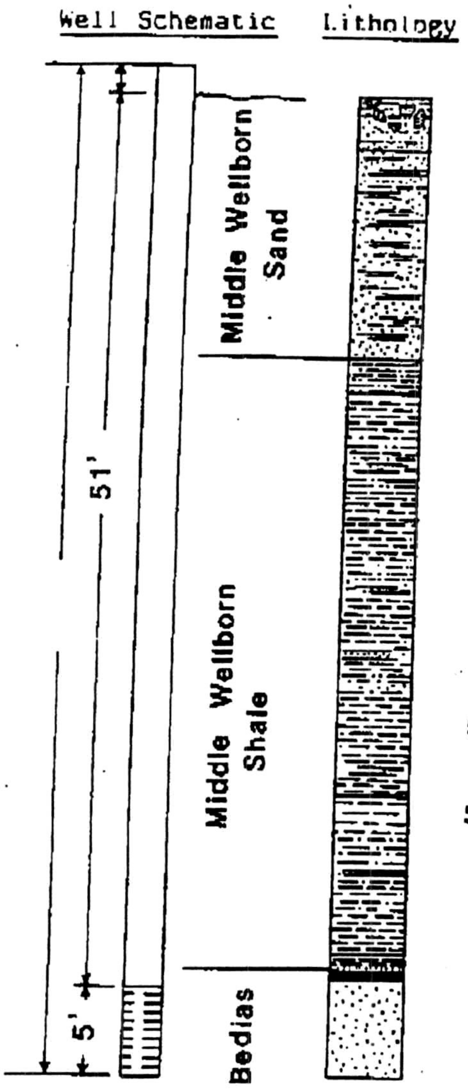
MONITORING WELL MW-15

Ground elevation at well: 304.03 ft.

Well depth from top of casing: 57.08 ft.

Height of casing: 1.08 ft.

Well screen interval: 253.03 ft. to 248.03 ft.



Interval	Description
0' - 3'	Fine to V. fine grained sands and clayey silty sands; Cream and tan in color; Angular fragments (1" to 6") of well cemented sandstone; Fe-oxidation present throughout.
3' - 15'	Clayey sand; Fine to V. fine grained; Tan and brown in color; Fe-oxidized, Orthoquartzite stringers, 1/8" thick throughout.
15' - 17'	Sandy clay; reddish brown; Fe-oxidation present.
17' - 40'	Clay to silty clay; Tan; Hard; Horizontally laminated; Few light gray sandy stringers randomly present.
40'	Oxidation limit.
40' - 49'	Clay to Silty clay; Blue-green; Hard; Cemented sand stringers.
49' - 50'	Clay, Blue-green to dark gray; V. hard; cemented sands.
50' - 50'6"	Lignite; Black; V. hard interbedded lignites and shales, fractured by coring.
50'6" - 56'	Sand; Fine grained; Blue-green to light gray; soft.

(4 Inch Wells Unless Noted)	Elevation (MSL)	Ft. from Ground	Casing, Ft.	Information (1)	Interval Ft.	Information (2)	Casing Diam., In.	
MW1	297.66	111.99	1.51	8/22/85	20	9/82	4	
MW2	290.13	54.83	1.67	8/22/85	40	9/82	4	
MW3	260.65	26.25	1.38	"	17	"	4	
MW4	263.71	35.93	1.78	"	23	"	4	
MW5	270.37	38.48	1.47	"	27	"	4	
MW6	291.31	72.25	1.63	"	45	"	4	
T2	272.47	36.03	1.80	"	19	"	4	
T3	303	22.06	0.98	"			4	
T5	273.90	20.1	1.95	"			4	
MW7		28 (well core)					2	
MW8		23 "					4	

1 S. Hall, Geol. Dept. TAMU, Field work

2 CSI Solid Waste Mgt. Manual Site "A" Landfill, GCSES

TMPA Form A-42 (Nov.'80) (Overprinting on this form is NOT authorized.)

Part I
CLOSURE PLAN

Site A Ash Landfill
Gibbons Creek Steam Electric Plant
Carlos, Texas

Prepared by

Calvin Woods, P.E., Consulting Engineer
505 Church Street, College Station, Texas 77840

September 30, 1991

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INTRODUCTION AND DESCRIPTION OF LANDFILL

This landfill receives only Class II and Class III industrial waste composed of fly ash, bottom ash, and stabilized FGD sludge. The area of the land covered with ash is approximately 161.2 acres. The general layout of the landfill and the existing elevations (based on an aerial survey done on January 12, 1991) are shown on Navasota Mining Company Drawing Number 8003-51-50-1. The landfill has a compacted clay liner and a final cover; both have a nominal thickness of two (2) feet, and they are both constructed of the same clay soil.

Approximately 133 acres of landfill are at grade and covered with vegetation. There are approximately 28 acres that need to be covered with soil and vegetation. Approximately 15 acres of grassed final cover will be disturbed during the construction of the percolation collection system.

This closure plan follows an outline of closure requirements published in Technical Guideline Number 10, TEXAS WATER COMMISSION, Industrial Solid Waste Management, Issued 10/12/84, no revisions. Where this plan deviates from the technical guideline a brief explanation will be included. A brief description of the closure plan follows. In addition, the TEXAS WATER COMMISSION publishes Technical Guideline Number 3, Landfills; the appropriate guidelines will be reviewed in this closure plan.

CLOSURE PLAN

The closure plan has several important elements. Each of these elements is described as follows:

ELEMENT 1. REMOVE ALL ACCUMULATED LIQUIDS AND DISPOSE OF THEM PROPERLY.

The landfill is filled with essentially dry to moist materials. The ash is occasionally wetted to control dust. Precipitation occasionally falls directly on uncovered ash and infiltrates into the ash. Precipitation also infiltrates through the final cover and enters the ash. This water, called percolation water, migrates to the perimeter of the landfill and escapes. This percolation water will be intercepted by a combination of a perimeter filter, porous drain system, and holding ponds. The percolation water will be tested before the water is allowed to leave the holding pond. The collection system for the percolation water is described in ELEMENT 6, and the monitoring program for this percolation water is described in ELEMENT 8-D and APPENDIX A.

<u>ELEMENT 2</u>. IDENTIFY AND REMOVE ALL SURROUNDING SURFACE SOILS CONTAMINATED WITH WASTE DUE TO FACILITY OPERATIONS, AND PLACE THEM IN OPEN CELLS.

All ash or ash/soil mixtures that are outside of the landfill will be collected and properly disposed of in the landfill. Proper disposal of ash requires placing the ash in the landfill, compaction, and placement of a final cover (See ELEMENT 3). Any ash or ash/soil mixtures that escape after the landfill is completely covered and after the vegetation is established will be disposed of in the newly opened Site F Ash Landfill.

The areas that contain ash or ash/soil mixtures and need cleaning are identified on <u>FIGURE 4</u>.

<u>ELEMENT 3</u>. PLACE CLEAN FILL OR CLASS III WASTE IN OPEN CELLS TO REACH NECESSARY GRADES PRIOR TO CAPPING. THIS MATERIAL SHOULD BE COMPACTED TO MINIMIZE LONG-TERM SETTLEMENT.

Any ash or ash/soil mixtures placed in the landfill will be compacted, covered with a two (2) foot final cover, and the area will be vegetated with grass.

<u>ELEMENT 4</u>. REMOVE OR DECONTAMINATE ALL EQUIPMENT AND RELATED STRUCTURES, AND DISPOSE OF WASTES GENERATED AT AN AUTHORIZED FACILITY.

All construction equipment will be removed from the landfill at the conclusion of construction. This equipment will be washed in a vehicle maintenance area. Any resulting ash will be collected and disposed of in an approved landfill operation.

<u>ELEMENT 5</u>. PLACE A FINAL COVER OVER THE ENTIRE LANDFILL. THE COVER SHOULD HAVE A PERMEABILITY LESS THAN OR EQUAL TO THAT OF THE BOTTOM LINER. IT SHOULD BE LANDSCAPED TO PREVENT SURFACE-WATER PONDING AND MINIMIZE EROSION, AND CROWNED SUFFICIENTLY TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

A final cover consisting of two (2) feet of compacted clay and vegetated with a grass cover is being constructed. The cover and the liner are constructed of the same clay with the same thickness so the permeabilities are considered equal. When this landfill was being designed, and during most of the operational stage, Guideline Number 3 recommended a liner and a final cover with a thickness of two (2) feet for a Class I and Class II waste.

The final cover will have a slope that does not allow for the ponding of surface water. The slopes range from a minimum of about one (1) percent to a maximum of four (4) percent on the surface cap. The side-slopes range from less than twenty (20) percent to slightly more than thirty-five (35) percent. The side- slopes that are too steep or suspected of being too steep are shown on FIGURE 3 and these will be modified so that their slopes are equal to or less than 3H:1V.

Properly vegetated surface slopes that are five (5) percent or less and side-slopes that are equal to or less than 3H:1V and that have properly designed and constructed drop structures to convey surface runoff from the top of the landfill to the natural ground below and adjacent to the landfill are flat enough to minimize erosion. These slopes are also flat enough that the vegetation can be maintained safely with a tractor mower.

The ash deposited in this landfill does not decompose or consolidate over time so long-term settlement is not a consideration.

ELEMENT 6. STORM-WATER SHOULD BE MANAGED IN ACCORDANCE WITH ALL APPLICABLE RULES AND PERMIT CONDITIONS UNTIL COMPLETION OF THE ABOVE CLOSURE ACTIVITIES. UPON THEIR COMPLETION, DIKES, DITCHES, BERMS AND OTHER STORM-WATER CONTROL STRUCTURES SHOULD BE CONSTRUCTED, REMOVED, OR ALTERED AS NECESSARY TO FACILITATE PROMPT DRAINAGE OF THE SITE ON A PERMANENT BASIS.

Two water control systems will be constructed. The first system that is presently being constructed is a surface storm-water control system. This system will consist of eight drop structures to convey surface runoff from the top of the landfill to the natural ground below and adjacent to the landfill. These drop structures are composed of a series of ditches leading to an enclosed pipe system that will carry the water from the cap down the side-slopes. The surface storm runoff will be discharged from the enclosed pipe system into an open channel. The enclosed pipes are corrugated polyethylene that range in size from twenty-four (24) inches to thirty-six (36) inches in diameter. The open channels are trapezoidal earth channels with a twelve (12) foot bottom and 5H:1V side-slopes; they average approximately two (2) feet in depth. The length of the open channels varies from approximately fifty (50) feet to 450 feet. The general layout and details of this system are shown on Navasota Mining Company Drawing Numbers 8003-51-50-01, 02, 03, and 04 and also on FIGURES 5 AND 8.

In order to assure that no storm surface water leaves the cap except through a drop structure a clay dike will be constructed around the periphery of the cap. The purpose of this dike is to divert water into the drop structures and to protect the top of the side-slope from erosion.

The second system collects the percolation water. This water flows through the ash to the perimeter of the landfill. As the water exits the landfill through the toe of the slope, it will be intercepted by a system made up of a filter, a porous drain system composed of bottom ash (a Class III waste), and a series of clay-lined ditches and holding ponds. The general details of this system are shown on FIGURES 5, 6, 7 and 8.

Monitoring of the water collected by the porous drain system is described in ELEMENT 8-D.

ELEMENT 7. THE ENTIRE LANDFILL AREA SHOULD HAVE A SELF-SUSTAINING VEGETATIVE COVER OR OTHER METHOD OF EROSION CONTROL ESTABLISHED.

The entire landfill area will be covered with a self-sustaining vegetative cover. This vegetative cover will prevent surface erosion on the cap, but the grass-covered side-slopes are too steep to allow surface drainage without the use of drop structures. The drop structures are described in ELEMENT 6 and the self-sustaining vegetative cover is described in ELEMENT 8-B.

The goal of having a vegetative cover that is self-sustaining is permanency. The term permanent means that the self-sustaining vegetative cover will survive with a minimum of intervention by man; however, this requires that the permanent cover will change in character in response to changing climatic conditions. A permanent vegetative cover is dynamic in nature rather than static. In order to achieve this kind of self-sustaining permanence, it is necessary to have a broad diversity of species, and these plants will be the native species or modifications of the native species. Some of the plants expected on the landfill are: switch grass, common coastal bermuda, dove weed, native blue stem, and indian grass. Yucchi aeroleaf (a clover) will likely be planted.

The vegetative cover will be primarily grass (Gramineae) but it will also include some of the legume family (Leguminosae). Gramineae includes many species, including the food crops such as wheat and rice; however, it is the sod crops that will be used. Leguminosae includes the clovers, lepedezas, alfalfas, and many others.

In order to develop a self-sustaining vegetative cover it is necessary to establish a maintenance program for a period of time to help establish the cover and an inspection program to determine the effectiveness of the maintenance program. The maintenance program is described in ELEMENT 8-B and the inspection program is described in ELEMENT 8-A and in APPENDIX C.

The beginnings of a self-sustaining vegetative cover have been established over about seventy (70) percent of the landfill.

<u>ELEMENT 8</u>. THE POST-CLOSURE CARE PERIOD FOR CLASS II INDUSTRIAL WASTE/HAZARDOUS WASTE LANDFILLS IS TYPICALLY TEN (10) YEARS BUT IS DETERMINED ON A CASE-BY-CASE BASIS. CLASS III LANDFILLS SHOULD NOT REQUIRE ANY POST-CLOSURE MAINTENANCE.

The post-closure care period for this landfill will be ten (10) years. Routine inspections will indicate whether the post-closure care period should be extended for a longer period of time. These routine inspections are described in APPENDIX C.

<u>ELEMENT 8-A</u>. MAINTAIN THE INTEGRITY AND EFFECTIVENESS OF THE FINAL COVER, INCLUDING MAKING REPAIRS TO THE CAP AS NECESSARY TO CORRECT THE EFFECTS OF SETTLING, SUBSIDENCE, EROSION, OR OTHER DETERIORATION.

The integrity and effectiveness of the final cover will be maintained by a system of inspections on a routine basis and repairs as needed.

The inspections will be conducted at least once per fortnight (two weeks), more often if necessary. If, after two (2) years, conditions indicate that inspections less often are satisfactory, the periodic inspections may be rescheduled. The inspections are described in APPENDIX C.

<u>ELEMENT 8-B</u>. MAINTAIN THE VEGETATIVE COVER THROUGH PERIODIC MOWING, FERTILIZATION, AND RE-ESTABLISHMENT OF VEGETATION UNTIL THE COVER BECOMES SELF-SUSTAINING.

The maintenance of the vegetative cover will include shredding, application of fertilizer and field liming, and burning.

Under normal conditions shredding will occur once per year, generally between March 1 and April 15 unless clover is planted. If an extensive clover cover occurs, the shredding may be postponed until July. The equipment should be set for a six (6) inch shred.

The application of fertilizer and the practice of field liming will occur if soil testing and field inspections of the vegetation indicate that it is necessary. Approximately ten (10) percent of the landfill will be soil tested each year; the results of this soil testing will be used for recommendations for the entire landfill. The amount of nitrogen applied will generally be less than 100 pounds per acre per year which is appropriate for native species and species diversity.

The burning will control the buildup of thatch; thatch reduces the surface runoff (increases the infiltration of water into the landfill). The burning will be done by an experienced contractor during the months of December, January or February. Twenty (20) percent of the landfill will be burned each year so that the entire landfill is burned once every five years. The burning will be conducted during the meteorological conditions recommended by the Texas Air Control Board and in accordance with their regulations.

<u>ELEMENT 8-C</u>. MAINTAIN AND MONITOR THE LEAK-DETECTION SYSTEM AT LEAST SEMI-ANNUALLY WHERE SUCH A SYSTEM IS PRESENT BETWEEN DUAL LINER SYSTEMS.

There is no leak-detection system between dual liner systems. However, there is the infiltration of water into the ash through the final cover, and this system is scheduled for inspection at least fortnightly.

<u>ELEMENT 8-D</u>. CONTINUE TO OPERATE THE LEACHATE COLLECTION AND REMOVAL SYSTEM AT AN APPROPRIATE FREQUENCY UNTIL LEACHATE IS NO LONGER DETECTED (IF APPLICABLE).

The system for collecting the percolation water will continue in operation for at least ten (10) years, longer if infiltration continues. This system will be inspected on a semi-annual basis. Water collected in this system will be stored in clay-lined ponds until field and laboratory testing indicates that it can be released. The frequency and parameters to be tested are described in APPENDIX A.

<u>ELEMENT 8-E</u>. OPERATE AND MAINTAIN THE GROUNDWATER MONITORING SYSTEM AT LEAST SEMI-ANNUALLY. WELLS OR OTHER DEVICES SHOULD BE INSPECTED, COLLECTION OF WATER SAMPLES ATTEMPTED, AND RECOVERED SAMPLES ANALYZED FOR GROUNDWATER QUALITY PARAMETERS.

There are fourteen (14) monitoring wells around and under the landfill and two (2) piezometers. However, samples will be collected on an annual basis from six (6) monitoring wells. This schedule was adopted based on three (3) years of quarterly sampling from all monitoring wells with no indication of groundwater contamination. If the results of the analysis of water quality indicate a potential groundwater contamination problem, the number of monitoring wells sampled and the frequency of sampling will be increased. The locations of the monitoring wells are shown on <u>FIGURE 2</u>.

The frequency and parameters to be tested are described in APPENDIX B.

ELEMENT 8-F. MAINTAIN RUN-ON AND RUNOFF CONTROL STRUCTURES TO MITIGATE EROSION AND DAMAGE TO THE COVER.

The entire landfill will be inspected on a fortnightly basis and repairs will be done as necessary. The all-weather road constructed around the landfill will prevent any water from running onto the landfill.

ELEMENT 8-G. INSPECT AT LEAST ANNUALLY ALL BOUNDARY FENCES, AND REPAIR OR REPLACE THEM AS NECESSARY.

Fences will be inspected twice per year. Repairs will be made as required.

ELEMENT 8-H. PROTECT AND MAINTAIN SURVEYED BENCHMARKS.

At least one benchmark on the final cap and one benchmark on undisturbed land will be protected, maintained, and inspected. This inspection will occur twice per year.

CERTIFICATION

This closure plan was prepared by an independent registered professional engineer licensed in the State of Texas.

Calvin Woods

Calvin Woods, P. E.
Consulting Engineer

STATE OF TEXAS
CALVIN E. WOODS
19546
ENGINEER

Appendix A
FREQUENCY AND PARAMETERS FOR MONITORING PERCOLATION WATER

General Recommendations

The percolation water monitoring program should consist of the following steps or operations:

1. The elevation of the water table or piezometric surface should be determined by reading the staff gage (Water Elevation Determination).

2. Three water samples should be collected from the surface storage.

    a. Field measurements should be made (Field Measurements) on an unfiltered sample or directly in the surface storage tank.

    b. Two filtered samples should be collected for laboratory analysis (Sample Collection).

        (1) One of these samples should be delivered to the laboratory without processing for chemical analysis (Chemical Quality Analysis).

        (2) The other sample should be acidified with nitric acid and delivered to the laboratory for metals analysis (Metals Analysis).

    c. One unfiltered sample should be collected and delivered to the laboratory without processing for analysis of total suspended solids (Suspended Solids Analysis).

Field Measurements should include pH, Temperature, and Electrical Conductivity.

Chemical Quality Analysis should include pH, Total Dissolved Solids, Selenium, Iron, Manganese, Sulfate, Chloride, and Calcium.

Metals Analysis should include Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury. Nickel, Silver, Zinc and Fluoride.

Frequency of Analysis

The following general frequency of analysis should be followed starting immediately before any water is released from surface storage for the <u>first time</u>:

1. The Water Elevation Determination should be made and recorded with the field data.

2. Field Measurements should be made and recorded.

3. Samples should be collected and submitted to the laboratory for Chemical Quality Analysis, Metals Analysis, and Total Suspended Solids Analysis.

Assuming that the Metals Analysis does not indicate the presence of significant metals content, the frequency of analysis should be modified by deleting Metals Analysis directly from the surface storage after the first release of water. After the first release of water from surface storage, the frequency of analysis should be as follows before water is again released:

1. The Water Elevation Determination should be made and recorded with the field data.

2. Field Measurements should be made and recorded.

3. Samples should be collected and submitted to the laboratory for Chemical Quality Analysis and Total Suspended Solids Analysis.

   NOTE: No Metals Analysis samples should be collected after the first discharge from the surface storage tank.

4. After the first release from surface storage, samples for Metals Analysis should be collected quarterly directly from the drain system.

<u>Schedule of Monitoring Events</u>

Before a release is made from a surface storage tank, the Water Elevation Determination, Chemical Quality Analysis, and Total Suspended Solids Analysis should be made. The Metals Analysis should be made on a sample collected from the surface storage tank for the first release only.

After the first release (assuming no significant metals are detected), the Metals Analysis sample should be collected directly from the porous drain system on a quarterly basis. After the Metals Analysis is made for four quarters, this analysis should be made once every four years.

Appendix B
FREQUENCY AND PARAMETERS FOR MONITORING GROUNDWATER

General Recommendations

The groundwater monitoring program should consist of the following steps or operations:

1. The elevation of the water table or piezometric surface should be determined by measuring the distance from the top of the well to the water in the well (Water Elevation Determination).

2. The well should either be pumped dry or the volume of water equivalent to three volumes of water stored in the well casing should be pumped from the well (Well Evacuation).

   a. Field Measurements should be made (Field Measurements).

   b. Two filtered samples should be collected for laboratory analysis (Sample Collection).

      (1) One of these samples should be delivered to the laboratory without processing for chemical analysis (Chemical Quality Analysis).

      (2) The other sample should be acidified with nitric acid and delivered to the laboratory for metals analysis (Metals Analysis).

Field Measurements should include pH, Temperature, and Electrical Conductivity.

Chemical Quality Analysis should include pH, Total Dissolved Solids, Selenium, Iron, Manganese, Sulfate, Chloride, and Calcium.

Metals Analysis should include Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Mercury. Nickel, Silver, Zinc and Fluoride.

Frequency of Analysis

The following general frequency of analysis should be followed starting immediately:

1. The Water Elevation Determination should be made at all

wells each quarter.

2. Each well should be properly evacuated once per year.

3. For each well listed in the Schedule of Monitoring Events:

   a. Field Measurements should be conducted once per year.

   b. Sample collection should be conducted once per year.

      (1) Chemical Quality Analysis should be conducted once per year.

      (2) Metals Analysis should be conducted once every four years.

<u>Schedule of Monitoring Events</u>

The following schedule is recommended for the following monitoring wells at the ash landfill: MW-2, 3, 4, 5, 10 and 13.

- Water Elevation Determination every quarter.
- Well Evacuation, Field Analysis, and Chemical Analysis every 2nd quarter.
- Metals Analysis in 2nd quarter in 1994, 1998, and 2002.

The following schedule is recommended for the piezometer at the ash landfill: MW-7 (Piezometer)

- Water Elevation Determination every quarter.

Appendix C
INSPECTION OF THE LANDFILL AND LANDFILL APPURTENANCES

General Recommendations

The inspection of the landfill should involve two different inspections, Landfill Inspection and Landfill Appurtenances Inspection.

Landfill Inspection

The Landfill Inspection should include the following:

- o Inspection of Vegetative Cover
- o Inspection of Final Cover
- o Inspection of Surface Storm-Water Drainage System
- o Inspection of Percolation Water Collection System
- o Inspection of Access Road

A description of each of the recommended inspections follows:

1. Inspection of Vegetative Cover

   a. Note the location and size of bare spots to determine whether they are spreading or receding.

   b. Note the general health of the vegetative cover, locations and sizes of distressed areas.

   c. Note the locations of damage due to wild hogs, infestations of parasites or other plant diseases.

   d. Note the locations of noxious weeds or other undesirable plants.

   e. Note the locations of dominant species of plants.

2. Inspection of Final Cover

   a. Note the locations of wet spots on the surface of the landfill or the flow of water out of the landfill along the slopes.

   b. Note the locations of erosion.

   c. Note the locations of exposed ash. If the ash is along a waterway, find the source of the ash.

3. Inspection of Surface Storm-Water Drainage System

   a. Note the locations of erosion.

b. Check for obstructions (brush, soil, ash) in the closed pipes.

c. Note the presence of any ash in the system and find its source.

4. Inspection of Percolation Water Collection System

a. Surface Storage Areas

(1) Check for ash.

(2) Observe and record the depth of water.

(3) Observe and record the flow of percolation water.

(4) Check for cracks or evidence of burrowing animals in the earth embankments.

(5) Check for leaks from the outflow valve or piping.

b. Drain System

(1) Open all manhole covers:

Check for the presence of soil or ash.

Check for an indication of clogged piping (water standing stagnant in the manhole).

(2) Note any evidence of a hydraulic overload of the system (water overflowing or evidence of water overflowing a manhole during or after wet weather).

(3) Check for evidence of subsidence of manholes or the soil cover over the system.

(4) Check for evidence of water seeping in or out of the system at any location along its length including between the road and the side-slope of the landfill.

5. Inspection of Access Road

a. Inspect the outside slope of the road (the side away from the landfill) for evidence of wet spots, flowing water, eroding soil or ash.

b. Inspect the road surface for wet spots, flowing water, or ash.

Landfill Appurtenances Inspection

This group of inspections should include the following:

- Inspection of Monitoring Well System
- Inspection of Fences
- Inspection of Benchmarks

A description of these recommended inspections follows:

1. Inspection of Monitoring Well System

This inspection should be made by the person responsible for collecting groundwater samples. The procedure used to collect or attempt to collect groundwater samples constitutes an inspection. When samples are not to be collected, a minimum inspection should include a visual inspection of the outside of the monitoring well and the measurement of the depth of water in the monitoring well.

2. Inspection of Fences

This is a visual inspection of the general condition of the posts and wire.

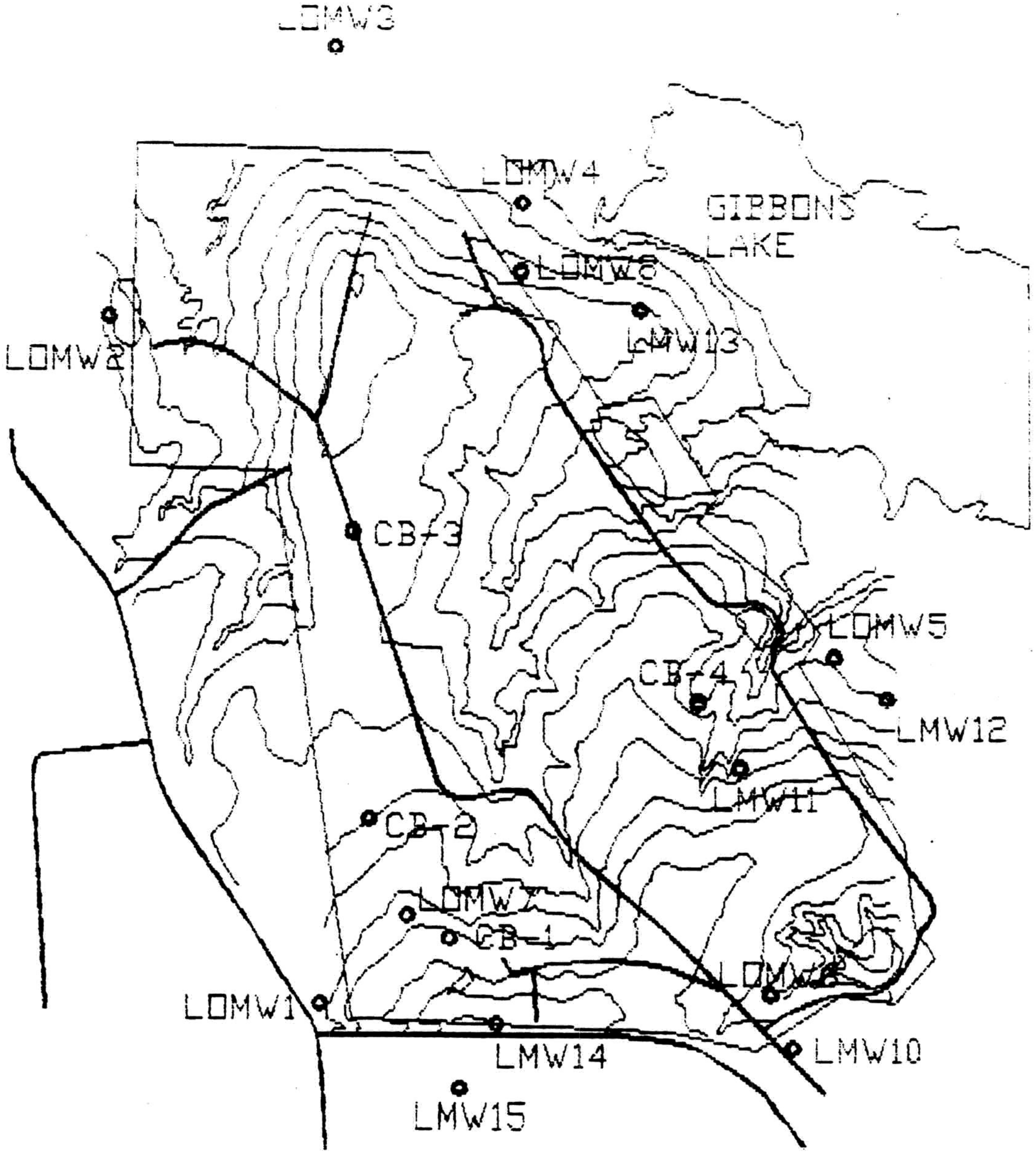
3. Inspection of Benchmarks

This is a visual inspection of the general condition of the benchmarks.

Frequency of Inspections

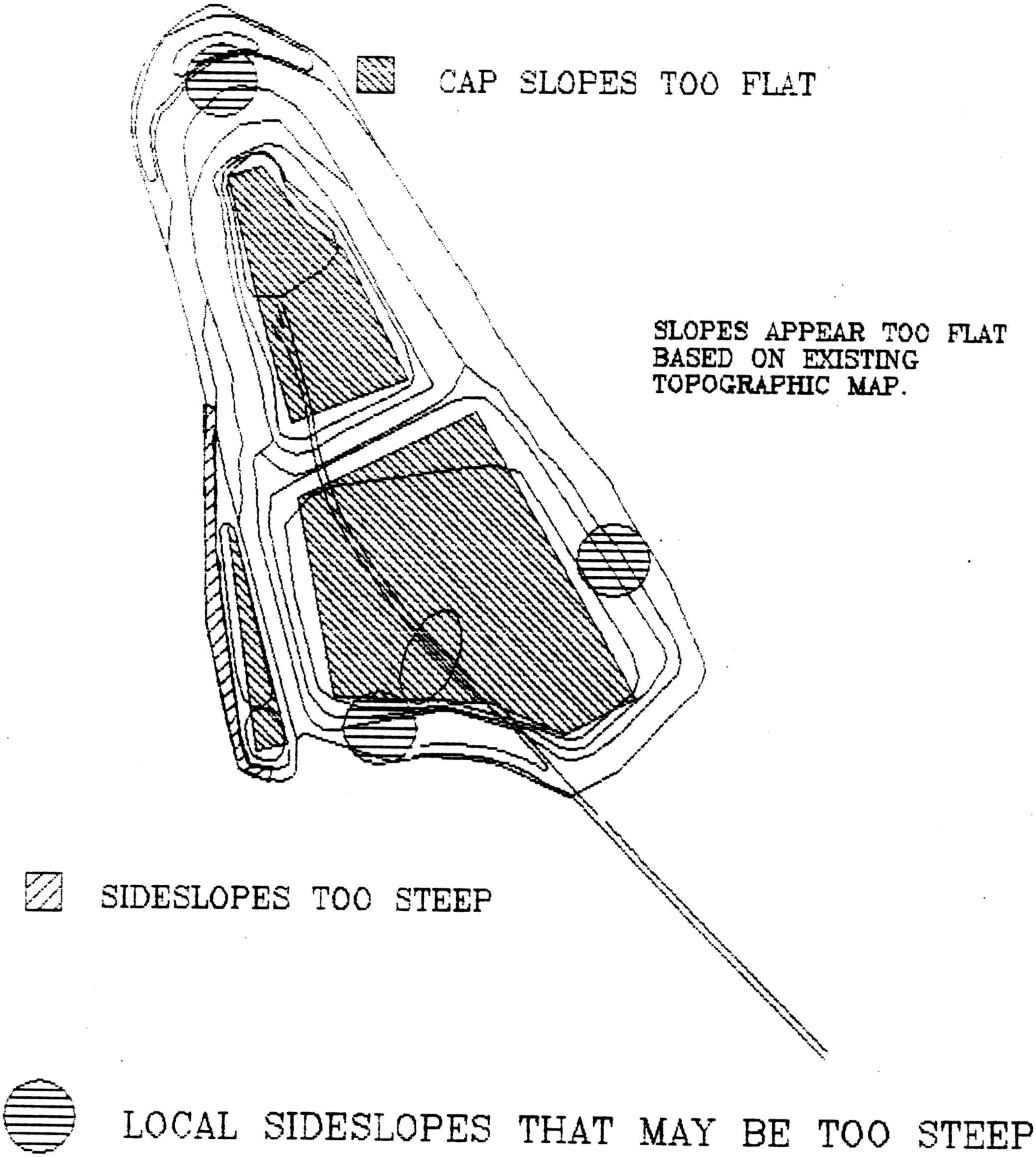
All of the inspections described as being part of the Landfill Inspection should be done fortnightly (once each two weeks) unless experience indicates that inspections are required more often. An evaluation of the inspection frequency should be made after one year of experience to determine if the frequency should be reduced.

The inspections described as being part of the Landfill Appurtenances Inspection should be done twice per year.



ORIGINAL CONTOURS
LANDFILL BOUNDARY
LOCATION OF MONITORING WELLS

FIGURE 2



SLOPES THAT APPEAR TOO FLAT

FIGURE 3

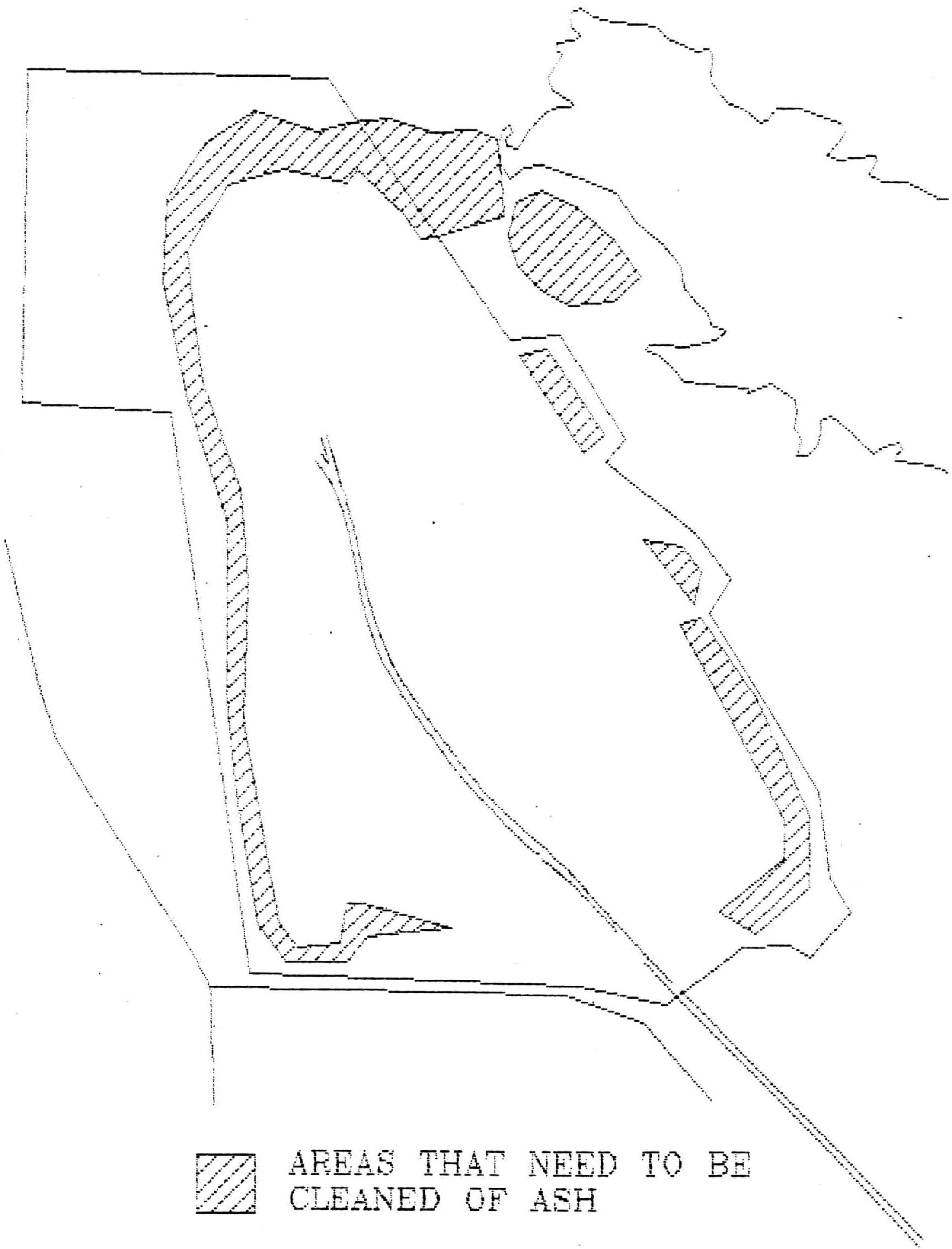


FIGURE 4

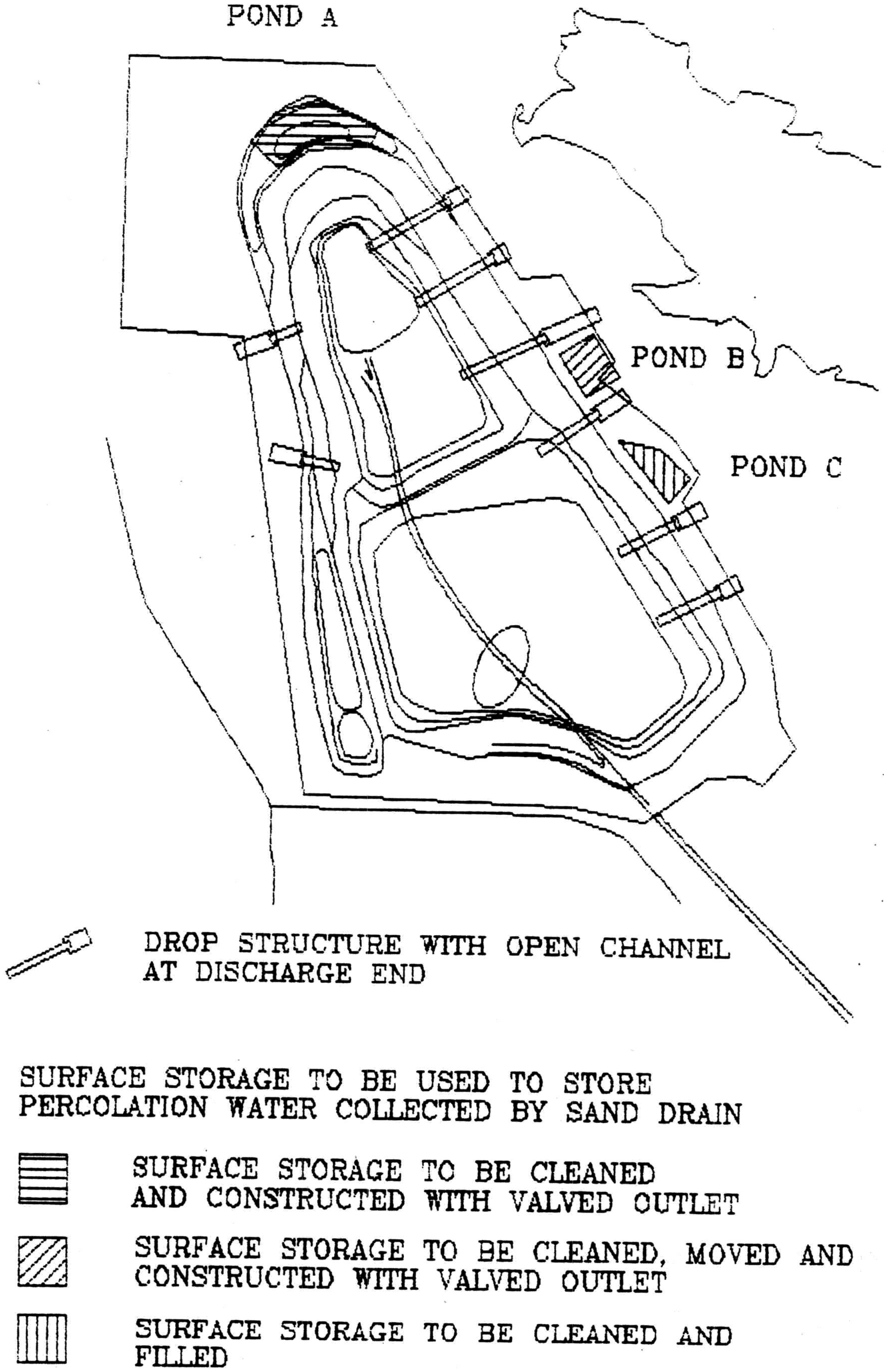
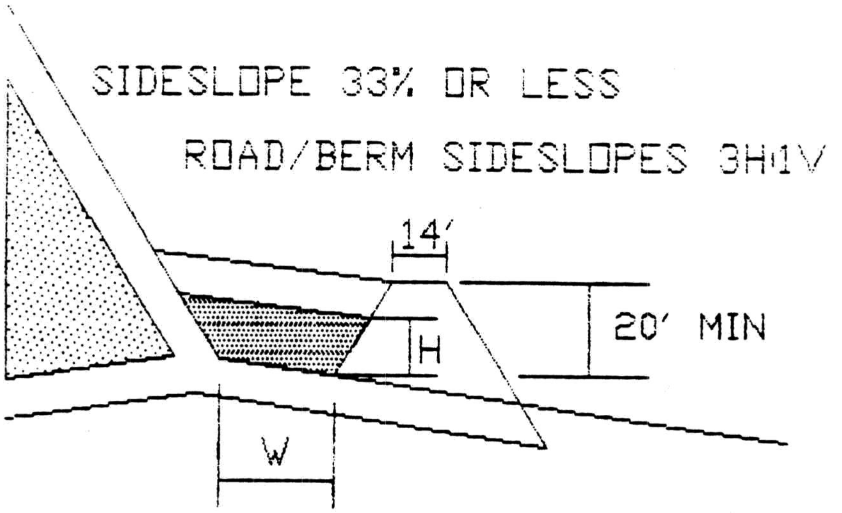
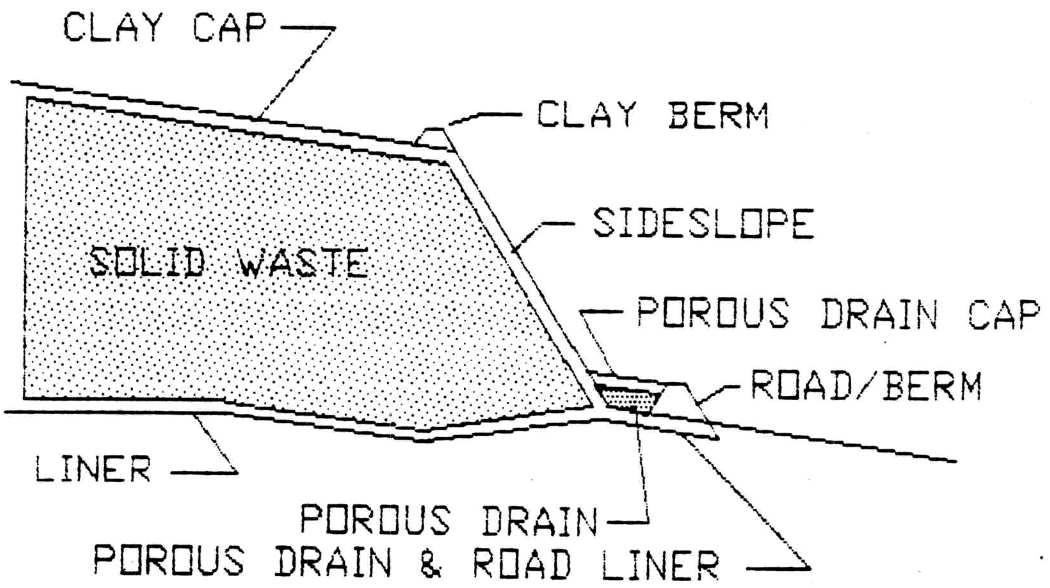

POND A
POND B
POND C
DROP STRUCTURE WITH OPEN CHANNEL AT DISCHARGE END
SURFACE STORAGE TO BE USED TO STORE PERCOLATION WATER COLLECTED BY SAND DRAIN
SURFACE STORAGE TO BE CLEANED AND CONSTRUCTED WITH VALVED OUTLET
SURFACE STORAGE TO BE CLEANED, MOVED AND CONSTRUCTED WITH VALVED OUTLET
SURFACE STORAGE TO BE CLEANED AND FILLED

FIGURE 5

ALL LINERS & CAPS 2' THICK

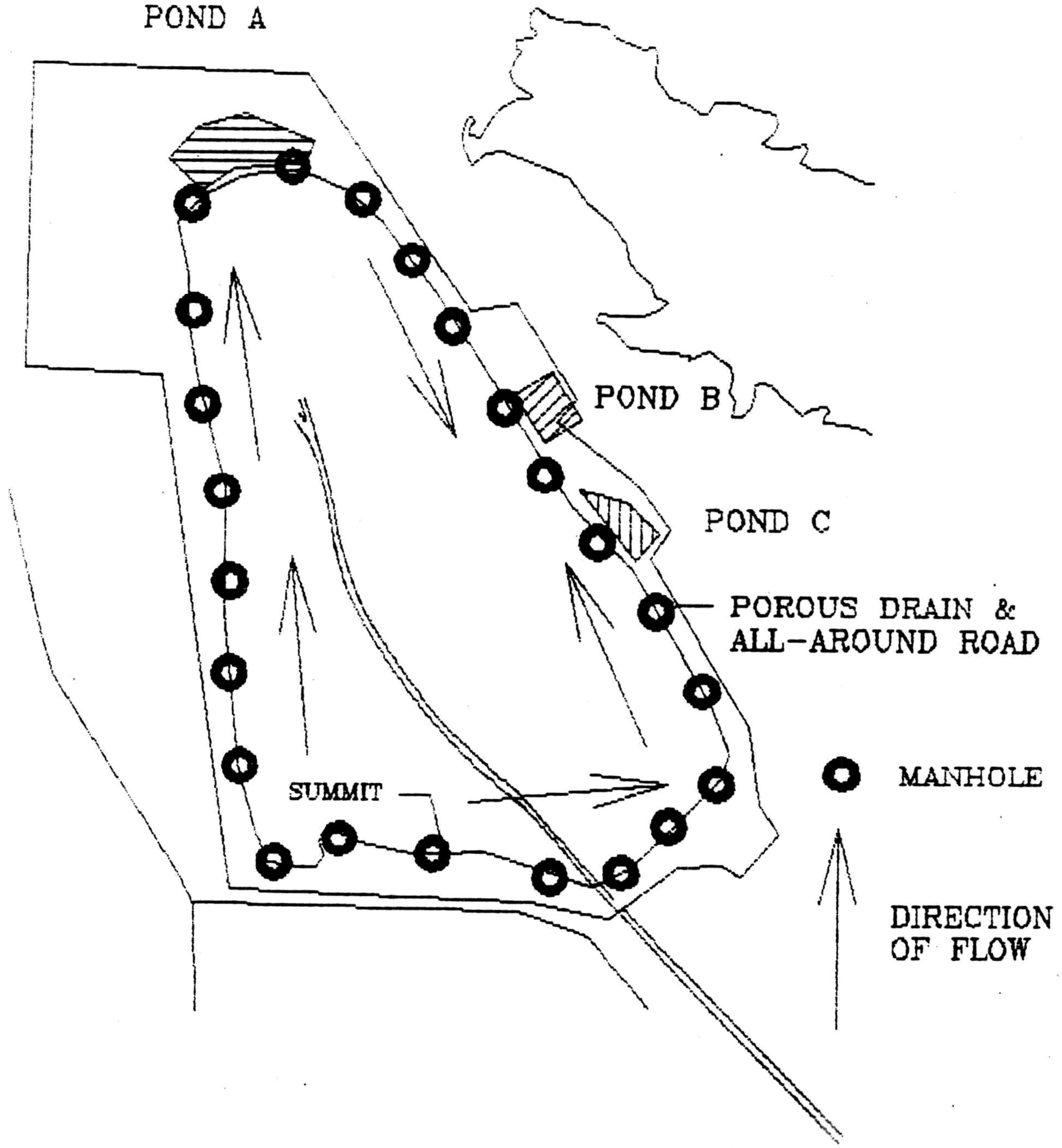


POROUS DRAIN COMPOSED OF BOTTOM ASH



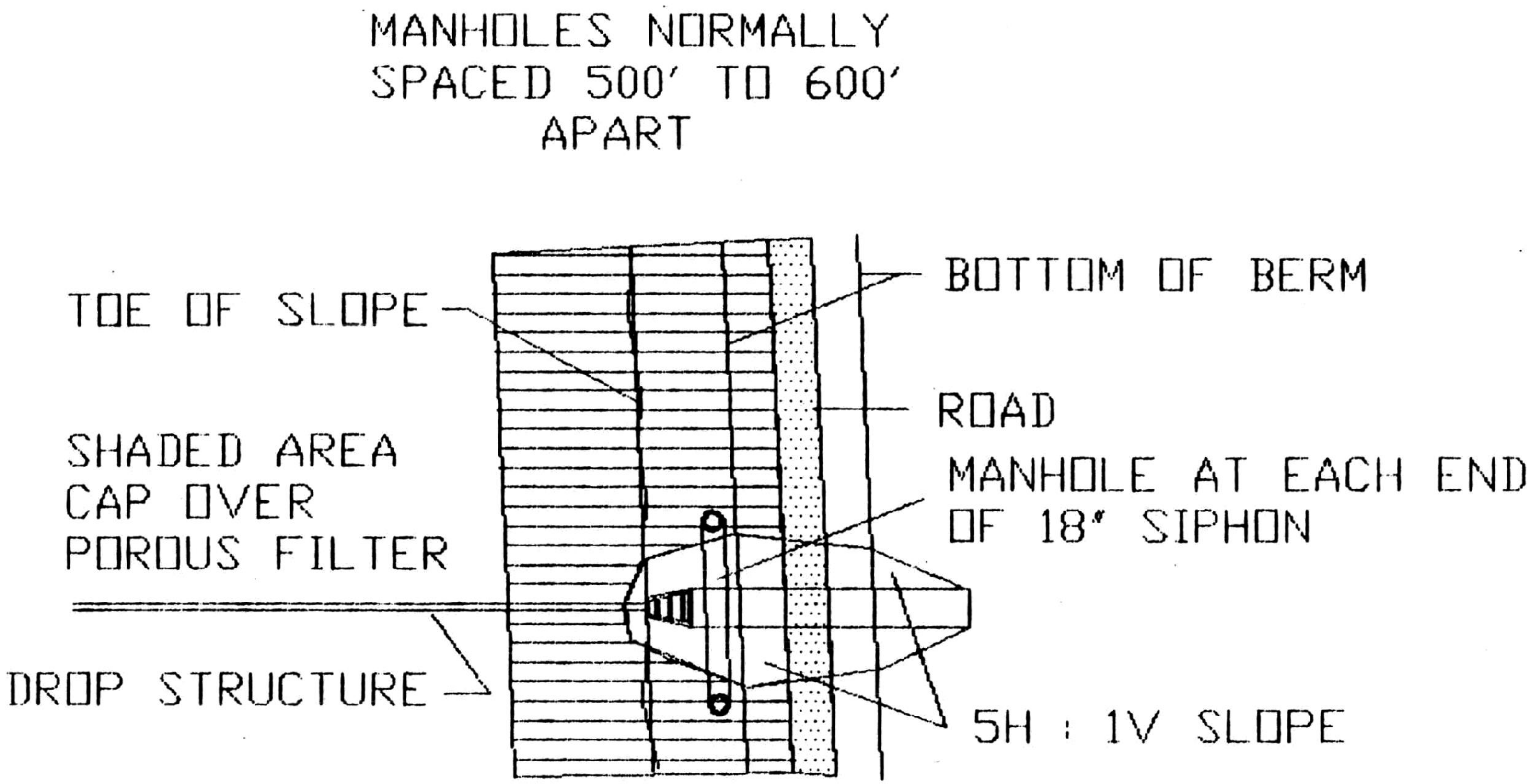
SECTION THROUGH TYPICAL POROUS DRAIN

FIGURE 6



GENERAL LAYOUT OF POROUS DRAIN & ROAD/BERM

FIGURE 7



ROAD CROSSES SURFACE DRAINAGE STRUCTURE
THROUGH OPEN CHANNEL TO DAYLIGHT

WATER CROSSES SURFACE DRAINAGE STRUCTURE
THROUGH 18" SIPHON UNDER OPEN CHANNEL TO DAYLIGHT

FIGURE [illegible]

Part II
SUPPORTING INFORMATION
FOR THE
CLOSURE PLAN

Site A Ash Landfill
Gibbons Creek Steam Electric Plant
Carlos, Texas

Prepared by

Calvin Woods, P.E., Consulting Engineer
505 Church Street, College Station, Texas 77840

September 30, 1991

Table of Contents
Part II
SUPPORTING INFORMATION
FOR THE
CLOSURE PLAN
Site A Ash Landfill
Gibbons Creek Steam Electric Plant
Carlos, Texas

Chapter I
BACKGROUND

A. INTRODUCTION

This document discusses and outlines the actions that must be taken to close an existing operational Class II Landfill in a safe, economical manner in compliance with applicable regulations.

B. HISTORY OF LANDFILL

The Site A Ash Landfill (Class II Landfill) has been in operation since November, 1982. It was originally designed to have an area of 247 acres with an expected life of twelve (12) years. This landfill was taken out of routine operation in 1991 and it will be closed as soon as possible.

This landfill operation is registered with the Texas Water Commission (TWC).

C. REVIEW OF ORIGINAL PLAN

Texas Municipal Power Agency (TMPA) engaged Conversion Systems, Inc. (CSI) to develop specifications for the construction and operation of a landfill to dispose of fly ash, bottom ash, and stabilized FGD sludge and to prepare a Solid Waste Management Plan for construction and operation of the landfill. The resulting documents are:

- o Landfill Site Development Technical Specifications, Revised September 1982.
- o Landfill Site Development Technical Specifications, Addendum 1, Fly Ash, September 1982.
- o Solid Waste Management Manual for Gibbons Creek Steam Electric Station, Texas, Site A Landfill, Revised September 1982.
- o Drawing F 151L - L 10 through L 17, Revision 0, September 17, 1982.

It is these documents that are listed in the Navasota Mining Ash Disposal Contract that outlines the scope of services to be provided to TMPA by Navasota Mining Company for plant waste disposal from the Gibbons Creek Steam Electric Station, November 1982, Revised April 14, 1983.

The documents show a proposed landfill with an area of 247 acres (page 3 of contract) and an expected life of twelve (12) years (page 5 of contract) (Navasota Mining Company <u>Scope Of</u>

Service For Plant Waste Disposal From the Gibbons Creek Steam Electric Station, November 1982, Revised April 14, 1983). The side-slopes and cap had specified slopes and thicknesses. The slope on the cap was attained by having a saw-tooth arrangement; that is, a positive slope existed for a few feet followed by a similar negative slope.

The design rainfall event specified in the contract between Navasota Mining Company and TMPA for the design and operation of the landfill is as follows:

For revegetation purposes - the five-year, 24-hour event or a rainfall intensity of 1.5 inches per hour (page 4 of contract).

For storage volume of runoff water purposes - the ten-year, 24-hour event (page 8 of contract).

The following information was taken from various documents:

- o Thickness of liner - a minimum of two feet of low permeable soils. Taken from Navasota Mining Company Scope of Services For Plant Waste Disposal From The Gibbons Creek Steam Electric Station, November 1982, Revised April 14, 1983, Section 2 (2.1 Landfill Plan) page 3.

- o Slope of cap or final cover - a minimum of 0.03 feet/foot (3 percent). Taken from Drawing Number F151L-L12, General Notes.

- o Slope of perimeter of landfill - requires a 3H to 1V. Taken from Drawing Number F151L-L15, Cross Sections.

- o Thickness of cap or final cover - a minimum of two feet of compacted topsoil and suitable subsoil on all exterior slopes, benches and embankment crest. Taken from Navasota Mining Company Scope of Services For Plant Waste Disposal From The Gibbons Creek Steam Electric Station, November 1982, Revised April 14, 1983, Section 2, (2.1 Landfill Plan) page 4.

D. REVIEW OF CORRESPONDENCE WITH REGULATORY AGENCY

The documents prepared by CSI concerning the landfill operation and specifications were submitted to the Texas Department of Water Resources(TDWR) (the predecessor of the Texas Water Commission) so that the activity would be registered. The Texas Department of Water Resources reviewed the documents and assigned Solid Waste Registration Number 32271. Their letter dated December 2, 1982 indicates that "the design of the five-acre initial demonstration area substantially conforms to TDWR

Industrial Solid Waste Technical Guidelines, as applicable, and if properly constructed and operated, should provide reasonable assurance of effective industrial solid waste management." Their letter confirms that a clay liner with a thickness of two (2) feet was acceptable. The purpose of the demonstration was to indicate that a clay liner was not necessary to the operation of the landfill. The TDWR approved the demonstration but they required that liner construction continue (Texas Department of Water Resources, Letter to Manager of Environmental Services, TMPA, dated December 2, 1982).

E. REVIEW OF EXISTING OPERATIONS

The past and present operations resulted in a landfill that has a nominal two (2) foot thick liner (average thickness is 1.31 feet based on four (4) borings), an average permeability that is about 2.42 times lower than the required 1x10-7 cm/sec, and a two (2) foot thick final cover with a grass cover. The slopes on the final cover are much flatter than in the original design slope of three (3) percent, and the uncovered area that is receiving ash (the working area) is larger than visualized. The side-slopes of the landfill are generally flatter than the specified 3 horizontal to 1 vertical. However, there are side-slopes that are too steep and there are places where the final cover is too thin (see Chapter III, POST-OPERATIONAL MAINTENANCE PERIOD, A. WATER CONTROL SYSTEM).

The end result is that water percolates through the final cover into the ash, downward to the bottom liner, and from there it flows downslope to the perimeter of the landfill. As the water flows through the toe of the slope, it carries suspended ash that settles out in the ditches and holding ponds. Examples of this kind of failure that has resulted in ash being deposited in a ditch is shown in Photographs 1 and 2. Photographs 3 and 4 show ponds that contain ash. Photographs 9 and 10 show close-up views of an unstable toe that permits ash to escape. The location of the photographs are indicated in FIGURE I-1.

When the flow is too high, the water flowing through the toe of the slope causes a failure of the slope and large volumes of ash escape from the landfill. This type of failure has occurred once approximately three or four years ago.

When large rains occur and large areas of ash are uncovered, large amounts of ash flow out of the landfill. This kind of failure has occurred on a large scale twice, once in April 1991 and once about two years ago. The April 1991 failure is depicted in Photographs 5, 6, 7, and 8. The failure that occurred about two years ago is shown in Photographs 11, 12, and 13.

The flat slopes on the final cover result in ponded water (Photograph 14). Failure to adequately convey the surface runoff from the top of the landfill to the bottom of the side-slopes results in damage as shown in Photographs 15 and 16. Other damage due to erosion is shown in Photographs 17 and 18.

The side-slopes of this landfill will continue to be unstable due to flow of water through the toe of the slope, and excessive erosion will continue to occur unless the landfill is closed properly.

F. TYPES OF WASTE

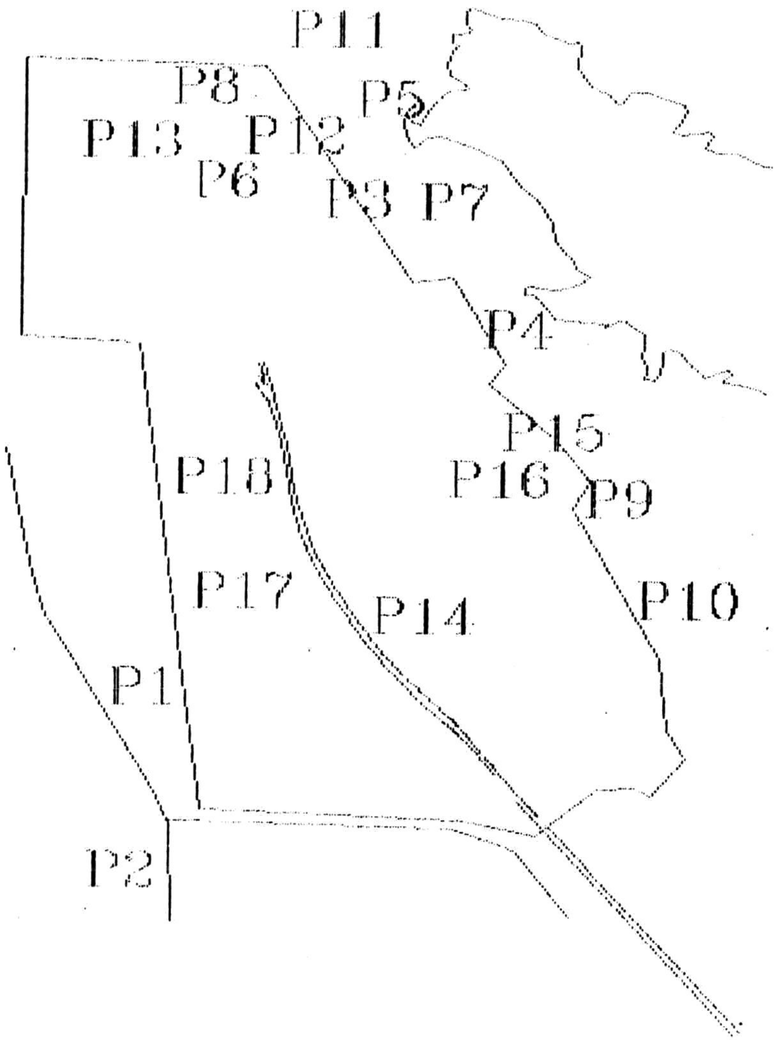
The materials deposited in this landfill are fly ash, bottom ash, and stabilized sludge. In general, there is no segregation of the various products.

G. DENSITY, STRENGTH, AND PERMEABILITY OF ASH

The permeability of the fly ash and the stabilized sludge is approximately 1x10-4 cm/sec. The permeability of the bottom ash is approximately 0.25 cm/sec. The ash is a non-cohesive material that gains its strength from overburden pressure and angle of internal friction. If the material is confined it will develop shear strength. The density of the material in the landfill is variable; a typical value is sixty-eight (68) pounds per cubic foot (dry).

H. ORIGINAL AND FINAL TOPOGRAPHY

The original topography is shown on various drawings (F151L-L11, L12, L13, and L14) and it is shown in Part I of this report on FIGURE 2. At various times during the project topographic maps were prepared by aerial photogrammetric techniques. The last topographic map is based on photographs taken in early January, 1991. The results of this survey are shown on Navasota Mining Company Drawing No. 8003-51-50-01.

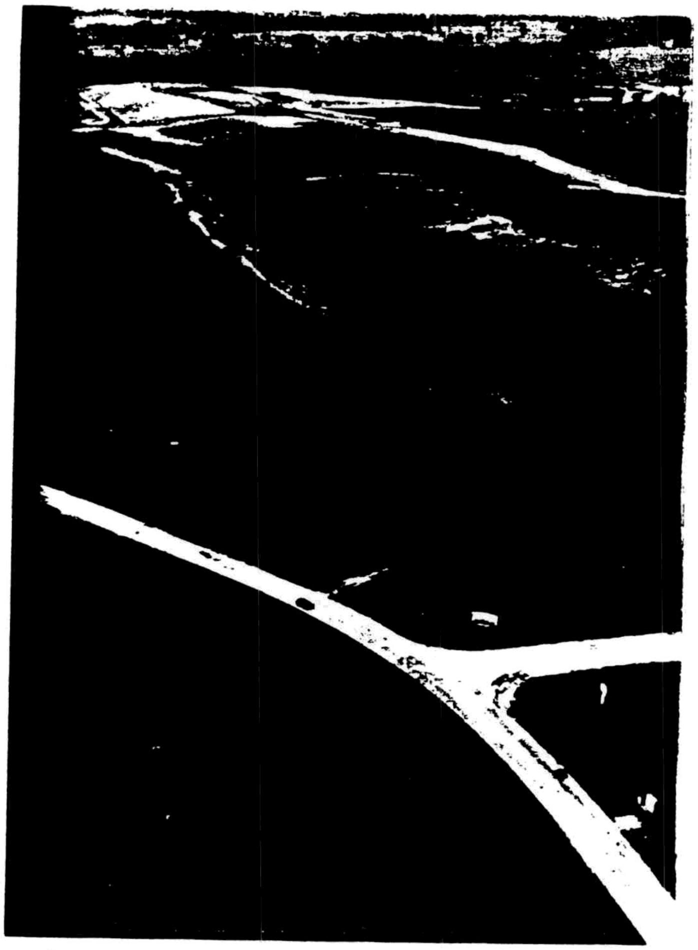


ASH LANDFILL PHOTO LOCATIONS
FIGURE I 1

Water that flows out of the landfill through the toe of the slope carries small amounts of suspended ash that is deposited in the ditches and holding ponds. These two photographs (photograph 1 and photograph 2) show an example to a ditch that contains large amounts of ash. This ditch is identified in Figure 1-1 as Ditch A.

Photograph 1

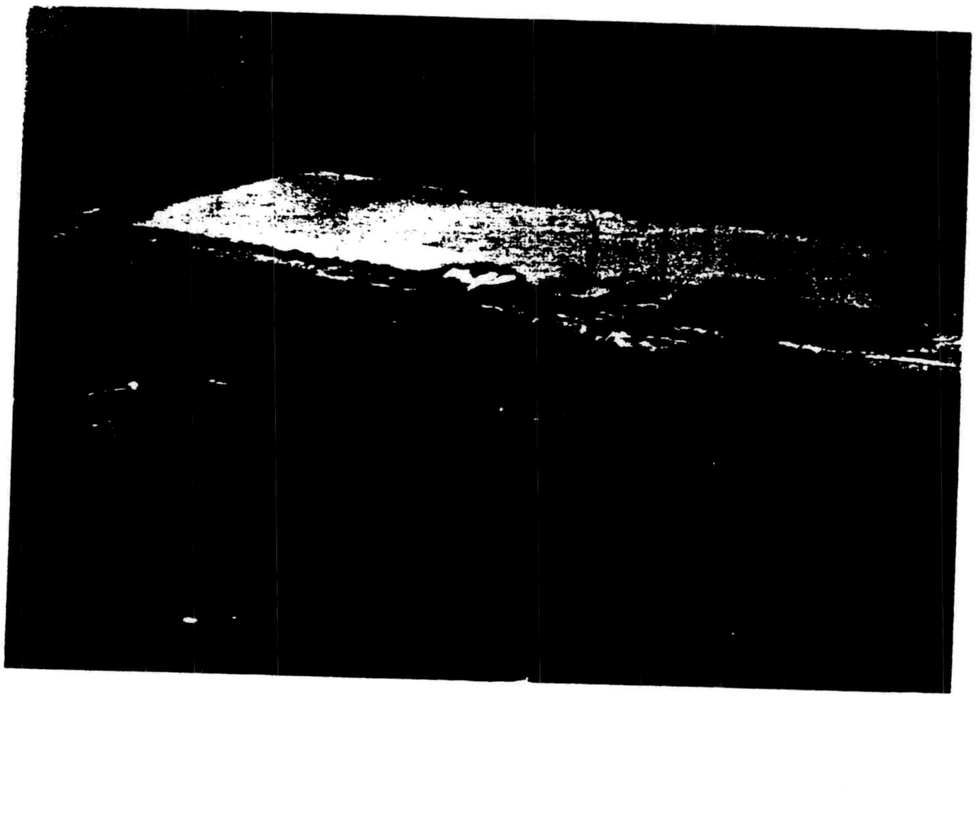
Photograph 2



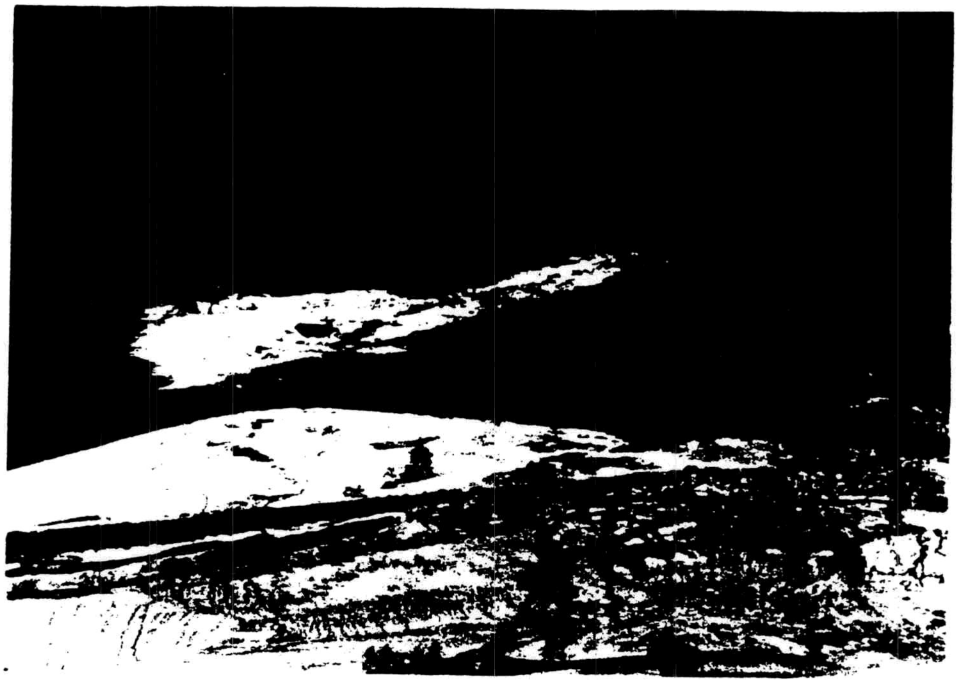
Photograph 3

Photograph 3 and 4 are examples of holding ponds and other ponds that contain ash that must be removed. The pond in Photograph 3 is identified in figure 1-1 as # 3 and the holding pond in Photograph 4 is identified as # 4.

Photograph 4



Photograph 5



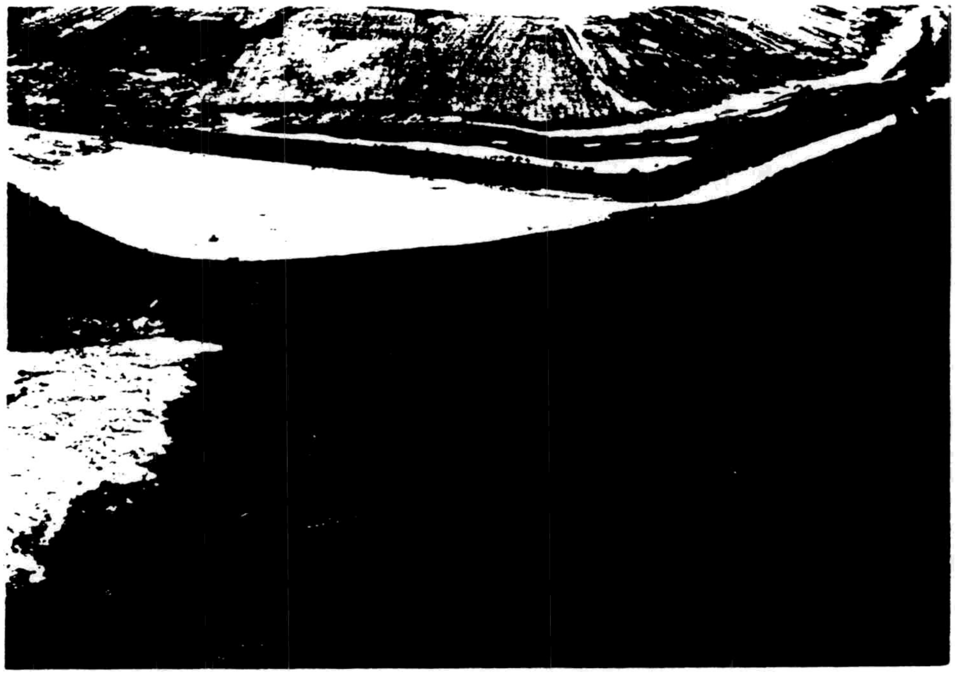
Photographs 5 and 6 show an example of a wash-out of uncovered ash from the landfill. The location of the general area of this failure is identified as # 5 and # 6 on Figure 1-1. Large amounts of ash have filled the holding pond and escaped to a natural drain adjacent to the lake.

Photograph 6

Photograph 7

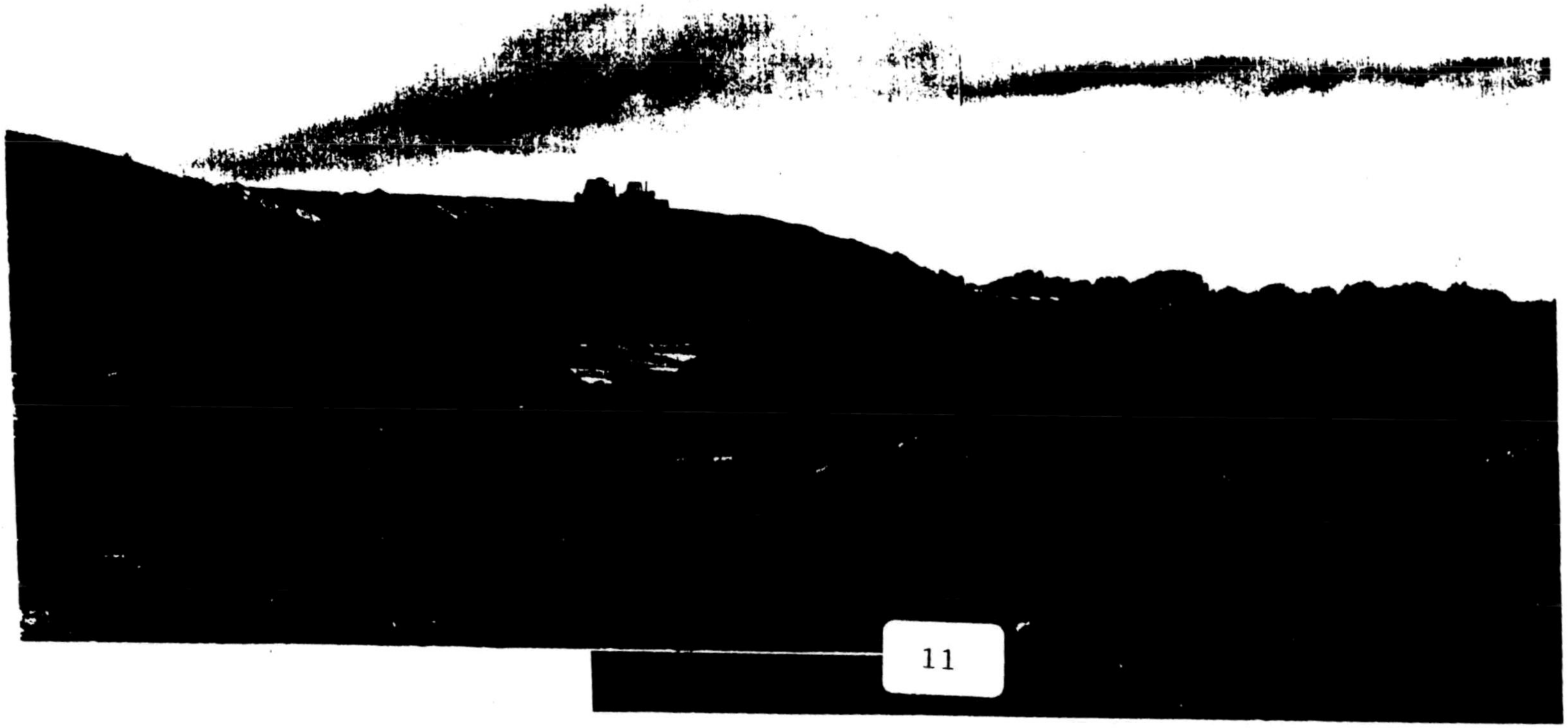
Photographs 7 and 8 show the same failure as depicted in photographs 5 and 6. These points are identified as # 7 and # 8 on Figure 1-1.

Photograph 8

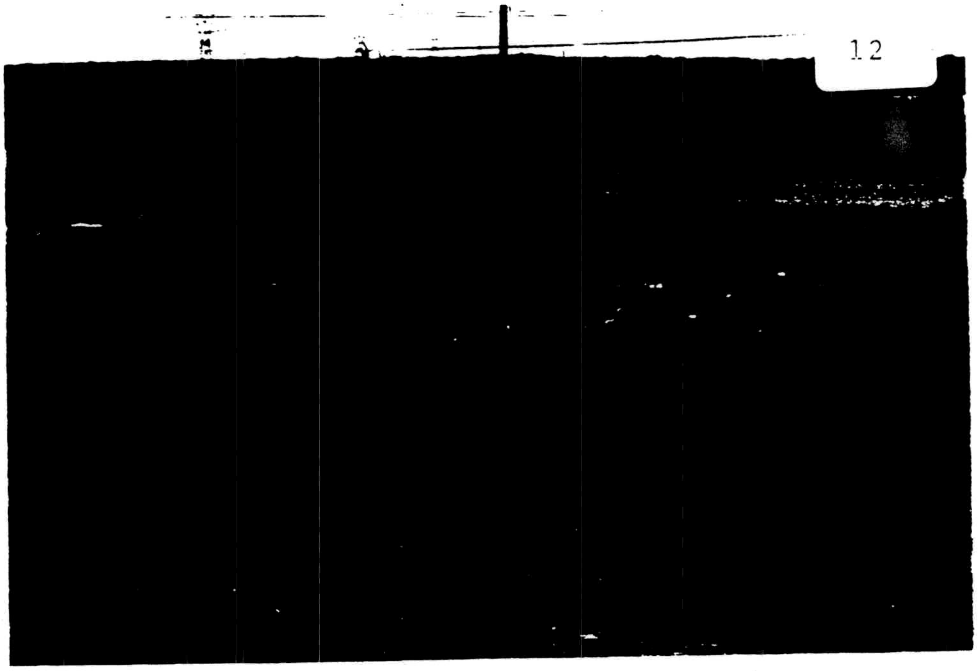


Failure of toe of side-slope due to water flowing out of the landfill through the toe.

A general failure of uncovered ash due to high rainfall.

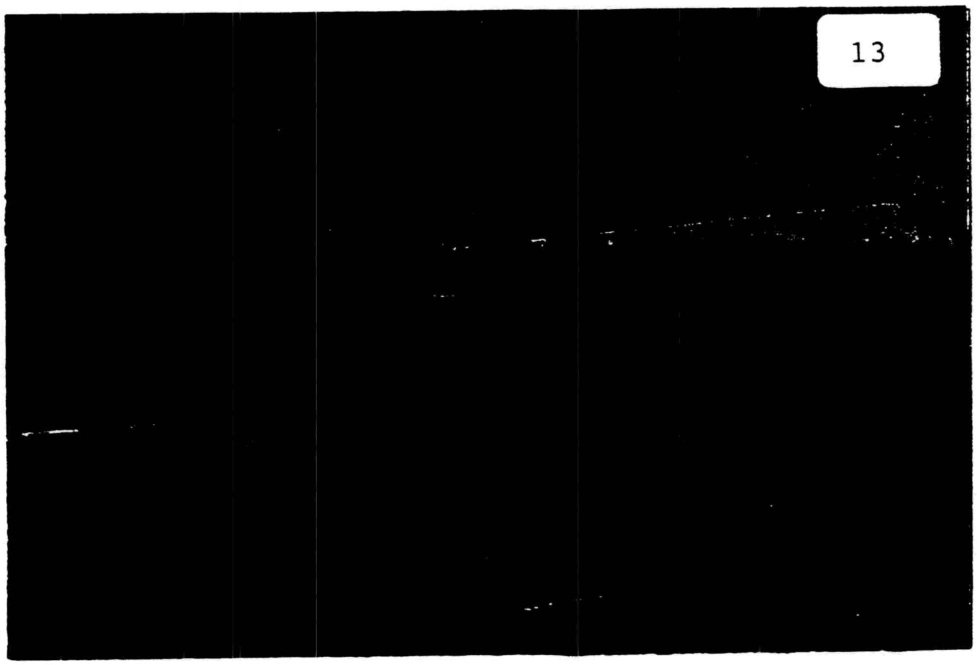


12

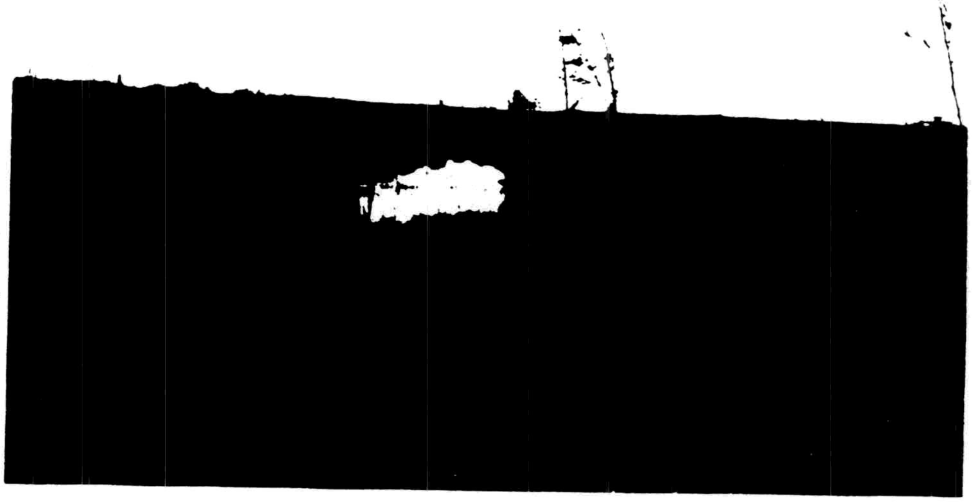


Close up of a failure of
uncovered ash due to high
rainfall.

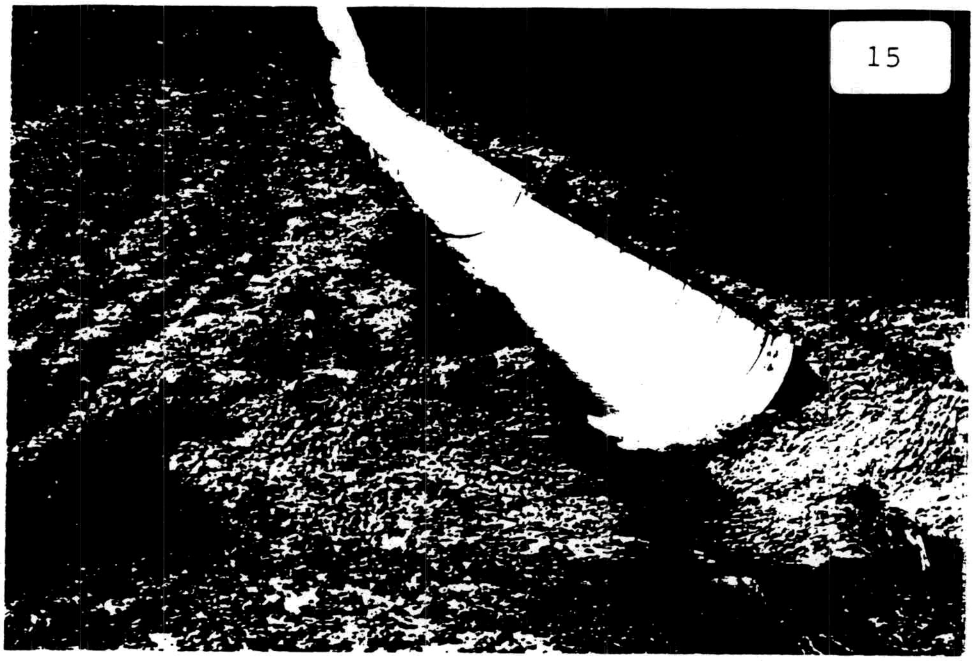
13



Photograph 14 shows surface ponding



Photographs 15 and 16 show typical surface erosion problem.



Typical erosion due to surface runoff.

Chapter II
PHYSICAL SITING OF LANDFILL

A. RAINFALL AND POTENTIAL EVAPOTRANSPIRATION

The record of rainfall and pan evaporation data for the Gibbons Creek Steam Electric Plant is too short to be suitable for long-term water balance computations. The nearest station that has a long continuous record of rainfall and pan evaporation is College Station, Texas. A comparison of the short record of the monthly rainfall data for Gibbons Creek with the College Station, Texas data for the same time period indicates good agreement (See FIGURE II-1).

The U. S. Weather Bureau long-term monthly precipitaton and pan evaporation data for College Station, Texas (Station Number 013) was used to calculate a water balance for a landfill. This record is for January 1969 through September 1990, a period of 21.75 years. This data is listed in TABLE II-1. The average precipitation is 40.08 inches per year and the average pan evaporation is 76.92 inches per year.

In order to see trends in rainfall and pan evaporation data a five-month moving average is computed and plotted. An example of the computation of a five-month moving average for the data is shown below:

Month	Precip.	Five-month Average
1	2	
2	3	
3	1	Total for months 1-5 = 13/5 = 2.6
4	4	Total for months 2-6 = 12/5 = 2.4
5	3	Total for months 3-7 = 10/5 = 2.0
6	1	
7	1	

The advantage of a five-month moving average is that the resulting curve is much smoother than plotting each data point individually. The results of the five-month moving average computation for College Station are shown on TABLE II-2. The five-month moving average for rainfall is shown on FIGURE II-2 and the five-month moving average for pan evaporation is shown on FIGURE II-3. The moving averages for rainfall and pan evaporation are shown on the same graph on FIGURE II-4 to show the relative variations in the data.

These data indicate that the last three years of the rainfall record indicate less rainfall than average; the average rainfall for the period of record is 3.34 inches per month while the average for the last three years is 2.45 inches per month.

The pan evaporation is greater for the last three years than average; the average pan evaporation for the period of record is 6.41 inches per month while the average for the last three years is 7.41 inches per month.

B. WATER BALANCE

Introduction

The water balance, as developed in the soil and water conservation literature, is based on the relationships among precipitation, evapotranspiration, surface runoff, and soil moisture storage. Precipitation represents the amount of water added per month. Evapotranspiration, the combined evaporation from the plant and soil surfaces and transpiration from plants, represents the transport of water from the earth back to the atmosphere. This is the reverse of precipitation. The evapotranspiration is computed by taking seven-tenths (0.7) of the pan evaporation for Grimes County. Surface runoff represents water which flows directly off the area of concern. The soil moisture storage capacity represents water which can be held in the soil.

The water placed on the landfill by precipitation will either evaporate directly back to the atmosphere from the soil surface, or it will infiltrate into the soil to be utilized by plants through transpiration, or it will recharge a dried soil to field capacity, or it will become downward percolation. The relative amounts of each of these depend on the relationship between precipitation and evapotranspiration.

The water balance method centers around the amount of free water present in the soil. Until the field capacity of the soil is reached, the moisture in the soil is regarded as being a balance between what enters it as a result of precipitation and what leaves through evapotranspiration. If monthly moisture loss from the soil through evapotranspiration is compared with the monthly precipitation, an accounting of the soil moisture can be made by a simple bookkeeping procedure. The moisture in the soil is analogous to a bank account where precipitation adds to the account, and evapotranspiration withdraws from it.

Determination of Water Storage Capacity of the Root Zone of the Final Cover

The normal root zone for the native vegetation that grows on the landfill is greater than the thickness of the final cover (two (2) feet). This was verified by examination of the soil samples collected during the investigation of the depth of the final cover. The soil is a light clay or a clay loam which has a water storage capacity of about three (3) inches per foot of depth. Therefore, at field capacity, the soil will contain three (3) inches of water for each foot of final cover; in this case, the storage will be six (6) inches for two (2) feet of soil.

Determination of the Runoff Coefficient for the Final Cover

A relationship between slope and runoff coefficient for a soil composed of clay or clay loam that is covered with grass is illustrated in FIGURE II-5.

The existing slope on the final cover is relatively flat; the final cover is a clay soil that is covered with grass. This results in a runoff coefficient that is between 0.08 and 0.15, with a typical value of 0.10.

A grass-covered clay soil used as a final cover with a slope of two (2) percent would have a runoff coefficient that ranges from 0.15 to 0.20 and a typical value of 0.17. A similar final cover with a slope of three (3) percent would have a runoff coefficient that ranges from 0.165 to 0.215 with a typical value of 0.20.

Results of Water Balance Computations

Water balance computations were made for various values of storage capacity in the root zone of the final cover and runoff coefficients using twenty years of College Station rainfall data and the potential evapotranspiration computed from the College Station pan evaporation data. Computations were made for storage capacities of three (3), six (6), nine (9), and twelve (12) inches of water and for runoff coefficients of 0.07, 0.10, 0.15, 0.17, 0.20, 0.215, 0.23 and 0.25. The results of these computations are shown in APPENDIX: WATER BALANCE COMPUTATIONS at the end of this report.

The total percolation for the twenty-year period is computed. The average monthly percolation is computed by dividing the total percolation by 240 months. These results are shown in TABLE II-3. The maximum monthly percolation for each water balance computation for the period of record and the maximum percolation during any twelve (12) month period for the period of record are also shown in TABLE II-3. The amount of percolation for varioius runoff coefficients and storage values are shown in TABLE II-4. The volume of water that flows through the toe of the landfill during the worst month of record based on the assumption that only twenty (20) percent of the percolation water will leave the landfill is shown in TABLE II-5. The volume of water that flows through the toe of the landfill during the worst twleve (12) continuous months based on the assumption that only twenty (20 percent of the percolation water will leave the landfill is shown on TABLE II-6.

C. GEOLOGY OF THE AREA

Introduction

The Site A Ash Landfill is located in Grimes County, Texas, near the town of Carlos (FIGURE II-7). To evaluate the long-term effects of the environment on the ash landfill, the general climatalogical, geological, and geomorphological processes and relationships in the region and at the site are examined. General trends and average parameters are used to determine a characteristic geological setting for the region and site. Analyses are synthesized from previous research in theses, from geotechnical engineering report data, and from original work based on these compiled results.

Physical Setting

Climate

The climate within the area is humid subtropical with hot summers and is designated by Koppen classification. The prevailing winds are from the south, year-round, with the highest velocity winds occurring in the months of March and April. A large variance in temperature exists in the region with average annual temperature extremes from -5 degrees C (23 degrees F) to 49 degrees C (120 degrees F). Total annual precipitation averages approximately 99 cm (39-40 in) and is distributed relatively evenly throughout the year with the months of April, May and September having the highest average rainfall amounts (10 cm, 4 in).

Regional Geology

FIGURE II-8 shows the distribution of geologic units on the surface around the TMPA Ash Landfill area. The surface outcrops consist of members of the Manning Formation, Jackson Group of Eocene Age (40 to 60 million years ago). A generalized cross-section through the area is shown in FIGURE II-9. The lignite coal occurs principally in four thin (approximately 5 to 10 feet thick) layers or seams and is usually found just above the Bedias sandstone within a claystone or sandstone, with the geologic units striking in a general direction of N 60 degrees E with a southeast dip of approximately 1/2 to 2 degrees (<1% to 3.5%) (Mathewson and Bishop, 1979). Surface exposures and outcrops consist primarily of alternating layers of diagenetically mature sands and clays forming sandstones, clay or mudstones, and shales. Specific outcrops at or near the site within the

Wellborn Formation (200 ft. thick) include an upper sand member (Carlos sandstone), a middle sandstone, and a lower sandstone unit (Bedias sandstone).

FIGURE II-10 shows a typical geologic stratigraphic section near the site with approximate thicknesses of each lithologic unit. The soils developed on top of the surface exposures are typically alfisol order which have subsurface horizons of clay accumulation and a substantial availability of basic ions. Specifically, the soils in the region are probably suborder ustalf. Ustalf soils develop under conditions similar to those in the region, with hot to temperate climates and dry periods of 90 days or more during periods when temperature is suitable for plant or crop growth (Strahler and Strahler, 1978).

The geological units in the region are probably of deltaic origin with the lignite coal resulting from the maturation of peat beds between adjacent distributary channels. The peat is then covered with sandy or silty clay material which acts as a seal, thus producing an anaerobic environment within a relatively short geologic time period. Mathewson and Bishop (1979) also note that the coal lithologies are results of autochthonous peat deposition in forested swamps, implying that the beds were formed in place and were not transported from another region for deposition at the site. FIGURE II-11 shows a block diagram of the various geologic units in the area, while FIGURE II-12 demonstrates the stratigraphic relationships in the area along the strike direction of the bedding (northeast-southwest).

Regional Geomorphology

The TMPA Ash Landfill lies within the Gulf Coastal Plain physiographic province. The geomorphology of the region of the landfill is characterized by gently-undulating coastal plains with little natural relief variation. However, cuestas or small hills striking northeast to southwest and dipping approximately 3 percent toward the south dominate as the significant geomorphic features of the area. The cuesta caps consist of rock (usually the Bedias, Middle Wellborn, Carlos and Chita sandstones) that is more resistant to weathering and erosion, which dip gently gulfward into the softer claystone deposits. The Chita sandstone produces the most prominent and continuous cuesta ridges (Walton, 1959). However, Walton (1959) also notes that the cuestas adjacent to the Gibbons Creek floodplain are usually composed of the Carlos and Middle Wellborn sandstone members. In this area, the hydraulic flows associated with Gibbons Creek have deeply eroded the softer clay strata and exposed the more resistant sandstone beds forming the cuesta capstones. This erosion mechanism creates relatively steep scarp slopes (Walton, 1959).

