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Final Consulting Engineer's Report: Investigation and Evaluation on the Feasibility of Wastewater Treatment and Disposal at the Proposed Green Acres Site

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TOWNSHIP OF BEDMINSTER
SOMERSET COUNTY, NEW JERSEY

FINAL
CONSULTING ENGINEER'S REPORT: Investigation and Evaluation on the Feasibility of Wastewater Treatment and Disposal at the Proposed Green Acres Site

October 1984

KUPPER ASSOCIATES

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15 Stelton Road, Piscataway, N.J. 08854 • (201) 752-5600

October 23, 1984

Township Committee
Township of Bedminster
Municipal Building
Hillside Avenue
Bedminster, New Jersey 07921

Attention: Mrs. Elizabeth Merck

Re: Final Consulting Engineer's Report: Investigation and Evaluation on the Possibility of Wastewater Treatment and Disposal at the proposed Green Acres Site

Gentlemen:

We have completed our investigation and evaluation of the possibility of employing onsite wastewater treatment and disposal at the proposed Green Acres Site, which included documents submitted since our September 28, 1984 report.

The information provided by the optionee is sketchy and does not provide relevant facts to justify an onsite treatment and disposal system.

On the contrary, we found that the proposed Green Acre site could not be developed using onsite treatment and disposal.

Our independent engineering efforts included review of optionee data, review of previous studies in the area, onsite field investigation, piezometric testing, soil and water sampling and laboratory analysis, and regulatory agency requirements review. This report replaces earlier dated revisions in their entirety.

We wish to thank John Cilo, John Hogan, and Fred Nance for their help in providing information and coordinating site access.

Very truly yours,

KUPPER ASSOCIATES

Harry S. Allen, P.E.
Consulting Engineer

HSA/ma
Enclosure

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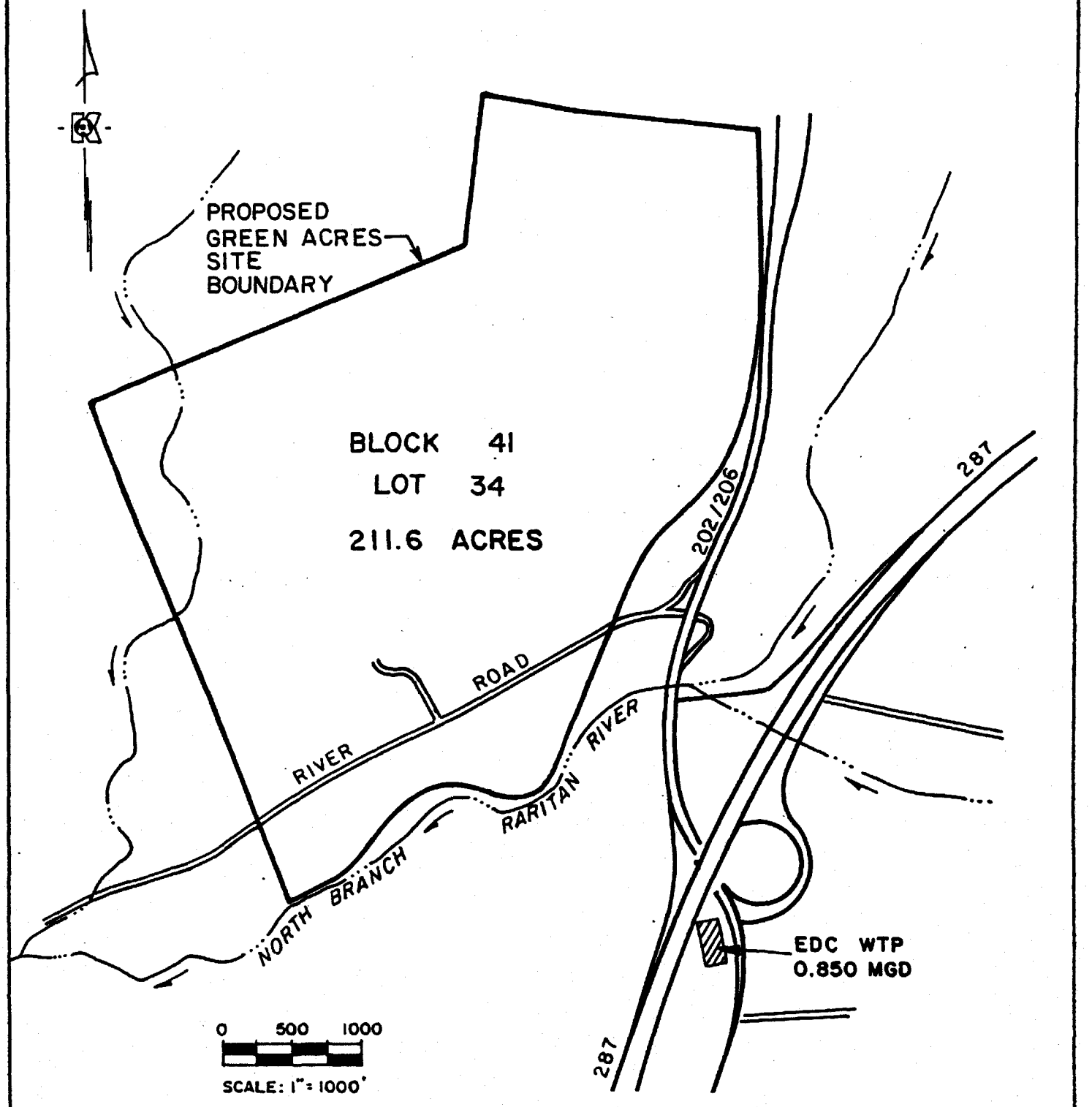
APPENDIX