Surficial deposits consist of clay and silty sand generally of types CL, CH and SM (Unified Soil Classification System).

Because of the deltaic depositional environment involving distributary flow, river flow and shallow ocean processes in the past, the deposits are complexly interfingered and exact depositional facies determinations are not clear. Quaternary alluvium consisting primarily of overbank deposits of clays and silts predominate the surficial deposits on either side of Gibbons Creek creating an almost featureless flat floodplain approximately one mile in width.

Gibbons Creek and its tributaries produce a dendritic drainage pattern, and whereas Gibbons Creek flows continuously, the other streams in the area have only intermittent flow.

Site Geologic Features

Structural Features

Examination of a 1:250,000 geological map and the literature reveals that no major faults exist in the area except for the Galaspy fault, trending approximately N 70 degrees W, mentioned by Walton (1959) and Mathewson and Bishop (1979). Evidence for the fault is seen in its modification of the drainage of Peach Creek and steeply dipping (15 degrees) beds in the Chita sandstone. It is probable that no lithologic units are folded significantly on a regional level. This results in an overall homoclinal structure with strata dipping gently toward the southeast. However, small-scale local folding and creation of breccia is possible around minor micro faults associated with the Galaspy fault.

Aquifers

Pietrzak and LaFrance (1982) note an abundance of temporary perched water tables throughout the region varying in depth from two to twenty-nine feet from the surface. This water is held by the clay formations near the surface. However, several aquifers are found in the Bedias and Wellborn Formations and the underlying Caddel and Yegua Formations. The recharge areas for these aquifers are located at their outcrops in the northern part of the study region.

Pietrzak and LaFrance (1982) conclude that potential groundwater contamination is not probable. However, because of the complex facies and bedding relationships with interfingered sands, some caution is recommended if aquifers exist downdip. The hydraulic conductivity of the sands is usually 10 to 100 times as great as the surrounding clays and these sand beds may potentially serve as conduits for landfill leachate.

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Mathewson, C.C. and Bishop, M.A., 1979. Geology of the Gibbons Creek Lignite Deposit, Manning Member (Jackson Group), Grimes County, Texas. In Lower Tertiary of the Brazos River, David G. Kersey ed. Houston Geological Society, Houston, Texas, 26-36p.

Pietrzak, A.P. and LaFrance, G.G., 1982. Industrial Waste Disposal Plan, Gibbons Creek Steam Electric Station, Grimes County, Texas. Report prepared by National Soil Services, Inc. for TMPA.

Walton, W.L., 1959. Geology of the Carlos-East Area, Grimes County, Texas. Thesis, Texas A&M University, College Station, Texas, 97p.

D. GROUNDWATER IN THE VICINITY OF THE LANDFILL

The groundwater in the vicinity of the landfill has the following average values: Electrical Conductivity is 6,200, pH is 4.2, Chlorides are 1,700 mg/l, Calcium is 5,700 mg/l, Sulfates are 2,050 mg/l, and Iron is 2.7 mg/l. The groundwater temperature shows a generalized seasonal variation with summer high temperatures being about five (5) degrees higher than the winter low temperatures. There are variations in values over time but no obvious trends of increase or decrease over time with pH, Water Level, Electrical Conductivity, Total Dissolved Solids, Iron, Manganese, Sulfate, Chloride, Calcium and Hardness. Selenium is at or below the detection limit.

An investigation of the groundwater quality does not indicate that the operation of the landfill has affected the groundwater quality directly under or around the landfill operation. No evidence has been found of leachate migrating from the landfill into the groundwater in the vicinity of the landfill. In general, the water that has infiltrated into the landfill is of better quality than the groundwater.

The locations of the monitoring wells are shown in FIGURE 2 in Part I, CLOSURE PLAN.

E. SURFACE WATER IN THE VICINITY OF THE LANDFILL

There are no surface streams in the immediate vicinity of the landfill. The Gibbons Creek Reservoir is located adjacent to the landfill.

F. EXISTING LINER

A geotechnical investigation including four (4) soil borings indicates that the liner thickness varies from zero (0) feet to two-and-a-half (2.5) feet with an average thickness of 1.31 feet. Three out of four measurements indicated that the constructed clay liner was less than the design thickness of two (2) feet.

The permeabilities of the liner ranged from 1x10-7 to 2.7x10-9 cm/sec with an average value of 4.12x10-8. The average coefficient of permeability is about 2.42 times lower than the required 1x10-7 cm/sec.

The Atterberg Limits of the liner soil indicate that it should produce an impermeable liner. The liquid limits ranged from a low of 44 to a high of 73 and the plasticity index ranged from a low of 18 to a high of 39.

The soil liner is generally saturated; the soil under the liner is generally unsaturated, indicating little leakage from the landfill. There was no evidence of any deterioration of the liner due to chemical interaction with the leachate.

G. EXISTING CAP

There are three major criteria that are used to determine if the existing cap meets the design specifications; they are:

Criteria	Specification
SOIL TYPE	SUITABLE SOIL
CAP THICKNESS	2 FEET
CAP SLOPE	3% MINIMUM ON TOP 3H:1V MAXIMUM ON SIDE-SLOPES VEGETATIVE COVER (GRASS)

The existing final cover or cap is constructed of clay soils that are classified as a low-plasticity clay or a high-plasticity clay (a CL or a CH based on the Unified Soil Classification System). These soils are suitable, actually desirable, for the final cover and meet the specifications.

The cap thickness averages more than two (2) feet; however, of the 106 measurements of thickness, seventeen (17) resulted in thicknesses of less than two feet. This amounts to approximately sixteen (16) percent of the measurements. The thin places are at the intersection of the side-slopes and the top-slope and other areas of local scour or erosion.

The slope of the cap on top of the landfill was calculated by use of the contour map with a contour interval of five (5) feet. Based on these measurements the slope of the cap on top of the landfill is very flat. The slope of the cap on top is less than one (1) percent over 13.9 acres (approximately 14%); it is less than two (2) percent over 74.7 (approximately 75%) acres (this includes that part with a slope of less than one (1) percent); and it is less than three (3) percent over 91.0 acres (approximately 91%). Approximately 9.0 acres of the cap on top of the landfill have a slope of three (3) percent or more (approximately 9%). The slope of the cap does not meet the slope specification.

The topographic map used to make the slope determinations is based on photography taken in early January of 1991. Some of the final cover on the north end of the landfill was constructed after the site was photographed. It is possible that the slopes on the newly constructed final cover are greater than shown by the topographic map.

The side-slopes are in better shape. Approximately 14,100 feet (or 80.4%) of the side-slopes have a slope of less than 25 percent. Approximately 3,400 feet (or 19.6%) of the side-slopes have a slope of 25 percent or more, and approximately 1,000 feet or (5.7%) of the side-slopes have a slope of 33 percent or more. The side-slopes generally meet the slope specification.

Where the vegetative cover is established, it is well on its way to meeting the specifications (see Chapter III, POST-OPERATIONAL MAINTENANCE PERIOD (BEFORE CONTRACTOR LEAVES, B. Grass and Tree Cover).

H. EXISTING WATER CONTROL SYSTEM

The water control system that existed as recently as several months ago was inadequate for several reasons; they were:

- o The installed surface drainage structures tended to fail after a short performance life.
- o There were not enough drainage structures installed.
- o The slope of the cap is too flat, thus too much water was infiltrating into the landfill.
- o The water that infiltrated into the landfill followed the slope of the liner and exited the landfill through the toe of the side-slope and no provisions were made for keeping the toe stable or for collecting the water.

A new surface water control system is now under construction. This system will consist of eight (8) drop structures to convey surface runoff from the top of the landfill to the natural ground below and adjacent to the landfill. These drop structures are composed of a series of ditches leading to an enclosed pipe system that will carry the water from the cap down the side-slopes. The surface storm runoff will be discharged from the enclosed pipe system into an open channel. The enclosed pipes are corrugated polyethylene that range in size from 24 inches to 36 inches in diameter. The open channels are trapezoidal earth channels with a twelve (12) foot bottom and 5H:1V side-slopes; they average approximately two (2) feet in depth. The length of the open channels varies from approximately fifty (50) feet to 450 feet. The general layout and details of this system are shown on Navasota Mining Company Drawing Numbers 8003-51-50-01, 02, 03, and 04. This plan, as shown in the drawings, does not provide for drop structures on the southern portion of the ash landfill. The vertical distance from the cap to the natural ground generally exceeds twenty (20) feet, and the slopes are steep enough that erosion will surely occur without drop structures in this area.

The reason that the cap was constructed with a slope that is too flat is unknown. The ash is known to be difficult to work with and slopes of uncovered ash tend to be reduced during rainfall events. The ash was not always compacted in horizontal lifts which might have aggravated the general construction problem.

Plans have not yet been formulated to modify the slope of the cap or to address the problem of toe instability and the collection of water leaving the landfill.

I. STABILITY OF THE SIDE-SLOPES

The toe of the side-slope has proven to be unstable because of the seepage of water that has infiltrated the cap of the landfill follows the contour of the lining and escapes from the landfill through the toe. Seepage water exits the landfill at all locations of the toe around the perimeter of the landfill. However, the seepage is higher at locations that coincide with the location of natural drainage channels that survived the construction of the liner.

There have been no major failures of the side-slopes or the toe of the side-slopes during the last two years. This is probably due to the fact that the last three years have been drier than normal. The record of the climatological data indicates that from October 1987 through September 1990 the rainfall averaged 2.45 inches per month compared to 3.34 inches per month for the period January 1970 through September 1990 (approximately 20 years). In addition, the pan evaporation averaged 7.31 inches per month compared to 6.41 inches per month for the same twenty (20) year period. The average rainfall averaged approximately 0.9 inches less than the twenty (20) year average and the pan evaporation averaged approximately 0.9 inches more than the twenty (20) year average.

J. EXISTING ACCESS ROAD

The existing access road is approximately 40 feet wide. The road is very satisfactory as a haul road used to deliver ash to the landfill. There is no all-around, all-weather road at this landfill. The purpose of the all-around, all-weather road is to allow maintenance and other vehicles to have access around the perimeter of the landfill. The closure plan provides for an all-around, all-weather road constructed of the materials salvaged from the haul road.

Comparison of College Station and
Gibbons Creek (TMPA) Rainfall

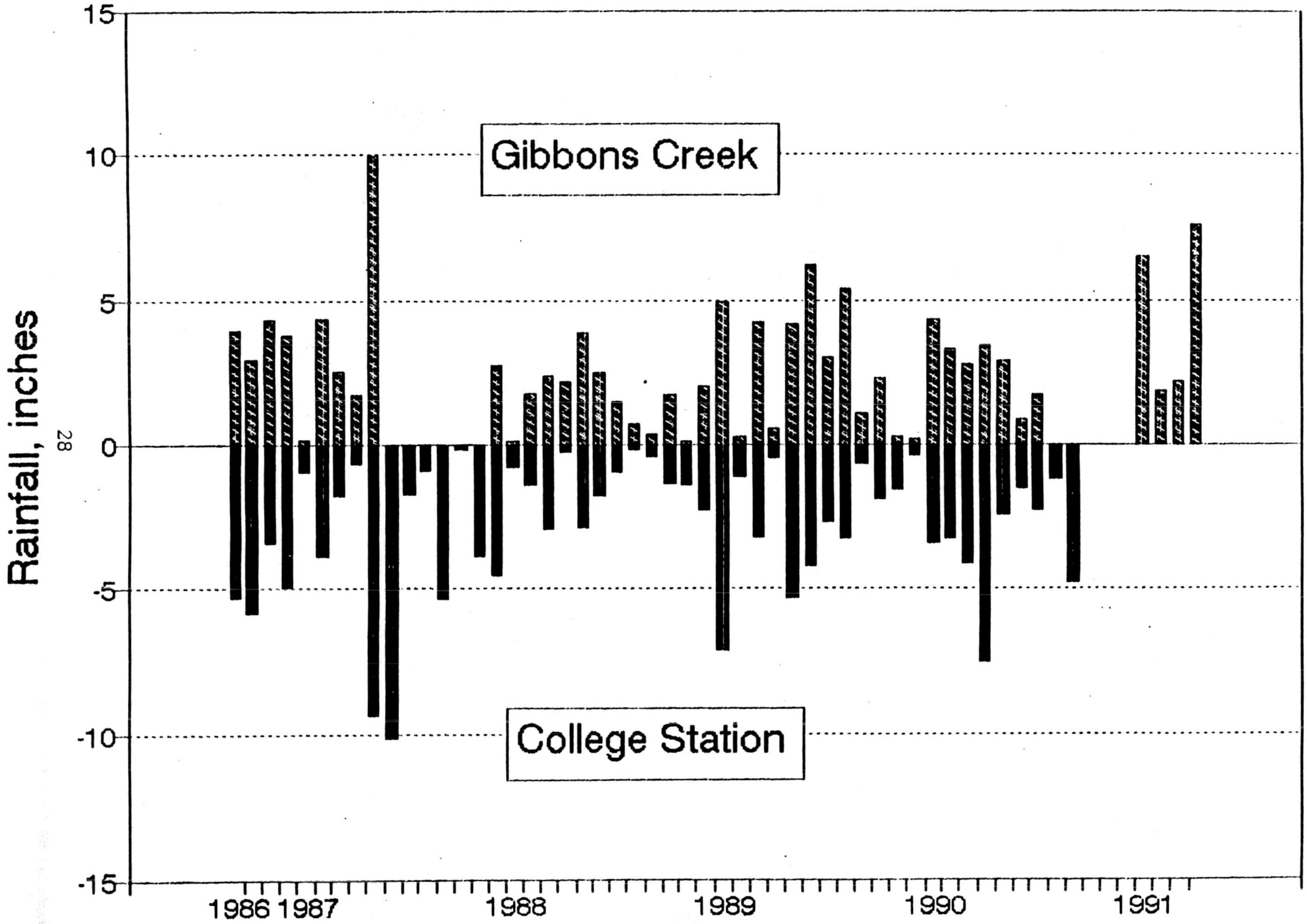


FIGURE II-1

MONTHLY RAINFALL

5 MONTH MOVING AVERAGE

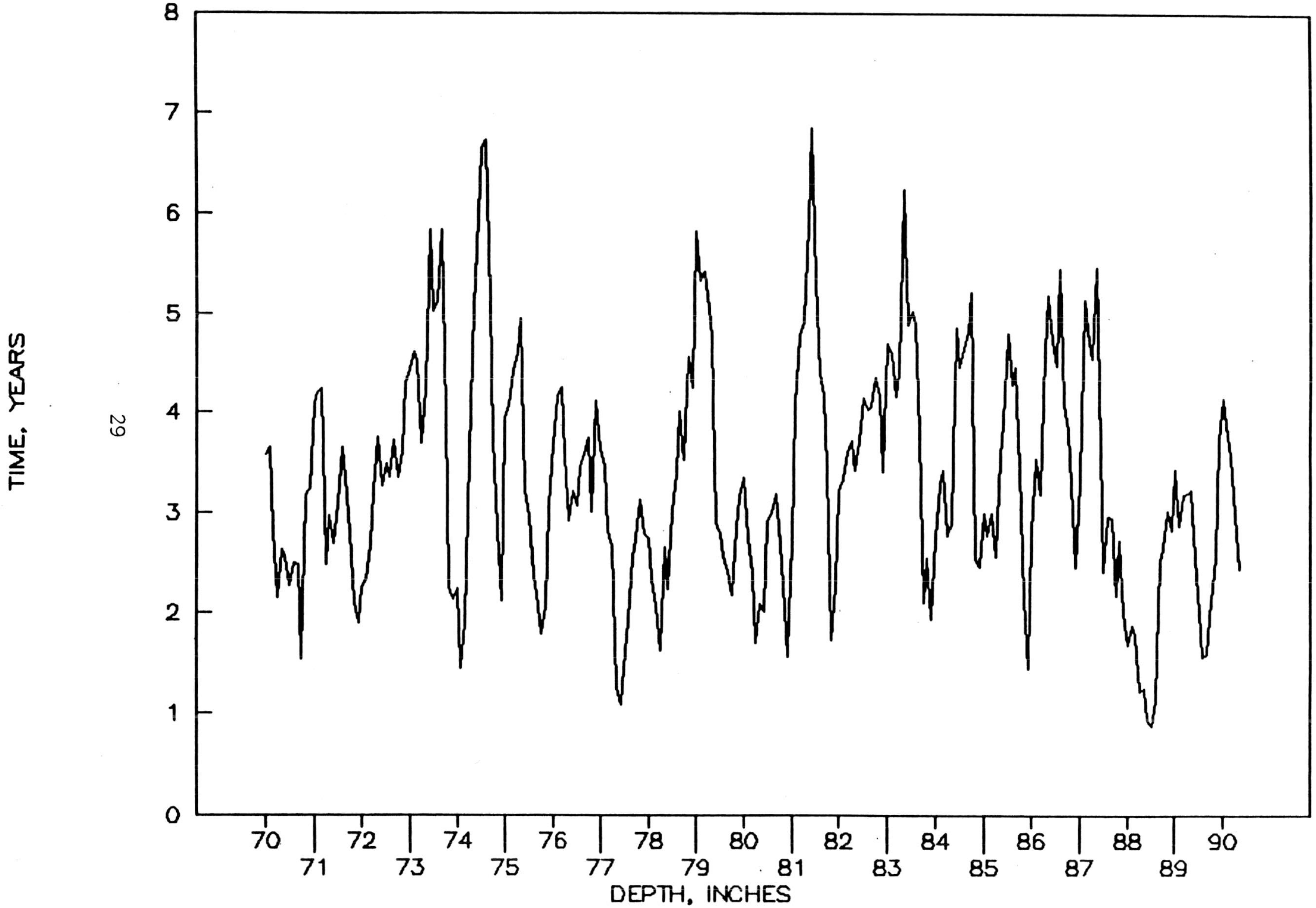
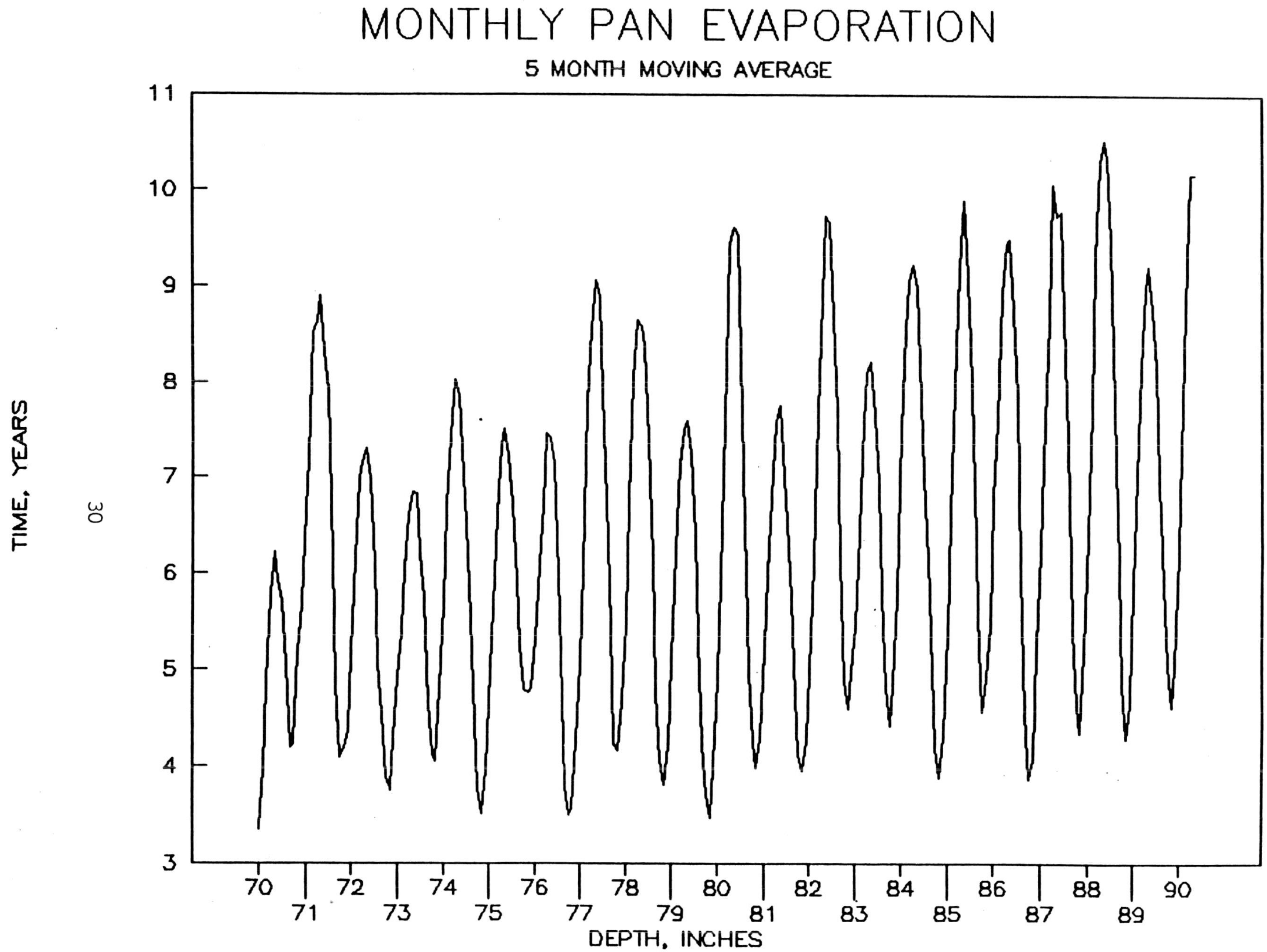


FIGURE II-2



30

FIGURE II-3

RAINFALL AND PAN EVAPORATION

VERSUS TIME

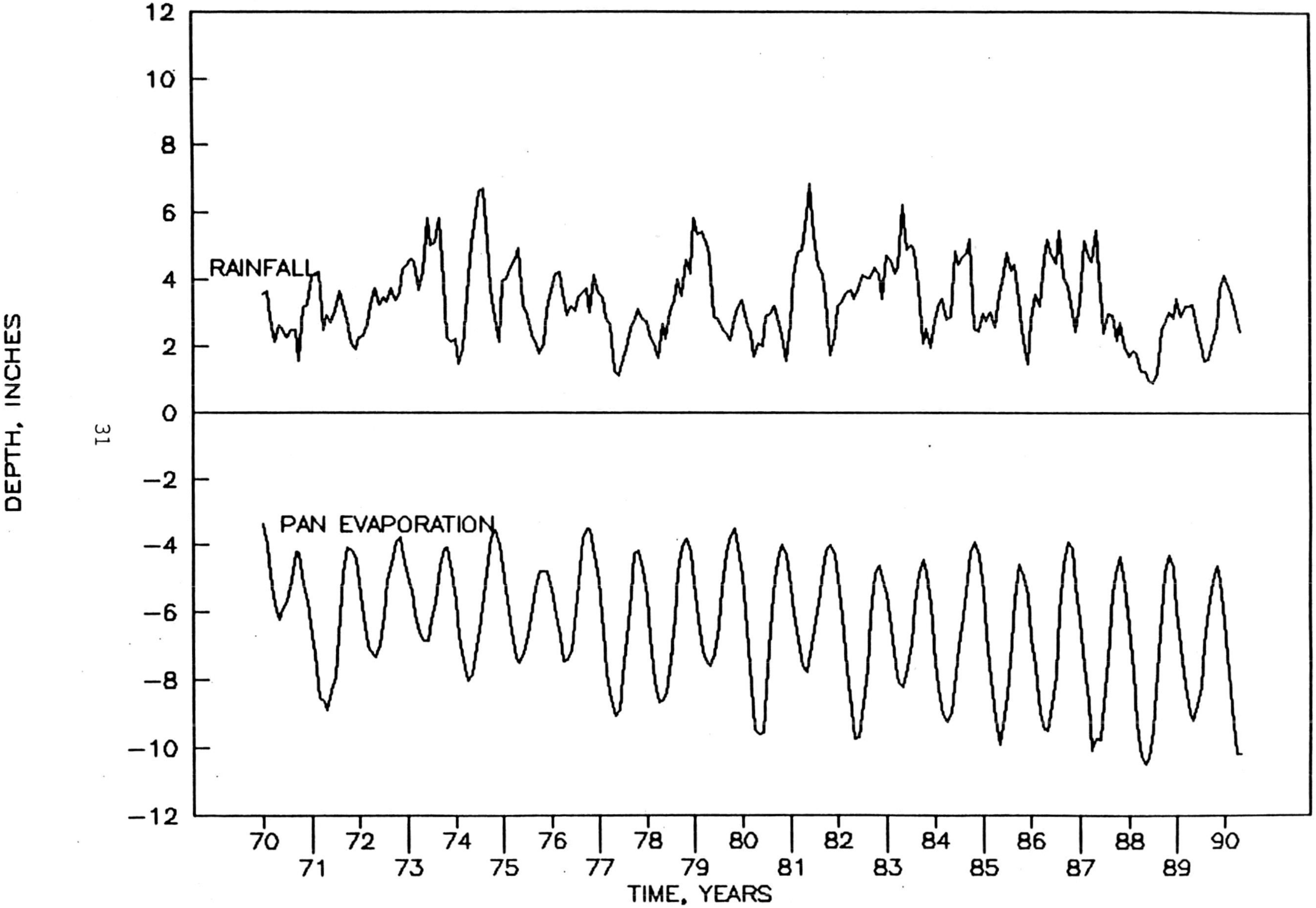
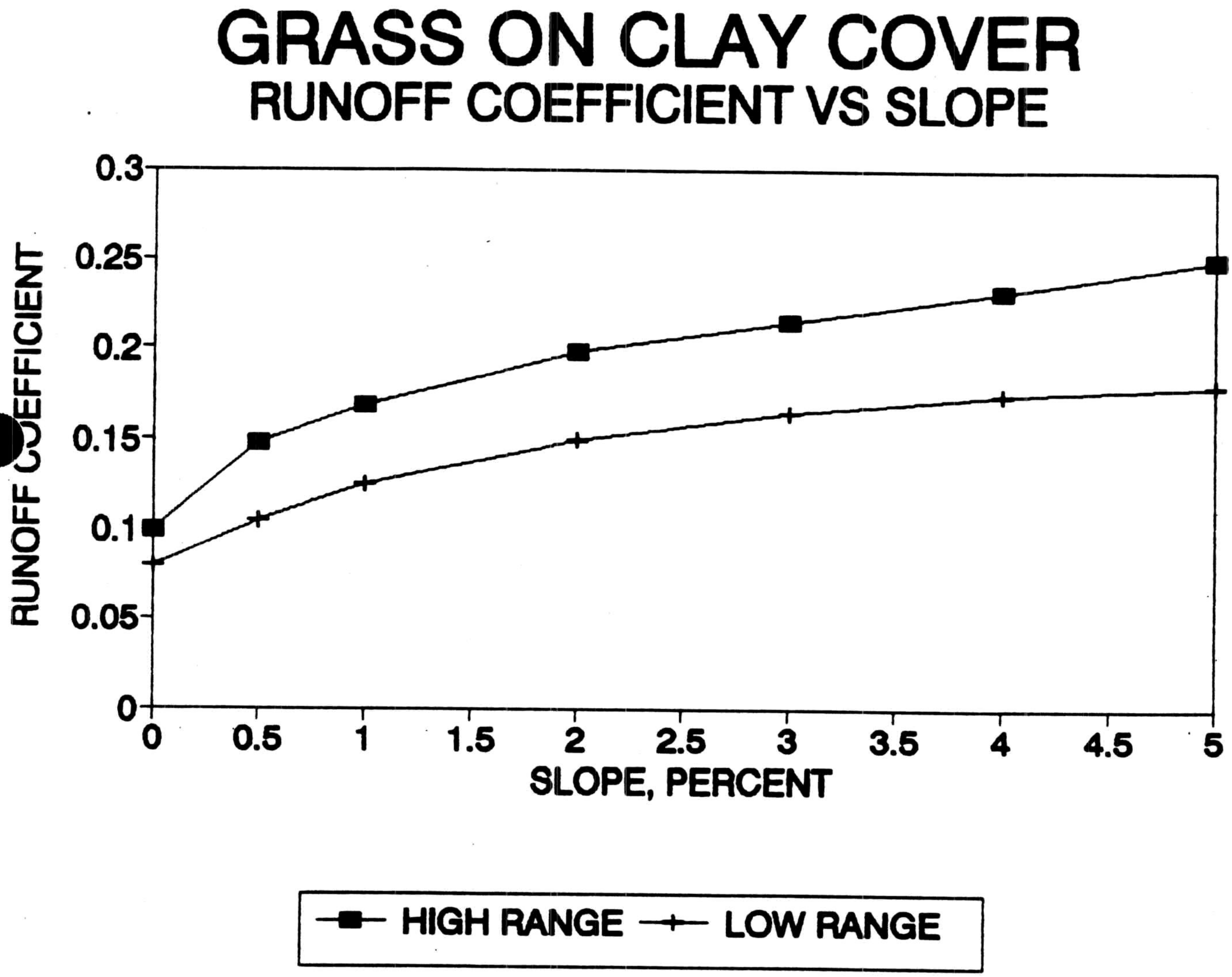


FIGURE II-4


GRASS ON CLAY COVER
RUNOFF COEFFICIENT VS SLOPE
RUNOFF COEFFICIENT
0.3
0.25
0.2
0.15
0.1
0.05
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
SLOPE, PERCENT
HIGH RANGE
LOW RANGE

Water Balance Computation
Site A Ash Landfill

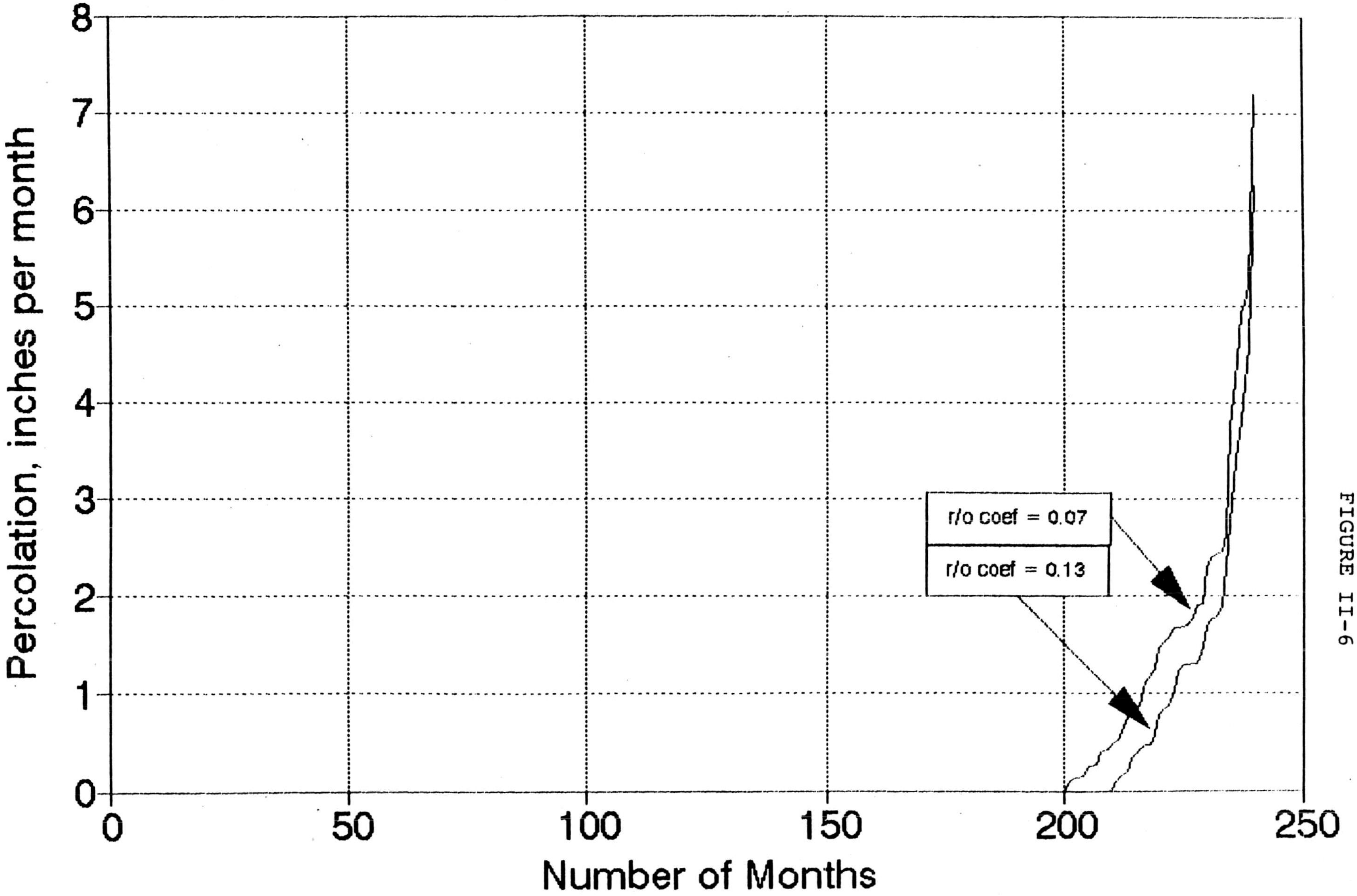
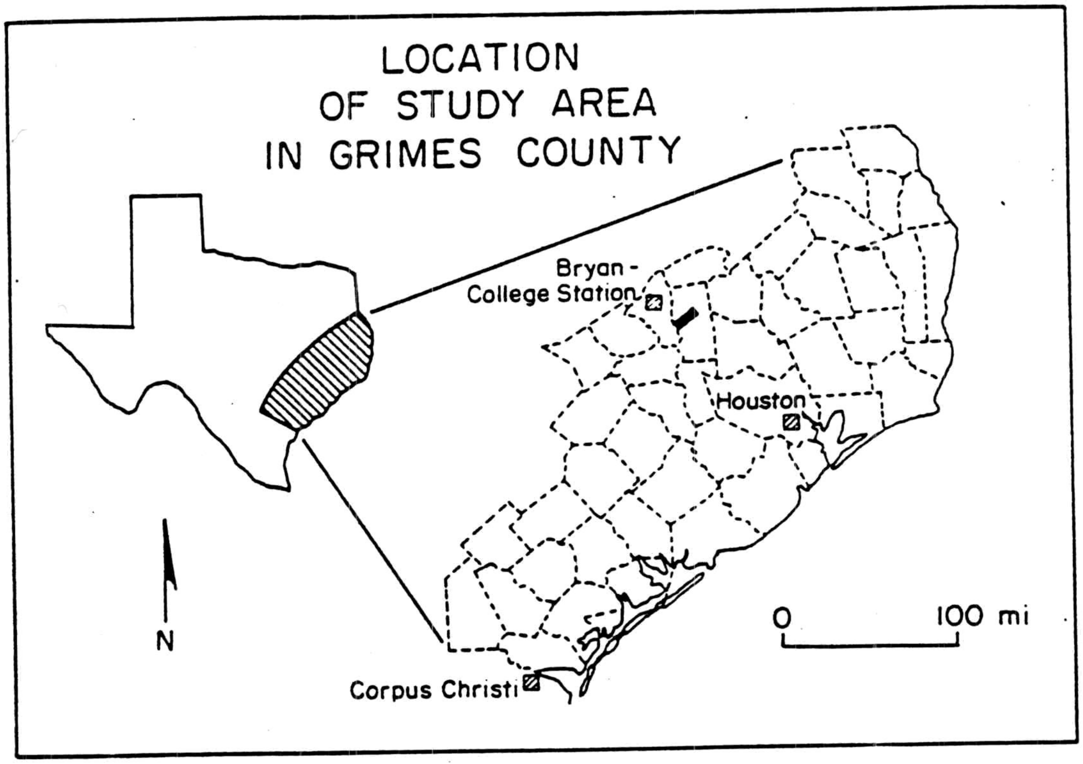


FIGURE II-6



Location of the study area. Study area is shown by the black rectangle. (Allen Eicher, 1985)

FIGURE II-8

0 MILES 5

Recent	Qal	Quaternary Alluvium
Pleistocene	Qt	Fluviatile terrace Deposits
Eocene or Oligocene	EØw	Whitsett Formation
Eocene	Em	Manning Formation
	Ewb	Wellborn Formation
	Ecd	Caddell Formation
Miocene	Mc	Catahoula Formation

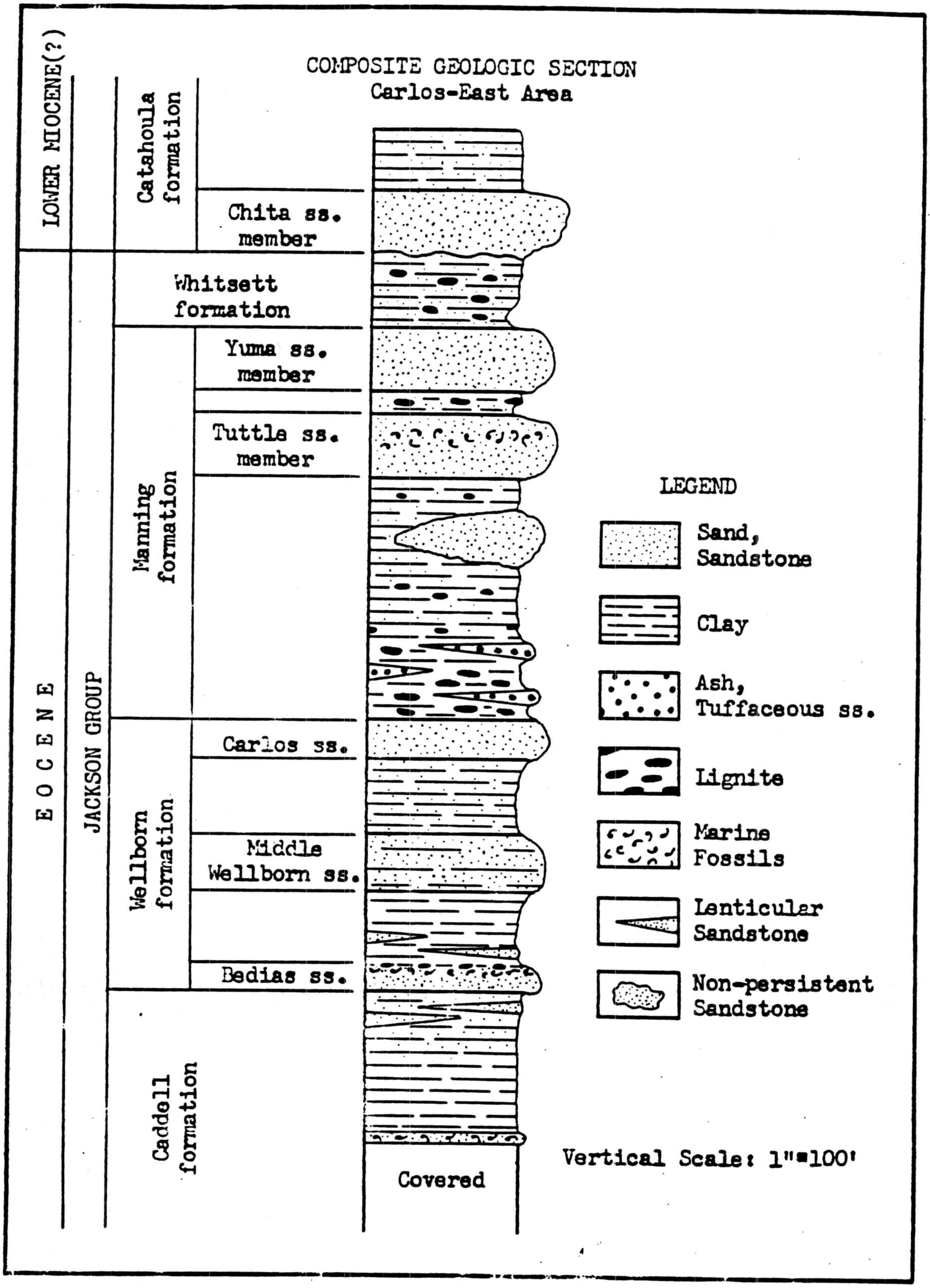
Figure . Surficial geology within the Study Area.

FIGURE II-9

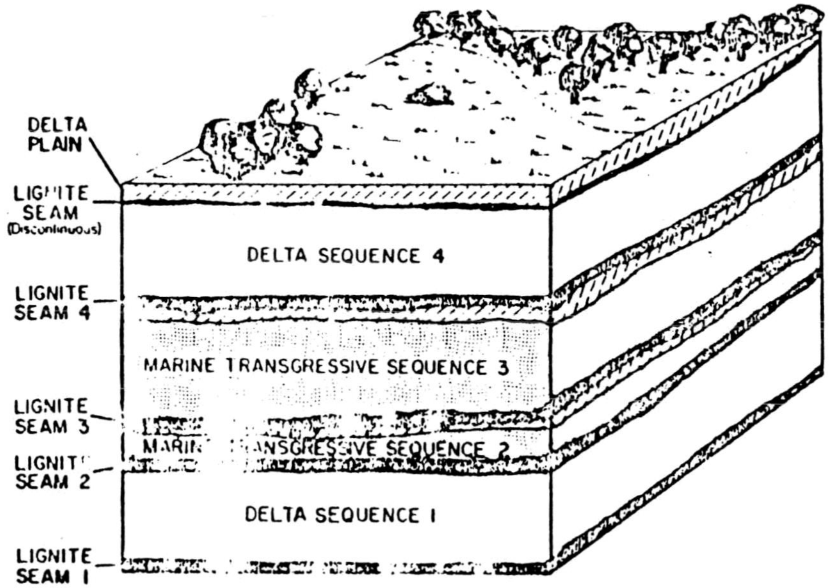
Approximate position of
▬ - principal Lignite member.

[illegible] Not to scale

Figure . Idealized [illegible] the study
Area.



Typical Geologic Section within the study Area (After Walton, 1959)



Diagrammatic block diagram of sedimentary sequences present in the Gibbons Creek Lignite Deposit. (After Mathewson and Bishop, 1979).

FIGURE II-11

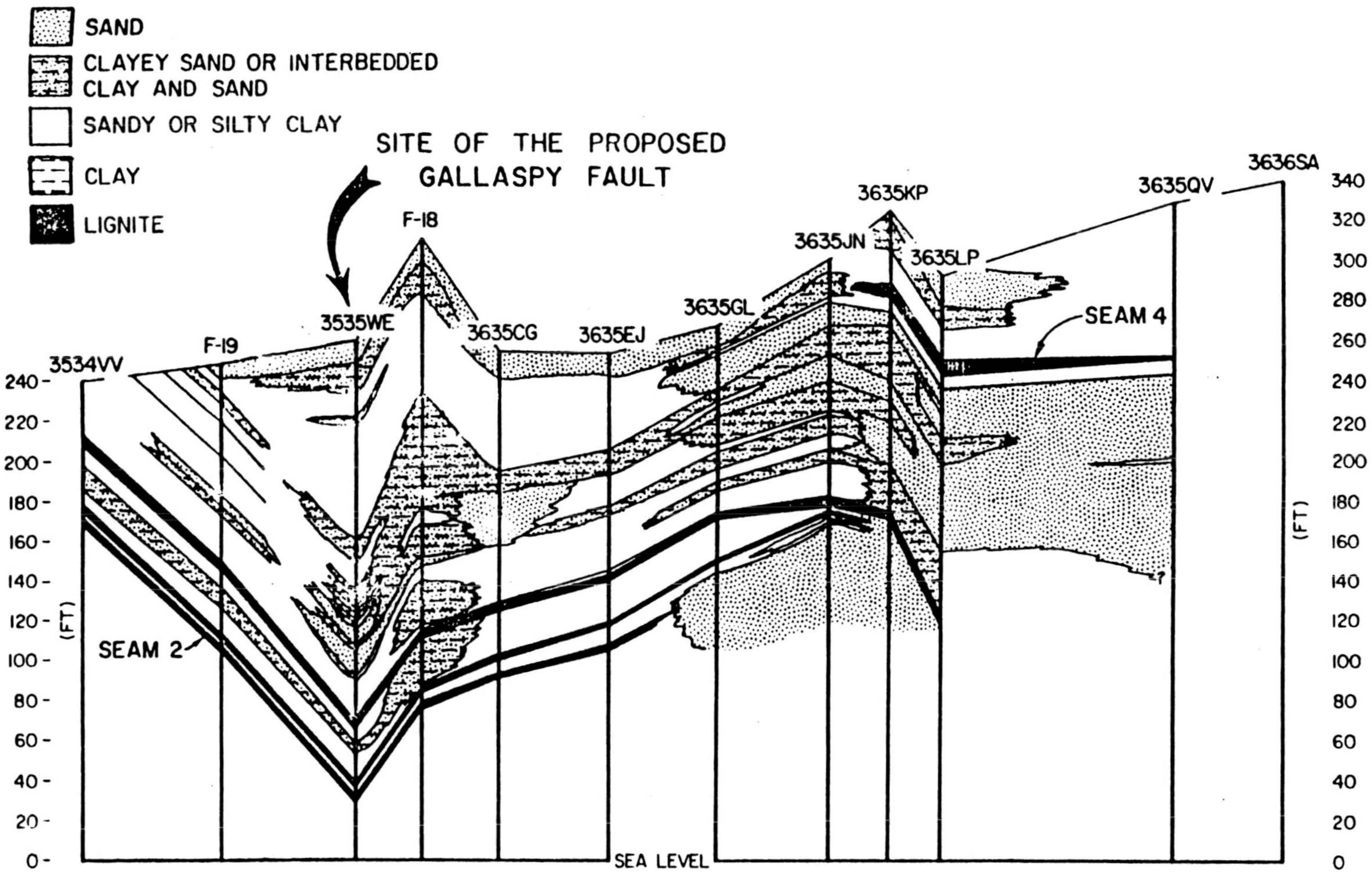


FIGURE II-12

Stratigraphic strike section through the site of the proposed Gallaspy Fault.
(After Mathewson & Bishop, 1979).

	YR	MO	PRECIP	NUM OF OBSER	ADJUSTED PAN EVAP
70	70	1	1.63	7	2.14
	70	2	4.40	8	2.52
	70	3	3.58	9	3.67
	70	4	4.01	5	3.22
	70	5	4.22	8	5.24
	70	6	2.02	3	5.22
	70	7	0.26	5	6.94
	70	8	0.23	4	8.22
	70	9	6.38	11	5.46
	70	10	3.84	6	3.74
	70	11	0.62	2	4.10
	70	12	1.40	7	3.68
71	71	1	0.15	2	4.02
	71	2	1.68	6	5.71
	71	3	12.00	3	8.39
	71	4	0.89	6	6.51
	71	5	5.65	8	8.57
	71	6	0.76	7	6.77
	71	7	1.87	9	12.34
	71	8	3.20	11	8.96
	71	9	3.31	8	7.89
	71	10	4.30	10	5.62
	71	11	2.75	3	4.72
	71	12	4.63	12	3.48
72	72	1	1.73	9	2.53
	72	2	0.50	3	4.11
	72	3	0.91	6	6.05
	72	4	1.71	6	5.75
	72	5	6.38	9	7.36
	72	6	2.13	6	7.49
	72	7	2.17	9	8.20
	72	8	3.60	11	6.98
	72	9	4.45	10	6.51
	72	10	3.95	7	5.65
	72	11	3.26	10	3.09
	72	12	1.47	11	3.03
73	73	1	5.51	14	4.45
	73	2	2.60	11	3.24
	73	3	5.17	11	5.05
	73	4	6.74	12	5.66
	73	5	2.12	7	6.14
	73	6	6.44	10	6.81
	73	7	2.15	8	6.51
	73	8	1.03	8	7.88
	73	9	9.44	9	6.86
	73	10	10.17	13	6.07
	73	11	2.40	7	3.71
	73	12	2.52	7	4.10
74	74	1	4.66	18	2.50
	74	2	0.13	5	4.28
	74	3	1.56	5	5.67
	74	4	1.76	8	7.46
	74	5	3.09	8	8.41
	74	6	0.73	2	7.65
	74	7	2.40	4	7.96
	74	8	9.88	8	8.64
	74	9	9.22	11	6.61

	74	10	6.02	6	5.60
	74	11	5.68	12	3.76
	74	12	2.82	10	3.02
75	75	1	1.80	9	3.24
	75	2	2.45	7	3.17
	75	3	1.41	11	4.41
	75	4	2.08	10	5.96
	75	5	11.99	13	6.52
	75	6	2.42	8	8.19
	75	7	4.16	10	7.89
	75	8	2.44	9	8.17
	75	9	3.78	7	6.74
	75	10	3.35	6	5.17
	75	11	1.07	6	5.64
	75	12	1.18	8	3.88
76	76	1	1.60	2	4.82
	76	2	1.74	4	4.43
	76	3	4.81	14	5.06
	76	4	5.95	13	5.81
	76	5	4.32	8	6.47
	76	6	4.02	9	8.65
	76	7	2.13	10	7.53
	76	8	1.48	5	8.85
	76	9	2.68	8	5.57
	76	10	5.77	9	5.17
	76	11	3.27	5	2.66
	76	12	4.05	8	3.50
77	77	1	2.14	14	2.05
	77	2	3.55	7	4.14
	77	3	2.06	8	5.44
	77	4	8.81	9	6.25
	77	5	1.56	3	7.44
	77	6	1.35	8	9.68
	77	7	0.31	3	10.14
	77	8	1.35	4	9.28
	77	9	1.69	3	8.80
	77	10	0.79	5	6.63
	77	11	3.10	8	4.63
	77	12	2.67	6	4.39
78	78	1	4.51	11	2.75
	78	2	2.62	8	2.83
	78	3	2.72	8	6.27
	78	4	1.37	7	7.13
	78	5	2.52	6	8.44
	78	6	2.44	4	9.03
	78	7	1.26	8	9.33
	78	8	0.57	4	9.33
	78	9	6.50	10	6.83
	78	10	0.41	3	7.41
	78	11	6.31	10	4.08
	78	12	3.17	5	3.12
79	79	1	3.70	13	2.48
	79	2	4.08	13	3.20
	79	3	5.54	11	6.21
	79	4	4.74	7	6.10
	79	5	11.05	11	7.51
	79	6	1.30	3	8.15
	79	7	4.48	9	7.72
	79	8	3.81	5	8.08
	79	9	3.20	3	6.50

	79	10	1.70	2	5.84
	79	11	0.77	2	3.84
	79	12	3.32	31	2.33
80	80	1	3.12	31	2.68
	80	2	1.94	29	3.85
	80	3	5.04	31	4.66
	80	4	2.38	30	6.60
	80	5	4.31	31	6.81
	80	6	0.10	1	10.48
	80	7	0.06	2	12.25
	80	8	1.67	6	11.13
	80	9	4.28	9	7.40
	80	10	3.93	7	6.46
	80	11	4.58	5	4.10
	80	12	0.50	2	3.47
81	81	1	2.67	4	3.50
	81	2	1.80	7	3.77
	81	3	1.88	9	5.08
	81	4	0.97	8	5.65
	81	5	6.28	9	8.10
	81	6	9.48	13	7.44
	81	7	5.35	9	7.66
	81	8	2.51	3	9.13
	81	9	5.96	13	6.50
	81	10	10.95	14	5.58
	81	11	1.93	2	3.78
	81	12	0.64	7	3.71
82	82	1	1.43	10	4.06
	82	2	2.26	13	3.58
	82	3	2.40	10	4.70
	82	4	4.67	9	5.34
	82	5	5.35	8	7.25
	82	6	2.00	9	9.72
	82	7	3.58	5	11.36
	82	8	2.96	17	10.67
	82	9	3.19	7	9.66
	82	10	6.89	10	6.98
	82	11	4.09	15	4.80
	82	12	3.05	14	6.31
83	83	1	3.07	11	2.95
	83	2	4.66	11	3.42
	83	3	5.97	14	5.51
	83	4	0.31	10	6.76
	83	5	9.49	16	8.64
	83	6	2.60	10	7.76
	83	7	2.46	8	9.21
	83	8	7.24	15	8.12
	83	9	9.40	16	7.34
	83	10	2.81	9	5.86
	83	11	3.25	12	4.08
	83	12	1.83	10	3.43
84	84	1	1.67	10	3.38
	84	2	0.99	7	5.34
	84	3	4.98	6	8.03
	84	4	0.34	3	8.66
	84	5	5.76	6	12.16
	84	6	4.39	6	8.53
	84	7	1.61	2	7.84
	84	8	1.83	8	8.96
	84	9	0.77	3	7.48

	84	10	15.69	10	6.29
	84	11	2.38	30	4.62
	84	12	2.59	7	3.34
85	85	1	2.63	10	3.29
	85	2	2.82	6	3.42
	85	3	2.30	7	4.77
	85	4	1.93	6	6.76
	85	5	5.29	6	8.69
	85	6	1.48	3	9.33
	85	7	4.01	5	10.22
	85	8	0.13	3	10.90
	85	9	6.96	7	10.36
	85	10	6.91	9	6.15
	85	11	6.02	8	4.50
	85	12	1.38	4	2.72
86	86	1	1.02	4	4.25
	86	2	1.84	3	5.25
	86	3	0.50	6	7.82
	86	4	2.53	7	7.35
	86	5	8.12	9	9.20
	86	6	4.71	15	8.43
	86	7	0.06	3	11.77
	86	8	7.74	10	10.51
	86	9	5.33	12	7.59
	86	10	5.85	11	5.51
	86	11	3.44	14	3.84
	86	12	4.95	13	2.58
87	87	1	0.96	8	3.22
	87	2	3.90	12	4.25
	87	3	1.79	9	6.50
	87	4	0.68	1	9.69
	87	5	9.31	18	7.54
	87	6	10.09	14	9.89
	87	7	1.76	15	9.62
	87	8	0.90	13	13.57
	87	9	5.34	9	8.06
	87	10	0.19	1	7.74
	87	11	3.88	7	4.45
	87	12	4.54	8	3.17
88	88	1	0.81	4	3.65
	88	2	1.44	9	4.23
	88	3	2.97	8	6.26
	88	4	0.28	3	8.63
	88	5	2.91	6	9.27
	88	6	1.81	6	10.18
	88	7	0.96	5	12.12
	88	8	0.19	3	11.27
	88	9	0.43	4	9.74
	88	10	1.37	3	8.38
	88	11	1.46	7	5.89
	88	12	2.27	5	3.55
89	89	1	7.07	14	2.72
	89	2	1.10	6	3.73
	89	3	3.22	7	5.53
	89	4	0.51	3	7.68
	89	5	5.29	9	9.75
	89	6	4.23	9	8.40
	89	7	2.70	6	9.38
	89	8	3.26	5	9.68
	89	9	0.68	4	8.87

	89	10	1.93	3	7.49
	89	11	1.61	7	5.43
	89	12	0.37	7	3.28
90	90	1	3.43	12	4.41
	90	2	3.29	11	4.68
	90	3	4.10	15	5.25
	90	4	7.51	14	7.53
	90	5	2.42	11	9.36
	90	6	1.56	4	11.99
	90	7	2.25	13	9.78
	90	8	1.21	8	12.19
	90	9	4.79	10	7.53
AVG			3.34		6.41

YR	MO	PRECIP	PRECIP 5 MO MOV AVERAGE	PAN EVAP 5 MO MOV AVERAGE	ADJUSTED PAN EVAP
70	1	1.63			2.14
70	2	4.40			2.52
70	3	3.58	3.57	3.36	3.67
70	4	4.01	3.65	3.97	3.22
70	5	4.22	2.82	4.86	5.24
70	6	2.02	2.15	5.77	5.22
70	7	0.26	2.62	6.22	6.94
70	8	0.23	2.55	5.92	8.22
70	9	6.38	2.27	5.69	5.46
70	10	3.84	2.49	5.04	3.74
70	11	0.62	2.48	4.20	4.10
70	12	1.40	1.54	4.25	3.68
71	1	0.15	3.17	5.18	4.02
71	2	1.68	3.22	5.66	5.71
71	3	12.00	4.07	6.64	8.39
71	4	0.89	4.20	7.19	6.51
71	5	5.65	4.23	8.52	8.57
71	6	0.76	2.47	8.63	6.77
71	7	1.87	2.96	8.91	12.34
71	8	3.20	2.69	8.32	8.96
71	9	3.31	3.09	7.91	7.89
71	10	4.30	3.64	6.13	5.62
71	11	2.75	3.34	4.85	4.72
71	12	4.63	2.78	4.09	3.48
72	1	1.73	2.10	4.18	2.53
72	2	0.50	1.90	4.38	4.11
72	3	0.91	2.25	5.16	6.05
72	4	1.71	2.33	6.15	5.75
72	5	6.38	2.66	6.97	7.36
72	6	2.13	3.20	7.16	7.49
72	7	2.17	3.75	7.31	8.20
72	8	3.60	3.26	6.96	6.98
72	9	4.45	3.49	6.08	6.51
72	10	3.95	3.35	5.05	5.65
72	11	3.26	3.73	4.54	3.09
72	12	1.47	3.36	3.89	3.03
73	1	5.51	3.60	3.77	4.45
73	2	2.60	4.30	4.29	3.24
73	3	5.17	4.43	4.91	5.05
73	4	6.74	4.61	5.38	5.66
73	5	2.12	4.52	6.04	6.14
73	6	6.44	3.70	6.60	6.81
73	7	2.15	4.24	6.84	6.51
73	8	1.03	5.85	6.82	7.88
73	9	9.44	5.04	6.20	6.86
73	10	10.17	5.11	5.72	6.07
73	11	2.40	5.84	4.65	3.71

YR	MO	PRECIP	PRECIP 5 MO MOV AVERAGE	PAN EVAP 5 MO MOV AVERAGE	ADJUSTED PAN EVAP
73	12	2.52	3.98	4.13	4.10
74	1	4.66	2.25	4.05	2.50
74	2	0.13	2.13	4.80	4.28
74	3	1.56	2.24	5.67	5.67
74	4	1.76	1.45	6.69	7.46
74	5	3.09	1.91	7.43	8.41
74	6	0.73	3.57	8.02	7.65
74	7	2.40	5.06	7.85	7.96
74	8	9.88	5.65	7.29	8.64
74	9	9.22	6.64	6.51	6.61
74	10	6.02	6.72	5.53	5.60
74	11	5.68	5.11	4.45	3.76
74	12	2.82	3.75	3.76	3.02
75	1	1.80	2.83	3.52	3.24
75	2	2.45	2.11	3.96	3.17
75	3	1.41	3.95	4.66	4.41
75	4	2.08	4.07	5.65	5.96
75	5	11.99	4.41	6.59	6.52
75	6	2.42	4.62	7.35	8.19
75	7	4.16	4.96	7.50	7.89
75	8	2.44	3.23	7.23	8.17
75	9	3.78	2.96	6.72	6.74
75	10	3.35	2.36	5.92	5.17
75	11	1.07	2.20	5.25	5.64
75	12	1.18	1.79	4.79	3.88
76	1	1.60	2.08	4.77	4.82
76	2	1.74	3.06	4.80	4.43
76	3	4.81	3.68	5.32	5.06
76	4	5.95	4.17	6.09	5.81
76	5	4.32	4.25	6.71	6.47
76	6	4.02	3.58	7.46	8.65
76	7	2.13	2.93	7.42	7.53
76	8	1.48	3.22	7.16	8.85
76	9	2.68	3.07	5.96	5.57
76	10	5.77	3.45	5.15	5.17
76	11	3.27	3.58	3.79	2.66
76	12	4.05	3.76	3.50	3.50
77	1	2.14	3.01	3.56	2.05
77	2	3.55	4.12	4.28	4.14
77	3	2.06	3.62	5.06	5.44
77	4	8.81	3.47	6.59	6.25
77	5	1.56	2.82	7.79	7.44
77	6	1.35	2.68	8.56	9.68
77	7	0.31	1.25	9.07	10.14
77	8	1.35	1.10	8.91	9.28
77	9	1.69	1.45	7.90	8.80
77	10	0.79	1.92	6.75	6.63

YR	MO	PRECIP	PRECIP 5 MO MOV AVERAGE	PAN EVAP 5 MO MOV AVERAGE	ADJUSTED PAN EVAP
77	11	3.10	2.55	5.44	4.63
77	12	2.67	2.74	4.25	4.39
78	1	4.51	3.12	4.17	2.75
78	2	2.62	2.78	4.68	2.83
78	3	2.72	2.75	5.49	6.27
78	4	1.37	2.33	6.74	7.13
78	5	2.52	2.06	8.04	8.44
78	6	2.44	1.63	8.65	9.03
78	7	1.26	2.66	8.59	9.33
78	8	0.57	2.24	8.39	9.33
78	9	6.50	3.01	7.40	6.83
78	10	0.41	3.39	6.15	7.41
78	11	6.31	4.02	4.78	4.08
78	12	3.17	3.53	4.06	3.12
79	1	3.70	4.56	3.82	2.48
79	2	4.08	4.25	4.22	3.20
79	3	5.54	5.82	5.10	6.21
79	4	4.74	5.34	6.24	6.10
79	5	11.05	5.42	7.14	7.51
79	6	1.30	5.08	7.51	8.15
79	7	4.48	4.77	7.59	7.72
79	8	3.81	2.90	7.26	8.08
9	9	3.20	2.79	6.40	6.50
79	10	1.70	2.56	5.32	5.84
79	11	0.77	2.42	4.24	3.84
79	12	3.32	2.17	3.71	2.33
80	1	3.12	2.84	3.47	2.68
80	2	1.94	3.16	4.02	3.85
80	3	5.04	3.36	4.92	4.66
80	4	2.38	2.75	6.48	6.60
80	5	4.31	2.38	8.16	6.81
80	6	0.10	1.70	9.45	10.48
80	7	0.06	2.08	9.61	12.25
80	8	1.67	2.01	9.54	11.13
80	9	4.28	2.90	8.27	7.40
80	10	3.93	2.99	6.51	6.46
80	11	4.58	3.19	4.99	4.10
80	12	0.50	2.70	4.26	3.47
81	1	2.67	2.29	3.99	3.50
81	2	1.80	1.56	4.30	3.77
81	3	1.88	2.72	5.22	5.08
81	4	0.97	4.08	6.01	5.65
81	5	6.28	4.79	6.79	8.10
81	6	9.48	4.92	7.60	7.44
81	7	5.35	5.92	7.77	7.66
81	8	2.51	6.85	7.26	9.13
81	9	5.96	5.34	6.53	6.50

YR	MO	PRECIP	PRECIP 5 MO MOV AVERAGE	PAN EVAP 5 MO MOV AVERAGE	ADJUSTED PAN EVAP
81	10	10.95	4.40	5.74	5.58
81	11	1.93	4.18	4.73	3.78
81	12	0.64	3.44	4.14	3.71
82	1	1.43	1.73	3.97	4.06
82	2	2.26	2.28	4.28	3.58
82	3	2.40	3.22	4.99	4.70
82	4	4.67	3.34	6.12	5.34
82	5	5.35	3.60	7.67	7.25
82	6	2.00	3.71	8.87	9.72
82	7	3.58	3.42	9.73	11.36
82	8	2.96	3.72	9.68	10.67
82	9	3.19	4.14	8.69	9.66
82	10	6.89	4.04	7.68	6.98
82	11	4.09	4.06	6.14	4.80
82	12	3.05	4.35	4.89	6.31
83	1	3.07	4.17	4.60	2.95
83	2	4.66	3.41	4.99	3.42
83	3	5.97	4.70	5.46	5.51
83	4	0.31	4.61	6.42	6.76
83	5	9.49	4.17	7.57	8.64
83	6	2.60	4.42	8.10	7.76
3	7	2.46	6.24	8.21	9.21
3	8	7.24	4.90	7.66	8.12
83	9	9.40	5.03	6.92	7.34
83	10	2.81	4.91	5.77	5.86
83	11	3.25	3.79	4.82	4.08
83	12	1.83	2.11	4.42	3.43
84	1	1.67	2.54	4.85	3.38
84	2	0.99	1.96	5.77	5.34
84	3	4.98	2.75	7.51	8.03
84	4	0.34	3.29	8.54	8.66
84	5	5.76	3.42	9.05	12.16
84	6	4.39	2.79	9.23	8.53
84	7	1.61	2.87	8.99	7.84
84	8	1.83	4.86	7.82	8.96
84	9	0.77	4.46	7.04	7.48
84	10	15.69	4.65	6.14	6.29
84	11	2.38	4.81	5.00	4.62
84	12	2.59	5.22	4.19	3.34
85	1	2.63	2.54	3.89	3.29
85	2	2.82	2.45	4.32	3.42
85	3	2.30	2.99	5.39	4.77
85	4	1.93	2.76	6.60	6.76
85	5	5.29	3.00	7.95	8.69
85	6	1.48	2.57	9.18	9.33
85	7	4.01	3.57	9.90	10.22
5	8	0.13	3.90	9.39	10.90

YR	MO	PRECIP	PRECIP 5 MO MOV AVERAGE	PAN EVAP 5 MO MOV AVERAGE	ADJUSTED PAN EVAP
85	9	6.96	4.81	8.43	10.36
85	10	6.91	4.28	6.93	6.15
85	11	6.02	4.46	5.60	4.50
85	12	1.38	3.43	4.57	2.72
86	1	1.02	2.15	4.91	4.25
86	2	1.84	1.45	5.48	5.25
86	3	0.50	2.80	6.77	7.82
86	4	2.53	3.54	7.61	7.35
86	5	8.12	3.18	8.91	9.20
86	6	4.71	4.63	9.45	8.43
86	7	0.06	5.19	9.50	11.77
86	8	7.74	4.74	8.76	10.51
86	9	5.33	4.48	7.84	7.59
86	10	5.85	5.46	6.01	5.51
86	11	3.44	4.11	4.55	3.84
86	12	4.95	3.82	3.88	2.58
87	1	0.96	3.01	4.08	3.22
87	2	3.90	2.46	5.25	4.25
87	3	1.79	3.33	6.24	6.50
87	4	0.68	5.15	7.57	9.69
87	5	9.31	4.73	8.65	7.54
87	6	10.09	4.55	10.06	9.89
87	7	1.76	5.48	9.74	9.62
87	8	0.90	3.66	9.78	13.57
87	9	5.34	2.41	8.69	8.06
87	10	0.19	2.97	7.40	7.74
87	11	3.88	2.95	5.41	4.45
87	12	4.54	2.17	4.65	3.17
88	1	0.81	2.73	4.35	3.65
88	2	1.44	2.01	5.19	4.23
88	3	2.97	1.68	6.40	6.26
88	4	0.28	1.88	7.71	8.63
88	5	2.91	1.79	9.29	9.27
88	6	1.81	1.23	10.29	10.18
88	7	0.96	1.26	10.51	12.12
88	8	0.19	0.95	10.34	11.27
88	9	0.43	0.88	9.48	9.74
88	10	1.37	1.14	7.77	8.38
88	11	1.46	2.52	6.06	5.89
88	12	2.27	2.65	4.86	3.55
89	1	7.07	3.02	4.28	2.72
89	2	1.10	2.83	4.64	3.73
89	3	3.22	3.44	5.88	5.53
89	4	0.51	2.87	7.02	7.68
89	5	5.29	3.19	8.15	9.75
89	6	4.23	3.20	8.98	8.40
89	7	2.70	3.23	9.22	9.38

YR	MO	PRECIP	PRECIP 5 MO MOV AVERAGE	PAN EVAP 5 MO MOV AVERAGE	ADJUSTED PAN EVAP
89	8	3.26	2.56	8.76	9.68
89	9	0.68	2.04	8.17	8.87
89	10	1.93	1.57	6.95	7.49
89	11	1.61	1.60	5.90	5.43
89	12	0.37	2.13	5.06	3.28
90	1	3.43	2.56	4.61	4.41
90	2	3.29	3.74	5.03	4.68
90	3	4.10	4.15	6.24	5.25
90	4	7.51	3.78	7.76	7.53
90	5	2.42	3.57	8.78	9.36
90	6	1.56	2.99	10.17	11.99
90	7	2.25	2.45	10.17	9.78
90	8	1.21	RAINFALL		12.19
90	9	4.79			7.53
AVG		3.34			6.41

TABLE II-3

STORAGE = SIX INCHES

PERCOLATION, INCHES	SLOPE, %			
	As Is	1	2	3
Worst Twelve Month Period	9.25	7.76	4.32	2.85
Worst Single Month	5.68	4.60	3.40	2.20
Average Per Month	0.144	0.112	0.059	0.039
Total in 20 Years	34.58	26.95	14.15	9.31

PERCOLATION TABLE II-4

	307	310	315	317	320	321S	323	325
1	0.1							
2	0.11							
3	0.12							
4	0.14							
5	0.2							
6	0.2							
7	0.26	0.1						
8	0.4	0.13						
9	0.4	0.2						
10	0.5	0.3						
11	0.51	0.4						
12	0.56	0.4						
13	0.7	0.42	0.1					
14	0.8	0.49	0.12					
15	0.8	0.6	0.21					
16	0.8	0.6	0.28	0.1				
17	1.13	0.64	0.3	0.18				
18	1.2	0.88	0.38	0.2				
19	1.28	0.89	0.38	0.2				
20	1.48	1.1	0.5	0.23				
21	1.5	1.2	0.5	0.29				
22	1.5	1.4	0.6	0.36				
23	1.6	1.4	0.7	0.4	0.01			
24	1.68	1.4	0.9	0.5	0.14	0.1		
25	1.7	1.4	1.1	0.9	0.4	0.1		
26	1.7	1.5	1.14	0.9	0.55	0.24	0.06	
27	1.79	1.5	1.2	0.98	0.7	0.6	0.4	0.1
28	1.9	1.5	1.2	1.08	0.75	0.6	0.43	0.11
29	1.9	1.54	1.3	1.1	0.8	0.62	0.46	0.18
30	2.31	2.07	1.4	1.18	0.8	0.64	0.5	0.38
31	2.39	2.09	1.43	1.18	0.9	0.72	0.52	0.4
32	2.4	2.1	1.6	1.2	1	0.81	0.72	0.44
33	2.44	2.1	1.61	1.4	1	0.9	0.82	0.6
34	2.65	2.48	2.2	1.97	1.4	1.11	0.9	0.8
35	3.74	3.31	2.35	2.08	1.91	1.83	1.74	1.5
36	4.22	3.81	3.14	2.87	2.4	2.1	1.8	1.63
37	4.9	4.3	3.4	3	2.48	2.28	2.08	1.82
38	5	4.6	3.8	3.5	3.1	2.9	2.6	2.2
39	5.21	4.9	4.4	4.19	3.76	3.46	3.15	2.73
40	7.1	6.7	5.9	5.6	5.1	4.9	4.6	4.3
	69.32	58.45	42.14	35.59	27.2	23.91	20.78	17.19
	70.16	59.273	42.682	36.34	27.556	24.098	20.987	17.379

	607	610	615	617	620	6215	623	626
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23	0.1							
24	0.13							
25	0.2							
26	0.51							
27	0.73	0.1						
28	0.8	0.42						
29	0.8	0.49						
30	1.07	0.6						
31	1.5	1	0.28					
32	1.68	1.06	0.3	0.21				
33	1.72	1.45	0.72	0.23				
34	1.81	1.5	1.02	0.7	0.14		0.06	
35	2.65	2.4	1.2	0.84	0.58	0.46	0.33	
36	3.2	2.48	2.1	1.8	1.35	0.9	0.43	0.12
37	3.34	2.87	2.2	2.08	1.36	1.06	0.63	0.16
38	4.2	3.7	2.71	2.18	1.4	1.12	0.9	0.4
39	4.74	4.06	2.9	2.6	2.1	1.6	1.1	0.53
40	5	4.6	3.8	3.4	2.2	1.9	1.6	1.3
	34.18	26.73	17.23	14.04	9.13	7.04	5.05	2.51
	34.579	26.947	17.42	14.148	9.31	7.184	5.161	2.622

	907	910	915	917	920	9215	923	925
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
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18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32	0.48							
33	0.51							
34	0.9	0.42						
35	1.4	0.9	0.28	0.28				
36	1.69	1.42	0.55	0.55				
37	2.65	2.15	0.59	0.59				
38	2.93	2.17	0.96	0.96				
39	3.15	2.44	1.4	1.4				
40	4.8	3.5	1.61	~~1.61~~	0.34			
	18.51	13	5.39	5.39	0.34			
	18.635	13.114	5.524	5.524	0.338	0	0	

TABLE II-5

VOLUME OF WATER DISCHARGED FROM ASH LANDFILL

VOLUME OF WATER DISCHARGED FROM THE ASH LANDFILL FOR VARIOUS RUNOFF COEFFICIENTS IN CUBIC FEET.

STORAGE EQUALS THREE INCHES

BASIN	0.07	0.1	0.15	0.17	0.2	0.215	0.23	0.25
1	489627	462099	406923	386232	351747	337953	317262	296571
2	113401	107012	94235	89443	81457	78263	73471	68680
3	113401	107012	94235	89443	81457	78263	73471	68690
4	25773	24321	21417	20328	18513	17787	16698	15609
5	61355	58370	51401	48787	44431	42689	40075	37462
6	56701	53306	47117	44722	40729	39131	36736	34340
	860818	812321	715328	678955	618334	594056	557717	521341

STORAGE EQUALS SIX INCHES

BASIN	0.07	0.1	0.15	0.17	0.2	0.215	0.23	0.25
1	344850	317262	262086	234498	151734	131043	110352	89661
2	79860	73471	60694	54305	35138	30347	25555	20764
3	79860	73471	60694	54305	35138	30347	25555	20764
4	18150	16698	13794	12342	7986	6897	5808	4719
5	43560	40075	33106	29621	19166	16553	13939	11326
6	39930	36736	30347	27152	17569	15173	12778	10382
	606210	557713	460720	412223	266732	230360	193987	157615

STORAGE EQUALS NINE INCHES

BASIN	0.07	0.1	0.15	0.17	0.2	0.215	0.23	0.25
1	331056	241395	111771	64832	23450	0	0	0
2	76666	55902	25875	15014	5430		0	0
3	76666	55902	25875	15014	5430	0	0	0
4	17424	12705	5861	3412	1234	0	0	0
5	41618	30492	14113	8189	2962	0	0	0
6	38333	27951	12937	7507	2715	0	0	0
	581762	424347	196412	113967	41222	0	0	0

TABLE II-6

COMPUTATIONS FOR POROUS FILTER BASED ON WORST TWELVE MONTH PERIOD OF RECORD

Storage = 6 inches				
Runoff Coefficient	0.07	0.10	0.17	0.20
Slope, percent	Existing	1.00	2.00	3.00
Percolation, in	9.25	7.76	4.32	2.85
Volume Water Through Toe, cu ft	1121489	940838	523765	345540
Volume Bottom Ash, cu ft	5607443	4704190	2618827	1727699
Area of Porous Filter, sq ft	467.3	392.0	218.2	144.0
Volume of Reservoirs, cu ft	900000	800000	470000	330000

Chapter III
POST-OPERATIONAL MAINTENANCE PERIOD
(BEFORE CONTRACTOR LEAVES)

A. WATER CONTROL SYSTEM

The establishment of a suitable water control system for this landfill involves seven critical elements; they are:

1. <u>The slope of the final cover</u>. The slopes that exist on the top of the landfill are generally much flatter than considered good engineering practice. Regulatory agencies generally require the slope of the final cover to fall between two (2) percent and six (6) percent. The plans and contract documents for this project required a slope of not less than three (3) percent.

The side-slopes of a landfill that contains unconfined ash that does not develop bonding or shear strength over time should not exceed about twenty-five (25) percent slope. Regulatory agencies generally require the side-slopes to be not greater than thirty-three (33) percent. The plans and contract documents for this project required a side-slope of not more than 3H:1V (33.33%).

Slopes that meet the minimum specifications of the regulatory agencies, coupled with a liner, a retaining berm and a final cover with the same permeability as the liner are generally expected to result in a rate of infiltration of precipitation that does not exceed the rate of exfiltration out of the liner. The primary purpose of the retaining berm recommended by regulatory agencies is to hold the water that infiltrates into the landfill. In this case, the flat slopes, coupled with the lack of a retaining berm, allows the infiltration water to seep out of the landfill through the toe of the side-slope, causing a gradual small-scale failure of the toe during dry periods and sudden large-scale failure of the side-slopes during wet periods. During months of normal rainfall and evaporation, there is a slow release of infiltration water, causing a slow release of ash through the toe and a gradual flattening of the toe slope.

The existing cap has an effective slope of approximately one (1) percent or less over a large area. Most of the cap-slopes are less than the maximum allowable slope and, therefore, too flat. Making the slopes equal to three (3) percent will significantly reduce the instability of the toe, but it will not totally solve the problem.

a. All side-slopes that are in excess of thirty-three (33) percent should be reworked to meet the specified maximum slope. This is approximately 1,000 linear feet of slope.

b. Any portion of a side-slope that exceeds a slope of 3H:1V should be repaired. This involves approximately 2,000 feet of side-slope that has part of its slope in excess of thirty-three (33) percent.

c. All slopes on the cap that are covered with vegetation should be repaired to give a minimum slope of one (1) percent, and the toe drain should be installed as outlined.

d. All slopes that are presently uncovered or unvegetated should be remediated to a minimum slope of three (3) percent.

e. Where the cap is being remediated because of a thickness of less than two (2) feet (see Element 2) the slope should also be remediated to three (3) percent slope.

f. The inspection program outlined in the closure plan should be initiated immediately and continued in the future. Repairs should be made in a timely manner.

g. After all remediation work is completed, a new topographic map should be prepared to serve as an as-built drawing.

2. <u>The thickness of the final cover (or cap) on the landfill</u>. The purpose of the final cover is to protect the ash from wind or water erosion, to support a vegetative cover, and to prevent water from entering the landfill. The average thickness of the final cover is two (2) feet; however, approximately sixteen (16) percent of the thickness measurements were less than two (2) feet.

a. Field measurements should be made with an auger to measure the thickness of the cap. A grid of 150 feet by 150 feet should be established, and measurements should be made at the nodes (one measurement each 22,500 square feet). This will result in 320 measurements.

b. In addition to the measurements at the nodes, measurements should be made at the crest of all slopes and other points of maximum erosion. This will result in more than 100 measurements.

c. All areas with thicknesses that do not meet specifications should be repaired.

d. All areas being remediated for thickness should also be remediated for a slope (see Element 1) of three (3) percent where feasible.

e. The inspection program outlined in the Closure Plan should be initiated, and repairs should be made in a timely manner.

3. <u>The thickness of the liner below the ash</u>. The purpose of the liner is to prevent leachate from the ash from seeping into the groundwater. The liner averages less than the two (2) feet thickness required by the specifications. However, extensive groundwater quality monitoring indicates no changes in groundwater quality.

a. No remedial action is recommended for the liner thickness.

b. Groundwater monitoring should continue.

4. <u>The type of soil in the final cover and the liner</u>. The regulatory agencies usually specify a clayey soil, either a low plasticity clay (CL) or a clayey sand (SC). They will allow high plasticity clays (CH) to be used as a final cover if low plasticity clay (CL) and clayey sands (SC) are not readily available. These types of soil are specified because they are relatively impermeable and they have a high storage capacity for water. The soil in the final cover is predominantly (approximately 90%) a low plasticity clay (CL) with some (approximately 10%) high plasticity clay (CH). The soil used for the liner and final cover are in compliance with the specifications.

a. No remedial action is necessary because the soil meets the specifications.

5. <u>The establishment of a vegetative cover on the landfill cap</u>. The existing grass cover appears to be healthy and productive with roots that penetrate and radiate through the soil cover. The techniques required to establish a tree cover have not yet been developed. The purpose of the vegetative cover is to protect the cap and the ash from wind and water erosion, to provide an aesthetic effect, and to help prevent water from entering the landfill.

a. The maintenance program that includes shredding, application of fertilizer, field liming, and burning should be executed as outlined in the Closure Plan.

b. The inspections of the landfill and the landfill appurtenances should be conducted as outlined in the Closure Plan.

6. <u>The establishment of a storm-water drainage system</u>. The storm-water drainage structures have been designed and are under construction.

a. The lack of drop structures at the southern end of the landfill should be corrected.

a. The inspection program described in the Closure Plan should be executed.

b. Repairs should be made in a timely manner.

6. <u>Control of the surface water that infiltrates into the landfill.</u>

There are three major problems with the toe of the side-slopes. There is a constant flow of leachate from the landfill through the toe of the side-slope, some ash is transported out of the landfill into the adjacent ditches with the leachate, and the toe of the side-slope is generally in a state of instability.

The toe of the side-slope will not be stable until the flow of water is stopped or controlled. This flow could have been stopped by use of a steeper and thicker cap, or a retaining berm, or a combination of the two. The flow can be controlled by use of the system described below. In addition to stabilizing the side-slope, the leachate needs to be collected and subjected to chemical analysis prior to releasing it to the natural drainage.

Stabilization of the toe and collection of the percolation water can be accomplished by installing a combination of the following elements to make a percolation water management system.

1. <u>A filter to allow the water to flow from the landfill that will hold the ash in place</u>. The material to be protected is the fly ash. The filter material will be bottom ash. The size distribution of the bottom ash generally meets the requirements to serve as a filter for the fly ash.

2. <u>Porous drains to transport the water from the toe to collection points</u>. The porous drain will be constructed of the bottom ash which has a permeability of approximately 0.25 cm/sec (approximately 709 feet/day). The average slope of the porous drain is only about one foot per hundred feet (0.01) which results in an average velocity of seven (7) feet per day. The porous drain is designed to hold the volume of water that will enter through the toe of the slope during the worst twelve (12) months of record as computed by the appropriate water balance computations. These values are computed in Chapter II, PHYSICAL SITING OF LANDFILL, B.

Observations of past events indicate that the failure of the slopes takes place in approximately two (2) days after rainfall. The design flow from each of the areas is estimated to be approximately twenty (20) percent of the average infiltration rate. The twenty (20) percent corresponds to the approximate specific yield of the ash in the landfill. The storage capacity of the bottom ash is also assumed to be twenty (20) percent of the volume of bottom ash.

Water balance and the results are shown in the APPENDIX at the end of this report. The general layout and details of this system are shown on FIGURE 6, 7, and 8, Part 1, Closure Plan. The bottom ash will be placed between the landfill and the berm over a two (2) foot thick liner. The bottom ash will be covered with a two (2) foot thick cap with a slope of three (3) percent. The dimensions B and H (FIGURE 6) are dependent upon the effective slope of the cap. These values are shown in TABLE III-1.

3. A berm to help stabilize the toe, this berm also serves as an all-around, all-weather road. The berm will be constructed of the same clay materials that are used to construct the final cover. The liner of the landfill will be extended so that the road will be constructed over a two (2) foot thick liner.

4. Storage reservoirs to hold the percolation water in temporary storage to allow for analysis. The two storage reservoirs will be designed to hold the maximum volume of water expected during the twenty (20) year period of record. This storage volume is dependent upon the effective slope of the cap and these values are shown in TABLE II-6. The volume of the reservoir is the volume of rainfall during a year plus the maximum volume of water expected to flow through the toe during the critical twelve (12) month period. The water in these storage reservoirs will evaporate and infiltrate during most of the time that they are in operation, and water will be released only about one year in twenty.

5. Drop structures to route the storm-water from the cap of the landfill and release it to the natural drainage outside of the percolation water collection system. This system is described in Part I, CLOSURE PLAN, ELEMENT 6.

B. CONSTRUCTION QUANTITIES AND COST ESTIMATES

Clay soil for extension of liner under bottom ash and road.

WIDE POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	183,867	157,985	103,022	79,111

DEEP POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	88,889	88,889	88,889	75,556

Clay soil for construction of combination berm/road.

WIDE POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	89,600	88,178	86,756	85,333

DEEP POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	179,444	149,222	96,778	85,333

Clay soil for cap on porous drain.

WIDE POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	177,334	151,452	96,489	72,578

DEEP POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	82,356	82,356	82,356	69,023

Clay soil for rehabilitation of side-slopes.

20,000 cy

Clay soil for rehabilitation of cap.

21,000 cy based on 161 acres, 16%, 0.5 feet.

Crushed rock for all-around, all-weather road.

WIDE POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	3,127	3,077	3,027	2,978

DEEP POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	2,978	2,978	2,978	2,978

Bottom ash for combination filter and porous drain.

Slope	As Is	1%	2%	3%
Vol, cy	207,683	174,229	96,994	63,989

Manhole structures.

32 manholes including inverted siphons @ $300 each = $9,600

Siphons for transporting water under drop-structures.

8 inverted siphons, 160 ft of 18" pipe @$1000 each = $8,000

SUMMATION OF CLAY SOIL

Total Clay Soil for Road/Berm, Cover and Liner for Porous Drain

WIDE POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	450,801	397,615	286,267	237,022

DEEP POROUS DRAIN

Slope	As Is	1%	2%	3%
Vol, cy	350,689	320,467	268,023	229,912

Total Clay Soil for Side-slopes, and Cap

41,000 cy

TOTAL CLAY SOIL

Slope	As Is	1%	2%	3%
Vol, cy	391,689	361,467	309,023	270,912
Cost, $3/cy	1,175,067	1,084,401	927,069	812,736

TOTAL COST OF PROJECT

Total Cost,$	1,201,667	1,111,001	953,669	839,336

TABLE III-1 VALUES OF B AND H

Slope	W	H
As Is	50 ft	8.5 ft
1 %	50 ft	6.5 ft
2 %	50 ft	5.5 ft
3 %	35 ft	3.0 ft

Chapter IV
POST-CLOSURE MAINTENANCE PERIOD
(AFTER CONTRACTOR LEAVES)

The Closure Plan should be followed which calls for groundwater monitoring, monitoring of percolation water, inspection of landfill and landfill appurtenances, and maintenance. These are outlined in Part I CLOSURE PLAN.