1.0 Purpose

The purpose of our study was to investigate and evaluate proposals for onsite wastewater management facilities for the property referred to as the proposed Green Acres site situated on approximately 211 acres in the Township of Bedminster on the northwest corner of the intersections of River Road and Route 202/206 as shown on Figure 1.

These proposals have been put forth by the optionee of the proposed Green Acres site. The level of detail as submitted with the proposals lead numerous Township Officials to seriously suspect the possibility of building a treatment plant capable of functioning at all on the site, and that furthermore, additional engineering was required before decisions could be made concerning onsite solutions of wastewater treatment and disposal. In brief, the Optionee's proposal involves wastewater treatment employing in part rotating biological contactors with effluent disposal by means of subsurface infiltration and percolation. We have been requested by the Township of Bedminster to provide an independent review of the optionee's proposal with an evaluation and findings concerning the ability to provide for onsite wastewater management on the proposed Green Acres site.



WASTEWATER TREATMENT AND DISPOSAL AT THE PROPOSED GREEN ACRES SITE

BASE MAP

FIGURE 1

2.0 Procedures

The procedure that we have developed is patterned after our own investigations into the development of onsite systems for projects located throughout the State of New Jersey. The first step in developing a project, such as the proposed Green Acres site, is to determine the feasibility of either offsite or onsite wastewater management. The nature of the documents submitted by the Optionee presupposes that onsite wastewater management is preferable to offsite wastewater management. Accordingly, our investigation and evaluation is based upon the premise of onsite disposal.

Given the premise of onsite disposal, the Optionee has prepared planning, engineering and environmental documentation which has concluded that the use of a rotating biological contactor system with effluent disposal by subsurface infiltration/percolation would provide suitable disposal of wastewater. Our procedure will test this conclusion by the following procedure:

1. Review documents of records as indicated herein under Section 3, References, provided by the Optionee and the Township of Bedminster.
2. Perform additional field investigations as required, if it is found that the Optionee has not gathered sufficient site specific data.
3. If it is found that the treatment process is incapable of meeting regulatory agency effluent quality requirements, provide additional engineering to determine if it is possible to correct deficiencies in the proposed treatment process.

4. If it is found that the recommended subsurface infiltration/ percolation system cannot be installed to perform, given the exisiting site conditions, provide additional engineering to determine if it is possible for a subsurface infiltration/ percolation system to be modified to function or if is is possible for the existing site conditions to be adjusted to provide an effluent disposal system that complies with the regulatory agency groundwater discharge requirements.
5. Lastly, provide our findings on the developer's proposal, and the possibility of onsite wastewater management at the proposed Green Acres site.

3.0 REFERENCES

The proposed Green Acres site Optionee has had professionals prepare research documents in the areas of water resources consultation, architecture, landscape architecture, urban and ecological planning. Six of these references numbered 1, 2, 3, 4, 8 and 9 below were used as reference material in preparing this report.

Four other references numbered 5, 6, 7 and 10 below were prepared by professionals who considered the possibility of land application of effluents in areas on or near the proposed Green Acres site.

A reference inventory list is presented below followed by a brief summary highlighting the significance of each of the references:

REFERENCES INVENTORY

1. A letter report addressed to the Honorable Eugene D. Serpentelli prepared by Wallace, Roberts and Todd entitled "Dobb's Property Development as it Relates to Allan-Deane vs. Bedminster Township and Dobb's vs. Bedminster Township" dated February 7, 1984.
2. Addendum to Wallace, Roberts and Todd letter of February 7, 1984 prepared by Robert M. Hordon, Ph.D.
3. A preliminary report on sewer capacities in Bedminster Township, New Jersey prepared by Robert M. Hordon, Ph.D. dated March 27, 1984.
4. Memo to George Raymond of Raymond, Parish, Pine and Weiner from David A. Wallace of Wallace, Roberts and Todd, re: Allan-Deane (Hills) vs. Bedminster Township dated March 30, 1984.
5. Feasibility Study of Spray Irrigation of Sewage Effluents prepared for Johns-Manville Properties Corp. by William E. Sopper dated March 1977.
6. Sketch Plan of a Land Treatment Wastewater Management Alternative prepared by Scheaffer and Roland, Inc., Chicago, Illinois in June 1978.