APPENDIX

WATER BALANCE COMPUTATIONS

input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 2

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.07	1.52	0.11	0.02	-14.98	0.02	0.02	1.50	0.00
2	4.40	1.76	0.07	4.09	0.31	2.33	-0.71	2.35	2.33	1.76	0.00
3	3.58	2.57	0.07	3.33	0.25	0.76	0.00	3.00	0.65	2.57	0.11
4	4.01	2.25	0.07	3.73	0.28	1.48	0.00	3.00	0.00	2.25	1.48
5	4.22	3.67	0.07	3.92	0.30	0.26	0.00	3.00	0.00	3.67	0.26
6	2.02	3.65	0.07	1.88	0.14	-1.78	-1.78	1.63	-1.37	3.25	0.00
7	0.26	4.86	0.07	0.24	0.02	-4.62	-6.39	0.34	-1.29	1.54	0.00
8	0.23	5.75	0.07	0.21	0.02	-5.54	-11.93	0.05	-0.29	0.50	0.00
9	6.38	3.82	0.07	5.93	0.45	2.11	-0.95	2.16	2.11	3.82	0.00
10	3.84	2.62	0.07	3.57	0.27	0.95	0.00	3.00	0.84	2.62	0.12
11	0.62	2.87	0.07	0.58	0.04	-2.29	-2.29	1.37	-1.63	2.21	0.00
12	1.40	2.58	0.07	1.30	0.10	-1.27	-3.57	0.89	-0.48	1.78	0.00
13	0.15	2.81	0.07	0.14	0.01	-2.67	-6.24	0.36	-0.53	0.67	0.00
14	1.68	4.00	0.07	1.56	0.12	-2.43	-8.68	0.15	-0.20	1.76	0.00
15	12.00	5.87	0.07	11.16	0.84	5.29	0.00	3.00	2.85	5.87	2.44
16	0.89	4.56	0.07	0.83	0.06	-3.73	-3.73	0.84	-2.16	2.99	0.00
17	5.65	6.00	0.07	5.25	0.40	-0.74	-4.47	0.65	-0.19	5.44	0.00
18	0.76	4.74	0.07	0.71	0.05	-4.03	-8.51	0.16	-0.49	1.19	0.00
19	1.87	8.64	0.07	1.74	0.13	-6.90	-15.40	0.02	-0.15	1.89	0.00
20	3.20	6.27	0.07	2.98	0.22	-3.30	-18.70	0.01	-0.01	2.99	0.00
21	3.31	5.52	0.07	3.08	0.23	-2.44	-21.15	0.00	-0.00	3.08	0.00
22	4.30	3.93	0.07	4.00	0.30	0.07	-11.12	0.07	0.07	3.93	0.00
23	2.75	3.30	0.07	2.56	0.19	-0.75	-11.86	0.05	-0.02	2.57	0.00
24	4.63	2.44	0.07	4.31	0.32	1.87	-1.30	1.92	1.87	2.44	0.00
25	1.73	1.77	0.07	1.61	0.12	-0.16	-1.46	1.82	-0.11	1.71	0.00
26	0.50	2.88	0.07	0.47	0.04	-2.41	-3.87	0.80	-1.02	1.48	0.00
27	0.91	4.24	0.07	0.85	0.06	-3.39	-7.26	0.25	-0.55	1.39	0.00
28	1.71	4.03	0.07	1.59	0.12	-2.43	-9.70	0.11	-0.14	1.73	0.00
29	6.38	5.15	0.07	5.93	0.45	0.78	-3.55	0.89	0.78	5.15	0.00
30	2.13	5.24	0.07	1.98	0.15	-3.26	-6.81	0.29	-0.60	2.58	0.00
31	2.17	5.74	0.07	2.02	0.15	-3.72	-10.53	0.08	-0.21	2.23	0.00
32	3.60	4.89	0.07	3.35	0.25	-1.54	-12.07	0.05	-0.03	3.38	0.00
33	4.45	4.56	0.07	4.14	0.31	-0.42	-12.49	0.04	-0.01	4.14	0.00
34	3.95	3.95	0.07	3.67	0.28	-0.28	-12.77	0.04	-0.00	3.68	0.00
35	3.26	2.16	0.07	3.03	0.23	0.87	-3.50	0.91	0.87	2.16	0.00
36	1.47	2.12	0.07	1.37	0.10	-0.75	-4.25	0.70	-0.21	1.57	0.00
37	5.51	3.11	0.07	5.12	0.39	2.01	-0.29	2.71	2.01	3.11	0.00
38	2.60	2.27	0.07	2.42	0.18	0.15	-0.13	2.86	0.15	2.27	0.00
39	5.17	3.54	0.07	4.81	0.36	1.27	0.00	3.00	0.14	3.54	1.13
40	6.74	3.96	0.07	6.27	0.47	2.31	0.00	3.00	0.00	3.96	2.31
41	2.12	4.30	0.07	1.97	0.15	-2.33	-2.33	1.35	-1.65	3.62	0.00
42	6.44	4.77	0.07	5.99	0.45	1.22	-0.44	2.57	1.22	4.77	0.00
43	2.15	4.56	0.07	2.00	0.15	-2.56	-3.00	1.07	-1.50	3.50	0.00
44	1.03	5.52	0.07	0.96	0.07	-4.56	-7.56	0.23	-0.85	1.81	0.00
45	9.44	4.80	0.07	8.78	0.66	3.98	0.00	3.00	2.77	4.80	1.20
46	10.17	4.25	0.07	9.46	0.71	5.21	0.00	3.00	0.00	4.25	5.21
47	2.40	2.60	0.07	2.23	0.17	-0.36	-0.36	2.64	-0.36	2.59	0.00
48	2.52	2.87	0.07	2.34	0.18	-0.53	-0.89	2.21	-0.43	2.78	0.00
49	4.66	1.75	0.07	4.33	0.33	2.58	0.00	3.00	0.79	1.75	1.79
50	0.13	3.00	0.07	0.12	0.01	-2.88	-2.88	1.12	-1.88	2.00	0.00
51	1.56	3.97	0.07	1.45	0.11	-2.52	-5.39	0.47	-0.65	2.10	0.00
52	1.76	5.22	0.07	1.64	0.12	-3.59	-8.98	0.14	-0.34	1.97	0.00
53	3.09	5.89	0.07	2.87	0.22	-3.01	-11.99	0.05	-0.09	2.96	0.00

54	0.73	5.36	0.07	0.68	0.05	-4.68	-16.67	0.01	-0.04	0.72	0.00
55	2.40	5.57	0.07	2.23	0.17	-3.34	-20.01	0.00	-0.01	2.24	0.00
56	9.88	6.05	0.07	9.19	0.69	3.14	0.00	3.00	3.00	6.05	0.14
57	9.22	4.84	0.07	8.57	0.65	3.74	0.00	3.00	0.00	4.84	3.74
58	6.02	3.92	0.07	5.60	0.42	1.68	0.00	3.00	0.00	3.92	1.68
59	5.68	2.63	0.07	5.28	0.40	2.65	0.00	3.00	0.00	2.63	2.65
60	2.82	2.11	0.07	2.62	0.20	0.51	0.00	3.00	0.00	2.11	0.51
61	1.80	2.27	0.07	1.67	0.13	-0.59	-0.59	2.44	-0.56	2.23	0.00
62	2.45	2.22	0.07	2.28	0.17	0.06	-0.53	2.50	0.06	2.22	0.00
63	1.41	3.09	0.07	1.31	0.10	-1.78	-2.30	1.36	-1.14	2.45	0.00
64	2.08	4.17	0.07	1.93	0.15	-2.24	-4.54	0.64	-0.73	2.66	0.00
65	11.99	4.56	0.07	11.15	0.84	6.59	0.00	3.00	2.36	4.56	4.22
66	2.42	5.73	0.07	2.25	0.17	-3.48	-3.48	0.91	-2.09	4.34	0.00
67	4.16	5.52	0.07	3.87	0.29	-1.65	-5.14	0.52	-0.39	4.26	0.00
68	2.44	5.72	0.07	2.27	0.17	-3.45	-8.59	0.16	-0.36	2.63	0.00
69	3.78	4.72	0.07	3.52	0.26	-1.20	-9.79	0.11	-0.05	3.57	0.00
70	3.35	3.62	0.07	3.12	0.23	-0.50	-10.29	0.09	-0.02	3.13	0.00
71	1.07	3.95	0.07	1.00	0.07	-2.95	-13.25	0.03	-0.06	1.05	0.00
72	1.18	2.72	0.07	1.10	0.08	-1.62	-14.86	0.02	-0.01	1.11	0.00
73	1.60	3.37	0.07	1.49	0.11	-1.89	-16.75	0.01	-0.01	1.50	0.00
74	1.74	3.10	0.07	1.62	0.12	-1.48	-18.23	0.01	-0.00	1.62	0.00
75	4.81	3.54	0.07	4.47	0.34	0.93	-3.40	0.94	0.93	3.54	0.00
76	5.95	4.07	0.07	5.53	0.42	1.47	-0.64	2.40	1.47	4.07	0.00
77	4.32	4.53	0.07	4.02	0.30	-0.51	-1.16	2.02	-0.39	4.40	0.00
78	4.02	6.05	0.07	3.74	0.28	-2.32	-3.47	0.91	-1.10	4.84	0.00
79	2.13	5.27	0.07	1.98	0.15	-3.29	-6.76	0.30	-0.62	2.60	0.00
80	1.48	6.20	0.07	1.38	0.10	-4.82	-11.58	0.06	-0.24	1.62	0.00
81	2.68	3.90	0.07	2.49	0.19	-1.41	-12.99	0.04	-0.02	2.51	0.00
82	5.77	3.62	0.07	5.37	0.40	1.75	-1.52	1.78	1.75	3.62	0.00
83	3.27	1.86	0.07	3.04	0.23	1.18	-0.03	2.96	1.18	1.86	0.00
84	4.05	2.45	0.07	3.77	0.28	1.32	0.00	3.00	0.04	2.45	1.28
85	2.14	1.43	0.07	1.99	0.15	0.56	0.00	3.00	0.00	1.43	0.56
86	3.55	2.90	0.07	3.30	0.25	0.40	0.00	3.00	0.00	2.90	0.40
87	2.06	3.81	0.07	1.92	0.14	-1.89	-1.89	1.57	-1.43	3.35	0.00
88	8.81	4.38	0.07	8.19	0.62	3.82	0.00	3.00	1.43	4.38	2.39
89	1.56	5.21	0.07	1.45	0.11	-3.76	-3.76	0.83	-2.17	3.62	0.00
90	1.35	6.78	0.07	1.26	0.09	-5.52	-9.28	0.13	-0.70	1.96	0.00
91	0.31	7.10	0.07	0.29	0.02	-6.81	-16.09	0.01	-0.11	0.40	0.00
92	1.35	6.50	0.07	1.26	0.09	-5.24	-21.33	0.00	-0.01	1.27	0.00
93	1.69	6.16	0.07	1.57	0.12	-4.59	-25.92	0.00	-0.00	1.57	0.00
94	0.79	4.64	0.07	0.73	0.06	-3.91	-29.82	0.00	-0.00	0.74	0.00
95	3.10	3.24	0.07	2.88	0.22	-0.36	-30.18	0.00	-0.00	2.88	0.00
96	2.67	3.07	0.07	2.48	0.19	-0.59	-30.77	0.00	-0.00	2.48	0.00
97	4.51	1.92	0.07	4.19	0.32	2.27	-0.81	2.27	2.27	1.92	0.00
98	2.62	1.98	0.07	2.44	0.18	0.46	-0.28	2.72	0.46	1.98	0.00
99	2.72	4.39	0.07	2.53	0.19	-1.86	-2.14	1.44	-1.28	3.81	0.00
%100	1.37	4.99	0.07	1.27	0.10	-3.72	-5.85	0.41	-1.04	2.31	0.0
%101	2.52	5.91	0.07	2.34	0.18	-3.56	-9.42	0.12	-0.29	2.63	0.0
%102	2.44	6.32	0.07	2.27	0.17	-4.05	-13.47	0.03	-0.09	2.36	0.0
%103	1.26	6.53	0.07	1.17	0.09	-5.36	-18.83	0.00	-0.03	1.20	0.0
%104	0.57	6.53	0.07	0.53	0.04	-6.00	-24.83	0.00	-0.00	0.53	0.0
%105	6.50	4.78	0.07	6.05	0.46	1.26	-2.52	1.26	1.26	4.78	0.0
%106	0.41	5.19	0.07	0.38	0.03	-4.81	-7.33	0.25	-1.02	1.40	0.0
%107	6.31	2.86	0.07	5.87	0.44	3.01	0.00	3.00	2.75	2.86	0.2
%108	3.17	2.18	0.07	2.95	0.22	0.76	0.00	3.00	0.00	2.18	0.7
%109	3.70	1.74	0.07	3.44	0.26	1.71	0.00	3.00	0.00	1.74	1.7
%110	4.08	2.24	0.07	3.79	0.29	1.55	0.00	3.00	0.00	2.24	1.5
%111	5.54	4.35	0.07	5.15	0.39	0.81	0.00	3.00	0.00	4.35	0.8
%112	4.74	4.27	0.07	4.41	0.33	0.14	0.00	3.00	0.00	4.27	0.1
%113	11.05	5.26	0.07	10.28	0.77	5.02	0.00	3.00	0.00	5.26	5.0
%114	1.30	5.70	0.07	1.21	0.09	-4.50	-4.50	0.64	-2.36	3.56	0.0
%115	4.48	5.40	0.07	4.17	0.31	-1.24	-5.73	0.42	-0.22	4.39	0.0
%116	3.81	5.66	0.07	3.54	0.27	-2.11	-7.85	0.21	-0.22	3.76	0.0

%117	3.20	4.55	0.07	2.98	0.22	-1.57	-9.42	0.12	-0.09	3.06	0.0
%118	1.70	4.09	0.07	1.58	0.12	-2.51	-11.93	0.05	-0.07	1.65	0.0
%119	0.77	2.69	0.07	0.72	0.05	-1.97	-13.90	0.03	-0.02	0.74	0.0
%120	3.32	1.63	0.07	3.09	0.23	1.46	-2.06	1.48	1.46	1.63	0.0
%121	3.12	1.88	0.07	2.90	0.22	1.03	-0.52	2.51	1.03	1.88	0.0
%122	1.94	2.69	0.07	1.80	0.14	-0.89	-1.41	1.85	-0.66	2.46	0.0
%123	5.04	3.26	0.07	4.69	0.35	1.43	0.00	3.00	1.15	3.26	0.2
%124	2.38	4.62	0.07	2.21	0.17	-2.41	-2.41	1.32	-1.68	3.90	0.0
%125	4.31	4.77	0.07	4.01	0.30	-0.76	-3.17	1.02	-0.30	4.31	0.0
%126	0.10	7.34	0.07	0.09	0.01	-7.24	-10.41	0.09	-0.93	1.02	0.0
%127	0.06	8.57	0.07	0.06	0.00	-8.52	-18.93	0.00	-0.08	0.14	0.0
%128	1.67	7.79	0.07	1.55	0.12	-6.24	-25.17	0.00	-0.00	1.56	0.0
%129	4.28	5.18	0.07	3.98	0.30	-1.20	-26.36	0.00	-0.00	3.98	0.0
%130	3.93	4.52	0.07	3.65	0.28	-0.87	-27.23	0.00	-0.00	3.65	0.0
%131	4.58	2.87	0.07	4.26	0.32	1.39	-2.25	1.39	1.39	2.87	0.0
%132	0.50	2.43	0.07	0.47	0.04	-1.96	-4.21	0.71	-0.68	1.14	0.0
%133	2.67	2.45	0.07	2.48	0.19	0.03	-4.08	0.74	0.03	2.45	0.0
%134	1.80	2.64	0.07	1.67	0.13	-0.97	-5.04	0.53	-0.21	1.88	0.0
%135	1.88	3.56	0.07	1.75	0.13	-1.81	-6.85	0.29	-0.25	1.99	0.0
%136	0.97	3.95	0.07	0.90	0.07	-3.05	-9.90	0.10	-0.19	1.09	0.0
%137	6.28	5.67	0.07	5.84	0.44	0.17	-7.02	0.27	0.17	5.67	0.0
%138	9.48	5.21	0.07	8.82	0.66	3.61	0.00	3.00	2.73	5.21	0.8
%139	5.35	5.36	0.07	4.98	0.37	-0.39	-0.39	2.62	-0.38	5.35	0.0
%140	2.51	6.39	0.07	2.33	0.18	-4.06	-4.44	0.66	-1.97	4.30	0.0
%141	5.96	4.55	0.07	5.54	0.42	0.99	-1.75	1.65	0.99	4.55	0.0
%142	10.95	3.91	0.07	10.18	0.77	6.28	0.00	3.00	1.35	3.91	4.9
%143	1.93	2.65	0.07	1.79	0.14	-0.85	-0.85	2.24	-0.76	2.56	0.0
%144	0.64	2.60	0.07	0.60	0.04	-2.00	-2.85	1.13	-1.11	1.70	0.0
%145	1.43	2.84	0.07	1.33	0.10	-1.51	-4.36	0.67	-0.46	1.79	0.0
%146	2.26	2.51	0.07	2.10	0.16	-0.40	-4.77	0.59	-0.09	2.19	0.0
%147	2.40	3.29	0.07	2.23	0.17	-1.06	-5.83	0.41	-0.18	2.41	0.0
%148	4.67	3.74	0.07	4.34	0.33	0.61	-3.17	1.01	0.61	3.74	0.0
%149	5.35	5.07	0.07	4.98	0.37	-0.10	-3.27	0.98	-0.03	5.01	0.0
%150	2.00	6.80	0.07	1.86	0.14	-4.94	-8.21	0.18	-0.80	2.66	0.0
%151	3.58	7.95	0.07	3.33	0.25	-4.62	-12.84	0.04	-0.14	3.47	0.0
%152	2.96	7.47	0.07	2.75	0.21	-4.72	-17.55	0.01	-0.03	2.78	0.0
%153	3.19	6.76	0.07	2.97	0.22	-3.80	-21.35	0.00	-0.01	2.97	0.0
%154	6.89	4.89	0.07	6.41	0.48	1.52	-1.98	1.52	1.52	4.89	0.0
%155	4.09	3.36	0.07	3.80	0.29	0.44	-1.23	1.97	0.44	3.36	0.0
%156	3.05	4.42	0.07	2.84	0.21	-1.58	-2.81	1.15	-0.82	3.66	0.0
%157	3.07	2.07	0.07	2.86	0.21	0.79	-1.28	1.94	0.79	2.07	0.0
%158	4.66	2.39	0.07	4.33	0.33	1.94	0.00	3.00	1.06	2.39	0.8
%159	5.97	3.86	0.07	5.55	0.42	1.70	0.00	3.00	0.00	3.86	1.7
%160	0.31	4.73	0.07	0.29	0.02	-4.44	-4.44	0.66	-2.34	2.63	0.0
%161	9.49	6.05	0.07	8.83	0.66	2.78	0.00	3.00	2.34	6.05	0.4
%162	2.60	5.43	0.07	2.42	0.18	-3.01	-3.01	1.07	-1.93	4.35	0.0
%163	2.46	6.45	0.07	2.29	0.17	-4.16	-7.17	0.26	-0.81	3.10	0.0
%164	7.24	5.68	0.07	6.73	0.51	1.05	-2.43	1.31	1.05	5.68	0.0
%165	9.40	5.14	0.07	8.74	0.66	3.60	0.00	3.00	1.69	5.14	1.9
%166	2.81	4.10	0.07	2.61	0.20	-1.49	-1.49	1.80	-1.20	3.81	0.0
%167	3.25	2.86	0.07	3.02	0.23	0.17	-1.23	1.97	0.17	2.86	0.0
%168	1.83	2.40	0.07	1.70	0.13	-0.70	-1.93	1.55	-0.42	2.12	0.0
%169	1.67	2.37	0.07	1.55	0.12	-0.81	-2.74	1.17	-0.37	1.93	0.0
%170	0.99	3.74	0.07	0.92	0.07	-2.82	-5.56	0.45	-0.72	1.64	0.0
%171	4.98	5.62	0.07	4.63	0.35	-0.99	-6.55	0.32	-0.13	4.76	0.0
%172	0.34	6.06	0.07	0.32	0.02	-5.75	-12.30	0.04	-0.27	0.59	0.0
%173	5.76	8.51	0.07	5.36	0.40	-3.16	-15.45	0.02	-0.03	5.39	0.0
%174	4.39	5.97	0.07	4.08	0.31	-1.89	-17.34	0.01	-0.01	4.09	0.0
%175	1.61	5.49	0.07	1.50	0.11	-3.99	-21.33	0.00	-0.01	1.50	0.0
%176	1.83	6.27	0.07	1.70	0.13	-4.57	-25.90	0.00	-0.00	1.70	0.0
%177	0.77	5.24	0.07	0.72	0.05	-4.52	-30.42	0.00	-0.00	0.72	0.0
%178	15.69	4.40	0.07	14.59	1.10	10.19	0.00	3.00	3.00	4.40	7.1
%179	2.38	3.23	0.07	2.21	0.17	-1.02	-1.02	2.11	-0.89	3.10	0.0

%180	2.59	2.34	0.07	2.41	0.18	0.07	-0.93	2.18	0.07	2.34	0.0
%181	2.63	2.30	0.07	2.45	0.18	0.14	-0.74	2.32	0.14	2.30	0.0
%182	2.82	2.39	0.07	2.62	0.20	0.23	-0.47	2.55	0.23	2.39	0.0
%183	2.30	3.34	0.07	2.14	0.16	-1.20	-1.67	1.69	-0.86	3.00	0.0
%184	1.93	4.73	0.07	1.79	0.14	-2.94	-4.60	0.62	-1.07	2.87	0.0
%185	5.29	6.08	0.07	4.92	0.37	-1.16	-5.77	0.42	-0.20	5.12	0.0
%186	1.48	6.53	0.07	1.38	0.10	-5.15	-10.92	0.07	-0.35	1.72	0.0
%187	4.01	7.15	0.07	3.73	0.28	-3.42	-14.35	0.02	-0.05	3.78	0.0
%188	0.13	7.63	0.07	0.12	0.01	-7.51	-21.86	0.00	-0.02	0.14	0.0
%189	6.96	7.25	0.07	6.47	0.49	-0.78	-22.63	0.00	-0.00	6.47	0.0
%190	6.91	4.30	0.07	6.43	0.48	2.12	-1.01	2.12	2.12	4.30	0.0
%191	6.02	3.15	0.07	5.60	0.42	2.45	0.00	3.00	0.88	3.15	1.5
%192	1.38	1.90	0.07	1.28	0.10	-0.62	-0.62	2.42	-0.58	1.86	0.0
%193	1.02	2.97	0.07	0.95	0.07	-2.03	-2.65	1.21	-1.21	2.16	0.0
%194	1.84	3.67	0.07	1.71	0.13	-1.96	-4.61	0.62	-0.59	2.30	0.0
%195	0.50	5.47	0.07	0.47	0.04	-5.01	-9.62	0.11	-0.51	0.97	0.0
%196	2.53	5.14	0.07	2.35	0.18	-2.79	-12.41	0.04	-0.07	2.42	0.0
%197	8.12	6.44	0.07	7.55	0.57	1.11	-2.79	1.15	1.11	6.44	0.0
%198	4.71	5.90	0.07	4.38	0.33	-1.52	-4.31	0.69	-0.47	4.85	0.0
%199	0.06	8.24	0.07	0.06	0.00	-8.18	-12.49	0.04	-0.64	0.70	0.0
%200	7.74	7.36	0.07	7.20	0.54	-0.16	-12.65	0.04	-0.00	7.20	0.0
%201	5.33	5.31	0.07	4.96	0.37	-0.36	-13.01	0.04	-0.00	4.96	0.0
%202	5.85	3.86	0.07	5.44	0.41	1.58	-1.80	1.62	1.58	3.86	0.0
%203	3.44	2.69	0.07	3.20	0.24	0.51	-1.00	2.13	0.51	2.69	0.0
%204	4.95	1.81	0.07	4.60	0.35	2.80	0.00	3.00	0.87	1.81	1.9
%205	0.96	2.25	0.07	0.89	0.07	-1.36	-1.36	1.88	-1.12	2.01	0.0
%206	3.90	2.97	0.07	3.63	0.27	0.65	-0.49	2.53	0.65	2.97	0.0
%207	1.79	4.55	0.07	1.66	0.13	-2.89	-3.38	0.94	-1.59	3.25	0.0
%208	0.68	6.78	0.07	0.63	0.05	-6.15	-9.53	0.12	-0.83	1.46	0.0
%209	9.31	5.28	0.07	8.66	0.65	3.38	0.00	3.00	2.88	5.28	0.5
%210	10.09	6.92	0.07	9.38	0.71	2.46	0.00	3.00	0.00	6.92	2.4
%211	1.76	6.73	0.07	1.64	0.12	-5.10	-5.10	0.53	-2.47	4.11	0.0
%212	0.90	9.50	0.07	0.84	0.06	-8.66	-13.76	0.03	-0.50	1.33	0.0
%213	5.34	5.64	0.07	4.97	0.37	-0.68	-14.43	0.02	-0.01	4.97	0.0
%214	0.19	5.42	0.07	0.18	0.01	-5.24	-19.68	0.00	-0.02	0.19	0.0
%215	3.88	3.11	0.07	3.61	0.27	0.49	-5.26	0.50	0.49	3.11	0.0
%216	4.54	2.22	0.07	4.22	0.32	2.00	-0.53	2.50	2.00	2.22	0.0
%217	0.81	2.56	0.07	0.75	0.06	-1.80	-2.33	1.35	-1.15	1.90	0.0
%218	1.44	2.96	0.07	1.34	0.10	-1.62	-3.95	0.78	-0.57	1.91	0.0
%219	2.97	4.38	0.07	2.76	0.21	-1.62	-5.57	0.45	-0.33	3.09	0.0
%220	0.28	6.04	0.07	0.26	0.02	-5.78	-11.35	0.06	-0.38	0.64	0.0
%221	2.91	6.49	0.07	2.71	0.20	-3.78	-15.14	0.02	-0.05	2.75	0.0
%222	1.81	7.13	0.07	1.68	0.13	-5.44	-20.58	0.00	-0.01	1.70	0.0
%223	0.96	8.48	0.07	0.89	0.07	-7.59	-28.17	0.00	-0.00	0.90	0.0
%224	0.19	7.89	0.07	0.18	0.01	-7.71	-35.88	0.00	-0.00	0.18	0.0
%225	0.43	6.82	0.07	0.40	0.03	-6.42	-42.30	0.00	-0.00	0.40	0.0
%226	1.37	5.87	0.07	1.27	0.10	-4.59	-46.89	0.00	-0.00	1.27	0.0
%227	1.46	4.12	0.07	1.36	0.10	-2.77	-49.66	0.00	-0.00	1.36	0.0
%228	2.27	2.48	0.07	2.11	0.16	-0.37	-50.03	0.00	-0.00	2.11	0.0
%229	7.07	1.90	0.07	6.58	0.49	4.67	0.00	3.00	3.00	1.90	1.6
%230	1.10	2.61	0.07	1.02	0.08	-1.59	-1.59	1.74	-1.26	2.28	0.0
%231	3.22	3.87	0.07	2.99	0.23	-0.88	-2.46	1.29	-0.45	3.44	0.0
%232	0.51	5.38	0.07	0.47	0.04	-4.90	-7.37	0.24	-1.05	1.52	0.0
%233	5.29	6.82	0.07	4.92	0.37	-1.91	-9.27	0.13	-0.12	5.04	0.0
%234	4.23	5.88	0.07	3.93	0.30	-1.95	-11.22	0.07	-0.06	4.00	0.0
%235	2.70	6.57	0.07	2.51	0.19	-4.05	-15.27	0.02	-0.05	2.56	0.0
%236	3.26	6.78	0.07	3.03	0.23	-3.74	-19.02	0.00	-0.01	3.04	0.0
%237	0.68	6.21	0.07	0.63	0.05	-5.58	-24.59	0.00	-0.00	0.64	0.0
%238	1.93	5.24	0.07	1.79	0.14	-3.45	-28.04	0.00	-0.00	1.80	0.0
%239	1.61	3.80	0.07	1.50	0.11	-2.30	-30.35	0.00	-0.00	1.50	0.0
%240	0.37	2.30	0.07	0.34	0.03	-1.95	-32.30	0.00	-0.00	0.34	0.0

TOTAL PERCOLATION = 70.160

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input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.10	1.47	0.16	-0.03	-33.07	0.00	-0.00	1.47	0.00
2	4.40	1.76	0.10	3.96	0.44	2.20	-0.91	2.20	2.20	1.76	0.00
3	3.58	2.57	0.10	3.22	0.36	0.65	-0.15	2.85	0.65	2.57	0.00
4	4.01	2.25	0.10	3.61	0.40	1.36	0.00	3.00	0.15	2.25	1.20
5	4.22	3.67	0.10	3.80	0.42	0.13	0.00	3.00	0.00	3.67	0.13
6	2.02	3.65	0.10	1.82	0.20	-1.84	-1.84	1.60	-1.40	3.22	0.00
7	0.26	4.86	0.10	0.23	0.03	-4.62	-6.46	0.33	-1.27	1.50	0.00
8	0.23	5.75	0.10	0.21	0.02	-5.55	-12.01	0.05	-0.28	0.49	0.00
9	6.38	3.82	0.10	5.74	0.64	1.92	-1.23	1.97	1.92	3.82	0.00
10	3.84	2.62	0.10	3.46	0.38	0.84	-0.19	2.81	0.84	2.62	0.00
11	0.62	2.87	0.10	0.56	0.06	-2.31	-2.50	1.27	-1.53	2.09	0.00
12	1.40	2.58	0.10	1.26	0.14	-1.32	-3.82	0.81	-0.46	1.72	0.00
13	0.15	2.81	0.10	0.14	0.02	-2.68	-6.50	0.33	-0.49	0.62	0.00
14	1.68	4.00	0.10	1.51	0.17	-2.49	-8.98	0.14	-0.19	1.70	0.00
15	12.00	5.87	0.10	10.80	1.20	4.93	0.00	3.00	2.86	5.87	2.07
16	0.89	4.56	0.10	0.80	0.09	-3.76	-3.76	0.83	-2.17	2.97	0.00
17	5.65	6.00	0.10	5.09	0.56	-0.91	-4.67	0.61	-0.22	5.31	0.00
18	0.76	4.74	0.10	0.68	0.08	-4.05	-8.72	0.15	-0.46	1.14	0.00
19	1.87	8.64	0.10	1.68	0.19	-6.95	-15.68	0.01	-0.14	1.82	0.00
20	3.20	6.27	0.10	2.88	0.32	-3.39	-19.07	0.00	-0.01	2.89	0.00
21	3.31	5.52	0.10	2.98	0.33	-2.54	-21.62	0.00	-0.00	2.98	0.00
22	4.30	3.93	0.10	3.87	0.43	-0.06	-21.68	0.00	-0.00	3.87	0.00
23	2.75	3.30	0.10	2.47	0.28	-0.83	-22.51	0.00	-0.00	2.48	0.00
24	4.63	2.44	0.10	4.17	0.46	1.73	-1.60	1.73	1.73	2.44	0.00
25	1.73	1.77	0.10	1.56	0.17	-0.21	-1.82	1.61	-0.12	1.68	0.00
26	0.50	2.88	0.10	0.45	0.05	-2.43	-4.24	0.70	-0.91	1.36	0.00
27	0.91	4.24	0.10	0.82	0.09	-3.42	-7.66	0.22	-0.48	1.30	0.00
28	1.71	4.03	0.10	1.54	0.17	-2.49	-10.15	0.09	-0.13	1.66	0.00
29	6.38	5.15	0.10	5.74	0.64	0.59	-4.32	0.68	0.59	5.15	0.00
30	2.13	5.24	0.10	1.92	0.21	-3.33	-7.65	0.22	-0.46	2.38	0.00
31	2.17	5.74	0.10	1.95	0.22	-3.79	-11.44	0.06	-0.16	2.11	0.00
32	3.60	4.89	0.10	3.24	0.36	-1.65	-13.08	0.03	-0.03	3.27	0.00
33	4.45	4.56	0.10	4.00	0.44	-0.55	-13.63	0.03	-0.01	4.01	0.00
34	3.95	3.95	0.10	3.56	0.40	-0.40	-14.03	0.02	-0.00	3.56	0.00
35	3.26	2.16	0.10	2.93	0.33	0.77	-3.88	0.80	0.77	2.16	0.00
36	1.47	2.12	0.10	1.32	0.15	-0.80	-4.68	0.61	-0.19	1.51	0.00
37	5.51	3.11	0.10	4.96	0.55	1.84	-0.59	2.45	1.84	3.11	0.00
38	2.60	2.27	0.10	2.34	0.26	0.07	-0.50	2.52	0.07	2.27	0.00
39	5.17	3.54	0.10	4.65	0.52	1.12	0.00	3.00	0.48	3.54	0.64
40	6.74	3.96	0.10	6.07	0.67	2.10	0.00	3.00	0.00	3.96	2.10
41	2.12	4.30	0.10	1.91	0.21	-2.39	-2.39	1.32	-1.68	3.59	0.00
42	6.44	4.77	0.10	5.80	0.64	1.03	-0.71	2.35	1.03	4.77	0.00
43	2.15	4.56	0.10	1.94	0.22	-2.62	-3.33	0.96	-1.39	3.33	0.00
44	1.03	5.52	0.10	0.93	0.10	-4.59	-7.92	0.20	-0.76	1.69	0.00
45	9.44	4.80	0.10	8.50	0.94	3.69	0.00	3.00	2.80	4.80	0.89
46	10.17	4.25	0.10	9.15	1.02	4.90	0.00	3.00	0.00	4.25	4.90
47	2.40	2.60	0.10	2.16	0.24	-0.44	-0.44	2.58	-0.42	2.58	0.00
48	2.52	2.87	0.10	2.27	0.25	-0.60	-1.04	2.10	-0.48	2.75	0.00
49	4.66	1.75	0.10	4.19	0.47	2.44	0.00	3.00	0.90	1.75	1.54
50	0.13	3.00	0.10	0.12	0.01	-2.88	-2.88	1.12	-1.88	2.00	0.00
51	1.56	3.97	0.10	1.40	0.16	-2.57	-5.44	0.47	-0.65	2.06	0.00
52	1.76	5.22	0.10	1.58	0.18	-3.64	-9.08	0.13	-0.33	1.92	0.00
53	3.09	5.89	0.10	2.78	0.31	-3.11	-12.19	0.05	-0.09	2.87	0.00

54	0.73	5.36	0.10	0.66	0.07	-4.70	-16.89	0.01	-0.04	0.69	0.00
55	2.40	5.57	0.10	2.16	0.24	-3.41	-20.30	0.00	-0.01	2.17	0.00
56	9.88	6.05	0.10	8.89	0.99	2.84	-0.15	2.85	2.84	6.05	0.00
57	9.22	4.84	0.10	8.30	0.92	3.46	0.00	3.00	0.15	4.84	3.31
58	6.02	3.92	0.10	5.42	0.60	1.50	0.00	3.00	0.00	3.92	1.50
59	5.68	2.63	0.10	5.11	0.57	2.48	0.00	3.00	0.00	2.63	2.48
60	2.82	2.11	0.10	2.54	0.28	0.42	0.00	3.00	0.00	2.11	0.42
61	1.80	2.27	0.10	1.62	0.18	-0.65	-0.65	2.40	-0.60	2.22	0.00
62	2.45	2.22	0.10	2.20	0.25	-0.01	-0.66	2.39	-0.01	2.22	0.00
63	1.41	3.09	0.10	1.27	0.14	-1.82	-2.48	1.28	-1.10	2.37	0.00
64	2.08	4.17	0.10	1.87	0.21	-2.30	-4.78	0.59	-0.70	2.57	0.00
65	11.99	4.56	0.10	10.79	1.20	6.23	0.00	3.00	2.41	4.56	3.81
66	2.42	5.73	0.10	2.18	0.24	-3.55	-3.55	0.89	-2.11	4.29	0.00
67	4.16	5.52	0.10	3.74	0.42	-1.78	-5.33	0.48	-0.40	4.15	0.00
68	2.44	5.72	0.10	2.20	0.24	-3.52	-8.86	0.15	-0.34	2.53	0.00
69	3.78	4.72	0.10	3.40	0.38	-1.32	-10.17	0.09	-0.05	3.45	0.00
70	3.35	3.62	0.10	3.01	0.34	-0.60	-10.78	0.08	-0.02	3.03	0.00
71	1.07	3.95	0.10	0.96	0.11	-2.98	-13.76	0.03	-0.05	1.01	0.00
72	1.18	2.72	0.10	1.06	0.12	-1.65	-15.42	0.02	-0.01	1.07	0.00
73	1.60	3.37	0.10	1.44	0.16	-1.93	-17.35	0.01	-0.01	1.45	0.00
74	1.74	3.10	0.10	1.57	0.17	-1.53	-18.88	0.00	-0.00	1.57	0.00
75	4.81	3.54	0.10	4.33	0.48	0.79	-3.89	0.79	0.79	3.54	0.00
76	5.95	4.07	0.10	5.36	0.59	1.29	-1.07	2.08	1.29	4.07	0.00
77	4.32	4.53	0.10	3.89	0.43	-0.64	-1.71	1.67	-0.41	4.30	0.00
78	4.02	6.05	0.10	3.62	0.40	-2.44	-4.15	0.73	-0.94	4.56	0.00
79	2.13	5.27	0.10	1.92	0.21	-3.35	-7.50	0.23	-0.50	2.41	0.00
80	1.48	6.20	0.10	1.33	0.15	-4.86	-12.36	0.04	-0.19	1.52	0.00
81	2.68	3.90	0.10	2.41	0.27	-1.49	-13.85	0.03	-0.02	2.43	0.00
82	5.77	3.62	0.10	5.19	0.58	1.57	-1.83	1.60	1.57	3.62	0.00
83	3.27	1.86	0.10	2.94	0.33	1.08	-0.32	2.68	1.08	1.86	0.00
84	4.05	2.45	0.10	3.65	0.41	1.20	0.00	3.00	0.32	2.45	0.88
85	2.14	1.43	0.10	1.93	0.21	0.49	0.00	3.00	0.00	1.43	0.49
86	3.55	2.90	0.10	3.19	0.35	0.30	0.00	3.00	0.00	2.90	0.30
87	2.06	3.81	0.10	1.85	0.21	-1.95	-1.95	1.54	-1.46	3.32	0.00
88	8.81	4.38	0.10	7.93	0.88	3.55	0.00	3.00	1.46	4.38	2.09
89	1.56	5.21	0.10	1.40	0.16	-3.80	-3.80	0.82	-2.18	3.59	0.00
90	1.35	6.78	0.10	1.22	0.14	-5.56	-9.36	0.12	-0.69	1.91	0.00
91	0.31	7.10	0.10	0.28	0.03	-6.82	-16.18	0.01	-0.11	0.39	0.00
92	1.35	6.50	0.10	1.22	0.14	-5.28	-21.47	0.00	-0.01	1.22	0.00
93	1.69	6.16	0.10	1.52	0.17	-4.64	-26.10	0.00	-0.00	1.52	0.00
94	0.79	4.64	0.10	0.71	0.08	-3.93	-30.03	0.00	-0.00	0.71	0.00
95	3.10	3.24	0.10	2.79	0.31	-0.45	-30.49	0.00	-0.00	2.79	0.00
96	2.67	3.07	0.10	2.40	0.27	-0.67	-31.16	0.00	-0.00	2.40	0.00
97	4.51	1.92	0.10	4.06	0.45	2.13	-0.99	2.13	2.13	1.92	0.00
98	2.62	1.98	0.10	2.36	0.26	0.38	-0.52	2.51	0.38	1.98	0.00
99	2.72	4.39	0.10	2.45	0.27	-1.94	-2.46	1.29	-1.22	3.67	0.00
%100	1.37	4.99	0.10	1.23	0.14	-3.76	-6.21	0.36	-0.93	2.17	0.0
%101	2.52	5.91	0.10	2.27	0.25	-3.64	-9.85	0.10	-0.26	2.52	0.0
%102	2.44	6.32	0.10	2.20	0.24	-4.12	-13.98	0.03	-0.08	2.27	0.0
%103	1.26	6.53	0.10	1.13	0.13	-5.40	-19.38	0.00	-0.02	1.16	0.0
%104	0.57	6.53	0.10	0.51	0.06	-6.02	-25.39	0.00	-0.00	0.52	0.0
%105	6.50	4.78	0.10	5.85	0.65	1.07	-3.01	1.07	1.07	4.78	0.0
%106	0.41	5.19	0.10	0.37	0.04	-4.82	-7.83	0.21	-0.86	1.23	0.0
%107	6.31	2.86	0.10	5.68	0.63	2.82	0.00	3.00	2.79	2.86	0.0
%108	3.17	2.18	0.10	2.85	0.32	0.67	0.00	3.00	0.00	2.18	0.6
%109	3.70	1.74	0.10	3.33	0.37	1.59	0.00	3.00	0.00	1.74	1.5
%110	4.08	2.24	0.10	3.67	0.41	1.43	0.00	3.00	0.00	2.24	1.4
%111	5.54	4.35	0.10	4.99	0.55	0.64	0.00	3.00	0.00	4.35	0.6
%112	4.74	4.27	0.10	4.27	0.47	-0.00	-0.00	2.99	-0.01	4.28	0.0
%113	11.05	5.26	0.10	9.94	1.11	4.69	0.00	3.00	0.01	5.26	4.6
%114	1.30	5.70	0.10	1.17	0.13	-4.53	-4.53	0.64	-2.36	3.53	0.0
%115	4.48	5.40	0.10	4.03	0.45	-1.37	-5.91	0.40	-0.24	4.27	0.0
%116	3.81	5.66	0.10	3.43	0.38	-2.23	-8.13	0.19	-0.21	3.64	0.0

%117	3.20	4.55	0.10	2.88	0.32	-1.67	-9.80	0.11	-0.08	2.96	0.0	0
%118	1.70	4.09	0.10	1.53	0.17	-2.56	-12.36	0.04	-0.06	1.59	0.0	0
%119	0.77	2.69	0.10	0.69	0.08	-2.00	-14.36	0.02	-0.02	0.71	0.0	0
%120	3.32	1.63	0.10	2.99	0.33	1.36	-2.27	1.38	1.36	1.63	0.0	0
%121	3.12	1.88	0.10	2.81	0.31	0.93	-0.76	2.31	0.93	1.88	0.0	0
%122	1.94	2.69	0.10	1.75	0.19	-0.95	-1.71	1.67	-0.64	2.39	0.0	0
%123	5.04	3.26	0.10	4.54	0.50	1.27	-0.05	2.94	1.27	3.26	0.0	0
%124	2.38	4.62	0.10	2.14	0.24	-2.48	-2.53	1.26	-1.68	3.82	0.0	0
%125	4.31	4.77	0.10	3.88	0.43	-0.89	-3.42	0.93	-0.33	4.21	0.0	0
%126	0.10	7.34	0.10	0.09	0.01	-7.25	-10.66	0.08	-0.85	0.94	0.0	0
%127	0.06	8.57	0.10	0.05	0.01	-8.52	-19.18	0.00	-0.07	0.13	0.0	0
%128	1.67	7.79	0.10	1.50	0.17	-6.29	-25.47	0.00	-0.00	1.51	0.0	0
%129	4.28	5.18	0.10	3.85	0.43	-1.33	-26.80	0.00	-0.00	3.85	0.0	1
%130	3.93	4.52	0.10	3.54	0.39	-0.98	-27.78	0.00	-0.00	3.54	0.0	0
%131	4.58	2.87	0.10	4.12	0.46	1.25	-2.55	1.25	1.25	2.87	0.0	0
%132	0.50	2.43	0.10	0.45	0.05	-1.98	-4.53	0.64	-0.62	1.07	0.0	0
%133	2.67	2.45	0.10	2.40	0.27	-0.05	-4.58	0.63	-0.01	2.41	0.0	0
%134	1.80	2.64	0.10	1.62	0.18	-1.02	-5.60	0.44	-0.18	1.80	0.0	0
%135	1.88	3.56	0.10	1.69	0.19	-1.86	-7.46	0.23	-0.21	1.90	0.0	0
%136	0.97	3.95	0.10	0.87	0.10	-3.08	-10.54	0.08	-0.15	1.03	0.0	0
%137	6.28	5.67	0.10	5.65	0.63	-0.02	-10.56	0.08	-0.00	5.65	0.0	0
%138	9.48	5.21	0.10	8.53	0.95	3.32	0.00	3.00	2.92	5.21	0.4	0
%139	5.35	5.36	0.10	4.82	0.54	-0.55	-0.55	2.48	-0.52	5.33	0.0	0
%140	2.51	6.39	0.10	2.26	0.25	-4.13	-4.68	0.61	-1.88	4.14	0.0	0
%141	5.96	4.55	0.10	5.36	0.60	0.81	-2.19	1.42	0.81	4.55	0.0	0
%142	10.95	3.91	0.10	9.85	1.10	5.95	0.00	3.00	1.58	3.91	0.0	4
%143	1.93	2.65	0.10	1.74	0.19	-0.91	-0.91	2.19	-0.81	2.54	4.3	0
[illegible]4	0.64	2.60	0.10	0.58	0.06	-2.02	-2.93	1.10	-1.09	1.67	0.0	0
[illegible]5	1.43	2.84	0.10	1.29	0.14	-1.56	-4.48	0.65	-0.45	1.74	0.0	0
[illegible]6	2.26	2.51	0.10	2.03	0.23	-0.47	-4.96	0.55	-0.10	2.13	0.0	2
%147	2.40	3.29	0.10	2.16	0.24	-1.13	-6.09	0.37	-0.18	2.34	0.0	1
%148	4.67	3.74	0.10	4.20	0.47	0.46	-3.72	0.84	0.46	3.74	0.0	0
%149	5.35	5.07	0.10	4.82	0.54	-0.26	-3.98	0.77	-0.07	4.89	0.0	0
%150	2.00	6.80	0.10	1.80	0.20	-5.00	-8.99	0.14	-0.63	2.43	0.0	0
%151	3.58	7.95	0.10	3.22	0.36	-4.73	-13.72	0.03	-0.11	3.33	0.0	0
%152	2.96	7.47	0.10	2.66	0.30	-4.80	-18.52	0.01	-0.02	2.69	0.0	0
%153	3.19	6.76	0.10	2.87	0.32	-3.89	-22.41	0.00	-0.00	2.87	0.0	0
%154	6.89	4.89	0.10	6.20	0.69	1.31	-2.41	1.32	1.31	4.89	0.0	0
%155	4.09	3.36	0.10	3.68	0.41	0.32	-1.77	1.64	0.32	3.36	0.0	0
%156	3.05	4.42	0.10	2.74	0.31	-1.67	-3.44	0.92	-0.71	3.46	0.0	0
%157	3.07	2.07	0.10	2.76	0.31	0.70	-1.79	1.62	0.70	2.07	0.0	0
%158	4.66	2.39	0.10	4.19	0.47	1.80	0.00	3.00	1.38	2.39	0.4	0
%159	5.97	3.86	0.10	5.37	0.60	1.52	0.00	3.00	0.00	3.86	1.5	0
%160	0.31	4.73	0.10	0.28	0.03	-4.45	-4.45	0.65	-2.35	2.62	0.0	0
%161	9.49	6.05	0.10	8.54	0.95	2.49	0.00	3.00	2.35	6.05	0.1	0
%162	2.60	5.43	0.10	2.34	0.26	-3.09	-3.09	1.04	-1.96	4.30	0.0	0
%163	2.46	6.45	0.10	2.21	0.25	-4.23	-7.32	0.25	-0.80	3.01	0.0	0
%164	7.24	5.68	0.10	6.52	0.72	0.83	-2.99	1.08	0.83	5.68	0.0	0
%165	9.40	5.14	0.10	8.46	0.94	3.32	0.00	3.00	1.92	5.14	0.0	0
%166	2.81	4.10	0.10	2.53	0.28	-1.57	-1.57	1.75	-1.25	3.78	1.4	0
%167	3.25	2.86	0.10	2.92	0.33	0.07	-1.46	1.82	0.07	2.86	0.0	4
%168	1.83	2.40	0.10	1.65	0.18	-0.75	-2.22	1.40	-0.41	2.06	0.0	0
%169	1.67	2.37	0.10	1.50	0.17	-0.86	-3.08	1.05	-0.36	1.86	0.0	0
%170	0.99	3.74	0.10	0.89	0.10	-2.85	-5.93	0.40	-0.65	1.54	0.0	0
%171	4.98	5.62	0.10	4.48	0.50	-1.14	-7.07	0.27	-0.13	4.61	0.0	0
%172	0.34	6.06	0.10	0.31	0.03	-5.76	-12.82	0.04	-0.23	0.54	0.0	0
%173	5.76	8.51	0.10	5.18	0.58	-3.33	-16.15	0.01	-0.03	5.21	0.0	0
[illegible]	4.39	5.97	0.10	3.95	0.44	-2.02	-18.17	0.01	-0.01	3.96	0.0	0
[illegible]	1.61	5.49	0.10	1.45	0.16	-4.04	-22.21	0.00	-0.00	1.45	0.0	0
%176	1.83	6.27	0.10	1.65	0.18	-4.63	-26.83	0.00	-0.00	1.65	0.0	0
%177	0.77	5.24	0.10	0.69	0.08	-4.54	-31.38	0.00	-0.00	0.69	0.0	0
%178	15.69	4.40	0.10	14.12	1.57	9.72	0.00	3.00	3.00	4.40	6.7	0
%179	2.38	3.23	0.10	2.14	0.24	-1.09	-1.09	2.06	-0.94	3.08	0.0	

input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.15	1.39	0.24	-0.11	-34.40	0.00	-0.00	1.39	0.00
2	4.40	1.76	0.15	3.74	0.66	1.98	-1.22	1.98	1.98	1.76	0.00
3	3.58	2.57	0.15	3.04	0.54	0.47	-0.59	2.45	0.47	2.57	0.00
4	4.01	2.25	0.15	3.41	0.60	1.15	0.00	3.00	0.55	2.25	0.60
5	4.22	3.67	0.15	3.59	0.63	-0.08	-0.08	2.91	-0.09	3.68	0.00
6	2.02	3.65	0.15	1.72	0.30	-1.94	-2.02	1.50	-1.41	3.12	0.00
7	0.26	4.86	0.15	0.22	0.04	-4.64	-6.65	0.31	-1.19	1.41	0.00
8	0.23	5.75	0.15	0.20	0.03	-5.56	-12.21	0.05	-0.26	0.46	0.00
9	6.38	3.82	0.15	5.42	0.96	1.60	-1.75	1.65	1.60	3.82	0.00
10	3.84	2.62	0.15	3.26	0.58	0.65	-0.78	2.29	0.65	2.62	0.00
11	0.62	2.87	0.15	0.53	0.09	-2.34	-3.12	1.03	-1.26	1.79	0.00
12	1.40	2.58	0.15	1.19	0.21	-1.39	-4.51	0.64	-0.39	1.58	0.00
13	0.15	2.81	0.15	0.13	0.02	-2.69	-7.20	0.26	-0.39	0.51	0.00
14	1.68	4.00	0.15	1.43	0.25	-2.57	-9.77	0.11	-0.15	1.58	0.00
15	12.00	5.87	0.15	10.20	1.80	4.33	0.00	3.00	2.89	5.87	1.43
16	0.89	4.56	0.15	0.76	0.13	-3.80	-3.80	0.82	-2.18	2.94	0.00
17	5.65	6.00	0.15	4.80	0.85	-1.20	-5.00	0.54	-0.27	5.08	0.00
18	0.76	4.74	0.15	0.65	0.11	-4.09	-9.09	0.13	-0.41	1.05	0.00
19	1.87	8.64	0.15	1.59	0.28	-7.05	-16.14	0.01	-0.12	1.71	0.00
20	3.20	6.27	0.15	2.72	0.48	-3.55	-19.69	0.00	-0.01	2.73	0.00
21	3.31	5.52	0.15	2.81	0.50	-2.71	-22.40	0.00	-0.00	2.82	0.00
22	4.30	3.93	0.15	3.66	0.65	-0.28	-22.68	0.00	-0.00	3.66	0.00
23	2.75	3.30	0.15	2.34	0.41	-0.97	-23.65	0.00	-0.00	2.34	0.00
24	4.63	2.44	0.15	3.94	0.69	1.50	-2.02	1.50	1.50	2.44	0.00
25	1.73	1.77	0.15	1.47	0.26	-0.30	-2.32	1.35	-0.15	1.62	0.00
26	0.50	2.88	0.15	0.43	0.08	-2.45	-4.78	0.59	-0.77	1.19	0.00
27	0.91	4.24	0.15	0.77	0.14	-3.46	-8.24	0.18	-0.41	1.18	0.00
28	1.71	4.03	0.15	1.45	0.26	-2.57	-10.81	0.07	-0.11	1.56	0.00
29	6.38	5.15	0.15	5.42	0.96	0.27	-6.32	0.35	0.27	5.15	0.00
30	2.13	5.24	0.15	1.81	0.32	-3.43	-9.75	0.11	-0.24	2.05	0.00
31	2.17	5.74	0.15	1.84	0.33	-3.90	-13.65	0.03	-0.08	1.92	0.00
32	3.60	4.89	0.15	3.06	0.54	-1.83	-15.47	0.02	-0.01	3.07	0.00
33	4.45	4.56	0.15	3.78	0.67	-0.77	-16.25	0.01	-0.00	3.79	0.00
34	3.95	3.95	0.15	3.36	0.59	-0.60	-16.85	0.01	-0.00	3.36	0.00
35	3.26	2.16	0.15	2.77	0.49	0.61	-4.62	0.62	0.61	2.16	0.00
36	1.47	2.12	0.15	1.25	0.22	-0.87	-5.49	0.46	-0.16	1.41	0.00
37	5.51	3.11	0.15	4.68	0.83	1.57	-1.14	2.03	1.57	3.11	0.00
38	2.60	2.27	0.15	2.21	0.39	-0.06	-1.20	1.99	-0.04	2.25	0.00
39	5.17	3.54	0.15	4.39	0.78	0.86	-0.15	2.85	0.86	3.54	0.00
40	6.74	3.96	0.15	5.73	1.01	1.77	0.00	3.00	0.15	3.96	1.61
41	2.12	4.30	0.15	1.80	0.32	-2.50	-2.50	1.28	-1.72	3.53	0.00
42	6.44	4.77	0.15	5.47	0.97	0.71	-1.21	1.98	0.71	4.77	0.00
43	2.15	4.56	0.15	1.83	0.32	-2.73	-3.94	0.78	-1.20	3.03	0.00
44	1.03	5.52	0.15	0.88	0.15	-4.64	-8.58	0.16	-0.62	1.50	0.00
45	9.44	4.80	0.15	8.02	1.42	3.22	0.00	3.00	2.84	4.80	0.38
46	10.17	4.25	0.15	8.64	1.53	4.40	0.00	3.00	0.00	4.25	4.40
47	2.40	2.60	0.15	2.04	0.36	-0.56	-0.56	2.47	-0.53	2.57	0.00
48	2.52	2.87	0.15	2.14	0.38	-0.73	-1.28	1.93	-0.54	2.69	0.00
49	4.66	1.75	0.15	3.96	0.70	2.21	0.00	3.00	1.07	1.75	1.14
50	0.13	3.00	0.15	0.11	0.02	-2.89	-2.89	1.12	-1.88	1.99	0.00
51	1.56	3.97	0.15	1.33	0.23	-2.64	-5.53	0.45	-0.66	1.99	0.00
52	1.76	5.22	0.15	1.50	0.26	-3.73	-9.25	0.13	-0.33	1.82	0.00
53	3.09	5.89	0.15	2.63	0.46	-3.26	-12.52	0.04	-0.09	2.71	0.00

54	0.73	5.36	0.15	0.62	0.11	-4.73	-17.25	0.01	-0.03	0.65	0.00
55	2.40	5.57	0.15	2.04	0.36	-3.53	-20.78	0.00	-0.01	2.05	0.00
56	9.88	6.05	0.15	8.40	1.48	2.35	-0.71	2.35	2.35	6.05	0.00
57	9.22	4.84	0.15	7.84	1.38	3.00	0.00	3.00	0.65	4.84	2.35
58	6.02	3.92	0.15	5.12	0.90	1.20	0.00	3.00	0.00	3.92	1.20
59	5.68	2.63	0.15	4.83	0.85	2.20	0.00	3.00	0.00	2.63	2.20
60	2.82	2.11	0.15	2.40	0.42	0.28	0.00	3.00	0.00	2.11	0.28
61	1.80	2.27	0.15	1.53	0.27	-0.74	-0.74	2.33	-0.67	2.20	0.00
62	2.45	2.22	0.15	2.08	0.37	-0.14	-0.87	2.22	-0.11	2.19	0.00
63	1.41	3.09	0.15	1.20	0.21	-1.89	-2.76	1.16	-1.05	2.25	0.00
64	2.08	4.17	0.15	1.77	0.31	-2.40	-5.17	0.51	-0.65	2.42	0.00
65	11.99	4.56	0.15	10.19	1.80	5.63	0.00	3.00	2.49	4.56	3.14
66	2.42	5.73	0.15	2.06	0.36	-3.68	-3.68	0.85	-2.15	4.20	0.00
67	4.16	5.52	0.15	3.54	0.62	-1.99	-5.66	0.43	-0.42	3.96	0.00
68	2.44	5.72	0.15	2.07	0.37	-3.64	-9.31	0.12	-0.31	2.38	0.00
69	3.78	4.72	0.15	3.21	0.57	-1.51	-10.81	0.07	-0.05	3.26	0.00
70	3.35	3.62	0.15	2.85	0.50	-0.77	-11.58	0.06	-0.02	2.86	0.00
71	1.07	3.95	0.15	0.91	0.16	-3.04	-14.62	0.02	-0.04	0.95	0.00
72	1.18	2.72	0.15	1.00	0.18	-1.71	-16.34	0.01	-0.01	1.01	0.00
73	1.60	3.37	0.15	1.36	0.24	-2.01	-18.35	0.01	-0.01	1.37	0.00
74	1.74	3.10	0.15	1.48	0.26	-1.62	-19.97	0.00	-0.00	1.48	0.00
75	4.81	3.54	0.15	4.09	0.72	0.55	-4.96	0.55	0.55	3.54	0.00
76	5.95	4.07	0.15	5.06	0.89	0.99	-1.95	1.54	0.99	4.07	0.00
77	4.32	4.53	0.15	3.67	0.65	-0.86	-2.80	1.15	-0.39	4.06	0.00
78	4.02	6.05	0.15	3.42	0.60	-2.64	-5.44	0.47	-0.68	4.10	0.00
79	2.13	5.27	0.15	1.81	0.32	-3.46	-8.90	0.14	-0.32	2.13	0.00
80	1.48	6.20	0.15	1.26	0.22	-4.94	-13.84	0.03	-0.12	2.13	0.00
81	2.68	3.90	0.15	2.28	0.40	-1.62	-15.46	0.02	-0.01	1.37	0.00
82	5.77	3.62	0.15	4.90	0.87	1.29	-2.44	1.30	1.29	2.29	0.00
83	3.27	1.86	0.15	2.78	0.49	0.92	-0.88	2.22	0.92	3.62	0.00
84	4.05	2.45	0.15	3.44	0.61	0.99	0.00	3.00	0.78	1.86	0.00
85	2.14	1.43	0.15	1.82	0.32	0.38	0.00	3.00	0.00	2.45	0.21
86	3.55	2.90	0.15	3.02	0.53	0.12	0.00	3.00	0.00	1.43	0.38
87	2.06	3.81	0.15	1.75	0.31	-2.06	-2.06	1.48	-1.52	2.90	0.12
88	8.81	4.38	0.15	7.49	1.32	3.11	0.00	3.00	1.52	3.27	0.00
89	1.56	5.21	0.15	1.33	0.23	-3.88	-3.88	0.80	-2.20	4.38	1.60
90	1.35	6.78	0.15	1.15	0.20	-5.63	-9.51	0.12	-0.68	3.53	0.00
91	0.31	7.10	0.15	0.26	0.05	-6.83	-16.34	0.01	-0.11	1.83	0.00
92	1.35	6.50	0.15	1.15	0.20	-5.35	-21.69	0.00	-0.01	0.37	0.00
93	1.69	6.16	0.15	1.44	0.25	-4.72	-26.42	0.00	-0.00	1.16	0.00
94	0.79	4.64	0.15	0.67	0.12	-3.97	-30.39	0.00	-0.00	1.44	0.00
95	3.10	3.24	0.15	2.63	0.47	-0.61	-30.99	0.00	-0.00	0.67	0.00
96	2.67	3.07	0.15	2.27	0.40	-0.80	-31.80	0.00	-0.00	2.64	0.00
97	4.51	1.92	0.15	3.83	0.68	1.91	-1.32	1.91	1.91	2.27	0.00
98	2.62	1.98	0.15	2.23	0.39	0.25	-0.96	2.15	0.25	1.92	0.00
99	2.72	4.39	0.15	2.31	0.41	-2.08	-3.04	1.06	-1.10	1.98	0.00
%100	1.37	4.99	0.15	1.16	0.21	-3.83	-6.87	0.29	-0.77	3.41	0.00
%101	2.52	5.91	0.15	2.14	0.38	-3.77	-10.63	0.08	-0.21	1.94	0.0
%102	2.44	6.32	0.15	2.07	0.37	-4.25	-14.88	0.02	-0.06	2.35	0.0
%103	1.26	6.53	0.15	1.07	0.19	-5.46	-20.34	0.00	-0.02	2.13	0.0
%104	0.57	6.53	0.15	0.48	0.09	-6.05	-26.39	0.00	-0.00	1.09	0.0
%105	6.50	4.78	0.15	5.53	0.98	0.74	-4.08	0.74	0.74	0.49	0.0
%106	0.41	5.19	0.15	0.35	0.06	-4.84	-8.91	0.14	-0.60	4.78	0.0
%107	6.31	2.86	0.15	5.36	0.95	2.51	-0.36	2.65	2.51	0.95	0.0
%108	3.17	2.18	0.15	2.69	0.48	0.51	0.00	3.00	0.35	2.86	0.0
%109	3.70	1.74	0.15	3.14	0.56	1.41	0.00	3.00	0.00	2.18	0.1
%110	4.08	2.24	0.15	3.47	0.61	1.23	0.00	3.00	0.00	1.74	1.4
%111	5.54	4.35	0.15	4.71	0.83	0.36	0.00	3.00	0.00	2.24	1.2
%112	4.74	4.27	0.15	4.03	0.71	-0.24	-0.24	2.75	-0.25	4.35	0.3
%113	11.05	5.26	0.15	9.39	1.66	4.14	0.00	3.00	0.25	4.27	0.0
%114	1.30	5.70	0.15	1.10	0.20	-4.60	-4.60	0.62	-2.38	5.26	3.8
%115	4.48	5.40	0.15	3.81	0.67	-1.60	-6.20	0.36	-0.26	3.48	0.0
%116	3.81	5.66	0.15	3.24	0.57	-2.42	-8.61	0.16	-0.20	4.07	0.0
										3.44	0.0

%117	3.20	4.55	0.15	2.72	0.48	-1.83	-10.44	0.08	-0.07	2.79	0.0
%118	1.70	4.09	0.15	1.45	0.26	-2.64	-13.09	0.03	-0.05	1.50	0.0
%119	0.77	2.69	0.15	0.65	0.12	-2.03	-15.12	0.02	-0.02	0.67	0.0
%120	3.32	1.63	0.15	2.82	0.50	1.19	-2.66	1.21	1.19	1.63	0.0
%121	3.12	1.88	0.15	2.65	0.47	0.78	-1.21	1.98	0.78	1.88	0.0
%122	1.94	2.69	0.15	1.65	0.29	-1.05	-2.25	1.39	-0.60	2.25	0.0
%123	5.04	3.26	0.15	4.28	0.76	1.02	-0.64	2.41	1.02	3.26	0.0
%124	2.38	4.62	0.15	2.02	0.36	-2.60	-3.23	0.99	-1.42	3.44	0.0
%125	4.31	4.77	0.15	3.66	0.65	-1.10	-4.34	0.68	-0.31	3.97	0.0
%126	0.10	7.34	0.15	0.09	0.02	-7.25	-11.59	0.06	-0.62	0.71	0.0
%127	0.06	8.57	0.15	0.05	0.01	-8.52	-20.11	0.00	-0.05	0.11	0.0
%128	1.67	7.79	0.15	1.42	0.25	-6.37	-26.48	0.00	-0.00	1.42	0.0
%129	4.28	5.18	0.15	3.64	0.64	-1.54	-28.03	0.00	-0.00	3.64	0.0
%130	3.93	4.52	0.15	3.34	0.59	-1.18	-29.21	0.00	-0.00	3.34	0.0
%131	4.58	2.87	0.15	3.89	0.69	1.02	-3.14	1.02	1.02	2.87	0.0
%132	0.50	2.43	0.15	0.43	0.08	-2.00	-5.15	0.52	-0.51	0.93	0.0
%133	2.67	2.45	0.15	2.27	0.40	-0.18	-5.33	0.49	-0.03	2.30	0.0
%134	1.80	2.64	0.15	1.53	0.27	-1.11	-6.44	0.33	-0.15	1.68	0.0
%135	1.88	3.56	0.15	1.60	0.28	-1.96	-8.40	0.17	-0.16	1.76	0.0
%136	0.97	3.95	0.15	0.82	0.15	-3.13	-11.53	0.06	-0.11	0.94	0.0
%137	6.28	5.67	0.15	5.34	0.94	-0.33	-11.86	0.05	-0.01	5.34	0.0
%138	9.48	5.21	0.15	8.06	1.42	2.85	-0.09	2.90	2.85	5.21	0.0
%139	5.35	5.36	0.15	4.55	0.80	-0.81	-0.91	2.20	-0.71	5.25	0.0
%140	2.51	6.39	0.15	2.13	0.38	-4.26	-5.16	0.51	-1.68	3.82	0.0
%141	5.96	4.55	0.15	5.07	0.89	0.52	-3.13	1.03	0.52	4.55	0.0
%142	10.95	3.91	0.15	9.31	1.64	5.40	0.00	3.00	1.97	3.91	3.4
%143	1.93	2.65	0.15	1.64	0.29	-1.01	-1.01	2.12	-0.88	2.52	0.0
%144	0.64	2.60	0.15	0.54	0.10	-2.05	-3.06	1.05	-1.07	1.61	0.0
%145	1.43	2.84	0.15	1.22	0.21	-1.63	-4.68	0.60	-0.45	1.66	0.0
%146	2.26	2.51	0.15	1.92	0.34	-0.58	-5.27	0.50	-0.11	2.03	0.0
%147	2.40	3.29	0.15	2.04	0.36	-1.25	-6.52	0.32	-0.17	2.21	0.0
%148	4.67	3.74	0.15	3.97	0.70	0.23	-4.94	0.55	0.23	3.74	0.0
%149	5.35	5.07	0.15	4.55	0.80	-0.53	-5.46	0.46	-0.09	4.64	0.0
%150	2.00	6.80	0.15	1.70	0.30	-5.10	-10.57	0.08	-0.38	2.08	0.0
%151	3.58	7.95	0.15	3.04	0.54	-4.91	-15.48	0.02	-0.07	2.08	0.0
%152	2.96	7.47	0.15	2.52	0.44	-4.95	-20.43	0.00	-0.01	3.11	0.0
%153	3.19	6.76	0.15	2.71	0.48	-4.05	-24.48	0.00	-0.01	2.53	0.0
%154	6.89	4.89	0.15	5.86	1.03	0.97	-3.30	0.97	-0.00	2.71	0.0
%155	4.09	3.36	0.15	3.48	0.61	0.12	-2.96	1.09	0.97	4.89	0.0
%156	3.05	4.42	0.15	2.59	0.46	-1.82	-4.79	0.58	0.12	3.36	0.0
%157	3.07	2.07	0.15	2.61	0.46	0.54	-2.86	1.13	-0.50	3.10	0.0
%158	4.66	2.39	0.15	3.96	0.70	1.57	-0.31	2.69	0.54	2.07	0.0
%159	5.97	3.86	0.15	5.07	0.90	1.22	0.00	3.00	1.57	2.39	0.0
%160	0.31	4.73	0.15	0.26	0.05	-4.47	-4.47	0.65	0.31	3.86	0.9
%161	9.49	6.05	0.15	8.07	1.42	2.02	-0.34	2.67	-2.35	2.61	0.0
%162	2.60	5.43	0.15	2.21	0.39	-3.22	-3.56	0.89	2.02	6.05	0.0
%163	2.46	6.45	0.15	2.09	0.37	-4.36	-7.91	0.20	-1.78	3.99	0.0
%164	7.24	5.68	0.15	6.15	1.09	0.47	-4.38	0.67	-0.69	2.78	0.0
%165	9.40	5.14	0.15	7.99	1.41	2.85	0.00	3.00	0.47	5.68	0.0
%166	2.81	4.10	0.15	2.39	0.42	-1.71	-1.71	1.67	2.33	5.14	0.5
%167	3.25	2.86	0.15	2.76	0.49	-0.09	-1.81	1.61	-1.33	3.72	0.0
%168	1.83	2.40	0.15	1.56	0.27	-0.85	-2.65	1.21	-0.05	2.81	0.0
%169	1.67	2.37	0.15	1.42	0.25	-0.95	-3.60	0.88	-0.40	1.96	0.0
%170	0.99	3.74	0.15	0.84	0.15	-2.90	-6.50	0.33	-0.33	1.75	0.0
%171	4.98	5.62	0.15	4.23	0.75	-1.39	-7.88	0.20	-0.55	1.39	0.0
%172	0.34	6.06	0.15	0.29	0.05	-5.77	-13.66	0.03	-0.12	4.36	0.0
%173	5.76	8.51	0.15	4.90	0.86	-3.62	-17.27	0.01	-0.17	0.46	0.0
%174	4.39	5.97	0.15	3.73	0.66	-2.24	-19.51	0.00	-0.02	4.92	0.0
%175	1.61	5.49	0.15	1.37	0.24	-4.12	-23.63	0.00	-0.00	3.74	0.0
%176	1.83	6.27	0.15	1.56	0.27	-4.72	-28.35	0.00	-0.00	1.37	0.0
%177	0.77	5.24	0.15	0.65	0.12	-4.58	-32.93	0.00	-0.00	1.56	0.0
%178	15.69	4.40	0.15	13.34	2.35	8.93	0.00	3.00	-0.00	0.65	0.0
%179	2.38	3.23	0.15	2.02	0.36	-1.21	-1.21	1.98	3.00	4.40	5.9

%180	2.59	2.34	0.15	2.20	0.39	-0.14	-1.35	1.89	-0.09	2.29	0.0
%181	2.63	2.30	0.15	2.24	0.39	-0.07	-1.41	1.85	-0.04	2.28	0.0
%182	2.82	2.39	0.15	2.40	0.42	0.00	-1.41	1.85	0.00	2.39	0.0
%183	2.30	3.34	0.15	1.95	0.34	-1.38	-2.80	1.15	-0.70	2.65	0.0
%184	1.93	4.73	0.15	1.64	0.29	-3.09	-5.89	0.40	-0.75	2.39	0.0
%185	5.29	6.08	0.15	4.50	0.79	-1.59	-7.47	0.23	-0.17	4.66	0.0
%186	1.48	6.53	0.15	1.26	0.22	-5.27	-12.75	0.04	-0.19	1.45	0.0
%187	4.01	7.15	0.15	3.41	0.60	-3.75	-16.49	0.01	-0.03	3.44	0.0
%188	0.13	7.63	0.15	0.11	0.02	-7.52	-24.01	0.00	-0.01	0.12	0.0
%189	6.96	7.25	0.15	5.92	1.04	-1.34	-25.35	0.00	-0.00	5.92	0.0
%190	6.91	4.30	0.15	5.87	1.04	1.57	-1.89	1.57	1.57	4.30	0.0
%191	6.02	3.15	0.15	5.12	0.90	1.97	0.00	3.00	1.43	3.15	0.5
%192	1.38	1.90	0.15	1.17	0.21	-0.73	-0.73	2.33	-0.67	1.84	0.0
%193	1.02	2.97	0.15	0.87	0.15	-2.11	-2.84	1.13	-1.20	2.06	0.0
%194	1.84	3.67	0.15	1.56	0.28	-2.11	-4.95	0.55	-0.58	2.15	0.0
%195	0.50	5.47	0.15	0.43	0.08	-5.05	-10.00	0.10	-0.45	0.88	0.0
%196	2.53	5.14	0.15	2.15	0.38	-2.99	-12.99	0.04	-0.06	2.21	0.0
%197	8.12	6.44	0.15	6.90	1.22	0.46	-5.26	0.50	0.46	6.44	0.0
%198	4.71	5.90	0.15	4.00	0.71	-1.90	-7.15	0.26	-0.24	4.24	0.0
%199	0.06	8.24	0.15	0.05	0.01	-8.19	-15.34	0.02	-0.24	0.30	0.0
%200	7.74	7.36	0.15	6.58	1.16	-0.78	-16.12	0.01	-0.00	6.58	0.0
%201	5.33	5.31	0.15	4.53	0.80	-0.78	-16.90	0.01	-0.00	4.53	0.0
%202	5.85	3.86	0.15	4.97	0.88	1.12	-2.87	1.12	1.12	3.86	0.0
%203	3.44	2.69	0.15	2.92	0.52	0.24	-2.31	1.36	0.24	2.69	0.0
%204	4.95	1.81	0.15	4.21	0.74	2.40	0.00	3.00	1.64	1.81	0.7
%205	0.96	2.25	0.15	0.82	0.14	-1.44	-1.44	1.83	-1.17	1.99	0.0
%206	3.90	2.97	0.15	3.32	0.59	0.34	-0.94	2.17	0.34	2.97	0.0
%207	1.79	4.55	0.15	1.52	0.27	-3.03	-3.97	0.77	-1.40	2.92	0.0
%208	0.68	6.78	0.15	0.58	0.10	-6.20	-10.18	0.09	-0.68	1.26	0.0
%209	9.31	5.28	0.15	7.91	1.40	2.64	-0.27	2.73	2.64	5.28	0.0
%210	10.09	6.92	0.15	8.58	1.51	1.65	0.00	3.00	0.27	6.92	1.3
%211	1.76	6.73	0.15	1.50	0.26	-5.24	-5.24	0.50	-2.50	4.00	0.0
%212	0.90	9.50	0.15	0.76	0.14	-8.73	-13.97	0.03	-0.48	1.24	0.0
%213	5.34	5.64	0.15	4.54	0.80	-1.10	-15.07	0.02	-0.01	1.24	0.0
%214	0.19	5.42	0.15	0.16	0.03	-5.26	-20.33	0.00	-0.01	4.55	0.0
%215	3.88	3.11	0.15	3.30	0.58	0.18	-8.14	0.19	0.18	0.18	0.0
%216	4.54	2.22	0.15	3.86	0.68	1.64	-1.45	1.83	1.64	3.11	0.0
%217	0.81	2.56	0.15	0.69	0.12	-1.87	-3.32	0.96	-0.86	2.22	0.0
%218	1.44	2.96	0.15	1.22	0.22	-1.74	-5.05	0.53	-0.43	1.55	0.0
%219	2.97	4.38	0.15	2.52	0.45	-1.86	-6.91	0.28	-0.25	1.66	0.0
%220	0.28	6.04	0.15	0.24	0.04	-5.80	-12.71	0.04	-0.24	2.77	0.0
%221	2.91	6.49	0.15	2.47	0.44	-4.02	-16.73	0.01	-0.03	0.48	0.0
%222	1.81	7.13	0.15	1.54	0.27	-5.59	-22.32	0.00	-0.01	2.50	0.0
%223	0.96	8.48	0.15	0.82	0.14	-7.67	-29.98	0.00	-0.01	1.55	0.0
%224	0.19	7.89	0.15	0.16	0.03	-7.73	-37.71	0.00	-0.00	0.82	0.0
%225	0.43	6.82	0.15	0.37	0.06	-6.45	-44.16	0.00	-0.00	0.16	0.0
%226	1.37	5.87	0.15	1.16	0.21	-4.70	-48.87	0.00	-0.00	0.37	0.0
%227	1.46	4.12	0.15	1.24	0.22	-2.88	-51.75	0.00	-0.00	1.16	0.0
%228	2.27	2.48	0.15	1.93	0.34	-0.56	-52.30	0.00	-0.00	1.24	0.0
%229	7.07	1.90	0.15	6.01	1.06	4.11	0.00	3.00	3.00	1.93	0.0
%230	1.10	2.61	0.15	0.94	0.17	-1.68	-1.68	1.69	-1.31	1.90	1.1
%231	3.22	3.87	0.15	2.74	0.48	-1.13	-2.81	1.15	-0.54	2.25	0.0
%232	0.51	5.38	0.15	0.43	0.08	-4.94	-7.75	0.21	-0.93	3.28	0.0
%233	5.29	6.82	0.15	4.50	0.79	-2.33	-10.08	0.10	-0.12	1.37	0.0
%234	4.23	5.88	0.15	3.60	0.63	-2.28	-12.37	0.04	-0.05	4.61	0.0
%235	2.70	6.57	0.15	2.30	0.41	-4.27	-16.64	0.01	-0.03	3.65	0.0
%236	3.26	6.78	0.15	2.77	0.49	-4.01	-20.64	0.00	-0.01	2.33	0.0
%237	0.68	6.21	0.15	0.58	0.10	-5.63	-26.27	0.00	-0.00	2.78	0.0
%238	1.93	5.24	0.15	1.64	0.29	-3.60	-29.87	0.00	-0.00	0.58	0.0
%239	1.61	3.80	0.15	1.37	0.24	-2.43	-32.31	0.00	-0.00	1.64	0.0
%240	0.37	2.30	0.15	0.31	0.06	-1.98	-34.29	0.00	-0.00	1.37	0.0

TOTAL PERCOLATION = 42.682

input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.17	1.35	0.28	-0.15	-34.93	0.00	-0.00	1.35	0.00
2	4.40	1.76	0.17	3.65	0.75	1.89	-1.35	1.89	1.89	1.76	0.00
3	3.58	2.57	0.17	2.97	0.61	0.40	-0.78	2.29	0.40	2.57	0.00
4	4.01	2.25	0.17	3.33	0.68	1.07	0.00	3.00	0.71	2.25	0.36
5	4.22	3.67	0.17	3.50	0.72	-0.17	-0.17	2.83	-0.17	3.68	0.00
6	2.02	3.65	0.17	1.68	0.34	-1.98	-2.14	1.44	-1.39	3.06	0.00
7	0.26	4.86	0.17	0.22	0.04	-4.64	-6.78	0.30	-1.14	1.36	0.00
8	0.23	5.75	0.17	0.19	0.04	-5.56	-12.35	0.04	-0.25	0.44	0.00
9	6.38	3.82	0.17	5.30	1.08	1.47	-1.99	1.52	1.47	3.82	0.00
10	3.84	2.62	0.17	3.19	0.65	0.57	-1.06	2.09	0.57	2.62	0.00
11	0.62	2.87	0.17	0.51	0.11	-2.36	-3.41	0.93	-1.15	1.67	0.00
12	1.40	2.58	0.17	1.16	0.24	-1.41	-4.83	0.58	-0.36	1.52	0.00
13	0.15	2.81	0.17	0.12	0.03	-2.69	-7.52	0.23	-0.35	0.47	0.00
14	1.68	4.00	0.17	1.39	0.29	-2.60	-10.12	0.09	-0.14	1.53	0.00
15	12.00	5.87	0.17	9.96	2.04	4.09	0.00	3.00	2.91	5.87	1.18
16	0.89	4.56	0.17	0.74	0.15	-3.82	-3.82	0.81	-2.19	2.93	0.00
17	5.65	6.00	0.17	4.69	0.96	-1.31	-5.13	0.52	-0.29	4.98	0.00
18	0.76	4.74	0.17	0.63	0.13	-4.11	-9.24	0.13	-0.39	1.02	0.00
19	1.87	8.64	0.17	1.55	0.32	-7.09	-16.32	0.01	-0.12	1.67	0.00
20	3.20	6.27	0.17	2.66	0.54	-3.62	-19.94	0.00	-0.01	2.66	0.00
21	3.31	5.52	0.17	2.75	0.56	-2.78	-22.71	0.00	-0.00	2.75	0.00
22	4.30	3.93	0.17	3.57	0.73	-0.36	-23.08	0.00	-0.00	3.57	0.00
23	2.75	3.30	0.17	2.28	0.47	-1.02	-24.10	0.00	-0.00	2.28	0.00
24	4.63	2.44	0.17	3.84	0.79	1.41	-2.21	1.41	1.41	2.44	0.00
25	1.73	1.77	0.17	1.44	0.29	-0.34	-2.55	1.25	-0.15	1.59	0.00
26	0.50	2.88	0.17	0.41	0.09	-2.46	-5.01	0.54	-0.71	1.13	0.00
27	0.91	4.24	0.17	0.76	0.15	-3.48	-8.49	0.17	-0.38	1.13	0.00
28	1.71	4.03	0.17	1.42	0.29	-2.61	-11.09	0.07	-0.10	1.52	0.00
29	6.38	5.15	0.17	5.30	1.08	0.14	-7.76	0.21	0.14	5.15	0.00
30	2.13	5.24	0.17	1.77	0.36	-3.48	-11.24	0.06	-0.15	1.91	0.00
31	2.17	5.74	0.17	1.80	0.37	-3.94	-15.18	0.02	-0.05	1.85	0.00
32	3.60	4.89	0.17	2.99	0.61	-1.90	-17.07	0.01	-0.01	3.00	0.00
33	4.45	4.56	0.17	3.69	0.76	-0.86	-17.94	0.01	-0.00	3.70	0.00
34	3.95	3.95	0.17	3.28	0.67	-0.68	-18.61	0.01	-0.00	3.28	0.00
35	3.26	2.16	0.17	2.71	0.55	0.54	-4.97	0.55	0.54	2.16	0.00
36	1.47	2.12	0.17	1.22	0.25	-0.90	-5.87	0.40	-0.15	1.37	0.00
37	5.51	3.11	0.17	4.57	0.94	1.46	-1.39	1.86	1.46	3.11	0.00
38	2.60	2.27	0.17	2.16	0.44	-0.11	-1.50	1.79	-0.07	2.23	0.00
39	5.17	3.54	0.17	4.29	0.88	0.76	-0.47	2.55	0.76	3.54	0.00
40	6.74	3.96	0.17	5.59	1.15	1.63	0.00	3.00	0.45	3.96	1.18
41	2.12	4.30	0.17	1.76	0.36	-2.54	-2.54	1.26	-1.74	3.50	0.00
42	6.44	4.77	0.17	5.35	1.09	0.58	-1.43	1.84	0.58	4.77	0.00
43	2.15	4.56	0.17	1.78	0.37	-2.77	-4.21	0.71	-1.12	2.91	0.00
44	1.03	5.52	0.17	0.85	0.18	-4.66	-8.87	0.15	-0.57	1.42	0.00
45	9.44	4.80	0.17	7.84	1.60	3.03	0.00	3.00	2.85	4.80	0.18
46	10.17	4.25	0.17	8.44	1.73	4.19	0.00	3.00	0.00	4.25	4.19
47	2.40	2.60	0.17	1.99	0.41	-0.60	-0.60	2.43	-0.57	2.56	0.00
48	2.52	2.87	0.17	2.09	0.43	-0.78	-1.38	1.87	-0.57	2.66	0.00
49	4.66	1.75	0.17	3.87	0.79	2.12	0.00	3.00	1.13	1.75	0.98
50	0.13	3.00	0.17	0.11	0.02	-2.89	-2.89	1.12	-1.88	1.99	0.00
51	1.56	3.97	0.17	1.29	0.27	-2.67	-5.56	0.45	-0.67	1.96	0.00
52	1.76	5.22	0.17	1.46	0.30	-3.76	-9.32	0.12	-0.32	1.78	0.00
53	3.09	5.89	0.17	2.56	0.53	-3.32	-12.65	0.04	-0.08	2.65	0.00

54	0.73	5.36	0.17	0.61	0.12	-4.75	-17.39	0.01	-0.03	0.64	0.00
55	2.40	5.57	0.17	1.99	0.41	-3.58	-20.97	0.00	-0.01	2.00	0.00
56	9.88	6.05	0.17	8.20	1.68	2.15	-0.96	2.15	2.15	6.05	0.00
57	9.22	4.84	0.17	7.65	1.57	2.82	0.00	3.00	0.85	4.84	1.97
58	6.02	3.92	0.17	5.00	1.02	1.08	0.00	3.00	0.00	3.92	1.08
59	5.68	2.63	0.17	4.71	0.97	2.08	0.00	3.00	0.00	2.63	2.08
60	2.82	2.11	0.17	2.34	0.48	0.23	0.00	3.00	0.00	2.11	0.23
61	1.80	2.27	0.17	1.49	0.31	-0.77	-0.77	2.30	-0.70	2.20	0.00
62	2.45	2.22	0.17	2.03	0.42	-0.19	-0.96	2.16	-0.14	2.17	0.00
63	1.41	3.09	0.17	1.17	0.24	-1.92	-2.88	1.12	-1.04	2.21	0.00
64	2.08	4.17	0.17	1.73	0.35	-2.45	-5.32	0.49	-0.63	2.36	0.00
65	11.99	4.56	0.17	9.95	2.04	5.39	0.00	3.00	2.51	4.56	2.87
66	2.42	5.73	0.17	2.01	0.41	-3.72	-3.72	0.84	-2.16	4.17	0.00
67	4.16	5.52	0.17	3.45	0.71	-2.07	-5.79	0.41	-0.43	3.88	0.00
68	2.44	5.72	0.17	2.03	0.41	-3.69	-9.49	0.12	-0.30	2.32	0.00
69	3.78	4.72	0.17	3.14	0.64	-1.58	-11.07	0.07	-0.05	3.19	0.00
70	3.35	3.62	0.17	2.78	0.57	-0.84	-11.91	0.05	-0.02	2.80	0.00
71	1.07	3.95	0.17	0.89	0.18	-3.06	-14.97	0.02	-0.03	0.92	0.00
72	1.18	2.72	0.17	0.98	0.20	-1.74	-16.70	0.01	-0.01	0.99	0.00
73	1.60	3.37	0.17	1.33	0.27	-2.05	-18.75	0.00	-0.01	1.33	0.00
74	1.74	3.10	0.17	1.44	0.30	-1.66	-20.41	0.00	-0.00	1.45	0.00
75	4.81	3.54	0.17	3.99	0.82	0.45	-5.53	0.45	0.45	3.54	0.00
76	5.95	4.07	0.17	4.94	1.01	0.87	-2.39	1.32	0.87	4.07	0.00
77	4.32	4.53	0.17	3.59	0.73	-0.94	-3.33	0.96	-0.37	3.95	0.00
78	4.02	6.05	0.17	3.34	0.68	-2.72	-6.05	0.38	-0.58	3.92	0.00
79	2.13	5.27	0.17	1.77	0.36	-3.50	-9.55	0.11	-0.26	2.03	0.00
80	1.48	6.20	0.17	1.23	0.25	-4.97	-14.52	0.02	-0.09	1.32	0.00
81	2.68	3.90	0.17	2.22	0.46	-1.67	-16.19	0.01	-0.01	2.23	0.00
82	5.77	3.62	0.17	4.79	0.98	1.17	-2.72	1.18	1.17	3.62	0.00
83	3.27	1.86	0.17	2.71	0.56	0.85	-1.13	2.03	0.85	1.86	0.00
84	4.05	2.45	0.17	3.36	0.69	0.91	-0.05	2.95	0.91	2.45	0.00
85	2.14	1.43	0.17	1.78	0.36	0.34	0.00	3.00	0.05	1.43	0.29
86	3.55	2.90	0.17	2.95	0.60	0.05	0.00	3.00	0.00	2.90	0.05
87	2.06	3.81	0.17	1.71	0.35	-2.10	-2.10	1.46	-1.54	3.25	0.00
88	8.81	4.38	0.17	7.31	1.50	2.94	0.00	3.00	1.54	4.38	1.40
89	1.56	5.21	0.17	1.29	0.27	-3.91	-3.91	0.79	-2.21	3.51	0.00
90	1.35	6.78	0.17	1.12	0.23	-5.66	-9.57	0.11	-0.67	1.79	0.00
91	0.31	7.10	0.17	0.26	0.05	-6.84	-16.41	0.01	-0.10	0.36	0.00
92	1.35	6.50	0.17	1.12	0.23	-5.38	-21.78	0.00	-0.01	1.13	0.00
93	1.69	6.16	0.17	1.40	0.29	-4.76	-26.54	0.00	-0.00	1.40	0.00
94	0.79	4.64	0.17	0.66	0.13	-3.99	-30.53	0.00	-0.00	0.66	0.00
95	3.10	3.24	0.17	2.57	0.53	-0.67	-31.20	0.00	-0.00	2.57	0.00
96	2.67	3.07	0.17	2.22	0.45	-0.86	-32.05	0.00	-0.00	2.22	0.00
97	4.51	1.92	0.17	3.74	0.77	1.82	-1.46	1.82	1.82	1.92	0.00
98	2.62	1.98	0.17	2.17	0.45	0.19	-1.16	2.01	0.19	1.98	0.00
99	2.72	4.39	0.17	2.26	0.46	-2.13	-3.30	0.97	-1.04	3.30	0.00
%100	1.37	4.99	0.17	1.14	0.23	-3.85	-7.15	0.26	-0.71	1.85	0.0
%101	2.52	5.91	0.17	2.09	0.43	-3.82	-10.97	0.07	-0.19	2.28	0.0
%102	2.44	6.32	0.17	2.03	0.41	-4.30	-15.26	0.02	-0.05	2.08	0.0
%103	1.26	6.53	0.17	1.05	0.21	-5.49	-20.75	0.00	-0.01	1.06	0.0
%104	0.57	6.53	0.17	0.47	0.10	-6.06	-26.81	0.00	-0.00	0.48	0.0
%105	6.50	4.78	0.17	5.39	1.11	0.61	-4.64	0.61	0.61	4.78	0.0
%106	0.41	5.19	0.17	0.34	0.07	-4.85	-9.48	0.12	-0.50	0.84	0.0
%107	6.31	2.86	0.17	5.24	1.07	2.38	-0.53	2.50	2.38	2.86	0.0
%108	3.17	2.18	0.17	2.63	0.54	0.45	-0.05	2.95	0.45	2.18	0.0
%109	3.70	1.74	0.17	3.07	0.63	1.34	0.00	3.00	0.05	1.74	1.2
%110	4.08	2.24	0.17	3.39	0.69	1.15	0.00	3.00	0.00	2.24	1.1
%111	5.54	4.35	0.17	4.60	0.94	0.25	0.00	3.00	0.00	4.35	0.2
%112	4.74	4.27	0.17	3.93	0.81	-0.34	-0.34	2.67	-0.33	4.27	0.0
%113	11.05	5.26	0.17	9.17	1.88	3.91	0.00	3.00	0.33	5.26	3.5
%114	1.30	5.70	0.17	1.08	0.22	-4.63	-4.63	0.62	-2.38	3.46	0.0
%115	4.48	5.40	0.17	3.72	0.76	-1.69	-6.31	0.35	-0.27	3.99	0.0
%116	3.81	5.66	0.17	3.16	0.65	-2.49	-8.81	0.15	-0.20	3.36	0.0

%117	3.20	4.55	0.17	2.66	0.54	-1.89	-10.70	0.08	-0.07	2.73	0.0
%118	1.70	4.09	0.17	1.41	0.29	-2.68	-13.38	0.03	-0.05	1.46	0.0
%119	0.77	2.69	0.17	0.64	0.13	-2.05	-15.43	0.02	-0.02	0.65	0.0
%120	3.32	1.63	0.17	2.76	0.56	1.12	-2.83	1.14	1.12	1.63	0.0
%121	3.12	1.88	0.17	2.59	0.53	0.71	-1.40	1.85	0.71	1.88	0.0
%122	1.94	2.69	0.17	1.61	0.33	-1.08	-2.49	1.28	-0.57	2.18	0.0
%123	5.04	3.26	0.17	4.18	0.86	0.92	-0.90	2.20	0.92	3.26	0.0
%124	2.38	4.62	0.17	1.98	0.40	-2.64	-3.55	0.89	-1.31	3.28	0.0
%125	4.31	4.77	0.17	3.58	0.73	-1.19	-4.74	0.59	-0.30	3.87	0.0
%126	0.10	7.34	0.17	0.08	0.02	-7.25	-11.99	0.05	-0.54	0.63	0.0
%127	0.06	8.57	0.17	0.05	0.01	-8.53	-20.52	0.00	-0.05	0.10	0.0
%128	1.67	7.79	0.17	1.39	0.28	-6.40	-26.92	0.00	-0.00	1.39	0.0
%129	4.28	5.18	0.17	3.55	0.73	-1.63	-28.55	0.00	-0.00	3.55	0.0
%130	3.93	4.52	0.17	3.26	0.67	-1.26	-29.81	0.00	-0.00	3.26	0.0
%131	4.58	2.87	0.17	3.80	0.78	0.93	-3.42	0.93	0.93	2.87	0.0
%132	0.50	2.43	0.17	0.41	0.09	-2.01	-5.43	0.47	-0.46	0.88	0.0
%133	2.67	2.45	0.17	2.22	0.45	-0.23	-5.67	0.43	-0.04	2.25	0.0
%134	1.80	2.64	0.17	1.49	0.31	-1.14	-6.81	0.29	-0.14	1.63	0.0
%135	1.88	3.56	0.17	1.56	0.32	-2.00	-8.81	0.15	-0.14	1.70	0.0
%136	0.97	3.95	0.17	0.81	0.16	-3.15	-11.96	0.05	-0.10	0.90	0.0
%137	6.28	5.67	0.17	5.21	1.07	-0.46	-12.41	0.04	-0.01	5.22	0.0
%138	9.48	5.21	0.17	7.87	1.61	2.66	-0.30	2.70	2.66	5.21	0.0
%139	5.35	5.36	0.17	4.44	0.91	-0.92	-1.22	1.97	-0.73	5.17	0.0
%140	2.51	6.39	0.17	2.08	0.43	-4.31	-5.53	0.45	-1.52	3.60	0.0
%141	5.96	4.55	0.17	4.95	1.01	0.40	-3.69	0.85	0.40	4.55	0.0
%142	10.95	3.91	0.17	9.09	1.86	5.18	0.00	3.00	2.15	3.91	3.0
%143	1.93	2.65	0.17	1.60	0.33	-1.04	-1.04	2.09	-0.91	2.51	0.0
%144	0.64	2.60	0.17	0.53	0.11	-2.07	-3.11	1.03	-1.06	1.59	0.0
%145	1.43	2.84	0.17	1.19	0.24	-1.66	-4.77	0.59	-0.45	1.63	0.0
%146	2.26	2.51	0.17	1.88	0.38	-0.63	-5.40	0.47	-0.11	1.99	0.0
%147	2.40	3.29	0.17	1.99	0.41	-1.30	-6.69	0.30	-0.17	2.16	0.0
%148	4.67	3.74	0.17	3.88	0.79	0.14	-5.60	0.44	0.14	3.74	0.0
%149	5.35	5.07	0.17	4.44	0.91	-0.63	-6.23	0.36	-0.09	4.53	0.0
%150	2.00	6.80	0.17	1.66	0.34	-5.14	-11.38	0.06	-0.29	1.95	0.0
%151	3.58	7.95	0.17	2.97	0.61	-4.98	-16.36	0.01	-0.05	3.02	0.0
%152	2.96	7.47	0.17	2.46	0.50	-5.01	-21.37	0.00	-0.01	2.47	0.0
%153	3.19	6.76	0.17	2.65	0.54	-4.11	-25.48	0.00	-0.00	2.65	0.0
%154	6.89	4.89	0.17	5.72	1.17	0.83	-3.75	0.83	0.83	4.89	0.0
%155	4.09	3.36	0.17	3.39	0.70	0.03	-3.63	0.87	0.03	3.36	0.0
%156	3.05	4.42	0.17	2.53	0.52	-1.89	-5.51	0.46	-0.41	2.94	0.0
%157	3.07	2.07	0.17	2.55	0.52	0.48	-3.40	0.94	0.48	2.07	0.0
%158	4.66	2.39	0.17	3.87	0.79	1.47	-0.63	2.41	1.47	2.39	0.0
%159	5.97	3.86	0.17	4.96	1.01	1.10	0.00	3.00	0.59	3.86	0.5
%160	0.31	4.73	0.17	0.26	0.05	-4.47	-4.47	0.65	-2.35	2.61	0.0
%161	9.49	6.05	0.17	7.88	1.61	1.83	-0.55	2.48	1.83	6.05	0.0
%162	2.60	5.43	0.17	2.16	0.44	-3.27	-3.83	0.81	-1.67	3.83	0.0
%163	2.46	6.45	0.17	2.04	0.42	-4.41	-8.23	0.18	-0.63	2.67	0.0
%164	7.24	5.68	0.17	6.01	1.23	0.33	-5.21	0.51	0.33	5.68	0.0
%165	9.40	5.14	0.17	7.80	1.60	2.66	0.00	3.00	2.49	5.14	0.1
%166	2.81	4.10	0.17	2.33	0.48	-1.77	-1.77	1.63	-1.37	3.70	0.0
%167	3.25	2.86	0.17	2.70	0.55	-0.16	-1.93	1.55	-0.09	2.78	0.0
%168	1.83	2.40	0.17	1.52	0.31	-0.88	-2.81	1.15	-0.40	1.92	0.0
%169	1.67	2.37	0.17	1.39	0.28	-0.98	-3.79	0.82	-0.33	1.71	0.0
%170	0.99	3.74	0.17	0.82	0.17	-2.92	-6.71	0.30	-0.52	1.34	0.0
%171	4.98	5.62	0.17	4.13	0.85	-1.49	-8.19	0.18	-0.12	4.25	0.0
%172	0.34	6.06	0.17	0.28	0.06	-5.78	-13.97	0.03	-0.16	0.44	0.0
%173	5.76	8.51	0.17	4.78	0.98	-3.73	-17.71	0.01	-0.02	4.80	0.0
%174	4.39	5.97	0.17	3.64	0.75	-2.33	-20.03	0.00	-0.00	3.65	0.0
%175	1.61	5.49	0.17	1.34	0.27	-4.15	-24.18	0.00	-0.00	1.34	0.0
%176	1.83	6.27	0.17	1.52	0.31	-4.75	-28.94	0.00	-0.00	1.52	0.0
%177	0.77	5.24	0.17	0.64	0.13	-4.60	-33.53	0.00	-0.00	0.64	0.0
%178	15.69	4.40	0.17	13.02	2.67	8.62	0.00	3.00	3.00	4.40	5.6
%179	2.38	3.23	0.17	1.98	0.40	-1.26	-1.26	1.95	-1.05	3.03	0.0

%180	2.59	2.34	0.17	2.15	0.44	-0.19	-1.45	1.83	-0.12	2.27	0.0
%181	2.63	2.30	0.17	2.18	0.45	-0.12	-1.57	1.75	-0.07	2.26	0.0
%182	2.82	2.39	0.17	2.34	0.48	-0.05	-1.62	1.72	-0.03	2.37	0.0
%183	2.30	3.34	0.17	1.91	0.39	-1.43	-3.05	1.06	-0.66	2.57	0.0
%184	1.93	4.73	0.17	1.60	0.33	-3.13	-6.18	0.36	-0.69	2.30	0.0
%185	5.29	6.08	0.17	4.39	0.90	-1.69	-7.87	0.20	-0.16	4.55	0.0
%186	1.48	6.53	0.17	1.23	0.25	-5.30	-13.18	0.03	-0.17	1.40	0.0
%187	4.01	7.15	0.17	3.33	0.68	-3.83	-17.00	0.01	-0.02	3.35	0.0
%188	0.13	7.63	0.17	0.11	0.02	-7.52	-24.52	0.00	-0.01	0.12	0.0
%189	6.96	7.25	0.17	5.78	1.18	-1.48	-26.00	0.00	-0.00	5.78	0.0
%190	6.91	4.30	0.17	5.74	1.17	1.43	-2.16	1.43	1.43	4.30	0.0
%191	6.02	3.15	0.17	5.00	1.02	1.85	0.00	3.00	1.57	3.15	0.2
%192	1.38	1.90	0.17	1.15	0.23	-0.76	-0.76	2.31	-0.69	1.84	0.0
%193	1.02	2.97	0.17	0.85	0.17	-2.13	-2.89	1.12	-1.19	2.04	0.0
%194	1.84	3.67	0.17	1.53	0.31	-2.15	-5.03	0.54	-0.58	2.11	0.0
%195	0.50	5.47	0.17	0.41	0.09	-5.06	-10.09	0.10	-0.44	0.86	0.0
%196	2.53	5.14	0.17	2.10	0.43	-3.05	-13.14	0.03	-0.06	2.16	0.0
%197	8.12	6.44	0.17	6.74	1.38	0.30	-6.43	0.33	0.30	6.44	0.0
%198	4.71	5.90	0.17	3.91	0.80	-1.99	-8.42	0.17	-0.16	4.07	0.0
%199	0.06	8.24	0.17	0.05	0.01	-8.19	-16.61	0.01	-0.16	0.21	0.0
%200	7.74	7.36	0.17	6.42	1.32	-0.93	-17.54	0.01	-0.00	6.43	0.0
%201	5.33	5.31	0.17	4.42	0.91	-0.89	-18.43	0.01	-0.00	4.43	0.0
%202	5.85	3.86	0.17	4.86	0.99	1.00	-3.20	1.00	1.00	3.86	0.0
%203	3.44	2.69	0.17	2.86	0.58	0.17	-2.75	1.17	0.17	2.69	0.0
%204	4.95	1.81	0.17	4.11	0.84	2.30	0.00	3.00	1.83	1.81	0.4
%205	0.96	2.25	0.17	0.80	0.16	-1.46	-1.46	1.82	-1.18	1.98	0.0
%206	3.90	2.97	0.17	3.24	0.66	0.26	-1.07	2.08	0.26	2.97	0.0
%207	1.79	4.55	0.17	1.49	0.30	-3.06	-4.13	0.73	-1.35	2.84	0.0
%208	0.68	6.78	0.17	0.56	0.12	-6.22	-10.35	0.09	-0.64	1.21	0.0
%209	9.31	5.28	0.17	7.73	1.58	2.45	-0.49	2.54	2.45	5.28	0.0
%210	10.09	6.92	0.17	8.37	1.72	1.45	0.00	3.00	0.46	6.92	0.9
%211	1.76	6.73	0.17	1.46	0.30	-5.27	-5.27	0.49	-2.51	3.97	0.0
%212	0.90	9.50	0.17	0.75	0.15	-8.75	-14.03	0.02	-0.47	1.22	0.0
%213	5.34	5.64	0.17	4.43	0.91	-1.21	-15.24	0.02	-0.01	4.44	0.0
%214	0.19	5.42	0.17	0.16	0.03	-5.26	-20.50	0.00	-0.01	0.17	0.0
%215	3.88	3.11	0.17	3.22	0.66	0.11	-9.72	0.11	0.11	3.11	0.0
%216	4.54	2.22	0.17	3.77	0.77	1.55	-1.73	1.66	1.55	2.22	0.0
%217	0.81	2.56	0.17	0.67	0.14	-1.88	-3.61	0.87	-0.79	1.46	0.0
%218	1.44	2.96	0.17	1.20	0.24	-1.77	-5.38	0.48	-0.39	1.59	0.0
%219	2.97	4.38	0.17	2.47	0.50	-1.92	-7.30	0.25	-0.23	2.69	0.0
%220	0.28	6.04	0.17	0.23	0.05	-5.81	-13.11	0.03	-0.21	0.45	0.0
%221	2.91	6.49	0.17	2.42	0.49	-4.07	-17.18	0.01	-0.03	2.44	0.0
%222	1.81	7.13	0.17	1.50	0.31	-5.62	-22.80	0.00	-0.01	1.51	0.0
%223	0.96	8.48	0.17	0.80	0.16	-7.69	-30.49	0.00	-0.00	0.80	0.0
%224	0.19	7.89	0.17	0.16	0.03	-7.73	-38.22	0.00	-0.00	0.16	0.0
%225	0.43	6.82	0.17	0.36	0.07	-6.46	-44.68	0.00	-0.00	0.36	0.0
%226	1.37	5.87	0.17	1.14	0.23	-4.73	-49.41	0.00	-0.00	1.14	0.0
%227	1.46	4.12	0.17	1.21	0.25	-2.91	-52.32	0.00	-0.00	1.21	0.0
%228	2.27	2.48	0.17	1.88	0.39	-0.60	-52.92	0.00	-0.00	1.88	0.0
%229	7.07	1.90	0.17	5.87	1.20	3.96	0.00	3.00	3.00	1.90	0.9
%230	1.10	2.61	0.17	0.91	0.19	-1.70	-1.70	1.68	-1.32	2.24	0.0
%231	3.22	3.87	0.17	2.67	0.55	-1.20	-2.90	1.11	-0.56	3.24	0.0
%232	0.51	5.38	0.17	0.42	0.09	-4.95	-7.85	0.21	-0.91	1.33	0.0
%233	5.29	6.82	0.17	4.39	0.90	-2.43	-10.28	0.09	-0.12	4.51	0.0
%234	4.23	5.88	0.17	3.51	0.72	-2.37	-12.65	0.04	-0.05	3.56	0.0
%235	2.70	6.57	0.17	2.24	0.46	-4.32	-16.98	0.01	-0.03	2.27	0.0
%236	3.26	6.78	0.17	2.71	0.55	-4.07	-21.05	0.00	-0.01	2.71	0.0
%237	0.68	6.21	0.17	0.56	0.12	-5.64	-26.69	0.00	-0.00	0.57	0.0
%238	1.93	5.24	0.17	1.60	0.33	-3.64	-30.33	0.00	-0.00	1.60	0.0
%239	1.61	3.80	0.17	1.34	0.27	-2.46	-32.80	0.00	-0.00	1.34	0.0
%240	0.37	2.30	0.17	0.31	0.06	-1.99	-34.79	0.00	-0.00	0.31	0.0

TOTAL PERCOLATION = 36.340

input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.20	1.30	0.33	-0.19	-35.73	0.00	-0.00	1.30	0.00
2	4.40	1.76	0.20	3.52	0.88	1.76	-1.56	1.76	1.76	1.76	0.00
3	3.58	2.57	0.20	2.86	0.72	0.29	-1.11	2.05	0.29	2.57	0.00
4	4.01	2.25	0.20	3.21	0.80	0.95	0.00	3.00	0.95	2.25	0.01
5	4.22	3.67	0.20	3.38	0.84	-0.29	-0.29	2.71	-0.29	3.67	0.00
6	2.02	3.65	0.20	1.62	0.40	-2.04	-2.33	1.35	-1.36	2.97	0.00
7	0.26	4.86	0.20	0.21	0.05	-4.65	-6.98	0.28	-1.07	1.28	0.00
8	0.23	5.75	0.20	0.18	0.05	-5.57	-12.55	0.04	-0.23	0.42	0.00
9	6.38	3.82	0.20	5.10	1.28	1.28	-2.39	1.32	1.28	3.82	0.00
10	3.84	2.62	0.20	3.07	0.77	0.45	-1.53	1.78	0.45	2.62	0.00
11	0.62	2.87	0.20	0.50	0.12	-2.37	-3.90	0.79	-0.99	1.48	0.00
12	1.40	2.58	0.20	1.12	0.28	-1.46	-5.36	0.48	-0.31	1.43	0.00
13	0.15	2.81	0.20	0.12	0.03	-2.69	-8.05	0.19	-0.29	0.41	0.00
14	1.68	4.00	0.20	1.34	0.34	-2.65	-10.70	0.08	-0.11	1.46	0.00
15	12.00	5.87	0.20	9.60	2.40	3.73	0.00	3.00	2.92	5.87	0.80
16	0.89	4.56	0.20	0.71	0.18	-3.85	-3.85	0.81	-2.19	2.91	0.00
17	5.65	6.00	0.20	4.52	1.13	-1.48	-5.32	0.49	-0.32	4.84	0.00
18	0.76	4.74	0.20	0.61	0.15	-4.13	-9.45	0.12	-0.37	0.98	0.00
19	1.87	8.64	0.20	1.50	0.37	-7.14	-16.60	0.01	-0.11	1.60	0.00
20	3.20	6.27	0.20	2.56	0.64	-3.71	-20.31	0.00	-0.01	2.57	0.00
21	3.31	5.52	0.20	2.65	0.66	-2.87	-23.18	0.00	-0.00	2.65	0.00
22	4.30	3.93	0.20	3.44	0.86	-0.49	-23.68	0.00	-0.00	3.44	0.00
23	2.75	3.30	0.20	2.20	0.55	-1.10	-24.78	0.00	-0.00	2.20	0.00
24	4.63	2.44	0.20	3.70	0.93	1.27	-2.51	1.27	1.27	2.44	0.00
25	1.73	1.77	0.20	1.38	0.35	-0.39	-2.90	1.11	-0.16	1.54	0.00
26	0.50	2.88	0.20	0.40	0.10	-2.48	-5.38	0.48	-0.63	1.03	0.00
27	0.91	4.24	0.20	0.73	0.18	-3.51	-8.89	0.14	-0.33	1.06	0.00
28	1.71	4.03	0.20	1.37	0.34	-2.66	-11.54	0.06	-0.09	1.45	0.00
29	6.38	5.15	0.20	5.10	1.28	-0.05	-11.59	0.06	-0.00	5.10	0.00
30	2.13	5.24	0.20	1.70	0.43	-3.54	-15.13	0.02	-0.04	1.74	0.00
31	2.17	5.74	0.20	1.74	0.43	-4.00	-19.13	0.00	-0.01	1.75	0.00
32	3.60	4.89	0.20	2.88	0.72	-2.01	-21.14	0.00	-0.00	2.88	0.00
33	4.45	4.56	0.20	3.56	0.89	-1.00	-22.14	0.00	-0.00	3.56	0.00
34	3.95	3.95	0.20	3.16	0.79	-0.79	-22.93	0.00	-0.00	3.16	0.00
35	3.26	2.16	0.20	2.61	0.65	0.45	-5.57	0.45	0.45	2.16	0.00
36	1.47	2.12	0.20	1.18	0.29	-0.95	-6.52	0.32	-0.12	1.30	0.00
37	5.51	3.11	0.20	4.41	1.10	1.29	-1.81	1.62	1.29	3.11	0.00
38	2.60	2.27	0.20	2.08	0.52	-0.19	-1.99	1.51	-0.10	2.18	0.00
39	5.17	3.54	0.20	4.14	1.03	0.60	-1.02	2.12	0.60	3.54	0.00
40	6.74	3.96	0.20	5.39	1.35	1.43	0.00	3.00	0.88	3.96	0.55
41	2.12	4.30	0.20	1.70	0.42	-2.60	-2.60	1.23	-1.77	3.47	0.00
42	6.44	4.77	0.20	5.15	1.29	0.39	-1.81	1.62	0.39	4.77	0.00
43	2.15	4.56	0.20	1.72	0.43	-2.84	-4.64	0.61	-1.00	2.72	0.00
44	1.03	5.52	0.20	0.82	0.21	-4.69	-9.34	0.12	-0.49	1.31	0.00
45	9.44	4.80	0.20	7.55	1.89	2.75	-0.12	2.87	2.75	4.80	0.00
46	10.17	4.25	0.20	8.14	2.03	3.89	0.00	3.00	0.13	4.25	3.76
47	2.40	2.60	0.20	1.92	0.48	-0.68	-0.68	2.37	-0.63	2.55	0.00
48	2.52	2.87	0.20	2.02	0.50	-0.85	-1.53	1.77	-0.60	2.62	0.00
49	4.66	1.75	0.20	3.73	0.93	1.98	0.00	3.00	1.23	1.75	0.75
50	0.13	3.00	0.20	0.10	0.03	-2.89	-2.89	1.11	-1.89	1.99	0.00
51	1.56	3.97	0.20	1.25	0.31	-2.72	-5.61	0.44	-0.67	1.92	0.00
52	1.76	5.22	0.20	1.41	0.35	-3.81	-9.43	0.12	-0.32	1.73	0.00
53	3.09	5.89	0.20	2.47	0.62	-3.41	-12.84	0.04	-0.08	2.55	0.00

54	0.73	5.36	0.20	0.58	0.15	-4.77	-17.61	0.01	-0.03	0.61	0.00
55	2.40	5.57	0.20	1.92	0.48	-3.65	-21.26	0.00	-0.01	1.93	0.00
56	9.88	6.05	0.20	7.90	1.98	1.86	-1.40	1.86	1.86	6.05	0.00
57	9.22	4.84	0.20	7.38	1.84	2.54	0.00	3.00	1.14	4.84	1.40
58	6.02	3.92	0.20	4.82	1.20	0.90	0.00	3.00	0.00	3.92	0.90
59	5.68	2.63	0.20	4.54	1.14	1.91	0.00	3.00	0.00	2.63	1.91
60	2.82	2.11	0.20	2.26	0.56	0.14	0.00	3.00	0.00	2.11	0.14
61	1.80	2.27	0.20	1.44	0.36	-0.83	-0.83	2.25	-0.75	2.19	0.00
62	2.45	2.22	0.20	1.96	0.49	-0.26	-1.09	2.06	-0.19	2.15	0.00
63	1.41	3.09	0.20	1.13	0.28	-1.96	-3.05	1.06	-1.01	2.13	0.00
64	2.08	4.17	0.20	1.66	0.42	-2.51	-5.55	0.45	-0.61	2.27	0.00
65	11.99	4.56	0.20	9.59	2.40	5.03	0.00	3.00	2.55	4.56	2.48
66	2.42	5.73	0.20	1.94	0.48	-3.80	-3.80	0.82	-2.18	4.12	0.00
67	4.16	5.52	0.20	3.33	0.83	-2.19	-5.99	0.39	-0.43	3.76	0.00
68	2.44	5.72	0.20	1.95	0.49	-3.77	-9.76	0.11	-0.28	2.23	0.00
69	3.78	4.72	0.20	3.02	0.76	-1.69	-11.45	0.06	-0.05	3.07	0.00
70	3.35	3.62	0.20	2.68	0.67	-0.94	-12.39	0.04	-0.02	2.70	0.00
71	1.07	3.95	0.20	0.86	0.21	-3.09	-15.48	0.02	-0.03	0.88	0.00
72	1.18	2.72	0.20	0.94	0.24	-1.77	-17.26	0.01	-0.01	0.95	0.00
73	1.60	3.37	0.20	1.28	0.32	-2.09	-19.35	0.00	-0.00	1.28	0.00
74	1.74	3.10	0.20	1.39	0.35	-1.71	-21.06	0.00	-0.00	1.39	0.00
75	4.81	3.54	0.20	3.85	0.96	0.31	-6.66	0.31	0.31	3.54	0.00
76	5.95	4.07	0.20	4.76	1.19	0.69	-3.21	1.00	0.69	4.07	0.00
77	4.32	4.53	0.20	3.46	0.86	-1.07	-4.28	0.69	-0.31	3.76	0.00
78	4.02	6.05	0.20	3.22	0.80	-2.84	-7.12	0.26	-0.43	3.65	0.00
79	2.13	5.27	0.20	1.70	0.43	-3.57	-10.69	0.08	-0.19	1.89	0.00
80	1.48	6.20	0.20	1.18	0.30	-5.01	-15.70	0.01	-0.06	1.25	0.00
81	2.68	3.90	0.20	2.14	0.54	-1.76	-17.45	0.01	-0.01	2.15	0.00
82	5.77	3.62	0.20	4.62	1.15	1.00	-3.20	1.00	1.00	3.62	0.00
83	3.27	1.86	0.20	2.62	0.65	0.75	-1.56	1.76	0.75	1.86	0.00
84	4.05	2.45	0.20	3.24	0.81	0.79	-0.47	2.55	0.79	2.45	0.00
85	2.14	1.43	0.20	1.71	0.43	0.28	-0.17	2.83	0.28	1.43	0.00
86	3.55	2.90	0.20	2.84	0.71	-0.06	-0.23	2.77	-0.06	2.90	0.00
87	2.06	3.81	0.20	1.65	0.41	-2.16	-2.39	1.32	-1.44	3.09	0.00
88	8.81	4.38	0.20	7.05	1.76	2.67	0.00	3.00	1.68	4.38	1.00
89	1.56	5.21	0.20	1.25	0.31	-3.96	-3.96	0.77	-2.23	3.47	0.00
90	1.35	6.78	0.20	1.08	0.27	-5.70	-9.66	0.11	-0.66	1.74	0.00
91	0.31	7.10	0.20	0.25	0.06	-6.85	-16.51	0.01	-0.10	0.35	0.00
92	1.35	6.50	0.20	1.08	0.27	-5.42	-21.92	0.00	-0.01	1.09	0.00
93	1.69	6.16	0.20	1.35	0.34	-4.81	-26.73	0.00	-0.00	1.35	0.00
94	0.79	4.64	0.20	0.63	0.16	-4.01	-30.74	0.00	-0.00	0.63	0.00
95	3.10	3.24	0.20	2.48	0.62	-0.76	-31.50	0.00	-0.00	2.48	0.00
96	2.67	3.07	0.20	2.14	0.53	-0.94	-32.44	0.00	-0.00	2.14	0.00
97	4.51	1.92	0.20	3.61	0.90	1.68	-1.69	1.68	1.68	1.92	0.00
98	2.62	1.98	0.20	2.10	0.52	0.12	-1.49	1.80	0.12	1.98	0.00
99	2.72	4.39	0.20	2.18	0.54	-2.21	-3.71	0.84	-0.95	3.13	0.00
%100	1.37	4.99	0.20	1.10	0.27	-3.90	-7.60	0.22	-0.62	1.72	0.0
%101	2.52	5.91	0.20	2.02	0.50	-3.89	-11.49	0.06	-0.16	2.18	0.0
%102	2.44	6.32	0.20	1.95	0.49	-4.37	-15.86	0.01	-0.05	2.00	0.0
%103	1.26	6.53	0.20	1.01	0.25	-5.52	-21.39	0.00	-0.01	1.02	0.0
%104	0.57	6.53	0.20	0.46	0.11	-6.07	-27.46	0.00	-0.00	0.46	0.0
%105	6.50	4.78	0.20	5.20	1.30	0.42	-5.76	0.42	0.42	4.78	0.0
%106	0.41	5.19	0.20	0.33	0.08	-4.86	-10.61	0.08	-0.34	0.67	0.0
%107	6.31	2.86	0.20	5.05	1.26	2.19	-0.81	2.27	2.19	2.86	0.0
%108	3.17	2.18	0.20	2.54	0.63	0.35	-0.39	2.62	0.35	2.18	0.0
%109	3.70	1.74	0.20	2.96	0.74	1.22	0.00	3.00	0.38	1.74	0.8
%110	4.08	2.24	0.20	3.26	0.82	1.02	0.00	3.00	0.00	2.24	1.0
%111	5.54	4.35	0.20	4.43	1.11	0.09	0.00	3.00	0.00	4.35	0.0
%112	4.74	4.27	0.20	3.79	0.95	-0.48	-0.48	2.54	-0.46	4.25	0.0
%113	11.05	5.26	0.20	8.84	2.21	3.58	0.00	3.00	0.46	5.26	3.1
%114	1.30	5.70	0.20	1.04	0.26	-4.66	-4.66	0.61	-2.39	3.43	0.0
%115	4.48	5.40	0.20	3.58	0.90	-1.82	-6.48	0.33	-0.28	3.87	0.0
%116	3.81	5.66	0.20	3.05	0.76	-2.61	-9.09	0.13	-0.19	3.24	0.0

%117	3.20	4.55	0.20	2.56	0.64	-1.99	-11.08	0.07	-0.07	2.63	0.0
%118	1.70	4.09	0.20	1.36	0.34	-2.73	-13.81	0.03	-0.04	1.40	0.0
%119	0.77	2.69	0.20	0.62	0.15	-2.07	-15.88	0.01	-0.01	0.63	0.0
%120	3.32	1.63	0.20	2.66	0.66	1.02	-3.10	1.04	1.02	1.63	0.0
%121	3.12	1.88	0.20	2.50	0.62	0.62	-1.73	1.66	0.62	1.88	0.0
%122	1.94	2.69	0.20	1.55	0.39	-1.14	-2.87	1.12	-0.54	2.09	0.0
%123	5.04	3.26	0.20	4.03	1.01	0.77	-1.34	1.89	0.77	3.26	0.0
%124	2.38	4.62	0.20	1.90	0.48	-2.72	-4.06	0.75	-1.14	3.05	0.0
%125	4.31	4.77	0.20	3.45	0.86	-1.32	-5.38	0.48	-0.27	3.72	0.0
%126	0.10	7.34	0.20	0.08	0.02	-7.26	-12.64	0.04	-0.44	0.52	0.0
%127	0.06	8.57	0.20	0.05	0.01	-8.53	-21.16	0.00	-0.04	0.09	0.0
%128	1.67	7.79	0.20	1.34	0.33	-6.45	-27.62	0.00	-0.00	1.34	0.0
%129	4.28	5.18	0.20	3.42	0.86	-1.76	-29.37	0.00	-0.00	3.42	0.0
%130	3.93	4.52	0.20	3.14	0.79	-1.38	-30.75	0.00	-0.00	3.14	0.0
%131	4.58	2.87	0.20	3.66	0.92	0.79	-3.89	0.79	0.79	2.87	0.0
%132	0.50	2.43	0.20	0.40	0.10	-2.03	-5.91	0.40	-0.40	0.80	0.0
%133	2.67	2.45	0.20	2.14	0.53	-0.31	-6.23	0.36	-0.04	2.18	0.0
%134	1.80	2.64	0.20	1.44	0.36	-1.20	-7.43	0.24	-0.12	1.56	0.0
%135	1.88	3.56	0.20	1.50	0.38	-2.05	-9.48	0.12	-0.12	1.62	0.0
%136	0.97	3.95	0.20	0.78	0.19	-3.18	-12.66	0.04	-0.08	0.85	0.0
%137	6.28	5.67	0.20	5.02	1.26	-0.65	-13.30	0.03	-0.01	5.03	0.0
%138	9.48	5.21	0.20	7.58	1.90	2.38	-0.64	2.41	2.38	5.21	0.0
%139	5.35	5.36	0.20	4.28	1.07	-1.08	-1.72	1.66	-0.75	5.03	0.0
%140	2.51	6.39	0.20	2.01	0.50	-4.38	-6.10	0.37	-1.29	3.30	0.0
%141	5.96	4.55	0.20	4.77	1.19	0.22	-4.75	0.59	0.22	4.55	0.0
%142	10.95	3.91	0.20	8.76	2.19	4.85	0.00	3.00	2.41	3.91	2.4
%143	1.93	2.65	0.20	1.54	0.39	-1.10	-1.10	2.05	-0.95	2.49	0.0
%144	0.64	2.60	0.20	0.51	0.13	-2.09	-3.19	1.01	-1.05	1.56	0.0
%145	1.43	2.84	0.20	1.14	0.29	-1.70	-4.89	0.56	-0.44	1.59	0.0
%146	2.26	2.51	0.20	1.81	0.45	-0.70	-5.58	0.44	-0.12	1.93	0.0
%147	2.40	3.29	0.20	1.92	0.48	-1.37	-6.95	0.28	-0.17	2.09	0.0
%148	4.67	3.74	0.20	3.74	0.93	-0.00	-6.95	0.28	-0.00	3.74	0.0
%149	5.35	5.07	0.20	4.28	1.07	-0.80	-7.75	0.21	-0.07	4.35	0.0
%150	2.00	6.80	0.20	1.60	0.40	-5.20	-12.95	0.04	-0.18	1.78	0.0
%151	3.58	7.95	0.20	2.86	0.72	-5.09	-18.04	0.01	-0.03	2.89	0.0
%152	2.96	7.47	0.20	2.37	0.59	-5.10	-23.14	0.00	-0.01	2.37	0.0
%153	3.19	6.76	0.20	2.55	0.64	-4.21	-27.35	0.00	-0.00	2.55	0.0
%154	6.89	4.89	0.20	5.51	1.38	0.63	-4.58	0.63	0.63	4.89	0.0
%155	4.09	3.36	0.20	3.27	0.82	-0.09	-4.67	0.61	-0.02	3.29	0.0
%156	3.05	4.42	0.20	2.44	0.61	-1.98	-6.65	0.31	-0.30	2.74	0.0
%157	3.07	2.07	0.20	2.46	0.61	0.39	-4.25	0.70	0.39	2.07	0.0
%158	4.66	2.39	0.20	3.73	0.93	1.33	-1.13	2.03	1.33	2.39	0.0
%159	5.97	3.86	0.20	4.78	1.19	0.92	-0.04	2.95	0.92	3.86	0.0
%160	0.31	4.73	0.20	0.25	0.06	-4.48	-4.52	0.64	-2.32	2.56	0.0
%161	9.49	6.05	0.20	7.59	1.90	1.54	-0.93	2.18	1.54	6.05	0.0
%162	2.60	5.43	0.20	2.08	0.52	-3.35	-4.28	0.69	-1.49	3.57	0.0
%163	2.46	6.45	0.20	1.97	0.49	-4.48	-8.76	0.15	-0.54	2.51	0.0
%164	7.24	5.68	0.20	5.79	1.45	0.11	-7.17	0.26	0.11	5.68	0.0
%165	9.40	5.14	0.20	7.52	1.88	2.38	-0.37	2.64	2.38	5.14	0.0
%166	2.81	4.10	0.20	2.25	0.56	-1.85	-2.22	1.40	-1.24	3.49	0.0
%167	3.25	2.86	0.20	2.60	0.65	-0.26	-2.48	1.28	-0.12	2.72	0.0
%168	1.83	2.40	0.20	1.46	0.37	-0.94	-3.42	0.93	-0.35	1.82	0.0
%169	1.67	2.37	0.20	1.34	0.33	-1.03	-4.45	0.66	-0.28	1.61	0.0
%170	0.99	3.74	0.20	0.79	0.20	-2.95	-7.39	0.24	-0.42	1.21	0.0
%171	4.98	5.62	0.20	3.98	1.00	-1.64	-9.03	0.14	-0.10	4.09	0.0
%172	0.34	6.06	0.20	0.27	0.07	-5.79	-14.82	0.02	-0.12	0.39	0.0
%173	5.76	8.51	0.20	4.61	1.15	-3.90	-18.72	0.01	-0.01	4.62	0.0
%174	4.39	5.97	0.20	3.51	0.88	-2.46	-21.18	0.00	-0.00	3.51	0.0
%175	1.61	5.49	0.20	1.29	0.32	-4.20	-25.38	0.00	-0.00	1.29	0.0
%176	1.83	6.27	0.20	1.46	0.37	-4.81	-30.19	0.00	-0.00	1.46	0.0
%177	0.77	5.24	0.20	0.62	0.15	-4.62	-34.81	0.00	-0.00	0.62	0.0
%178	15.69	4.40	0.20	12.55	3.14	8.15	0.00	3.00	3.00	4.40	5.1
%179	2.38	3.23	0.20	1.90	0.48	-1.33	-1.33	1.90	-1.10	3.00	0.0

%180	2.59	2.34	0.20	2.07	0.52	-0.27	-1.60	1.73	-0.16	2.24	0.0
%181	2.63	2.30	0.20	2.10	0.53	-0.20	-1.79	1.62	-0.11	2.22	0.0
%182	2.82	2.39	0.20	2.26	0.56	-0.14	-1.93	1.55	-0.07	2.33	0.0
%183	2.30	3.34	0.20	1.84	0.46	-1.50	-3.43	0.93	-0.62	2.46	0.0
%184	1.93	4.73	0.20	1.54	0.39	-3.19	-6.62	0.31	-0.61	2.16	0.0
%185	5.29	6.08	0.20	4.23	1.06	-1.85	-8.47	0.17	-0.15	4.38	0.0
%186	1.48	6.53	0.20	1.18	0.30	-5.35	-13.82	0.03	-0.14	1.32	0.0
%187	4.01	7.15	0.20	3.21	0.80	-3.95	-17.76	0.01	-0.02	3.23	0.0
%188	0.13	7.63	0.20	0.10	0.03	-7.53	-25.29	0.00	-0.01	0.11	0.0
%189	6.96	7.25	0.20	5.57	1.39	-1.68	-26.97	0.00	-0.00	5.57	0.0
%190	6.91	4.30	0.20	5.53	1.38	1.22	-2.62	1.22	1.22	4.30	0.0
%191	6.02	3.15	0.20	4.82	1.20	1.67	-0.10	2.89	1.67	3.15	0.0
%192	1.38	1.90	0.20	1.10	0.28	-0.80	-0.90	2.20	-0.69	1.80	0.0
%193	1.02	2.97	0.20	0.82	0.20	-2.16	-3.06	1.05	-1.15	1.96	0.0
%194	1.84	3.67	0.20	1.47	0.37	-2.20	-5.27	0.50	-0.56	2.03	0.0
%195	0.50	5.47	0.20	0.40	0.10	-5.07	-10.34	0.09	-0.41	0.81	0.0
%196	2.53	5.14	0.20	2.02	0.51	-3.12	-13.46	0.03	-0.06	2.08	0.0
%197	8.12	6.44	0.20	6.50	1.62	0.06	-10.39	0.09	0.06	6.44	0.0
%198	4.71	5.90	0.20	3.77	0.94	-2.13	-12.52	0.04	-0.04	3.81	0.0
%199	0.06	8.24	0.20	0.05	0.01	-8.19	-20.71	0.00	-0.04	0.09	0.0
%200	7.74	7.36	0.20	6.19	1.55	-1.16	-21.87	0.00	-0.00	6.19	0.0
%201	5.33	5.31	0.20	4.26	1.07	-1.05	-22.92	0.00	-0.00	4.26	0.0
%202	5.85	3.86	0.20	4.68	1.17	0.82	-3.78	0.82	0.82	3.86	0.0
%203	3.44	2.69	0.20	2.75	0.69	0.06	-3.56	0.89	0.06	2.69	0.0
%204	4.95	1.81	0.20	3.96	0.99	2.15	0.00	3.00	2.11	1.81	0.0
%205	0.96	2.25	0.20	0.77	0.19	-1.49	-1.49	1.80	-1.20	1.97	0.0
%206	3.90	2.97	0.20	3.12	0.78	0.15	-1.26	1.95	0.15	2.97	0.0
%207	1.79	4.55	0.20	1.43	0.36	-3.12	-4.38	0.67	-1.28	2.71	0.0
%208	0.68	6.78	0.20	0.54	0.14	-6.24	-10.62	0.08	-0.59	1.14	0.0
%209	9.31	5.28	0.20	7.45	1.86	2.17	-0.84	2.25	2.17	5.28	0.0
%210	10.09	6.92	0.20	8.07	2.02	1.15	0.00	3.00	0.75	6.92	0.4
%211	1.76	6.73	0.20	1.41	0.35	-5.33	-5.33	0.49	-2.51	3.92	0.0
%212	0.90	9.50	0.20	0.72	0.18	-8.78	-14.10	0.02	-0.46	1.18	0.0
%213	5.34	5.64	0.20	4.27	1.07	-1.37	-15.47	0.02	-0.01	4.28	0.0
%214	0.19	5.42	0.20	0.15	0.04	-5.27	-20.74	0.00	-0.01	0.16	0.0
%215	3.88	3.11	0.20	3.10	0.78	-0.01	-20.75	0.00	-0.00	3.10	0.0
%216	4.54	2.22	0.20	3.63	0.91	1.41	-2.19	1.42	1.41	2.22	0.0
%217	0.81	2.56	0.20	0.65	0.16	-1.91	-4.10	0.74	-0.68	1.33	0.0
%218	1.44	2.96	0.20	1.15	0.29	-1.81	-5.91	0.40	-0.34	1.49	0.0
%219	2.97	4.38	0.20	2.38	0.59	-2.01	-7.92	0.20	-0.20	2.57	0.0
%220	0.28	6.04	0.20	0.22	0.06	-5.82	-13.73	0.03	-0.17	0.40	0.0
%221	2.91	6.49	0.20	2.33	0.58	-4.16	-17.89	0.01	-0.02	2.35	0.0
%222	1.81	7.13	0.20	1.45	0.36	-5.68	-23.57	0.00	-0.01	1.45	0.0
%223	0.96	8.48	0.20	0.77	0.19	-7.72	-31.29	0.00	-0.00	0.77	0.0
%224	0.19	7.89	0.20	0.15	0.04	-7.74	-39.02	0.00	-0.00	0.15	0.0
%225	0.43	6.82	0.20	0.34	0.09	-6.47	-45.50	0.00	-0.00	0.34	0.0
%226	1.37	5.87	0.20	1.10	0.27	-4.77	-50.27	0.00	-0.00	1.10	0.0
%227	1.46	4.12	0.20	1.17	0.29	-2.95	-53.22	0.00	-0.00	1.17	0.0
%228	2.27	2.48	0.20	1.82	0.45	-0.67	-53.89	0.00	-0.00	1.82	0.0
%229	7.07	1.90	0.20	5.66	1.41	3.75	0.00	3.00	3.00	1.90	0.7
%230	1.10	2.61	0.20	0.88	0.22	-1.73	-1.73	1.66	-1.34	2.22	0.0
%231	3.22	3.87	0.20	2.58	0.64	-1.30	-3.03	1.06	-0.59	3.17	0.0
%232	0.51	5.38	0.20	0.41	0.10	-4.97	-7.99	0.20	-0.87	1.28	0.0
%233	5.29	6.82	0.20	4.23	1.06	-2.59	-10.59	0.08	-0.11	4.35	0.0
%234	4.23	5.88	0.20	3.38	0.85	-2.50	-13.08	0.03	-0.05	3.43	0.0
%235	2.70	6.57	0.20	2.16	0.54	-4.41	-17.49	0.01	-0.03	2.19	0.0
%236	3.26	6.78	0.20	2.61	0.65	-4.17	-21.66	0.00	-0.01	2.61	0.0
%237	0.68	6.21	0.20	0.54	0.14	-5.66	-27.32	0.00	-0.00	0.55	0.0
%238	1.93	5.24	0.20	1.54	0.39	-3.70	-31.02	0.00	-0.00	1.54	0.0
%239	1.61	3.80	0.20	1.29	0.32	-2.51	-33.53	0.00	-0.00	1.29	0.0
%240	0.37	2.30	0.20	0.30	0.07	-2.00	-35.53	0.00	-0.00	0.30	0.0

TOTAL PERCOLATION = 27.556

input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.22	1.28	0.35	-0.22	-36.13	0.00	-0.00	1.28	0.00
2	4.40	1.76	0.22	3.45	0.95	1.69	-1.67	1.69	1.69	1.76	0.00
3	3.58	2.57	0.22	2.81	0.77	0.24	-1.28	1.93	0.24	2.57	0.00
4	4.01	2.25	0.22	3.15	0.86	0.89	-0.17	2.83	0.89	2.25	0.00
5	4.22	3.67	0.22	3.31	0.91	-0.36	-0.53	2.50	-0.33	3.64	0.00
6	2.02	3.65	0.22	1.59	0.43	-2.07	-2.59	1.23	-1.27	2.85	0.00
7	0.26	4.86	0.22	0.20	0.06	-4.65	-7.25	0.25	-0.98	1.19	0.00
8	0.23	5.75	0.22	0.18	0.05	-5.57	-12.82	0.04	-0.21	0.39	0.00
9	6.38	3.82	0.22	5.01	1.37	1.19	-2.62	1.22	1.19	3.82	0.00
10	3.84	2.62	0.22	3.01	0.83	0.40	-1.80	1.62	0.40	2.62	0.00
11	0.62	2.87	0.22	0.49	0.13	-2.38	-4.18	0.72	-0.90	1.39	0.00
12	1.40	2.58	0.22	1.10	0.30	-1.48	-5.66	0.43	-0.28	1.38	0.00
13	0.15	2.81	0.22	0.12	0.03	-2.70	-8.35	0.17	-0.26	0.38	0.00
14	1.68	4.00	0.22	1.32	0.36	-2.68	-11.03	0.07	-0.10	1.42	0.00
15	12.00	5.87	0.22	9.42	2.58	3.55	0.00	3.00	2.93	5.87	0.62
16	0.89	4.56	0.22	0.70	0.19	-3.86	-3.86	0.80	-2.20	2.90	0.00
17	5.65	6.00	0.22	4.44	1.21	-1.56	-5.42	0.47	-0.33	4.77	0.00
18	0.76	4.74	0.22	0.60	0.16	-4.14	-9.56	0.11	-0.36	0.95	0.00
19	1.87	8.64	0.22	1.47	0.40	-7.17	-16.73	0.01	-0.10	1.57	0.00
20	3.20	6.27	0.22	2.51	0.69	-3.76	-20.49	0.00	-0.01	2.52	0.00
21	3.31	5.52	0.22	2.60	0.71	-2.92	-23.42	0.00	-0.00	2.60	0.00
22	4.30	3.93	0.22	3.38	0.92	-0.56	-23.98	0.00	-0.00	3.38	0.00
23	2.75	3.30	0.22	2.16	0.59	-1.15	-25.12	0.00	-0.00	2.16	0.00
24	4.63	2.44	0.22	3.63	1.00	1.20	-2.68	1.20	1.20	2.44	0.00
25	1.73	1.77	0.22	1.36	0.37	-0.41	-3.09	1.04	-0.16	1.52	0.00
26	0.50	2.88	0.22	0.39	0.11	-2.48	-5.58	0.45	-0.60	0.99	0.00
27	0.91	4.24	0.22	0.71	0.20	-3.52	-9.10	0.13	-0.31	1.03	0.00
28	1.71	4.03	0.22	1.34	0.37	-2.68	-11.78	0.05	-0.08	1.42	0.00
29	6.38	5.15	0.22	5.01	1.37	-0.14	-11.92	0.05	-0.00	5.01	0.00
30	2.13	5.24	0.22	1.67	0.46	-3.57	-15.49	0.02	-0.04	1.71	0.00
31	2.17	5.74	0.22	1.70	0.47	-4.04	-19.53	0.00	-0.01	1.71	0.00
32	3.60	4.89	0.22	2.83	0.77	-2.06	-21.59	0.00	-0.00	2.83	0.00
33	4.45	4.56	0.22	3.49	0.96	-1.06	-22.66	0.00	-0.00	3.49	0.00
34	3.95	3.95	0.22	3.10	0.85	-0.85	-23.51	0.00	-0.00	3.10	0.00
35	3.26	2.16	0.22	2.56	0.70	0.40	-5.91	0.40	0.40	2.16	0.00
36	1.47	2.12	0.22	1.15	0.32	-0.97	-6.88	0.29	-0.11	1.27	0.00
37	5.51	3.11	0.22	4.33	1.18	1.21	-2.03	1.50	1.21	3.11	0.00
38	2.60	2.27	0.22	2.04	0.56	-0.23	-2.26	1.38	-0.11	2.15	0.00
39	5.17	3.54	0.22	4.06	1.11	0.52	-1.32	1.91	0.52	3.54	0.00
40	6.74	3.96	0.22	5.29	1.45	1.33	0.00	3.00	1.09	3.96	0.24
41	2.12	4.30	0.22	1.66	0.46	-2.63	-2.63	1.22	-1.78	3.45	0.00
42	6.44	4.77	0.22	5.06	1.38	0.29	-2.01	1.51	0.29	4.77	0.00
43	2.15	4.56	0.22	1.69	0.46	-2.87	-4.88	0.57	-0.94	2.63	0.00
44	1.03	5.52	0.22	0.81	0.22	-4.71	-9.59	0.11	-0.45	1.26	0.00
45	9.44	4.80	0.22	7.41	2.03	2.61	-0.28	2.72	2.61	4.80	0.00
46	10.17	4.25	0.22	7.98	2.19	3.73	0.00	3.00	0.28	4.25	3.46
47	2.40	2.60	0.22	1.88	0.52	-0.71	-0.71	2.34	-0.66	2.54	0.00
48	2.52	2.87	0.22	1.98	0.54	-0.89	-1.60	1.73	-0.62	2.59	0.00
49	4.66	1.75	0.22	3.66	1.00	1.91	0.00	3.00	1.27	1.75	0.64
50	0.13	3.00	0.22	0.10	0.03	-2.89	-2.89	1.11	-1.89	1.99	0.00
51	1.56	3.97	0.22	1.22	0.34	-2.74	-5.64	0.44	-0.68	1.90	0.00
52	1.76	5.22	0.22	1.38	0.38	-3.84	-9.48	0.12	-0.32	1.70	0.00
53	3.09	5.89	0.22	2.43	0.66	-3.46	-12.94	0.04	-0.08	2.51	0.00

54	0.73	5.36	0.22	0.57	0.16	-4.78	-17.72	0.01	-0.03	0.60	0.00
55	2.40	5.57	0.22	1.88	0.52	-3.69	-21.41	0.00	-0.01	1.89	0.00
56	9.88	6.05	0.22	7.76	2.12	1.71	-1.64	1.71	1.71	6.05	0.00
57	9.22	4.84	0.22	7.24	1.98	2.40	0.00	3.00	1.29	4.84	1.11
58	6.02	3.92	0.22	4.73	1.29	0.81	0.00	3.00	0.00	3.92	0.81
59	5.68	2.63	0.22	4.46	1.22	1.83	0.00	3.00	0.00	2.63	1.83
60	2.82	2.11	0.22	2.21	0.61	0.10	0.00	3.00	0.00	2.11	0.10
61	1.80	2.27	0.22	1.41	0.39	-0.85	-0.85	2.23	-0.77	2.18	0.00
62	2.45	2.22	0.22	1.92	0.53	-0.30	-1.15	2.02	-0.21	2.14	0.00
63	1.41	3.09	0.22	1.11	0.30	-1.98	-3.13	1.03	-0.99	2.10	0.00
64	2.08	4.17	0.22	1.63	0.45	-2.54	-5.67	0.43	-0.60	2.23	0.00
65	11.99	4.56	0.22	9.41	2.58	4.85	0.00	3.00	2.57	4.56	2.28
66	2.42	5.73	0.22	1.90	0.52	-3.83	-3.83	0.81	-2.19	4.09	0.00
67	4.16	5.52	0.22	3.27	0.89	-2.26	-6.09	0.37	-0.43	3.70	0.00
68	2.44	5.72	0.22	1.92	0.52	-3.80	-9.89	0.10	-0.27	2.19	0.00
69	3.78	4.72	0.22	2.97	0.81	-1.75	-11.64	0.06	-0.05	3.01	0.00
70	3.35	3.62	0.22	2.63	0.72	-0.99	-12.63	0.04	-0.02	2.65	0.00
71	1.07	3.95	0.22	0.84	0.23	-3.11	-15.74	0.01	-0.03	0.87	0.00
72	1.18	2.72	0.22	0.93	0.25	-1.79	-17.53	0.01	-0.01	0.93	0.00
73	1.60	3.37	0.22	1.26	0.34	-2.12	-19.65	0.00	-0.00	1.26	0.00
74	1.74	3.10	0.22	1.37	0.37	-1.74	-21.39	0.00	-0.00	1.37	0.00
75	4.81	3.54	0.22	3.78	1.03	0.23	-7.44	0.24	0.23	3.54	0.00
76	5.95	4.07	0.22	4.67	1.28	0.60	-3.72	0.84	0.60	4.07	0.00
77	4.32	4.53	0.22	3.39	0.93	-1.14	-4.86	0.57	-0.27	3.66	0.00
78	4.02	6.05	0.22	3.16	0.86	-2.90	-7.76	0.21	-0.36	3.51	0.00
79	2.13	5.27	0.22	1.67	0.46	-3.60	-11.36	0.06	-0.15	1.82	0.00
80	1.48	6.20	0.22	1.16	0.32	-5.03	-16.39	0.01	-0.05	1.21	0.00
81	2.68	3.90	0.22	2.10	0.58	-1.80	-18.19	0.01	-0.01	2.11	0.00
82	5.77	3.62	0.22	4.53	1.24	0.91	-3.47	0.92	0.91	3.62	0.00
83	3.27	1.86	0.22	2.57	0.70	0.70	-1.80	1.62	0.70	1.86	0.00
84	4.05	2.45	0.22	3.18	0.87	0.73	-0.71	2.35	0.73	2.45	0.00
85	2.14	1.43	0.22	1.68	0.46	0.24	-0.42	2.60	0.24	1.43	0.00
86	3.55	2.90	0.22	2.79	0.76	-0.11	-0.53	2.50	-0.10	2.89	0.00
87	2.06	3.81	0.22	1.62	0.44	-2.19	-2.72	1.18	-1.31	2.93	0.00
88	8.81	4.38	0.22	6.92	1.89	2.54	0.00	3.00	1.82	4.38	0.72
89	1.56	5.21	0.22	1.22	0.34	-3.98	-3.98	0.77	-2.23	3.46	0.00
90	1.35	6.78	0.22	1.06	0.29	-5.72	-9.70	0.11	-0.66	1.72	0.00
91	0.31	7.10	0.22	0.24	0.07	-6.85	-16.55	0.01	-0.10	0.34	0.00
92	1.35	6.50	0.22	1.06	0.29	-5.44	-21.99	0.00	-0.01	1.07	0.00
93	1.69	6.16	0.22	1.33	0.36	-4.83	-26.82	0.00	-0.00	1.33	0.00
94	0.79	4.64	0.22	0.62	0.17	-4.02	-30.84	0.00	-0.00	0.62	0.00
95	3.10	3.24	0.22	2.43	0.67	-0.81	-31.65	0.00	-0.00	2.43	0.00
96	2.67	3.07	0.22	2.10	0.57	-0.98	-32.63	0.00	-0.00	2.10	0.00
97	4.51	1.92	0.22	3.54	0.97	1.62	-1.81	1.62	1.62	1.92	0.00
98	2.62	1.98	0.22	2.06	0.56	0.08	-1.67	1.69	0.08	1.98	0.00
99	2.72	4.39	0.22	2.14	0.58	-2.25	-3.93	0.78	-0.91	3.04	0.00
%100	1.37	4.99	0.22	1.08	0.29	-3.92	-7.84	0.21	-0.58	1.65	0.0
%101	2.52	5.91	0.22	1.98	0.54	-3.93	-11.77	0.05	-0.15	2.13	0.0
%102	2.44	6.32	0.22	1.92	0.52	-4.41	-16.18	0.01	-0.04	1.96	0.0
%103	1.26	6.53	0.22	0.99	0.27	-5.54	-21.72	0.00	-0.01	1.00	0.0
%104	0.57	6.53	0.22	0.45	0.12	-6.08	-27.80	0.00	-0.00	0.45	0.0
%105	6.50	4.78	0.22	5.10	1.40	0.32	-6.53	0.32	0.32	4.78	0.0
%106	0.41	5.19	0.22	0.32	0.09	-4.87	-11.40	0.06	-0.26	0.58	0.0
%107	6.31	2.86	0.22	4.95	1.36	2.10	-0.96	2.16	2.10	2.86	0.0
%108	3.17	2.18	0.22	2.49	0.68	0.30	-0.57	2.46	0.30	2.18	0.0
%109	3.70	1.74	0.22	2.90	0.80	1.17	0.00	3.00	0.54	1.74	0.6
%110	4.08	2.24	0.22	3.20	0.88	0.96	0.00	3.00	0.00	2.24	0.9
%111	5.54	4.35	0.22	4.35	1.19	0.00	0.00	3.00	0.00	4.35	0.0
%112	4.74	4.27	0.22	3.72	1.02	-0.55	-0.55	2.48	-0.52	4.24	0.0
%113	11.05	5.26	0.22	8.67	2.38	3.42	0.00	3.00	0.52	5.26	2.9
%114	1.30	5.70	0.22	1.02	0.28	-4.68	-4.68	0.60	-2.40	3.42	0.0
%115	4.48	5.40	0.22	3.52	0.96	-1.89	-6.57	0.32	-0.29	3.80	0.0
%116	3.81	5.66	0.22	2.99	0.82	-2.67	-9.24	0.13	-0.19	3.18	0.0

%117	3.20	4.55	0.22	2.51	0.69	-2.04	-11.27	0.06	-0.06	2.58	0.0
%118	1.70	4.09	0.22	1.33	0.37	-2.75	-14.03	0.02	-0.04	1.37	0.0
%119	0.77	2.69	0.22	0.60	0.17	-2.08	-16.11	0.01	-0.01	0.62	0.0
%120	3.32	1.63	0.22	2.61	0.71	0.98	-3.25	0.99	0.98	1.63	0.0
%121	3.12	1.88	0.22	2.45	0.67	0.57	-1.91	1.56	0.57	1.88	0.0
%122	1.94	2.69	0.22	1.52	0.42	-1.17	-3.08	1.05	-0.52	2.04	0.0
%123	5.04	3.26	0.22	3.96	1.08	0.69	-1.59	1.74	0.69	3.26	0.0
%124	2.38	4.62	0.22	1.87	0.51	-2.75	-4.34	0.68	-1.06	2.93	0.0
%125	4.31	4.77	0.22	3.38	0.93	-1.38	-5.73	0.42	-0.26	3.64	0.0
%126	0.10	7.34	0.22	0.08	0.02	-7.26	-12.98	0.04	-0.39	0.47	0.0
%127	0.06	8.57	0.22	0.05	0.01	-8.53	-21.51	0.00	-0.03	0.08	0.0
%128	1.67	7.79	0.22	1.31	0.36	-6.48	-27.99	0.00	-0.00	1.31	0.0
%129	4.28	5.18	0.22	3.36	0.92	-1.82	-29.81	0.00	-0.00	3.36	0.0
%130	3.93	4.52	0.22	3.09	0.84	-1.44	-31.25	0.00	-0.00	3.09	0.0
%131	4.58	2.87	0.22	3.60	0.98	0.73	-4.15	0.73	0.73	2.87	0.0
%132	0.50	2.43	0.22	0.39	0.11	-2.04	-6.19	0.36	-0.36	0.76	0.0
%133	2.67	2.45	0.22	2.10	0.57	-0.35	-6.54	0.32	-0.04	2.14	0.0
%134	1.80	2.64	0.22	1.41	0.39	-1.23	-7.77	0.21	-0.11	1.52	0.0
%135	1.88	3.56	0.22	1.48	0.40	-2.08	-9.85	0.10	-0.11	1.58	0.0
%136	0.97	3.95	0.22	0.76	0.21	-3.19	-13.04	0.03	-0.07	0.83	0.0
%137	6.28	5.67	0.22	4.93	1.35	-0.74	-13.78	0.03	-0.01	4.94	0.0
%138	9.48	5.21	0.22	7.44	2.04	2.23	-0.82	2.26	2.23	5.21	0.0
%139	5.35	5.36	0.22	4.20	1.15	-1.16	-1.99	1.52	-0.74	4.94	0.0
%140	2.51	6.39	0.22	1.97	0.54	-4.42	-6.41	0.34	-1.18	3.15	0.0
%141	5.96	4.55	0.22	4.68	1.28	0.13	-5.46	0.46	0.13	4.55	0.0
%142	10.95	3.91	0.22	8.60	2.35	4.69	0.00	3.00	2.54	3.91	2.1
%143	1.93	2.65	0.22	1.52	0.41	-1.13	-1.13	2.03	-0.97	2.48	0.0
%144	0.64	2.60	0.22	0.50	0.14	-2.09	-3.23	0.99	-1.04	1.54	0.0
%145	1.43	2.84	0.22	1.12	0.31	-1.72	-4.94	0.55	-0.44	1.56	0.0
%146	2.26	2.51	0.22	1.77	0.49	-0.73	-5.68	0.43	-0.12	1.90	0.0
%147	2.40	3.29	0.22	1.88	0.52	-1.41	-7.08	0.27	-0.16	2.05	0.0
%148	4.67	3.74	0.22	3.67	1.00	-0.07	-7.15	0.26	-0.01	3.67	0.0
%149	5.35	5.07	0.22	4.20	1.15	-0.88	-8.03	0.19	-0.07	4.27	0.0
%150	2.00	6.80	0.22	1.57	0.43	-5.23	-13.26	0.03	-0.16	1.73	0.0
%151	3.58	7.95	0.22	2.81	0.77	-5.14	-18.41	0.01	-0.03	2.84	0.0
%152	2.96	7.47	0.22	2.32	0.64	-5.15	-23.55	0.00	-0.00	2.33	0.0
%153	3.19	6.76	0.22	2.50	0.69	-4.26	-27.81	0.00	-0.00	2.50	0.0
%154	6.89	4.89	0.22	5.41	1.48	0.52	-5.11	0.52	0.52	4.89	0.0
%155	4.09	3.36	0.22	3.21	0.88	-0.15	-5.26	0.50	-0.03	3.24	0.0
%156	3.05	4.42	0.22	2.39	0.66	-2.02	-7.28	0.25	-0.25	2.64	0.0
%157	3.07	2.07	0.22	2.41	0.66	0.34	-4.74	0.59	0.34	2.07	0.0
%158	4.66	2.39	0.22	3.66	1.00	1.26	-1.40	1.86	1.26	2.39	0.0
%159	5.97	3.86	0.22	4.69	1.28	0.83	-0.32	2.69	0.83	3.86	0.0
%160	0.31	4.73	0.22	0.24	0.07	-4.49	-4.81	0.58	-2.11	2.35	0.0
%161	9.49	6.05	0.22	7.45	2.04	1.40	-1.21	1.98	1.40	6.05	0.0
%162	2.60	5.43	0.22	2.04	0.56	-3.39	-4.60	0.62	-1.36	3.40	0.0
%163	2.46	6.45	0.22	1.93	0.53	-4.52	-9.12	0.13	-0.49	2.42	0.0
%164	7.24	5.68	0.22	5.68	1.56	-0.00	-9.12	0.13	-0.00	5.68	0.0
%165	9.40	5.14	0.22	7.38	2.02	2.24	-0.68	2.37	2.24	5.14	0.0
%166	2.81	4.10	0.22	2.21	0.60	-1.90	-2.58	1.24	-1.13	3.34	0.0
%167	3.25	2.86	0.22	2.55	0.70	-0.30	-2.88	1.12	-0.12	2.67	0.0
%168	1.83	2.40	0.22	1.44	0.39	-0.96	-3.85	0.81	-0.31	1.75	0.0
%169	1.67	2.37	0.22	1.31	0.36	-1.06	-4.90	0.56	-0.24	1.55	0.0
%170	0.99	3.74	0.22	0.78	0.21	-2.96	-7.86	0.20	-0.36	1.13	0.0
%171	4.98	5.62	0.22	3.91	1.07	-1.71	-9.57	0.11	-0.09	4.00	0.0
%172	0.34	6.06	0.22	0.27	0.07	-5.80	-15.37	0.02	-0.10	0.37	0.0
%173	5.76	8.51	0.22	4.52	1.24	-3.99	-19.36	0.00	-0.01	4.53	0.0
%174	4.39	5.97	0.22	3.45	0.94	-2.52	-21.88	0.00	-0.00	3.45	0.0
%175	1.61	5.49	0.22	1.26	0.35	-4.22	-26.11	0.00	-0.00	1.27	0.0
%176	1.83	6.27	0.22	1.44	0.39	-4.84	-30.94	0.00	-0.00	1.44	0.0
%177	0.77	5.24	0.22	0.60	0.17	-4.63	-35.57	0.00	-0.00	0.60	0.0
%178	15.69	4.40	0.22	12.32	3.37	7.91	0.00	3.00	3.00	4.40	4.9
%179	2.38	3.23	0.22	1.87	0.51	-1.37	-1.37	1.88	-1.12	2.99	0.0

%180	2.59	2.34	0.22	2.03	0.56	-0.30	-1.67	1.69	-0.19	2.22	0.0
%181	2.63	2.30	0.22	2.06	0.57	-0.24	-1.91	1.56	-0.13	2.20	0.0
%182	2.82	2.39	0.22	2.21	0.61	-0.18	-2.09	1.47	-0.09	2.31	0.0
%183	2.30	3.34	0.22	1.81	0.49	-1.53	-3.62	0.87	-0.60	2.40	0.0
%184	1.93	4.73	0.22	1.52	0.41	-3.22	-6.84	0.29	-0.58	2.09	0.0
%185	5.29	6.08	0.22	4.15	1.14	-1.93	-8.77	0.15	-0.14	4.29	0.0
%186	1.48	6.53	0.22	1.16	0.32	-5.37	-14.14	0.02	-0.13	1.29	0.0
%187	4.01	7.15	0.22	3.15	0.86	-4.01	-18.15	0.01	-0.02	3.17	0.0
%188	0.13	7.63	0.22	0.10	0.03	-7.53	-25.67	0.00	-0.01	0.11	0.0
%189	6.96	7.25	0.22	5.46	1.50	-1.79	-27.46	0.00	-0.00	5.46	0.0
%190	6.91	4.30	0.22	5.42	1.49	1.12	-2.88	1.12	1.12	4.30	0.0
%191	6.02	3.15	0.22	4.73	1.29	1.58	-0.31	2.70	1.58	3.15	0.0
%192	1.38	1.90	0.22	1.08	0.30	-0.82	-1.13	2.03	-0.66	1.74	0.0
%193	1.02	2.97	0.22	0.80	0.22	-2.17	-3.30	0.97	-1.07	1.87	0.0
%194	1.84	3.67	0.22	1.44	0.40	-2.23	-5.53	0.45	-0.52	1.96	0.0
%195	0.50	5.47	0.22	0.39	0.11	-5.08	-10.62	0.08	-0.37	0.77	0.0
%196	2.53	5.14	0.22	1.99	0.54	-3.16	-13.77	0.03	-0.05	2.04	0.0
%197	8.12	6.44	0.22	6.37	1.75	-0.07	-13.84	0.03	-0.00	6.37	0.0
%198	4.71	5.90	0.22	3.70	1.01	-2.20	-16.04	0.01	-0.01	3.71	0.0
%199	0.06	8.24	0.22	0.05	0.01	-8.19	-24.24	0.00	-0.01	0.06	0.0
%200	7.74	7.36	0.22	6.08	1.66	-1.28	-25.52	0.00	-0.00	6.08	0.0
%201	5.33	5.31	0.22	4.18	1.15	-1.13	-26.65	0.00	-0.00	4.18	0.0
%202	5.85	3.86	0.22	4.59	1.26	0.74	-4.11	0.74	0.74	3.86	0.0
%203	3.44	2.69	0.22	2.70	0.74	0.01	-4.06	0.75	0.01	2.69	0.0
%204	4.95	1.81	0.22	3.89	1.06	2.08	-0.17	2.83	2.08	1.81	0.0
%205	0.96	2.25	0.22	0.75	0.21	-1.50	-1.67	1.69	-1.14	1.89	0.0
%206	3.90	2.97	0.22	3.06	0.84	0.09	-1.52	1.78	0.09	2.97	0.0
%207	1.79	4.55	0.22	1.41	0.38	-3.14	-4.67	0.61	-1.17	2.58	0.0
%208	0.68	6.78	0.22	0.53	0.15	-6.25	-10.92	0.07	-0.54	1.07	0.0
%209	9.31	5.28	0.22	7.31	2.00	2.03	-1.04	2.10	2.03	5.28	0.0
%210	10.09	6.92	0.22	7.92	2.17	1.00	0.00	3.00	0.90	6.92	0.1
%211	1.76	6.73	0.22	1.38	0.38	-5.35	-5.35	0.48	-2.52	3.90	0.0
%212	0.90	9.50	0.22	0.71	0.19	-8.79	-14.14	0.02	-0.46	1.16	0.0
%213	5.34	5.64	0.22	4.19	1.15	-1.45	-15.59	0.01	-0.01	4.20	0.0
%214	0.19	5.42	0.22	0.15	0.04	-5.27	-20.86	0.00	-0.01	0.16	0.0
%215	3.88	3.11	0.22	3.05	0.83	-0.07	-20.93	0.00	-0.00	3.05	0.0
%216	4.54	2.22	0.22	3.56	0.98	1.34	-2.34	1.35	1.34	2.22	0.0
%217	0.81	2.56	0.22	0.64	0.17	-1.92	-4.26	0.70	-0.65	1.28	0.0
%218	1.44	2.96	0.22	1.13	0.31	-1.83	-6.09	0.37	-0.32	1.46	0.0
%219	2.97	4.38	0.22	2.33	0.64	-2.05	-8.14	0.19	-0.19	2.52	0.0
%220	0.28	6.04	0.22	0.22	0.06	-5.82	-13.96	0.03	-0.16	0.38	0.0
%221	2.91	6.49	0.22	2.28	0.63	-4.20	-18.16	0.01	-0.02	2.30	0.0
%222	1.81	7.13	0.22	1.42	0.39	-5.71	-23.87	0.00	-0.01	1.43	0.0
%223	0.96	8.48	0.22	0.75	0.21	-7.73	-31.60	0.00	-0.00	0.75	0.0
%224	0.19	7.89	0.22	0.15	0.04	-7.74	-39.34	0.00	-0.00	0.15	0.0
%225	0.43	6.82	0.22	0.34	0.09	-6.48	-45.82	0.00	-0.00	0.34	0.0
%226	1.37	5.87	0.22	1.08	0.29	-4.79	-50.61	0.00	-0.00	1.08	0.0
%227	1.46	4.12	0.22	1.15	0.31	-2.98	-53.59	0.00	-0.00	1.15	0.0
%228	2.27	2.48	0.22	1.78	0.49	-0.70	-54.29	0.00	-0.00	1.78	0.0
%229	7.07	1.90	0.22	5.55	1.52	3.65	0.00	3.00	3.00	1.90	0.6
%230	1.10	2.61	0.22	0.86	0.24	-1.75	-1.75	1.65	-1.35	2.22	0.0
%231	3.22	3.87	0.22	2.53	0.69	-1.34	-3.09	1.04	-0.61	3.13	0.0
%232	0.51	5.38	0.22	0.40	0.11	-4.98	-8.07	0.19	-0.85	1.25	0.0
%233	5.29	6.82	0.22	4.15	1.14	-2.67	-10.74	0.08	-0.11	4.27	0.0
%234	4.23	5.88	0.22	3.32	0.91	-2.56	-13.30	0.03	-0.04	3.37	0.0
%235	2.70	6.57	0.22	2.12	0.58	-4.45	-17.74	0.01	-0.02	2.14	0.0
%236	3.26	6.78	0.22	2.56	0.70	-4.22	-21.96	0.00	-0.01	2.56	0.0
%237	0.68	6.21	0.22	0.53	0.15	-5.68	-27.64	0.00	-0.00	0.54	0.0
%238	1.93	5.24	0.22	1.52	0.41	-3.73	-31.36	0.00	-0.00	1.52	0.0
%239	1.61	3.80	0.22	1.26	0.35	-2.54	-33.90	0.00	-0.00	1.26	0.0
%240	0.37	2.30	0.22	0.29	0.08	-2.01	-35.91	0.00	-0.00	0.29	0.0

TOTAL PERCOLATION = 24.098

input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.23	1.26	0.37	-0.24	-36.52	0.00	-0.00	1.26	0.00
2	4.40	1.76	0.23	3.39	1.01	1.62	-1.79	1.62	1.62	1.76	0.00
3	3.58	2.57	0.23	2.76	0.82	0.19	-1.47	1.81	0.19	2.57	0.00
4	4.01	2.25	0.23	3.09	0.92	0.83	-0.36	2.65	0.83	2.25	0.00
5	4.22	3.67	0.23	3.25	0.97	-0.42	-0.78	2.29	-0.35	3.60	0.00
6	2.02	3.65	0.23	1.56	0.46	-2.10	-2.88	1.12	-1.17	2.73	0.00
7	0.26	4.86	0.23	0.20	0.06	-4.66	-7.54	0.23	-0.89	1.09	0.00
8	0.23	5.75	0.23	0.18	0.05	-5.58	-13.12	0.03	-0.19	0.37	0.00
9	6.38	3.82	0.23	4.91	1.47	1.09	-2.87	1.12	1.09	3.82	0.00
10	3.84	2.62	0.23	2.96	0.88	0.34	-2.10	1.46	0.34	2.62	0.00
11	0.62	2.87	0.23	0.48	0.14	-2.39	-4.49	0.65	-0.82	1.29	0.00
12	1.40	2.58	0.23	1.08	0.32	-1.50	-5.99	0.39	-0.26	1.34	0.00
13	0.15	2.81	0.23	0.12	0.03	-2.70	-8.69	0.15	-0.23	0.35	0.00
14	1.68	4.00	0.23	1.29	0.39	-2.70	-11.39	0.06	-0.09	1.39	0.00
15	12.00	5.87	0.23	9.24	2.76	3.37	0.00	3.00	2.94	5.87	0.43
16	0.89	4.56	0.23	0.69	0.20	-3.87	-3.87	0.80	-2.20	2.89	0.00
17	5.65	6.00	0.23	4.35	1.30	-1.65	-5.52	0.45	-0.34	4.69	0.00
18	0.76	4.74	0.23	0.59	0.17	-4.15	-9.67	0.11	-0.34	0.93	0.00
19	1.87	8.64	0.23	1.44	0.43	-7.20	-16.87	0.01	-0.10	1.54	0.00
20	3.20	6.27	0.23	2.46	0.74	-3.81	-20.68	0.00	-0.01	2.47	0.00
21	3.31	5.52	0.23	2.55	0.76	-2.97	-23.65	0.00	-0.00	2.55	0.00
22	4.30	3.93	0.23	3.31	0.99	-0.62	-24.28	0.00	-0.00	3.31	0.00
23	2.75	3.30	0.23	2.12	0.63	-1.19	-25.46	0.00	-0.00	2.12	0.00
24	4.63	2.44	0.23	3.57	1.06	1.13	-2.85	1.13	1.13	2.44	0.00
25	1.73	1.77	0.23	1.33	0.40	-0.44	-3.29	0.97	-0.16	1.49	0.00
26	0.50	2.88	0.23	0.38	0.12	-2.49	-5.79	0.42	-0.56	0.94	0.00
27	0.91	4.24	0.23	0.70	0.21	-3.53	-9.32	0.12	-0.29	0.99	0.00
28	1.71	4.03	0.23	1.32	0.39	-2.71	-12.03	0.05	-0.07	1.39	0.00
29	6.38	5.15	0.23	4.91	1.47	-0.24	-12.27	0.05	-0.00	4.92	0.00
30	2.13	5.24	0.23	1.64	0.49	-3.60	-15.87	0.01	-0.03	1.67	0.00
31	2.17	5.74	0.23	1.67	0.50	-4.07	-19.94	0.00	-0.01	1.68	0.00
32	3.60	4.89	0.23	2.77	0.83	-2.11	-22.05	0.00	-0.00	2.77	0.00
33	4.45	4.56	0.23	3.43	1.02	-1.13	-23.18	0.00	-0.00	3.43	0.00
34	3.95	3.95	0.23	3.04	0.91	-0.91	-24.10	0.00	-0.00	3.04	0.00
35	3.26	2.16	0.23	2.51	0.75	0.35	-6.30	0.35	0.35	2.16	0.00
36	1.47	2.12	0.23	1.13	0.34	-0.99	-7.29	0.25	-0.10	1.23	0.00
37	5.51	3.11	0.23	4.24	1.27	1.13	-2.28	1.38	1.13	3.11	0.00
38	2.60	2.27	0.23	2.00	0.60	-0.27	-2.54	1.26	-0.12	2.12	0.00
39	5.17	3.54	0.23	3.98	1.19	0.45	-1.65	1.70	0.45	3.54	0.00
40	6.74	3.96	0.23	5.19	1.55	1.23	-0.06	2.93	1.23	3.96	0.00
41	2.12	4.30	0.23	1.63	0.49	-2.67	-2.73	1.18	-1.75	3.38	0.00
42	6.44	4.77	0.23	4.96	1.48	0.19	-2.29	1.37	0.19	4.77	0.00
43	2.15	4.56	0.23	1.66	0.49	-2.90	-5.19	0.51	-0.86	2.52	0.00
44	1.03	5.52	0.23	0.79	0.24	-4.72	-9.91	0.10	-0.41	1.20	0.00
45	9.44	4.80	0.23	7.27	2.17	2.47	-0.45	2.57	2.47	4.80	0.00
46	10.17	4.25	0.23	7.83	2.34	3.58	0.00	3.00	0.43	4.25	3.15
47	2.40	2.60	0.23	1.85	0.55	-0.75	-0.75	2.32	-0.68	2.53	0.00
48	2.52	2.87	0.23	1.94	0.58	-0.93	-1.68	1.69	-0.63	2.57	0.00
49	4.66	1.75	0.23	3.59	1.07	1.84	0.00	3.00	1.31	1.75	0.52
50	0.13	3.00	0.23	0.10	0.03	-2.90	-2.90	1.11	-1.89	1.99	0.00
51	1.56	3.97	0.23	1.20	0.36	-2.77	-5.66	0.43	-0.68	1.88	0.00
52	1.76	5.22	0.23	1.36	0.40	-3.87	-9.53	0.12	-0.32	1.67	0.00
53	3.09	5.89	0.23	2.38	0.71	-3.51	-13.04	0.03	-0.08	2.46	0.00

54	0.73	5.36	0.23	0.56	0.17	-4.79	-17.83	0.01	-0.03	0.59	0.00
55	2.40	5.57	0.23	1.85	0.55	-3.72	-21.56	0.00	-0.00	1.85	0.00
56	9.88	6.05	0.23	7.61	2.27	1.56	-1.91	1.56	1.56	6.05	0.00
57	9.22	4.84	0.23	7.10	2.12	2.26	0.00	3.00	1.44	4.84	0.82
58	6.02	3.92	0.23	4.64	1.38	0.72	0.00	3.00	0.00	3.92	0.72
59	5.68	2.63	0.23	4.37	1.31	1.74	0.00	3.00	0.00	2.63	1.74
60	2.82	2.11	0.23	2.17	0.65	0.06	0.00	3.00	0.00	2.11	0.06
61	1.80	2.27	0.23	1.39	0.41	-0.88	-0.88	2.21	-0.79	2.17	0.00
62	2.45	2.22	0.23	1.89	0.56	-0.33	-1.21	1.98	-0.24	2.12	0.00
63	1.41	3.09	0.23	1.09	0.32	-2.00	-3.22	1.00	-0.98	2.06	0.00
64	2.08	4.17	0.23	1.60	0.48	-2.57	-5.79	0.42	-0.58	2.18	0.00
65	11.99	4.56	0.23	9.23	2.76	4.67	0.00	3.00	2.58	4.56	2.08
66	2.42	5.73	0.23	1.86	0.56	-3.87	-3.87	0.80	-2.20	4.06	0.00
67	4.16	5.52	0.23	3.20	0.96	-2.32	-6.19	0.36	-0.44	3.64	0.00
68	2.44	5.72	0.23	1.88	0.56	-3.84	-10.03	0.10	-0.26	2.14	0.00
69	3.78	4.72	0.23	2.91	0.87	-1.81	-11.84	0.05	-0.04	2.96	0.00
70	3.35	3.62	0.23	2.58	0.77	-1.04	-12.88	0.04	-0.02	2.60	0.00
71	1.07	3.95	0.23	0.82	0.25	-3.12	-16.00	0.01	-0.02	0.85	0.00
72	1.18	2.72	0.23	0.91	0.27	-1.81	-17.81	0.01	-0.01	0.91	0.00
73	1.60	3.37	0.23	1.23	0.37	-2.14	-19.95	0.00	-0.00	1.24	0.00
74	1.74	3.10	0.23	1.34	0.40	-1.76	-21.71	0.00	-0.00	1.34	0.00
75	4.81	3.54	0.23	3.70	1.11	0.16	-8.51	0.16	0.16	3.54	0.00
76	5.95	4.07	0.23	4.58	1.37	0.51	-4.35	0.68	0.51	4.07	0.00
77	4.32	4.53	0.23	3.33	0.99	-1.20	-5.55	0.45	-0.23	3.55	0.00
78	4.02	6.05	0.23	3.10	0.92	-2.96	-8.51	0.16	-0.29	3.38	0.00
79	2.13	5.27	0.23	1.64	0.49	-3.63	-12.14	0.05	-0.12	1.76	0.00
80	1.48	6.20	0.23	1.14	0.34	-5.06	-17.20	0.01	-0.04	1.18	0.00
81	2.68	3.90	0.23	2.06	0.62	-1.84	-19.03	0.00	-0.00	2.07	0.00
82	5.77	3.62	0.23	4.44	1.33	0.82	-3.76	0.83	0.82	3.62	0.00
83	3.27	1.86	0.23	2.52	0.75	0.66	-2.05	1.48	0.66	1.86	0.00
84	4.05	2.45	0.23	3.12	0.93	0.67	-0.97	2.15	0.67	2.45	0.00
85	2.14	1.43	0.23	1.65	0.49	0.21	-0.69	2.37	0.21	1.43	0.00
86	3.55	2.90	0.23	2.73	0.82	-0.16	-0.85	2.23	-0.13	2.86	0.00
87	2.06	3.81	0.23	1.59	0.47	-2.22	-3.08	1.05	-1.19	2.77	0.00
88	8.81	4.38	0.23	6.78	2.03	2.41	0.00	3.00	1.95	4.38	0.46
89	1.56	5.21	0.23	1.20	0.36	-4.01	-4.01	0.76	-2.24	3.44	0.00
90	1.35	6.78	0.23	1.04	0.31	-5.74	-9.74	0.11	-0.65	1.69	0.00
91	0.31	7.10	0.23	0.24	0.07	-6.86	-16.60	0.01	-0.10	0.34	0.00
92	1.35	6.50	0.23	1.04	0.31	-5.46	-22.06	0.00	-0.01	1.05	0.00
93	1.69	6.16	0.23	1.30	0.39	-4.86	-26.92	0.00	-0.00	1.30	0.00
94	0.79	4.64	0.23	0.61	0.18	-4.03	-30.95	0.00	-0.00	0.61	0.00
95	3.10	3.24	0.23	2.39	0.71	-0.85	-31.80	0.00	-0.00	2.39	0.00
96	2.67	3.07	0.23	2.06	0.61	-1.02	-32.82	0.00	-0.00	2.06	0.00
97	4.51	1.92	0.23	3.47	1.04	1.55	-1.93	1.55	1.55	1.92	0.00
98	2.62	1.98	0.23	2.02	0.60	0.04	-1.86	1.58	0.04	1.98	0.00
99	2.72	4.39	0.23	2.09	0.63	-2.29	-4.16	0.72	-0.86	2.96	0.00
%100	1.37	4.99	0.23	1.05	0.32	-3.94	-8.09	0.19	-0.53	1.59	0.0
%101	2.52	5.91	0.23	1.94	0.58	-3.97	-12.06	0.05	-0.14	2.08	0.0
%102	2.44	6.32	0.23	1.88	0.56	-4.44	-16.50	0.01	-0.04	1.92	0.0
%103	1.26	6.53	0.23	0.97	0.29	-5.56	-22.07	0.00	-0.01	0.98	0.0
%104	0.57	6.53	0.23	0.44	0.13	-6.09	-28.16	0.00	-0.00	0.44	0.0
%105	6.50	4.78	0.23	5.01	1.50	0.22	-7.59	0.22	0.22	4.78	0.0
%106	0.41	5.19	0.23	0.32	0.09	-4.87	-12.46	0.04	-0.18	0.50	0.0
%107	6.31	2.86	0.23	4.86	1.45	2.00	-1.12	2.05	2.00	2.86	0.0
%108	3.17	2.18	0.23	2.44	0.73	0.26	-0.77	2.30	0.26	2.18	0.0
%109	3.70	1.74	0.23	2.85	0.85	1.11	0.00	3.00	0.70	1.74	0.4
%110	4.08	2.24	0.23	3.14	0.94	0.90	0.00	3.00	0.00	2.24	0.9
%111	5.54	4.35	0.23	4.27	1.27	-0.08	-0.08	2.91	-0.09	4.36	0.0
%112	4.74	4.27	0.23	3.65	1.09	-0.62	-0.70	2.35	-0.56	4.20	0.0
%113	11.05	5.26	0.23	8.51	2.54	3.25	0.00	3.00	0.65	5.26	2.6
%114	1.30	5.70	0.23	1.00	0.30	-4.70	-4.70	0.60	-2.40	3.40	0.0
%115	4.48	5.40	0.23	3.45	1.03	-1.95	-6.66	0.31	-0.29	3.74	0.0
%116	3.81	5.66	0.23	2.93	0.88	-2.72	-9.38	0.12	-0.19	3.12	0.0

%117	3.20	4.55	0.23	2.46	0.74	-2.09	-11.47	0.06	-0.06	2.53	0.0
%118	1.70	4.09	0.23	1.31	0.39	-2.78	-14.25	0.02	-0.04	1.35	0.0
%119	0.77	2.69	0.23	0.59	0.18	-2.10	-16.34	0.01	-0.01	0.60	0.0
%120	3.32	1.63	0.23	2.56	0.76	0.93	-3.40	0.94	0.93	1.63	0.0
%121	3.12	1.88	0.23	2.40	0.72	0.53	-2.10	1.46	0.53	1.88	0.0
%122	1.94	2.69	0.23	1.49	0.45	-1.20	-3.30	0.97	-0.49	1.99	0.0
%123	5.04	3.26	0.23	3.88	1.16	0.62	-1.86	1.59	0.62	3.26	0.0
%124	2.38	4.62	0.23	1.83	0.55	-2.79	-4.64	0.61	-0.98	2.81	0.0
%125	4.31	4.77	0.23	3.32	0.99	-1.45	-6.09	0.37	-0.24	3.56	0.0
%126	0.10	7.34	0.23	0.08	0.02	-7.26	-13.35	0.03	-0.34	0.42	0.0
%127	0.06	8.57	0.23	0.05	0.01	-8.53	-21.88	0.00	-0.03	0.08	0.0
%128	1.67	7.79	0.23	1.29	0.38	-6.51	-28.38	0.00	-0.00	1.29	0.0
%129	4.28	5.18	0.23	3.30	0.98	-1.88	-30.27	0.00	-0.00	3.30	0.0
%130	3.93	4.52	0.23	3.03	0.90	-1.50	-31.76	0.00	-0.00	3.03	0.0
%131	4.58	2.87	0.23	3.53	1.05	0.66	-4.44	0.66	0.66	2.87	0.0
%132	0.50	2.43	0.23	0.38	0.12	-2.04	-6.49	0.33	-0.33	0.71	0.0
%133	2.67	2.45	0.23	2.06	0.61	-0.39	-6.88	0.29	-0.04	2.10	0.0
%134	1.80	2.64	0.23	1.39	0.41	-1.25	-8.13	0.19	-0.10	1.49	0.0
%135	1.88	3.56	0.23	1.45	0.43	-2.11	-10.24	0.09	-0.10	1.54	0.0
%136	0.97	3.95	0.23	0.75	0.22	-3.21	-13.45	0.03	-0.06	0.81	0.0
%137	6.28	5.67	0.23	4.84	1.44	-0.83	-14.28	0.02	-0.01	4.84	0.0
%138	9.48	5.21	0.23	7.30	2.18	2.09	-1.02	2.11	2.09	5.21	0.0
%139	5.35	5.36	0.23	4.12	1.23	-1.24	-2.26	1.38	-0.73	4.85	0.0
%140	2.51	6.39	0.23	1.93	0.58	-4.46	-6.72	0.30	-1.08	3.01	0.0
%141	5.96	4.55	0.23	4.59	1.37	0.04	-6.36	0.34	0.04	4.55	0.0
%142	10.95	3.91	0.23	8.43	2.52	4.53	0.00	3.00	2.66	3.91	1.8
%143	1.93	2.65	0.23	1.49	0.44	-1.16	-1.16	2.01	-0.99	2.47	0.0
%144	0.64	2.60	0.23	0.49	0.15	-2.10	-3.26	0.98	-1.03	1.52	0.0
%145	1.43	2.84	0.23	1.10	0.33	-1.74	-5.01	0.54	-0.44	1.54	0.0
%146	2.26	2.51	0.23	1.74	0.52	-0.77	-5.77	0.42	-0.12	1.86	0.0
%147	2.40	3.29	0.23	1.85	0.55	-1.44	-7.21	0.26	-0.16	2.01	0.0
%148	4.67	3.74	0.23	3.60	1.07	-0.14	-7.35	0.24	-0.01	3.61	0.0
%149	5.35	5.07	0.23	4.12	1.23	-0.96	-8.31	0.18	-0.07	4.19	0.0
%150	2.00	6.80	0.23	1.54	0.46	-5.26	-13.57	0.03	-0.15	1.69	0.0
%151	3.58	7.95	0.23	2.76	0.82	-5.20	-18.77	0.00	-0.02	2.78	0.0
%152	2.96	7.47	0.23	2.28	0.68	-5.19	-23.96	0.00	-0.00	2.28	0.0
%153	3.19	6.76	0.23	2.46	0.73	-4.31	-28.27	0.00	-0.00	2.46	0.0
%154	6.89	4.89	0.23	5.31	1.58	0.42	-5.75	0.42	0.42	4.89	0.0
%155	4.09	3.36	0.23	3.15	0.94	-0.21	-5.96	0.39	-0.03	3.18	0.0
%156	3.05	4.42	0.23	2.35	0.70	-2.07	-8.03	0.19	-0.20	2.55	0.0
%157	3.07	2.07	0.23	2.36	0.71	0.30	-5.29	0.49	0.30	2.07	0.0
%158	4.66	2.39	0.23	3.59	1.07	1.19	-1.68	1.69	1.19	2.39	0.0
%159	5.97	3.86	0.23	4.60	1.37	0.74	-0.62	2.43	0.74	3.86	0.0
%160	0.31	4.73	0.23	0.24	0.07	-4.49	-5.11	0.52	-1.90	2.14	0.0
%161	9.49	6.05	0.23	7.31	2.18	1.26	-1.52	1.78	1.26	6.05	0.0
%162	2.60	5.43	0.23	2.00	0.60	-3.43	-4.95	0.55	-1.23	3.23	0.0
%163	2.46	6.45	0.23	1.89	0.57	-4.55	-9.50	0.12	-0.44	2.33	0.0
%164	7.24	5.68	0.23	5.57	1.67	-0.11	-9.61	0.11	-0.00	5.58	0.0
%165	9.40	5.14	0.23	7.24	2.16	2.10	-0.89	2.21	2.10	5.14	0.0
%166	2.81	4.10	0.23	2.16	0.65	-1.94	-2.82	1.14	-1.07	3.24	0.0
%167	3.25	2.86	0.23	2.50	0.75	-0.35	-3.18	1.01	-0.13	2.63	0.0
%168	1.83	2.40	0.23	1.41	0.42	-0.99	-4.17	0.72	-0.29	1.70	0.0
%169	1.67	2.37	0.23	1.29	0.38	-1.08	-5.25	0.50	-0.22	1.51	0.0
%170	0.99	3.74	0.23	0.76	0.23	-2.98	-8.23	0.18	-0.32	1.08	0.0
%171	4.98	5.62	0.23	3.83	1.15	-1.79	-10.01	0.10	-0.08	3.92	0.0
%172	0.34	6.06	0.23	0.26	0.08	-5.80	-15.81	0.01	-0.08	0.35	0.0
%173	5.76	8.51	0.23	4.44	1.32	-4.08	-19.89	0.00	-0.01	4.45	0.0
%174	4.39	5.97	0.23	3.38	1.01	-2.59	-22.48	0.00	-0.00	3.38	0.0
%175	1.61	5.49	0.23	1.24	0.37	-4.25	-26.73	0.00	-0.00	1.24	0.0
%176	1.83	6.27	0.23	1.41	0.42	-4.86	-31.59	0.00	-0.00	1.41	0.0
%177	0.77	5.24	0.23	0.59	0.18	-4.64	-36.23	0.00	-0.00	0.59	0.0
%178	15.69	4.40	0.23	12.08	3.61	7.68	0.00	3.00	3.00	4.40	4.6
%179	2.38	3.23	0.23	1.83	0.55	-1.40	-1.40	1.85	-1.15	2.98	0.0

%180	2.59	2.34	0.23	1.99	0.60	-0.34	-1.75	1.65	-0.21	2.20	0.0
%181	2.63	2.30	0.23	2.03	0.60	-0.28	-2.02	1.50	-0.15	2.17	0.0
%182	2.82	2.39	0.23	2.17	0.65	-0.22	-2.25	1.39	-0.11	2.28	0.0
%183	2.30	3.34	0.23	1.77	0.53	-1.57	-3.81	0.81	-0.58	2.35	0.0
%184	1.93	4.73	0.23	1.49	0.44	-3.25	-7.06	0.27	-0.55	2.03	0.0
%185	5.29	6.08	0.23	4.07	1.22	-2.01	-9.07	0.14	-0.13	4.21	0.0
%186	1.48	6.53	0.23	1.14	0.34	-5.39	-14.46	0.02	-0.11	1.25	0.0
%187	4.01	7.15	0.23	3.09	0.92	-4.07	-18.53	0.01	-0.02	3.10	0.0
%188	0.13	7.63	0.23	0.10	0.03	-7.53	-26.06	0.00	-0.00	0.11	0.0
%189	6.96	7.25	0.23	5.36	1.60	-1.89	-27.95	0.00	-0.00	5.36	0.0
%190	6.91	4.30	0.23	5.32	1.59	1.02	-3.16	1.02	1.02	4.30	0.0
%191	6.02	3.15	0.23	4.64	1.38	1.49	-0.53	2.50	1.49	3.15	0.0
%192	1.38	1.90	0.23	1.06	0.32	-0.84	-1.37	1.87	-0.63	1.69	0.0
%193	1.02	2.97	0.23	0.79	0.23	-2.19	-3.56	0.89	-0.99	1.77	0.0
%194	1.84	3.67	0.23	1.42	0.42	-2.26	-5.82	0.41	-0.48	1.89	0.0
%195	0.50	5.47	0.23	0.38	0.12	-5.09	-10.91	0.07	-0.34	0.72	0.0
%196	2.53	5.14	0.23	1.95	0.58	-3.20	-14.10	0.02	-0.05	2.00	0.0
%197	8.12	6.44	0.23	6.25	1.87	-0.19	-14.29	0.02	-0.00	6.25	0.0
%198	4.71	5.90	0.23	3.63	1.08	-2.27	-16.56	0.01	-0.01	3.64	0.0
%199	0.06	8.24	0.23	0.05	0.01	-8.19	-24.76	0.00	-0.01	0.06	0.0
%200	7.74	7.36	0.23	5.96	1.78	-1.40	-26.15	0.00	-0.00	5.96	0.0
%201	5.33	5.31	0.23	4.10	1.23	-1.21	-27.36	0.00	-0.00	4.10	0.0
%202	5.85	3.86	0.23	4.50	1.35	0.65	-4.48	0.65	0.65	3.86	0.0
%203	3.44	2.69	0.23	2.65	0.79	-0.04	-4.52	0.64	-0.01	2.66	0.0
%204	4.95	1.81	0.23	3.81	1.14	2.01	-0.36	2.64	2.01	1.81	0.0
%205	0.96	2.25	0.23	0.74	0.22	-1.51	-1.88	1.58	-1.07	1.81	0.0
%206	3.90	2.97	0.23	3.00	0.90	0.03	-1.83	1.60	0.03	2.97	0.0
%207	1.79	4.55	0.23	1.38	0.41	-3.17	-5.00	0.54	-1.06	2.44	0.0
%208	0.68	6.78	0.23	0.52	0.16	-6.26	-11.26	0.06	-0.48	1.00	0.0
%209	9.31	5.28	0.23	7.17	2.14	1.89	-1.25	1.95	1.89	5.28	0.0
%210	10.09	6.92	0.23	7.77	2.32	0.85	-0.20	2.80	0.85	6.92	0.0
%211	1.76	6.73	0.23	1.36	0.40	-5.38	-5.57	0.45	-2.35	3.71	0.0
%212	0.90	9.50	0.23	0.69	0.21	-8.81	-14.38	0.02	-0.42	1.12	0.0
%213	5.34	5.64	0.23	4.11	1.23	-1.53	-15.91	0.01	-0.01	4.12	0.0
%214	0.19	5.42	0.23	0.15	0.04	-5.27	-21.18	0.00	-0.01	0.16	0.0
%215	3.88	3.11	0.23	2.99	0.89	-0.13	-21.31	0.00	-0.00	2.99	0.0
%216	4.54	2.22	0.23	3.50	1.04	1.28	-2.49	1.28	1.28	2.22	0.0
%217	0.81	2.56	0.23	0.62	0.19	-1.93	-4.42	0.66	-0.62	1.24	0.0
%218	1.44	2.96	0.23	1.11	0.33	-1.85	-6.27	0.35	-0.31	1.42	0.0
%219	2.97	4.38	0.23	2.29	0.68	-2.10	-8.37	0.17	-0.18	2.47	0.0
%220	0.28	6.04	0.23	0.22	0.06	-5.83	-14.19	0.02	-0.15	0.36	0.0
%221	2.91	6.49	0.23	2.24	0.67	-4.25	-18.44	0.01	-0.02	2.26	0.0
%222	1.81	7.13	0.23	1.39	0.42	-5.73	-24.18	0.00	-0.00	1.40	0.0
%223	0.96	8.48	0.23	0.74	0.22	-7.74	-31.92	0.00	-0.00	0.74	0.0
%224	0.19	7.89	0.23	0.15	0.04	-7.74	-39.66	0.00	-0.00	0.15	0.0
%225	0.43	6.82	0.23	0.33	0.10	-6.49	-46.15	0.00	-0.00	0.33	0.0
%226	1.37	5.87	0.23	1.05	0.32	-4.81	-50.96	0.00	-0.00	1.05	0.0
%227	1.46	4.12	0.23	1.12	0.34	-3.00	-53.96	0.00	-0.00	1.12	0.0
%228	2.27	2.48	0.23	1.75	0.52	-0.74	-54.70	0.00	-0.00	1.75	0.0
%229	7.07	1.90	0.23	5.44	1.63	3.54	0.00	3.00	3.00	1.90	0.5
%230	1.10	2.61	0.23	0.85	0.25	-1.76	-1.76	1.64	-1.36	2.21	0.0
%231	3.22	3.87	0.23	2.48	0.74	-1.39	-3.16	1.02	-0.62	3.10	0.0
%232	0.51	5.38	0.23	0.39	0.12	-4.98	-8.14	0.19	-0.83	1.23	0.0
%233	5.29	6.82	0.23	4.07	1.22	-2.75	-10.89	0.07	-0.11	4.19	0.0
%234	4.23	5.88	0.23	3.26	0.97	-2.62	-13.51	0.03	-0.04	3.30	0.0
%235	2.70	6.57	0.23	2.08	0.62	-4.49	-18.00	0.01	-0.02	2.10	0.0
%236	3.26	6.78	0.23	2.51	0.75	-4.27	-22.27	0.00	-0.00	2.52	0.0
%237	0.68	6.21	0.23	0.52	0.16	-5.69	-27.95	0.00	-0.00	0.52	0.0
%238	1.93	5.24	0.23	1.49	0.44	-3.76	-31.71	0.00	-0.00	1.49	0.0
%239	1.61	3.80	0.23	1.24	0.37	-2.56	-34.27	0.00	-0.00	1.24	0.0
%240	0.37	2.30	0.23	0.28	0.09	-2.01	-36.28	0.00	-0.00	0.28	0.0

TOTAL PERCOLATION = 20.987

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input data for the present case

number of data points : 240
maximum storage : 3

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.25	1.22	0.41	-0.28	-37.05	0.00	-0.00	1.22	0.00
2	4.40	1.76	0.25	3.30	1.10	1.54	-1.95	1.54	1.54	1.76	0.00
3	3.58	2.57	0.25	2.68	0.89	0.12	-1.74	1.65	0.12	2.57	0.00
4	4.01	2.25	0.25	3.01	1.00	0.75	-0.64	2.41	0.75	2.25	0.00
5	4.22	3.67	0.25	3.16	1.05	-0.50	-1.14	2.02	-0.38	3.55	0.00
6	2.02	3.65	0.25	1.51	0.50	-2.14	-3.28	0.98	-1.05	2.56	0.00
7	0.26	4.86	0.25	0.19	0.06	-4.66	-7.95	0.20	-0.78	0.97	0.00
8	0.23	5.75	0.25	0.17	0.06	-5.58	-13.53	0.03	-0.17	0.34	0.00
9	6.38	3.82	0.25	4.78	1.60	0.96	-3.23	0.99	0.96	3.82	0.00
10	3.84	2.62	0.25	2.88	0.96	0.26	-2.55	1.25	0.26	2.62	0.00
11	0.62	2.87	0.25	0.47	0.16	-2.40	-4.95	0.55	-0.70	1.17	0.00
12	1.40	2.58	0.25	1.05	0.35	-1.53	-6.48	0.33	-0.22	1.27	0.00
13	0.15	2.81	0.25	0.11	0.04	-2.70	-9.18	0.13	-0.20	0.31	0.00
14	1.68	4.00	0.25	1.26	0.42	-2.74	-11.92	0.05	-0.08	1.34	0.00
15	12.00	5.87	0.25	9.00	3.00	3.13	0.00	3.00	2.95	5.87	0.18
16	0.89	4.56	0.25	0.67	0.22	-3.89	-3.89	0.79	-2.21	2.87	0.00
17	5.65	6.00	0.25	4.24	1.41	-1.76	-5.65	0.43	-0.36	4.60	0.00
18	0.76	4.74	0.25	0.57	0.19	-4.17	-9.82	0.10	-0.33	0.90	0.00
19	1.87	8.64	0.25	1.40	0.47	-7.24	-17.06	0.01	-0.10	1.50	0.00
20	3.20	6.27	0.25	2.40	0.80	-3.87	-20.93	0.00	-0.01	2.41	0.00
21	3.31	5.52	0.25	2.48	0.83	-3.04	-23.97	0.00	-0.00	2.48	0.00
22	4.30	3.93	0.25	3.23	1.08	-0.71	-24.68	0.00	-0.00	3.23	0.00
23	2.75	3.30	0.25	2.06	0.69	-1.24	-25.92	0.00	-0.00	2.06	0.00
24	4.63	2.44	0.25	3.47	1.16	1.04	-3.10	1.04	1.04	2.44	0.00
25	1.73	1.77	0.25	1.30	0.43	-0.47	-3.58	0.88	-0.16	1.45	0.00
26	0.50	2.88	0.25	0.38	0.13	-2.50	-6.08	0.38	-0.51	0.88	0.00
27	0.91	4.24	0.25	0.68	0.23	-3.55	-9.63	0.11	-0.26	0.95	0.00
28	1.71	4.03	0.25	1.28	0.43	-2.74	-12.38	0.04	-0.07	1.35	0.00
29	6.38	5.15	0.25	4.78	1.60	-0.37	-12.74	0.04	-0.01	4.79	0.00
30	2.13	5.24	0.25	1.60	0.53	-3.65	-16.39	0.01	-0.03	1.63	0.00
31	2.17	5.74	0.25	1.63	0.54	-4.11	-20.50	0.00	-0.01	1.64	0.00
32	3.60	4.89	0.25	2.70	0.90	-2.19	-22.69	0.00	-0.00	2.70	0.00
33	4.45	4.56	0.25	3.34	1.11	-1.22	-23.91	0.00	-0.00	3.34	0.00
34	3.95	3.95	0.25	2.96	0.99	-0.99	-24.90	0.00	-0.00	2.96	0.00
35	3.26	2.16	0.25	2.44	0.81	0.28	-6.91	0.28	0.28	2.16	0.00
36	1.47	2.12	0.25	1.10	0.37	-1.02	-7.93	0.20	-0.08	1.19	0.00
37	5.51	3.11	0.25	4.13	1.38	1.02	-2.64	1.22	1.02	3.11	0.00
38	2.60	2.27	0.25	1.95	0.65	-0.32	-2.95	1.09	-0.13	2.08	0.00
39	5.17	3.54	0.25	3.88	1.29	0.34	-2.16	1.43	0.34	3.54	0.00
40	6.74	3.96	0.25	5.05	1.68	1.09	-0.50	2.53	1.09	3.96	0.00
41	2.12	4.30	0.25	1.59	0.53	-2.71	-3.21	1.00	-1.53	3.12	0.00
42	6.44	4.77	0.25	4.83	1.61	0.06	-3.03	1.06	0.06	4.77	0.00
43	2.15	4.56	0.25	1.61	0.54	-2.94	-5.97	0.39	-0.68	2.29	0.00
44	1.03	5.52	0.25	0.77	0.26	-4.74	-10.72	0.08	-0.31	1.08	0.00
45	9.44	4.80	0.25	7.08	2.36	2.28	-0.70	2.36	2.28	4.80	0.00
46	10.17	4.25	0.25	7.63	2.54	3.38	0.00	3.00	0.64	4.25	2.73
47	2.40	2.60	0.25	1.80	0.60	-0.80	-0.80	2.28	-0.72	2.52	0.00
48	2.52	2.87	0.25	1.89	0.63	-0.98	-1.78	1.63	-0.65	2.54	0.00
49	4.66	1.75	0.25	3.49	1.16	1.74	0.00	3.00	1.37	1.75	0.38
50	0.13	3.00	0.25	0.10	0.03	-2.90	-2.90	1.11	-1.89	1.99	0.00
51	1.56	3.97	0.25	1.17	0.39	-2.80	-5.70	0.43	-0.68	1.85	0.00
52	1.76	5.22	0.25	1.32	0.44	-3.90	-9.60	0.11	-0.31	1.63	0.00
53	3.09	5.89	0.25	2.32	0.77	-3.57	-13.17	0.03	-0.08	2.40	0.00