7. Bedminster Township report addendum to a Sketch Plan of a Land Treatment Wastewater Management Alternative prepared by Schaeffer and Roland, Inc. dated September 8, 1978.

8. A report entitled "A Proposed Onsite Tertiary Wastewater Disposal System for the Dobbs Site in Bedminster, Somerset County, New Jersey" dated August 31, 1984 prepared by Robert M. Hordon.

9. A report entitled "Allan Deane vs. Bedminster Township" prepared for Leonard Dobbs by Wallace, Roberts and Todd dated September 1, 1984.

10. Extract from a planning report which includes a section entitled "Site Identification Map and Development Potential", prepared by Richard Coppola, dated September 5, 1984.

HIGHLIGHTS OF REFERENCES

1. Discussion: Reference 1 is in response to a January 26, 1984 conference with Judge Serpentelli, Wallace, Roberts and Todd prepared three separate scenarios for land use concept plans of the 211.6 acre property. All three scenarios were dependent upon a proposed tertiary sewage treatment plant which relied upon on-site subsurface sewage disposal fields. In brief Plan A proposed 960 dwelling units on 120 acres of the site. A sewage treatment plant would be located on the southeast corner of the property with a disposal field of approximately 12-18 acres situated on Birdsboro soils.

   Plan B provides for 1,160 dwelling units on 145 acres of developable land.

   Plan C is a mixed use alternative which provides for a 10-acre municipal complex, 50 acres of residential development encompassing 500 dwelling units and 85 acres of top quality office park. Net development 145 acres.

   Significance: Flow quantities and characteristics can be determined from the proposed land usage recommendations in each of the three scenarios.

2. Discussion: Reference 2 is the Robert M. Hordon addendum to the February 7 letter Reference 1 presents a discussion of the wastewater management treatment and effluent disposal proposals. The key to Dr. Hordon's concept is to employ an on-site tertiary sewage treatment plant with subsurface disposal. Dr. Hordon feels the advantages are in the form of effluent recharge to groundwater, only a 6-12 month time period to obtain a discharge permit and Dr. Hordon claims there is no odor from the plant. Dr. Hordon cites experience with five separate rotating biological disk systems at various locations in New Jersey.

Dr. Hordon claims that Birdsboro soils on site are suitable for subsurface effluent disposal and that Plans A, B and C from Reference 1 could be accommodated on 12-18 acres of land. Dr. Hordon concludes that it is possible to very quickly obtain a discharge permit and to provide for onsite wastewater disposal.

Significance: In general the addendum lacks the details supported by calculations used to arrive at the conclusions nor does it contain original field data to support the soil condition claims and the treatment plant capability claims. During the Kupper study additional engineering was performed in the following areas:

1. Considered the likelihood of a 6-12 month time frame to obtain a discharge permit.
2. Investigated the 100,000 gallon/day Passaic County treatment plant.
3. Evaluated the rotating biological disk system as a part of a secondary treatment and nitrification processing unit.

4. Investigated the relevance of the four rotating biological disk systems located in Hudson County, Mercer County, Morris County and Camden County.

5. Performed a field soil sampling and developed a soils analysis including test pits, laboratory soils analysis, laboratory groundwater analysis, percolation tests and installation of semi-permanent piezometers.

6. Utilized field information to determine actual field types and field capabilities and performed calculations for disposal field requirements.

7. Rigorously evaluated the claim that wastewater disposal at the proposed Green Acres site can be handled by tertiary treatment followed by subsurface land disposal.

8. Commented on Dr. Hordon's claim that no odors would be generated at the treatment plant.

3. Discussion: Reference 3 is a report by Dr. Hordon which comments on the capabilities and requirements placed upon the Environmental Disposal Corporation treatment plant and the Bedminster Township treatment plant. In the first section of the report it is mentioned that the present capacity of 850,000 gallons/day of the Environmental Disposal Corporation treatment plant will be exceeded by development of Parcels H, I, J, K, L, M and N which could require as much as 916,560 gallons/day of capacity. Dr. Hordon goes on to state that the EDC treatment plant employs state-of-the-art technology which requires that the efficacy be established by operating experience before an expansion be undertaken. Furthermore, obtaining the operation data, gaining the approvals and permits could take as long as 10 years.