54	0.73	5.36	0.25	0.55	0.18	-4.81	-17.98	0.01	-0.03	0.57	0.00
55	2.40	5.57	0.25	1.80	0.60	-3.77	-21.75	0.00	-0.00	1.80	0.00
56	9.88	6.05	0.25	7.41	2.47	1.36	-2.30	1.36	1.36	6.05	0.00
57	9.22	4.84	0.25	6.91	2.31	2.08	0.00	3.00	1.64	4.84	0.44
58	6.02	3.92	0.25	4.51	1.50	0.60	0.00	3.00	0.00	3.92	0.60
59	5.68	2.63	0.25	4.26	1.42	1.63	0.00	3.00	0.00	2.63	1.63
60	2.82	2.11	0.25	2.12	0.70	0.00	0.00	3.00	0.00	2.11	0.00
61	1.80	2.27	0.25	1.35	0.45	-0.92	-0.92	2.19	-0.81	2.16	0.00
62	2.45	2.22	0.25	1.84	0.61	-0.38	-1.30	1.92	-0.27	2.10	0.00
63	1.41	3.09	0.25	1.06	0.35	-2.03	-3.33	0.96	-0.96	2.02	0.00
64	2.08	4.17	0.25	1.56	0.52	-2.61	-5.94	0.39	-0.57	2.13	0.00
65	11.99	4.56	0.25	8.99	3.00	4.43	0.00	3.00	2.61	4.56	1.82
66	2.42	5.73	0.25	1.82	0.61	-3.92	-3.92	0.79	-2.21	4.03	0.00
67	4.16	5.52	0.25	3.12	1.04	-2.40	-6.32	0.35	-0.44	3.56	0.00
68	2.44	5.72	0.25	1.83	0.61	-3.89	-10.21	0.09	-0.25	2.08	0.00
69	3.78	4.72	0.25	2.84	0.94	-1.88	-12.09	0.05	-0.04	2.88	0.00
70	3.35	3.62	0.25	2.51	0.84	-1.11	-13.20	0.03	-0.02	2.53	0.00
71	1.07	3.95	0.25	0.80	0.27	-3.15	-16.34	0.01	-0.02	0.82	0.00
72	1.18	2.72	0.25	0.88	0.29	-1.83	-18.18	0.01	-0.01	0.89	0.00
73	1.60	3.37	0.25	1.20	0.40	-2.17	-20.35	0.00	-0.00	1.20	0.00
74	1.74	3.10	0.25	1.31	0.44	-1.80	-22.15	0.00	-0.00	1.31	0.00
75	4.81	3.54	0.25	3.61	1.20	0.07	-11.12	0.07	0.07	3.54	0.00
76	5.95	4.07	0.25	4.46	1.49	0.40	-5.47	0.46	0.40	4.07	0.00
77	4.32	4.53	0.25	3.24	1.08	-1.29	-6.76	0.30	-0.16	3.40	0.00
78	4.02	6.05	0.25	3.01	1.00	-3.04	-9.80	0.11	-0.19	3.21	0.00
79	2.13	5.27	0.25	1.60	0.53	-3.67	-13.47	0.03	-0.08	1.67	0.00
80	1.48	6.20	0.25	1.11	0.37	-5.09	-18.56	0.01	-0.02	1.13	0.00
81	2.68	3.90	0.25	2.01	0.67	-1.89	-20.44	0.00	-0.00	2.01	0.00
82	5.77	3.62	0.25	4.33	1.44	0.71	-4.21	0.71	0.71	3.62	0.00
83	3.27	1.86	0.25	2.45	0.82	0.59	-2.44	1.30	0.59	1.86	0.00
84	4.05	2.45	0.25	3.04	1.01	0.59	-1.35	1.89	0.59	2.45	0.00
85	2.14	1.43	0.25	1.61	0.54	0.17	-1.10	2.06	0.17	1.43	0.00
86	3.55	2.90	0.25	2.66	0.89	-0.24	-1.33	1.90	-0.16	2.82	0.00
87	2.06	3.81	0.25	1.54	0.51	-2.26	-3.59	0.88	-1.02	2.57	0.00
88	8.81	4.38	0.25	6.61	2.20	2.23	0.00	3.00	2.12	4.38	0.11
89	1.56	5.21	0.25	1.17	0.39	-4.04	-4.04	0.75	-2.25	3.42	0.00
90	1.35	6.78	0.25	1.01	0.34	-5.76	-9.80	0.11	-0.65	1.66	0.00
91	0.31	7.10	0.25	0.23	0.08	-6.87	-16.67	0.01	-0.10	0.33	0.00
92	1.35	6.50	0.25	1.01	0.34	-5.48	-22.15	0.00	-0.01	1.02	0.00
93	1.69	6.16	0.25	1.27	0.42	-4.89	-27.04	0.00	-0.00	1.27	0.00
94	0.79	4.64	0.25	0.59	0.20	-4.05	-31.09	0.00	-0.00	0.59	0.00
95	3.10	3.24	0.25	2.32	0.77	-0.92	-32.01	0.00	-0.00	2.33	0.00
96	2.67	3.07	0.25	2.00	0.67	-1.07	-33.08	0.00	-0.00	2.00	0.00
97	4.51	1.92	0.25	3.38	1.13	1.46	-2.11	1.46	1.46	1.92	0.00
98	2.62	1.98	0.25	1.96	0.65	-0.02	-2.12	1.45	-0.01	1.97	0.00
99	2.72	4.39	0.25	2.04	0.68	-2.35	-4.47	0.65	-0.80	2.84	0.00
%100	1.37	4.99	0.25	1.03	0.34	-3.96	-8.44	0.17	-0.48	1.51	0.0
%101	2.52	5.91	0.25	1.89	0.63	-4.02	-12.45	0.04	-0.13	2.02	0.0
%102	2.44	6.32	0.25	1.83	0.61	-4.49	-16.95	0.01	-0.03	1.86	0.0
%103	1.26	6.53	0.25	0.94	0.31	-5.59	-22.53	0.00	-0.01	0.95	0.0
%104	0.57	6.53	0.25	0.43	0.14	-6.10	-28.64	0.00	-0.00	0.43	0.0
%105	6.50	4.78	0.25	4.88	1.63	0.09	-10.13	0.09	0.09	4.78	0.0
%106	0.41	5.19	0.25	0.31	0.10	-4.88	-15.01	0.02	-0.08	0.38	0.0
%107	6.31	2.86	0.25	4.73	1.58	1.88	-1.34	1.89	1.88	2.86	0.0
%108	3.17	2.18	0.25	2.38	0.79	0.19	-1.06	2.09	0.19	2.18	0.0
%109	3.70	1.74	0.25	2.78	0.93	1.04	0.00	3.00	0.91	1.74	0.1
%110	4.08	2.24	0.25	3.06	1.02	0.82	0.00	3.00	0.00	2.24	0.8
%111	5.54	4.35	0.25	4.15	1.38	-0.19	-0.19	2.80	-0.20	4.35	0.0
%112	4.74	4.27	0.25	3.55	1.18	-0.72	-0.91	2.19	-0.61	4.16	0.0
%113	11.05	5.26	0.25	8.29	2.76	3.03	0.00	3.00	0.81	5.26	2.2
%114	1.30	5.70	0.25	0.97	0.32	-4.73	-4.73	0.60	-2.40	3.38	0.0
%115	4.48	5.40	0.25	3.36	1.12	-2.04	-6.77	0.30	-0.30	3.66	0.0
%116	3.81	5.66	0.25	2.86	0.95	-2.80	-9.57	0.11	-0.18	3.04	0.0

%117	3.20	4.55	0.25	2.40	0.80	-2.15	-11.72	0.05	-0.06	2.46	0.0
%118	1.70	4.09	0.25	1.28	0.43	-2.81	-14.54	0.02	-0.03	1.31	0.0
%119	0.77	2.69	0.25	0.58	0.19	-2.11	-16.65	0.01	-0.01	0.59	0.0
%120	3.32	1.63	0.25	2.49	0.83	0.86	-3.62	0.87	0.86	1.63	0.0
%121	3.12	1.88	0.25	2.34	0.78	0.46	-2.37	1.33	0.46	1.88	0.0
%122	1.94	2.69	0.25	1.46	0.49	-1.24	-3.61	0.87	-0.46	1.92	0.0
%123	5.04	3.26	0.25	3.78	1.26	0.52	-2.25	1.39	0.52	3.26	0.0
%124	2.38	4.62	0.25	1.79	0.60	-2.83	-5.08	0.53	-0.86	2.65	0.0
%125	4.31	4.77	0.25	3.23	1.08	-1.53	-6.62	0.31	-0.22	3.45	0.0
%126	0.10	7.34	0.25	0.08	0.03	-7.26	-13.88	0.03	-0.29	0.36	0.0
%127	0.06	8.57	0.25	0.04	0.01	-8.53	-22.41	0.00	-0.02	0.07	0.0
%128	1.67	7.79	0.25	1.25	0.42	-6.54	-28.94	0.00	-0.00	1.25	0.0
%129	4.28	5.18	0.25	3.21	1.07	-1.97	-30.91	0.00	-0.00	3.21	0.0
%130	3.93	4.52	0.25	2.95	0.98	-1.57	-32.49	0.00	-0.00	2.95	0.0
%131	4.58	2.87	0.25	3.43	1.14	0.57	-4.88	0.57	0.57	2.87	0.0
%132	0.50	2.43	0.25	0.38	0.13	-2.05	-6.94	0.28	-0.28	0.66	0.0
%133	2.67	2.45	0.25	2.00	0.67	-0.45	-7.38	0.24	-0.04	2.04	0.0
%134	1.80	2.64	0.25	1.35	0.45	-1.29	-8.67	0.15	-0.09	1.44	0.0
%135	1.88	3.56	0.25	1.41	0.47	-2.15	-10.82	0.07	-0.08	1.49	0.0
%136	0.97	3.95	0.25	0.73	0.24	-3.23	-14.05	0.02	-0.05	0.78	0.0
%137	6.28	5.67	0.25	4.71	1.57	-0.96	-15.01	0.02	-0.01	4.72	0.0
%138	9.48	5.21	0.25	7.11	2.37	1.90	-1.30	1.92	1.90	5.21	0.0
%139	5.35	5.36	0.25	4.01	1.34	-1.35	-2.65	1.21	-0.71	4.72	0.0
%140	2.51	6.39	0.25	1.88	0.63	-4.51	-7.16	0.26	-0.95	2.83	0.0
%141	5.96	4.55	0.25	4.47	1.49	-0.08	-7.24	0.25	-0.01	4.48	0.0
%142	10.95	3.91	0.25	8.21	2.74	4.31	0.00	3.00	2.75	3.91	1.5
%143	1.93	2.65	0.25	1.45	0.48	-1.20	-1.20	1.99	-1.01	2.46	0.0
%144	0.64	2.60	0.25	0.48	0.16	-2.12	-3.32	0.96	-1.02	1.50	0.0
%145	1.43	2.84	0.25	1.07	0.36	-1.77	-5.09	0.53	-0.44	1.51	0.0
%146	2.26	2.51	0.25	1.69	0.56	-0.81	-5.90	0.40	-0.13	1.82	0.0
%147	2.40	3.29	0.25	1.80	0.60	-1.49	-7.39	0.24	-0.16	1.96	0.0
%148	4.67	3.74	0.25	3.50	1.17	-0.24	-7.62	0.22	-0.02	3.52	0.0
%149	5.35	5.07	0.25	4.01	1.34	-1.06	-8.68	0.15	-0.07	4.08	0.0
%150	2.00	6.80	0.25	1.50	0.50	-5.30	-13.99	0.03	-0.13	1.63	0.0
%151	3.58	7.95	0.25	2.68	0.89	-5.27	-19.25	0.00	-0.02	2.71	0.0
%152	2.96	7.47	0.25	2.22	0.74	-5.25	-24.50	0.00	-0.00	2.22	0.0
%153	3.19	6.76	0.25	2.39	0.80	-4.37	-28.87	0.00	-0.00	2.39	0.0
%154	6.89	4.89	0.25	5.17	1.72	0.28	-6.92	0.28	0.28	4.89	0.0
%155	4.09	3.36	0.25	3.07	1.02	-0.29	-7.21	0.26	-0.03	3.09	0.0
%156	3.05	4.42	0.25	2.29	0.76	-2.13	-9.34	0.12	-0.13	2.42	0.0
%157	3.07	2.07	0.25	2.30	0.77	0.24	-6.20	0.36	0.24	2.07	0.0
%158	4.66	2.39	0.25	3.49	1.16	1.10	-2.10	1.46	1.10	2.39	0.0
%159	5.97	3.86	0.25	4.48	1.49	0.62	-1.06	2.08	0.62	3.86	0.0
%160	0.31	4.73	0.25	0.23	0.08	-4.50	-5.56	0.45	-1.63	1.87	0.0
%161	9.49	6.05	0.25	7.12	2.37	1.07	-1.99	1.52	1.07	6.05	0.0
%162	2.60	5.43	0.25	1.95	0.65	-3.48	-5.47	0.46	-1.06	3.01	0.0
%163	2.46	6.45	0.25	1.85	0.62	-4.60	-10.07	0.10	-0.37	2.21	0.0
%164	7.24	5.68	0.25	5.43	1.81	-0.25	-10.33	0.09	-0.01	5.44	0.0
%165	9.40	5.14	0.25	7.05	2.35	1.91	-1.18	2.00	1.91	5.14	0.0
%166	2.81	4.10	0.25	2.11	0.70	-1.99	-3.18	1.01	-0.99	3.10	0.0
%167	3.25	2.86	0.25	2.44	0.81	-0.42	-3.59	0.88	-0.13	2.57	0.0
%168	1.83	2.40	0.25	1.37	0.46	-1.03	-4.62	0.62	-0.26	1.63	0.0
%169	1.67	2.37	0.25	1.25	0.42	-1.11	-5.74	0.42	-0.20	1.45	0.0
%170	0.99	3.74	0.25	0.74	0.25	-3.00	-8.73	0.15	-0.27	1.01	0.0
%171	4.98	5.62	0.25	3.74	1.25	-1.89	-10.62	0.08	-0.07	3.81	0.0
%172	0.34	6.06	0.25	0.25	0.09	-5.81	-16.43	0.01	-0.07	0.32	0.0
%173	5.76	8.51	0.25	4.32	1.44	-4.19	-20.62	0.00	-0.01	4.33	0.0
%174	4.39	5.97	0.25	3.29	1.10	-2.68	-23.30	0.00	-0.00	3.29	0.0
%175	1.61	5.49	0.25	1.21	0.40	-4.28	-27.58	0.00	-0.00	1.21	0.0
%176	1.83	6.27	0.25	1.37	0.46	-4.90	-32.48	0.00	-0.00	1.37	0.0
%177	0.77	5.24	0.25	0.58	0.19	-4.66	-37.13	0.00	-0.00	0.58	0.0
%178	15.69	4.40	0.25	11.77	3.92	7.36	0.00	3.00	3.00	4.40	4.3
%179	2.38	3.23	0.25	1.79	0.60	-1.45	-1.45	1.82	-1.18	2.96	0.0

%180	2.59	2.34	0.25	1.94	0.65	-0.40	-1.84	1.59	-0.23	2.17	0.0
%181	2.63	2.30	0.25	1.97	0.66	-0.33	-2.17	1.42	-0.17	2.14	0.0
%182	2.82	2.39	0.25	2.12	0.70	-0.28	-2.45	1.29	-0.13	2.24	0.0
%183	2.30	3.34	0.25	1.72	0.57	-1.61	-4.07	0.75	-0.55	2.27	0.0
%184	1.93	4.73	0.25	1.45	0.48	-3.28	-7.35	0.24	-0.50	1.95	0.0
%185	5.29	6.08	0.25	3.97	1.32	-2.12	-9.47	0.12	-0.13	4.09	0.0
%186	1.48	6.53	0.25	1.11	0.37	-5.42	-14.89	0.02	-0.10	1.21	0.0
%187	4.01	7.15	0.25	3.01	1.00	-4.15	-19.04	0.00	-0.01	3.02	0.0
%188	0.13	7.63	0.25	0.10	0.03	-7.53	-26.57	0.00	-0.00	0.10	0.0
%189	6.96	7.25	0.25	5.22	1.74	-2.03	-28.60	0.00	-0.00	5.22	0.0
%190	6.91	4.30	0.25	5.18	1.73	0.88	-3.59	0.88	0.88	4.30	0.0
%191	6.02	3.15	0.25	4.51	1.50	1.37	-0.85	2.24	1.37	3.15	0.0
%192	1.38	1.90	0.25	1.03	0.34	-0.87	-1.72	1.67	-0.58	1.61	0.0
%193	1.02	2.97	0.25	0.76	0.25	-2.21	-3.93	0.78	-0.88	1.65	0.0
%194	1.84	3.67	0.25	1.38	0.46	-2.30	-6.22	0.36	-0.43	1.81	0.0
%195	0.50	5.47	0.25	0.38	0.13	-5.10	-11.32	0.06	-0.30	0.67	0.0
%196	2.53	5.14	0.25	1.90	0.63	-3.25	-14.57	0.02	-0.04	1.94	0.0
%197	8.12	6.44	0.25	6.09	2.03	-0.35	-14.92	0.02	-0.00	6.09	0.0
%198	4.71	5.90	0.25	3.53	1.18	-2.37	-17.29	0.01	-0.01	3.54	0.0
%199	0.06	8.24	0.25	0.04	0.01	-8.19	-25.48	0.00	-0.01	0.05	0.0
%200	7.74	7.36	0.25	5.80	1.93	-1.55	-27.03	0.00	-0.00	5.81	0.0
%201	5.33	5.31	0.25	4.00	1.33	-1.32	-28.35	0.00	-0.00	4.00	0.0
%202	5.85	3.86	0.25	4.39	1.46	0.53	-5.07	0.53	0.53	3.86	0.0
%203	3.44	2.69	0.25	2.58	0.86	-0.11	-5.17	0.51	-0.02	2.60	0.0
%204	4.95	1.81	0.25	3.71	1.24	1.91	-0.63	2.42	1.91	1.81	0.0
%205	0.96	2.25	0.25	0.72	0.24	-1.53	-2.16	1.43	-0.99	1.71	0.0
%206	3.90	2.97	0.25	2.93	0.98	-0.05	-2.21	1.41	-0.02	2.95	0.0
%207	1.79	4.55	0.25	1.34	0.45	-3.21	-5.42	0.47	-0.94	2.28	0.0
%208	0.68	6.78	0.25	0.51	0.17	-6.27	-11.69	0.06	-0.42	0.93	0.0
%209	9.31	5.28	0.25	6.98	2.33	1.70	-1.56	1.76	1.70	5.28	0.0
%210	10.09	6.92	0.25	7.57	2.52	0.64	-0.64	2.40	0.64	6.92	0.0
%211	1.76	6.73	0.25	1.32	0.44	-5.41	-6.06	0.38	-2.03	3.35	0.0
%212	0.90	9.50	0.25	0.67	0.22	-8.82	-14.88	0.02	-0.36	1.03	0.0
%213	5.34	5.64	0.25	4.01	1.34	-1.64	-16.52	0.01	-0.01	4.01	0.0
%214	0.19	5.42	0.25	0.14	0.05	-5.28	-21.79	0.00	-0.01	0.15	0.0
%215	3.88	3.11	0.25	2.91	0.97	-0.20	-22.00	0.00	-0.00	2.91	0.0
%216	4.54	2.22	0.25	3.40	1.13	1.19	-2.71	1.19	1.19	2.22	0.0
%217	0.81	2.56	0.25	0.61	0.20	-1.95	-4.66	0.61	-0.58	1.18	0.0
%218	1.44	2.96	0.25	1.08	0.36	-1.88	-6.54	0.32	-0.29	1.37	0.0
%219	2.97	4.38	0.25	2.23	0.74	-2.15	-8.69	0.15	-0.17	2.39	0.0
%220	0.28	6.04	0.25	0.21	0.07	-5.83	-14.52	0.02	-0.13	0.34	0.0
%221	2.91	6.49	0.25	2.18	0.73	-4.31	-18.83	0.00	-0.02	2.20	0.0
%222	1.81	7.13	0.25	1.36	0.45	-5.77	-24.60	0.00	-0.00	1.36	0.0
%223	0.96	8.48	0.25	0.72	0.24	-7.76	-32.36	0.00	-0.00	0.72	0.0
%224	0.19	7.89	0.25	0.14	0.05	-7.75	-40.11	0.00	-0.00	0.14	0.0
%225	0.43	6.82	0.25	0.32	0.11	-6.50	-46.60	0.00	-0.00	0.32	0.0
%226	1.37	5.87	0.25	1.03	0.34	-4.84	-51.44	0.00	-0.00	1.03	0.0
%227	1.46	4.12	0.25	1.10	0.37	-3.03	-54.47	0.00	-0.00	1.10	0.0
%228	2.27	2.48	0.25	1.70	0.57	-0.78	-55.25	0.00	-0.00	1.70	0.0
%229	7.07	1.90	0.25	5.30	1.77	3.40	0.00	3.00	3.00	1.90	0.4
%230	1.10	2.61	0.25	0.83	0.28	-1.79	-1.79	1.63	-1.37	2.20	0.0
%231	3.22	3.87	0.25	2.41	0.81	-1.46	-3.24	0.99	-0.64	3.05	0.0
%232	0.51	5.38	0.25	0.38	0.13	-4.99	-8.24	0.18	-0.81	1.19	0.0
%233	5.29	6.82	0.25	3.97	1.32	-2.86	-11.09	0.07	-0.11	4.08	0.0
%234	4.23	5.88	0.25	3.17	1.06	-2.71	-13.80	0.03	-0.04	3.21	0.0
%235	2.70	6.57	0.25	2.03	0.68	-4.54	-18.34	0.01	-0.02	2.05	0.0
%236	3.26	6.78	0.25	2.44	0.81	-4.33	-22.67	0.00	-0.00	2.45	0.0
%237	0.68	6.21	0.25	0.51	0.17	-5.70	-28.37	0.00	-0.00	0.51	0.0
%238	1.93	5.24	0.25	1.45	0.48	-3.80	-32.17	0.00	-0.00	1.45	0.0
%239	1.61	3.80	0.25	1.21	0.40	-2.59	-34.76	0.00	-0.00	1.21	0.0
%240	0.37	2.30	0.25	0.28	0.09	-2.02	-36.78	0.00	-0.00	0.28	0.0

TOTAL PERCOLATION = 17.379

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input data for the present case

number of data points : 240
maximum storage : 6

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.07	1.52	0.11	0.02	-29.82	0.04	0.02	1.50	0.00
2	4.40	1.76	0.07	4.09	0.31	2.33	-5.44	2.36	2.33	1.76	0.00
3	3.58	2.57	0.07	3.33	0.25	0.76	-3.81	3.13	0.76	2.57	0.00
4	4.01	2.25	0.07	3.73	0.28	1.48	-1.54	4.60	1.48	2.25	0.00
5	4.22	3.67	0.07	3.92	0.30	0.26	-1.23	4.86	0.26	3.67	0.00
6	2.02	3.65	0.07	1.88	0.14	-1.78	-3.00	3.58	-1.27	3.15	0.00
7	0.26	4.86	0.07	0.24	0.02	-4.62	-7.62	1.63	-1.95	2.20	0.00
8	0.23	5.75	0.07	0.21	0.02	-5.54	-13.16	0.63	-1.00	1.21	0.00
9	6.38	3.82	0.07	5.93	0.45	2.11	-4.57	2.74	2.11	3.82	0.00
10	3.84	2.62	0.07	3.57	0.27	0.95	-2.82	3.70	0.95	2.62	0.00
11	0.62	2.87	0.07	0.58	0.04	-2.29	-5.12	2.50	-1.20	1.78	0.00
12	1.40	2.58	0.07	1.30	0.10	-1.27	-6.39	2.01	-0.49	1.79	0.00
13	0.15	2.81	0.07	0.14	0.01	-2.67	-9.07	1.27	-0.74	0.88	0.00
14	1.68	4.00	0.07	1.56	0.12	-2.43	-11.50	0.84	-0.43	2.00	0.00
15	12.00	5.87	0.07	11.16	0.84	5.29	0.00	6.00	5.16	5.87	0.13
16	0.89	4.56	0.07	0.83	0.06	-3.73	-3.73	3.17	-2.83	3.66	0.00
17	5.65	6.00	0.07	5.25	0.40	-0.74	-4.47	2.79	-0.38	5.63	0.00
18	0.76	4.74	0.07	0.71	0.05	-4.03	-8.51	1.40	-1.39	2.09	0.00
19	1.87	8.64	0.07	1.74	0.13	-6.90	-15.40	0.43	-0.97	2.71	0.00
20	3.20	6.27	0.07	2.98	0.22	-3.30	-18.70	0.25	-0.19	3.16	0.00
21	3.31	5.52	0.07	3.08	0.23	-2.44	-21.15	0.16	-0.08	3.16	0.00
22	4.30	3.93	0.07	4.00	0.30	0.07	-19.16	0.23	0.07	3.93	0.00
23	2.75	3.30	0.07	2.56	0.19	-0.75	-19.91	0.20	-0.03	2.58	0.00
24	4.63	2.44	0.07	4.31	0.32	1.87	-6.22	2.07	1.87	2.44	0.00
25	1.73	1.77	0.07	1.61	0.12	-0.16	-6.38	2.01	-0.06	1.67	0.00
26	0.50	2.88	0.07	0.47	0.04	-2.41	-8.79	1.33	-0.68	1.14	0.00
27	0.91	4.24	0.07	0.85	0.06	-3.39	-12.18	0.75	-0.59	1.43	0.00
28	1.71	4.03	0.07	1.59	0.12	-2.43	-14.62	0.49	-0.25	1.84	0.00
29	6.38	5.15	0.07	5.93	0.45	0.78	-9.06	1.28	0.78	5.15	0.00
30	2.13	5.24	0.07	1.98	0.15	-3.26	-12.32	0.73	-0.54	2.53	0.00
31	2.17	5.74	0.07	2.02	0.15	-3.72	-16.04	0.39	-0.34	2.36	0.00
32	3.60	4.89	0.07	3.35	0.25	-1.54	-17.58	0.30	-0.09	3.44	0.00
33	4.45	4.56	0.07	4.14	0.31	-0.42	-18.00	0.28	-0.02	4.16	0.00
34	3.95	3.95	0.07	3.67	0.28	-0.28	-18.28	0.26	-0.01	3.69	0.00
35	3.26	2.16	0.07	3.03	0.23	0.87	-9.75	1.13	0.87	2.16	0.00
36	1.47	2.12	0.07	1.37	0.10	-0.75	-10.50	1.00	-0.14	1.50	0.00
37	5.51	3.11	0.07	5.12	0.39	2.01	-4.04	3.01	2.01	3.11	0.00
38	2.60	2.27	0.07	2.42	0.18	0.15	-3.75	3.16	0.15	2.27	0.00
39	5.17	3.54	0.07	4.81	0.36	1.27	-1.77	4.43	1.27	3.54	0.00
40	6.74	3.96	0.07	6.27	0.47	2.31	0.00	6.00	1.57	3.96	0.73
41	2.12	4.30	0.07	1.97	0.15	-2.33	-2.33	4.02	-1.98	3.95	0.00
42	6.44	4.77	0.07	5.99	0.45	1.22	-0.78	5.24	1.22	4.77	0.00
43	2.15	4.56	0.07	2.00	0.15	-2.56	-3.34	3.39	-1.86	3.86	0.00
44	1.03	5.52	0.07	0.96	0.07	-4.56	-7.89	1.56	-1.83	2.79	0.00
45	9.44	4.80	0.07	8.78	0.66	3.98	-0.46	5.53	3.98	4.80	0.00
46	10.17	4.25	0.07	9.46	0.71	5.21	0.00	6.00	0.47	4.25	4.74
47	2.40	2.60	0.07	2.23	0.17	-0.36	-0.36	5.62	-0.38	2.61	0.00
48	2.52	2.87	0.07	2.34	0.18	-0.53	-0.89	5.14	-0.48	2.83	0.00
49	4.66	1.75	0.07	4.33	0.33	2.58	0.00	6.00	0.86	1.75	1.72
50	0.13	3.00	0.07	0.12	0.01	-2.88	-2.88	3.66	-2.34	2.46	0.00
51	1.56	3.97	0.07	1.45	0.11	-2.52	-5.39	2.38	-1.28	2.73	0.00
52	1.76	5.22	0.07	1.64	0.12	-3.59	-8.98	1.29	-1.09	2.73	0.00
53	3.09	5.89	0.07	2.87	0.22	-3.01	-11.99	0.77	-0.52	3.39	0.00

54	0.73	5.36	0.07	0.68	0.05	-4.68	-16.67	0.35	-0.42	1.10	0.00
55	2.40	5.57	0.07	2.23	0.17	-3.34	-20.01	0.20	-0.15	2.38	0.00
56	9.88	6.05	0.07	9.19	0.69	3.14	-3.42	3.34	3.14	6.05	0.00
57	9.22	4.84	0.07	8.57	0.65	3.74	0.00	6.00	2.66	4.84	1.07
58	6.02	3.92	0.07	5.60	0.42	1.68	0.00	6.00	0.00	3.92	1.68
59	5.68	2.63	0.07	5.28	0.40	2.65	0.00	6.00	0.00	2.63	2.65
60	2.82	2.11	0.07	2.62	0.20	0.51	0.00	6.00	0.00	2.11	0.51
61	1.80	2.27	0.07	1.67	0.13	-0.59	-0.59	5.41	-0.59	2.27	0.00
62	2.45	2.22	0.07	2.28	0.17	0.06	-0.54	5.47	0.06	2.22	0.00
63	1.41	3.09	0.07	1.31	0.10	-1.78	-2.31	4.03	-1.43	2.74	0.00
64	2.08	4.17	0.07	1.93	0.15	-2.24	-4.55	2.75	-1.28	3.21	0.00
65	11.99	4.56	0.07	11.15	0.84	6.59	0.00	6.00	3.25	4.56	3.34
66	2.42	5.73	0.07	2.25	0.17	-3.48	-3.48	3.30	-2.70	4.95	0.00
67	4.16	5.52	0.07	3.87	0.29	-1.65	-5.14	2.49	-0.81	4.68	0.00
68	2.44	5.72	0.07	2.27	0.17	-3.45	-8.59	1.38	-1.11	3.38	0.00
69	3.78	4.72	0.07	3.52	0.26	-1.20	-9.79	1.13	-0.26	3.77	0.00
70	3.35	3.62	0.07	3.12	0.23	-0.50	-10.29	1.03	-0.09	3.21	0.00
71	1.07	3.95	0.07	1.00	0.07	-2.95	-13.25	0.62	-0.41	1.40	0.00
72	1.18	2.72	0.07	1.10	0.08	-1.62	-14.86	0.47	-0.15	1.25	0.00
73	1.60	3.37	0.07	1.49	0.11	-1.89	-16.75	0.34	-0.13	1.62	0.00
74	1.74	3.10	0.07	1.62	0.12	-1.48	-18.23	0.27	-0.08	1.69	0.00
75	4.81	3.54	0.07	4.47	0.34	0.93	-9.42	1.20	0.93	3.54	0.00
76	5.95	4.07	0.07	5.53	0.42	1.47	-4.74	2.66	1.47	4.07	0.00
77	4.32	4.53	0.07	4.02	0.30	-0.51	-5.25	2.44	-0.22	4.24	0.00
78	4.02	6.05	0.07	3.74	0.28	-2.32	-7.57	1.64	-0.80	4.54	0.00
79	2.13	5.27	0.07	1.98	0.15	-3.29	-10.86	0.94	-0.71	2.69	0.00
80	1.48	6.20	0.07	1.38	0.10	-4.82	-15.68	0.41	-0.53	1.90	0.00
81	2.68	3.90	0.07	2.49	0.19	-1.41	-17.09	0.32	-0.09	2.58	0.00
82	5.77	3.62	0.07	5.37	0.40	1.75	-6.22	2.07	1.75	3.62	0.00
83	3.27	1.86	0.07	3.04	0.23	1.18	-3.58	3.25	1.18	1.86	0.00
84	4.05	2.45	0.07	3.77	0.28	1.32	-1.59	4.57	1.32	2.45	0.00
85	2.14	1.43	0.07	1.99	0.15	0.56	-0.92	5.12	0.56	1.43	0.00
86	3.55	2.90	0.07	3.30	0.25	0.40	-0.47	5.53	0.40	2.90	0.00
87	2.06	3.81	0.07	1.92	0.14	-1.89	-2.36	4.00	-1.53	3.45	0.00
88	8.81	4.38	0.07	8.19	0.62	3.82	0.00	6.00	2.00	4.38	1.81
89	1.56	5.21	0.07	1.45	0.11	-3.76	-3.76	3.15	-2.85	4.30	0.00
90	1.35	6.78	0.07	1.26	0.09	-5.52	-9.28	1.23	-1.92	3.18	0.00
91	0.31	7.10	0.07	0.29	0.02	-6.81	-16.09	0.38	-0.84	1.13	0.00
92	1.35	6.50	0.07	1.26	0.09	-5.24	-21.33	0.16	-0.23	1.48	0.00
93	1.69	6.16	0.07	1.57	0.12	-4.59	-25.92	0.07	-0.09	1.66	0.00
94	0.79	4.64	0.07	0.73	0.06	-3.91	-29.82	0.04	-0.03	0.77	0.00
95	3.10	3.24	0.07	2.88	0.22	-0.36	-30.18	0.03	-0.00	2.89	0.00
96	2.67	3.07	0.07	2.48	0.19	-0.59	-30.77	0.03	-0.00	2.49	0.00
97	4.51	1.92	0.07	4.19	0.32	2.27	-5.60	2.30	2.27	1.92	0.00
98	2.62	1.98	0.07	2.44	0.18	0.46	-4.54	2.76	0.46	1.98	0.00
99	2.72	4.39	0.07	2.53	0.19	-1.86	-6.40	2.01	-0.75	3.28	0.00
%100	1.37	4.99	0.07	1.27	0.10	-3.72	-10.12	1.06	-0.94	2.22	0.0
%101	2.52	5.91	0.07	2.34	0.18	-3.56	-13.68	0.58	-0.48	2.83	0.0
%102	2.44	6.32	0.07	2.27	0.17	-4.05	-17.74	0.29	-0.29	2.56	0.0
%103	1.26	6.53	0.07	1.17	0.09	-5.36	-23.10	0.12	-0.17	1.35	0.0
%104	0.57	6.53	0.07	0.53	0.04	-6.00	-29.10	0.04	-0.07	0.60	0.0
%105	6.50	4.78	0.07	6.05	0.46	1.26	-8.92	1.31	1.26	4.78	0.0
%106	0.41	5.19	0.07	0.38	0.03	-4.81	-13.72	0.57	-0.73	1.11	0.0
%107	6.31	2.86	0.07	5.87	0.44	3.01	-3.00	3.59	3.01	2.86	0.0
%108	3.17	2.18	0.07	2.95	0.22	0.76	-1.87	4.35	0.76	2.18	0.0
%109	3.70	1.74	0.07	3.44	0.26	1.71	0.00	6.00	1.65	1.74	0.0
%110	4.08	2.24	0.07	3.79	0.29	1.55	0.00	6.00	0.00	2.24	1.5
%111	5.54	4.35	0.07	5.15	0.39	0.81	0.00	6.00	0.00	4.35	0.8
%112	4.74	4.27	0.07	4.41	0.33	0.14	0.00	6.00	0.00	4.27	0.1
%113	11.05	5.26	0.07	10.28	0.77	5.02	0.00	6.00	0.00	5.26	5.0
%114	1.30	5.70	0.07	1.21	0.09	-4.50	-4.50	2.78	-3.22	4.43	0.0
%115	4.48	5.40	0.07	4.17	0.31	-1.24	-5.73	2.25	-0.53	4.70	0.0
%116	3.81	5.66	0.07	3.54	0.27	-2.11	-7.85	1.57	-0.68	4.22	0.0

%117	3.20	4.55	0.07	2.98	0.22	-1.57	-9.42	1.20	-0.37	3.35	0.0
%118	1.70	4.09	0.07	1.58	0.12	-2.51	-11.93	0.78	-0.42	2.00	0.0
%119	0.77	2.69	0.07	0.72	0.05	-1.97	-13.90	0.56	-0.22	0.94	0.0
%120	3.32	1.63	0.07	3.09	0.23	1.46	-6.38	2.01	1.46	1.63	0.0
%121	3.12	1.88	0.07	2.90	0.22	1.03	-3.97	3.04	1.03	1.88	0.0
%122	1.94	2.69	0.07	1.80	0.14	-0.89	-4.86	2.61	-0.43	2.23	0.0
%123	5.04	3.26	0.07	4.69	0.35	1.43	-2.31	4.03	1.43	3.26	0.0
%124	2.38	4.62	0.07	2.21	0.17	-2.41	-4.72	2.67	-1.36	3.57	0.0
%125	4.31	4.77	0.07	4.01	0.30	-0.76	-5.48	2.35	-0.32	4.33	0.0
%126	0.10	7.34	0.07	0.09	0.01	-7.24	-12.72	0.68	-1.67	1.76	0.0
%127	0.06	8.57	0.07	0.06	0.00	-8.52	-21.24	0.16	-0.52	0.58	0.0
%128	1.67	7.79	0.07	1.55	0.12	-6.24	-27.48	0.05	-0.10	1.66	0.0
%129	4.28	5.18	0.07	3.98	0.30	-1.20	-28.68	0.04	-0.01	3.99	0.0
%130	3.93	4.52	0.07	3.65	0.28	-0.87	-29.55	0.04	-0.01	3.66	0.0
%131	4.58	2.87	0.07	4.26	0.32	1.39	-8.39	1.43	1.39	2.87	0.0
%132	0.50	2.43	0.07	0.47	0.04	-1.96	-10.36	1.02	-0.41	0.87	0.0
%133	2.67	2.45	0.07	2.48	0.19	0.03	-10.17	1.05	0.03	2.45	0.0
%134	1.80	2.64	0.07	1.67	0.13	-0.97	-11.14	0.89	-0.16	1.83	0.0
%135	1.88	3.56	0.07	1.75	0.13	-1.81	-12.94	0.66	-0.24	1.99	0.0
%136	0.97	3.95	0.07	0.90	0.07	-3.05	-16.00	0.39	-0.27	1.17	0.0
%137	6.28	5.67	0.07	5.84	0.44	0.17	-13.87	0.56	0.17	5.67	0.0
%138	9.48	5.21	0.07	8.82	0.66	3.61	-2.12	4.17	3.61	5.21	0.0
%139	5.35	5.36	0.07	4.98	0.37	-0.39	-2.51	3.90	-0.27	5.25	0.0
%140	2.51	6.39	0.07	2.33	0.18	-4.06	-6.56	1.95	-1.95	4.28	0.0
%141	5.96	4.55	0.07	5.54	0.42	0.99	-4.16	2.94	0.99	4.55	0.0
%142	10.95	3.91	0.07	10.18	0.77	6.28	0.00	6.00	3.06	3.91	3.2
%143	1.93	2.65	0.07	1.79	0.14	-0.85	-0.85	5.17	-0.83	2.62	0.0
%144	0.64	2.60	0.07	0.60	0.04	-2.00	-2.85	3.68	-1.50	2.09	0.0
%145	1.43	2.84	0.07	1.33	0.10	-1.51	-4.36	2.84	-0.84	2.17	0.0
%146	2.26	2.51	0.07	2.10	0.16	-0.40	-4.77	2.65	-0.19	2.29	0.0
%147	2.40	3.29	0.07	2.23	0.17	-1.06	-5.83	2.21	-0.44	2.67	0.0
%148	4.67	3.74	0.07	4.34	0.33	0.61	-4.41	2.82	0.61	3.74	0.0
%149	5.35	5.07	0.07	4.98	0.37	-0.10	-4.51	2.77	-0.05	5.02	0.0
%150	2.00	6.80	0.07	1.86	0.14	-4.94	-9.46	1.19	-1.58	3.44	0.0
%151	3.58	7.95	0.07	3.33	0.25	-4.62	-14.08	0.54	-0.65	3.98	0.0
%152	2.96	7.47	0.07	2.75	0.21	-4.72	-18.80	0.24	-0.30	3.05	0.0
%153	3.19	6.76	0.07	2.97	0.22	-3.80	-22.59	0.13	-0.12	3.08	0.0
%154	6.89	4.89	0.07	6.41	0.48	1.52	-7.55	1.65	1.52	4.89	0.0
%155	4.09	3.36	0.07	3.80	0.29	0.44	-6.16	2.09	0.44	3.36	0.0
%156	3.05	4.42	0.07	2.84	0.21	-1.58	-7.74	1.60	-0.50	3.33	0.0
%157	3.07	2.07	0.07	2.86	0.21	0.79	-5.39	2.39	0.79	2.07	0.0
%158	4.66	2.39	0.07	4.33	0.33	1.94	-1.90	4.33	1.94	2.39	0.0
%159	5.97	3.86	0.07	5.55	0.42	1.70	0.00	6.00	1.67	3.86	0.0
%160	0.31	4.73	0.07	0.29	0.02	-4.44	-4.44	2.80	-3.20	3.49	0.0
%161	9.49	6.05	0.07	8.83	0.66	2.78	-0.41	5.58	2.78	6.05	0.0
%162	2.60	5.43	0.07	2.42	0.18	-3.01	-3.43	3.33	-2.25	4.67	0.0
%163	2.46	6.45	0.07	2.29	0.17	-4.16	-7.59	1.64	-1.69	3.98	0.0
%164	7.24	5.68	0.07	6.73	0.51	1.05	-4.69	2.69	1.05	5.68	0.0
%165	9.40	5.14	0.07	8.74	0.66	3.60	0.00	6.00	3.31	5.14	0.2
%166	2.81	4.10	0.07	2.61	0.20	-1.49	-1.49	4.64	-1.36	3.97	0.0
%167	3.25	2.86	0.07	3.02	0.23	0.17	-1.29	4.81	0.17	2.86	0.0
%168	1.83	2.40	0.07	1.70	0.13	-0.70	-1.99	4.26	-0.55	2.25	0.0
%169	1.67	2.37	0.07	1.55	0.12	-0.81	-2.80	3.71	-0.55	2.11	0.0
%170	0.99	3.74	0.07	0.92	0.07	-2.82	-5.62	2.29	-1.42	2.34	0.0
%171	4.98	5.62	0.07	4.63	0.35	-0.99	-6.61	1.94	-0.36	4.99	0.0
%172	0.34	6.06	0.07	0.32	0.02	-5.75	-12.35	0.73	-1.21	1.53	0.0
%173	5.76	8.51	0.07	5.36	0.40	-3.16	-15.51	0.42	-0.30	5.66	0.0
%174	4.39	5.97	0.07	4.08	0.31	-1.89	-17.40	0.31	-0.12	4.20	0.0
%175	1.61	5.49	0.07	1.50	0.11	-3.99	-21.39	0.16	-0.15	1.65	0.0
%176	1.83	6.27	0.07	1.70	0.13	-4.57	-25.96	0.07	-0.08	1.79	0.0
%177	0.77	5.24	0.07	0.72	0.05	-4.52	-30.48	0.03	-0.04	0.75	0.0
%178	15.69	4.40	0.07	14.59	1.10	10.19	0.00	6.00	5.97	4.40	4.2
%179	2.38	3.23	0.07	2.21	0.17	-1.02	-1.02	5.03	-0.97	3.19	0.0

%180	2.59	2.34	0.07	2.41	0.18	0.07	-0.95	5.10	0.07	2.34	0.0
%181	2.63	2.30	0.07	2.45	0.18	0.14	-0.78	5.24	0.14	2.30	0.0
%182	2.82	2.39	0.07	2.62	0.20	0.23	-0.53	5.47	0.23	2.39	0.0
%183	2.30	3.34	0.07	2.14	0.16	-1.20	-1.73	4.45	-1.02	3.16	0.0
%184	1.93	4.73	0.07	1.79	0.14	-2.94	-4.67	2.70	-1.75	3.55	0.0
%185	5.29	6.08	0.07	4.92	0.37	-1.16	-5.83	2.21	-0.49	5.41	0.0
%186	1.48	6.53	0.07	1.38	0.10	-5.15	-10.99	0.92	-1.29	2.67	0.0
%187	4.01	7.15	0.07	3.73	0.28	-3.42	-14.41	0.51	-0.41	4.14	0.0
%188	0.13	7.63	0.07	0.12	0.01	-7.51	-21.92	0.14	-0.37	0.49	0.0
%189	6.96	7.25	0.07	6.47	0.49	-0.78	-22.70	0.12	-0.02	6.49	0.0
%190	6.91	4.30	0.07	6.43	0.48	2.12	-5.74	2.25	2.12	4.30	0.0
%191	6.02	3.15	0.07	5.60	0.42	2.45	-1.43	4.69	2.45	3.15	0.0
%192	1.38	1.90	0.07	1.28	0.10	-0.62	-2.05	4.22	-0.48	1.76	0.0
%193	1.02	2.97	0.07	0.95	0.07	-2.03	-4.07	2.98	-1.23	2.18	0.0
%194	1.84	3.67	0.07	1.71	0.13	-1.96	-6.04	2.13	-0.85	2.56	0.0
%195	0.50	5.47	0.07	0.47	0.04	-5.01	-11.05	0.91	-1.23	1.69	0.0
%196	2.53	5.14	0.07	2.35	0.18	-2.79	-13.84	0.56	-0.34	2.70	0.0
%197	8.12	6.44	0.07	7.55	0.57	1.11	-7.46	1.68	1.11	6.44	0.0
%198	4.71	5.90	0.07	4.38	0.33	-1.52	-8.98	1.29	-0.38	4.76	0.0
%199	0.06	8.24	0.07	0.06	0.00	-8.18	-17.16	0.32	-0.97	1.03	0.0
%200	7.74	7.36	0.07	7.20	0.54	-0.16	-17.32	0.31	-0.01	7.21	0.0
%201	5.33	5.31	0.07	4.96	0.37	-0.36	-17.68	0.29	-0.02	4.98	0.0
%202	5.85	3.86	0.07	5.44	0.41	1.58	-6.80	1.88	1.58	3.86	0.0
%203	3.44	2.69	0.07	3.20	0.24	0.51	-5.39	2.39	0.51	2.69	0.0
%204	4.95	1.81	0.07	4.60	0.35	2.80	-0.84	5.19	2.80	1.81	0.0
%205	0.96	2.25	0.07	0.89	0.07	-1.36	-2.21	4.11	-1.08	1.97	0.0
%206	3.90	2.97	0.07	3.63	0.27	0.65	-1.35	4.76	0.65	2.97	0.0
%207	1.79	4.55	0.07	1.66	0.13	-2.89	-4.23	2.90	-1.85	3.52	0.0
%208	0.68	6.78	0.07	0.63	0.05	-6.15	-10.38	1.02	-1.89	2.52	0.0
%209	9.31	5.28	0.07	8.66	0.65	3.38	-1.81	4.40	3.38	5.28	0.0
%210	10.09	6.92	0.07	9.38	0.71	2.46	0.00	6.00	1.60	6.92	0.8
%211	1.76	6.73	0.07	1.64	0.12	-5.10	-5.10	2.51	-3.49	5.13	0.0
%212	0.90	9.50	0.07	0.84	0.06	-8.66	-13.76	0.57	-1.93	2.77	0.0
%213	5.34	5.64	0.07	4.97	0.37	-0.68	-14.43	0.51	-0.06	5.03	0.0
%214	0.19	5.42	0.07	0.18	0.01	-5.24	-19.68	0.21	-0.30	0.48	0.0
%215	3.88	3.11	0.07	3.61	0.27	0.49	-12.56	0.70	0.49	3.11	0.0
%216	4.54	2.22	0.07	4.22	0.32	2.00	-4.65	2.70	2.00	2.22	0.0
%217	0.81	2.56	0.07	0.75	0.06	-1.80	-6.46	1.99	-0.72	1.47	0.0
%218	1.44	2.96	0.07	1.34	0.10	-1.62	-8.08	1.51	-0.48	1.82	0.0
%219	2.97	4.38	0.07	2.76	0.21	-1.62	-9.70	1.14	-0.36	3.13	0.0
%220	0.28	6.04	0.07	0.26	0.02	-5.78	-15.48	0.43	-0.72	0.98	0.0
%221	2.91	6.49	0.07	2.71	0.20	-3.78	-19.26	0.22	-0.20	2.91	0.0
%222	1.81	7.13	0.07	1.68	0.13	-5.44	-24.70	0.09	-0.14	1.82	0.0
%223	0.96	8.48	0.07	0.89	0.07	-7.59	-32.30	0.02	-0.06	0.96	0.0
%224	0.19	7.89	0.07	0.18	0.01	-7.71	-40.01	0.01	-0.02	0.19	0.0
%225	0.43	6.82	0.07	0.40	0.03	-6.42	-46.43	0.00	-0.00	0.40	0.0
%226	1.37	5.87	0.07	1.27	0.10	-4.59	-51.02	0.00	-0.00	1.28	0.0
%227	1.46	4.12	0.07	1.36	0.10	-2.77	-53.78	0.00	-0.00	1.36	0.0
%228	2.27	2.48	0.07	2.11	0.16	-0.37	-54.16	0.00	-0.00	2.11	0.0
%229	7.07	1.90	0.07	6.58	0.49	4.67	-1.45	4.67	4.67	1.90	0.0
%230	1.10	2.61	0.07	1.02	0.08	-1.59	-3.04	3.56	-1.11	2.14	0.0
%231	3.22	3.87	0.07	2.99	0.23	-0.88	-3.92	3.06	-0.49	3.49	0.0
%232	0.51	5.38	0.07	0.47	0.04	-4.90	-8.82	1.33	-1.74	2.21	0.0
%233	5.29	6.82	0.07	4.92	0.37	-1.91	-10.73	0.96	-0.37	5.29	0.0
%234	4.23	5.88	0.07	3.93	0.30	-1.95	-12.67	0.69	-0.27	4.20	0.0
%235	2.70	6.57	0.07	2.51	0.19	-4.05	-16.73	0.34	-0.34	2.85	0.0
%236	3.26	6.78	0.07	3.03	0.23	-3.74	-20.47	0.18	-0.16	3.19	0.0
%237	0.68	6.21	0.07	0.63	0.05	-5.58	-26.05	0.07	-0.11	0.74	0.0
%238	1.93	5.24	0.07	1.79	0.14	-3.45	-29.50	0.04	-0.03	1.83	0.0
%239	1.61	3.80	0.07	1.50	0.11	-2.30	-31.80	0.03	-0.01	1.51	0.0
%240	0.37	2.30	0.07	0.34	0.03	-1.95	-33.75	0.02	-0.01	0.35	0.0

TOTAL PERCOLATION = 34.579

input data for the present case

number of data points : 240
maximum storage : 6

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.10	1.47	0.16	-0.03	-34.80	0.02	-0.00	1.47	0.00
2	4.40	1.76	0.10	3.96	0.44	2.20	-5.83	2.21	2.20	1.76	0.00
3	3.58	2.57	0.10	3.22	0.36	0.65	-4.32	2.86	0.65	2.57	0.00
4	4.01	2.25	0.10	3.61	0.40	1.36	-2.05	4.22	1.36	2.25	0.00
5	4.22	3.67	0.10	3.80	0.42	0.13	-1.87	4.35	0.13	3.67	0.00
6	2.02	3.65	0.10	1.82	0.20	-1.84	-3.71	3.18	-1.17	2.99	0.00
7	0.26	4.86	0.10	0.23	0.03	-4.62	-8.33	1.44	-1.73	1.97	0.00
8	0.23	5.75	0.10	0.21	0.02	-5.55	-13.88	0.56	-0.88	1.09	0.00
9	6.38	3.82	0.10	5.74	0.64	1.92	-5.16	2.48	1.92	3.82	0.00
10	3.84	2.62	0.10	3.46	0.38	0.84	-3.46	3.32	0.84	2.62	0.00
11	0.62	2.87	0.10	0.56	0.06	-2.31	-5.77	2.23	-1.08	1.64	0.00
12	1.40	2.58	0.10	1.26	0.14	-1.32	-7.09	1.78	-0.45	1.71	0.00
13	0.15	2.81	0.10	0.14	0.02	-2.68	-9.77	1.13	-0.65	0.79	0.00
14	1.68	4.00	0.10	1.51	0.17	-2.49	-12.25	0.74	-0.39	1.90	0.00
15	12.00	5.87	0.10	10.80	1.20	4.93	-0.32	5.67	4.93	5.87	0.00
16	0.89	4.56	0.10	0.80	0.09	-3.76	-4.08	2.98	-2.69	3.49	0.00
17	5.65	6.00	0.10	5.09	0.56	-0.91	-4.99	2.55	-0.43	5.52	0.00
18	0.76	4.74	0.10	0.68	0.08	-4.05	-9.05	1.28	-1.27	1.96	0.00
19	1.87	8.64	0.10	1.68	0.19	-6.95	-16.00	0.39	-0.89	2.57	0.00
20	3.20	6.27	0.10	2.88	0.32	-3.39	-19.40	0.22	-0.17	3.05	0.00
21	3.31	5.52	0.10	2.98	0.33	-2.54	-21.94	0.14	-0.08	3.06	0.00
22	4.30	3.93	0.10	3.87	0.43	-0.06	-22.00	0.14	-0.00	3.87	0.00
23	2.75	3.30	0.10	2.47	0.28	-0.83	-22.83	0.12	-0.02	2.49	0.00
24	4.63	2.44	0.10	4.17	0.46	1.73	-6.87	1.85	1.73	2.44	0.00
25	1.73	1.77	0.10	1.56	0.17	-0.21	-7.08	1.79	-0.07	1.62	0.00
26	0.50	2.88	0.10	0.45	0.05	-2.43	-9.51	1.18	-0.61	1.06	0.00
27	0.91	4.24	0.10	0.82	0.09	-3.42	-12.93	0.66	-0.52	1.34	0.00
28	1.71	4.03	0.10	1.54	0.17	-2.49	-15.41	0.43	-0.23	1.77	0.00
29	6.38	5.15	0.10	5.74	0.64	0.59	-10.36	1.02	0.59	5.15	0.00
30	2.13	5.24	0.10	1.92	0.21	-3.33	-13.68	0.58	-0.44	2.36	0.00
31	2.17	5.74	0.10	1.95	0.22	-3.79	-17.47	0.30	-0.28	2.23	0.00
32	3.60	4.89	0.10	3.24	0.36	-1.65	-19.12	0.23	-0.07	3.31	0.00
33	4.45	4.56	0.10	4.00	0.44	-0.55	-19.67	0.21	-0.02	4.03	0.00
34	3.95	3.95	0.10	3.56	0.40	-0.40	-20.07	0.19	-0.01	3.57	0.00
35	3.26	2.16	0.10	2.93	0.33	0.77	-10.68	0.97	0.77	2.16	0.00
36	1.47	2.12	0.10	1.32	0.15	-0.80	-11.48	0.84	-0.12	1.45	0.00
37	5.51	3.11	0.10	4.96	0.55	1.84	-4.69	2.69	1.84	3.11	0.00
38	2.60	2.27	0.10	2.34	0.26	0.07	-4.54	2.76	0.07	2.27	0.00
39	5.17	3.54	0.10	4.65	0.52	1.12	-2.55	3.88	1.12	3.54	0.00
40	6.74	3.96	0.10	6.07	0.67	2.10	-0.01	5.98	2.10	3.96	0.00
41	2.12	4.30	0.10	1.91	0.21	-2.39	-2.40	3.97	-2.01	3.92	0.00
42	6.44	4.77	0.10	5.80	0.64	1.03	-1.06	5.00	1.03	4.77	0.00
43	2.15	4.56	0.10	1.94	0.22	-2.62	-3.68	3.19	-1.81	3.74	0.00
44	1.03	5.52	0.10	0.93	0.10	-4.59	-8.27	1.46	-1.73	2.66	0.00
45	9.44	4.80	0.10	8.50	0.94	3.69	-0.88	5.15	3.69	4.80	0.00
46	10.17	4.25	0.10	9.15	1.02	4.90	0.00	6.00	0.85	4.25	4.06
47	2.40	2.60	0.10	2.16	0.24	-0.44	-0.44	5.55	-0.45	2.61	0.00
48	2.52	2.87	0.10	2.27	0.25	-0.60	-1.04	5.01	-0.54	2.81	0.00
49	4.66	1.75	0.10	4.19	0.47	2.44	0.00	6.00	0.99	1.75	1.45
50	0.13	3.00	0.10	0.12	0.01	-2.88	-2.88	3.66	-2.34	2.46	0.00
51	1.56	3.97	0.10	1.40	0.16	-2.57	-5.44	2.36	-1.30	2.70	0.00
52	1.76	5.22	0.10	1.58	0.18	-3.64	-9.08	1.27	-1.09	2.68	0.00
53	3.09	5.89	0.10	2.78	0.31	-3.11	-12.19	0.75	-0.52	3.30	0.00

54	0.73	5.36	0.10	0.66	0.07	-4.70	-16.89	0.34	-0.41	1.07	0.00
55	2.40	5.57	0.10	2.16	0.24	-3.41	-20.30	0.19	-0.15	2.31	0.00
56	9.88	6.05	0.10	8.89	0.99	2.84	-3.99	3.03	2.84	6.05	0.00
57	9.22	4.84	0.10	8.30	0.92	3.46	0.00	6.00	2.97	4.84	0.49
58	6.02	3.92	0.10	5.42	0.60	1.50	0.00	6.00	0.00	3.92	1.50
59	5.68	2.63	0.10	5.11	0.57	2.48	0.00	6.00	0.00	2.63	2.48
60	2.82	2.11	0.10	2.54	0.28	0.42	0.00	6.00	0.00	2.11	0.42
61	1.80	2.27	0.10	1.62	0.18	-0.65	-0.65	5.36	-0.64	2.26	0.00
62	2.45	2.22	0.10	2.20	0.25	-0.01	-0.66	5.34	-0.01	2.22	0.00
63	1.41	3.09	0.10	1.27	0.14	-1.82	-2.48	3.92	-1.43	2.69	0.00
64	2.08	4.17	0.10	1.87	0.21	-2.30	-4.78	2.65	-1.27	3.14	0.00
65	11.99	4.56	0.10	10.79	1.20	6.23	0.00	6.00	3.35	4.56	2.87
66	2.42	5.73	0.10	2.18	0.24	-3.55	-3.55	3.26	-2.74	4.92	0.00
67	4.16	5.52	0.10	3.74	0.42	-1.78	-5.33	2.41	-0.85	4.60	0.00
68	2.44	5.72	0.10	2.20	0.24	-3.52	-8.86	1.32	-1.09	3.28	0.00
69	3.78	4.72	0.10	3.40	0.38	-1.32	-10.17	1.05	-0.27	3.67	0.00
70	3.35	3.62	0.10	3.01	0.34	-0.60	-10.78	0.95	-0.10	3.12	0.00
71	1.07	3.95	0.10	0.96	0.11	-2.98	-13.76	0.57	-0.38	1.34	0.00
72	1.18	2.72	0.10	1.06	0.12	-1.65	-15.42	0.43	-0.14	1.20	0.00
73	1.60	3.37	0.10	1.44	0.16	-1.93	-17.35	0.31	-0.12	1.56	0.00
74	1.74	3.10	0.10	1.57	0.17	-1.53	-18.88	0.24	-0.07	1.64	0.00
75	4.81	3.54	0.10	4.33	0.48	0.79	-10.33	1.03	0.79	3.54	0.00
76	5.95	4.07	0.10	5.36	0.59	1.29	-5.57	2.31	1.29	4.07	0.00
77	4.32	4.53	0.10	3.89	0.43	-0.64	-6.21	2.07	-0.24	4.13	0.00
78	4.02	6.05	0.10	3.62	0.40	-2.44	-8.65	1.37	-0.71	4.32	0.00
79	2.13	5.27	0.10	1.92	0.21	-3.35	-12.00	0.77	-0.60	2.51	0.00
80	1.48	6.20	0.10	1.33	0.15	-4.86	-16.86	0.34	-0.44	1.77	0.00
81	2.68	3.90	0.10	2.41	0.27	-1.49	-18.35	0.26	-0.08	2.49	0.00
82	5.77	3.62	0.10	5.19	0.58	1.57	-6.93	1.84	1.57	3.62	0.00
83	3.27	1.86	0.10	2.94	0.33	1.08	-4.21	2.92	1.08	1.86	0.00
84	4.05	2.45	0.10	3.65	0.41	1.20	-2.20	4.11	1.19	2.45	0.00
85	2.14	1.43	0.10	1.93	0.21	0.49	-1.54	4.60	0.49	1.43	0.00
86	3.55	2.90	0.10	3.19	0.35	0.30	-1.18	4.90	0.30	2.90	0.00
87	2.06	3.81	0.10	1.85	0.21	-1.95	-3.13	3.51	-1.39	3.25	0.00
88	8.81	4.38	0.10	7.93	0.88	3.55	0.00	6.00	2.49	4.38	1.06
89	1.56	5.21	0.10	1.40	0.16	-3.80	-3.80	3.13	-2.87	4.28	0.00
90	1.35	6.78	0.10	1.22	0.14	-5.56	-9.36	1.21	-1.92	3.13	0.00
91	0.31	7.10	0.10	0.28	0.03	-6.82	-16.18	0.38	-0.83	1.11	0.00
92	1.35	6.50	0.10	1.22	0.14	-5.28	-21.47	0.15	-0.22	1.44	0.00
93	1.69	6.16	0.10	1.52	0.17	-4.64	-26.10	0.07	-0.08	1.60	0.00
94	0.79	4.64	0.10	0.71	0.08	-3.93	-30.03	0.04	-0.03	0.74	0.00
95	3.10	3.24	0.10	2.79	0.31	-0.45	-30.49	0.03	-0.00	2.79	0.00
96	2.67	3.07	0.10	2.40	0.27	-0.67	-31.16	0.03	-0.00	2.41	0.00
97	4.51	1.92	0.10	4.06	0.45	2.13	-5.96	2.16	2.13	1.92	0.00
98	2.62	1.98	0.10	2.36	0.26	0.38	-5.02	2.54	0.38	1.98	0.00
99	2.72	4.39	0.10	2.45	0.27	-1.94	-6.96	1.82	-0.72	3.17	0.00
%100	1.37	4.99	0.10	1.23	0.14	-3.76	-10.72	0.96	-0.86	2.10	0.0
%101	2.52	5.91	0.10	2.27	0.25	-3.64	-14.36	0.52	-0.44	2.71	0.0
%102	2.44	6.32	0.10	2.20	0.24	-4.12	-18.49	0.26	-0.26	2.46	0.0
%103	1.26	6.53	0.10	1.13	0.13	-5.40	-23.88	0.10	-0.15	1.29	0.0
%104	0.57	6.53	0.10	0.51	0.06	-6.02	-29.90	0.04	-0.07	0.58	0.0
%105	6.50	4.78	0.10	5.85	0.65	1.07	-9.89	1.11	1.07	4.78	0.0
%106	0.41	5.19	0.10	0.37	0.04	-4.82	-14.71	0.49	-0.62	0.99	0.0
%107	6.31	2.86	0.10	5.68	0.63	2.82	-3.47	3.31	2.82	2.86	0.0
%108	3.17	2.18	0.10	2.85	0.32	0.67	-2.40	3.98	0.67	2.18	0.0
%109	3.70	1.74	0.10	3.33	0.37	1.59	-0.42	5.57	1.59	1.74	0.0
%110	4.08	2.24	0.10	3.67	0.41	1.43	0.00	6.00	0.43	2.24	1.0
%111	5.54	4.35	0.10	4.99	0.55	0.64	0.00	6.00	0.00	4.35	0.6
%112	4.74	4.27	0.10	4.27	0.47	-0.00	-0.00	5.98	-0.02	4.29	0.0
%113	11.05	5.26	0.10	9.94	1.11	4.69	0.00	6.00	0.02	5.26	4.6
%114	1.30	5.70	0.10	1.17	0.13	-4.53	-4.53	2.76	-3.24	4.41	0.0
%115	4.48	5.40	0.10	4.03	0.45	-1.37	-5.91	2.18	-0.58	4.61	0.0
%116	3.81	5.66	0.10	3.43	0.38	-2.23	-8.13	1.49	-0.69	4.12	0.0

%117	3.20	4.55	0.10	2.88	0.32	-1.67	-9.80	1.12	-0.37	3.25	0.0
%118	1.70	4.09	0.10	1.53	0.17	-2.56	-12.36	0.73	-0.40	1.93	0.0
%119	0.77	2.69	0.10	0.69	0.08	-2.00	-14.36	0.52	-0.21	0.90	0.0
%120	3.32	1.63	0.10	2.99	0.33	1.36	-6.81	1.87	1.36	1.63	0.0
%121	3.12	1.88	0.10	2.81	0.31	0.93	-4.44	2.81	0.93	1.88	0.0
%122	1.94	2.69	0.10	1.75	0.19	-0.95	-5.39	2.38	-0.42	2.17	0.0
%123	5.04	3.26	0.10	4.54	0.50	1.27	-2.89	3.66	1.27	3.26	0.0
%124	2.38	4.62	0.10	2.14	0.24	-2.48	-5.36	2.39	-1.26	3.41	0.0
%125	4.31	4.77	0.10	3.88	0.43	-0.89	-6.25	2.06	-0.34	4.22	0.0
%126	0.10	7.34	0.10	0.09	0.01	-7.25	-13.50	0.60	-1.46	1.55	0.0
%127	0.06	8.57	0.10	0.05	0.01	-8.52	-22.02	0.14	-0.46	0.51	0.0
%128	1.67	7.79	0.10	1.50	0.17	-6.29	-28.31	0.05	-0.09	1.59	0.0
%129	4.28	5.18	0.10	3.85	0.43	-1.33	-29.64	0.04	-0.01	3.86	0.0
%130	3.93	4.52	0.10	3.54	0.39	-0.98	-30.62	0.03	-0.01	3.54	0.0
%131	4.58	2.87	0.10	4.12	0.46	1.25	-9.02	1.28	1.25	2.87	0.0
%132	0.50	2.43	0.10	0.45	0.05	-1.98	-10.99	0.92	-0.37	0.82	0.0
%133	2.67	2.45	0.10	2.40	0.27	-0.05	-11.04	0.91	-0.01	2.41	0.0
%134	1.80	2.64	0.10	1.62	0.18	-1.02	-12.06	0.76	-0.15	1.77	0.0
%135	1.88	3.56	0.10	1.69	0.19	-1.86	-13.92	0.56	-0.21	1.90	0.0
%136	0.97	3.95	0.10	0.87	0.10	-3.08	-17.01	0.33	-0.23	1.10	0.0
%137	6.28	5.67	0.10	5.65	0.63	-0.02	-17.02	0.33	-0.00	5.65	0.0
%138	9.48	5.21	0.10	8.53	0.95	3.32	-2.90	3.65	3.32	5.21	0.0
%139	5.35	5.36	0.10	4.82	0.54	-0.55	-3.44	3.32	-0.33	5.14	0.0
%140	2.51	6.39	0.10	2.26	0.25	-4.13	-7.58	1.64	-1.68	3.94	0.0
%141	5.96	4.55	0.10	5.36	0.60	0.81	-5.22	2.46	0.81	4.55	0.0
%142	10.95	3.91	0.10	9.85	1.10	5.95	0.00	6.00	3.54	3.91	2.4
%143	1.93	2.65	0.10	1.74	0.19	-0.91	-0.91	5.12	-0.88	2.61	0.0
%144	0.64	2.60	0.10	0.58	0.06	-2.02	-2.93	3.63	-1.49	2.07	0.0
%145	1.43	2.84	0.10	1.29	0.14	-1.56	-4.48	2.78	-0.85	2.13	0.0
%146	2.26	2.51	0.10	2.03	0.23	-0.47	-4.96	2.57	-0.22	2.25	0.0
%147	2.40	3.29	0.10	2.16	0.24	-1.13	-6.09	2.12	-0.45	2.61	0.0
%148	4.67	3.74	0.10	4.20	0.47	0.46	-4.93	2.58	0.46	3.74	0.0
%149	5.35	5.07	0.10	4.82	0.54	-0.26	-5.19	2.47	-0.11	4.93	0.0
%150	2.00	6.80	0.10	1.80	0.20	-5.00	-10.19	1.05	-1.42	3.22	0.0
%151	3.58	7.95	0.10	3.22	0.36	-4.73	-14.92	0.47	-0.58	3.80	0.0
%152	2.96	7.47	0.10	2.66	0.30	-4.80	-19.73	0.21	-0.26	2.93	0.0
%153	3.19	6.76	0.10	2.87	0.32	-3.89	-23.62	0.11	-0.10	2.97	0.0
%154	6.89	4.89	0.10	6.20	0.69	1.31	-8.42	1.42	1.31	4.89	0.0
%155	4.09	3.36	0.10	3.68	0.41	0.32	-7.23	1.74	0.32	3.36	0.0
%156	3.05	4.42	0.10	2.74	0.31	-1.67	-8.90	1.31	-0.43	3.18	0.0
%157	3.07	2.07	0.10	2.76	0.31	0.70	-6.40	2.01	0.70	2.07	0.0
%158	4.66	2.39	0.10	4.19	0.47	1.80	-2.65	3.81	1.80	2.39	0.0
%159	5.97	3.86	0.10	5.37	0.60	1.52	-0.69	5.32	1.52	3.86	0.0
%160	0.31	4.73	0.10	0.28	0.03	-4.45	-5.14	2.49	-2.84	3.12	0.0
%161	9.49	6.05	0.10	8.54	0.95	2.49	-1.08	4.98	2.49	6.05	0.0
%162	2.60	5.43	0.10	2.34	0.26	-3.09	-4.17	2.93	-2.05	4.39	0.0
%163	2.46	6.45	0.10	2.21	0.25	-4.23	-8.41	1.43	-1.51	3.72	0.0
%164	7.24	5.68	0.10	6.52	0.72	0.83	-5.71	2.26	0.83	5.68	0.0
%165	9.40	5.14	0.10	8.46	0.94	3.32	-0.42	5.58	3.32	5.14	0.0
%166	2.81	4.10	0.10	2.53	0.28	-1.57	-1.99	4.26	-1.32	3.85	0.0
%167	3.25	2.86	0.10	2.92	0.33	0.07	-1.90	4.33	0.07	2.86	0.0
%168	1.83	2.40	0.10	1.65	0.18	-0.75	-2.65	3.80	-0.53	2.17	0.0
%169	1.67	2.37	0.10	1.50	0.17	-0.86	-3.52	3.28	-0.52	2.02	0.0
%170	0.99	3.74	0.10	0.89	0.10	-2.85	-6.36	2.02	-1.26	2.15	0.0
%171	4.98	5.62	0.10	4.48	0.50	-1.14	-7.50	1.66	-0.36	4.84	0.0
%172	0.34	6.06	0.10	0.31	0.03	-5.76	-13.26	0.62	-1.04	1.35	0.0
%173	5.76	8.51	0.10	5.18	0.58	-3.33	-16.59	0.35	-0.27	5.45	0.0
%174	4.39	5.97	0.10	3.95	0.44	-2.02	-18.61	0.25	-0.10	4.05	0.0
%175	1.61	5.49	0.10	1.45	0.16	-4.04	-22.65	0.13	-0.12	1.57	0.0
%176	1.83	6.27	0.10	1.65	0.18	-4.63	-27.27	0.06	-0.07	1.72	0.0
%177	0.77	5.24	0.10	0.69	0.08	-4.54	-31.81	0.03	-0.03	0.72	0.0
%178	15.69	4.40	0.10	14.12	1.57	9.72	0.00	6.00	5.97	4.40	3.7
%179	2.38	3.23	0.10	2.14	0.24	-1.09	-1.09	4.97	-1.03	3.18	0.0

%180	2.59	2.34	0.10	2.33	0.26	-0.01	-1.10	4.96	-0.01	2.34	0.0
%181	2.63	2.30	0.10	2.37	0.26	0.06	-1.03	5.02	0.06	2.30	0.0
%182	2.82	2.39	0.10	2.54	0.28	0.14	-0.86	5.17	0.14	2.39	0.0
%183	2.30	3.34	0.10	2.07	0.23	-1.27	-2.13	4.16	-1.01	3.08	0.0
%184	1.93	4.73	0.10	1.74	0.19	-2.99	-5.13	2.49	-1.66	3.40	0.0
%185	5.29	6.08	0.10	4.76	0.53	-1.32	-6.45	1.99	-0.50	5.26	0.0
%186	1.48	6.53	0.10	1.33	0.15	-5.20	-11.65	0.82	-1.17	2.50	0.0
%187	4.01	7.15	0.10	3.61	0.40	-3.55	-15.19	0.45	-0.37	3.98	0.0
%188	0.13	7.63	0.10	0.12	0.01	-7.51	-22.71	0.12	-0.32	0.44	0.0
%189	6.96	7.25	0.10	6.26	0.70	-0.99	-23.70	0.10	-0.02	6.28	0.0
%190	6.91	4.30	0.10	6.22	0.69	1.91	-6.37	2.02	1.91	4.30	0.0
%191	6.02	3.15	0.10	5.42	0.60	2.27	-1.96	4.29	2.27	3.15	0.0
%192	1.38	1.90	0.10	1.24	0.14	-0.66	-2.62	3.83	-0.46	1.70	0.0
%193	1.02	2.97	0.10	0.92	0.10	-2.06	-4.68	2.69	-1.13	2.05	0.0
%194	1.84	3.67	0.10	1.66	0.18	-2.02	-6.70	1.91	-0.78	2.44	0.0
%195	0.50	5.47	0.10	0.45	0.05	-5.02	-11.72	0.81	-1.10	1.55	0.0
%196	2.53	5.14	0.10	2.28	0.25	-2.87	-14.59	0.50	-0.31	2.59	0.0
%197	8.12	6.44	0.10	7.31	0.81	0.87	-8.66	1.36	0.87	6.44	0.0
%198	4.71	5.90	0.10	4.24	0.47	-1.66	-10.32	1.03	-0.34	4.58	0.0
%199	0.06	8.24	0.10	0.05	0.01	-8.19	-18.51	0.25	-0.77	0.83	0.0
%200	7.74	7.36	0.10	6.97	0.77	-0.39	-18.90	0.24	-0.02	6.98	0.0
%201	5.33	5.31	0.10	4.80	0.53	-0.52	-19.42	0.22	-0.02	4.82	0.0
%202	5.85	3.86	0.10	5.26	0.58	1.41	-7.64	1.63	1.41	3.86	0.0
%203	3.44	2.69	0.10	3.10	0.34	0.41	-6.32	2.03	0.41	2.69	0.0
%204	4.95	1.81	0.10	4.45	0.49	2.65	-1.44	4.68	2.65	1.81	0.0
%205	0.96	2.25	0.10	0.86	0.10	-1.39	-2.83	3.69	-0.99	1.86	0.0
%206	3.90	2.97	0.10	3.51	0.39	0.54	-2.04	4.22	0.54	2.97	0.0
%207	1.79	4.55	0.10	1.61	0.18	-2.94	-4.98	2.56	-1.67	3.28	0.0
%208	0.68	6.78	0.10	0.61	0.07	-6.17	-11.15	0.89	-1.66	2.28	0.0
%209	9.31	5.28	0.10	8.38	0.93	3.10	-2.37	3.99	3.10	5.28	0.0
%210	10.09	6.92	0.10	9.08	1.01	2.16	0.00	6.00	2.01	6.92	0.1
%211	1.76	6.73	0.10	1.58	0.18	-5.15	-5.15	2.48	-3.52	5.10	0.0
%212	0.90	9.50	0.10	0.81	0.09	-8.69	-13.84	0.56	-1.92	2.73	0.0
%213	5.34	5.64	0.10	4.81	0.53	-0.84	-14.67	0.49	-0.07	4.88	0.0
%214	0.19	5.42	0.10	0.17	0.02	-5.25	-19.92	0.20	-0.29	0.46	0.0
%215	3.88	3.11	0.10	3.49	0.39	0.38	-13.70	0.58	0.38	3.11	0.0
%216	4.54	2.22	0.10	4.09	0.45	1.87	-5.25	2.44	1.87	2.22	0.0
%217	0.81	2.56	0.10	0.73	0.08	-1.83	-7.08	1.79	-0.66	1.38	0.0
%218	1.44	2.96	0.10	1.30	0.14	-1.66	-8.74	1.35	-0.44	1.74	0.0
%219	2.97	4.38	0.10	2.67	0.30	-1.71	-10.45	1.01	-0.34	3.01	0.0
%220	0.28	6.04	0.10	0.25	0.03	-5.79	-16.24	0.37	-0.63	0.88	0.0
%221	2.91	6.49	0.10	2.62	0.29	-3.87	-20.11	0.19	-0.18	2.80	0.0
%222	1.81	7.13	0.10	1.63	0.18	-5.50	-25.61	0.08	-0.12	1.75	0.0
%223	0.96	8.48	0.10	0.86	0.10	-7.62	-33.23	0.02	-0.06	0.92	0.0
%224	0.19	7.89	0.10	0.17	0.02	-7.72	-40.94	0.01	-0.02	0.19	0.0
%225	0.43	6.82	0.10	0.39	0.04	-6.43	-47.37	0.00	-0.00	0.39	0.0
%226	1.37	5.87	0.10	1.23	0.14	-4.63	-52.01	0.00	-0.00	1.23	0.0
%227	1.46	4.12	0.10	1.31	0.15	-2.81	-54.82	0.00	-0.00	1.31	0.0
%228	2.27	2.48	0.10	2.04	0.23	-0.44	-55.26	0.00	-0.00	2.04	0.0
%229	7.07	1.90	0.10	6.36	0.71	4.46	-1.73	4.46	4.46	1.90	0.0
%230	1.10	2.61	0.10	0.99	0.11	-1.62	-3.35	3.38	-1.08	2.07	0.0
%231	3.22	3.87	0.10	2.90	0.32	-0.97	-4.32	2.86	-0.52	3.41	0.0
%232	0.51	5.38	0.10	0.46	0.05	-4.92	-9.24	1.24	-1.63	2.08	0.0
%233	5.29	6.82	0.10	4.76	0.53	-2.06	-11.30	0.87	-0.37	5.13	0.0
%234	4.23	5.88	0.10	3.81	0.42	-2.07	-13.38	0.61	-0.26	4.07	0.0
%235	2.70	6.57	0.10	2.43	0.27	-4.14	-17.51	0.30	-0.31	2.74	0.0
%236	3.26	6.78	0.10	2.93	0.33	-3.84	-21.35	0.16	-0.14	3.08	0.0
%237	0.68	6.21	0.10	0.61	0.07	-5.60	-26.95	0.06	-0.10	0.71	0.0
%238	1.93	5.24	0.10	1.74	0.19	-3.51	-30.46	0.03	-0.03	1.76	0.0
%239	1.61	3.80	0.10	1.45	0.16	-2.35	-32.81	0.02	-0.01	1.46	0.0
%240	0.37	2.30	0.10	0.33	0.04	-1.96	-34.77	0.02	-0.01	0.34	0.0

TOTAL PERCOLATION = 26.947

input data for the present case

number of data points : 240
maximum storage : 6

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.25	1.22	0.41	-0.28	-40.37	0.01	-0.00	1.22	0.00
2	4.40	1.76	0.25	3.30	1.10	1.54	-7.94	1.54	1.54	1.76	0.00
3	3.58	2.57	0.25	2.68	0.89	0.12	-7.52	1.66	0.12	2.57	0.00
4	4.01	2.25	0.25	3.01	1.00	0.75	-5.33	2.41	0.75	2.25	0.00
5	4.22	3.67	0.25	3.16	1.05	-0.50	-5.83	2.21	-0.20	3.36	0.00
6	2.02	3.65	0.25	1.51	0.50	-2.14	-7.97	1.54	-0.68	2.19	0.00
7	0.26	4.86	0.25	0.19	0.06	-4.66	-12.63	0.69	-0.84	1.04	0.00
8	0.23	5.75	0.25	0.17	0.06	-5.58	-18.21	0.27	-0.43	0.60	0.00
9	6.38	3.82	0.25	4.78	1.60	0.96	-9.27	1.23	0.96	3.82	0.00
10	3.84	2.62	0.25	2.88	0.96	0.26	-8.14	1.49	0.26	2.62	0.00
11	0.62	2.87	0.25	0.47	0.16	-2.40	-10.54	0.99	-0.50	0.97	0.00
12	1.40	2.58	0.25	1.05	0.35	-1.53	-12.07	0.76	-0.23	1.28	0.00
13	0.15	2.81	0.25	0.11	0.04	-2.70	-14.77	0.48	-0.28	0.39	0.00
14	1.68	4.00	0.25	1.26	0.42	-2.74	-17.51	0.30	-0.18	1.44	0.00
15	12.00	5.87	0.25	9.00	3.00	3.13	-3.27	3.43	3.13	5.87	0.00
16	0.89	4.56	0.25	0.67	0.22	-3.89	-7.16	1.76	-1.66	2.33	0.00
17	5.65	6.00	0.25	4.24	1.41	-1.76	-8.92	1.31	-0.46	4.70	0.00
18	0.76	4.74	0.25	0.57	0.19	-4.17	-13.09	0.64	-0.66	1.23	0.00
19	1.87	8.64	0.25	1.40	0.47	-7.24	-20.32	0.19	-0.45	1.86	0.00
20	3.20	6.27	0.25	2.40	0.80	-3.87	-24.19	0.10	-0.09	2.49	0.00
21	3.31	5.52	0.25	2.48	0.83	-3.04	-27.23	0.06	-0.04	2.52	0.00
22	4.30	3.93	0.25	3.23	1.08	-0.71	-27.94	0.05	-0.01	3.23	0.00
23	2.75	3.30	0.25	2.06	0.69	-1.24	-29.18	0.04	-0.01	2.07	0.00
24	4.63	2.44	0.25	3.47	1.16	1.04	-10.04	1.08	1.04	2.44	0.00
25	1.73	1.77	0.25	1.30	0.43	-0.47	-10.52	0.99	-0.08	1.38	0.00
26	0.50	2.88	0.25	0.38	0.13	-2.50	-13.02	0.65	-0.35	0.72	0.00
27	0.91	4.24	0.25	0.68	0.23	-3.55	-16.57	0.35	-0.29	0.98	0.00
28	1.71	4.03	0.25	1.28	0.43	-2.74	-19.31	0.22	-0.13	1.41	0.00
29	6.38	5.15	0.25	4.78	1.60	-0.37	-19.68	0.21	-0.01	4.80	0.00
30	2.13	5.24	0.25	1.60	0.53	-3.65	-23.33	0.11	-0.10	1.69	0.00
31	2.17	5.74	0.25	1.63	0.54	-4.11	-27.44	0.06	-0.06	1.68	0.00
32	3.60	4.89	0.25	2.70	0.90	-2.19	-29.62	0.04	-0.02	2.72	0.00
33	4.45	4.56	0.25	3.34	1.11	-1.22	-30.84	0.03	-0.01	3.34	0.00
34	3.95	3.95	0.25	2.96	0.99	-0.99	-31.84	0.03	-0.00	2.97	0.00
35	3.26	2.16	0.25	2.44	0.81	0.28	-17.37	0.31	0.28	2.16	0.00
36	1.47	2.12	0.25	1.10	0.37	-1.02	-18.39	0.26	-0.05	1.15	0.00
37	5.51	3.11	0.25	4.13	1.38	1.02	-9.05	1.28	1.02	3.11	0.00
38	2.60	2.27	0.25	1.95	0.65	-0.32	-9.37	1.21	-0.07	2.02	0.00
39	5.17	3.54	0.25	3.88	1.29	0.34	-7.91	1.55	0.34	3.54	0.00
40	6.74	3.96	0.25	5.05	1.68	1.09	-4.79	2.64	1.09	3.96	0.00
41	2.12	4.30	0.25	1.59	0.53	-2.71	-7.49	1.67	-0.98	2.57	0.00
42	6.44	4.77	0.25	4.83	1.61	0.06	-7.28	1.73	0.06	4.77	0.00
43	2.15	4.56	0.25	1.61	0.54	-2.94	-10.22	1.05	-0.68	2.30	0.00
44	1.03	5.52	0.25	0.77	0.26	-4.74	-14.97	0.47	-0.58	1.35	0.00
45	9.44	4.80	0.25	7.08	2.36	2.28	-4.57	2.74	2.28	4.80	0.00
46	10.17	4.25	0.25	7.63	2.54	3.38	0.00	6.00	3.26	4.25	0.12
47	2.40	2.60	0.25	1.80	0.60	-0.80	-0.80	5.22	-0.78	2.58	0.00
48	2.52	2.87	0.25	1.89	0.63	-0.98	-1.78	4.42	-0.80	2.69	0.00
49	4.66	1.75	0.25	3.49	1.16	1.74	0.00	6.00	1.58	1.75	0.16
50	0.13	3.00	0.25	0.10	0.03	-2.90	-2.90	3.65	-2.35	2.45	0.00
51	1.56	3.97	0.25	1.17	0.39	-2.80	-5.70	2.26	-1.39	2.56	0.00
52	1.76	5.22	0.25	1.32	0.44	-3.90	-9.60	1.16	-1.10	2.42	0.00
53	3.09	5.89	0.25	2.32	0.77	-3.57	-13.17	0.63	-0.53	2.85	0.00

54	0.73	5.36	0.25	0.55	0.18	-4.81	-17.98	0.28	-0.35	0.90	0.00
55	2.40	5.57	0.25	1.80	0.60	-3.77	-21.75	0.15	-0.13	1.93	0.00
56	9.88	6.05	0.25	7.41	2.47	1.36	-8.07	1.51	1.36	6.05	0.00
57	9.22	4.84	0.25	6.91	2.31	2.08	-3.00	3.59	2.08	4.84	0.00
58	6.02	3.92	0.25	4.51	1.50	0.60	-2.10	4.18	0.59	3.92	0.00
59	5.68	2.63	0.25	4.26	1.42	1.63	-0.18	5.81	1.63	2.63	0.00
60	2.82	2.11	0.25	2.12	0.70	0.00	-0.18	5.81	0.00	2.11	0.00
61	1.80	2.27	0.25	1.35	0.45	-0.92	-1.10	4.96	-0.85	2.20	0.00
62	2.45	2.22	0.25	1.84	0.61	-0.38	-1.48	4.65	-0.31	2.15	0.00
63	1.41	3.09	0.25	1.06	0.35	-2.03	-3.51	3.29	-1.36	2.42	0.00
64	2.08	4.17	0.25	1.56	0.52	-2.61	-6.12	2.11	-1.18	2.74	0.00
65	11.99	4.56	0.25	8.99	3.00	4.43	0.00	6.00	3.89	4.56	0.53
66	2.42	5.73	0.25	1.82	0.61	-3.92	-3.92	3.07	-2.93	4.75	0.00
67	4.16	5.52	0.25	3.12	1.04	-2.40	-6.32	2.03	-1.03	4.15	0.00
68	2.44	5.72	0.25	1.83	0.61	-3.89	-10.21	1.05	-0.99	2.82	0.00
69	3.78	4.72	0.25	2.84	0.94	-1.88	-12.09	0.76	-0.29	3.12	0.00
70	3.35	3.62	0.25	2.51	0.84	-1.11	-13.20	0.63	-0.13	2.64	0.00
71	1.07	3.95	0.25	0.80	0.27	-3.15	-16.34	0.37	-0.26	1.06	0.00
72	1.18	2.72	0.25	0.88	0.29	-1.83	-18.18	0.27	-0.10	0.98	0.00
73	1.60	3.37	0.25	1.20	0.40	-2.17	-20.35	0.19	-0.08	1.28	0.00
74	1.74	3.10	0.25	1.31	0.44	-1.80	-22.15	0.14	-0.05	1.35	0.00
75	4.81	3.54	0.25	3.61	1.20	0.07	-19.84	0.20	0.07	3.54	0.00
76	5.95	4.07	0.25	4.46	1.49	0.40	-13.49	0.60	0.40	4.07	0.00
77	4.32	4.53	0.25	3.24	1.08	-1.29	-14.78	0.48	-0.12	3.36	0.00
78	4.02	6.05	0.25	3.01	1.00	-3.04	-17.82	0.29	-0.19	3.21	0.00
79	2.13	5.27	0.25	1.60	0.53	-3.67	-21.50	0.15	-0.13	1.73	0.00
80	1.48	6.20	0.25	1.11	0.37	-5.09	-26.58	0.06	-0.09	1.20	0.00
81	2.68	3.90	0.25	2.01	0.67	-1.89	-28.47	0.05	-0.02	2.03	0.00
82	5.77	3.62	0.25	4.33	1.44	0.71	-12.13	0.75	0.71	3.62	0.00
83	3.27	1.86	0.25	2.45	0.82	0.59	-8.74	1.35	0.59	1.86	0.00
84	4.05	2.45	0.25	3.04	1.01	0.59	-6.62	1.93	0.59	2.45	0.00
85	2.14	1.43	0.25	1.61	0.54	0.17	-6.13	2.10	0.17	1.43	0.00
86	3.55	2.90	0.25	2.66	0.89	-0.24	-6.36	2.02	-0.08	2.75	0.00
87	2.06	3.81	0.25	1.54	0.51	-2.26	-8.63	1.37	-0.65	2.19	0.00
88	8.81	4.38	0.25	6.61	2.20	2.23	-2.97	3.60	2.23	4.38	0.00
89	1.56	5.21	0.25	1.17	0.39	-4.04	-7.01	1.81	-1.80	2.97	0.00
90	1.35	6.78	0.25	1.01	0.34	-5.76	-12.77	0.68	-1.13	2.14	0.00
91	0.31	7.10	0.25	0.23	0.08	-6.87	-19.64	0.21	-0.47	0.70	0.00
92	1.35	6.50	0.25	1.01	0.34	-5.48	-25.12	0.08	-0.13	1.14	0.00
93	1.69	6.16	0.25	1.27	0.42	-4.89	-30.02	0.04	-0.05	1.31	0.00
94	0.79	4.64	0.25	0.59	0.20	-4.05	-34.06	0.02	-0.02	0.61	0.00
95	3.10	3.24	0.25	2.32	0.77	-0.92	-34.98	0.02	-0.00	2.33	0.00
96	2.67	3.07	0.25	2.00	0.67	-1.07	-36.05	0.01	-0.00	2.01	0.00
97	4.51	1.92	0.25	3.38	1.13	1.46	-8.22	1.47	1.46	1.92	0.00
98	2.62	1.98	0.25	1.96	0.65	-0.02	-8.24	1.47	-0.00	1.97	0.00
99	2.72	4.39	0.25	2.04	0.68	-2.35	-10.59	0.98	-0.48	2.52	0.00
%100	1.37	4.99	0.25	1.03	0.34	-3.96	-14.55	0.50	-0.48	1.51	0.0
%101	2.52	5.91	0.25	1.89	0.63	-4.02	-18.57	0.25	-0.25	2.14	0.0
%102	2.44	6.32	0.25	1.83	0.61	-4.49	-23.06	0.12	-0.13	1.96	0.0
%103	1.26	6.53	0.25	0.94	0.31	-5.59	-28.65	0.05	-0.07	1.02	0.0
%104	0.57	6.53	0.25	0.43	0.14	-6.10	-34.75	0.02	-0.03	0.46	0.0
%105	6.50	4.78	0.25	4.88	1.63	0.09	-23.41	0.11	0.09	4.78	0.0
%106	0.41	5.19	0.25	0.31	0.10	-4.88	-28.29	0.05	-0.06	0.37	0.0
%107	6.31	2.86	0.25	4.73	1.58	1.88	-6.65	1.92	1.88	2.86	0.0
%108	3.17	2.18	0.25	2.38	0.79	0.19	-6.09	2.12	0.19	2.18	0.0
%109	3.70	1.74	0.25	2.78	0.93	1.04	-3.75	3.16	1.04	1.74	0.0
%110	4.08	2.24	0.25	3.06	1.02	0.82	-2.40	3.98	0.82	2.24	0.0
%111	5.54	4.35	0.25	4.15	1.38	-0.19	-2.59	3.85	-0.13	4.29	0.0
%112	4.74	4.27	0.25	3.55	1.18	-0.72	-3.30	3.40	-0.44	4.00	0.0
%113	11.05	5.26	0.25	8.29	2.76	3.03	0.00	6.00	2.60	5.26	0.4
%114	1.30	5.70	0.25	0.97	0.32	-4.73	-4.73	2.67	-3.33	4.31	0.0
%115	4.48	5.40	0.25	3.36	1.12	-2.04	-6.77	1.88	-0.79	4.15	0.0
%116	3.81	5.66	0.25	2.86	0.95	-2.80	-9.57	1.17	-0.71	3.57	0.0

%117	3.20	4.55	0.25	2.40	0.80	-2.15	-11.72	0.81	-0.36	2.76	0.0
%118	1.70	4.09	0.25	1.28	0.43	-2.81	-14.54	0.50	-0.31	1.58	0.0
%119	0.77	2.69	0.25	0.58	0.19	-2.11	-16.65	0.35	-0.15	0.73	0.0
%120	3.32	1.63	0.25	2.49	0.83	0.86	-9.37	1.21	0.86	1.63	0.0
%121	3.12	1.88	0.25	2.34	0.78	0.46	-7.47	1.67	0.46	1.88	0.0
%122	1.94	2.69	0.25	1.46	0.49	-1.24	-8.71	1.35	-0.32	1.77	0.0
%123	5.04	3.26	0.25	3.78	1.26	0.52	-6.81	1.87	0.52	3.26	0.0
%124	2.38	4.62	0.25	1.79	0.60	-2.83	-9.65	1.15	-0.72	2.50	0.0
%125	4.31	4.77	0.25	3.23	1.08	-1.53	-11.18	0.89	-0.27	3.50	0.0
%126	0.10	7.34	0.25	0.08	0.03	-7.26	-18.44	0.26	-0.63	0.71	0.0
%127	0.06	8.57	0.25	0.04	0.01	-8.53	-26.97	0.06	-0.20	0.24	0.0
%128	1.67	7.79	0.25	1.25	0.42	-6.54	-33.51	0.02	-0.04	1.29	0.0
%129	4.28	5.18	0.25	3.21	1.07	-1.97	-35.48	0.01	-0.01	3.22	0.0
%130	3.93	4.52	0.25	2.95	0.98	-1.57	-37.06	0.01	-0.00	2.95	0.0
%131	4.58	2.87	0.25	3.43	1.14	0.57	-13.71	0.58	0.57	2.87	0.0
%132	0.50	2.43	0.25	0.38	0.13	-2.05	-15.77	0.41	-0.17	0.54	0.0
%133	2.67	2.45	0.25	2.00	0.67	-0.45	-16.21	0.38	-0.03	2.03	0.0
%134	1.80	2.64	0.25	1.35	0.45	-1.29	-17.50	0.30	-0.07	1.42	0.0
%135	1.88	3.56	0.25	1.41	0.47	-2.15	-19.65	0.21	-0.09	1.50	0.0
%136	0.97	3.95	0.25	0.73	0.24	-3.23	-22.88	0.12	-0.09	0.82	0.0
%137	6.28	5.67	0.25	4.71	1.57	-0.96	-23.84	0.10	-0.02	4.73	0.0
%138	9.48	5.21	0.25	7.11	2.37	1.90	-6.41	2.00	1.90	5.21	0.0
%139	5.35	5.36	0.25	4.01	1.34	-1.35	-7.76	1.59	-0.41	4.43	0.0
%140	2.51	6.39	0.25	1.88	0.63	-4.51	-12.27	0.74	-0.85	2.74	0.0
%141	5.96	4.55	0.25	4.47	1.49	-0.08	-12.35	0.73	-0.01	4.48	0.0
%142	10.95	3.91	0.25	8.21	2.74	4.31	-1.02	5.03	4.31	3.91	0.0
%143	1.93	2.65	0.25	1.45	0.48	-1.20	-2.22	4.10	-0.94	2.38	0.0
%144	0.64	2.60	0.25	0.48	0.16	-2.12	-4.33	2.86	-1.24	1.72	0.0
%145	1.43	2.84	0.25	1.07	0.36	-1.77	-6.10	2.11	-0.74	1.82	0.0
%146	2.26	2.51	0.25	1.69	0.56	-0.81	-6.91	1.84	-0.27	1.97	0.0
%147	2.40	3.29	0.25	1.80	0.60	-1.49	-8.40	1.43	-0.41	2.21	0.0
%148	4.67	3.74	0.25	3.50	1.17	-0.24	-8.64	1.37	-0.06	3.56	0.0
%149	5.35	5.07	0.25	4.01	1.34	-1.06	-9.70	1.14	-0.23	4.24	0.0
%150	2.00	6.80	0.25	1.50	0.50	-5.30	-15.01	0.46	-0.68	2.18	0.0
%151	3.58	7.95	0.25	2.68	0.89	-5.27	-20.27	0.19	-0.27	2.96	0.0
%152	2.96	7.47	0.25	2.22	0.74	-5.25	-25.52	0.08	-0.11	2.33	0.0
%153	3.19	6.76	0.25	2.39	0.80	-4.37	-29.89	0.04	-0.04	2.43	0.0
%154	6.89	4.89	0.25	5.17	1.72	0.28	-17.19	0.32	0.28	4.89	0.0
%155	4.09	3.36	0.25	3.07	1.02	-0.29	-17.48	0.30	-0.02	3.08	0.0
%156	3.05	4.42	0.25	2.29	0.76	-2.13	-19.61	0.21	-0.09	2.38	0.0
%157	3.07	2.07	0.25	2.30	0.77	0.24	-15.18	0.45	0.24	2.07	0.0
%158	4.66	2.39	0.25	3.49	1.16	1.10	-7.92	1.55	1.10	2.39	0.0
%159	5.97	3.86	0.25	4.48	1.49	0.62	-5.95	2.17	0.62	3.86	0.0
%160	0.31	4.73	0.25	0.23	0.08	-4.50	-10.45	1.01	-1.16	1.40	0.0
%161	9.49	6.05	0.25	7.12	2.37	1.07	-6.20	2.08	1.07	6.05	0.0
%162	2.60	5.43	0.25	1.95	0.65	-3.48	-9.69	1.15	-0.93	2.88	0.0
%163	2.46	6.45	0.25	1.85	0.62	-4.60	-14.29	0.52	-0.62	2.47	0.0
%164	7.24	5.68	0.25	5.43	1.81	-0.25	-14.54	0.50	-0.02	5.45	0.0
%165	9.40	5.14	0.25	7.05	2.35	1.91	-5.33	2.41	1.91	5.14	0.0
%166	2.81	4.10	0.25	2.11	0.70	-1.99	-7.32	1.72	-0.70	2.80	0.0
%167	3.25	2.86	0.25	2.44	0.81	-0.42	-7.74	1.60	-0.12	2.56	0.0
%168	1.83	2.40	0.25	1.37	0.46	-1.03	-8.77	1.34	-0.26	1.63	0.0
%169	1.67	2.37	0.25	1.25	0.42	-1.11	-9.88	1.11	-0.23	1.48	0.0
%170	0.99	3.74	0.25	0.74	0.25	-3.00	-12.88	0.66	-0.44	1.19	0.0
%171	4.98	5.62	0.25	3.74	1.25	-1.89	-14.76	0.48	-0.18	3.92	0.0
%172	0.34	6.06	0.25	0.25	0.09	-5.81	-20.57	0.18	-0.30	0.56	0.0
%173	5.76	8.51	0.25	4.32	1.44	-4.19	-24.76	0.09	-0.09	4.41	0.0
%174	4.39	5.97	0.25	3.29	1.10	-2.68	-27.44	0.06	-0.03	3.32	0.0
%175	1.61	5.49	0.25	1.21	0.40	-4.28	-31.72	0.03	-0.03	1.24	0.0
%176	1.83	6.27	0.25	1.37	0.46	-4.90	-36.62	0.01	-0.02	1.39	0.0
%177	0.77	5.24	0.25	0.58	0.19	-4.66	-41.28	0.01	-0.01	0.58	0.0
%178	15.69	4.40	0.25	11.77	3.92	7.36	0.00	6.00	5.99	4.40	1.3
%179	2.38	3.23	0.25	1.79	0.60	-1.45	-1.45	4.67	-1.33	3.11	0.0

%180	2.59	2.34	0.25	1.94	0.65	-0.40	-1.84	4.37	-0.30	2.25	0.0
%181	2.63	2.30	0.25	1.97	0.66	-0.33	-2.17	4.13	-0.24	2.21	0.0
%182	2.82	2.39	0.25	2.12	0.70	-0.28	-2.45	3.94	-0.19	2.31	0.0
%183	2.30	3.34	0.25	1.72	0.57	-1.61	-4.07	2.99	-0.95	2.67	0.0
%184	1.93	4.73	0.25	1.45	0.48	-3.28	-7.35	1.71	-1.28	2.73	0.0
%185	5.29	6.08	0.25	3.97	1.32	-2.12	-9.47	1.19	-0.52	4.48	0.0
%186	1.48	6.53	0.25	1.11	0.37	-5.42	-14.89	0.47	-0.72	1.83	0.0
%187	4.01	7.15	0.25	3.01	1.00	-4.15	-19.04	0.23	-0.24	3.25	0.0
%188	0.13	7.63	0.25	0.10	0.03	-7.53	-26.57	0.06	-0.17	0.27	0.0
%189	6.96	7.25	0.25	5.22	1.74	-2.03	-28.60	0.05	-0.02	5.24	0.0
%190	6.91	4.30	0.25	5.18	1.73	0.88	-10.95	0.92	0.88	4.30	0.0
%191	6.02	3.15	0.25	4.51	1.50	1.37	-5.63	2.29	1.37	3.15	0.0
%192	1.38	1.90	0.25	1.03	0.34	-0.87	-6.50	1.97	-0.32	1.35	0.0
%193	1.02	2.97	0.25	0.76	0.25	-2.21	-8.71	1.35	-0.62	1.38	0.0
%194	1.84	3.67	0.25	1.38	0.46	-2.30	-11.01	0.91	-0.44	1.82	0.0
%195	0.50	5.47	0.25	0.38	0.13	-5.10	-16.11	0.38	-0.53	0.91	0.0
%196	2.53	5.14	0.25	1.90	0.63	-3.25	-19.36	0.22	-0.16	2.06	0.0
%197	8.12	6.44	0.25	6.09	2.03	-0.35	-19.71	0.21	-0.01	6.10	0.0
%198	4.71	5.90	0.25	3.53	1.18	-2.37	-22.07	0.14	-0.07	3.60	0.0
%199	0.06	8.24	0.25	0.04	0.01	-8.19	-30.27	0.03	-0.10	0.15	0.0
%200	7.74	7.36	0.25	5.80	1.93	-1.55	-31.82	0.03	-0.01	5.81	0.0
%201	5.33	5.31	0.25	4.00	1.33	-1.32	-33.14	0.02	-0.01	4.00	0.0
%202	5.85	3.86	0.25	4.39	1.46	0.53	-13.97	0.55	0.53	3.86	0.0
%203	3.44	2.69	0.25	2.58	0.86	-0.11	-14.07	0.54	-0.01	2.59	0.0
%204	4.95	1.81	0.25	3.71	1.24	1.91	-5.24	2.45	1.91	1.81	0.0
%205	0.96	2.25	0.25	0.72	0.24	-1.53	-6.77	1.88	-0.56	1.28	0.0
%206	3.90	2.97	0.25	2.93	0.98	-0.05	-6.82	1.87	-0.02	2.94	0.0
%207	1.79	4.55	0.25	1.34	0.45	-3.21	-10.03	1.08	-0.79	2.13	0.0
%208	0.68	6.78	0.25	0.51	0.17	-6.27	-16.30	0.37	-0.71	1.22	0.0
%209	9.31	5.28	0.25	6.98	2.33	1.70	-6.21	2.07	1.70	5.28	0.0
%210	10.09	6.92	0.25	7.57	2.52	0.64	-4.62	2.72	0.64	6.92	0.0
%211	1.76	6.73	0.25	1.32	0.44	-5.41	-10.04	1.08	-1.64	2.96	0.0
%212	0.90	9.50	0.25	0.67	0.22	-8.82	-18.86	0.24	-0.84	1.51	0.0
%213	5.34	5.64	0.25	4.01	1.34	-1.64	-20.50	0.18	-0.06	4.06	0.0
%214	0.19	5.42	0.25	0.14	0.05	-5.28	-25.77	0.07	-0.11	0.25	0.0
%215	3.88	3.11	0.25	2.91	0.97	-0.20	-25.98	0.07	-0.00	2.91	0.0
%216	4.54	2.22	0.25	3.40	1.13	1.19	-9.14	1.26	1.19	2.22	0.0
%217	0.81	2.56	0.25	0.61	0.20	-1.95	-11.09	0.90	-0.36	0.96	0.0
%218	1.44	2.96	0.25	1.08	0.36	-1.88	-12.97	0.65	-0.25	1.33	0.0
%219	2.97	4.38	0.25	2.23	0.74	-2.15	-15.12	0.45	-0.20	2.43	0.0
%220	0.28	6.04	0.25	0.21	0.07	-5.83	-20.96	0.17	-0.29	0.50	0.0
%221	2.91	6.49	0.25	2.18	0.73	-4.31	-25.26	0.08	-0.09	2.27	0.0
%222	1.81	7.13	0.25	1.36	0.45	-5.77	-31.03	0.03	-0.05	1.41	0.0
%223	0.96	8.48	0.25	0.72	0.24	-7.76	-38.79	0.01	-0.02	0.74	0.0
%224	0.19	7.89	0.25	0.14	0.05	-7.75	-46.54	0.00	-0.01	0.15	0.0
%225	0.43	6.82	0.25	0.32	0.11	-6.50	-53.04	0.00	-0.00	0.32	0.0
%226	1.37	5.87	0.25	1.03	0.34	-4.84	-57.87	0.00	-0.00	1.03	0.0
%227	1.46	4.12	0.25	1.10	0.37	-3.03	-60.90	0.00	-0.00	1.10	0.0
%228	2.27	2.48	0.25	1.70	0.57	-0.78	-61.69	0.00	-0.00	1.70	0.0
%229	7.07	1.90	0.25	5.30	1.77	3.40	-3.32	3.40	3.40	1.90	0.0
%230	1.10	2.61	0.25	0.83	0.28	-1.79	-5.10	2.50	-0.89	1.72	0.0
%231	3.22	3.87	0.25	2.41	0.81	-1.46	-6.56	1.95	-0.55	2.97	0.0
%232	0.51	5.38	0.25	0.38	0.13	-4.99	-11.55	0.83	-1.12	1.50	0.0
%233	5.29	6.82	0.25	3.97	1.32	-2.86	-14.41	0.51	-0.32	4.29	0.0
%234	4.23	5.88	0.25	3.17	1.06	-2.71	-17.12	0.32	-0.19	3.36	0.0
%235	2.70	6.57	0.25	2.03	0.68	-4.54	-21.66	0.15	-0.17	2.20	0.0
%236	3.26	6.78	0.25	2.44	0.81	-4.33	-25.99	0.07	-0.08	2.52	0.0
%237	0.68	6.21	0.25	0.51	0.17	-5.70	-31.69	0.03	-0.04	0.55	0.0
%238	1.93	5.24	0.25	1.45	0.48	-3.80	-35.48	0.01	-0.01	1.46	0.0
%239	1.61	3.80	0.25	1.21	0.40	-2.59	-38.08	0.01	-0.01	1.21	0.0
%240	0.37	2.30	0.25	0.28	0.09	-2.02	-40.10	0.01	-0.00	0.28	0.0

TOTAL PERCOLATION = 2.622

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.07	1.52	0.11	0.02	-36.77	0.14	0.02	1.50	0.00
2	4.40	1.76	0.07	4.09	0.31	2.33	-11.36	2.46	2.33	1.76	0.00
3	3.58	2.57	0.07	3.33	0.25	0.76	-9.00	3.22	0.76	2.57	0.00
4	4.01	2.25	0.07	3.73	0.28	1.48	-5.69	4.70	1.48	2.25	0.00
5	4.22	3.67	0.07	3.92	0.30	0.26	-5.22	4.96	0.26	3.67	0.00
6	2.02	3.65	0.07	1.88	0.14	-1.78	-7.00	4.05	-0.91	2.79	0.00
7	0.26	4.86	0.07	0.24	0.02	-4.62	-11.61	2.39	-1.65	1.90	0.00
8	0.23	5.75	0.07	0.21	0.02	-5.54	-17.15	1.27	-1.12	1.33	0.00
9	6.38	3.82	0.07	5.93	0.45	2.11	-8.57	3.39	2.11	3.82	0.00
10	3.84	2.62	0.07	3.57	0.27	0.95	-6.39	4.34	0.95	2.62	0.00
11	0.62	2.87	0.07	0.58	0.04	-2.29	-8.69	3.34	-1.00	1.58	0.00
12	1.40	2.58	0.07	1.30	0.10	-1.27	-9.96	2.89	-0.45	1.75	0.00
13	0.15	2.81	0.07	0.14	0.01	-2.67	-12.63	2.13	-0.76	0.90	0.00
14	1.68	4.00	0.07	1.56	0.12	-2.43	-15.07	1.62	-0.52	2.08	0.00
15	12.00	5.87	0.07	11.16	0.84	5.29	-2.31	6.90	5.29	5.87	0.00
16	0.89	4.56	0.07	0.83	0.06	-3.73	-6.04	4.51	-2.39	3.22	0.00
17	5.65	6.00	0.07	5.25	0.40	-0.74	-6.79	4.15	-0.37	5.62	0.00
18	0.76	4.74	0.07	0.71	0.05	-4.03	-10.82	2.62	-1.53	2.23	0.00
19	1.87	8.64	0.07	1.74	0.13	-6.90	-17.72	1.20	-1.42	3.16	0.00
20	3.20	6.27	0.07	2.98	0.22	-3.30	-21.02	0.82	-0.37	3.35	0.00
21	3.31	5.52	0.07	3.08	0.23	-2.44	-23.46	0.62	-0.20	3.28	0.00
22	4.30	3.93	0.07	4.00	0.30	0.07	-22.58	0.69	0.07	3.93	0.00
23	2.75	3.30	0.07	2.56	0.19	-0.75	-23.33	0.63	-0.06	2.61	0.00
24	4.63	2.44	0.07	4.31	0.32	1.87	-11.23	2.50	1.87	2.44	0.00
25	1.73	1.77	0.07	1.61	0.12	-0.16	-11.39	2.46	-0.05	1.66	0.00
26	0.50	2.88	0.07	0.47	0.04	-2.41	-13.80	1.87	-0.59	1.05	0.00
27	0.91	4.24	0.07	0.85	0.06	-3.39	-17.19	1.27	-0.60	1.44	0.00
28	1.71	4.03	0.07	1.59	0.12	-2.43	-19.63	0.96	-0.31	1.90	0.00
29	6.38	5.15	0.07	5.93	0.45	0.78	-14.40	1.74	0.78	5.15	0.00
30	2.13	5.24	0.07	1.98	0.15	-3.26	-17.66	1.20	-0.54	2.52	0.00
31	2.17	5.74	0.07	2.02	0.15	-3.72	-21.38	0.79	-0.42	2.43	0.00
32	3.60	4.89	0.07	3.35	0.25	-1.54	-22.92	0.66	-0.13	3.47	0.00
33	4.45	4.56	0.07	4.14	0.31	-0.42	-23.34	0.63	-0.03	4.17	0.00
34	3.95	3.95	0.07	3.67	0.28	-0.28	-23.62	0.61	-0.02	3.69	0.00
35	3.26	2.16	0.07	3.03	0.23	0.87	-15.84	1.48	0.87	2.16	0.00
36	1.47	2.12	0.07	1.37	0.10	-0.75	-16.60	1.36	-0.12	1.49	0.00
37	5.51	3.11	0.07	5.12	0.39	2.01	-8.62	3.37	2.01	3.11	0.00
38	2.60	2.27	0.07	2.42	0.18	0.15	-8.24	3.52	0.15	2.27	0.00
39	5.17	3.54	0.07	4.81	0.36	1.27	-5.52	4.79	1.27	3.54	0.00
40	6.74	3.96	0.07	6.27	0.47	2.31	-2.07	7.10	2.31	3.96	0.00
41	2.12	4.30	0.07	1.97	0.15	-2.33	-4.40	5.44	-1.66	3.63	0.00
42	6.44	4.77	0.07	5.99	0.45	1.22	-2.63	6.66	1.22	4.77	0.00
43	2.15	4.56	0.07	2.00	0.15	-2.56	-5.18	4.98	-1.69	3.69	0.00
44	1.03	5.52	0.07	0.96	0.07	-4.56	-9.74	2.96	-2.01	2.97	0.00
45	9.44	4.80	0.07	8.78	0.66	3.98	-2.27	6.94	3.98	4.80	0.00
46	10.17	4.25	0.07	9.46	0.71	5.21	0.00	9.00	2.06	4.25	3.15
47	2.40	2.60	0.07	2.23	0.17	-0.36	-0.36	8.61	-0.39	2.62	0.00
48	2.52	2.87	0.07	2.34	0.18	-0.53	-0.89	8.11	-0.50	2.84	0.00
49	4.66	1.75	0.07	4.33	0.33	2.58	0.00	9.00	0.89	1.75	1.69
50	0.13	3.00	0.07	0.12	0.01	-2.88	-2.88	6.47	-2.53	2.65	0.00
51	1.56	3.97	0.07	1.45	0.11	-2.52	-5.39	4.86	-1.61	3.06	0.00
52	1.76	5.22	0.07	1.64	0.12	-3.59	-8.98	3.23	-1.63	3.26	0.00
53	3.09	5.89	0.07	2.87	0.22	-3.01	-11.99	2.29	-0.94	3.81	0.00

54	0.73	5.36	0.07	0.68	0.05	-4.68	-16.67	1.35	-0.95	1.62	0.00
55	2.40	5.57	0.07	2.23	0.17	-3.34	-20.01	0.92	-0.43	2.66	0.00
56	9.88	6.05	0.07	9.19	0.69	3.14	-6.97	4.06	3.14	6.05	0.00
57	9.22	4.84	0.07	8.57	0.65	3.74	-1.24	7.80	3.74	4.84	0.00
58	6.02	3.92	0.07	5.60	0.42	1.68	0.00	9.00	1.20	3.92	0.48
59	5.68	2.63	0.07	5.28	0.40	2.65	0.00	9.00	0.00	2.63	2.65
60	2.82	2.11	0.07	2.62	0.20	0.51	0.00	9.00	0.00	2.11	0.51
61	1.80	2.27	0.07	1.67	0.13	-0.59	-0.59	8.39	-0.61	2.29	0.00
62	2.45	2.22	0.07	2.28	0.17	0.06	-0.54	8.45	0.06	2.22	0.00
63	1.41	3.09	0.07	1.31	0.10	-1.78	-2.32	6.89	-1.55	2.86	0.00
64	2.08	4.17	0.07	1.93	0.15	-2.24	-4.56	5.34	-1.55	3.48	0.00
65	11.99	4.56	0.07	11.15	0.84	6.59	0.00	9.00	3.66	4.56	2.93
66	2.42	5.73	0.07	2.25	0.17	-3.48	-3.48	6.04	-2.96	5.21	0.00
67	4.16	5.52	0.07	3.87	0.29	-1.65	-5.14	5.00	-1.04	4.90	0.00
68	2.44	5.72	0.07	2.27	0.17	-3.45	-8.59	3.38	-1.62	3.89	0.00
69	3.78	4.72	0.07	3.52	0.26	-1.20	-9.79	2.95	-0.43	3.95	0.00
70	3.35	3.62	0.07	3.12	0.23	-0.50	-10.29	2.78	-0.16	3.28	0.00
71	1.07	3.95	0.07	1.00	0.07	-2.95	-13.25	1.99	-0.79	1.79	0.00
72	1.18	2.72	0.07	1.10	0.08	-1.62	-14.86	1.65	-0.33	1.43	0.00
73	1.60	3.37	0.07	1.49	0.11	-1.89	-16.75	1.33	-0.32	1.81	0.00
74	1.74	3.10	0.07	1.62	0.12	-1.48	-18.23	1.13	-0.21	1.83	0.00
75	4.81	3.54	0.07	4.47	0.34	0.93	-12.94	2.06	0.93	3.54	0.00
76	5.95	4.07	0.07	5.53	0.42	1.47	-8.22	3.53	1.47	4.07	0.00
77	4.32	4.53	0.07	4.02	0.30	-0.51	-8.73	3.32	-0.20	4.22	0.00
78	4.02	6.05	0.07	3.74	0.28	-2.32	-11.04	2.55	-0.77	4.51	0.00
79	2.13	5.27	0.07	1.98	0.15	-3.29	-14.33	1.76	-0.80	2.78	0.00
80	1.48	6.20	0.07	1.38	0.10	-4.82	-19.15	1.02	-0.74	2.12	0.00
81	2.68	3.90	0.07	2.49	0.19	-1.41	-20.56	0.87	-0.15	2.64	0.00
82	5.77	3.62	0.07	5.37	0.40	1.75	-10.85	2.61	1.75	3.62	0.00
83	3.27	1.86	0.07	3.04	0.23	1.18	-7.58	3.79	1.18	1.86	0.00
84	4.05	2.45	0.07	3.77	0.28	1.32	-4.96	5.11	1.32	2.45	0.00
85	2.14	1.43	0.07	1.99	0.15	0.56	-4.05	5.66	0.56	1.43	0.00
86	3.55	2.90	0.07	3.30	0.25	0.40	-3.45	6.07	0.40	2.90	0.00
87	2.06	3.81	0.07	1.92	0.14	-1.89	-5.34	4.89	-1.18	3.10	0.00
88	8.81	4.38	0.07	8.19	0.62	3.82	-0.28	8.71	3.82	4.38	0.00
89	1.56	5.21	0.07	1.45	0.11	-3.76	-4.03	5.67	-3.03	4.49	0.00
90	1.35	6.78	0.07	1.26	0.09	-5.52	-9.55	3.03	-2.64	3.90	0.00
91	0.31	7.10	0.07	0.29	0.02	-6.81	-16.36	1.39	-1.63	1.92	0.00
92	1.35	6.50	0.07	1.26	0.09	-5.24	-21.61	0.77	-0.63	1.88	0.00
93	1.69	6.16	0.07	1.57	0.12	-4.59	-26.19	0.46	-0.31	1.88	0.00
94	0.79	4.64	0.07	0.73	0.06	-3.91	-30.10	0.29	-0.16	0.90	0.00
95	3.10	3.24	0.07	2.88	0.22	-0.36	-30.46	0.28	-0.01	2.89	0.00
96	2.67	3.07	0.07	2.48	0.19	-0.59	-31.05	0.26	-0.02	2.50	0.00
97	4.51	1.92	0.07	4.19	0.32	2.27	-11.12	2.53	2.27	1.92	0.00
98	2.62	1.98	0.07	2.44	0.18	0.46	-9.67	2.99	0.46	1.98	0.00
99	2.72	4.39	0.07	2.53	0.19	-1.86	-11.53	2.42	-0.57	3.10	0.00
%100	1.37	4.99	0.07	1.27	0.10	-3.72	-15.25	1.58	-0.83	2.11	0.0
%101	2.52	5.91	0.07	2.34	0.18	-3.56	-18.81	1.06	-0.53	2.87	0.0
%102	2.44	6.32	0.07	2.27	0.17	-4.05	-22.86	0.67	-0.39	2.66	0.0
%103	1.26	6.53	0.07	1.17	0.09	-5.36	-28.22	0.36	-0.30	1.48	0.0
%104	0.57	6.53	0.07	0.53	0.04	-6.00	-34.22	0.18	-0.18	0.71	0.0
%105	6.50	4.78	0.07	6.05	0.46	1.26	-16.04	1.45	1.26	4.78	0.0
%106	0.41	5.19	0.07	0.38	0.03	-4.81	-20.84	0.84	-0.61	0.99	0.0
%107	6.31	2.86	0.07	5.87	0.44	3.01	-7.44	3.85	3.01	2.86	0.0
%108	3.17	2.18	0.07	2.95	0.22	0.76	-5.85	4.61	0.76	2.18	0.0
%109	3.70	1.74	0.07	3.44	0.26	1.71	-3.09	6.32	1.70	1.74	0.0
%110	4.08	2.24	0.07	3.79	0.29	1.55	-1.16	7.87	1.55	2.24	0.0
%111	5.54	4.35	0.07	5.15	0.39	0.81	-0.30	8.68	0.81	4.35	0.0
%112	4.74	4.27	0.07	4.41	0.33	0.14	-0.17	8.82	0.14	4.27	0.0
%113	11.05	5.26	0.07	10.28	0.77	5.02	0.00	9.00	0.18	5.26	4.8
%114	1.30	5.70	0.07	1.21	0.09	-4.50	-4.50	5.38	-3.62	4.83	0.0
%115	4.48	5.40	0.07	4.17	0.31	-1.24	-5.73	4.67	-0.71	4.87	0.0
%116	3.81	5.66	0.07	3.54	0.27	-2.11	-7.85	3.67	-1.00	4.54	0.0

%117	3.20	4.55	0.07	2.98	0.22	-1.57	-9.42	3.07	-0.60	3.58	0.0
%118	1.70	4.09	0.07	1.58	0.12	-2.51	-11.93	2.31	-0.76	2.34	0.0
%119	0.77	2.69	0.07	0.72	0.05	-1.97	-13.90	1.85	-0.46	1.18	0.0
%120	3.32	1.63	0.07	3.09	0.23	1.46	-8.79	3.30	1.46	1.63	0.0
%121	3.12	1.88	0.07	2.90	0.22	1.03	-6.41	4.33	1.03	1.88	0.0
%122	1.94	2.69	0.07	1.80	0.14	-0.89	-7.31	3.91	-0.42	2.22	0.0
%123	5.04	3.26	0.07	4.69	0.35	1.43	-4.58	5.33	1.43	3.26	0.0
%124	2.38	4.62	0.07	2.21	0.17	-2.41	-6.99	4.05	-1.28	3.49	0.0
%125	4.31	4.77	0.07	4.01	0.30	-0.76	-7.75	3.72	-0.34	4.34	0.0
%126	0.10	7.34	0.07	0.09	0.01	-7.24	-14.99	1.63	-2.09	2.18	0.0
%127	0.06	8.57	0.07	0.06	0.00	-8.52	-23.51	0.62	-1.01	1.07	0.0
%128	1.67	7.79	0.07	1.55	0.12	-6.24	-29.75	0.30	-0.31	1.87	0.0
%129	4.28	5.18	0.07	3.98	0.30	-1.20	-30.94	0.27	-0.04	4.02	0.0
%130	3.93	4.52	0.07	3.65	0.28	-0.87	-31.81	0.24	-0.02	3.68	0.0
%131	4.58	2.87	0.07	4.26	0.32	1.39	-14.99	1.63	1.39	2.87	0.0
%132	0.50	2.43	0.07	0.47	0.04	-1.96	-16.96	1.30	-0.33	0.79	0.0
%133	2.67	2.45	0.07	2.48	0.19	0.03	-16.73	1.34	0.03	2.45	0.0
%134	1.80	2.64	0.07	1.67	0.13	-0.97	-17.70	1.20	-0.14	1.81	0.0
%135	1.88	3.56	0.07	1.75	0.13	-1.81	-19.50	0.98	-0.22	1.97	0.0
%136	0.97	3.95	0.07	0.90	0.07	-3.05	-22.56	0.69	-0.29	1.19	0.0
%137	6.28	5.67	0.07	5.84	0.44	0.17	-20.61	0.86	0.17	5.67	0.0
%138	9.48	5.21	0.07	8.82	0.66	3.61	-6.13	4.47	3.61	5.21	0.0
%139	5.35	5.36	0.07	4.98	0.37	-0.39	-6.52	4.27	-0.20	5.17	0.0
%140	2.51	6.39	0.07	2.33	0.18	-4.06	-10.58	2.69	-1.58	3.91	0.0
%141	5.96	4.55	0.07	5.54	0.42	0.99	-7.82	3.69	0.99	4.55	0.0
%142	10.95	3.91	0.07	10.18	0.77	6.28	0.00	9.00	5.31	3.91	0.9
%143	1.93	2.65	0.07	1.79	0.14	-0.85	-0.85	8.15	-0.85	2.65	0.0
%144	0.64	2.60	0.07	0.60	0.04	-2.00	-2.85	6.49	-1.66	2.25	0.0
%145	1.43	2.84	0.07	1.33	0.10	-1.51	-4.36	5.46	-1.03	2.36	0.0
%146	2.26	2.51	0.07	2.10	0.16	-0.40	-4.77	5.22	-0.25	2.35	0.0
%147	2.40	3.29	0.07	2.23	0.17	-1.06	-5.83	4.62	-0.59	2.82	0.0
%148	4.67	3.74	0.07	4.34	0.33	0.61	-4.75	5.23	0.61	3.74	0.0
%149	5.35	5.07	0.07	4.98	0.37	-0.10	-4.85	5.17	-0.06	5.04	0.0
%150	2.00	6.80	0.07	1.86	0.14	-4.94	-9.80	2.94	-2.22	4.08	0.0
%151	3.58	7.95	0.07	3.33	0.25	-4.62	-14.42	1.74	-1.20	4.53	0.0
%152	2.96	7.47	0.07	2.75	0.21	-4.72	-19.14	1.02	-0.72	3.48	0.0
%153	3.19	6.76	0.07	2.97	0.22	-3.80	-22.93	0.66	-0.36	3.32	0.0
%154	6.89	4.89	0.07	6.41	0.48	1.52	-12.43	2.18	1.52	4.89	0.0
%155	4.09	3.36	0.07	3.80	0.29	0.44	-10.80	2.63	0.44	3.36	0.0
%156	3.05	4.42	0.07	2.84	0.21	-1.58	-12.38	2.19	-0.43	3.27	0.0
%157	3.07	2.07	0.07	2.86	0.21	0.79	-9.68	2.98	0.79	2.07	0.0
%158	4.66	2.39	0.07	4.33	0.33	1.94	-5.28	4.92	1.94	2.39	0.0
%159	5.97	3.86	0.07	5.55	0.42	1.70	-2.68	6.62	1.70	3.86	0.0
%160	0.31	4.73	0.07	0.29	0.02	-4.44	-7.13	3.99	-2.63	2.92	0.0
%161	9.49	6.05	0.07	8.83	0.66	2.78	-2.49	6.77	2.78	6.05	0.0
%162	2.60	5.43	0.07	2.42	0.18	-3.01	-5.51	4.80	-1.97	4.39	0.0
%163	2.46	6.45	0.07	2.29	0.17	-4.16	-9.66	2.99	-1.81	4.39	0.0
%164	7.24	5.68	0.07	6.73	0.51	1.05	-7.02	4.04	1.05	4.10	0.0
%165	9.40	5.14	0.07	8.74	0.66	3.60	-1.42	7.64	3.60	5.68	0.0
%166	2.81	4.10	0.07	2.61	0.20	-1.49	-2.91	6.44	-1.20	5.14	0.0
%167	3.25	2.86	0.07	3.02	0.23	0.17	-2.69	6.61	0.17	3.81	0.0
%168	1.83	2.40	0.07	1.70	0.13	-0.70	-3.39	6.10	-0.51	2.86	0.0
%169	1.67	2.37	0.07	1.55	0.12	-0.81	-4.21	5.56	-0.54	2.21	0.0
%170	0.99	3.74	0.07	0.92	0.07	-2.82	-7.02	4.04	-1.52	2.09	0.0
%171	4.98	5.62	0.07	4.63	0.35	-0.99	-8.01	3.61	-0.43	2.45	0.0
%172	0.34	6.06	0.07	0.32	0.02	-5.75	-13.76	1.88	-1.73	5.06	0.0
%173	5.76	8.51	0.07	5.36	0.40	-3.16	-16.91	1.31	-0.57	2.05	0.0
%174	4.39	5.97	0.07	4.08	0.31	-1.89	-18.80	1.06	-0.25	5.92	0.0
%175	1.61	5.49	0.07	1.50	0.11	-3.99	-22.79	0.67	-0.39	4.34	0.0
%176	1.83	6.27	0.07	1.70	0.13	-4.57	-27.36	0.40	-0.27	1.88	0.0
%177	0.77	5.24	0.07	0.72	0.05	-4.52	-31.88	0.24	-0.16	1.97	0.0
%178	15.69	4.40	0.07	14.59	1.10	10.19	0.00	9.00	8.76	0.88	0.0
%179	2.38	3.23	0.07	2.21	0.17	-1.02	-1.02	7.99	-1.01	4.40	1.4

%180	2.59	2.34	0.07	2.41	0.18	0.07	-0.95	8.06	0.07	2.34	0.0
%181	2.63	2.30	0.07	2.45	0.18	0.14	-0.80	8.20	0.14	2.30	0.0
%182	2.82	2.39	0.07	2.62	0.20	0.23	-0.56	8.43	0.23	2.39	0.0
%183	2.30	3.34	0.07	2.14	0.16	-1.20	-1.76	7.35	-1.08	3.22	0.0
%184	1.93	4.73	0.07	1.79	0.14	-2.94	-4.69	5.26	-2.09	3.88	0.0
%185	5.29	6.08	0.07	4.92	0.37	-1.16	-5.86	4.61	-0.65	5.57	0.0
%186	1.48	6.53	0.07	1.38	0.10	-5.15	-11.01	2.56	-2.04	3.42	0.0
%187	4.01	7.15	0.07	3.73	0.28	-3.42	-14.44	1.74	-0.83	4.56	0.0
%188	0.13	7.63	0.07	0.12	0.01	-7.51	-21.95	0.74	-1.00	1.12	0.0
%189	6.96	7.25	0.07	6.47	0.49	-0.78	-22.73	0.68	-0.06	6.54	0.0
%190	6.91	4.30	0.07	6.43	0.48	2.12	-10.25	2.80	2.12	4.30	0.0
%191	6.02	3.15	0.07	5.60	0.42	2.45	-4.72	5.25	2.45	3.15	0.0
%192	1.38	1.90	0.07	1.28	0.10	-0.62	-5.35	4.88	-0.36	1.64	0.0
%193	1.02	2.97	0.07	0.95	0.07	-2.03	-7.37	3.88	-1.01	1.95	0.0
%194	1.84	3.67	0.07	1.71	0.13	-1.96	-9.34	3.10	-0.78	2.49	0.0
%195	0.50	5.47	0.07	0.47	0.04	-5.01	-14.34	1.75	-1.35	1.81	0.0
%196	2.53	5.14	0.07	2.35	0.18	-2.79	-17.14	1.28	-0.48	2.83	0.0
%197	8.12	6.44	0.07	7.55	0.57	1.11	-11.63	2.39	1.11	6.44	0.0
%198	4.71	5.90	0.07	4.38	0.33	-1.52	-13.16	2.01	-0.38	4.76	0.0
%199	0.06	8.24	0.07	0.06	0.00	-8.18	-21.34	0.79	-1.22	1.27	0.0
%200	7.74	7.36	0.07	7.20	0.54	-0.16	-21.50	0.78	-0.01	7.21	0.0
%201	5.33	5.31	0.07	4.96	0.37	-0.36	-21.85	0.75	-0.03	4.99	0.0
%202	5.85	3.86	0.07	5.44	0.41	1.58	-11.85	2.33	1.58	3.86	0.0
%203	3.44	2.69	0.07	3.20	0.24	0.51	-10.11	2.84	0.51	2.69	0.0
%204	4.95	1.81	0.07	4.60	0.35	2.80	-4.09	5.64	2.80	1.81	0.0
%205	0.96	2.25	0.07	0.89	0.07	-1.36	-5.45	4.83	-0.81	1.71	0.0
%206	3.90	2.97	0.07	3.63	0.27	0.65	-4.35	5.48	0.65	2.97	0.0
%207	1.79	4.55	0.07	1.66	0.13	-2.89	-7.23	3.94	-1.54	3.20	0.0
%208	0.68	6.78	0.07	0.63	0.05	-6.15	-13.38	1.96	-1.98	2.62	0.0
%209	9.31	5.28	0.07	8.66	0.65	3.38	-4.57	5.34	3.38	5.28	0.0
%210	10.09	6.92	0.07	9.38	0.71	2.46	-1.24	7.80	2.46	6.92	0.0
%211	1.76	6.73	0.07	1.64	0.12	-5.10	-6.34	4.36	-3.44	5.07	0.0
%212	0.90	9.50	0.07	0.84	0.06	-8.66	-15.00	1.63	-2.73	3.57	0.0
%213	5.34	5.64	0.07	4.97	0.37	-0.68	-15.68	1.51	-0.12	5.09	0.0
%214	0.19	5.42	0.07	0.18	0.01	-5.24	-20.92	0.83	-0.68	0.85	0.0
%215	3.88	3.11	0.07	3.61	0.27	0.49	-16.82	1.32	0.49	3.11	0.0
%216	4.54	2.22	0.07	4.22	0.32	2.00	-8.72	3.33	2.00	2.22	0.0
%217	0.81	2.56	0.07	0.75	0.06	-1.80	-10.53	2.71	-0.62	1.37	0.0
%218	1.44	2.96	0.07	1.34	0.10	-1.62	-12.15	2.25	-0.46	1.80	0.0
%219	2.97	4.38	0.07	2.76	0.21	-1.62	-13.77	1.87	-0.38	3.14	0.0
%220	0.28	6.04	0.07	0.26	0.02	-5.78	-19.55	0.97	-0.90	1.16	0.0
%221	2.91	6.49	0.07	2.71	0.20	-3.78	-23.33	0.63	-0.34	3.05	0.0
%222	1.81	7.13	0.07	1.68	0.13	-5.44	-28.77	0.34	-0.29	1.97	0.0
%223	0.96	8.48	0.07	0.89	0.07	-7.59	-36.37	0.14	-0.20	1.09	0.0
%224	0.19	7.89	0.07	0.18	0.01	-7.71	-44.08	0.06	-0.08	0.26	0.0
%225	0.43	6.82	0.07	0.40	0.03	-6.42	-50.50	0.03	-0.03	0.43	0.0
%226	1.37	5.87	0.07	1.27	0.10	-4.59	-55.09	0.02	-0.01	1.29	0.0
%227	1.46	4.12	0.07	1.36	0.10	-2.77	-57.85	0.01	-0.00	1.36	0.0
%228	2.27	2.48	0.07	2.11	0.16	-0.37	-58.23	0.01	-0.00	2.11	0.0
%229	7.07	1.90	0.07	6.58	0.49	4.67	-5.72	4.68	4.67	1.90	0.0
%230	1.10	2.61	0.07	1.02	0.08	-1.59	-7.31	3.91	-0.78	1.80	0.0
%231	3.22	3.87	0.07	2.99	0.23	-0.88	-8.19	3.54	-0.37	3.37	0.0
%232	0.51	5.38	0.07	0.47	0.04	-4.90	-13.09	2.02	-1.51	1.99	0.0
%233	5.29	6.82	0.07	4.92	0.37	-1.91	-14.99	1.63	-0.39	5.31	0.0
%234	4.23	5.88	0.07	3.93	0.30	-1.95	-16.94	1.31	-0.32	4.26	0.0
%235	2.70	6.57	0.07	2.51	0.19	-4.05	-20.99	0.82	-0.48	2.99	0.0
%236	3.26	6.78	0.07	3.03	0.23	-3.74	-24.74	0.54	-0.29	3.32	0.0
%237	0.68	6.21	0.07	0.63	0.05	-5.58	-30.32	0.29	-0.25	0.89	0.0
%238	1.93	5.24	0.07	1.79	0.14	-3.45	-33.76	0.19	-0.09	1.89	0.0
%239	1.61	3.80	0.07	1.50	0.11	-2.30	-36.07	0.15	-0.04	1.54	0.0
%240	0.37	2.30	0.07	0.34	0.03	-1.95	-38.02	0.12	-0.03	0.37	0.0

TOTAL PERCOLATION = 18.635

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.10	1.47	0.16	-0.03	-39.21	0.10	-0.00	1.47	0.00
2	4.40	1.76	0.10	3.96	0.44	2.20	-11.97	2.30	2.20	1.76	0.00
3	3.58	2.57	0.10	3.22	0.36	0.65	-9.77	2.95	0.65	2.57	0.00
4	4.01	2.25	0.10	3.61	0.40	1.36	-6.46	4.31	1.36	2.25	0.00
5	4.22	3.67	0.10	3.80	0.42	0.13	-6.19	4.44	0.13	3.67	0.00
6	2.02	3.65	0.10	1.82	0.20	-1.84	-8.03	3.60	-0.84	2.66	0.00
7	0.26	4.86	0.10	0.23	0.03	-4.62	-12.65	2.13	-1.47	1.71	0.00
8	0.23	5.75	0.10	0.21	0.02	-5.55	-18.20	1.13	-1.00	1.20	0.00
9	6.38	3.82	0.10	5.74	0.64	1.92	-9.48	3.05	1.92	3.82	0.00
10	3.84	2.62	0.10	3.46	0.38	0.84	-7.35	3.89	0.84	2.62	0.00
11	0.62	2.87	0.10	0.56	0.06	-2.31	-9.67	2.99	-0.90	1.46	0.00
12	1.40	2.58	0.10	1.26	0.14	-1.32	-10.98	2.57	-0.42	1.68	0.00
13	0.15	2.81	0.10	0.14	0.02	-2.68	-13.66	1.90	-0.68	0.81	0.00
14	1.68	4.00	0.10	1.51	0.17	-2.49	-16.15	1.43	-0.47	1.98	0.00
15	12.00	5.87	0.10	10.80	1.20	4.93	-3.04	6.36	4.93	5.87	0.00
16	0.89	4.56	0.10	0.80	0.09	-3.76	-6.79	4.14	-2.21	3.02	0.00
17	5.65	6.00	0.10	5.09	0.56	-0.91	-7.71	3.73	-0.41	5.49	0.00
18	0.76	4.74	0.10	0.68	0.08	-4.05	-11.76	2.35	-1.38	2.06	0.00
19	1.87	8.64	0.10	1.68	0.19	-6.95	-18.72	1.07	-1.29	2.97	0.00
20	3.20	6.27	0.10	2.88	0.32	-3.39	-22.11	0.73	-0.34	3.22	0.00
21	3.31	5.52	0.10	2.98	0.33	-2.54	-24.65	0.54	-0.18	3.16	0.00
22	4.30	3.93	0.10	3.87	0.43	-0.06	-24.72	0.54	-0.00	3.87	0.00
23	2.75	3.30	0.10	2.47	0.28	-0.83	-25.55	0.49	-0.05	2.52	0.00
24	4.63	2.44	0.10	4.17	0.46	1.73	-12.27	2.22	1.73	2.44	0.00
25	1.73	1.77	0.10	1.56	0.17	-0.21	-12.49	2.17	-0.05	1.61	0.00
26	0.50	2.88	0.10	0.45	0.05	-2.43	-14.91	1.64	-0.52	0.97	0.00
27	0.91	4.24	0.10	0.82	0.09	-3.42	-18.33	1.12	-0.53	1.35	0.00
28	1.71	4.03	0.10	1.54	0.17	-2.49	-20.81	0.84	-0.27	1.81	0.00
29	6.38	5.15	0.10	5.74	0.64	0.59	-16.14	1.43	0.59	5.15	0.00
30	2.13	5.24	0.10	1.92	0.21	-3.33	-19.46	0.98	-0.45	2.37	0.00
31	2.17	5.74	0.10	1.95	0.22	-3.79	-23.25	0.64	-0.34	2.30	0.00
32	3.60	4.89	0.10	3.24	0.36	-1.65	-24.90	0.53	-0.11	3.35	0.00
33	4.45	4.56	0.10	4.00	0.44	-0.55	-25.45	0.50	-0.03	4.04	0.00
34	3.95	3.95	0.10	3.56	0.40	-0.40	-25.85	0.47	-0.02	3.58	0.00
35	3.26	2.16	0.10	2.93	0.33	0.77	-17.36	1.24	0.77	2.16	0.00
36	1.47	2.12	0.10	1.32	0.15	-0.80	-18.16	1.14	-0.11	1.43	0.00
37	5.51	3.11	0.10	4.96	0.55	1.84	-9.69	2.98	1.84	3.11	0.00
38	2.60	2.27	0.10	2.34	0.26	0.07	-9.48	3.05	0.07	2.27	0.00
39	5.17	3.54	0.10	4.65	0.52	1.12	-6.74	4.17	1.12	3.54	0.00
40	6.74	3.96	0.10	6.07	0.67	2.10	-3.15	6.28	2.10	3.96	0.00
41	2.12	4.30	0.10	1.91	0.21	-2.39	-5.54	4.78	-1.50	3.41	0.00
42	6.44	4.77	0.10	5.80	0.64	1.03	-3.83	5.81	1.03	4.77	0.00
43	2.15	4.56	0.10	1.94	0.22	-2.62	-6.46	4.30	-1.50	3.44	0.00
44	1.03	5.52	0.10	0.93	0.10	-4.59	-11.05	2.55	-1.75	2.68	0.00
45	9.44	4.80	0.10	8.50	0.94	3.69	-3.19	6.25	3.69	4.80	0.00
46	10.17	4.25	0.10	9.15	1.02	4.90	0.00	9.00	2.75	4.25	2.15
47	2.40	2.60	0.10	2.16	0.24	-0.44	-0.44	8.54	-0.46	2.62	0.00
48	2.52	2.87	0.10	2.27	0.25	-0.60	-1.04	7.97	-0.57	2.83	0.00
49	4.66	1.75	0.10	4.19	0.47	2.44	0.00	9.00	1.03	1.75	1.42
50	0.13	3.00	0.10	0.12	0.01	-2.88	-2.88	6.47	-2.53	2.65	0.00
51	1.56	3.97	0.10	1.40	0.16	-2.57	-5.44	4.83	-1.64	3.04	0.00
52	1.76	5.22	0.10	1.58	0.18	-3.64	-9.08	3.19	-1.64	3.22	0.00
53	3.09	5.89	0.10	2.78	0.31	-3.11	-12.19	2.24	-0.95	3.73	0.00

54	0.73	5.36	0.10	0.66	0.07	-4.70	-16.89	1.31	-0.93	1.59	0.00
55	2.40	5.57	0.10	2.16	0.24	-3.41	-20.30	0.89	-0.42	2.58	0.00
56	9.88	6.05	0.10	8.89	0.99	2.84	-7.71	3.74	2.84	6.05	0.00
57	9.22	4.84	0.10	8.30	0.92	3.46	-1.95	7.20	3.46	4.84	0.00
58	6.02	3.92	0.10	5.42	0.60	1.50	-0.29	8.69	1.50	3.92	0.00
59	5.68	2.63	0.10	5.11	0.57	2.48	0.00	9.00	0.31	2.63	0.00
60	2.82	2.11	0.10	2.54	0.28	0.42	0.00	9.00	0.00	2.11	2.17
61	1.80	2.27	0.10	1.62	0.18	-0.65	-0.65	8.34	-0.66	2.28	0.42
62	2.45	2.22	0.10	2.20	0.25	-0.01	-0.66	8.32	-0.01	2.22	0.00
63	1.41	3.09	0.10	1.27	0.14	-1.82	-2.48	6.77	-1.56	2.82	0.00
64	2.08	4.17	0.10	1.87	0.21	-2.30	-4.78	5.21	-1.56	3.43	0.00
65	11.99	4.56	0.10	10.79	1.20	6.23	0.00	9.00	3.79	4.56	0.00
66	2.42	5.73	0.10	2.18	0.24	-3.55	-3.55	5.99	-3.01	5.19	2.44
67	4.16	5.52	0.10	3.74	0.42	-1.78	-5.33	4.89	-1.10	4.84	0.00
68	2.44	5.72	0.10	2.20	0.24	-3.52	-8.86	3.28	-1.62	3.81	0.00
69	3.78	4.72	0.10	3.40	0.38	-1.32	-10.17	2.82	-0.46	3.86	0.00
70	3.35	3.62	0.10	3.01	0.34	-0.60	-10.78	2.63	-0.19	3.20	0.00
71	1.07	3.95	0.10	0.96	0.11	-2.98	-13.76	1.87	-0.76	1.72	0.00
72	1.18	2.72	0.10	1.06	0.12	-1.65	-15.42	1.55	-0.32	1.38	0.00
73	1.60	3.37	0.10	1.44	0.16	-1.93	-17.35	1.25	-0.31	1.75	0.00
74	1.74	3.10	0.10	1.57	0.17	-1.53	-18.88	1.05	-0.20	1.77	0.00
75	4.81	3.54	0.10	4.33	0.48	0.79	-13.96	1.83	0.79	3.54	0.00
76	5.95	4.07	0.10	5.36	0.59	1.29	-9.28	3.12	1.29	4.07	0.00
77	4.32	4.53	0.10	3.89	0.43	-0.64	-9.92	2.90	-0.22	4.11	0.00
78	4.02	6.05	0.10	3.62	0.40	-2.44	-12.36	2.20	-0.70	4.32	0.00
79	2.13	5.27	0.10	1.92	0.21	-3.35	-15.72	1.50	-0.70	2.61	0.00
80	1.48	6.20	0.10	1.33	0.15	-4.86	-20.58	0.86	-0.64	1.97	0.00
81	2.68	3.90	0.10	2.41	0.27	-1.49	-22.07	0.73	-0.13	2.55	0.00
82	5.77	3.62	0.10	5.19	0.58	1.57	-11.96	2.30	1.57	3.62	0.00
83	3.27	1.86	0.10	2.94	0.33	1.08	-8.58	3.38	1.08	1.86	0.00
84	4.05	2.45	0.10	3.65	0.41	1.20	-5.92	4.58	1.20	2.45	0.00
85	2.14	1.43	0.10	1.93	0.21	0.49	-5.03	5.07	0.49	1.43	0.00
86	3.55	2.90	0.10	3.19	0.35	0.30	-4.53	5.37	0.30	2.90	0.00
87	2.06	3.81	0.10	1.85	0.21	-1.95	-6.48	4.29	-1.07	2.93	0.00
88	8.81	4.38	0.10	7.93	0.88	3.55	-1.19	7.85	3.55	4.38	0.00
89	1.56	5.21	0.10	1.40	0.16	-3.80	-4.99	5.08	-2.76	4.17	0.00
90	1.35	6.78	0.10	1.22	0.14	-5.56	-10.55	2.70	-2.38	3.60	0.00
91	0.31	7.10	0.10	0.28	0.03	-6.82	-17.37	1.24	-1.46	1.74	0.00
92	1.35	6.50	0.10	1.22	0.14	-5.28	-22.65	0.68	-0.56	1.78	0.00
93	1.69	6.16	0.10	1.52	0.17	-4.64	-27.29	0.40	-0.28	1.80	0.00
94	0.79	4.64	0.10	0.71	0.08	-3.93	-31.22	0.26	-0.14	0.86	0.00
95	3.10	3.24	0.10	2.79	0.31	-0.45	-31.67	0.24	-0.01	2.80	0.00
96	2.67	3.07	0.10	2.40	0.27	-0.67	-32.34	0.23	-0.02	2.42	0.00
97	4.51	1.92	0.10	4.06	0.45	2.13	-11.74	2.36	2.13	1.92	0.00
98	2.62	1.98	0.10	2.36	0.26	0.38	-10.44	2.74	0.38	1.98	0.00
99	2.72	4.39	0.10	2.45	0.27	-1.94	-12.38	2.19	-0.54	2.99	0.00
%100	1.37	4.99	0.10	1.23	0.14	-3.76	-16.14	1.43	-0.76	2.00	0.0
%101	2.52	5.91	0.10	2.27	0.25	-3.64	-19.78	0.95	-0.49	2.75	0.0
%102	2.44	6.32	0.10	2.20	0.24	-4.12	-23.90	0.59	-0.35	2.55	0.0
%103	1.26	6.53	0.10	1.13	0.13	-5.40	-29.30	0.32	-0.27	1.41	0.0
%104	0.57	6.53	0.10	0.51	0.06	-6.02	-35.32	0.16	-0.16	0.67	0.0
%105	6.50	4.78	0.10	5.85	0.65	1.07	-17.46	1.23	1.07	4.78	0.0
%106	0.41	5.19	0.10	0.37	0.04	-4.82	-22.28	0.71	-0.52	0.89	0.0
%107	6.31	2.86	0.10	5.68	0.63	2.82	-8.19	3.53	2.82	2.86	0.0
%108	3.17	2.18	0.10	2.85	0.32	0.67	-6.67	4.20	0.67	2.18	0.0
%109	3.70	1.74	0.10	3.33	0.37	1.59	-3.85	5.80	1.59	1.74	0.0
%110	4.08	2.24	0.10	3.67	0.41	1.43	-1.91	7.23	1.43	2.24	0.0
%111	5.54	4.35	0.10	4.99	0.55	0.64	-1.16	7.87	0.64	4.35	0.0
%112	4.74	4.27	0.10	4.27	0.47	-0.00	-1.17	7.86	-0.01	4.28	0.0
%113	11.05	5.26	0.10	9.94	1.11	4.69	0.00	9.00	1.14	5.26	3.5
%114	1.30	5.70	0.10	1.17	0.13	-4.53	-4.53	5.36	-3.64	4.81	0.0
%115	4.48	5.40	0.10	4.03	0.45	-1.37	-5.91	4.58	-0.77	4.81	0.0
%116	3.81	5.66	0.10	3.43	0.38	-2.23	-8.13	3.56	-1.03	4.45	0.0

%117	3.20	4.55	0.10	2.88	0.32	-1.67	-9.80	2.94	-0.62	3.50	0.0
%118	1.70	4.09	0.10	1.53	0.17	-2.56	-12.36	2.20	-0.74	2.27	0.0
%119	0.77	2.69	0.10	0.69	0.08	-2.00	-14.36	1.75	-0.45	1.14	0.0
%120	3.32	1.63	0.10	2.99	0.33	1.36	-9.32	3.11	1.36	1.63	0.0
%121	3.12	1.88	0.10	2.81	0.31	0.93	-7.02	4.04	0.93	1.88	0.0
%122	1.94	2.69	0.10	1.75	0.19	-0.95	-7.97	3.63	-0.42	2.16	0.0
%123	5.04	3.26	0.10	4.54	0.50	1.27	-5.33	4.90	1.27	3.26	0.0
%124	2.38	4.62	0.10	2.14	0.24	-2.48	-7.80	3.69	-1.21	3.35	0.0
%125	4.31	4.77	0.10	3.88	0.43	-0.89	-8.69	3.34	-0.35	4.23	0.0
%126	0.10	7.34	0.10	0.09	0.01	-7.25	-15.94	1.46	-1.87	1.96	0.0
%127	0.06	8.57	0.10	0.05	0.01	-8.52	-24.46	0.56	-0.91	0.96	0.0
%128	1.67	7.79	0.10	1.50	0.17	-6.29	-30.75	0.27	-0.28	1.79	0.0
%129	4.28	5.18	0.10	3.85	0.43	-1.33	-32.07	0.23	-0.04	3.89	0.0
%130	3.93	4.52	0.10	3.54	0.39	-0.98	-33.06	0.21	-0.02	3.56	0.0
%131	4.58	2.87	0.10	4.12	0.46	1.25	-15.95	1.46	1.25	2.87	0.0
%132	0.50	2.43	0.10	0.45	0.05	-1.98	-17.93	1.17	-0.29	0.74	0.0
%133	2.67	2.45	0.10	2.40	0.27	-0.05	-17.98	1.16	-0.01	2.41	0.0
%134	1.80	2.64	0.10	1.62	0.18	-1.02	-19.00	1.03	-0.13	1.75	0.0
%135	1.88	3.56	0.10	1.69	0.19	-1.86	-20.86	0.84	-0.20	1.89	0.0
%136	0.97	3.95	0.10	0.87	0.10	-3.08	-23.94	0.59	-0.25	1.12	0.0
%137	6.28	5.67	0.10	5.65	0.63	-0.02	-23.96	0.59	-0.00	5.65	0.0
%138	9.48	5.21	0.10	8.53	0.95	3.32	-7.30	3.91	3.32	5.21	0.0
%139	5.35	5.36	0.10	4.82	0.54	-0.55	-7.85	3.67	-0.24	5.05	0.0
%140	2.51	6.39	0.10	2.26	0.25	-4.13	-11.98	2.30	-1.38	3.64	0.0
%141	5.96	4.55	0.10	5.36	0.60	0.81	-9.32	3.11	0.81	4.55	0.0
%142	10.95	3.91	0.10	9.85	1.10	5.95	0.00	9.00	5.89	3.91	0.0
%143	1.93	2.65	0.10	1.74	0.19	-0.91	-0.91	8.09	-0.91	2.65	0.0
%144	0.64	2.60	0.10	0.58	0.06	-2.02	-2.93	6.43	-1.66	2.24	0.0
%145	1.43	2.84	0.10	1.29	0.14	-1.56	-4.48	5.39	-1.04	2.33	0.0
%146	2.26	2.51	0.10	2.03	0.23	-0.47	-4.96	5.11	-0.28	2.32	0.0
%147	2.40	3.29	0.10	2.16	0.24	-1.13	-6.09	4.49	-0.62	2.78	0.0
%148	4.67	3.74	0.10	4.20	0.47	0.46	-5.23	4.95	0.46	3.74	0.0
%149	5.35	5.07	0.10	4.82	0.54	-0.26	-5.49	4.81	-0.15	4.96	0.0
%150	2.00	6.80	0.10	1.80	0.20	-5.00	-10.49	2.72	-2.09	3.89	0.0
%151	3.58	7.95	0.10	3.22	0.36	-4.73	-15.22	1.59	-1.13	4.35	0.0
%152	2.96	7.47	0.10	2.66	0.30	-4.80	-20.03	0.92	-0.67	3.33	0.0
%153	3.19	6.76	0.10	2.87	0.32	-3.89	-23.92	0.59	-0.33	3.20	0.0
%154	6.89	4.89	0.10	6.20	0.69	1.31	-13.62	1.91	1.31	4.89	0.0
%155	4.09	3.36	0.10	3.68	0.41	0.32	-12.25	2.23	0.32	3.36	0.0
%156	3.05	4.42	0.10	2.74	0.31	-1.67	-13.92	1.84	-0.39	3.13	0.0
%157	3.07	2.07	0.10	2.76	0.31	0.70	-11.10	2.54	0.70	2.07	0.0
%158	4.66	2.39	0.10	4.19	0.47	1.80	-6.39	4.34	1.80	2.39	0.0
%159	5.97	3.86	0.10	5.37	0.60	1.52	-3.76	5.85	1.52	3.86	0.0
%160	0.31	4.73	0.10	0.28	0.03	-4.45	-8.21	3.52	-2.33	2.61	0.0
%161	9.49	6.05	0.10	8.54	0.95	2.49	-3.52	6.02	2.49	6.05	0.0
%162	2.60	5.43	0.10	2.34	0.26	-3.09	-6.61	4.23	-1.79	4.13	0.0
%163	2.46	6.45	0.10	2.21	0.25	-4.23	-10.85	2.61	-1.62	3.83	0.0
%164	7.24	5.68	0.10	6.52	0.72	0.83	-8.42	3.44	0.83	5.68	0.0
%165	9.40	5.14	0.10	8.46	0.94	3.32	-2.49	6.77	3.32	5.14	0.0
%166	2.81	4.10	0.10	2.53	0.28	-1.57	-4.06	5.65	-1.11	3.64	0.0
%167	3.25	2.86	0.10	2.92	0.33	0.07	-3.96	5.72	0.07	2.86	0.0
%168	1.83	2.40	0.10	1.65	0.18	-0.75	-4.72	5.25	-0.47	2.12	0.0
%169	1.67	2.37	0.10	1.50	0.17	-0.86	-5.58	4.76	-0.49	1.99	0.0
%170	0.99	3.74	0.10	0.89	0.10	-2.85	-8.43	3.44	-1.32	2.21	0.0
%171	4.98	5.62	0.10	4.48	0.50	-1.14	-9.57	3.02	-0.42	4.90	0.0
%172	0.34	6.06	0.10	0.31	0.03	-5.76	-15.32	1.57	-1.45	1.76	0.0
%173	5.76	8.51	0.10	5.18	0.58	-3.33	-18.65	1.07	-0.49	5.68	0.0
%174	4.39	5.97	0.10	3.95	0.44	-2.02	-20.67	0.85	-0.22	4.17	0.0
%175	1.61	5.49	0.10	1.45	0.16	-4.04	-24.71	0.54	-0.31	1.76	0.0
%176	1.83	6.27	0.10	1.65	0.18	-4.63	-29.33	0.32	-0.22	1.87	0.0
%177	0.77	5.24	0.10	0.69	0.08	-4.54	-33.88	0.19	-0.13	0.82	0.0
%178	15.69	4.40	0.10	14.12	1.57	9.72	0.00	9.00	8.81	4.40	0.9
%179	2.38	3.23	0.10	2.14	0.24	-1.09	-1.09	7.92	-1.08	3.22	0.0

%180	2.59	2.34	0.10	2.33	0.26	-0.01	-1.10	7.92	-0.01	2.34	0.0
%181	2.63	2.30	0.10	2.37	0.26	0.06	-1.04	7.98	0.06	2.30	0.0
%182	2.82	2.39	0.10	2.54	0.28	0.14	-0.88	8.13	0.14	2.39	0.0
%183	2.30	3.34	0.10	2.07	0.23	-1.27	-2.15	7.03	-1.10	3.17	0.0
%184	1.93	4.73	0.10	1.74	0.19	-2.99	-5.15	5.00	-2.03	3.77	0.0
%185	5.29	6.08	0.10	4.76	0.53	-1.32	-6.47	4.30	-0.70	5.46	0.0
%186	1.48	6.53	0.10	1.33	0.15	-5.20	-11.67	2.38	-1.92	3.25	0.0
%187	4.01	7.15	0.10	3.61	0.40	-3.55	-15.21	1.59	-0.79	4.40	0.0
%188	0.13	7.63	0.10	0.12	0.01	-7.51	-22.72	0.68	-0.91	1.03	0.0
%189	6.96	7.25	0.10	6.26	0.70	-0.99	-23.71	0.60	-0.07	6.34	0.0
%190	6.91	4.30	0.10	6.22	0.69	1.91	-11.17	2.52	1.91	4.30	0.0
%191	6.02	3.15	0.10	5.42	0.60	2.27	-5.53	4.79	2.27	3.15	0.0
%192	1.38	1.90	0.10	1.24	0.14	-0.66	-6.19	4.44	-0.35	1.59	0.0
%193	1.02	2.97	0.10	0.92	0.10	-2.06	-8.25	3.51	-0.93	1.84	0.0
%194	1.84	3.67	0.10	1.66	0.18	-2.02	-10.27	2.79	-0.72	2.38	0.0
%195	0.50	5.47	0.10	0.45	0.05	-5.02	-15.29	1.58	-1.21	1.66	0.0
%196	2.53	5.14	0.10	2.28	0.25	-2.87	-18.16	1.14	-0.44	2.72	0.0
%197	8.12	6.44	0.10	7.31	0.81	0.87	-13.17	2.00	0.87	6.44	0.0
%198	4.71	5.90	0.10	4.24	0.47	-1.66	-14.84	1.66	-0.35	4.58	0.0
%199	0.06	8.24	0.10	0.05	0.01	-8.19	-23.02	0.65	-1.01	1.06	0.0
%200	7.74	7.36	0.10	6.97	0.77	-0.39	-23.41	0.63	-0.03	6.99	0.0
%201	5.33	5.31	0.10	4.80	0.53	-0.52	-23.93	0.59	-0.04	4.83	0.0
%202	5.85	3.86	0.10	5.26	0.58	1.41	-13.20	2.00	1.41	3.86	0.0
%203	3.44	2.69	0.10	3.10	0.34	0.41	-11.57	2.41	0.41	2.69	0.0
%204	4.95	1.81	0.10	4.45	0.49	2.65	-5.05	5.05	2.65	1.81	0.0
%205	0.96	2.25	0.10	0.86	0.10	-1.39	-6.44	4.31	-0.74	1.61	0.0
%206	3.90	2.97	0.10	3.51	0.39	0.54	-5.42	4.85	0.54	2.97	0.0
%207	1.79	4.55	0.10	1.61	0.18	-2.94	-8.36	3.47	-1.38	2.99	0.0
%208	0.68	6.78	0.10	0.61	0.07	-6.17	-14.53	1.72	-1.75	2.36	0.0
%209	9.31	5.28	0.10	8.38	0.93	3.10	-5.47	4.82	3.10	5.28	0.0
%210	10.09	6.92	0.10	9.08	1.01	2.16	-2.22	6.98	2.16	6.92	0.0
%211	1.76	6.73	0.10	1.58	0.18	-5.15	-7.37	3.88	-3.10	4.68	0.0
%212	0.90	9.50	0.10	0.81	0.09	-8.69	-16.06	1.44	-2.44	3.25	0.0
%213	5.34	5.64	0.10	4.81	0.53	-0.84	-16.90	1.31	-0.13	4.94	0.0
%214	0.19	5.42	0.10	0.17	0.02	-5.25	-22.14	0.72	-0.59	0.76	0.0
%215	3.88	3.11	0.10	3.49	0.39	0.38	-18.45	1.10	0.38	3.11	0.0
%216	4.54	2.22	0.10	4.09	0.45	1.87	-9.73	2.97	1.87	2.22	0.0
%217	0.81	2.56	0.10	0.73	0.08	-1.83	-11.56	2.41	-0.56	1.29	0.0
%218	1.44	2.96	0.10	1.30	0.14	-1.66	-13.22	1.99	-0.42	1.71	0.0
%219	2.97	4.38	0.10	2.67	0.30	-1.71	-14.93	1.64	-0.35	3.03	0.0
%220	0.28	6.04	0.10	0.25	0.03	-5.79	-20.72	0.85	-0.79	1.04	0.0
%221	2.91	6.49	0.10	2.62	0.29	-3.87	-24.59	0.55	-0.30	2.92	0.0
%222	1.81	7.13	0.10	1.63	0.18	-5.50	-30.09	0.29	-0.25	1.88	0.0
%223	0.96	8.48	0.10	0.86	0.10	-7.62	-37.71	0.12	-0.17	1.03	0.0
%224	0.19	7.89	0.10	0.17	0.02	-7.72	-45.43	0.05	-0.07	0.24	0.0
%225	0.43	6.82	0.10	0.39	0.04	-6.43	-51.86	0.02	-0.03	0.41	0.0
%226	1.37	5.87	0.10	1.23	0.14	-4.63	-56.49	0.01	-0.01	1.24	0.0
%227	1.46	4.12	0.10	1.31	0.15	-2.81	-59.30	0.01	-0.00	1.32	0.0
%228	2.27	2.48	0.10	2.04	0.23	-0.44	-59.74	0.01	-0.00	2.04	0.0
%229	7.07	1.90	0.10	6.36	0.71	4.46	-6.13	4.47	4.46	1.90	0.0
%230	1.10	2.61	0.10	0.99	0.11	-1.62	-7.75	3.71	-0.76	1.75	0.0
%231	3.22	3.87	0.10	2.90	0.32	-0.97	-8.73	3.32	-0.39	3.29	0.0
%232	0.51	5.38	0.10	0.46	0.05	-4.92	-13.64	1.90	-1.42	1.88	0.0
%233	5.29	6.82	0.10	4.76	0.53	-2.06	-15.71	1.50	-0.40	5.16	0.0
%234	4.23	5.88	0.10	3.81	0.42	-2.07	-17.78	1.19	-0.32	4.12	0.0
%235	2.70	6.57	0.10	2.43	0.27	-4.14	-21.92	0.74	-0.45	2.88	0.0
%236	3.26	6.78	0.10	2.93	0.33	-3.84	-25.76	0.48	-0.26	3.20	0.0
%237	0.68	6.21	0.10	0.61	0.07	-5.60	-31.36	0.25	-0.23	0.84	0.0
%238	1.93	5.24	0.10	1.74	0.19	-3.51	-34.86	0.17	-0.08	1.82	0.0
%239	1.61	3.80	0.10	1.45	0.16	-2.35	-37.21	0.13	-0.04	1.49	0.0
%240	0.37	2.30	0.10	0.33	0.04	-1.96	-39.18	0.10	-0.03	0.36	0.0

TOTAL PERCOLATION = 13.114

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.15	1.39	0.24	-0.11	-41.26	0.08	-0.00	1.39	0.00
2	4.40	1.76	0.15	3.74	0.66	1.98	-12.94	2.06	1.98	1.76	0.00
3	3.58	2.57	0.15	3.04	0.54	0.47	-11.12	2.53	0.47	2.57	0.00
4	4.01	2.25	0.15	3.41	0.60	1.15	-7.82	3.69	1.15	2.25	0.00
5	4.22	3.67	0.15	3.59	0.63	-0.08	-7.90	3.65	-0.04	3.62	0.00
6	2.02	3.65	0.15	1.72	0.30	-1.94	-9.84	2.93	-0.72	2.44	0.00
7	0.26	4.86	0.15	0.22	0.04	-4.64	-14.48	1.73	-1.20	1.42	0.00
8	0.23	5.75	0.15	0.20	0.03	-5.56	-20.04	0.92	-0.81	1.01	0.00
9	6.38	3.82	0.15	5.42	0.96	1.60	-11.17	2.52	1.60	3.82	0.00
10	3.84	2.62	0.15	3.26	0.58	0.65	-9.16	3.17	0.65	2.62	0.00
11	0.62	2.87	0.15	0.53	0.09	-2.34	-11.51	2.42	-0.74	1.27	0.00
12	1.40	2.58	0.15	1.19	0.21	-1.39	-12.89	2.07	-0.35	1.54	0.00
13	0.15	2.81	0.15	0.13	0.02	-2.69	-15.58	1.52	-0.55	0.67	0.00
14	1.68	4.00	0.15	1.43	0.25	-2.57	-18.15	1.14	-0.39	1.81	0.00
15	12.00	5.87	0.15	10.20	1.80	4.33	-4.37	5.47	4.33	5.87	0.00
16	0.89	4.56	0.15	0.76	0.13	-3.80	-8.17	3.54	-1.92	2.68	0.00
17	5.65	6.00	0.15	4.80	0.85	-1.20	-9.36	3.09	-0.45	5.25	0.00
18	0.76	4.74	0.15	0.65	0.11	-4.09	-13.46	1.94	-1.15	1.80	0.00
19	1.87	8.64	0.15	1.59	0.28	-7.05	-20.50	0.87	-1.07	2.66	0.00
20	3.20	6.27	0.15	2.72	0.48	-3.55	-24.06	0.58	-0.29	3.01	0.00
21	3.31	5.52	0.15	2.81	0.50	-2.71	-26.77	0.43	-0.15	2.97	0.00
22	4.30	3.93	0.15	3.66	0.65	-0.28	-27.04	0.41	-0.01	3.67	0.00
23	2.75	3.30	0.15	2.34	0.41	-0.97	-28.01	0.37	-0.04	2.38	0.00
24	4.63	2.44	0.15	3.94	0.69	1.50	-13.78	1.87	1.50	2.44	0.00
25	1.73	1.77	0.15	1.47	0.26	-0.30	-14.08	1.81	-0.06	1.53	0.00
26	0.50	2.88	0.15	0.43	0.08	-2.45	-16.54	1.37	-0.44	0.86	0.00
27	0.91	4.24	0.15	0.77	0.14	-3.46	-20.00	0.92	-0.45	1.22	0.00
28	1.71	4.03	0.15	1.45	0.26	-2.57	-22.57	0.69	-0.23	1.69	0.00
29	6.38	5.15	0.15	5.42	0.96	0.27	-19.65	0.96	0.27	5.15	0.00
30	2.13	5.24	0.15	1.81	0.32	-3.43	-23.08	0.65	-0.31	2.12	0.00
31	2.17	5.74	0.15	1.84	0.33	-3.90	-26.97	0.42	-0.23	2.08	0.00
32	3.60	4.89	0.15	3.06	0.54	-1.83	-28.80	0.34	-0.08	3.14	0.00
33	4.45	4.56	0.15	3.78	0.67	-0.77	-29.57	0.31	-0.03	3.81	0.00
34	3.95	3.95	0.15	3.36	0.59	-0.60	-30.17	0.29	-0.02	3.38	0.00
35	3.26	2.16	0.15	2.77	0.49	0.61	-20.23	0.90	0.61	2.16	0.00
36	1.47	2.12	0.15	1.25	0.22	-0.87	-21.10	0.81	-0.08	1.33	0.00
37	5.51	3.11	0.15	4.68	0.83	1.57	-11.66	2.38	1.57	3.11	0.00
38	2.60	2.27	0.15	2.21	0.39	-0.06	-11.72	2.37	-0.02	2.23	0.00
39	5.17	3.54	0.15	4.39	0.78	0.86	-9.00	3.23	0.86	3.54	0.00
40	6.74	3.96	0.15	5.73	1.01	1.77	-5.16	4.99	1.77	3.96	0.00
41	2.12	4.30	0.15	1.80	0.32	-2.50	-7.66	3.76	-1.24	3.04	0.00
42	6.44	4.77	0.15	5.47	0.97	0.71	-6.15	4.46	0.71	4.77	0.00
43	2.15	4.56	0.15	1.83	0.32	-2.73	-8.88	3.27	-1.19	3.02	0.00
44	1.03	5.52	0.15	0.88	0.15	-4.64	-13.52	1.93	-1.34	2.22	0.00
45	9.44	4.80	0.15	8.02	1.42	3.22	-4.89	5.15	3.22	4.80	0.00
46	10.17	4.25	0.15	8.64	1.53	4.40	0.00	9.00	3.85	4.25	0.55
47	2.40	2.60	0.15	2.04	0.36	-0.56	-0.56	8.42	-0.58	2.62	0.00
48	2.52	2.87	0.15	2.14	0.38	-0.73	-1.28	7.75	-0.67	2.81	0.00
49	4.66	1.75	0.15	3.96	0.70	2.21	0.00	9.00	1.25	1.75	0.96
50	0.13	3.00	0.15	0.11	0.02	-2.89	-2.89	6.46	-2.54	2.65	0.00
51	1.56	3.97	0.15	1.33	0.23	-2.64	-5.53	4.78	-1.68	3.00	0.00
52	1.76	5.22	0.15	1.50	0.26	-3.73	-9.25	3.13	-1.65	3.15	0.00
53	3.09	5.89	0.15	2.63	0.46	-3.26	-12.52	2.16	-0.97	3.60	0.00

54	0.73	5.36	0.15	0.62	0.11	-4.73	-17.25	1.26	-0.90	1.52	0.00
55	2.40	5.57	0.15	2.04	0.36	-3.53	-20.78	0.84	-0.42	2.46	0.00
56	9.88	6.05	0.15	8.40	1.48	2.35	-9.08	3.19	2.35	6.05	0.00
57	9.22	4.84	0.15	7.84	1.38	3.00	-3.27	6.19	3.00	4.84	0.00
58	6.02	3.92	0.15	5.12	0.90	1.20	-1.72	7.39	1.20	3.92	0.00
59	5.68	2.63	0.15	4.83	0.85	2.20	0.00	9.00	1.61	2.63	0.59
60	2.82	2.11	0.15	2.40	0.42	0.28	0.00	9.00	0.00	2.11	0.28
61	1.80	2.27	0.15	1.53	0.27	-0.74	-0.74	8.25	-0.75	2.28	0.00
62	2.45	2.22	0.15	2.08	0.37	-0.14	-0.87	8.12	-0.13	2.21	0.00
63	1.41	3.09	0.15	1.20	0.21	-1.89	-2.76	6.55	-1.57	2.77	0.00
64	2.08	4.17	0.15	1.77	0.31	-2.40	-5.17	4.98	-1.57	3.34	0.00
65	11.99	4.56	0.15	10.19	1.80	5.63	0.00	9.00	4.02	4.56	1.61
66	2.42	5.73	0.15	2.06	0.36	-3.68	-3.68	5.91	-3.09	5.15	0.00
67	4.16	5.52	0.15	3.54	0.62	-1.99	-5.66	4.71	-1.20	4.73	0.00
68	2.44	5.72	0.15	2.07	0.37	-3.64	-9.31	3.11	-1.60	3.67	0.00
69	3.78	4.72	0.15	3.21	0.57	-1.51	-10.81	2.62	-0.49	3.70	0.00
70	3.35	3.62	0.15	2.85	0.50	-0.77	-11.58	2.40	-0.22	3.07	0.00
71	1.07	3.95	0.15	0.91	0.16	-3.04	-14.62	1.70	-0.70	1.61	0.00
72	1.18	2.72	0.15	1.00	0.18	-1.71	-16.34	1.40	-0.30	1.30	0.00
73	1.60	3.37	0.15	1.36	0.24	-2.01	-18.35	1.11	-0.29	1.65	0.00
74	1.74	3.10	0.15	1.48	0.26	-1.62	-19.97	0.92	-0.19	1.67	0.00
75	4.81	3.54	0.15	4.09	0.72	0.55	-15.89	1.47	0.55	3.54	0.00
76	5.95	4.07	0.15	5.06	0.89	0.99	-11.37	2.46	0.99	4.07	0.00
77	4.32	4.53	0.15	3.67	0.65	-0.86	-12.23	2.23	-0.23	3.90	0.00
78	4.02	6.05	0.15	3.42	0.60	-2.64	-14.86	1.65	-0.58	4.00	0.00
79	2.13	5.27	0.15	1.81	0.32	-3.46	-18.32	1.12	-0.54	2.35	0.00
80	1.48	6.20	0.15	1.26	0.22	-4.94	-23.26	0.64	-0.48	1.74	0.00
81	2.68	3.90	0.15	2.28	0.40	-1.62	-24.88	0.53	-0.11	2.39	0.00
82	5.77	3.62	0.15	4.90	0.87	1.29	-14.05	1.81	1.29	3.62	0.00
83	3.27	1.86	0.15	2.78	0.49	0.92	-10.45	2.73	0.92	1.86	0.00
84	4.05	2.45	0.15	3.44	0.61	0.99	-7.73	3.72	0.99	2.45	0.00
85	2.14	1.43	0.15	1.82	0.32	0.38	-6.87	4.11	0.38	1.43	0.00
86	3.55	2.90	0.15	3.02	0.53	0.12	-6.62	4.23	0.12	2.90	0.00
87	2.06	3.81	0.15	1.75	0.31	-2.06	-8.68	3.34	-0.88	2.64	0.00
88	8.81	4.38	0.15	7.49	1.32	3.11	-2.90	6.46	3.11	4.38	0.00
89	1.56	5.21	0.15	1.33	0.23	-3.88	-6.78	4.15	-2.31	3.64	0.00
90	1.35	6.78	0.15	1.15	0.20	-5.63	-12.41	2.19	-1.96	3.11	0.00
91	0.31	7.10	0.15	0.26	0.05	-6.83	-19.25	1.00	-1.18	1.45	0.00
92	1.35	6.50	0.15	1.15	0.20	-5.35	-24.59	0.55	-0.46	1.61	0.00
93	1.69	6.16	0.15	1.44	0.25	-4.72	-29.32	0.32	-0.23	1.66	0.00
94	0.79	4.64	0.15	0.67	0.12	-3.97	-33.29	0.20	-0.12	0.79	0.00
95	3.10	3.24	0.15	2.63	0.47	-0.61	-33.89	0.19	-0.01	2.65	0.00
96	2.67	3.07	0.15	2.27	0.40	-0.80	-34.70	0.17	-0.02	2.29	0.00
97	4.51	1.92	0.15	3.83	0.68	1.91	-12.84	2.08	1.91	1.92	0.00
98	2.62	1.98	0.15	2.23	0.39	0.25	-11.86	2.33	0.25	1.98	0.00
99	2.72	4.39	0.15	2.31	0.41	-2.08	-13.94	1.84	-0.49	2.80	0.00
%100	1.37	4.99	0.15	1.16	0.21	-3.83	-17.76	1.19	-0.65	1.81	0.0
%101	2.52	5.91	0.15	2.14	0.38	-3.77	-21.53	0.77	-0.41	2.56	0.0
%102	2.44	6.32	0.15	2.07	0.37	-4.25	-25.78	0.48	-0.30	2.37	0.0
%103	1.26	6.53	0.15	1.07	0.19	-5.46	-31.24	0.26	-0.22	1.29	0.0
%104	0.57	6.53	0.15	0.48	0.09	-6.05	-37.28	0.13	-0.13	0.61	0.0
%105	6.50	4.78	0.15	5.53	0.98	0.74	-20.47	0.87	0.74	4.78	0.0
%106	0.41	5.19	0.15	0.35	0.06	-4.84	-25.31	0.50	-0.37	0.72	0.0
%107	6.31	2.86	0.15	5.36	0.95	2.51	-9.60	3.01	2.51	2.86	0.0
%108	3.17	2.18	0.15	2.69	0.48	0.51	-8.22	3.52	0.51	2.18	0.0
%109	3.70	1.74	0.15	3.14	0.56	1.41	-5.27	4.93	1.41	1.74	0.0
%110	4.08	2.24	0.15	3.47	0.61	1.23	-3.32	6.16	1.23	2.24	0.0
%111	5.54	4.35	0.15	4.71	0.83	0.36	-2.81	6.52	0.36	4.35	0.0
%112	4.74	4.27	0.15	4.03	0.71	-0.24	-3.06	6.34	-0.18	4.21	0.0
%113	11.05	5.26	0.15	9.39	1.66	4.14	0.00	9.00	2.66	5.26	1.4
%114	1.30	5.70	0.15	1.10	0.20	-4.60	-4.60	5.32	-3.68	4.79	0.0
%115	4.48	5.40	0.15	3.81	0.67	-1.60	-6.20	4.43	-0.88	4.69	0.0
%116	3.81	5.66	0.15	3.24	0.57	-2.42	-8.61	3.37	-1.07	4.30	0.0

%117	3.20	4.55	0.15	2.72	0.48	-1.83	-10.44	2.73	-0.63	3.35	0.0
%118	1.70	4.09	0.15	1.45	0.26	-2.64	-13.09	2.02	-0.71	2.16	0.0
%119	0.77	2.69	0.15	0.65	0.12	-2.03	-15.12	1.61	-0.42	1.07	0.0
%120	3.32	1.63	0.15	2.82	0.50	1.19	-10.25	2.80	1.19	1.63	0.0
%121	3.12	1.88	0.15	2.65	0.47	0.78	-8.10	3.57	0.78	1.88	0.0
%122	1.94	2.69	0.15	1.65	0.29	-1.05	-9.14	3.17	-0.40	2.05	0.0
%123	5.04	3.26	0.15	4.28	0.76	1.02	-6.69	4.19	1.02	3.26	0.0
%124	2.38	4.62	0.15	2.02	0.36	-2.60	-9.29	3.12	-1.07	3.10	0.0
%125	4.31	4.77	0.15	3.66	0.65	-1.10	-10.39	2.75	-0.37	4.03	0.0
%126	0.10	7.34	0.15	0.09	0.02	-7.25	-17.64	1.21	-1.55	1.63	0.0
%127	0.06	8.57	0.15	0.05	0.01	-8.52	-26.17	0.46	-0.75	0.80	0.0
%128	1.67	7.79	0.15	1.42	0.25	-6.37	-32.54	0.22	-0.24	1.66	0.0
%129	4.28	5.18	0.15	3.64	0.64	-1.54	-34.08	0.19	-0.04	3.67	0.0
%130	3.93	4.52	0.15	3.34	0.59	-1.18	-35.26	0.16	-0.02	3.36	0.0
%131	4.58	2.87	0.15	3.89	0.69	1.02	-17.79	1.19	1.02	2.87	0.0
%132	0.50	2.43	0.15	0.43	0.08	-2.00	-19.79	0.94	-0.24	0.67	0.0
%133	2.67	2.45	0.15	2.27	0.40	-0.18	-19.97	0.92	-0.02	2.29	0.0
%134	1.80	2.64	0.15	1.53	0.27	-1.11	-21.08	0.82	-0.11	1.64	0.0
%135	1.88	3.56	0.15	1.60	0.28	-1.96	-23.04	0.65	-0.16	1.76	0.0
%136	0.97	3.95	0.15	0.82	0.15	-3.13	-26.17	0.46	-0.20	1.02	0.0
%137	6.28	5.67	0.15	5.34	0.94	-0.33	-26.50	0.44	-0.02	5.35	0.0
%138	9.48	5.21	0.15	8.06	1.42	2.85	-8.82	3.29	2.85	5.21	0.0
%139	5.35	5.36	0.15	4.55	0.80	-0.81	-9.64	3.00	-0.29	4.84	0.0
%140	2.51	6.39	0.15	2.13	0.38	-4.26	-13.89	1.85	-1.15	3.28	0.0
%141	5.96	4.55	0.15	5.07	0.89	0.52	-11.73	2.36	0.52	4.55	0.0
%142	10.95	3.91	0.15	9.31	1.64	5.40	-1.28	7.76	5.40	3.91	0.0
%143	1.93	2.65	0.15	1.64	0.29	-1.01	-2.29	6.92	-0.85	2.49	0.0
%144	0.64	2.60	0.15	0.54	0.10	-2.05	-4.34	5.48	-1.44	1.98	0.0
%145	1.43	2.84	0.15	1.22	0.21	-1.63	-5.97	4.55	-0.93	2.14	0.0
%146	2.26	2.51	0.15	1.92	0.34	-0.58	-6.55	4.26	-0.29	2.21	0.0
%147	2.40	3.29	0.15	2.04	0.36	-1.25	-7.80	3.69	-0.56	2.60	0.0
%148	4.67	3.74	0.15	3.97	0.70	0.23	-7.27	3.93	0.23	3.74	0.0
%149	5.35	5.07	0.15	4.55	0.80	-0.53	-7.80	3.69	-0.23	4.78	0.0
%150	2.00	6.80	0.15	1.70	0.30	-5.10	-12.90	2.07	-1.63	3.33	0.0
%151	3.58	7.95	0.15	3.04	0.54	-4.91	-17.81	1.18	-0.88	3.93	0.0
%152	2.96	7.47	0.15	2.52	0.44	-4.95	-22.77	0.67	-0.51	3.03	0.0
%153	3.19	6.76	0.15	2.71	0.48	-4.05	-26.82	0.42	-0.25	2.96	0.0
%154	6.89	4.89	0.15	5.86	1.03	0.97	-16.36	1.40	0.97	4.89	0.0
%155	4.09	3.36	0.15	3.48	0.61	0.12	-15.65	1.51	0.12	3.36	0.0
%156	3.05	4.42	0.15	2.59	0.46	-1.82	-17.48	1.23	-0.28	2.88	0.0
%157	3.07	2.07	0.15	2.61	0.46	0.54	-14.25	1.77	0.54	2.07	0.0
%158	4.66	2.39	0.15	3.96	0.70	1.57	-8.69	3.34	1.57	2.39	0.0
%159	5.97	3.86	0.15	5.07	0.90	1.22	-5.96	4.56	1.22	3.86	0.0
%160	0.31	4.73	0.15	0.26	0.05	-4.47	-10.43	2.74	-1.82	2.08	0.0
%161	9.49	6.05	0.15	8.07	1.42	2.02	-5.58	4.76	2.02	6.05	0.0
%162	2.60	5.43	0.15	2.21	0.39	-3.22	-8.81	3.30	-1.46	3.67	0.0
%163	2.46	6.45	0.15	2.09	0.37	-4.36	-13.16	2.01	-1.29	3.38	0.0
%164	7.24	5.68	0.15	6.15	1.09	0.47	-11.31	2.48	0.47	5.68	0.0
%165	9.40	5.14	0.15	7.99	1.41	2.85	-4.59	5.33	2.85	5.14	0.0
%166	2.81	4.10	0.15	2.39	0.42	-1.71	-6.30	4.38	-0.95	3.34	0.0
%167	3.25	2.86	0.15	2.76	0.49	-0.09	-6.39	4.34	-0.05	2.81	0.0
%168	1.83	2.40	0.15	1.56	0.27	-0.85	-7.24	3.94	-0.40	1.95	0.0
%169	1.67	2.37	0.15	1.42	0.25	-0.95	-8.19	3.54	-0.40	1.82	0.0
%170	0.99	3.74	0.15	0.84	0.15	-2.90	-11.08	2.54	-0.99	1.83	0.0
%171	4.98	5.62	0.15	4.23	0.75	-1.39	-12.47	2.17	-0.37	4.60	0.0
%172	0.34	6.06	0.15	0.29	0.05	-5.77	-18.24	1.13	-1.05	1.33	0.0
%173	5.76	8.51	0.15	4.90	0.86	-3.62	-21.86	0.75	-0.38	5.28	0.0
%174	4.39	5.97	0.15	3.73	0.66	-2.24	-24.10	0.58	-0.17	3.90	0.0
%175	1.61	5.49	0.15	1.37	0.24	-4.12	-28.22	0.36	-0.22	1.58	0.0
%176	1.83	6.27	0.15	1.56	0.27	-4.72	-32.93	0.21	-0.15	1.71	0.0
%177	0.77	5.24	0.15	0.65	0.12	-4.58	-37.52	0.13	-0.09	0.74	0.0
%178	15.69	4.40	0.15	13.34	2.35	8.93	0.00	9.00	8.87	4.40	0.0
%179	2.38	3.23	0.15	2.02	0.36	-1.21	-1.21	7.82	-1.18	3.20	0.0

%180	2.59	2.34	0.15	2.20	0.39	-0.14	-1.35	7.70	-0.12	2.32	0.0
%181	2.63	2.30	0.15	2.24	0.39	-0.07	-1.41	7.64	-0.06	2.29	0.0
%182	2.82	2.39	0.15	2.40	0.42	0.00	-1.42	7.64	0.00	2.39	0.0
%183	2.30	3.34	0.15	1.95	0.34	-1.38	-2.81	6.52	-1.12	3.08	0.0
%184	1.93	4.73	0.15	1.64	0.29	-3.09	-5.90	4.59	-1.93	3.57	0.0
%185	5.29	6.08	0.15	4.50	0.79	-1.59	-7.48	3.83	-0.76	5.25	0.0
%186	1.48	6.53	0.15	1.26	0.22	-5.27	-12.76	2.10	-1.73	2.99	0.0
%187	4.01	7.15	0.15	3.41	0.60	-3.75	-16.50	1.37	-0.73	4.14	0.0
%188	0.13	7.63	0.15	0.11	0.02	-7.52	-24.02	0.58	-0.79	0.90	0.0
%189	6.96	7.25	0.15	5.92	1.04	-1.34	-25.36	0.50	-0.08	6.00	0.0
%190	6.91	4.30	0.15	5.87	1.04	1.57	-12.89	2.07	1.57	4.30	0.0
%191	6.02	3.15	0.15	5.12	0.90	1.97	-7.03	4.04	1.97	3.15	0.0
%192	1.38	1.90	0.15	1.17	0.21	-0.73	-7.76	3.71	-0.32	1.50	0.0
%193	1.02	2.97	0.15	0.87	0.15	-2.11	-9.87	2.92	-0.79	1.66	0.0
%194	1.84	3.67	0.15	1.56	0.28	-2.11	-11.98	2.30	-0.62	2.19	0.0
%195	0.50	5.47	0.15	0.43	0.08	-5.05	-17.03	1.29	-1.00	1.43	0.0
%196	2.53	5.14	0.15	2.15	0.38	-2.99	-20.02	0.92	-0.37	2.52	0.0
%197	8.12	6.44	0.15	6.90	1.22	0.46	-16.44	1.38	0.46	6.44	0.0
%198	4.71	5.90	0.15	4.00	0.71	-1.90	-18.34	1.11	-0.27	4.27	0.0
%199	0.06	8.24	0.15	0.05	0.01	-8.19	-26.53	0.44	-0.68	0.73	0.0
%200	7.74	7.36	0.15	6.58	1.16	-0.78	-27.30	0.40	-0.04	6.62	0.0
%201	5.33	5.31	0.15	4.53	0.80	-0.78	-28.09	0.37	-0.03	4.56	0.0
%202	5.85	3.86	0.15	4.97	0.88	1.12	-15.82	1.48	1.12	3.86	0.0
%203	3.44	2.69	0.15	2.92	0.52	0.24	-14.52	1.72	0.24	2.69	0.0
%204	4.95	1.81	0.15	4.21	0.74	2.40	-6.85	4.12	2.40	1.81	0.0
%205	0.96	2.25	0.15	0.82	0.14	-1.44	-8.28	3.50	-0.62	1.44	0.0
%206	3.90	2.97	0.15	3.32	0.59	0.34	-7.47	3.84	0.34	2.97	0.0
%207	1.79	4.55	0.15	1.52	0.27	-3.03	-10.50	2.72	-1.12	2.64	0.0
%208	0.68	6.78	0.15	0.58	0.10	-6.20	-16.71	1.34	-1.38	1.95	0.0
%209	9.31	5.28	0.15	7.91	1.40	2.64	-7.16	3.98	2.64	5.28	0.0
%210	10.09	6.92	0.15	8.58	1.51	1.65	-4.10	5.63	1.65	6.92	0.0
%211	1.76	6.73	0.15	1.50	0.26	-5.24	-9.34	3.10	-2.53	4.03	0.0
%212	0.90	9.50	0.15	0.76	0.14	-8.73	-18.08	1.15	-1.95	2.72	0.0
%213	5.34	5.64	0.15	4.54	0.80	-1.10	-19.18	1.01	-0.14	4.67	0.0
%214	0.19	5.42	0.15	0.16	0.03	-5.26	-24.44	0.56	-0.46	0.62	0.0
%215	3.88	3.11	0.15	3.30	0.58	0.18	-21.93	0.74	0.18	3.11	0.0
%216	4.54	2.22	0.15	3.86	0.68	1.64	-11.67	2.38	1.64	2.22	0.0
%217	0.81	2.56	0.15	0.69	0.12	-1.87	-13.53	1.92	-0.46	1.14	0.0
%218	1.44	2.96	0.15	1.22	0.22	-1.74	-15.27	1.58	-0.35	1.57	0.0
%219	2.97	4.38	0.15	2.52	0.45	-1.86	-17.13	1.28	-0.30	2.83	0.0
%220	0.28	6.04	0.15	0.24	0.04	-5.80	-22.93	0.66	-0.62	0.86	0.0
%221	2.91	6.49	0.15	2.47	0.44	-4.02	-26.95	0.42	-0.24	2.72	0.0
%222	1.81	7.13	0.15	1.54	0.27	-5.59	-32.53	0.22	-0.20	1.74	0.0
%223	0.96	8.48	0.15	0.82	0.14	-7.67	-40.20	0.09	-0.13	0.94	0.0
%224	0.19	7.89	0.15	0.16	0.03	-7.73	-47.93	0.04	-0.05	0.22	0.0
%225	0.43	6.82	0.15	0.37	0.06	-6.45	-54.38	0.02	-0.02	0.39	0.0
%226	1.37	5.87	0.15	1.16	0.21	-4.70	-59.08	0.01	-0.01	1.17	0.0
%227	1.46	4.12	0.15	1.24	0.22	-2.88	-61.97	0.01	-0.00	1.24	0.0
%228	2.27	2.48	0.15	1.93	0.34	-0.56	-62.52	0.01	-0.00	1.93	0.0
%229	7.07	1.90	0.15	6.01	1.06	4.11	-6.86	4.11	4.11	1.90	0.0
%230	1.10	2.61	0.15	0.94	0.17	-1.68	-8.54	3.40	-0.72	1.65	0.0
%231	3.22	3.87	0.15	2.74	0.48	-1.13	-9.67	2.99	-0.41	3.15	0.0
%232	0.51	5.38	0.15	0.43	0.08	-4.94	-14.61	1.70	-1.28	1.72	0.0
%233	5.29	6.82	0.15	4.50	0.79	-2.33	-16.94	1.31	-0.40	4.89	0.0
%234	4.23	5.88	0.15	3.60	0.63	-2.28	-19.23	1.01	-0.30	3.89	0.0
%235	2.70	6.57	0.15	2.30	0.41	-4.27	-23.50	0.62	-0.39	2.68	0.0
%236	3.26	6.78	0.15	2.77	0.49	-4.01	-27.50	0.39	-0.23	3.00	0.0
%237	0.68	6.21	0.15	0.58	0.10	-5.63	-33.13	0.21	-0.19	0.76	0.0
%238	1.93	5.24	0.15	1.64	0.29	-3.60	-36.74	0.14	-0.07	1.71	0.0
%239	1.61	3.80	0.15	1.37	0.24	-2.43	-39.17	0.10	-0.03	1.40	0.0
%240	0.37	2.30	0.15	0.31	0.06	-1.98	-41.15	0.08	-0.02	0.34	0.0

TOTAL PERCOLATION = 5.524

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.15	1.39	0.24	-0.11	-41.26	0.08	-0.00	1.39	0.00
2	4.40	1.76	0.15	3.74	0.66	1.98	-12.94	2.06	1.98	1.76	0.00
3	3.58	2.57	0.15	3.04	0.54	0.47	-11.12	2.53	0.47	2.57	0.00
4	4.01	2.25	0.15	3.41	0.60	1.15	-7.82	3.69	1.15	2.25	0.00
5	4.22	3.67	0.15	3.59	0.63	-0.08	-7.90	3.65	-0.04	3.62	0.00
6	2.02	3.65	0.15	1.72	0.30	-1.94	-9.84	2.93	-0.72	2.44	0.00
7	0.26	4.86	0.15	0.22	0.04	-4.64	-14.48	1.73	-1.20	1.42	0.00
8	0.23	5.75	0.15	0.20	0.03	-5.56	-20.04	0.92	-0.81	1.01	0.00
9	6.38	3.82	0.15	5.42	0.96	1.60	-11.17	2.52	1.60	3.82	0.00
10	3.84	2.62	0.15	3.26	0.58	0.65	-9.16	3.17	0.65	2.62	0.00
11	0.62	2.87	0.15	0.53	0.09	-2.34	-11.51	2.42	-0.74	1.27	0.00
12	1.40	2.58	0.15	1.19	0.21	-1.39	-12.89	2.07	-0.35	1.54	0.00
13	0.15	2.81	0.15	0.13	0.02	-2.69	-15.58	1.52	-0.55	0.67	0.00
14	1.68	4.00	0.15	1.43	0.25	-2.57	-18.15	1.14	-0.39	1.81	0.00
15	12.00	5.87	0.15	10.20	1.80	4.33	-4.37	5.47	4.33	5.87	0.00
16	0.89	4.56	0.15	0.76	0.13	-3.80	-8.17	3.54	-1.92	2.68	0.00
17	5.65	6.00	0.15	4.80	0.85	-1.20	-9.36	3.09	-0.45	5.25	0.00
18	0.76	4.74	0.15	0.65	0.11	-4.09	-13.46	1.94	-1.15	1.80	0.00
19	1.87	8.64	0.15	1.59	0.28	-7.05	-20.50	0.87	-1.07	2.66	0.00
20	3.20	6.27	0.15	2.72	0.48	-3.55	-24.06	0.58	-0.29	3.01	0.00
21	3.31	5.52	0.15	2.81	0.50	-2.71	-26.77	0.43	-0.15	2.97	0.00
22	4.30	3.93	0.15	3.66	0.65	-0.28	-27.04	0.41	-0.01	3.67	0.00
23	2.75	3.30	0.15	2.34	0.41	-0.97	-28.01	0.37	-0.04	2.38	0.00
24	4.63	2.44	0.15	3.94	0.69	1.50	-13.78	1.87	1.50	2.44	0.00
25	1.73	1.77	0.15	1.47	0.26	-0.30	-14.08	1.81	-0.06	1.53	0.00
26	0.50	2.88	0.15	0.43	0.08	-2.45	-16.54	1.37	-0.44	0.86	0.00
27	0.91	4.24	0.15	0.77	0.14	-3.46	-20.00	0.92	-0.45	1.22	0.00
28	1.71	4.03	0.15	1.45	0.26	-2.57	-22.57	0.69	-0.23	1.69	0.00
29	6.38	5.15	0.15	5.42	0.96	0.27	-19.65	0.96	0.27	5.15	0.00
30	2.13	5.24	0.15	1.81	0.32	-3.43	-23.08	0.65	-0.31	2.12	0.00
31	2.17	5.74	0.15	1.84	0.33	-3.90	-26.97	0.42	-0.23	2.08	0.00
32	3.60	4.89	0.15	3.06	0.54	-1.83	-28.80	0.34	-0.08	3.14	0.00
33	4.45	4.56	0.15	3.78	0.67	-0.77	-29.57	0.31	-0.03	3.81	0.00
34	3.95	3.95	0.15	3.36	0.59	-0.60	-30.17	0.29	-0.02	3.38	0.00
35	3.26	2.16	0.15	2.77	0.49	0.61	-20.23	0.90	0.61	2.16	0.00
36	1.47	2.12	0.15	1.25	0.22	-0.87	-21.10	0.81	-0.08	1.33	0.00
37	5.51	3.11	0.15	4.68	0.83	1.57	-11.66	2.38	1.57	3.11	0.00
38	2.60	2.27	0.15	2.21	0.39	-0.06	-11.72	2.37	-0.02	2.23	0.00
39	5.17	3.54	0.15	4.39	0.78	0.86	-9.00	3.23	0.86	3.54	0.00
40	6.74	3.96	0.15	5.73	1.01	1.77	-5.16	4.99	1.77	3.96	0.00
41	2.12	4.30	0.15	1.80	0.32	-2.50	-7.66	3.76	-1.24	3.04	0.00
42	6.44	4.77	0.15	5.47	0.97	0.71	-6.15	4.46	0.71	4.77	0.00
43	2.15	4.56	0.15	1.83	0.32	-2.73	-8.88	3.27	-1.19	3.02	0.00
44	1.03	5.52	0.15	0.88	0.15	-4.64	-13.52	1.93	-1.34	2.22	0.00
45	9.44	4.80	0.15	8.02	1.42	3.22	-4.89	5.15	3.22	4.80	0.00
46	10.17	4.25	0.15	8.64	1.53	4.40	0.00	9.00	3.85	4.25	0.55
47	2.40	2.60	0.15	2.04	0.36	-0.56	-0.56	8.42	-0.58	2.62	0.00
48	2.52	2.87	0.15	2.14	0.38	-0.73	-1.28	7.75	-0.67	2.81	0.00
49	4.66	1.75	0.15	3.96	0.70	2.21	0.00	9.00	1.25	1.75	0.96
50	0.13	3.00	0.15	0.11	0.02	-2.89	-2.89	6.46	-2.54	2.65	0.00
51	1.56	3.97	0.15	1.33	0.23	-2.64	-5.53	4.78	-1.68	3.00	0.00
52	1.76	5.22	0.15	1.50	0.26	-3.73	-9.25	3.13	-1.65	3.15	0.00
53	3.09	5.89	0.15	2.63	0.46	-3.26	-12.52	2.16	-0.97	3.60	0.00

54	0.73	5.36	0.15	0.62	0.11	-4.73	-17.25	1.26	-0.90	1.52	0.00
55	2.40	5.57	0.15	2.04	0.36	-3.53	-20.78	0.84	-0.42	2.46	0.00
56	9.88	6.05	0.15	8.40	1.48	2.35	-9.08	3.19	2.35	6.05	0.00
57	9.22	4.84	0.15	7.84	1.38	3.00	-3.27	6.19	3.00	4.84	0.00
58	6.02	3.92	0.15	5.12	0.90	1.20	-1.72	7.39	1.20	3.92	0.00
59	5.68	2.63	0.15	4.83	0.85	2.20	0.00	9.00	1.61	2.63	0.59
60	2.82	2.11	0.15	2.40	0.42	0.28	0.00	9.00	0.00	2.11	0.28
61	1.80	2.27	0.15	1.53	0.27	-0.74	-0.74	8.25	-0.75	2.28	0.00
62	2.45	2.22	0.15	2.08	0.37	-0.14	-0.87	8.12	-0.13	2.21	0.00
63	1.41	3.09	0.15	1.20	0.21	-1.89	-2.76	6.55	-1.57	2.77	0.00
64	2.08	4.17	0.15	1.77	0.31	-2.40	-5.17	4.98	-1.57	3.34	0.00
65	11.99	4.56	0.15	10.19	1.80	5.63	0.00	9.00	4.02	4.56	1.61
66	2.42	5.73	0.15	2.06	0.36	-3.68	-3.68	5.91	-3.09	5.15	0.00
67	4.16	5.52	0.15	3.54	0.62	-1.99	-5.66	4.71	-1.20	4.73	0.00
68	2.44	5.72	0.15	2.07	0.37	-3.64	-9.31	3.11	-1.60	3.67	0.00
69	3.78	4.72	0.15	3.21	0.57	-1.51	-10.81	2.62	-0.49	3.70	0.00
70	3.35	3.62	0.15	2.85	0.50	-0.77	-11.58	2.40	-0.22	3.07	0.00
71	1.07	3.95	0.15	0.91	0.16	-3.04	-14.62	1.70	-0.70	1.61	0.00
72	1.18	2.72	0.15	1.00	0.18	-1.71	-16.34	1.40	-0.30	1.30	0.00
73	1.60	3.37	0.15	1.36	0.24	-2.01	-18.35	1.11	-0.29	1.65	0.00
74	1.74	3.10	0.15	1.48	0.26	-1.62	-19.97	0.92	-0.19	1.67	0.00
75	4.81	3.54	0.15	4.09	0.72	0.55	-15.89	1.47	0.55	3.54	0.00
76	5.95	4.07	0.15	5.06	0.89	0.99	-11.37	2.46	0.99	4.07	0.00
77	4.32	4.53	0.15	3.67	0.65	-0.86	-12.23	2.23	-0.23	3.90	0.00
78	4.02	6.05	0.15	3.42	0.60	-2.64	-14.86	1.65	-0.58	4.00	0.00
79	2.13	5.27	0.15	1.81	0.32	-3.46	-18.32	1.12	-0.54	2.35	0.00
80	1.48	6.20	0.15	1.26	0.22	-4.94	-23.26	0.64	-0.48	1.74	0.00
81	2.68	3.90	0.15	2.28	0.40	-1.62	-24.88	0.53	-0.11	2.39	0.00
82	5.77	3.62	0.15	4.90	0.87	1.29	-14.05	1.81	1.29	3.62	0.00
83	3.27	1.86	0.15	2.78	0.49	0.92	-10.45	2.73	0.92	1.86	0.00
84	4.05	2.45	0.15	3.44	0.61	0.99	-7.73	3.72	0.99	2.45	0.00
85	2.14	1.43	0.15	1.82	0.32	0.38	-6.87	4.11	0.38	1.43	0.00
86	3.55	2.90	0.15	3.02	0.53	0.12	-6.62	4.23	0.12	2.90	0.00
87	2.06	3.81	0.15	1.75	0.31	-2.06	-8.68	3.34	-0.88	2.64	0.00
88	8.81	4.38	0.15	7.49	1.32	3.11	-2.90	6.46	3.11	4.38	0.00
89	1.56	5.21	0.15	1.33	0.23	-3.88	-6.78	4.15	-2.31	3.64	0.00
90	1.35	6.78	0.15	1.15	0.20	-5.63	-12.41	2.19	-1.96	3.11	0.00
91	0.31	7.10	0.15	0.26	0.05	-6.83	-19.25	1.00	-1.18	1.45	0.00
92	1.35	6.50	0.15	1.15	0.20	-5.35	-24.59	0.55	-0.46	1.61	0.00
93	1.69	6.16	0.15	1.44	0.25	-4.72	-29.32	0.32	-0.23	1.66	0.00
94	0.79	4.64	0.15	0.67	0.12	-3.97	-33.29	0.20	-0.12	0.79	0.00
95	3.10	3.24	0.15	2.63	0.47	-0.61	-33.89	0.19	-0.01	2.65	0.00
96	2.67	3.07	0.15	2.27	0.40	-0.80	-34.70	0.17	-0.02	2.29	0.00
97	4.51	1.92	0.15	3.83	0.68	1.91	-12.84	2.08	1.91	1.92	0.00
98	2.62	1.98	0.15	2.23	0.39	0.25	-11.86	2.33	0.25	1.98	0.00
99	2.72	4.39	0.15	2.31	0.41	-2.08	-13.94	1.84	-0.49	2.80	0.00
%100	1.37	4.99	0.15	1.16	0.21	-3.83	-17.76	1.19	-0.65	1.81	0.0
%101	2.52	5.91	0.15	2.14	0.38	-3.77	-21.53	0.77	-0.41	2.56	0.0
%102	2.44	6.32	0.15	2.07	0.37	-4.25	-25.78	0.48	-0.30	2.37	0.0
%103	1.26	6.53	0.15	1.07	0.19	-5.46	-31.24	0.26	-0.22	1.29	0.0
%104	0.57	6.53	0.15	0.48	0.09	-6.05	-37.28	0.13	-0.13	0.61	0.0
%105	6.50	4.78	0.15	5.53	0.98	0.74	-20.47	0.87	0.74	4.78	0.0
%106	0.41	5.19	0.15	0.35	0.06	-4.84	-25.31	0.50	-0.37	0.72	0.0
%107	6.31	2.86	0.15	5.36	0.95	2.51	-9.60	3.01	2.51	2.86	0.0
%108	3.17	2.18	0.15	2.69	0.48	0.51	-8.22	3.52	0.51	2.18	0.0
%109	3.70	1.74	0.15	3.14	0.56	1.41	-5.27	4.93	1.41	1.74	0.0
%110	4.08	2.24	0.15	3.47	0.61	1.23	-3.32	6.16	1.23	2.24	0.0
%111	5.54	4.35	0.15	4.71	0.83	0.36	-2.81	6.52	0.36	4.35	0.0
%112	4.74	4.27	0.15	4.03	0.71	-0.24	-3.06	6.34	-0.18	4.21	0.0
%113	11.05	5.26	0.15	9.39	1.66	4.14	0.00	9.00	2.66	5.26	1.4
%114	1.30	5.70	0.15	1.10	0.20	-4.60	-4.60	5.32	-3.68	4.79	0.0
%115	4.48	5.40	0.15	3.81	0.67	-1.60	-6.20	4.43	-0.88	4.69	0.0
%116	3.81	5.66	0.15	3.24	0.57	-2.42	-8.61	3.37	-1.07	4.30	0.0

%117	3.20	4.55	0.15	2.72	0.48	-1.83	-10.44	2.73	-0.63	3.35	0.0
%118	1.70	4.09	0.15	1.45	0.26	-2.64	-13.09	2.02	-0.71	2.16	0.0
%119	0.77	2.69	0.15	0.65	0.12	-2.03	-15.12	1.61	-0.42	1.07	0.0
%120	3.32	1.63	0.15	2.82	0.50	1.19	-10.25	2.80	1.19	1.63	0.0
%121	3.12	1.88	0.15	2.65	0.47	0.78	-8.10	3.57	0.78	1.88	0.0
%122	1.94	2.69	0.15	1.65	0.29	-1.05	-9.14	3.17	-0.40	2.05	0.0
%123	5.04	3.26	0.15	4.28	0.76	1.02	-6.69	4.19	1.02	3.26	0.0
%124	2.38	4.62	0.15	2.02	0.36	-2.60	-9.29	3.12	-1.07	3.10	0.0
%125	4.31	4.77	0.15	3.66	0.65	-1.10	-10.39	2.75	-0.37	4.03	0.0
%126	0.10	7.34	0.15	0.09	0.02	-7.25	-17.64	1.21	-1.55	1.63	0.0
%127	0.06	8.57	0.15	0.05	0.01	-8.52	-26.17	0.46	-0.75	0.80	0.0
%128	1.67	7.79	0.15	1.42	0.25	-6.37	-32.54	0.22	-0.24	1.66	0.0
%129	4.28	5.18	0.15	3.64	0.64	-1.54	-34.08	0.19	-0.04	3.67	0.0
%130	3.93	4.52	0.15	3.34	0.59	-1.18	-35.26	0.16	-0.02	3.36	0.0
%131	4.58	2.87	0.15	3.89	0.69	1.02	-17.79	1.19	1.02	2.87	0.0
%132	0.50	2.43	0.15	0.43	0.08	-2.00	-19.79	0.94	-0.24	0.67	0.0
%133	2.67	2.45	0.15	2.27	0.40	-0.18	-19.97	0.92	-0.02	2.29	0.0
%134	1.80	2.64	0.15	1.53	0.27	-1.11	-21.08	0.82	-0.11	1.64	0.0
%135	1.88	3.56	0.15	1.60	0.28	-1.96	-23.04	0.65	-0.16	1.76	0.0
%136	0.97	3.95	0.15	0.82	0.15	-3.13	-26.17	0.46	-0.20	1.02	0.0
%137	6.28	5.67	0.15	5.34	0.94	-0.33	-26.50	0.44	-0.02	5.35	0.0
%138	9.48	5.21	0.15	8.06	1.42	2.85	-8.82	3.29	2.85	5.21	0.0
%139	5.35	5.36	0.15	4.55	0.80	-0.81	-9.64	3.00	-0.29	4.84	0.0
%140	2.51	6.39	0.15	2.13	0.38	-4.26	-13.89	1.85	-1.15	3.28	0.0
%141	5.96	4.55	0.15	5.07	0.89	0.52	-11.73	2.36	0.52	4.55	0.0
%142	10.95	3.91	0.15	9.31	1.64	5.40	-1.28	7.76	5.40	3.91	0.0
%143	1.93	2.65	0.15	1.64	0.29	-1.01	-2.29	6.92	-0.85	2.49	0.0
%144	0.64	2.60	0.15	0.54	0.10	-2.05	-4.34	5.48	-1.44	1.98	0.0
%145	1.43	2.84	0.15	1.22	0.21	-1.63	-5.97	4.55	-0.93	2.14	0.0
%146	2.26	2.51	0.15	1.92	0.34	-0.58	-6.55	4.26	-0.29	2.21	0.0
%147	2.40	3.29	0.15	2.04	0.36	-1.25	-7.80	3.69	-0.56	2.60	0.0
%148	4.67	3.74	0.15	3.97	0.70	0.23	-7.27	3.93	0.23	3.74	0.0
%149	5.35	5.07	0.15	4.55	0.80	-0.53	-7.80	3.69	-0.23	4.78	0.0
%150	2.00	6.80	0.15	1.70	0.30	-5.10	-12.90	2.07	-1.63	3.33	0.0
%151	3.58	7.95	0.15	3.04	0.54	-4.91	-17.81	1.18	-0.88	3.93	0.0
%152	2.96	7.47	0.15	2.52	0.44	-4.95	-22.77	0.67	-0.51	3.03	0.0
%153	3.19	6.76	0.15	2.71	0.48	-4.05	-26.82	0.42	-0.25	2.96	0.0
%154	6.89	4.89	0.15	5.86	1.03	0.97	-16.36	1.40	0.97	4.89	0.0
%155	4.09	3.36	0.15	3.48	0.61	0.12	-15.65	1.51	0.12	3.36	0.0
%156	3.05	4.42	0.15	2.59	0.46	-1.82	-17.48	1.23	-0.28	2.88	0.0
%157	3.07	2.07	0.15	2.61	0.46	0.54	-14.25	1.77	0.54	2.07	0.0
%158	4.66	2.39	0.15	3.96	0.70	1.57	-8.69	3.34	1.57	2.39	0.0
%159	5.97	3.86	0.15	5.07	0.90	1.22	-5.96	4.56	1.22	3.86	0.0
%160	0.31	4.73	0.15	0.26	0.05	-4.47	-10.43	2.74	-1.82	2.08	0.0
%161	9.49	6.05	0.15	8.07	1.42	2.02	-5.58	4.76	2.02	6.05	0.0
%162	2.60	5.43	0.15	2.21	0.39	-3.22	-8.81	3.30	-1.46	3.67	0.0
%163	2.46	6.45	0.15	2.09	0.37	-4.36	-13.16	2.01	-1.29	3.38	0.0
%164	7.24	5.68	0.15	6.15	1.09	0.47	-11.31	2.48	0.47	5.68	0.0
%165	9.40	5.14	0.15	7.99	1.41	2.85	-4.59	5.33	2.85	5.14	0.0
%166	2.81	4.10	0.15	2.39	0.42	-1.71	-6.30	4.38	-0.95	3.34	0.0
%167	3.25	2.86	0.15	2.76	0.49	-0.09	-6.39	4.34	-0.05	2.81	0.0
%168	1.83	2.40	0.15	1.56	0.27	-0.85	-7.24	3.94	-0.40	1.95	0.0
%169	1.67	2.37	0.15	1.42	0.25	-0.95	-8.19	3.54	-0.40	1.82	0.0
%170	0.99	3.74	0.15	0.84	0.15	-2.90	-11.08	2.54	-0.99	1.83	0.0
%171	4.98	5.62	0.15	4.23	0.75	-1.39	-12.47	2.17	-0.37	4.60	0.0
%172	0.34	6.06	0.15	0.29	0.05	-5.77	-18.24	1.13	-1.05	1.33	0.0
%173	5.76	8.51	0.15	4.90	0.86	-3.62	-21.86	0.75	-0.38	5.28	0.0
%174	4.39	5.97	0.15	3.73	0.66	-2.24	-24.10	0.58	-0.17	3.90	0.0
%175	1.61	5.49	0.15	1.37	0.24	-4.12	-28.22	0.36	-0.22	1.58	0.0
%176	1.83	6.27	0.15	1.56	0.27	-4.72	-32.93	0.21	-0.15	1.71	0.0
%177	0.77	5.24	0.15	0.65	0.12	-4.58	-37.52	0.13	-0.09	0.74	0.0
%178	15.69	4.40	0.15	13.34	2.35	8.93	0.00	9.00	8.87	4.40	0.0
%179	2.38	3.23	0.15	2.02	0.36	-1.21	-1.21	7.82	-1.18	3.20	0.0

%180	2.59	2.34	0.15	2.20	0.39	-0.14	-1.35	7.70	-0.12	2.32	0.0
%181	2.63	2.30	0.15	2.24	0.39	-0.07	-1.41	7.64	-0.06	2.29	0.0
%182	2.82	2.39	0.15	2.40	0.42	0.00	-1.42	7.64	0.00	2.39	0.0
%183	2.30	3.34	0.15	1.95	0.34	-1.38	-2.81	6.52	-1.12	3.08	0.0
%184	1.93	4.73	0.15	1.64	0.29	-3.09	-5.90	4.59	-1.93	3.57	0.0
%185	5.29	6.08	0.15	4.50	0.79	-1.59	-7.48	3.83	-0.76	5.25	0.0
%186	1.48	6.53	0.15	1.26	0.22	-5.27	-12.76	2.10	-1.73	2.99	0.0
%187	4.01	7.15	0.15	3.41	0.60	-3.75	-16.50	1.37	-0.73	4.14	0.0
%188	0.13	7.63	0.15	0.11	0.02	-7.52	-24.02	0.58	-0.79	0.90	0.0
%189	6.96	7.25	0.15	5.92	1.04	-1.34	-25.36	0.50	-0.08	6.00	0.0
%190	6.91	4.30	0.15	5.87	1.04	1.57	-12.89	2.07	1.57	4.30	0.0
%191	6.02	3.15	0.15	5.12	0.90	1.97	-7.03	4.04	1.97	3.15	0.0
%192	1.38	1.90	0.15	1.17	0.21	-0.73	-7.76	3.71	-0.32	1.50	0.0
%193	1.02	2.97	0.15	0.87	0.15	-2.11	-9.87	2.92	-0.79	1.66	0.0
%194	1.84	3.67	0.15	1.56	0.28	-2.11	-11.98	2.30	-0.62	2.19	0.0
%195	0.50	5.47	0.15	0.43	0.08	-5.05	-17.03	1.29	-1.00	1.43	0.0
%196	2.53	5.14	0.15	2.15	0.38	-2.99	-20.02	0.92	-0.37	2.52	0.0
%197	8.12	6.44	0.15	6.90	1.22	0.46	-16.44	1.38	0.46	6.44	0.0
%198	4.71	5.90	0.15	4.00	0.71	-1.90	-18.34	1.11	-0.27	4.27	0.0
%199	0.06	8.24	0.15	0.05	0.01	-8.19	-26.53	0.44	-0.68	0.73	0.0
%200	7.74	7.36	0.15	6.58	1.16	-0.78	-27.30	0.40	-0.04	6.62	0.0
%201	5.33	5.31	0.15	4.53	0.80	-0.78	-28.09	0.37	-0.03	4.56	0.0
%202	5.85	3.86	0.15	4.97	0.88	1.12	-15.82	1.48	1.12	3.86	0.0
%203	3.44	2.69	0.15	2.92	0.52	0.24	-14.52	1.72	0.24	2.69	0.0
%204	4.95	1.81	0.15	4.21	0.74	2.40	-6.85	4.12	2.40	1.81	0.0
%205	0.96	2.25	0.15	0.82	0.14	-1.44	-8.28	3.50	-0.62	1.44	0.0
%206	3.90	2.97	0.15	3.32	0.59	0.34	-7.47	3.84	0.34	2.97	0.0
%207	1.79	4.55	0.15	1.52	0.27	-3.03	-10.50	2.72	-1.12	2.64	0.0
%208	0.68	6.78	0.15	0.58	0.10	-6.20	-16.71	1.34	-1.38	1.95	0.0
%209	9.31	5.28	0.15	7.91	1.40	2.64	-7.16	3.98	2.64	5.28	0.0
%210	10.09	6.92	0.15	8.58	1.51	1.65	-4.10	5.63	1.65	6.92	0.0
%211	1.76	6.73	0.15	1.50	0.26	-5.24	-9.34	3.10	-2.53	4.03	0.0
%212	0.90	9.50	0.15	0.76	0.14	-8.73	-18.08	1.15	-1.95	2.72	0.0
%213	5.34	5.64	0.15	4.54	0.80	-1.10	-19.18	1.01	-0.14	4.67	0.0
%214	0.19	5.42	0.15	0.16	0.03	-5.26	-24.44	0.56	-0.46	0.62	0.0
%215	3.88	3.11	0.15	3.30	0.58	0.18	-21.93	0.74	0.18	3.11	0.0
%216	4.54	2.22	0.15	3.86	0.68	1.64	-11.67	2.38	1.64	2.22	0.0
%217	0.81	2.56	0.15	0.69	0.12	-1.87	-13.53	1.92	-0.46	1.14	0.0
%218	1.44	2.96	0.15	1.22	0.22	-1.74	-15.27	1.58	-0.35	1.57	0.0
%219	2.97	4.38	0.15	2.52	0.45	-1.86	-17.13	1.28	-0.30	2.83	0.0
%220	0.28	6.04	0.15	0.24	0.04	-5.80	-22.93	0.66	-0.62	0.86	0.0
%221	2.91	6.49	0.15	2.47	0.44	-4.02	-26.95	0.42	-0.24	2.72	0.0
%222	1.81	7.13	0.15	1.54	0.27	-5.59	-32.53	0.22	-0.20	1.74	0.0
%223	0.96	8.48	0.15	0.82	0.14	-7.67	-40.20	0.09	-0.13	0.94	0.0
%224	0.19	7.89	0.15	0.16	0.03	-7.73	-47.93	0.04	-0.05	0.22	0.0
%225	0.43	6.82	0.15	0.37	0.06	-6.45	-54.38	0.02	-0.02	0.39	0.0
%226	1.37	5.87	0.15	1.16	0.21	-4.70	-59.08	0.01	-0.01	1.17	0.0
%227	1.46	4.12	0.15	1.24	0.22	-2.88	-61.97	0.01	-0.00	1.24	0.0
%228	2.27	2.48	0.15	1.93	0.34	-0.56	-62.52	0.01	-0.00	1.93	0.0
%229	7.07	1.90	0.15	6.01	1.06	4.11	-6.86	4.11	4.11	1.90	0.0
%230	1.10	2.61	0.15	0.94	0.17	-1.68	-8.54	3.40	-0.72	1.65	0.0
%231	3.22	3.87	0.15	2.74	0.48	-1.13	-9.67	2.99	-0.41	3.15	0.0
%232	0.51	5.38	0.15	0.43	0.08	-4.94	-14.61	1.70	-1.28	1.72	0.0
%233	5.29	6.82	0.15	4.50	0.79	-2.33	-16.94	1.31	-0.40	4.89	0.0
%234	4.23	5.88	0.15	3.60	0.63	-2.28	-19.23	1.01	-0.30	3.89	0.0
%235	2.70	6.57	0.15	2.30	0.41	-4.27	-23.50	0.62	-0.39	2.68	0.0
%236	3.26	6.78	0.15	2.77	0.49	-4.01	-27.50	0.39	-0.23	3.00	0.0
%237	0.68	6.21	0.15	0.58	0.10	-5.63	-33.13	0.21	-0.19	0.76	0.0
%238	1.93	5.24	0.15	1.64	0.29	-3.60	-36.74	0.14	-0.07	1.71	0.0
%239	1.61	3.80	0.15	1.37	0.24	-2.43	-39.17	0.10	-0.03	1.40	0.0
%240	0.37	2.30	0.15	0.31	0.06	-1.98	-41.15	0.08	-0.02	0.34	0.0

TOTAL PERCOLATION = 5.524

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station*****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.20	1.30	0.33	-0.19	-43.38	0.06	-0.00	1.31	0.00
2	4.40	1.76	0.20	3.52	0.88	1.76	-14.02	1.82	1.76	1.76	0.00
3	3.58	2.57	0.20	2.86	0.72	0.29	-12.70	2.12	0.29	2.57	0.00
4	4.01	2.25	0.20	3.21	0.80	0.95	-9.43	3.07	0.95	2.25	0.00
5	4.22	3.67	0.20	3.38	0.84	-0.29	-9.72	2.97	-0.10	3.48	0.00
6	2.02	3.65	0.20	1.62	0.40	-2.04	-11.76	2.35	-0.61	2.23	0.00
7	0.26	4.86	0.20	0.21	0.05	-4.65	-16.41	1.39	-0.97	1.18	0.00
8	0.23	5.75	0.20	0.18	0.05	-5.57	-21.98	0.74	-0.65	0.83	0.00
9	6.38	3.82	0.20	5.10	1.28	1.28	-13.12	2.02	1.28	3.82	0.00
10	3.84	2.62	0.20	3.07	0.77	0.45	-11.33	2.47	0.45	2.62	0.00
11	0.62	2.87	0.20	0.50	0.12	-2.37	-13.71	1.89	-0.59	1.08	0.00
12	1.40	2.58	0.20	1.12	0.28	-1.46	-15.16	1.60	-0.29	1.41	0.00
13	0.15	2.81	0.20	0.12	0.03	-2.69	-17.86	1.18	-0.42	0.54	0.00
14	1.68	4.00	0.20	1.34	0.34	-2.65	-20.51	0.87	-0.31	1.65	0.00
15	12.00	5.87	0.20	9.60	2.40	3.73	-5.89	4.60	3.73	5.87	0.00
16	0.89	4.56	0.20	0.71	0.18	-3.85	-9.73	2.97	-1.63	2.34	0.00
17	5.65	6.00	0.20	4.52	1.13	-1.48	-11.21	2.51	-0.46	4.98	0.00
18	0.76	4.74	0.20	0.61	0.15	-4.13	-15.34	1.57	-0.94	1.55	0.00
19	1.87	8.64	0.20	1.50	0.37	-7.14	-22.48	0.70	-0.87	2.37	0.00
20	3.20	6.27	0.20	2.56	0.64	-3.71	-26.19	0.46	-0.24	2.80	0.00
21	3.31	5.52	0.20	2.65	0.66	-2.87	-29.07	0.33	-0.13	2.78	0.00
22	4.30	3.93	0.20	3.44	0.86	-0.49	-29.56	0.31	-0.02	3.46	0.00
23	2.75	3.30	0.20	2.20	0.55	-1.10	-30.67	0.27	-0.04	2.24	0.00
24	4.63	2.44	0.20	3.70	0.93	1.27	-15.48	1.54	1.27	2.44	0.00
25	1.73	1.77	0.20	1.38	0.35	-0.39	-15.87	1.48	-0.07	1.45	0.00
26	0.50	2.88	0.20	0.40	0.10	-2.48	-18.34	1.11	-0.36	0.76	0.00
27	0.91	4.24	0.20	0.73	0.18	-3.51	-21.85	0.75	-0.37	1.09	0.00
28	1.71	4.03	0.20	1.37	0.34	-2.66	-24.51	0.55	-0.19	1.56	0.00
29	6.38	5.15	0.20	5.10	1.28	-0.05	-24.55	0.55	-0.00	5.11	0.00
30	2.13	5.24	0.20	1.70	0.43	-3.54	-28.09	0.37	-0.18	1.89	0.00
31	2.17	5.74	0.20	1.74	0.43	-4.00	-32.10	0.23	-0.13	1.87	0.00
32	3.60	4.89	0.20	2.88	0.72	-2.01	-34.10	0.19	-0.05	2.93	0.00
33	4.45	4.56	0.20	3.56	0.89	-1.00	-35.10	0.17	-0.02	3.58	0.00
34	3.95	3.95	0.20	3.16	0.79	-0.79	-35.90	0.15	-0.01	3.17	0.00
35	3.26	2.16	0.20	2.61	0.65	0.45	-23.82	0.60	0.45	2.16	0.00
36	1.47	2.12	0.20	1.18	0.29	-0.95	-24.77	0.54	-0.06	1.24	0.00
37	5.51	3.11	0.20	4.41	1.10	1.29	-13.98	1.83	1.29	3.11	0.00
38	2.60	2.27	0.20	2.08	0.52	-0.19	-14.17	1.79	-0.04	2.12	0.00
39	5.17	3.54	0.20	4.14	1.03	0.60	-11.62	2.39	0.60	3.54	0.00
40	6.74	3.96	0.20	5.39	1.35	1.43	-7.51	3.82	1.43	3.96	0.00
41	2.12	4.30	0.20	1.70	0.42	-2.60	-10.11	2.84	-0.98	2.68	0.00
42	6.44	4.77	0.20	5.15	1.29	0.39	-9.00	3.23	0.39	4.77	0.00
43	2.15	4.56	0.20	1.72	0.43	-2.84	-11.83	2.33	-0.89	2.61	0.00
44	1.03	5.52	0.20	0.82	0.21	-4.69	-16.53	1.37	-0.97	1.79	0.00
45	9.44	4.80	0.20	7.55	1.89	2.75	-6.85	4.12	2.75	4.80	0.00
46	10.17	4.25	0.20	8.14	2.03	3.89	-1.01	8.01	3.89	4.25	0.00
47	2.40	2.60	0.20	1.92	0.48	-0.68	-1.69	7.40	-0.60	2.52	0.00
48	2.52	2.87	0.20	2.02	0.50	-0.85	-2.54	6.72	-0.69	2.70	0.00
49	4.66	1.75	0.20	3.73	0.93	1.98	-0.29	8.70	1.98	1.75	0.00
50	0.13	3.00	0.20	0.10	0.03	-2.89	-3.18	6.25	-2.45	2.55	0.00
51	1.56	3.97	0.20	1.25	0.31	-2.72	-5.90	4.59	-1.66	2.91	0.00
52	1.76	5.22	0.20	1.41	0.35	-3.81	-9.71	2.97	-1.61	3.02	0.00
53	3.09	5.89	0.20	2.47	0.62	-3.41	-13.13	2.02	-0.96	3.43	0.00

54	0.73	5.36	0.20	0.58	0.15	-4.77	-17.90	1.17	-0.84	1.43	0.00
55	2.40	5.57	0.20	1.92	0.48	-3.65	-21.55	0.77	-0.40	2.32	0.00
56	9.88	6.05	0.20	7.90	1.98	1.86	-10.79	2.63	1.86	6.05	0.00
57	9.22	4.84	0.20	7.38	1.84	2.54	-4.86	5.17	2.54	4.84	0.00
58	6.02	3.92	0.20	4.82	1.20	0.90	-3.45	6.06	0.90	3.92	0.00
59	5.68	2.63	0.20	4.54	1.14	1.91	-1.05	7.98	1.91	2.63	0.00
60	2.82	2.11	0.20	2.26	0.56	0.14	-0.89	8.12	0.14	2.11	0.00
61	1.80	2.27	0.20	1.44	0.36	-0.83	-1.72	7.38	-0.74	2.18	0.00
62	2.45	2.22	0.20	1.96	0.49	-0.26	-1.98	7.17	-0.21	2.17	0.00
63	1.41	3.09	0.20	1.13	0.28	-1.96	-3.94	5.73	-1.43	2.56	0.00
64	2.08	4.17	0.20	1.66	0.42	-2.51	-6.44	4.31	-1.42	3.09	0.00
65	11.99	4.56	0.20	9.59	2.40	5.03	0.00	9.00	4.69	4.56	0.34
66	2.42	5.73	0.20	1.94	0.48	-3.80	-3.80	5.83	-3.17	5.11	0.00
67	4.16	5.52	0.20	3.33	0.83	-2.19	-5.99	4.54	-1.29	4.62	0.00
68	2.44	5.72	0.20	1.95	0.49	-3.77	-9.76	2.96	-1.58	3.53	0.00
69	3.78	4.72	0.20	3.02	0.76	-1.69	-11.45	2.44	-0.52	3.54	0.00
70	3.35	3.62	0.20	2.68	0.67	-0.94	-12.39	2.19	-0.25	2.93	0.00
71	1.07	3.95	0.20	0.86	0.21	-3.09	-15.48	1.54	-0.65	1.51	0.00
72	1.18	2.72	0.20	0.94	0.24	-1.77	-17.26	1.26	-0.28	1.23	0.00
73	1.60	3.37	0.20	1.28	0.32	-2.09	-19.35	0.99	-0.27	1.55	0.00
74	1.74	3.10	0.20	1.39	0.35	-1.71	-21.06	0.82	-0.18	1.57	0.00
75	4.81	3.54	0.20	3.85	0.96	0.31	-18.26	1.12	0.31	3.54	0.00
76	5.95	4.07	0.20	4.76	1.19	0.69	-14.04	1.82	0.69	4.07	0.00
77	4.32	4.53	0.20	3.46	0.86	-1.07	-15.11	1.61	-0.21	3.66	0.00
78	4.02	6.05	0.20	3.22	0.80	-2.84	-17.95	1.16	-0.44	3.66	0.00
79	2.13	5.27	0.20	1.70	0.43	-3.57	-21.52	0.78	-0.39	2.09	0.00
80	1.48	6.20	0.20	1.18	0.30	-5.01	-26.53	0.44	-0.34	1.52	0.00
81	2.68	3.90	0.20	2.14	0.54	-1.76	-28.28	0.36	-0.08	2.22	0.00
82	5.77	3.62	0.20	4.62	1.15	1.00	-16.61	1.36	1.00	3.62	0.00
83	3.27	1.86	0.20	2.62	0.65	0.75	-12.72	2.11	0.75	1.86	0.00
84	4.05	2.45	0.20	3.24	0.81	0.79	-9.93	2.90	0.79	2.45	0.00
85	2.14	1.43	0.20	1.71	0.43	0.28	-9.13	3.18	0.28	1.43	0.00
86	3.55	2.90	0.20	2.84	0.71	-0.06	-9.19	3.16	-0.02	2.86	0.00
87	2.06	3.81	0.20	1.65	0.41	-2.16	-11.35	2.47	-0.69	2.34	0.00
88	8.81	4.38	0.20	7.05	1.76	2.67	-4.90	5.14	2.67	4.38	0.00
89	1.56	5.21	0.20	1.25	0.31	-3.96	-8.86	3.27	-1.87	3.12	0.00
90	1.35	6.78	0.20	1.08	0.27	-5.70	-14.56	1.71	-1.56	2.64	0.00
91	0.31	7.10	0.20	0.25	0.06	-6.85	-21.41	0.79	-0.93	1.17	0.00
92	1.35	6.50	0.20	1.08	0.27	-5.42	-26.83	0.42	-0.36	1.44	0.00
93	1.69	6.16	0.20	1.35	0.34	-4.81	-31.63	0.25	-0.18	1.53	0.00
94	0.79	4.64	0.20	0.63	0.16	-4.01	-35.64	0.16	-0.09	0.72	0.00
95	3.10	3.24	0.20	2.48	0.62	-0.76	-36.40	0.14	-0.01	2.49	0.00
96	2.67	3.07	0.20	2.14	0.53	-0.94	-37.34	0.13	-0.01	2.15	0.00
97	4.51	1.92	0.20	3.61	0.90	1.68	-14.06	1.81	1.68	1.92	0.00
98	2.62	1.98	0.20	2.10	0.52	0.12	-13.52	1.93	0.12	1.98	0.00
99	2.72	4.39	0.20	2.18	0.54	-2.21	-15.74	1.50	-0.43	2.60	0.00
%100	1.37	4.99	0.20	1.10	0.27	-3.90	-19.63	0.96	-0.54	1.63	0.0
%101	2.52	5.91	0.20	2.02	0.50	-3.89	-23.52	0.62	-0.34	2.36	0.0
%102	2.44	6.32	0.20	1.95	0.49	-4.37	-27.89	0.38	-0.24	2.19	0.0
%103	1.26	6.53	0.20	1.01	0.25	-5.52	-33.42	0.20	-0.18	1.18	0.0
%104	0.57	6.53	0.20	0.46	0.11	-6.07	-39.49	0.10	-0.10	0.56	0.0
%105	6.50	4.78	0.20	5.20	1.30	0.42	-25.03	0.52	0.42	4.78	0.0
%106	0.41	5.19	0.20	0.33	0.08	-4.86	-29.89	0.30	-0.22	0.55	0.0
%107	6.31	2.86	0.20	5.05	1.26	2.19	-11.27	2.49	2.19	2.86	0.0
%108	3.17	2.18	0.20	2.54	0.63	0.35	-10.10	2.84	0.35	2.18	0.0
%109	3.70	1.74	0.20	2.96	0.74	1.22	-6.96	4.07	1.22	1.74	0.0
%110	4.08	2.24	0.20	3.26	0.82	1.02	-4.99	5.09	1.02	2.24	0.0
%111	5.54	4.35	0.20	4.43	1.11	0.09	-4.84	5.18	0.09	4.35	0.0
%112	4.74	4.27	0.20	3.79	0.95	-0.48	-5.32	4.90	-0.28	4.07	0.0
%113	11.05	5.26	0.20	8.84	2.21	3.58	-0.51	8.48	3.58	5.26	0.0
%114	1.30	5.70	0.20	1.04	0.26	-4.66	-5.17	4.98	-3.50	4.54	0.0
%115	4.48	5.40	0.20	3.58	0.90	-1.82	-6.99	4.05	-0.93	4.52	0.0
%116	3.81	5.66	0.20	3.05	0.76	-2.61	-9.60	3.01	-1.04	4.09	0.0

%117	3.20	4.55	0.20	2.56	0.64	-1.99	-11.59	2.40	-0.61	3.17	0.0
%118	1.70	4.09	0.20	1.36	0.34	-2.73	-14.32	1.76	-0.64	2.00	0.0
%119	0.77	2.69	0.20	0.62	0.15	-2.07	-16.39	1.39	-0.37	0.99	0.0
%120	3.32	1.63	0.20	2.66	0.66	1.02	-11.54	2.42	1.03	1.63	0.0
%121	3.12	1.88	0.20	2.50	0.62	0.62	-9.53	3.04	0.62	1.88	0.0
%122	1.94	2.69	0.20	1.55	0.39	-1.14	-10.67	2.66	-0.37	1.92	0.0
%123	5.04	3.26	0.20	4.03	1.01	0.77	-8.45	3.43	0.77	3.26	0.0
%124	2.38	4.62	0.20	1.90	0.48	-2.72	-11.16	2.52	-0.91	2.82	0.0
%125	4.31	4.77	0.20	3.45	0.86	-1.32	-12.48	2.17	-0.35	3.80	0.0
%126	0.10	7.34	0.20	0.08	0.02	-7.26	-19.74	0.95	-1.22	1.30	0.0
%127	0.06	8.57	0.20	0.05	0.01	-8.53	-28.26	0.36	-0.59	0.64	0.0
%128	1.67	7.79	0.20	1.34	0.33	-6.45	-34.72	0.17	-0.19	1.52	0.0
%129	4.28	5.18	0.20	3.42	0.86	-1.76	-36.47	0.14	-0.03	3.46	0.0
%130	3.93	4.52	0.20	3.14	0.79	-1.38	-37.85	0.12	-0.02	3.16	0.0
%131	4.58	2.87	0.20	3.66	0.92	0.79	-20.06	0.91	0.79	2.87	0.0
%132	0.50	2.43	0.20	0.40	0.10	-2.03	-22.09	0.73	-0.19	0.59	0.0
%133	2.67	2.45	0.20	2.14	0.53	-0.31	-22.41	0.70	-0.03	2.16	0.0
%134	1.80	2.64	0.20	1.44	0.36	-1.20	-23.60	0.61	-0.09	1.53	0.0
%135	1.88	3.56	0.20	1.50	0.38	-2.05	-25.66	0.48	-0.13	1.63	0.0
%136	0.97	3.95	0.20	0.78	0.19	-3.18	-28.84	0.34	-0.15	0.92	0.0
%137	6.28	5.67	0.20	5.02	1.26	-0.65	-29.48	0.31	-0.02	5.05	0.0
%138	9.48	5.21	0.20	7.58	1.90	2.38	-10.59	2.69	2.38	5.21	0.0
%139	5.35	5.36	0.20	4.28	1.07	-1.08	-11.67	2.38	-0.31	4.59	0.0
%140	2.51	6.39	0.20	2.01	0.50	-4.38	-16.06	1.44	-0.93	2.94	0.0
%141	5.96	4.55	0.20	4.77	1.19	0.22	-14.82	1.66	0.22	4.55	0.0
%142	10.95	3.91	0.20	8.76	2.19	4.85	-2.82	6.52	4.85	3.91	0.0
%143	1.93	2.65	0.20	1.54	0.39	-1.10	-3.92	5.74	-0.77	2.32	0.0
%144	0.64	2.60	0.20	0.51	0.13	-2.09	-6.01	4.53	-1.21	1.72	0.0
%145	1.43	2.84	0.20	1.14	0.29	-1.70	-7.71	3.73	-0.80	1.94	0.0
%146	2.26	2.51	0.20	1.81	0.45	-0.70	-8.40	3.45	-0.29	2.09	0.0
%147	2.40	3.29	0.20	1.92	0.48	-1.37	-9.77	2.95	-0.50	2.42	0.0
%148	4.67	3.74	0.20	3.74	0.93	-0.00	-9.78	2.95	-0.00	3.74	0.0
%149	5.35	5.07	0.20	4.28	1.07	-0.80	-10.57	2.70	-0.26	4.54	0.0
%150	2.00	6.80	0.20	1.60	0.40	-5.20	-15.78	1.49	-1.20	2.80	0.0
%151	3.58	7.95	0.20	2.86	0.72	-5.09	-20.86	0.84	-0.66	3.52	0.0
%152	2.96	7.47	0.20	2.37	0.59	-5.10	-25.96	0.47	-0.37	2.74	0.0
%153	3.19	6.76	0.20	2.55	0.64	-4.21	-30.17	0.29	-0.18	2.73	0.0
%154	6.89	4.89	0.20	5.51	1.38	0.63	-20.05	0.92	0.63	4.89	0.0
%155	4.09	3.36	0.20	3.27	0.82	-0.09	-20.14	0.91	-0.01	3.28	0.0
%156	3.05	4.42	0.20	2.44	0.61	-1.98	-22.12	0.72	-0.18	2.62	0.0
%157	3.07	2.07	0.20	2.46	0.61	0.39	-18.32	1.12	0.39	2.07	0.0
%158	4.66	2.39	0.20	3.73	0.93	1.33	-11.41	2.45	1.33	2.39	0.0
%159	5.97	3.86	0.20	4.78	1.19	0.92	-8.62	3.37	0.92	3.86	0.0
%160	0.31	4.73	0.20	0.25	0.06	-4.48	-13.10	2.02	-1.35	1.59	0.0
%161	9.49	6.05	0.20	7.59	1.90	1.54	-8.12	3.57	1.54	6.05	0.0
%162	2.60	5.43	0.20	2.08	0.52	-3.35	-11.47	2.43	-1.13	3.21	0.0
%163	2.46	6.45	0.20	1.97	0.49	-4.48	-15.95	1.46	-0.97	2.94	0.0
%164	7.24	5.68	0.20	5.79	1.45	0.11	-15.32	1.57	0.11	5.68	0.0
%165	9.40	5.14	0.20	7.52	1.88	2.38	-7.21	3.95	2.38	5.14	0.0
%166	2.81	4.10	0.20	2.25	0.56	-1.85	-9.07	3.20	-0.75	3.00	0.0
%167	3.25	2.86	0.20	2.60	0.65	-0.26	-9.32	3.11	-0.09	2.69	0.0
%168	1.83	2.40	0.20	1.46	0.37	-0.94	-10.26	2.79	-0.31	1.78	0.0
%169	1.67	2.37	0.20	1.34	0.33	-1.03	-11.29	2.48	-0.31	1.64	0.0
%170	0.99	3.74	0.20	0.79	0.20	-2.95	-14.24	1.78	-0.71	1.50	0.0
%171	4.98	5.62	0.20	3.98	1.00	-1.64	-15.87	1.47	-0.30	4.29	0.0
%172	0.34	6.06	0.20	0.27	0.07	-5.79	-21.66	0.76	-0.71	0.98	0.0
%173	5.76	8.51	0.20	4.61	1.15	-3.90	-25.57	0.49	-0.27	4.88	0.0
%174	4.39	5.97	0.20	3.51	0.88	-2.46	-28.03	0.37	-0.12	3.63	0.0
%175	1.61	5.49	0.20	1.29	0.32	-4.20	-32.23	0.23	-0.14	1.43	0.0
%176	1.83	6.27	0.20	1.46	0.37	-4.81	-37.03	0.13	-0.10	1.56	0.0
%177	0.77	5.24	0.20	0.62	0.15	-4.62	-41.65	0.08	-0.05	0.67	0.0
%178	15.69	4.40	0.20	12.55	3.14	8.15	-0.77	8.23	8.15	4.40	0.0
%179	2.38	3.23	0.20	1.90	0.48	-1.33	-2.10	7.06	-1.16	3.07	0.0

%180	2.59	2.34	0.20	2.07	0.52	-0.27	-2.37	6.85	-0.21	2.28	0.0
%181	2.63	2.30	0.20	2.10	0.53	-0.20	-2.57	6.70	-0.15	2.26	0.0
%182	2.82	2.39	0.20	2.26	0.56	-0.14	-2.71	6.60	-0.10	2.36	0.0
%183	2.30	3.34	0.20	1.84	0.46	-1.50	-4.20	5.56	-1.03	2.87	0.0
%184	1.93	4.73	0.20	1.54	0.39	-3.19	-7.39	3.87	-1.69	3.24	0.0
%185	5.29	6.08	0.20	4.23	1.06	-1.85	-9.24	3.13	-0.73	4.97	0.0
%186	1.48	6.53	0.20	1.18	0.30	-5.35	-14.59	1.71	-1.43	2.61	0.0
%187	4.01	7.15	0.20	3.21	0.80	-3.95	-18.54	1.09	-0.62	3.83	0.0
%188	0.13	7.63	0.20	0.10	0.03	-7.53	-26.06	0.46	-0.63	0.73	0.0
%189	6.96	7.25	0.20	5.57	1.39	-1.68	-27.75	0.38	-0.08	5.65	0.0
%190	6.91	4.30	0.20	5.53	1.38	1.22	-15.13	1.60	1.22	4.30	0.0
%191	6.02	3.15	0.20	4.82	1.20	1.67	-8.87	3.27	1.67	3.15	0.0
%192	1.38	1.90	0.20	1.10	0.28	-0.80	-9.67	2.99	-0.29	1.39	0.0
%193	1.02	2.97	0.20	0.82	0.20	-2.16	-11.83	2.33	-0.65	1.47	0.0
%194	1.84	3.67	0.20	1.47	0.37	-2.20	-14.04	1.82	-0.52	1.99	0.0
%195	0.50	5.47	0.20	0.40	0.10	-5.07	-19.11	1.02	-0.80	1.20	0.0
%196	2.53	5.14	0.20	2.02	0.51	-3.12	-22.23	0.72	-0.30	2.33	0.0
%197	8.12	6.44	0.20	6.50	1.62	0.06	-21.56	0.77	0.06	6.44	0.0
%198	4.71	5.90	0.20	3.77	0.94	-2.13	-23.69	0.61	-0.17	3.93	0.0
%199	0.06	8.24	0.20	0.05	0.01	-8.19	-31.89	0.24	-0.37	0.42	0.0
%200	7.74	7.36	0.20	6.19	1.55	-1.16	-33.05	0.21	-0.03	6.22	0.0
%201	5.33	5.31	0.20	4.26	1.07	-1.05	-34.10	0.19	-0.02	4.29	0.0
%202	5.85	3.86	0.20	4.68	1.17	0.82	-19.21	1.01	0.82	3.86	0.0
%203	3.44	2.69	0.20	2.75	0.69	0.06	-18.67	1.07	0.06	2.69	0.0
%204	4.95	1.81	0.20	3.96	0.99	2.15	-8.99	3.23	2.15	1.81	0.0
%205	0.96	2.25	0.20	0.77	0.19	-1.49	-10.48	2.72	-0.50	1.27	0.0
%206	3.90	2.97	0.20	3.12	0.78	0.15	-10.03	2.87	0.15	2.97	0.0
%207	1.79	4.55	0.20	1.43	0.36	-3.12	-13.15	2.01	-0.86	2.29	0.0
%208	0.68	6.78	0.20	0.54	0.14	-6.24	-19.38	0.99	-1.02	1.57	0.0
%209	9.31	5.28	0.20	7.45	1.86	2.17	-9.18	3.16	2.17	5.28	0.0
%210	10.09	6.92	0.20	8.07	2.02	1.15	-6.46	4.31	1.15	6.92	0.0
%211	1.76	6.73	0.20	1.41	0.35	-5.33	-11.78	2.35	-1.96	3.37	0.0
%212	0.90	9.50	0.20	0.72	0.18	-8.78	-20.56	0.87	-1.48	2.20	0.0
%213	5.34	5.64	0.20	4.27	1.07	-1.37	-21.93	0.74	-0.12	4.40	0.0
%214	0.19	5.42	0.20	0.15	0.04	-5.27	-27.20	0.41	-0.33	0.49	0.0
%215	3.88	3.11	0.20	3.10	0.78	-0.01	-27.21	0.41	-0.00	3.10	0.0
%216	4.54	2.22	0.20	3.63	0.91	1.41	-14.03	1.82	1.41	2.22	0.0
%217	0.81	2.56	0.20	0.65	0.16	-1.91	-15.93	1.46	-0.35	1.00	0.0
%218	1.44	2.96	0.20	1.15	0.29	-1.81	-17.74	1.19	-0.27	1.42	0.0
%219	2.97	4.38	0.20	2.38	0.59	-2.01	-19.75	0.95	-0.24	2.62	0.0
%220	0.28	6.04	0.20	0.22	0.06	-5.82	-25.57	0.49	-0.46	0.68	0.0
%221	2.91	6.49	0.20	2.33	0.58	-4.16	-29.73	0.30	-0.18	2.51	0.0
%222	1.81	7.13	0.20	1.45	0.36	-5.68	-35.40	0.16	-0.15	1.59	0.0
%223	0.96	8.48	0.20	0.77	0.19	-7.72	-43.12	0.07	-0.09	0.86	0.0
%224	0.19	7.89	0.20	0.15	0.04	-7.74	-50.86	0.03	-0.04	0.19	0.0
%225	0.43	6.82	0.20	0.34	0.09	-6.47	-57.33	0.01	-0.01	0.36	0.0
%226	1.37	5.87	0.20	1.10	0.27	-4.77	-62.10	0.01	-0.01	1.10	0.0
%227	1.46	4.12	0.20	1.17	0.29	-2.95	-65.06	0.01	-0.00	1.17	0.0
%228	2.27	2.48	0.20	1.82	0.45	-0.67	-65.73	0.01	-0.00	1.82	0.0
%229	7.07	1.90	0.20	5.66	1.41	3.75	-7.66	3.76	3.75	1.90	0.0
%230	1.10	2.61	0.20	0.88	0.22	-1.73	-9.39	3.08	-0.67	1.55	0.0
%231	3.22	3.87	0.20	2.58	0.64	-1.30	-10.68	2.66	-0.42	3.00	0.0
%232	0.51	5.38	0.20	0.41	0.10	-4.97	-15.65	1.51	-1.15	1.56	0.0
%233	5.29	6.82	0.20	4.23	1.06	-2.59	-18.24	1.13	-0.39	4.62	0.0
%234	4.23	5.88	0.20	3.38	0.85	-2.50	-20.74	0.85	-0.28	3.66	0.0
%235	2.70	6.57	0.20	2.16	0.54	-4.41	-25.15	0.51	-0.33	2.49	0.0
%236	3.26	6.78	0.20	2.61	0.65	-4.17	-29.31	0.32	-0.19	2.80	0.0
%237	0.68	6.21	0.20	0.54	0.14	-5.66	-34.98	0.17	-0.15	0.70	0.0
%238	1.93	5.24	0.20	1.54	0.39	-3.70	-38.68	0.11	-0.06	1.60	0.0
%239	1.61	3.80	0.20	1.29	0.32	-2.51	-41.19	0.08	-0.03	1.32	0.0
%240	0.37	2.30	0.20	0.30	0.07	-2.00	-43.19	0.07	-0.02	0.31	0.0

TOTAL PERCOLATION = 0.338

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.22	1.28	0.35	-0.22	-44.04	0.06	-0.00	1.28	0.00
2	4.40	1.76	0.22	3.45	0.95	1.69	-14.37	1.75	1.69	1.76	0.00
3	3.58	2.57	0.22	2.81	0.77	0.24	-13.23	1.99	0.24	2.57	0.00
4	4.01	2.25	0.22	3.15	0.86	0.89	-9.98	2.89	0.89	2.25	0.00
5	4.22	3.67	0.22	3.31	0.91	-0.36	-10.33	2.77	-0.12	3.43	0.00
6	2.02	3.65	0.22	1.59	0.43	-2.07	-12.40	2.19	-0.58	2.17	0.00
7	0.26	4.86	0.22	0.20	0.06	-4.65	-17.05	1.29	-0.90	1.10	0.00
8	0.23	5.75	0.22	0.18	0.05	-5.57	-22.63	0.68	-0.61	0.79	0.00
9	6.38	3.82	0.22	5.01	1.37	1.19	-13.78	1.87	1.19	3.82	0.00
10	3.84	2.62	0.22	3.01	0.83	0.40	-12.10	2.27	0.40	2.62	0.00
11	0.62	2.87	0.22	0.49	0.13	-2.38	-14.48	1.73	-0.54	1.03	0.00
12	1.40	2.58	0.22	1.10	0.30	-1.48	-15.96	1.46	-0.27	1.37	0.00
13	0.15	2.81	0.22	0.12	0.03	-2.70	-18.65	1.07	-0.39	0.50	0.00
14	1.68	4.00	0.22	1.32	0.36	-2.68	-21.33	0.79	-0.28	1.60	0.00
15	12.00	5.87	0.22	9.42	2.58	3.55	-6.39	4.34	3.55	5.87	0.00
16	0.89	4.56	0.22	0.70	0.19	-3.86	-10.25	2.80	-1.54	2.24	0.00
17	5.65	6.00	0.22	4.44	1.21	-1.56	-11.81	2.34	-0.46	4.89	0.00
18	0.76	4.74	0.22	0.60	0.16	-4.14	-15.96	1.46	-0.88	1.48	0.00
19	1.87	8.64	0.22	1.47	0.40	-7.17	-23.13	0.65	-0.81	2.28	0.00
20	3.20	6.27	0.22	2.51	0.69	-3.76	-26.89	0.42	-0.22	2.74	0.00
21	3.31	5.52	0.22	2.60	0.71	-2.92	-29.81	0.30	-0.12	2.72	0.00
22	4.30	3.93	0.22	3.38	0.92	-0.56	-30.37	0.28	-0.02	3.39	0.00
23	2.75	3.30	0.22	2.16	0.59	-1.15	-31.51	0.25	-0.03	2.19	0.00
24	4.63	2.44	0.22	3.63	1.00	1.20	-16.03	1.45	1.20	2.44	0.00
25	1.73	1.77	0.22	1.36	0.37	-0.41	-16.45	1.38	-0.07	1.42	0.00
26	0.50	2.88	0.22	0.39	0.11	-2.48	-18.93	1.04	-0.34	0.73	0.00
27	0.91	4.24	0.22	0.71	0.20	-3.52	-22.45	0.70	-0.34	1.06	0.00
28	1.71	4.03	0.22	1.34	0.37	-2.68	-25.14	0.51	-0.18	1.53	0.00
29	6.38	5.15	0.22	5.01	1.37	-0.14	-25.28	0.51	-0.01	5.02	0.00
30	2.13	5.24	0.22	1.67	0.46	-3.57	-28.85	0.34	-0.17	1.84	0.00
31	2.17	5.74	0.22	1.70	0.47	-4.04	-32.89	0.21	-0.12	1.83	0.00
32	3.60	4.89	0.22	2.83	0.77	-2.06	-34.95	0.17	-0.04	2.87	0.00
33	4.45	4.56	0.22	3.49	0.96	-1.06	-36.01	0.15	-0.02	3.51	0.00
34	3.95	3.95	0.22	3.10	0.85	-0.85	-36.86	0.14	-0.01	3.11	0.00
35	3.26	2.16	0.22	2.56	0.70	0.40	-24.83	0.53	0.40	2.16	0.00
36	1.47	2.12	0.22	1.15	0.32	-0.97	-25.80	0.48	-0.05	1.21	0.00
37	5.51	3.11	0.22	4.33	1.18	1.21	-14.69	1.69	1.21	3.11	0.00
38	2.60	2.27	0.22	2.04	0.56	-0.23	-14.92	1.64	-0.04	2.08	0.00
39	5.17	3.54	0.22	4.06	1.11	0.52	-12.49	2.17	0.52	3.54	0.00
40	6.74	3.96	0.22	5.29	1.45	1.33	-8.29	3.50	1.33	3.96	0.00
41	2.12	4.30	0.22	1.66	0.46	-2.63	-10.92	2.59	-0.91	2.57	0.00
42	6.44	4.77	0.22	5.06	1.38	0.29	-10.00	2.88	0.29	4.77	0.00
43	2.15	4.56	0.22	1.69	0.46	-2.87	-12.87	2.08	-0.80	2.49	0.00
44	1.03	5.52	0.22	0.81	0.22	-4.71	-17.57	1.22	-0.86	1.67	0.00
45	9.44	4.80	0.22	7.41	2.03	2.61	-7.50	3.82	2.61	4.80	0.00
46	10.17	4.25	0.22	7.98	2.19	3.73	-1.52	7.56	3.73	4.25	0.00
47	2.40	2.60	0.22	1.88	0.52	-0.71	-2.23	6.96	-0.60	2.48	0.00
48	2.52	2.87	0.22	1.98	0.54	-0.89	-3.12	6.29	-0.67	2.65	0.00
49	4.66	1.75	0.22	3.66	1.00	1.91	-0.80	8.20	1.91	1.75	0.00
50	0.13	3.00	0.22	0.10	0.03	-2.89	-3.70	5.89	-2.31	2.41	0.00
51	1.56	3.97	0.22	1.22	0.34	-2.74	-6.44	4.31	-1.58	2.80	0.00
52	1.76	5.22	0.22	1.38	0.38	-3.84	-10.28	2.79	-1.53	2.91	0.00
53	3.09	5.89	0.22	2.43	0.66	-3.46	-13.74	1.88	-0.91	3.33	0.00

54	0.73	5.36	0.22	0.57	0.16	-4.78	-18.53	1.09	-0.79	1.36	0.00
55	2.40	5.57	0.22	1.88	0.52	-3.69	-22.21	0.72	-0.37	2.26	0.00
56	9.88	6.05	0.22	7.76	2.12	1.71	-11.50	2.42	1.71	6.05	0.00
57	9.22	4.84	0.22	7.24	1.98	2.40	-5.46	4.83	2.40	4.84	0.00
58	6.02	3.92	0.22	4.73	1.29	0.81	-4.10	5.63	0.81	3.92	0.00
59	5.68	2.63	0.22	4.46	1.22	1.83	-1.64	7.46	1.83	2.63	0.00
60	2.82	2.11	0.22	2.21	0.61	0.10	-1.52	7.56	0.10	2.11	0.00
61	1.80	2.27	0.22	1.41	0.39	-0.85	-2.37	6.85	-0.71	2.12	0.00
62	2.45	2.22	0.22	1.92	0.53	-0.30	-2.67	6.62	-0.23	2.15	0.00
63	1.41	3.09	0.22	1.11	0.30	-1.98	-4.65	5.29	-1.34	2.44	0.00
64	2.08	4.17	0.22	1.63	0.45	-2.54	-7.19	3.96	-1.33	2.96	0.00
65	11.99	4.56	0.22	9.41	2.58	4.85	-0.17	8.81	4.85	4.56	0.00
66	2.42	5.73	0.22	1.90	0.52	-3.83	-4.01	5.69	-3.12	5.02	0.00
67	4.16	5.52	0.22	3.27	0.89	-2.26	-6.26	4.40	-1.29	4.55	0.00
68	2.44	5.72	0.22	1.92	0.52	-3.80	-10.07	2.85	-1.55	3.46	0.00
69	3.78	4.72	0.22	2.97	0.81	-1.75	-11.82	2.34	-0.52	3.48	0.00
70	3.35	3.62	0.22	2.63	0.72	-0.99	-12.81	2.09	-0.25	2.88	0.00
71	1.07	3.95	0.22	0.84	0.23	-3.11	-15.92	1.47	-0.62	1.46	0.00
72	1.18	2.72	0.22	0.93	0.25	-1.79	-17.71	1.20	-0.27	1.20	0.00
73	1.60	3.37	0.22	1.26	0.34	-2.12	-19.82	0.94	-0.26	1.51	0.00
74	1.74	3.10	0.22	1.37	0.37	-1.74	-21.56	0.77	-0.17	1.53	0.00
75	4.81	3.54	0.22	3.78	1.03	0.23	-19.23	1.01	0.23	3.54	0.00
76	5.95	4.07	0.22	4.67	1.28	0.60	-15.10	1.61	0.60	4.07	0.00
77	4.32	4.53	0.22	3.39	0.93	-1.14	-16.24	1.41	-0.20	3.59	0.00
78	4.02	6.05	0.22	3.16	0.86	-2.90	-19.14	1.02	-0.40	3.55	0.00
79	2.13	5.27	0.22	1.67	0.46	-3.60	-22.74	0.68	-0.34	2.01	0.00
80	1.48	6.20	0.22	1.16	0.32	-5.03	-27.77	0.38	-0.29	1.46	0.00
81	2.68	3.90	0.22	2.10	0.58	-1.80	-29.56	0.31	-0.07	2.17	0.00
82	5.77	3.62	0.22	4.53	1.24	0.91	-17.53	1.22	0.91	3.62	0.00
83	3.27	1.86	0.22	2.57	0.70	0.70	-13.53	1.93	0.70	1.86	0.00
84	4.05	2.45	0.22	3.18	0.87	0.73	-10.71	2.66	0.73	2.45	0.00
85	2.14	1.43	0.22	1.68	0.46	0.24	-9.93	2.90	0.24	1.43	0.00
86	3.55	2.90	0.22	2.79	0.76	-0.11	-10.04	2.86	-0.04	2.82	0.00
87	2.06	3.81	0.22	1.62	0.44	-2.19	-12.23	2.23	-0.63	2.25	0.00
88	8.81	4.38	0.22	6.92	1.89	2.54	-5.56	4.77	2.54	4.38	0.00
89	1.56	5.21	0.22	1.22	0.34	-3.98	-9.54	3.03	-1.74	2.97	0.00
90	1.35	6.78	0.22	1.06	0.29	-5.72	-15.26	1.58	-1.45	2.51	0.00
91	0.31	7.10	0.22	0.24	0.07	-6.85	-22.11	0.73	-0.86	1.10	0.00
92	1.35	6.50	0.22	1.06	0.29	-5.44	-27.55	0.39	-0.33	1.39	0.00
93	1.69	6.16	0.22	1.33	0.36	-4.83	-32.38	0.23	-0.17	1.49	0.00
94	0.79	4.64	0.22	0.62	0.17	-4.02	-36.40	0.14	-0.08	0.70	0.00
95	3.10	3.24	0.22	2.43	0.67	-0.81	-37.21	0.13	-0.01	2.45	0.00
96	2.67	3.07	0.22	2.10	0.57	-0.98	-38.19	0.12	-0.01	2.11	0.00
97	4.51	1.92	0.22	3.54	0.97	1.62	-14.46	1.73	1.62	1.92	0.00
98	2.62	1.98	0.22	2.06	0.56	0.08	-14.08	1.81	0.08	1.98	0.00
99	2.72	4.39	0.22	2.14	0.58	-2.25	-16.34	1.40	-0.41	2.54	0.00
%100	1.37	4.99	0.22	1.08	0.29	-3.92	-20.25	0.90	-0.50	1.58	0.0
%101	2.52	5.91	0.22	1.98	0.54	-3.93	-24.18	0.57	-0.32	2.30	0.0
%102	2.44	6.32	0.22	1.92	0.52	-4.41	-28.59	0.35	-0.23	2.14	0.0
%103	1.26	6.53	0.22	0.99	0.27	-5.54	-34.13	0.18	-0.16	1.15	0.0
%104	0.57	6.53	0.22	0.45	0.12	-6.08	-40.21	0.09	-0.09	0.54	0.0
%105	6.50	4.78	0.22	5.10	1.40	0.32	-27.03	0.41	0.32	4.78	0.0
%106	0.41	5.19	0.22	0.32	0.09	-4.87	-31.89	0.24	-0.18	0.50	0.0
%107	6.31	2.86	0.22	4.95	1.36	2.10	-11.83	2.34	2.10	2.86	0.0
%108	3.17	2.18	0.22	2.49	0.68	0.30	-10.76	2.64	0.30	2.18	0.0
%109	3.70	1.74	0.22	2.90	0.80	1.17	-7.54	3.81	1.17	1.74	0.0
%110	4.08	2.24	0.22	3.20	0.88	0.96	-5.56	4.77	0.96	2.24	0.0
%111	5.54	4.35	0.22	4.35	1.19	0.00	-5.55	4.77	0.00	4.35	0.0
%112	4.74	4.27	0.22	3.72	1.02	-0.55	-6.10	4.48	-0.29	4.01	0.0
%113	11.05	5.26	0.22	8.67	2.38	3.42	-1.13	7.90	3.42	5.26	0.0
%114	1.30	5.70	0.22	1.02	0.28	-4.68	-5.82	4.63	-3.27	4.29	0.0
%115	4.48	5.40	0.22	3.52	0.96	-1.89	-7.70	3.74	-0.89	4.41	0.0
%116	3.81	5.66	0.22	2.99	0.82	-2.67	-10.37	2.76	-0.98	3.97	0.0

%117	3.20	4.55	0.22	2.51	0.69	-2.04	-12.41	2.19	-0.57	3.08	0.0
%118	1.70	4.09	0.22	1.33	0.37	-2.75	-15.16	1.60	-0.59	1.92	0.0
%119	0.77	2.69	0.22	0.60	0.17	-2.08	-17.24	1.26	-0.34	0.94	0.0
%120	3.32	1.63	0.22	2.61	0.71	0.98	-12.21	2.24	0.98	1.63	0.0
%121	3.12	1.88	0.22	2.45	0.67	0.57	-10.21	2.81	0.57	1.88	0.0
%122	1.94	2.69	0.22	1.52	0.42	-1.17	-11.38	2.46	-0.35	1.87	0.0
%123	5.04	3.26	0.22	3.96	1.08	0.69	-9.20	3.15	0.69	3.26	0.0
%124	2.38	4.62	0.22	1.87	0.51	-2.75	-11.95	2.30	-0.85	2.72	0.0
%125	4.31	4.77	0.22	3.38	0.93	-1.38	-13.33	1.97	-0.34	3.72	0.0
%126	0.10	7.34	0.22	0.08	0.02	-7.26	-20.59	0.86	-1.11	1.19	0.0
%127	0.06	8.57	0.22	0.05	0.01	-8.53	-29.12	0.33	-0.54	0.58	0.0
%128	1.67	7.79	0.22	1.31	0.36	-6.48	-35.60	0.16	-0.17	1.48	0.0
%129	4.28	5.18	0.22	3.36	0.92	-1.82	-37.42	0.13	-0.03	3.39	0.0
%130	3.93	4.52	0.22	3.09	0.84	-1.44	-38.85	0.11	-0.02	3.10	0.0
%131	4.58	2.87	0.22	3.60	0.98	0.73	-20.88	0.83	0.73	2.87	0.0
%132	0.50	2.43	0.22	0.39	0.11	-2.04	-22.92	0.66	-0.17	0.56	0.0
%133	2.67	2.45	0.22	2.10	0.57	-0.35	-23.27	0.64	-0.03	2.12	0.0
%134	1.80	2.64	0.22	1.41	0.39	-1.23	-24.50	0.55	-0.08	1.50	0.0
%135	1.88	3.56	0.22	1.48	0.40	-2.08	-26.58	0.44	-0.12	1.59	0.0
%136	0.97	3.95	0.22	0.76	0.21	-3.19	-29.77	0.30	-0.13	0.89	0.0
%137	6.28	5.67	0.22	4.93	1.35	-0.74	-30.51	0.28	-0.02	4.95	0.0
%138	9.48	5.21	0.22	7.44	2.04	2.23	-11.19	2.51	2.23	5.21	0.0
%139	5.35	5.36	0.22	4.20	1.15	-1.16	-12.35	2.20	-0.31	4.51	0.0
%140	2.51	6.39	0.22	1.97	0.54	-4.42	-16.77	1.33	-0.87	2.84	0.0
%141	5.96	4.55	0.22	4.68	1.28	0.13	-15.96	1.46	0.13	4.55	0.0
%142	10.95	3.91	0.22	8.60	2.35	4.69	-3.33	6.15	4.69	3.91	0.0
%143	1.93	2.65	0.22	1.52	0.41	-1.13	-4.46	5.40	-0.75	2.26	0.0
%144	0.64	2.60	0.22	0.50	0.14	-2.09	-6.56	4.26	-1.15	1.65	0.0
%145	1.43	2.84	0.22	1.12	0.31	-1.72	-8.27	3.50	-0.76	1.88	0.0
%146	2.26	2.51	0.22	1.77	0.49	-0.73	-9.01	3.22	-0.28	2.05	0.0
%147	2.40	3.29	0.22	1.88	0.52	-1.41	-10.41	2.74	-0.48	2.36	0.0
%148	4.67	3.74	0.22	3.67	1.00	-0.07	-10.48	2.72	-0.02	3.69	0.0
%149	5.35	5.07	0.22	4.20	1.15	-0.88	-11.36	2.46	-0.26	4.46	0.0
%150	2.00	6.80	0.22	1.57	0.43	-5.23	-16.59	1.36	-1.11	2.68	0.0
%151	3.58	7.95	0.22	2.81	0.77	-5.14	-21.74	0.76	-0.60	3.41	0.0
%152	2.96	7.47	0.22	2.32	0.64	-5.15	-26.88	0.42	-0.34	2.66	0.0
%153	3.19	6.76	0.22	2.50	0.69	-4.26	-31.14	0.26	-0.16	2.67	0.0
%154	6.89	4.89	0.22	5.41	1.48	0.52	-21.44	0.78	0.52	4.89	0.0
%155	4.09	3.36	0.22	3.21	0.88	-0.15	-21.59	0.77	-0.01	3.22	0.0
%156	3.05	4.42	0.22	2.39	0.66	-2.02	-23.61	0.61	-0.16	2.55	0.0
%157	3.07	2.07	0.22	2.41	0.66	0.34	-19.67	0.96	0.34	2.07	0.0
%158	4.66	2.39	0.22	3.66	1.00	1.26	-12.28	2.22	1.26	2.39	0.0
%159	5.97	3.86	0.22	4.69	1.28	0.83	-9.49	3.05	0.83	3.86	0.0
%160	0.31	4.73	0.22	0.24	0.07	-4.49	-13.98	1.83	-1.22	1.46	0.0
%161	9.49	6.05	0.22	7.45	2.04	1.40	-8.98	3.23	1.40	6.05	0.0
%162	2.60	5.43	0.22	2.04	0.56	-3.39	-12.37	2.20	-1.04	3.08	0.0
%163	2.46	6.45	0.22	1.93	0.53	-4.52	-16.89	1.31	-0.88	2.81	0.0
%164	7.24	5.68	0.22	5.68	1.56	-0.00	-16.89	1.31	-0.00	5.68	0.0
%165	9.40	5.14	0.22	7.38	2.02	2.24	-8.14	3.55	2.24	5.14	0.0
%166	2.81	4.10	0.22	2.21	0.60	-1.90	-10.04	2.86	-0.69	2.90	0.0
%167	3.25	2.86	0.22	2.55	0.70	-0.30	-10.34	2.77	-0.10	2.65	0.0
%168	1.83	2.40	0.22	1.44	0.39	-0.96	-11.31	2.48	-0.29	1.72	0.0
%169	1.67	2.37	0.22	1.31	0.36	-1.06	-12.36	2.20	-0.28	1.59	0.0
%170	0.99	3.74	0.22	0.78	0.21	-2.96	-15.32	1.57	-0.63	1.41	0.0
%171	4.98	5.62	0.22	3.91	1.07	-1.71	-17.04	1.29	-0.28	4.19	0.0
%172	0.34	6.06	0.22	0.27	0.07	-5.80	-22.83	0.67	-0.62	0.89	0.0
%173	5.76	8.51	0.22	4.52	1.24	-3.99	-26.82	0.42	-0.24	4.77	0.0
%174	4.39	5.97	0.22	3.45	0.94	-2.52	-29.35	0.32	-0.11	3.55	0.0
%175	1.61	5.49	0.22	1.26	0.35	-4.22	-33.57	0.20	-0.12	1.39	0.0
%176	1.83	6.27	0.22	1.44	0.39	-4.84	-38.41	0.11	-0.08	1.52	0.0
%177	0.77	5.24	0.22	0.60	0.17	-4.63	-43.04	0.07	-0.05	0.65	0.0
%178	15.69	4.40	0.22	12.32	3.37	7.91	-1.04	7.98	7.91	4.40	0.0
%179	2.38	3.23	0.22	1.87	0.51	-1.37	-2.41	6.82	-1.16	3.02	0.0

%180	2.59	2.34	0.22	2.03	0.56	-0.30	-2.71	6.59	-0.23	2.27	0.0
%181	2.63	2.30	0.22	2.06	0.57	-0.24	-2.95	6.42	-0.18	2.24	0.0
%182	2.82	2.39	0.22	2.21	0.61	-0.18	-3.13	6.29	-0.13	2.34	0.0
%183	2.30	3.34	0.22	1.81	0.49	-1.53	-4.66	5.28	-1.01	2.81	0.0
%184	1.93	4.73	0.22	1.52	0.41	-3.22	-7.88	3.66	-1.62	3.13	0.0
%185	5.29	6.08	0.22	4.15	1.14	-1.93	-9.81	2.94	-0.72	4.87	0.0
%186	1.48	6.53	0.22	1.16	0.32	-5.37	-15.18	1.60	-1.34	2.51	0.0
%187	4.01	7.15	0.22	3.15	0.86	-4.01	-19.19	1.01	-0.58	3.73	0.0
%188	0.13	7.63	0.22	0.10	0.03	-7.53	-26.71	0.43	-0.58	0.68	0.0
%189	6.96	7.25	0.22	5.46	1.50	-1.79	-28.50	0.35	-0.08	5.54	0.0
%190	6.91	4.30	0.22	5.42	1.49	1.12	-15.90	1.47	1.12	4.30	0.0
%191	6.02	3.15	0.22	4.73	1.29	1.58	-9.50	3.05	1.58	3.15	0.0
%192	1.38	1.90	0.22	1.08	0.30	-0.82	-10.32	2.77	-0.27	1.36	0.0
%193	1.02	2.97	0.22	0.80	0.22	-2.17	-12.50	2.17	-0.61	1.41	0.0
%194	1.84	3.67	0.22	1.44	0.40	-2.23	-14.73	1.68	-0.49	1.93	0.0
%195	0.50	5.47	0.22	0.39	0.11	-5.08	-19.81	0.94	-0.74	1.13	0.0
%196	2.53	5.14	0.22	1.99	0.54	-3.16	-22.97	0.66	-0.28	2.27	0.0
%197	8.12	6.44	0.22	6.37	1.75	-0.07	-23.03	0.65	-0.00	6.38	0.0
%198	4.71	5.90	0.22	3.70	1.01	-2.20	-25.24	0.51	-0.14	3.84	0.0
%199	0.06	8.24	0.22	0.05	0.01	-8.19	-33.43	0.20	-0.31	0.36	0.0
%200	7.74	7.36	0.22	6.08	1.66	-1.28	-34.71	0.17	-0.03	6.10	0.0
%201	5.33	5.31	0.22	4.18	1.15	-1.13	-35.84	0.15	-0.02	4.20	0.0
%202	5.85	3.86	0.22	4.59	1.26	0.74	-20.33	0.89	0.74	3.86	0.0
%203	3.44	2.69	0.22	2.70	0.74	0.01	-20.21	0.90	0.01	2.69	0.0
%204	4.95	1.81	0.22	3.89	1.06	2.08	-9.69	2.98	2.08	1.81	0.0
%205	0.96	2.25	0.22	0.75	0.21	-1.50	-11.19	2.51	-0.47	1.22	0.0
%206	3.90	2.97	0.22	3.06	0.84	0.09	-10.90	2.60	0.09	2.97	0.0
%207	1.79	4.55	0.22	1.41	0.38	-3.14	-14.04	1.82	-0.78	2.19	0.0
%208	0.68	6.78	0.22	0.53	0.15	-6.25	-20.29	0.89	-0.92	1.46	0.0
%209	9.31	5.28	0.22	7.31	2.00	2.03	-9.86	2.92	2.03	5.28	0.0
%210	10.09	6.92	0.22	7.92	2.17	1.00	-7.28	3.92	1.00	6.92	0.0
%211	1.76	6.73	0.22	1.38	0.38	-5.35	-12.64	2.13	-1.79	3.17	0.0
%212	0.90	9.50	0.22	0.71	0.19	-8.79	-21.43	0.78	-1.35	2.05	0.0
%213	5.34	5.64	0.22	4.19	1.15	-1.45	-22.88	0.66	-0.12	4.31	0.0
%214	0.19	5.42	0.22	0.15	0.04	-5.27	-28.15	0.36	-0.30	0.45	0.0
%215	3.88	3.11	0.22	3.05	0.83	-0.07	-28.22	0.36	-0.00	3.05	0.0
%216	4.54	2.22	0.22	3.56	0.98	1.34	-14.59	1.71	1.34	2.22	0.0
%217	0.81	2.56	0.22	0.64	0.17	-1.92	-16.50	1.37	-0.33	0.97	0.0
%218	1.44	2.96	0.22	1.13	0.31	-1.83	-18.34	1.11	-0.26	1.39	0.0
%219	2.97	4.38	0.22	2.33	0.64	-2.05	-20.39	0.88	-0.23	2.56	0.0
%220	0.28	6.04	0.22	0.22	0.06	-5.82	-26.21	0.45	-0.43	0.65	0.0
%221	2.91	6.49	0.22	2.28	0.63	-4.20	-30.41	0.28	-0.17	2.46	0.0
%222	1.81	7.13	0.22	1.42	0.39	-5.71	-36.12	0.15	-0.13	1.56	0.0
%223	0.96	8.48	0.22	0.75	0.21	-7.73	-43.85	0.06	-0.09	0.84	0.0
%224	0.19	7.89	0.22	0.15	0.04	-7.74	-51.59	0.03	-0.04	0.18	0.0
%225	0.43	6.82	0.22	0.34	0.09	-6.48	-58.07	0.01	-0.01	0.35	0.0
%226	1.37	5.87	0.22	1.08	0.29	-4.79	-62.86	0.01	-0.01	1.08	0.0
%227	1.46	4.12	0.22	1.15	0.31	-2.98	-65.84	0.01	-0.00	1.15	0.0
%228	2.27	2.48	0.22	1.78	0.49	-0.70	-66.54	0.00	-0.00	1.78	0.0
%229	7.07	1.90	0.22	5.55	1.52	3.65	-7.91	3.65	3.65	1.90	0.0
%230	1.10	2.61	0.22	0.86	0.24	-1.75	-9.66	2.99	-0.66	1.52	0.0
%231	3.22	3.87	0.22	2.53	0.69	-1.34	-11.00	2.57	-0.42	2.95	0.0
%232	0.51	5.38	0.22	0.40	0.11	-4.98	-15.98	1.46	-1.11	1.51	0.0
%233	5.29	6.82	0.22	4.15	1.14	-2.67	-18.65	1.08	-0.38	4.53	0.0
%234	4.23	5.88	0.22	3.32	0.91	-2.56	-21.21	0.80	-0.27	3.59	0.0
%235	2.70	6.57	0.22	2.12	0.58	-4.45	-25.65	0.48	-0.32	2.44	0.0
%236	3.26	6.78	0.22	2.56	0.70	-4.22	-29.87	0.30	-0.18	2.74	0.0
%237	0.68	6.21	0.22	0.53	0.15	-5.68	-35.55	0.16	-0.14	0.68	0.0
%238	1.93	5.24	0.22	1.52	0.41	-3.73	-39.27	0.10	-0.05	1.57	0.0
%239	1.61	3.80	0.22	1.26	0.35	-2.54	-41.81	0.08	-0.03	1.29	0.0
%240	0.37	2.30	0.22	0.29	0.08	-2.01	-43.82	0.06	-0.02	0.31	0.0

TOTAL PERCOLATION = 0.000

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station*****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.23	1.26	0.37	-0.24	-44.69	0.06	-0.00	1.26	0.00
2	4.40	1.76	0.23	3.39	1.01	1.62	-14.73	1.68	1.62	1.76	0.00
3	3.58	2.57	0.23	2.76	0.82	0.19	-13.80	1.87	0.19	2.57	0.00
4	4.01	2.25	0.23	3.09	0.92	0.83	-10.56	2.70	0.83	2.25	0.00
5	4.22	3.67	0.23	3.25	0.97	-0.42	-10.97	2.57	-0.13	3.38	0.00
6	2.02	3.65	0.23	1.56	0.46	-2.10	-13.07	2.03	-0.55	2.10	0.00
7	0.26	4.86	0.23	0.20	0.06	-4.66	-17.73	1.19	-0.83	1.03	0.00
8	0.23	5.75	0.23	0.18	0.05	-5.58	-23.31	0.63	-0.56	0.74	0.00
9	6.38	3.82	0.23	4.91	1.47	1.09	-14.50	1.72	1.09	3.82	0.00
10	3.84	2.62	0.23	2.96	0.88	0.34	-12.92	2.06	0.34	2.62	0.00
11	0.62	2.87	0.23	0.48	0.14	-2.39	-15.32	1.57	-0.49	0.97	0.00
12	1.40	2.58	0.23	1.08	0.32	-1.50	-16.82	1.32	-0.25	1.32	0.00
13	0.15	2.81	0.23	0.12	0.03	-2.70	-19.51	0.97	-0.35	0.47	0.00
14	1.68	4.00	0.23	1.29	0.39	-2.70	-22.22	0.72	-0.26	1.55	0.00
15	12.00	5.87	0.23	9.24	2.76	3.37	-6.93	4.08	3.37	5.87	0.00
16	0.89	4.56	0.23	0.69	0.20	-3.87	-10.80	2.63	-1.46	2.14	0.00
17	5.65	6.00	0.23	4.35	1.30	-1.65	-12.45	2.18	-0.45	4.80	0.00
18	0.76	4.74	0.23	0.59	0.17	-4.15	-16.60	1.36	-0.82	1.41	0.00
19	1.87	8.64	0.23	1.44	0.43	-7.20	-23.80	0.60	-0.76	2.20	0.00
20	3.20	6.27	0.23	2.46	0.74	-3.81	-27.61	0.39	-0.21	2.67	0.00
21	3.31	5.52	0.23	2.55	0.76	-2.97	-30.58	0.28	-0.11	2.66	0.00
22	4.30	3.93	0.23	3.31	0.99	-0.62	-31.20	0.26	-0.02	3.33	0.00
23	2.75	3.30	0.23	2.12	0.63	-1.19	-32.39	0.23	-0.03	2.15	0.00
24	4.63	2.44	0.23	3.57	1.06	1.13	-16.62	1.35	1.13	2.44	0.00
25	1.73	1.77	0.23	1.33	0.40	-0.44	-17.06	1.29	-0.07	1.40	0.00
26	0.50	2.88	0.23	0.38	0.12	-2.49	-19.55	0.97	-0.32	0.70	0.00
27	0.91	4.24	0.23	0.70	0.21	-3.53	-23.08	0.65	-0.32	1.02	0.00
28	1.71	4.03	0.23	1.32	0.39	-2.71	-25.79	0.48	-0.17	1.49	0.00
29	6.38	5.15	0.23	4.91	1.47	-0.24	-26.03	0.46	-0.01	4.93	0.00
30	2.13	5.24	0.23	1.64	0.49	-3.60	-29.63	0.31	-0.16	1.80	0.00
31	2.17	5.74	0.23	1.67	0.50	-4.07	-33.70	0.19	-0.11	1.79	0.00
32	3.60	4.89	0.23	2.77	0.83	-2.11	-35.82	0.15	-0.04	2.81	0.00
33	4.45	4.56	0.23	3.43	1.02	-1.13	-36.95	0.13	-0.02	3.44	0.00
34	3.95	3.95	0.23	3.04	0.91	-0.91	-37.86	0.12	-0.01	3.05	0.00
35	3.26	2.16	0.23	2.51	0.75	0.35	-25.95	0.47	0.35	2.16	0.00
36	1.47	2.12	0.23	1.13	0.34	-0.99	-26.94	0.42	-0.05	1.18	0.00
37	5.51	3.11	0.23	4.24	1.27	1.13	-15.45	1.55	1.13	3.11	0.00
38	2.60	2.27	0.23	2.00	0.60	-0.27	-15.72	1.50	-0.05	2.05	0.00
39	5.17	3.54	0.23	3.98	1.19	0.45	-13.43	1.95	0.45	3.54	0.00
40	6.74	3.96	0.23	5.19	1.55	1.23	-9.14	3.17	1.23	3.96	0.00
41	2.12	4.30	0.23	1.63	0.49	-2.67	-11.80	2.34	-0.83	2.46	0.00
42	6.44	4.77	0.23	4.96	1.48	0.19	-11.11	2.53	0.19	4.77	0.00
43	2.15	4.56	0.23	1.66	0.49	-2.90	-14.01	1.82	-0.71	2.37	0.00
44	1.03	5.52	0.23	0.79	0.24	-4.72	-18.74	1.06	-0.76	1.55	0.00
45	9.44	4.80	0.23	7.27	2.17	2.47	-8.20	3.53	2.47	4.80	0.00
46	10.17	4.25	0.23	7.83	2.34	3.58	-2.05	7.11	3.58	4.25	0.00
47	2.40	2.60	0.23	1.85	0.55	-0.75	-2.80	6.53	-0.59	2.44	0.00
48	2.52	2.87	0.23	1.94	0.58	-0.93	-3.73	5.87	-0.65	2.60	0.00
49	4.66	1.75	0.23	3.59	1.07	1.84	-1.35	7.71	1.84	1.75	0.00
50	0.13	3.00	0.23	0.10	0.03	-2.90	-4.24	5.54	-2.17	2.27	0.00
51	1.56	3.97	0.23	1.20	0.36	-2.77	-7.01	4.04	-1.50	2.70	0.00
52	1.76	5.22	0.23	1.36	0.40	-3.87	-10.88	2.60	-1.44	2.79	0.00
53	3.09	5.89	0.23	2.38	0.71	-3.51	-14.38	1.75	-0.86	3.24	0.00

54	0.73	5.36	0.23	0.56	0.17	-4.79	-19.18	1.01	-0.73	1.30	0.00
55	2.40	5.57	0.23	1.85	0.55	-3.72	-22.90	0.66	-0.35	2.20	0.00
56	9.88	6.05	0.23	7.61	2.27	1.56	-12.27	2.22	1.56	6.05	0.00
57	9.22	4.84	0.23	7.10	2.12	2.26	-6.10	4.48	2.26	4.84	0.00
58	6.02	3.92	0.23	4.64	1.38	0.72	-4.80	5.20	0.72	3.92	0.00
59	5.68	2.63	0.23	4.37	1.31	1.74	-2.27	6.94	1.74	2.63	0.00
60	2.82	2.11	0.23	2.17	0.65	0.06	-2.19	7.00	0.06	2.11	0.00
61	1.80	2.27	0.23	1.39	0.41	-0.88	-3.07	6.32	-0.67	2.06	0.00
62	2.45	2.22	0.23	1.89	0.56	-0.33	-3.41	6.09	-0.23	2.12	0.00
63	1.41	3.09	0.23	1.09	0.32	-2.00	-5.41	4.85	-1.24	2.33	0.00
64	2.08	4.17	0.23	1.60	0.48	-2.57	-7.98	3.62	-1.23	2.83	0.00
65	11.99	4.56	0.23	9.23	2.76	4.67	-0.71	8.29	4.67	4.56	0.00
66	2.42	5.73	0.23	1.86	0.56	-3.87	-4.58	5.33	-2.96	4.82	0.00
67	4.16	5.52	0.23	3.20	0.96	-2.32	-6.90	4.09	-1.24	4.44	0.00
68	2.44	5.72	0.23	1.88	0.56	-3.84	-10.74	2.64	-1.45	3.33	0.00
69	3.78	4.72	0.23	2.91	0.87	-1.81	-12.55	2.15	-0.49	3.40	0.00
70	3.35	3.62	0.23	2.58	0.77	-1.04	-13.58	1.91	-0.24	2.82	0.00
71	1.07	3.95	0.23	0.82	0.25	-3.12	-16.71	1.34	-0.57	1.40	0.00
72	1.18	2.72	0.23	0.91	0.27	-1.81	-18.52	1.09	-0.25	1.16	0.00
73	1.60	3.37	0.23	1.23	0.37	-2.14	-20.66	0.86	-0.24	1.47	0.00
74	1.74	3.10	0.23	1.34	0.40	-1.76	-22.42	0.70	-0.16	1.50	0.00
75	4.81	3.54	0.23	3.70	1.11	0.16	-20.59	0.86	0.16	3.54	0.00
76	5.95	4.07	0.23	4.58	1.37	0.51	-16.48	1.38	0.51	4.07	0.00
77	4.32	4.53	0.23	3.33	0.99	-1.20	-17.68	1.20	-0.18	3.50	0.00
78	4.02	6.05	0.23	3.10	0.92	-2.96	-20.64	0.86	-0.34	3.44	0.00
79	2.13	5.27	0.23	1.64	0.49	-3.63	-24.27	0.57	-0.29	1.93	0.00
80	1.48	6.20	0.23	1.14	0.34	-5.06	-29.32	0.32	-0.25	1.39	0.00
81	2.68	3.90	0.23	2.06	0.62	-1.84	-31.16	0.26	-0.06	2.12	0.00
82	5.77	3.62	0.23	4.44	1.33	0.82	-18.58	1.08	0.82	3.62	0.00
83	3.27	1.86	0.23	2.52	0.75	0.66	-14.42	1.74	0.66	1.86	0.00
84	4.05	2.45	0.23	3.12	0.93	0.67	-11.57	2.41	0.67	2.45	0.00
85	2.14	1.43	0.23	1.65	0.49	0.21	-10.82	2.62	0.21	1.43	0.00
86	3.55	2.90	0.23	2.73	0.82	-0.16	-10.99	2.57	-0.05	2.78	0.00
87	2.06	3.81	0.23	1.59	0.47	-2.22	-13.21	2.00	-0.57	2.16	0.00
88	8.81	4.38	0.23	6.78	2.03	2.41	-6.26	4.41	2.41	4.38	0.00
89	1.56	5.21	0.23	1.20	0.36	-4.01	-10.27	2.79	-1.61	2.82	0.00
90	1.35	6.78	0.23	1.04	0.31	-5.74	-16.00	1.45	-1.34	2.38	0.00
91	0.31	7.10	0.23	0.24	0.07	-6.86	-22.86	0.67	-0.79	1.03	0.00
92	1.35	6.50	0.23	1.04	0.31	-5.46	-28.32	0.36	-0.31	1.35	0.00
93	1.69	6.16	0.23	1.30	0.39	-4.86	-33.18	0.21	-0.15	1.45	0.00
94	0.79	4.64	0.23	0.61	0.18	-4.03	-37.21	0.13	-0.08	0.68	0.00
95	3.10	3.24	0.23	2.39	0.71	-0.85	-38.06	0.12	-0.08	2.40	0.00
96	2.67	3.07	0.23	2.06	0.61	-1.02	-39.08	0.11	-0.01	2.07	0.00
97	4.51	1.92	0.23	3.47	1.04	1.55	-14.87	1.65	1.55	1.92	0.00
98	2.62	1.98	0.23	2.02	0.60	0.04	-14.68	1.69	0.04	1.98	0.00
99	2.72	4.39	0.23	2.09	0.63	-2.29	-16.97	1.30	-0.39	2.48	0.00
%100	1.37	4.99	0.23	1.05	0.32	-3.94	-20.91	0.83	-0.47	1.52	0.0
%101	2.52	5.91	0.23	1.94	0.58	-3.97	-24.88	0.53	-0.30	2.24	0.0
%102	2.44	6.32	0.23	1.88	0.56	-4.44	-29.32	0.32	-0.21	2.09	0.0
%103	1.26	6.53	0.23	0.97	0.29	-5.56	-34.88	0.17	-0.15	1.12	0.0
%104	0.57	6.53	0.23	0.44	0.13	-6.09	-40.97	0.08	-0.08	0.52	0.0
%105	6.50	4.78	0.23	5.01	1.50	0.22	-29.60	0.31	0.22	4.78	0.0
%106	0.41	5.19	0.23	0.32	0.09	-4.87	-34.47	0.18	-0.13	0.45	0.0
%107	6.31	2.86	0.23	4.86	1.45	2.00	-12.44	2.18	2.00	2.86	0.0
%108	3.17	2.18	0.23	2.44	0.73	0.26	-11.46	2.44	0.26	2.18	0.0
%109	3.70	1.74	0.23	2.85	0.85	1.11	-8.15	3.55	1.11	1.74	0.0
%110	4.08	2.24	0.23	3.14	0.94	0.90	-6.17	4.45	0.90	2.24	0.0
%111	5.54	4.35	0.23	4.27	1.27	-0.08	-6.25	4.41	-0.04	4.31	0.0
%112	4.74	4.27	0.23	3.65	1.09	-0.62	-6.87	4.11	-0.30	3.95	0.0
%113	11.05	5.26	0.23	8.51	2.54	3.25	-1.75	7.36	3.25	5.26	0.0
%114	1.30	5.70	0.23	1.00	0.30	-4.70	-6.46	4.30	-3.05	4.06	0.0
%115	4.48	5.40	0.23	3.45	1.03	-1.95	-8.41	3.45	-0.86	4.31	0.0
%116	3.81	5.66	0.23	2.93	0.88	-2.72	-11.13	2.53	-0.92	3.85	0.0

%117	3.20	4.55	0.23	2.46	0.74	-2.09	-13.22	1.99	-0.53	3.00	0.0
%118	1.70	4.09	0.23	1.31	0.39	-2.78	-16.00	1.45	-0.54	1.85	0.0
%119	0.77	2.69	0.23	0.59	0.18	-2.10	-18.09	1.15	-0.31	0.90	0.0
%120	3.32	1.63	0.23	2.56	0.76	0.93	-12.89	2.07	0.93	1.63	0.0
%121	3.12	1.88	0.23	2.40	0.72	0.53	-10.90	2.60	0.53	1.88	0.0
%122	1.94	2.69	0.23	1.49	0.45	-1.20	-12.10	2.26	-0.33	1.83	0.0
%123	5.04	3.26	0.23	3.88	1.16	0.62	-9.98	2.88	0.62	3.26	0.0
%124	2.38	4.62	0.23	1.83	0.55	-2.79	-12.77	2.10	-0.78	2.62	0.0
%125	4.31	4.77	0.23	3.32	0.99	-1.45	-14.22	1.78	-0.32	3.64	0.0
%126	0.10	7.34	0.23	0.08	0.02	-7.26	-21.48	0.78	-1.00	1.08	0.0
%127	0.06	8.57	0.23	0.05	0.01	-8.53	-30.00	0.30	-0.48	0.53	0.0
%128	1.67	7.79	0.23	1.29	0.38	-6.51	-36.51	0.14	-0.15	1.44	0.0
%129	4.28	5.18	0.23	3.30	0.98	-1.88	-38.39	0.11	-0.03	3.32	0.0
%130	3.93	4.52	0.23	3.03	0.90	-1.50	-39.89	0.10	-0.02	3.04	0.0
%131	4.58	2.87	0.23	3.53	1.05	0.66	-21.78	0.75	0.66	2.87	0.0
%132	0.50	2.43	0.23	0.38	0.12	-2.04	-23.82	0.60	-0.16	0.54	0.0
%133	2.67	2.45	0.23	2.06	0.61	-0.39	-24.22	0.57	-0.03	2.08	0.0
%134	1.80	2.64	0.23	1.39	0.41	-1.25	-25.47	0.49	-0.08	1.46	0.0
%135	1.88	3.56	0.23	1.45	0.43	-2.11	-27.58	0.39	-0.11	1.55	0.0
%136	0.97	3.95	0.23	0.75	0.22	-3.21	-30.79	0.27	-0.12	0.87	0.0
%137	6.28	5.67	0.23	4.84	1.44	-0.83	-31.62	0.25	-0.02	4.86	0.0
%138	9.48	5.21	0.23	7.30	2.18	2.09	-11.82	2.34	2.09	5.21	0.0
%139	5.35	5.36	0.23	4.12	1.23	-1.24	-13.07	2.03	-0.31	4.43	0.0
%140	2.51	6.39	0.23	1.93	0.58	-4.46	-17.53	1.22	-0.81	2.74	0.0
%141	5.96	4.55	0.23	4.59	1.37	0.04	-17.25	1.26	0.04	4.55	0.0
%142	10.95	3.91	0.23	8.43	2.52	4.53	-3.86	5.79	4.53	3.91	0.0
%143	1.93	2.65	0.23	1.49	0.44	-1.16	-5.02	5.07	-0.72	2.21	0.0
%144	0.64	2.60	0.23	0.49	0.15	-2.10	-7.13	3.99	-1.08	1.57	0.0
%145	1.43	2.84	0.23	1.10	0.33	-1.74	-8.87	3.27	-0.72	1.82	0.0
%146	2.26	2.51	0.23	1.74	0.52	-0.77	-9.63	3.00	-0.27	2.01	0.0
%147	2.40	3.29	0.23	1.85	0.55	-1.44	-11.08	2.54	-0.45	2.30	0.0
%148	4.67	3.74	0.23	3.60	1.07	-0.14	-11.22	2.50	-0.04	3.64	0.0
%149	5.35	5.07	0.23	4.12	1.23	-0.96	-12.17	2.25	-0.26	4.38	0.0
%150	2.00	6.80	0.23	1.54	0.46	-5.26	-17.44	1.23	-1.01	2.55	0.0
%151	3.58	7.95	0.23	2.76	0.82	-5.20	-22.63	0.68	-0.55	3.31	0.0
%152	2.96	7.47	0.23	2.28	0.68	-5.19	-27.82	0.38	-0.30	2.58	0.0
%153	3.19	6.76	0.23	2.46	0.73	-4.31	-32.13	0.23	-0.15	2.60	0.0
%154	6.89	4.89	0.23	5.31	1.58	0.42	-23.05	0.65	0.42	4.89	0.0
%155	4.09	3.36	0.23	3.15	0.94	-0.21	-23.26	0.64	-0.01	3.16	0.0
%156	3.05	4.42	0.23	2.35	0.70	-2.07	-25.33	0.50	-0.13	2.48	0.0
%157	3.07	2.07	0.23	2.36	0.71	0.30	-21.22	0.80	0.30	2.07	0.0
%158	4.66	2.39	0.23	3.59	1.07	1.19	-13.21	2.00	1.19	2.39	0.0
%159	5.97	3.86	0.23	4.60	1.37	0.74	-10.44	2.74	0.74	3.86	0.0
%160	0.31	4.73	0.23	0.24	0.07	-4.49	-14.94	1.64	-1.10	1.33	0.0
%161	9.49	6.05	0.23	7.31	2.18	1.26	-9.93	2.90	1.26	6.05	0.0
%162	2.60	5.43	0.23	2.00	0.60	-3.43	-13.36	1.96	-0.94	2.94	0.0
%163	2.46	6.45	0.23	1.89	0.57	-4.55	-17.91	1.17	-0.79	2.69	0.0
%164	7.24	5.68	0.23	5.57	1.67	-0.11	-18.02	1.15	-0.01	5.59	0.0
%165	9.40	5.14	0.23	7.24	2.16	2.10	-8.92	3.25	2.10	5.14	0.0
%166	2.81	4.10	0.23	2.16	0.65	-1.94	-10.86	2.61	-0.65	2.81	0.0
%167	3.25	2.86	0.23	2.50	0.75	-0.35	-11.21	2.51	-0.10	2.61	0.0
%168	1.83	2.40	0.23	1.41	0.42	-0.99	-12.20	2.24	-0.27	1.68	0.0
%169	1.67	2.37	0.23	1.29	0.38	-1.08	-13.28	1.98	-0.26	1.54	0.0
%170	0.99	3.74	0.23	0.76	0.23	-2.98	-16.26	1.41	-0.57	1.33	0.0
%171	4.98	5.62	0.23	3.83	1.15	-1.79	-18.04	1.15	-0.26	4.09	0.0
%172	0.34	6.06	0.23	0.26	0.08	-5.80	-23.84	0.60	-0.56	0.82	0.0
%173	5.76	8.51	0.23	4.44	1.32	-4.08	-27.92	0.37	-0.22	4.66	0.0
%174	4.39	5.97	0.23	3.38	1.01	-2.59	-30.51	0.28	-0.10	3.48	0.0
%175	1.61	5.49	0.23	1.24	0.37	-4.25	-34.76	0.17	-0.11	1.35	0.0
%176	1.83	6.27	0.23	1.41	0.42	-4.86	-39.62	0.10	-0.07	1.48	0.0
%177	0.77	5.24	0.23	0.59	0.18	-4.64	-44.27	0.06	-0.04	0.63	0.0
%178	15.69	4.40	0.23	12.08	3.61	7.68	-1.31	7.74	7.68	4.40	0.0
%179	2.38	3.23	0.23	1.83	0.55	-1.40	-2.71	6.59	-1.15	2.98	0.0

%180	2.59	2.34	0.23	1.99	0.60	-0.34	-3.06	6.34	-0.25	2.25	0.0
%181	2.63	2.30	0.23	2.03	0.60	-0.28	-3.34	6.14	-0.20	2.22	0.0
%182	2.82	2.39	0.23	2.17	0.65	-0.22	-3.56	5.99	-0.15	2.32	0.0
%183	2.30	3.34	0.23	1.77	0.53	-1.57	-5.13	5.01	-0.98	2.75	0.0
%184	1.93	4.73	0.23	1.49	0.44	-3.25	-8.37	3.46	-1.55	3.03	0.0
%185	5.29	6.08	0.23	4.07	1.22	-2.01	-10.38	2.75	-0.71	4.78	0.0
%186	1.48	6.53	0.23	1.14	0.34	-5.39	-15.77	1.49	-1.26	2.40	0.0
%187	4.01	7.15	0.23	3.09	0.92	-4.07	-19.84	0.94	-0.55	3.64	0.0
%188	0.13	7.63	0.23	0.10	0.03	-7.53	-27.37	0.40	-0.54	0.64	0.0
%189	6.96	7.25	0.23	5.36	1.60	-1.89	-29.26	0.32	-0.08	5.44	0.0
%190	6.91	4.30	0.23	5.32	1.59	1.02	-16.73	1.34	1.02	4.30	0.0
%191	6.02	3.15	0.23	4.64	1.38	1.49	-10.17	2.82	1.49	3.15	0.0
%192	1.38	1.90	0.23	1.06	0.32	-0.84	-11.01	2.56	-0.26	1.32	0.0
%193	1.02	2.97	0.23	0.79	0.23	-2.19	-13.20	2.00	-0.57	1.35	0.0
%194	1.84	3.67	0.23	1.42	0.42	-2.26	-15.46	1.55	-0.45	1.87	0.0
%195	0.50	5.47	0.23	0.38	0.12	-5.09	-20.55	0.87	-0.68	1.06	0.0
%196	2.53	5.14	0.23	1.95	0.58	-3.20	-23.74	0.60	-0.26	2.21	0.0
%197	8.12	6.44	0.23	6.25	1.87	-0.19	-23.93	0.59	-0.01	6.27	0.0
%198	4.71	5.90	0.23	3.63	1.08	-2.27	-26.21	0.46	-0.13	3.76	0.0
%199	0.06	8.24	0.23	0.05	0.01	-8.19	-34.40	0.18	-0.28	0.32	0.0
%200	7.74	7.36	0.23	5.96	1.78	-1.40	-35.80	0.15	-0.03	5.99	0.0
%201	5.33	5.31	0.23	4.10	1.23	-1.21	-37.00	0.13	-0.02	4.12	0.0
%202	5.85	3.86	0.23	4.50	1.35	0.65	-21.46	0.78	0.65	3.86	0.0
%203	3.44	2.69	0.23	2.65	0.79	-0.04	-21.49	0.78	-0.00	2.65	0.0
%204	4.95	1.81	0.23	3.81	1.14	2.01	-10.29	2.78	2.01	1.81	0.0
%205	0.96	2.25	0.23	0.74	0.22	-1.51	-11.81	2.34	-0.44	1.18	0.0
%206	3.90	2.97	0.23	3.00	0.90	0.03	-11.70	2.37	0.03	2.97	0.0
%207	1.79	4.55	0.23	1.38	0.41	-3.17	-14.88	1.65	-0.72	2.10	0.0
%208	0.68	6.78	0.23	0.52	0.16	-6.26	-21.13	0.81	-0.84	1.37	0.0
%209	9.31	5.28	0.23	7.17	2.14	1.89	-10.56	2.70	1.89	5.28	0.0
%210	10.09	6.92	0.23	7.77	2.32	0.85	-8.16	3.55	0.85	6.92	0.0
%211	1.76	6.73	0.23	1.36	0.40	-5.38	-13.54	1.92	-1.62	2.98	0.0
%212	0.90	9.50	0.23	0.69	0.21	-8.81	-22.35	0.71	-1.22	1.91	0.0
%213	5.34	5.64	0.23	4.11	1.23	-1.53	-23.88	0.59	-0.11	4.22	0.0
%214	0.19	5.42	0.23	0.15	0.04	-5.27	-29.15	0.33	-0.27	0.41	0.0
%215	3.88	3.11	0.23	2.99	0.89	-0.13	-29.28	0.32	-0.00	2.99	0.0
%216	4.54	2.22	0.23	3.50	1.04	1.28	-15.17	1.60	1.28	2.22	0.0
%217	0.81	2.56	0.23	0.62	0.19	-1.93	-17.10	1.28	-0.31	0.94	0.0
%218	1.44	2.96	0.23	1.11	0.33	-1.85	-18.95	1.04	-0.24	1.35	0.0
%219	2.97	4.38	0.23	2.29	0.68	-2.10	-21.04	0.82	-0.22	2.51	0.0
%220	0.28	6.04	0.23	0.22	0.06	-5.83	-26.87	0.42	-0.40	0.61	0.0
%221	2.91	6.49	0.23	2.24	0.67	-4.25	-31.12	0.26	-0.16	2.40	0.0
%222	1.81	7.13	0.23	1.39	0.42	-5.73	-36.85	0.14	-0.12	1.52	0.0
%223	0.96	8.48	0.23	0.74	0.22	-7.74	-44.60	0.06	-0.08	0.82	0.0
%224	0.19	7.89	0.23	0.15	0.04	-7.74	-52.34	0.02	-0.03	0.18	0.0
%225	0.43	6.82	0.23	0.33	0.10	-6.49	-58.83	0.01	-0.01	0.34	0.0
%226	1.37	5.87	0.23	1.05	0.32	-4.81	-63.64	0.01	-0.00	1.06	0.0
%227	1.46	4.12	0.23	1.12	0.34	-3.00	-66.64	0.00	-0.00	1.13	0.0
%228	2.27	2.48	0.23	1.75	0.52	-0.74	-67.37	0.00	-0.00	1.75	0.0
%229	7.07	1.90	0.23	5.44	1.63	3.54	-8.17	3.54	3.54	1.90	0.0
%230	1.10	2.61	0.23	0.85	0.25	-1.76	-9.93	2.90	-0.65	1.49	0.0
%231	3.22	3.87	0.23	2.48	0.74	-1.39	-11.32	2.47	-0.42	2.90	0.0
%232	0.51	5.38	0.23	0.39	0.12	-4.98	-16.31	1.40	-1.07	1.46	0.0
%233	5.29	6.82	0.23	4.07	1.22	-2.75	-19.06	1.03	-0.38	4.45	0.0
%234	4.23	5.88	0.23	3.26	0.97	-2.62	-21.68	0.76	-0.26	3.52	0.0
%235	2.70	6.57	0.23	2.08	0.62	-4.49	-26.17	0.46	-0.30	2.38	0.0
%236	3.26	6.78	0.23	2.51	0.75	-4.27	-30.44	0.28	-0.18	2.69	0.0
%237	0.68	6.21	0.23	0.52	0.16	-5.69	-36.12	0.15	-0.13	0.66	0.0
%238	1.93	5.24	0.23	1.49	0.44	-3.76	-39.88	0.10	-0.05	1.54	0.0
%239	1.61	3.80	0.23	1.24	0.37	-2.56	-42.44	0.07	-0.02	1.26	0.0
%240	0.37	2.30	0.23	0.28	0.09	-2.01	-44.45	0.06	-0.01	0.30	0.0

TOTAL PERCOLATION = 0.000

input data for the present case

number of data points : 240
maximum storage : 9

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.25	1.22	0.41	-0.28	-45.58	0.05	-0.00	1.22	0.00
2	4.40	1.76	0.25	3.30	1.10	1.54	-15.23	1.59	1.54	1.76	0.00
3	3.58	2.57	0.25	2.68	0.89	0.12	-14.61	1.70	0.12	2.57	0.00
4	4.01	2.25	0.25	3.01	1.00	0.75	-11.39	2.46	0.75	2.25	0.00
5	4.22	3.67	0.25	3.16	1.05	-0.50	-11.89	2.32	-0.14	3.30	0.00
6	2.02	3.65	0.25	1.51	0.50	-2.14	-14.03	1.82	-0.50	2.02	0.00
7	0.26	4.86	0.25	0.19	0.06	-4.66	-18.70	1.07	-0.75	0.94	0.00
8	0.23	5.75	0.25	0.17	0.06	-5.58	-24.28	0.57	-0.50	0.68	0.00
9	6.38	3.82	0.25	4.78	1.60	0.96	-15.55	1.53	0.96	3.82	0.00
10	3.84	2.62	0.25	2.88	0.96	0.26	-14.16	1.79	0.26	2.62	0.00
11	0.62	2.87	0.25	0.47	0.16	-2.40	-16.56	1.36	-0.43	0.89	0.00
12	1.40	2.58	0.25	1.05	0.35	-1.53	-18.09	1.15	-0.22	1.27	0.00
13	0.15	2.81	0.25	0.11	0.04	-2.70	-20.79	0.84	-0.30	0.42	0.00
14	1.68	4.00	0.25	1.26	0.42	-2.74	-23.53	0.62	-0.23	1.49	0.00
15	12.00	5.87	0.25	9.00	3.00	3.13	-7.69	3.74	3.13	5.87	0.00
16	0.89	4.56	0.25	0.67	0.22	-3.89	-11.58	2.40	-1.34	2.01	0.00
17	5.65	6.00	0.25	4.24	1.41	-1.76	-13.34	1.97	-0.44	4.67	0.00
18	0.76	4.74	0.25	0.57	0.19	-4.17	-17.51	1.22	-0.74	1.31	0.00
19	1.87	8.64	0.25	1.40	0.47	-7.24	-24.74	0.54	-0.69	2.09	0.00
20	3.20	6.27	0.25	2.40	0.80	-3.87	-28.61	0.35	-0.19	2.59	0.00
21	3.31	5.52	0.25	2.48	0.83	-3.04	-31.66	0.24	-0.10	2.58	0.00
22	4.30	3.93	0.25	3.23	1.08	-0.71	-32.36	0.23	-0.02	3.24	0.00
23	2.75	3.30	0.25	2.06	0.69	-1.24	-33.61	0.20	-0.03	2.09	0.00
24	4.63	2.44	0.25	3.47	1.16	1.04	-17.44	1.23	1.04	2.44	0.00
25	1.73	1.77	0.25	1.30	0.43	-0.47	-17.92	1.17	-0.06	1.36	0.00
26	0.50	2.88	0.25	0.38	0.13	-2.50	-20.42	0.88	-0.29	0.66	0.00
27	0.91	4.24	0.25	0.68	0.23	-3.55	-23.97	0.59	-0.29	0.97	0.00
28	1.71	4.03	0.25	1.28	0.43	-2.74	-26.72	0.43	-0.16	1.44	0.00
29	6.38	5.15	0.25	4.78	1.60	-0.37	-27.08	0.41	-0.02	4.80	0.00
30	2.13	5.24	0.25	1.60	0.53	-3.65	-30.73	0.27	-0.14	1.74	0.00
31	2.17	5.74	0.25	1.63	0.54	-4.11	-34.84	0.17	-0.10	1.73	0.00
32	3.60	4.89	0.25	2.70	0.90	-2.19	-37.03	0.13	-0.04	2.74	0.00
33	4.45	4.56	0.25	3.34	1.11	-1.22	-38.25	0.12	-0.02	3.35	0.00
34	3.95	3.95	0.25	2.96	0.99	-0.99	-39.24	0.10	-0.01	2.97	0.00
35	3.26	2.16	0.25	2.44	0.81	0.28	-27.66	0.39	0.28	2.16	0.00
36	1.47	2.12	0.25	1.10	0.37	-1.02	-28.68	0.34	-0.04	1.14	0.00
37	5.51	3.11	0.25	4.13	1.38	1.02	-16.57	1.36	1.02	3.11	0.00
38	2.60	2.27	0.25	1.95	0.65	-0.32	-16.89	1.31	-0.05	2.00	0.00
39	5.17	3.54	0.25	3.88	1.29	0.34	-14.85	1.66	0.34	3.54	0.00
40	6.74	3.96	0.25	5.05	1.68	1.09	-10.40	2.75	1.09	3.96	0.00
41	2.12	4.30	0.25	1.59	0.53	-2.71	-13.11	2.02	-0.73	2.32	0.00
42	6.44	4.77	0.25	4.83	1.61	0.06	-12.84	2.08	0.06	4.77	0.00
43	2.15	4.56	0.25	1.61	0.54	-2.94	-15.78	1.49	-0.59	2.21	0.00
44	1.03	5.52	0.25	0.77	0.26	-4.74	-20.53	0.87	-0.62	1.39	0.00
45	9.44	4.80	0.25	7.08	2.36	2.28	-9.22	3.15	2.28	4.80	0.00
46	10.17	4.25	0.25	7.63	2.54	3.38	-2.81	6.52	3.38	4.25	0.00
47	2.40	2.60	0.25	1.80	0.60	-0.80	-3.61	5.95	-0.57	2.37	0.00
48	2.52	2.87	0.25	1.89	0.63	-0.98	-4.59	5.33	-0.63	2.52	0.00
49	4.66	1.75	0.25	3.49	1.16	1.74	-2.10	7.07	1.74	1.75	0.00
50	0.13	3.00	0.25	0.10	0.03	-2.90	-5.00	5.08	-1.99	2.09	0.00
51	1.56	3.97	0.25	1.17	0.39	-2.80	-7.80	3.69	-1.39	2.56	0.00
52	1.76	5.22	0.25	1.32	0.44	-3.90	-11.70	2.37	-1.32	2.64	0.00
53	3.09	5.89	0.25	2.32	0.77	-3.57	-15.27	1.58	-0.79	3.11	0.00

54	0.73	5.36	0.25	0.55	0.18	-4.81	-20.08	0.91	-0.67	1.21	0.00
55	2.40	5.57	0.25	1.80	0.60	-3.77	-23.85	0.59	-0.32	2.12	0.00
56	9.88	6.05	0.25	7.41	2.47	1.36	-13.39	1.96	1.36	6.05	0.00
57	9.22	4.84	0.25	6.91	2.31	2.08	-7.03	4.03	2.08	4.84	0.00
58	6.02	3.92	0.25	4.51	1.50	0.60	-5.82	4.63	0.59	3.92	0.00
59	5.68	2.63	0.25	4.26	1.42	1.63	-3.18	6.26	1.63	2.63	0.00
60	2.82	2.11	0.25	2.12	0.70	0.00	-3.17	6.26	0.00	2.11	0.00
61	1.80	2.27	0.25	1.35	0.45	-0.92	-4.09	5.63	-0.63	1.98	0.00
62	2.45	2.22	0.25	1.84	0.61	-0.38	-4.47	5.39	-0.24	2.08	0.00
63	1.41	3.09	0.25	1.06	0.35	-2.03	-6.50	4.28	-1.11	2.17	0.00
64	2.08	4.17	0.25	1.56	0.52	-2.61	-9.12	3.18	-1.10	2.66	0.00
65	11.99	4.56	0.25	8.99	3.00	4.43	-1.46	7.61	4.43	4.56	0.00
66	2.42	5.73	0.25	1.82	0.61	-3.92	-5.38	4.87	-2.74	4.56	0.00
67	4.16	5.52	0.25	3.12	1.04	-2.40	-7.78	3.70	-1.16	4.28	0.00
68	2.44	5.72	0.25	1.83	0.61	-3.89	-11.67	2.38	-1.32	3.15	0.00
69	3.78	4.72	0.25	2.84	0.94	-1.88	-13.55	1.92	-0.46	3.29	0.00
70	3.35	3.62	0.25	2.51	0.84	-1.11	-14.66	1.69	-0.23	2.74	0.00
71	1.07	3.95	0.25	0.80	0.27	-3.15	-17.80	1.18	-0.51	1.31	0.00
72	1.18	2.72	0.25	0.88	0.29	-1.83	-19.63	0.96	-0.22	1.11	0.00
73	1.60	3.37	0.25	1.20	0.40	-2.17	-21.81	0.75	-0.21	1.41	0.00
74	1.74	3.10	0.25	1.31	0.44	-1.80	-23.60	0.61	-0.14	1.44	0.00
75	4.81	3.54	0.25	3.61	1.20	0.07	-22.70	0.68	0.07	3.54	0.00
76	5.95	4.07	0.25	4.46	1.49	0.40	-18.66	1.07	0.40	4.07	0.00
77	4.32	4.53	0.25	3.24	1.08	-1.29	-19.95	0.93	-0.15	3.39	0.00
78	4.02	6.05	0.25	3.01	1.00	-3.04	-22.99	0.66	-0.27	3.29	0.00
79	2.13	5.27	0.25	1.60	0.53	-3.67	-26.67	0.43	-0.22	1.82	0.00
80	1.48	6.20	0.25	1.11	0.37	-5.09	-31.75	0.24	-0.19	1.30	0.00
81	2.68	3.90	0.25	2.01	0.67	-1.89	-33.64	0.20	-0.05	2.06	0.00
82	5.77	3.62	0.25	4.33	1.44	0.71	-20.17	0.90	0.71	3.62	0.00
83	3.27	1.86	0.25	2.45	0.82	0.59	-15.75	1.49	0.59	1.86	0.00
84	4.05	2.45	0.25	3.04	1.01	0.59	-12.84	2.08	0.59	2.45	0.00
85	2.14	1.43	0.25	1.61	0.54	0.17	-12.15	2.25	0.17	1.43	0.00
86	3.55	2.90	0.25	2.66	0.89	-0.24	-12.39	2.19	-0.06	2.72	0.00
87	2.06	3.81	0.25	1.54	0.51	-2.26	-14.65	1.69	-0.50	2.04	0.00
88	8.81	4.38	0.25	6.61	2.20	2.23	-7.27	3.93	2.23	4.38	0.00
89	1.56	5.21	0.25	1.17	0.39	-4.04	-11.31	2.48	-1.45	2.62	0.00
90	1.35	6.78	0.25	1.01	0.34	-5.76	-17.07	1.29	-1.19	2.20	0.00
91	0.31	7.10	0.25	0.23	0.08	-6.87	-23.94	0.59	-0.70	0.93	0.00
92	1.35	6.50	0.25	1.01	0.34	-5.48	-29.42	0.32	-0.27	1.29	0.00
93	1.69	6.16	0.25	1.27	0.42	-4.89	-34.31	0.18	-0.13	1.40	0.00
94	0.79	4.64	0.25	0.59	0.20	-4.05	-38.36	0.11	-0.07	0.66	0.00
95	3.10	3.24	0.25	2.32	0.77	-0.92	-39.28	0.10	-0.01	2.34	0.00
96	2.67	3.07	0.25	2.00	0.67	-1.07	-40.35	0.09	-0.01	2.01	0.00
97	4.51	1.92	0.25	3.38	1.13	1.46	-15.44	1.55	1.46	1.92	0.00
98	2.62	1.98	0.25	1.96	0.65	-0.02	-15.46	1.55	-0.00	1.97	0.00
99	2.72	4.39	0.25	2.04	0.68	-2.35	-17.81	1.18	-0.36	2.40	0.00
%100	1.37	4.99	0.25	1.03	0.34	-3.96	-21.77	0.75	-0.43	1.46	0.0
%101	2.52	5.91	0.25	1.89	0.63	-4.02	-25.79	0.48	-0.28	2.17	0.0
%102	2.44	6.32	0.25	1.83	0.61	-4.49	-30.28	0.29	-0.19	2.02	0.0
%103	1.26	6.53	0.25	0.94	0.31	-5.59	-35.86	0.15	-0.13	1.08	0.0
%104	0.57	6.53	0.25	0.43	0.14	-6.10	-41.97	0.08	-0.08	0.50	0.0
%105	6.50	4.78	0.25	4.88	1.63	0.09	-34.86	0.17	0.09	4.78	0.0
%106	0.41	5.19	0.25	0.31	0.10	-4.88	-39.74	0.10	-0.07	0.38	0.0
%107	6.31	2.86	0.25	4.73	1.58	1.88	-13.31	1.97	1.88	2.86	0.0
%108	3.17	2.18	0.25	2.38	0.79	0.19	-12.49	2.17	0.19	2.18	0.0
%109	3.70	1.74	0.25	2.78	0.93	1.04	-9.05	3.21	1.04	1.74	0.0
%110	4.08	2.24	0.25	3.06	1.02	0.82	-7.05	4.03	0.82	2.24	0.0
%111	5.54	4.35	0.25	4.15	1.38	-0.19	-7.24	3.94	-0.09	4.24	0.0
%112	4.74	4.27	0.25	3.55	1.18	-0.72	-7.96	3.63	-0.31	3.86	0.0
%113	11.05	5.26	0.25	8.29	2.76	3.03	-2.63	6.66	3.03	5.26	0.0
%114	1.30	5.70	0.25	0.97	0.32	-4.73	-7.36	3.88	-2.78	3.75	0.0
%115	4.48	5.40	0.25	3.36	1.12	-2.04	-9.40	3.08	-0.81	4.17	0.0
%116	3.81	5.66	0.25	2.86	0.95	-2.80	-12.20	2.24	-0.84	3.70	0.0

%117	3.20	4.55	0.25	2.40	0.80	-2.15	-14.35	1.75	-0.49	2.89	0.0
%118	1.70	4.09	0.25	1.28	0.43	-2.81	-17.16	1.27	-0.48	1.76	0.0
%119	0.77	2.69	0.25	0.58	0.19	-2.11	-19.27	1.00	-0.27	0.85	0.0
%120	3.32	1.63	0.25	2.49	0.83	0.86	-13.83	1.86	0.86	1.63	0.0
%121	3.12	1.88	0.25	2.34	0.78	0.46	-11.87	2.32	0.46	1.88	0.0
%122	1.94	2.69	0.25	1.46	0.49	-1.24	-13.11	2.02	-0.31	1.76	0.0
%123	5.04	3.26	0.25	3.78	1.26	0.52	-11.11	2.54	0.52	3.26	0.0
%124	2.38	4.62	0.25	1.79	0.60	-2.83	-13.94	1.84	-0.70	2.48	0.0
%125	4.31	4.77	0.25	3.23	1.08	-1.53	-15.48	1.54	-0.29	3.53	0.0
%126	0.10	7.34	0.25	0.08	0.03	-7.26	-22.74	0.68	-0.87	0.94	0.0
%127	0.06	8.57	0.25	0.04	0.01	-8.53	-31.27	0.26	-0.42	0.46	0.0
%128	1.67	7.79	0.25	1.25	0.42	-6.54	-37.81	0.12	-0.13	1.39	0.0
%129	4.28	5.18	0.25	3.21	1.07	-1.97	-39.78	0.10	-0.02	3.23	0.0
%130	3.93	4.52	0.25	2.95	0.98	-1.57	-41.35	0.08	-0.02	2.96	0.0
%131	4.58	2.87	0.25	3.43	1.14	0.57	-23.12	0.65	0.57	2.87	0.0
%132	0.50	2.43	0.25	0.38	0.13	-2.05	-25.17	0.51	-0.13	0.51	0.0
%133	2.67	2.45	0.25	2.00	0.67	-0.45	-25.62	0.49	-0.03	2.03	0.0
%134	1.80	2.64	0.25	1.35	0.45	-1.29	-26.91	0.42	-0.07	1.42	0.0
%135	1.88	3.56	0.25	1.41	0.47	-2.15	-29.05	0.33	-0.09	1.50	0.0
%136	0.97	3.95	0.25	0.73	0.24	-3.23	-32.28	0.23	-0.10	0.83	0.0
%137	6.28	5.67	0.25	4.71	1.57	-0.96	-33.24	0.20	-0.02	4.73	0.0
%138	9.48	5.21	0.25	7.11	2.37	1.90	-12.74	2.11	1.90	5.21	0.0
%139	5.35	5.36	0.25	4.01	1.34	-1.35	-14.09	1.81	-0.30	4.31	0.0
%140	2.51	6.39	0.25	1.88	0.63	-4.51	-18.60	1.08	-0.72	2.61	0.0
%141	5.96	4.55	0.25	4.47	1.49	-0.08	-18.68	1.07	-0.01	4.48	0.0
%142	10.95	3.91	0.25	8.21	2.74	4.31	-4.51	5.38	4.31	3.91	0.0
%143	1.93	2.65	0.25	1.45	0.48	-1.20	-5.70	4.69	-0.69	2.14	0.0
%144	0.64	2.60	0.25	0.48	0.16	-2.12	-7.82	3.69	-1.00	1.48	0.0
%145	1.43	2.84	0.25	1.07	0.36	-1.77	-9.59	3.01	-0.67	1.74	0.0
%146	2.26	2.51	0.25	1.69	0.56	-0.81	-10.40	2.75	-0.27	1.96	0.0
%147	2.40	3.29	0.25	1.80	0.60	-1.49	-11.89	2.32	-0.43	2.23	0.0
%148	4.67	3.74	0.25	3.50	1.17	-0.24	-12.13	2.26	-0.06	3.56	0.0
%149	5.35	5.07	0.25	4.01	1.34	-1.06	-13.19	2.00	-0.26	4.27	0.0
%150	2.00	6.80	0.25	1.50	0.50	-5.30	-18.49	1.09	-0.91	2.41	0.0
%151	3.58	7.95	0.25	2.68	0.89	-5.27	-23.76	0.60	-0.49	3.18	0.0
%152	2.96	7.47	0.25	2.22	0.74	-5.25	-29.01	0.33	-0.27	2.49	0.0
%153	3.19	6.76	0.25	2.39	0.80	-4.37	-33.38	0.20	-0.13	2.52	0.0
%154	6.89	4.89	0.25	5.17	1.72	0.28	-25.68	0.48	0.28	4.89	0.0
%155	4.09	3.36	0.25	3.07	1.02	-0.29	-25.97	0.47	-0.02	3.08	0.0
%156	3.05	4.42	0.25	2.29	0.76	-2.13	-28.10	0.37	-0.10	2.39	0.0
%157	3.07	2.07	0.25	2.30	0.77	0.24	-23.70	0.60	0.24	2.07	0.0
%158	4.66	2.39	0.25	3.49	1.16	1.10	-14.59	1.71	1.10	2.39	0.0
%159	5.97	3.86	0.25	4.48	1.49	0.62	-11.87	2.33	0.62	3.86	0.0
%160	0.31	4.73	0.25	0.23	0.08	-4.50	-16.37	1.39	-0.93	1.16	0.0
%161	9.49	6.05	0.25	7.12	2.37	1.07	-11.36	2.46	1.07	6.05	0.0
%162	2.60	5.43	0.25	1.95	0.65	-3.48	-14.85	1.66	-0.81	2.76	0.0
%163	2.46	6.45	0.25	1.85	0.62	-4.60	-19.45	0.98	-0.68	2.52	0.0
%164	7.24	5.68	0.25	5.43	1.81	-0.25	-19.70	0.95	-0.03	5.46	0.0
%165	9.40	5.14	0.25	7.05	2.35	1.91	-10.04	2.87	1.91	5.14	0.0
%166	2.81	4.10	0.25	2.11	0.70	-1.99	-12.03	2.28	-0.58	2.69	0.0
%167	3.25	2.86	0.25	2.44	0.81	-0.42	-12.45	2.18	-0.11	2.54	0.0
%168	1.83	2.40	0.25	1.37	0.46	-1.03	-13.48	1.94	-0.24	1.61	0.0
%169	1.67	2.37	0.25	1.25	0.42	-1.11	-14.59	1.71	-0.23	1.48	0.0
%170	0.99	3.74	0.25	0.74	0.25	-3.00	-17.59	1.21	-0.49	1.24	0.0
%171	4.98	5.62	0.25	3.74	1.25	-1.89	-19.47	0.98	-0.23	3.97	0.0
%172	0.34	6.06	0.25	0.25	0.09	-5.81	-25.28	0.51	-0.47	0.73	0.0
%173	5.76	8.51	0.25	4.32	1.44	-4.19	-29.47	0.31	-0.19	4.51	0.0
%174	4.39	5.97	0.25	3.29	1.10	-2.68	-32.15	0.23	-0.08	3.37	0.0
%175	1.61	5.49	0.25	1.21	0.40	-4.28	-36.43	0.14	-0.09	1.30	0.0
%176	1.83	6.27	0.25	1.37	0.46	-4.90	-41.33	0.08	-0.06	1.43	0.0
%177	0.77	5.24	0.25	0.58	0.19	-4.66	-45.99	0.05	-0.03	0.61	0.0
%178	15.69	4.40	0.25	11.77	3.92	7.36	-1.69	7.41	7.36	4.40	0.0
%179	2.38	3.23	0.25	1.79	0.60	-1.45	-3.14	6.28	-1.13	2.92	0.0

%180	2.59	2.34	0.25	1.94	0.65	-0.40	-3.53	6.00	-0.28	2.22	0.0
%181	2.63	2.30	0.25	1.97	0.66	-0.33	-3.86	5.78	-0.22	2.19	0.0
%182	2.82	2.39	0.25	2.12	0.70	-0.28	-4.14	5.60	-0.18	2.30	0.0
%183	2.30	3.34	0.25	1.72	0.57	-1.61	-5.76	4.66	-0.94	2.66	0.0
%184	1.93	4.73	0.25	1.45	0.48	-3.28	-9.04	3.21	-1.45	2.90	0.0
%185	5.29	6.08	0.25	3.97	1.32	-2.12	-11.16	2.52	-0.69	4.65	0.0
%186	1.48	6.53	0.25	1.11	0.37	-5.42	-16.58	1.36	-1.16	2.27	0.0
%187	4.01	7.15	0.25	3.01	1.00	-4.15	-20.72	0.85	-0.51	3.52	0.0
%188	0.13	7.63	0.25	0.10	0.03	-7.53	-28.26	0.36	-0.49	0.59	0.0
%189	6.96	7.25	0.25	5.22	1.74	-2.03	-30.29	0.29	-0.07	5.29	0.0
%190	6.91	4.30	0.25	5.18	1.73	0.88	-17.95	1.16	0.88	4.30	0.0
%191	6.02	3.15	0.25	4.51	1.50	1.37	-11.13	2.53	1.37	3.15	0.0
%192	1.38	1.90	0.25	1.03	0.34	-0.87	-12.00	2.29	-0.24	1.27	0.0
%193	1.02	2.97	0.25	0.76	0.25	-2.21	-14.21	1.78	-0.51	1.27	0.0
%194	1.84	3.67	0.25	1.38	0.46	-2.30	-16.51	1.37	-0.41	1.79	0.0
%195	0.50	5.47	0.25	0.38	0.13	-5.10	-21.61	0.77	-0.60	0.98	0.0
%196	2.53	5.14	0.25	1.90	0.63	-3.25	-24.86	0.53	-0.24	2.13	0.0
%197	8.12	6.44	0.25	6.09	2.03	-0.35	-25.21	0.51	-0.02	6.11	0.0
%198	4.71	5.90	0.25	3.53	1.18	-2.37	-27.57	0.39	-0.12	3.65	0.0
%199	0.06	8.24	0.25	0.04	0.01	-8.19	-35.77	0.15	-0.24	0.28	0.0
%200	7.74	7.36	0.25	5.80	1.93	-1.55	-37.32	0.13	-0.02	5.83	0.0
%201	5.33	5.31	0.25	4.00	1.33	-1.32	-38.64	0.11	-0.02	4.02	0.0
%202	5.85	3.86	0.25	4.39	1.46	0.53	-23.19	0.64	0.53	3.86	0.0
%203	3.44	2.69	0.25	2.58	0.86	-0.11	-23.29	0.63	-0.01	2.59	0.0
%204	4.95	1.81	0.25	3.71	1.24	1.91	-11.09	2.54	1.91	1.81	0.0
%205	0.96	2.25	0.25	0.72	0.24	-1.53	-12.63	2.13	-0.41	1.13	0.0
%206	3.90	2.97	0.25	2.93	0.98	-0.05	-12.68	2.12	-0.01	2.94	0.0
%207	1.79	4.55	0.25	1.34	0.45	-3.21	-15.89	1.47	-0.65	1.99	0.0
%208	0.68	6.78	0.25	0.51	0.17	-6.27	-22.16	0.72	-0.75	1.26	0.0
%209	9.31	5.28	0.25	6.98	2.33	1.70	-11.50	2.43	1.70	5.28	0.0
%210	10.09	6.92	0.25	7.57	2.52	0.64	-9.43	3.07	0.64	6.92	0.0
%211	1.76	6.73	0.25	1.32	0.44	-5.41	-14.84	1.66	-1.41	2.73	0.0
%212	0.90	9.50	0.25	0.67	0.22	-8.82	-23.67	0.61	-1.05	1.73	0.0
%213	5.34	5.64	0.25	4.01	1.34	-1.64	-25.30	0.50	-0.10	4.11	0.0
%214	0.19	5.42	0.25	0.14	0.05	-5.28	-30.58	0.28	-0.23	0.37	0.0
%215	3.88	3.11	0.25	2.91	0.97	-0.20	-30.79	0.27	-0.01	2.92	0.0
%216	4.54	2.22	0.25	3.40	1.13	1.19	-15.98	1.46	1.19	2.22	0.0
%217	0.81	2.56	0.25	0.61	0.20	-1.95	-17.93	1.17	-0.29	0.90	0.0
%218	1.44	2.96	0.25	1.08	0.36	-1.88	-19.81	0.94	-0.22	1.30	0.0
%219	2.97	4.38	0.25	2.23	0.74	-2.15	-21.96	0.74	-0.20	2.43	0.0
%220	0.28	6.04	0.25	0.21	0.07	-5.83	-27.79	0.38	-0.36	0.57	0.0
%221	2.91	6.49	0.25	2.18	0.73	-4.31	-32.10	0.23	-0.15	2.33	0.0
%222	1.81	7.13	0.25	1.36	0.45	-5.77	-37.87	0.12	-0.11	1.47	0.0
%223	0.96	8.48	0.25	0.72	0.24	-7.76	-45.63	0.05	-0.07	0.79	0.0
%224	0.19	7.89	0.25	0.14	0.05	-7.75	-53.38	0.02	-0.03	0.17	0.0
%225	0.43	6.82	0.25	0.32	0.11	-6.50	-59.88	0.01	-0.01	0.33	0.0
%226	1.37	5.87	0.25	1.03	0.34	-4.84	-64.71	0.01	-0.00	1.03	0.0
%227	1.46	4.12	0.25	1.10	0.37	-3.03	-67.74	0.00	-0.00	1.10	0.0
%228	2.27	2.48	0.25	1.70	0.57	-0.78	-68.52	0.00	-0.00	1.70	0.0
%229	7.07	1.90	0.25	5.30	1.77	3.40	-8.53	3.40	3.40	1.90	0.0
%230	1.10	2.61	0.25	0.83	0.28	-1.79	-10.31	2.78	-0.63	1.45	0.0
%231	3.22	3.87	0.25	2.41	0.81	-1.46	-11.77	2.35	-0.42	2.84	0.0
%232	0.51	5.38	0.25	0.38	0.13	-4.99	-16.76	1.33	-1.02	1.40	0.0
%233	5.29	6.82	0.25	3.97	1.32	-2.86	-19.62	0.96	-0.37	4.34	0.0
%234	4.23	5.88	0.25	3.17	1.06	-2.71	-22.33	0.71	-0.26	3.43	0.0
%235	2.70	6.57	0.25	2.03	0.68	-4.54	-26.87	0.42	-0.29	2.31	0.0
%236	3.26	6.78	0.25	2.44	0.81	-4.33	-31.20	0.26	-0.16	2.61	0.0
%237	0.68	6.21	0.25	0.51	0.17	-5.70	-36.90	0.13	-0.12	0.63	0.0
%238	1.93	5.24	0.25	1.45	0.48	-3.80	-40.70	0.09	-0.05	1.49	0.0
%239	1.61	3.80	0.25	1.21	0.40	-2.59	-43.29	0.07	-0.02	1.23	0.0
%240	0.37	2.30	0.25	0.28	0.09	-2.02	-45.31	0.05	-0.01	0.29	0.0

TOTAL PERCOLATION = 0.000

input data for the present case

number of data points : 240
maximum storage : 12

************** FINAL RESULTS FOR Bryan/College Station****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.07	1.52	0.11	0.02	-42.48	0.32	0.02	1.50	0.00
2	4.40	1.76	0.07	4.09	0.31	2.33	-17.68	2.65	2.33	1.76	0.00
3	3.58	2.57	0.07	3.33	0.25	0.76	-14.72	3.41	0.76	2.57	0.00
4	4.01	2.25	0.07	3.73	0.28	1.48	-10.51	4.88	1.48	2.25	0.00
5	4.22	3.67	0.07	3.92	0.30	0.26	-9.91	5.14	0.26	3.67	0.00
6	2.02	3.65	0.07	1.88	0.14	-1.78	-11.69	4.41	-0.72	2.60	0.00
7	0.26	4.86	0.07	0.24	0.02	-4.62	-16.30	2.98	-1.44	1.68	0.00
8	0.23	5.75	0.07	0.21	0.02	-5.54	-21.84	1.86	-1.12	1.34	0.00
9	6.38	3.82	0.07	5.93	0.45	2.11	-12.94	3.97	2.11	3.82	0.00
10	3.84	2.62	0.07	3.57	0.27	0.95	-10.42	4.92	0.95	2.62	0.00
11	0.62	2.87	0.07	0.58	0.04	-2.29	-12.71	4.04	-0.88	1.45	0.00
12	1.40	2.58	0.07	1.30	0.10	-1.27	-13.99	3.63	-0.42	1.72	0.00
13	0.15	2.81	0.07	0.14	0.01	-2.67	-16.66	2.89	-0.74	0.88	0.00
14	1.68	4.00	0.07	1.56	0.12	-2.43	-19.10	2.35	-0.54	2.10	0.00
15	12.00	5.87	0.07	11.16	0.84	5.29	-5.28	7.63	5.29	5.87	0.00
16	0.89	4.56	0.07	0.83	0.06	-3.73	-9.01	5.55	-2.09	2.91	0.00
17	5.65	6.00	0.07	5.25	0.40	-0.74	-9.75	5.21	-0.34	5.60	0.00
18	0.76	4.74	0.07	0.71	0.05	-4.03	-13.78	3.69	-1.52	2.22	0.00
19	1.87	8.64	0.07	1.74	0.13	-6.90	-20.68	2.05	-1.64	3.38	0.00
20	3.20	6.27	0.07	2.98	0.22	-3.30	-23.98	1.55	-0.50	3.48	0.00
21	3.31	5.52	0.07	3.08	0.23	-2.44	-26.42	1.26	-0.29	3.37	0.00
22	4.30	3.93	0.07	4.00	0.30	0.07	-25.83	1.32	0.07	3.93	0.00
23	2.75	3.30	0.07	2.56	0.19	-0.75	-26.57	1.24	-0.08	2.64	0.00
24	4.63	2.44	0.07	4.31	0.32	1.87	-15.79	3.11	1.87	2.44	0.00
25	1.73	1.77	0.07	1.61	0.12	-0.16	-15.96	3.07	-0.04	1.65	0.00
26	0.50	2.88	0.07	0.47	0.04	-2.41	-18.37	2.50	-0.57	1.04	0.00
27	0.91	4.24	0.07	0.85	0.06	-3.39	-21.76	1.87	-0.63	1.47	0.00
28	1.71	4.03	0.07	1.59	0.12	-2.43	-24.19	1.52	-0.35	1.94	0.00
29	6.38	5.15	0.07	5.93	0.45	0.78	-19.33	2.30	0.78	5.15	0.00
30	2.13	5.24	0.07	1.98	0.15	-3.26	-22.59	1.74	-0.56	2.54	0.00
31	2.17	5.74	0.07	2.02	0.15	-3.72	-26.31	1.27	-0.47	2.49	0.00
32	3.60	4.89	0.07	3.35	0.25	-1.54	-27.85	1.11	-0.16	3.50	0.00
33	4.45	4.56	0.07	4.14	0.31	-0.42	-28.27	1.07	-0.04	4.18	0.00
34	3.95	3.95	0.07	3.67	0.28	-0.28	-28.55	1.05	-0.03	3.70	0.00
35	3.26	2.16	0.07	3.03	0.23	0.87	-21.46	1.92	0.87	2.16	0.00
36	1.47	2.12	0.07	1.37	0.10	-0.75	-22.22	1.80	-0.12	1.49	0.00
37	5.51	3.11	0.07	5.12	0.39	2.01	-13.43	3.81	2.01	3.11	0.00
38	2.60	2.27	0.07	2.42	0.18	0.15	-12.97	3.96	0.15	2.27	0.00
39	5.17	3.54	0.07	4.81	0.36	1.27	-9.71	5.23	1.27	3.54	0.00
40	6.74	3.96	0.07	6.27	0.47	2.31	-5.43	7.54	2.31	3.96	0.00
41	2.12	4.30	0.07	1.97	0.15	-2.33	-7.75	6.17	-1.36	3.33	0.00
42	6.44	4.77	0.07	5.99	0.45	1.22	-5.65	7.40	1.22	4.77	0.00
43	2.15	4.56	0.07	2.00	0.15	-2.56	-8.20	5.94	-1.46	3.45	0.00
44	1.03	5.52	0.07	0.96	0.07	-4.56	-12.76	4.03	-1.91	2.87	0.00
45	9.44	4.80	0.07	8.78	0.66	3.98	-4.72	8.00	3.98	4.80	0.00
46	10.17	4.25	0.07	9.46	0.71	5.21	0.00	12.00	4.00	4.25	1.21
47	2.40	2.60	0.07	2.23	0.17	-0.36	-0.36	11.60	-0.40	2.63	0.00
48	2.52	2.87	0.07	2.34	0.18	-0.53	-0.89	11.09	-0.51	2.85	0.00
49	4.66	1.75	0.07	4.33	0.33	2.58	0.00	12.00	0.91	1.75	1.67
50	0.13	3.00	0.07	0.12	0.01	-2.88	-2.88	9.36	-2.64	2.76	0.00
51	1.56	3.97	0.07	1.45	0.11	-2.52	-5.39	7.55	-1.81	3.26	0.00
52	1.76	5.22	0.07	1.64	0.12	-3.59	-8.98	5.56	-1.99	3.63	0.00
53	3.09	5.89	0.07	2.87	0.22	-3.01	-11.99	4.30	-1.26	4.13	0.00

54	0.73	5.36	0.07	0.68	0.05	-4.68	-16.67	2.89	-1.41	2.09	0.00
55	2.40	5.57	0.07	2.23	0.17	-3.34	-20.01	2.17	-0.72	2.95	0.00
56	9.88	6.05	0.07	9.19	0.69	3.14	-9.53	5.31	3.14	6.05	0.00
57	9.22	4.84	0.07	8.57	0.65	3.74	-3.29	9.05	3.74	4.84	0.00
58	6.02	3.92	0.07	5.60	0.42	1.68	-1.29	10.73	1.68	3.92	0.00
59	5.68	2.63	0.07	5.28	0.40	2.65	0.00	12.00	1.27	2.63	1.38
60	2.82	2.11	0.07	2.62	0.20	0.51	0.00	12.00	0.00	2.11	0.51
61	1.80	2.27	0.07	1.67	0.13	-0.59	-0.59	11.37	-0.63	2.30	0.00
62	2.45	2.22	0.07	2.28	0.17	0.06	-0.55	11.43	0.06	2.22	0.00
63	1.41	3.09	0.07	1.31	0.10	-1.78	-2.32	9.81	-1.62	2.93	0.00
64	2.08	4.17	0.07	1.93	0.15	-2.24	-4.56	8.11	-1.71	3.64	0.00
65	11.99	4.56	0.07	11.15	0.84	6.59	0.00	12.00	3.89	4.56	2.69
66	2.42	5.73	0.07	2.25	0.17	-3.48	-3.48	8.89	-3.11	5.36	0.00
67	4.16	5.52	0.07	3.87	0.29	-1.65	-5.14	7.72	-1.17	5.04	0.00
68	2.44	5.72	0.07	2.27	0.17	-3.45	-8.59	5.75	-1.97	4.24	0.00
69	3.78	4.72	0.07	3.52	0.26	-1.20	-9.79	5.19	-0.56	4.08	0.00
70	3.35	3.62	0.07	3.12	0.23	-0.50	-10.29	4.97	-0.22	3.33	0.00
71	1.07	3.95	0.07	1.00	0.07	-2.95	-13.25	3.86	-1.11	2.10	0.00
72	1.18	2.72	0.07	1.10	0.08	-1.62	-14.86	3.37	-0.50	1.60	0.00
73	1.60	3.37	0.07	1.49	0.11	-1.89	-16.75	2.87	-0.50	1.99	0.00
74	1.74	3.10	0.07	1.62	0.12	-1.48	-18.23	2.52	-0.34	1.96	0.00
75	4.81	3.54	0.07	4.47	0.34	0.93	-14.56	3.46	0.93	3.54	0.00
76	5.95	4.07	0.07	5.53	0.42	1.47	-10.41	4.92	1.47	4.07	0.00
77	4.32	4.53	0.07	4.02	0.30	-0.51	-10.93	4.71	-0.21	4.23	0.00
78	4.02	6.05	0.07	3.74	0.28	-2.32	-13.24	3.87	-0.84	4.58	0.00
79	2.13	5.27	0.07	1.98	0.15	-3.29	-16.53	2.92	-0.95	2.93	0.00
80	1.48	6.20	0.07	1.38	0.10	-4.82	-21.35	1.93	-0.98	2.36	0.00
81	2.68	3.90	0.07	2.49	0.19	-1.41	-22.76	1.72	-0.22	2.71	0.00
82	5.77	3.62	0.07	5.37	0.40	1.75	-14.53	3.46	1.75	3.62	0.00
83	3.27	1.86	0.07	3.04	0.23	1.18	-11.10	4.64	1.18	1.86	0.00
84	4.05	2.45	0.07	3.77	0.28	1.32	-8.18	5.96	1.32	2.45	0.00
85	2.14	1.43	0.07	1.99	0.15	0.56	-7.13	6.51	0.56	1.43	0.00
86	3.55	2.90	0.07	3.30	0.25	0.40	-6.43	6.92	0.40	2.90	0.00
87	2.06	3.81	0.07	1.92	0.14	-1.89	-8.32	5.88	-1.04	2.95	0.00
88	8.81	4.38	0.07	8.19	0.62	3.82	-2.47	9.70	3.82	4.38	0.00
89	1.56	5.21	0.07	1.45	0.11	-3.76	-6.23	7.03	-2.67	4.12	0.00
90	1.35	6.78	0.07	1.26	0.09	-5.52	-11.75	4.39	-2.64	3.90	0.00
91	0.31	7.10	0.07	0.29	0.02	-6.81	-18.56	2.46	-1.93	2.22	0.00
92	1.35	6.50	0.07	1.26	0.09	-5.24	-23.80	1.57	-0.89	2.14	0.00
93	1.69	6.16	0.07	1.57	0.12	-4.59	-28.39	1.06	-0.51	2.08	0.00
94	0.79	4.64	0.07	0.73	0.06	-3.91	-32.29	0.76	-0.30	1.04	0.00
95	3.10	3.24	0.07	2.88	0.22	-0.36	-32.65	0.74	-0.02	2.91	0.00
96	2.67	3.07	0.07	2.48	0.19	-0.59	-33.24	0.70	-0.04	2.52	0.00
97	4.51	1.92	0.07	4.19	0.32	2.27	-16.33	2.97	2.27	1.92	0.00
98	2.62	1.98	0.07	2.44	0.18	0.46	-14.66	3.43	0.46	1.92	0.00
99	2.72	4.39	0.07	2.53	0.19	-1.86	-16.52	2.92	-0.50	1.98	0.00
%100	1.37	4.99	0.07	1.27	0.10	-3.72	-20.23	2.13	-0.79	3.03	0.00
%101	2.52	5.91	0.07	2.34	0.18	-3.56	-23.80	1.57	-0.56	2.07	0.0
%102	2.44	6.32	0.07	2.27	0.17	-4.05	-27.85	1.11	-0.46	2.90	0.0
%103	1.26	6.53	0.07	1.17	0.09	-5.36	-33.21	0.70	-0.41	2.73	0.0
%104	0.57	6.53	0.07	0.53	0.04	-6.00	-39.21	0.42	-0.28	1.58	0.0
%105	6.50	4.78	0.07	6.05	0.46	1.26	-22.96	1.69	1.26	0.81	0.0
%106	0.41	5.19	0.07	0.38	0.03	-4.81	-27.77	1.12	-0.57	4.78	0.0
%107	6.31	2.86	0.07	5.87	0.44	3.01	-12.47	4.13	3.01	0.95	0.0
%108	3.17	2.18	0.07	2.95	0.22	0.76	-10.48	4.90	0.76	2.86	0.0
%109	3.70	1.74	0.07	3.44	0.26	1.71	-6.98	6.60	1.70	2.18	0.0
%110	4.08	2.24	0.07	3.79	0.29	1.55	-4.50	8.15	1.55	1.74	0.0
%111	5.54	4.35	0.07	5.15	0.39	0.81	-3.40	8.96	0.81	2.24	0.0
%112	4.74	4.27	0.07	4.41	0.33	0.14	-3.22	9.10	0.14	4.35	0.0
%113	11.05	5.26	0.07	10.28	0.77	5.02	0.00	12.00	2.90	4.27	0.0
%114	1.30	5.70	0.07	1.21	0.09	-4.50	-4.50	8.15	-3.85	5.26	2.1
%115	4.48	5.40	0.07	4.17	0.31	-1.24	-5.73	7.34	-0.82	5.06	0.0
%116	3.81	5.66	0.07	3.54	0.27	-2.11	-7.85	6.13	-1.21	4.98	0.0

%117	3.20	4.55	0.07	2.98	0.22	-1.57	-9.42	5.36	-0.77	3.75	0.0
%118	1.70	4.09	0.07	1.58	0.12	-2.51	-11.93	4.32	-1.03	2.61	0.0
%119	0.77	2.69	0.07	0.72	0.05	-1.97	-13.90	3.65	-0.67	1.39	0.0
%120	3.32	1.63	0.07	3.09	0.23	1.46	-9.97	5.11	1.46	1.63	0.0
%121	3.12	1.88	0.07	2.90	0.22	1.03	-7.83	6.14	1.03	1.88	0.0
%122	1.94	2.69	0.07	1.80	0.14	-0.89	-8.72	5.68	-0.45	2.26	0.0
%123	5.04	3.26	0.07	4.69	0.35	1.43	-6.11	7.11	1.43	3.26	0.0
%124	2.38	4.62	0.07	2.21	0.17	-2.41	-8.52	5.78	-1.32	3.54	0.0
%125	4.31	4.77	0.07	4.01	0.30	-0.76	-9.28	5.42	-0.36	4.37	0.0
%126	0.10	7.34	0.07	0.09	0.01	-7.24	-16.52	2.92	-2.50	2.59	0.0
%127	0.06	8.57	0.07	0.06	0.00	-8.52	-25.04	1.41	-1.51	1.57	0.0
%128	1.67	7.79	0.07	1.55	0.12	-6.24	-31.28	0.83	-0.58	2.14	0.0
%129	4.28	5.18	0.07	3.98	0.30	-1.20	-32.48	0.75	-0.08	4.06	0.0
%130	3.93	4.52	0.07	3.65	0.28	-0.87	-33.34	0.70	-0.05	3.71	0.0
%131	4.58	2.87	0.07	4.26	0.32	1.39	-20.47	2.08	1.39	2.87	0.0
%132	0.50	2.43	0.07	0.47	0.04	-1.96	-22.44	1.76	-0.32	0.79	0.0
%133	2.67	2.45	0.07	2.48	0.19	0.03	-22.22	1.80	0.03	2.45	0.0
%134	1.80	2.64	0.07	1.67	0.13	-0.97	-23.18	1.66	-0.14	1.82	0.0
%135	1.88	3.56	0.07	1.75	0.13	-1.81	-24.99	1.42	-0.24	1.98	0.0
%136	0.97	3.95	0.07	0.90	0.07	-3.05	-28.04	1.09	-0.33	1.23	0.0
%137	6.28	5.67	0.07	5.84	0.44	0.17	-26.34	1.26	0.17	5.67	0.0
%138	9.48	5.21	0.07	8.82	0.66	3.61	-10.53	4.87	3.61	5.21	0.0
%139	5.35	5.36	0.07	4.98	0.37	-0.39	-10.92	4.71	-0.16	5.14	0.0
%140	2.51	6.39	0.07	2.33	0.18	-4.06	-14.98	3.33	-1.38	3.71	0.0
%141	5.96	4.55	0.07	5.54	0.42	0.99	-11.93	4.33	0.99	4.55	0.0
%142	10.95	3.91	0.07	10.18	0.77	6.28	-1.43	10.60	6.28	3.91	0.0
%143	1.93	2.65	0.07	1.79	0.14	-0.85	-2.28	9.85	-0.75	2.55	0.0
%144	0.64	2.60	0.07	0.60	0.04	-2.00	-4.28	8.30	-1.55	2.14	0.0
%145	1.43	2.84	0.07	1.33	0.10	-1.51	-5.79	7.30	-1.01	2.33	0.0
%146	2.26	2.51	0.07	2.10	0.16	-0.40	-6.20	7.05	-0.25	2.35	0.0
%147	2.40	3.29	0.07	2.23	0.17	-1.06	-7.26	6.44	-0.61	2.84	0.0
%148	4.67	3.74	0.07	4.34	0.33	0.61	-6.21	7.05	0.61	3.74	0.0
%149	5.35	5.07	0.07	4.98	0.37	-0.10	-6.31	6.98	-0.07	5.04	0.0
%150	2.00	6.80	0.07	1.86	0.14	-4.94	-11.26	4.58	-2.40	4.26	0.0
%151	3.58	7.95	0.07	3.33	0.25	-4.62	-15.88	3.09	-1.49	4.82	0.0
%152	2.96	7.47	0.07	2.75	0.21	-4.72	-20.60	2.06	-1.02	3.78	0.0
%153	3.19	6.76	0.07	2.97	0.22	-3.80	-24.39	1.49	-0.57	3.54	0.0
%154	6.89	4.89	0.07	6.41	0.48	1.52	-16.16	3.01	1.52	4.89	0.0
%155	4.09	3.36	0.07	3.80	0.29	0.44	-14.55	3.46	0.44	3.36	0.0
%156	3.05	4.42	0.07	2.84	0.21	-1.58	-16.13	3.02	-0.44	3.27	0.0
%157	3.07	2.07	0.07	2.86	0.21	0.79	-13.41	3.81	0.79	2.07	0.0
%158	4.66	2.39	0.07	4.33	0.33	1.94	-8.59	5.75	1.94	2.39	0.0
%159	5.97	3.86	0.07	5.55	0.42	1.70	-5.57	7.45	1.70	3.86	0.0
%160	0.31	4.73	0.07	0.29	0.02	-4.44	-10.01	5.09	-2.35	2.64	0.0
%161	9.49	6.05	0.07	8.83	0.66	2.78	-4.92	7.87	2.78	6.05	0.0
%162	2.60	5.43	0.07	2.42	0.18	-3.01	-7.93	6.08	-1.79	4.21	0.0
%163	2.46	6.45	0.07	2.29	0.17	-4.16	-12.09	4.26	-1.82	4.10	0.0
%164	7.24	5.68	0.07	6.73	0.51	1.05	-9.52	5.31	1.05	5.68	0.0
%165	9.40	5.14	0.07	8.74	0.66	3.60	-3.46	8.92	3.60	5.14	0.0
%166	2.81	4.10	0.07	2.61	0.20	-1.49	-4.95	7.84	-1.07	3.68	0.0
%167	3.25	2.86	0.07	3.02	0.23	0.17	-4.71	8.01	0.17	2.86	0.0
%168	1.83	2.40	0.07	1.70	0.13	-0.70	-5.41	7.54	-0.47	2.17	0.0
%169	1.67	2.37	0.07	1.55	0.12	-0.81	-6.22	7.04	-0.51	2.06	0.0
%170	0.99	3.74	0.07	0.92	0.07	-2.82	-9.04	5.53	-1.50	2.42	0.0
%171	4.98	5.62	0.07	4.63	0.35	-0.99	-10.03	5.08	-0.45	5.08	0.0
%172	0.34	6.06	0.07	0.32	0.02	-5.75	-15.78	3.11	-1.97	2.29	0.0
%173	5.76	8.51	0.07	5.36	0.40	-3.16	-18.93	2.38	-0.73	6.09	0.0
%174	4.39	5.97	0.07	4.08	0.31	-1.89	-20.82	2.02	-0.35	4.44	0.0
%175	1.61	5.49	0.07	1.50	0.11	-3.99	-24.81	1.44	-0.58	2.08	0.0
%176	1.83	6.27	0.07	1.70	0.13	-4.57	-29.38	0.98	-0.47	2.17	0.0
%177	0.77	5.24	0.07	0.72	0.05	-4.52	-33.90	0.66	-0.31	1.03	0.0
%178	15.69	4.40	0.07	14.59	1.10	10.19	-1.16	10.85	10.19	4.40	0.0
%179	2.38	3.23	0.07	2.21	0.17	-1.02	-2.18	9.94	-0.92	3.13	0.0

%180	2.59	2.34	0.07	2.41	0.18	0.07	-2.11	10.01	0.07	2.34	0.0
%181	2.63	2.30	0.07	2.45	0.18	0.14	-1.94	10.15	0.14	2.30	0.0
%182	2.82	2.39	0.07	2.62	0.20	0.23	-1.68	10.38	0.23	2.39	0.0
%183	2.30	3.34	0.07	2.14	0.16	-1.20	-2.88	9.36	-1.02	3.16	0.0
%184	1.93	4.73	0.07	1.79	0.14	-2.94	-5.82	7.28	-2.07	3.87	0.0
%185	5.29	6.08	0.07	4.92	0.37	-1.16	-6.98	6.59	-0.69	5.61	0.0
%186	1.48	6.53	0.07	1.38	0.10	-5.15	-12.14	4.25	-2.35	3.72	0.0
%187	4.01	7.15	0.07	3.73	0.28	-3.42	-15.56	3.17	-1.08	4.81	0.0
%188	0.13	7.63	0.07	0.12	0.01	-7.51	-23.07	1.67	-1.50	1.62	0.0
%189	6.96	7.25	0.07	6.47	0.49	-0.78	-23.85	1.56	-0.11	6.58	0.0
%190	6.91	4.30	0.07	6.43	0.48	2.12	-13.81	3.68	2.12	4.30	0.0
%191	6.02	3.15	0.07	5.60	0.42	2.45	-7.84	6.13	2.45	3.15	0.0
%192	1.38	1.90	0.07	1.28	0.10	-0.62	-8.46	5.81	-0.32	1.60	0.0
%193	1.02	2.97	0.07	0.95	0.07	-2.03	-10.49	4.89	-0.92	1.87	0.0
%194	1.84	3.67	0.07	1.71	0.13	-1.96	-12.45	4.14	-0.75	2.47	0.0
%195	0.50	5.47	0.07	0.47	0.04	-5.01	-17.46	2.70	-1.44	1.90	0.0
%196	2.53	5.14	0.07	2.35	0.18	-2.79	-20.25	2.13	-0.57	2.92	0.0
%197	8.12	6.44	0.07	7.55	0.57	1.11	-15.32	3.24	1.11	6.44	0.0
%198	4.71	5.90	0.07	4.38	0.33	-1.52	-16.84	2.84	-0.39	4.77	0.0
%199	0.06	8.24	0.07	0.06	0.00	-8.18	-25.03	1.41	-1.43	1.48	0.0
%200	7.74	7.36	0.07	7.20	0.54	-0.16	-25.19	1.39	-0.02	7.22	0.0
%201	5.33	5.31	0.07	4.96	0.37	-0.36	-25.54	1.35	-0.04	5.00	0.0
%202	5.85	3.86	0.07	5.44	0.41	1.58	-16.46	2.94	1.58	3.86	0.0
%203	3.44	2.69	0.07	3.20	0.24	0.51	-14.58	3.45	0.51	2.69	0.0
%204	4.95	1.81	0.07	4.60	0.35	2.80	-7.63	6.25	2.80	1.81	0.0
%205	0.96	2.25	0.07	0.89	0.07	-1.36	-8.99	5.56	-0.69	1.58	0.0
%206	3.90	2.97	0.07	3.63	0.27	0.65	-7.70	6.21	0.65	2.97	0.0
%207	1.79	4.55	0.07	1.66	0.13	-2.89	-10.58	4.85	-1.36	3.02	0.0
%208	0.68	6.78	0.07	0.63	0.05	-6.15	-16.73	2.87	-1.98	2.61	0.0
%209	9.31	5.28	0.07	8.66	0.65	3.38	-7.62	6.25	3.38	5.28	0.0
%210	10.09	6.92	0.07	9.38	0.71	2.46	-3.73	8.71	2.46	6.92	0.0
%211	1.76	6.73	0.07	1.64	0.12	-5.10	-8.83	5.63	-3.08	4.71	0.0
%212	0.90	9.50	0.07	0.84	0.06	-8.66	-17.49	2.69	-2.94	3.78	0.0
%213	5.34	5.64	0.07	4.97	0.37	-0.68	-18.17	2.54	-0.15	5.12	0.0
%214	0.19	5.42	0.07	0.18	0.01	-5.24	-23.41	1.62	-0.92	1.09	0.0
%215	3.88	3.11	0.07	3.61	0.27	0.49	-20.30	2.12	0.49	3.11	0.0
%216	4.54	2.22	0.07	4.22	0.32	2.00	-12.50	4.12	2.00	2.22	0.0
%217	0.81	2.56	0.07	0.75	0.06	-1.80	-14.30	3.53	-0.59	1.34	0.0
%218	1.44	2.96	0.07	1.34	0.10	-1.62	-15.92	3.08	-0.46	1.80	0.0
%219	2.97	4.38	0.07	2.76	0.21	-1.62	-17.54	2.68	-0.40	3.16	0.0
%220	0.28	6.04	0.07	0.26	0.02	-5.78	-23.32	1.64	-1.04	1.30	0.0
%221	2.91	6.49	0.07	2.71	0.20	-3.78	-27.10	1.18	-0.45	3.16	0.0
%222	1.81	7.13	0.07	1.68	0.13	-5.44	-32.55	0.74	-0.44	2.12	0.0
%223	0.96	8.48	0.07	0.89	0.07	-7.59	-40.14	0.39	-0.35	1.25	0.0
%224	0.19	7.89	0.07	0.18	0.01	-7.71	-47.85	0.20	-0.19	0.36	0.0
%225	0.43	6.82	0.07	0.40	0.03	-6.42	-54.27	0.12	-0.09	0.48	0.0
%226	1.37	5.87	0.07	1.27	0.10	-4.59	-58.86	0.08	-0.04	1.31	0.0
%227	1.46	4.12	0.07	1.36	0.10	-2.77	-61.63	0.06	-0.02	1.37	0.0
%228	2.27	2.48	0.07	2.11	0.16	-0.37	-62.00	0.06	-0.00	2.11	0.0
%229	7.07	1.90	0.07	6.58	0.49	4.67	-10.88	4.73	4.67	1.90	0.0
%230	1.10	2.61	0.07	1.02	0.08	-1.59	-12.47	4.13	-0.60	1.62	0.0
%231	3.22	3.87	0.07	2.99	0.23	-0.88	-13.34	3.83	-0.30	3.29	0.0
%232	0.51	5.38	0.07	0.47	0.04	-4.90	-18.24	2.52	-1.31	1.78	0.0
%233	5.29	6.82	0.07	4.92	0.37	-1.91	-20.15	2.14	-0.38	5.30	0.0
%234	4.23	5.88	0.07	3.93	0.30	-1.95	-22.10	1.82	-0.33	4.26	0.0
%235	2.70	6.57	0.07	2.51	0.19	-4.05	-26.15	1.28	-0.53	3.04	0.0
%236	3.26	6.78	0.07	3.03	0.23	-3.74	-29.89	0.93	-0.35	3.38	0.0
%237	0.68	6.21	0.07	0.63	0.05	-5.58	-35.47	0.58	-0.35	0.99	0.0
%238	1.93	5.24	0.07	1.79	0.14	-3.45	-38.92	0.43	-0.15	1.94	0.0
%239	1.61	3.80	0.07	1.50	0.11	-2.30	-41.22	0.35	-0.08	1.57	0.0
%240	0.37	2.30	0.07	0.34	0.03	-1.95	-43.17	0.30	-0.05	0.40	0.0

TOTAL PERCOLATION = 9.582

input data for the present case

number of data points : 240
maximum storage : 12

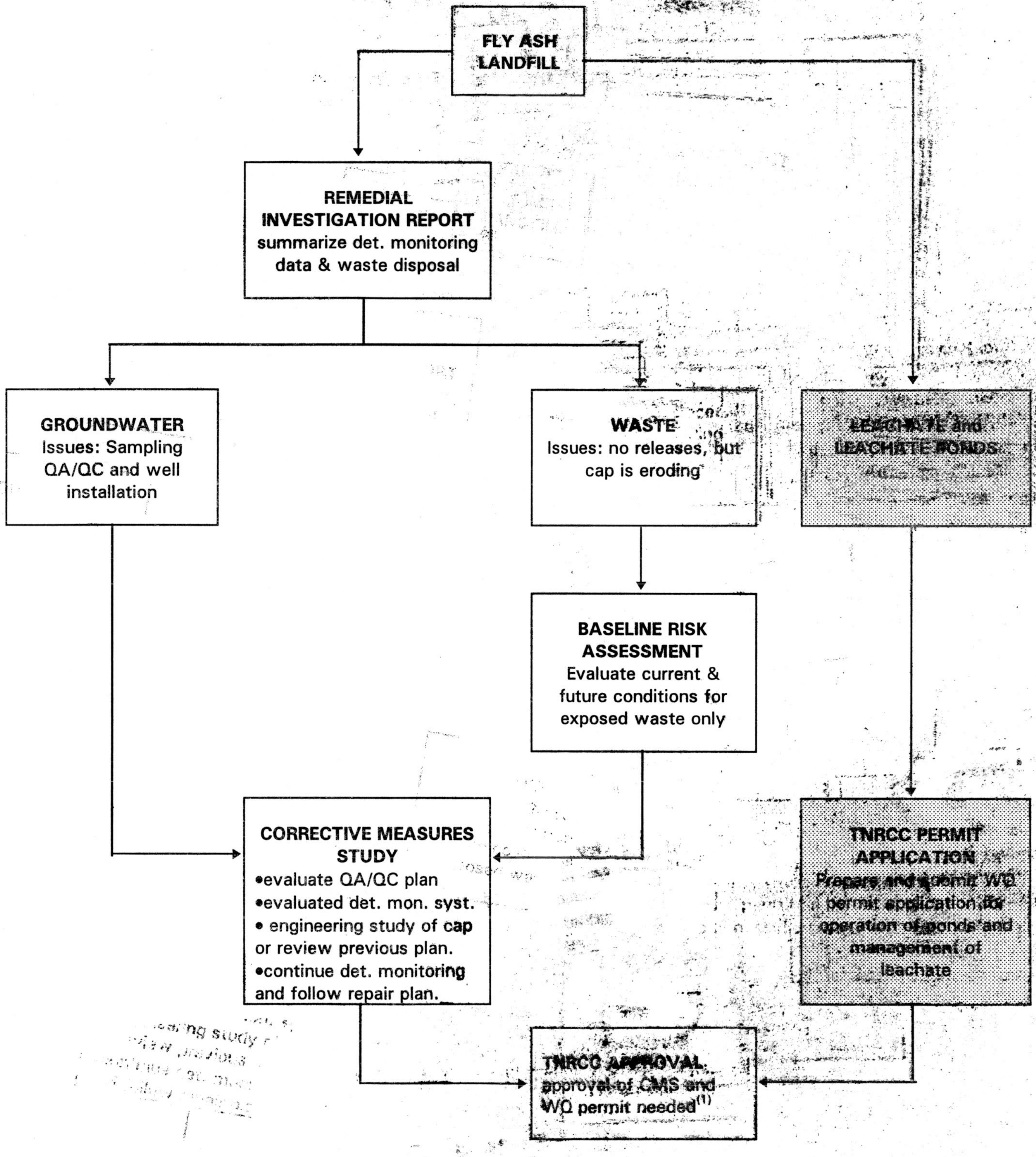
************** FINAL RESULTS FOR Bryan/College Station*****************

number of iterations = 3

num	precip	pet	cro	infilt	runoff	i-pet	sumneg	storage	delsto	aet	perc
1	1.63	1.50	0.10	1.47	0.16	-0.03	-44.51	0.27	-0.00	1.47	0.00
2	4.40	1.76	0.10	3.96	0.44	2.20	-18.52	2.46	2.20	1.76	0.00
3	3.58	2.57	0.10	3.22	0.36	0.65	-15.76	3.12	0.65	2.57	0.00
4	4.01	2.25	0.10	3.61	0.40	1.36	-11.54	4.47	1.36	2.25	0.00
5	4.22	3.67	0.10	3.80	0.42	0.13	-11.20	4.60	0.13	3.67	0.00
6	2.02	3.65	0.10	1.82	0.20	-1.84	-13.04	3.93	-0.67	2.49	0.00
7	0.26	4.86	0.10	0.23	0.03	-4.62	-17.66	2.65	-1.28	1.52	0.00
8	0.23	5.75	0.10	0.21	0.02	-5.55	-23.21	1.65	-1.00	1.21	0.00
9	6.38	3.82	0.10	5.74	0.64	1.92	-14.17	3.57	1.92	3.82	0.00
10	3.84	2.62	0.10	3.46	0.38	0.84	-11.70	4.41	0.84	2.62	0.00
11	0.62	2.87	0.10	0.56	0.06	-2.31	-14.02	3.62	-0.79	1.35	0.00
12	1.40	2.58	0.10	1.26	0.14	-1.32	-15.33	3.23	-0.38	1.64	0.00
13	0.15	2.81	0.10	0.14	0.02	-2.68	-18.01	2.57	-0.66	0.80	0.00
14	1.68	4.00	0.10	1.51	0.17	-2.49	-20.50	2.08	-0.49	2.00	0.00
15	12.00	5.87	0.10	10.80	1.20	4.93	-6.28	7.01	4.93	5.87	0.00
16	0.89	4.56	0.10	0.80	0.09	-3.76	-10.03	5.08	-1.93	2.73	0.00
17	5.65	6.00	0.10	5.09	0.56	-0.91	-10.95	4.70	-0.38	5.47	0.00
18	0.76	4.74	0.10	0.68	0.08	-4.05	-15.00	3.33	-1.38	2.06	0.00
19	1.87	8.64	0.10	1.68	0.19	-6.95	-21.96	1.84	-1.49	3.17	0.00
20	3.20	6.27	0.10	2.88	0.32	-3.39	-25.35	1.38	-0.46	3.34	0.00
21	3.31	5.52	0.10	2.98	0.33	-2.54	-27.89	1.11	-0.27	3.25	0.00
22	4.30	3.93	0.10	3.87	0.43	-0.06	-27.96	1.10	-0.01	3.88	0.00
23	2.75	3.30	0.10	2.47	0.28	-0.83	-28.79	1.03	-0.08	2.55	0.00
24	4.63	2.44	0.10	4.17	0.46	1.73	-17.20	2.76	1.73	2.44	0.00
25	1.73	1.77	0.10	1.56	0.17	-0.21	-17.42	2.71	-0.05	1.61	0.00
26	0.50	2.88	0.10	0.45	0.05	-2.43	-19.84	2.20	-0.51	0.96	0.00
27	0.91	4.24	0.10	0.82	0.09	-3.42	-23.26	1.64	-0.56	1.38	0.00
28	1.71	4.03	0.10	1.54	0.17	-2.49	-25.75	1.33	-0.31	1.85	0.00
29	6.38	5.15	0.10	5.74	0.64	0.59	-21.44	1.92	0.59	5.15	0.00
30	2.13	5.24	0.10	1.92	0.21	-3.33	-24.77	1.45	-0.47	2.39	0.00
31	2.17	5.74	0.10	1.95	0.22	-3.79	-28.55	1.05	-0.40	2.35	0.00
32	3.60	4.89	0.10	3.24	0.36	-1.65	-30.20	0.91	-0.14	3.38	0.00
33	4.45	4.56	0.10	4.00	0.44	-0.55	-30.75	0.87	-0.04	4.05	0.00
34	3.95	3.95	0.10	3.56	0.40	-0.40	-31.15	0.84	-0.03	3.58	0.00
35	3.26	2.16	0.10	2.93	0.33	0.77	-23.50	1.61	0.77	2.16	0.00
36	1.47	2.12	0.10	1.32	0.15	-0.80	-24.30	1.50	-0.11	1.43	0.00
37	5.51	3.11	0.10	4.96	0.55	1.84	-14.93	3.35	1.84	3.11	0.00
38	2.60	2.27	0.10	2.34	0.26	0.07	-14.68	3.42	0.07	2.27	0.00
39	5.17	3.54	0.10	4.65	0.52	1.12	-11.37	4.54	1.12	3.54	0.00
40	6.74	3.96	0.10	6.07	0.67	2.10	-6.91	6.64	2.10	3.96	0.00
41	2.12	4.30	0.10	1.91	0.21	-2.39	-9.30	5.41	-1.23	3.14	0.00
42	6.44	4.77	0.10	5.80	0.64	1.03	-7.26	6.44	1.03	4.77	0.00
43	2.15	4.56	0.10	1.94	0.22	-2.62	-9.89	5.15	-1.30	3.23	0.00
44	1.03	5.52	0.10	0.93	0.10	-4.59	-14.48	3.48	-1.67	2.59	0.00
45	9.44	4.80	0.10	8.50	0.94	3.69	-6.01	7.17	3.69	4.80	0.00
46	10.17	4.25	0.10	9.15	1.02	4.90	0.00	12.00	4.83	4.25	0.08
47	2.40	2.60	0.10	2.16	0.24	-0.44	-0.44	11.53	-0.47	2.63	0.00
48	2.52	2.87	0.10	2.27	0.25	-0.60	-1.04	10.95	-0.58	2.85	0.00
49	4.66	1.75	0.10	4.19	0.47	2.44	0.00	12.00	1.05	1.75	1.39
50	0.13	3.00	0.10	0.12	0.01	-2.88	-2.88	9.36	-2.64	2.76	0.00
51	1.56	3.97	0.10	1.40	0.16	-2.57	-5.44	7.52	-1.84	3.24	0.00
52	1.76	5.22	0.10	1.58	0.18	-3.64	-9.08	5.51	-2.01	3.59	0.00
53	3.09	5.89	0.10	2.78	0.31	-3.11	-12.19	4.23	-1.28	4.06	0.00

Mike Nasi - Discussed during October 1996 meeting with David Wadsack, Dr. Mathewson, & RMT/JN, Kathleen Ken

PROPOSED APPROACH FOR TMPA CLOSURE PROJECT



NOTE: (shaded box) to be prepared by Dr. Mathewson

(unshaded box) to be prepared by RMT/JN

1 TNRCC may require engineering and hydrogeological studies or ecological risk assessment

to be performed prior to approval of RRS#3 closure plan or WQ permit.


LANDFILL LIMIT
SEDIMENTATION POND #1
SEDIMENTATION POND #2
SEDIMENTATION POND #3
SEDIMENTATION POND #4
SEDIMENTATION POND #5
1989
1988
1987
1986
1985
1985 / 1984
1985 / 1986
TO OCTOBER 1985
DRAINAGE CHANNEL
HWY 244
PLANT ACCESS ROAD
HAULROAD TO PLANT
N 379 000
N 378 000
N 377 000
N 376 000
E 3 331 000
E 3 332 000
E 3 333 000
E 3 334 000
E 3 335 000
N
NOTE :
REFERENCE FROM - SITE "A" LANDFILL FINAL GRADING PLAN, AND LEGEND, DWG. NO. F151L-L11 (CONVERSION SYSTEMS, INC. HORSHAM, PA.)
LEGEND :
EXISTING GROUND CONTOUR
PROPOSED ELEVATION
TOP OF PROPOSED SLOPE
TOE OF PROPOSED SLOPE
TRANSMISSION TOWER
OVERHEAD ELECTRIC - POST
OWNER: TEXAS MUNICIPAL POWER AGENCY
GIBBONS CREEK LIGNITE MINE
GRIMES COUNTY, TEXAS
OPERATOR: NAVASOTA MINING COMPANY
P.O. BOX EF
COLLEGE STATION, TEXAS 77840
MINING SEQUENCE 1986 - 1989
ASH DISPOSAL PLAN
1" 200'
NOV. 1985
1
NAVASOTA MINING CO.