By Dr. Hordon's assessment the Bedminster treatment plant capacity is 203,750 gallons/day which is allocated between AT&T, Far Hills and Bedminster. Some maximum, minimum and average flow values are presented along with comments on excessive infiltration in Far Hills and an additional 48,240 gallons/day from Parcels C and D in a proposed development suggested by town planner, Mr. Coppola. In aggregate Dr. Hordon claims flows will exceed the capacity of the plant. It is not clear upon reviewing the figures as to why this claim was made.

Lastly, Dr. Hordon returns to the theme of on-site treatment at the proposed Green Acres site where he restates the advantages found in the addendum to Reference 2 such as benefits of effluent recharge to groundwater, a 6-12 month lead time to obtain a permit, and no odors. The report concludes that the EDC plant does not have sufficient capacity to treat proposed flows, the Bernards portion of the Hills Development is ignored relative to EDC capacity requirements and the Bedminster plant requires expansion before Parcels C and D can be developed.

Significance: A careful and more rigorous flow projection development is needed to substantiate the claims concerning the capacity requirements of the Environmental Disposal Corporation treatment plant and the Township of Bedminster municipal treatment plant.

4. Discussion: Reference 4 provides information and assessment on the capability of sites identified by Mr. Coppola lettered C, D, H, I, J, K, L, M and N to meet Bedminster's fair share obligations.

The report provides overall comments which are heavily dependent upon inadequate sewer capacity (Note: I believe Wallace, Roberts and Todd mean sewerage capacity in that a sewer is a conduit which has heretofore not been referenced by either Wallace, Roberts and Todd or Dr. Hordon.) and is generally critical of the ability of the proposed sites to meet fair share obligations on the basis of the previously mentioned sewerage capacity, overzoning, noise levels, excessive densities, inflated costs for selected users and delayed development. The report summarizes that Bedminster will not be able to achieve fair share housing obligations from sites C through N. The report also concludes that the Green Acres site is ready, willing and able to provide the fair share housing obligations.

Specific site problems are as follows:

Site C - Infiltration problems in Bedminster preclude development.

Site D - Infiltration problems in Bedminster preclude development.

Site H - The Upper Raritan Watershed Wastewater Facilties Plan excludes Site H from the EDC service area.

Site I - Noise problems and a long lead time for site acquisition.

Site J - Acquisition problems will delay development until after 1990.

Site K - No controversy.

Site L - Inadequate sewerage capacity.

Site M - Access problems.

Site N - Surrounding land uses preclude residential usage.

Significance: Most of the issues in this report address non-sewerage capacity problems. It would be necessary to verify the sewerage capacity claims which will be done relative to Reference 3 above. Original work will be performed to evaluate the service area as covered by the Upper Raritan Watershed Wastewater Facilities Plan.

5. Discussion: Reference 5 provides a Feasibility Study to evaluate the potential for spray irrigation, disposal of treated effluent from the Allan-Deane Corporation properties amounting to 1.185 million gallons/day. Two alternative spray irrigation sites were evaluated, each located east of Route 287 and north of Route 78. The evaluations used historical data supplemented by field testing.

Based upon the site characteristics the wastewater quantity and quality was considered in developing application rates and limiting characteristics of the site such as nitrogen and phosphorous.

Public health aspects, system performance and system management considerations were presented.

Significance: Spray irrigation systems require greater land areas than infiltration, percolation systems and most likely serves as the reason why it was not considered for use on the proposed Green Acres site. This document will be used as a reference document in the event spray irrigation comes under consideration for that site.

6. Discussion: Reference 6 as its name "Sketch Plan" implies is a mini-feasibility study presented in five parts as follows:

1. Proposed Development gives environmental and physical data surrounding the Bedminster area.

2. Resource management opportunities discuss water and land use issues.

3. Discusses advanced wastewater treatment plant techniques.

4. Describes land treatment alternatives presenting flow quantities, design parameters and land treatment component considerations.

5. Costs of alternative systems are presented.

Advanced waste effluent discharges are suggested for disposal by means of land treatment. The report describes the different process units of the actual treatment process followed by irrigation techniques. A cost section is presented that quantifies the land treatment alternative and presents capital and operating and maintenance costs.

Significance: This report identifies the proposed Green Acres site as a potential site for effluent spray irrigation; however, inasmuch as the report is 6 years old and lacks site specific field investigation data, this report is of interest only.

7. Discussion: Reference 7 expands upon the Reference 6 Sketch Plan by presenting a site specific land treatment scheme on the Stevenson Farm. This site is located south of Route 78 and west of Route 287. A soils and geology discussion is presented, however, it appears to have been developed from historical data with little or no site specific field testing. A facultative lagoon process employing polishing lagoons and chlorination is utilizied. The Stevenson site irrigation system is then sized to accommodate the treated effluent given the existing site conditions.

It is important to note than an on-site alternative for treatment and disposal is also considered but is dismissed due to poor design conditions. The costs for an 804,000 gallons/day design flow treatment system is presented with a recommendation that the design system is economically viable for the Allan-Deane project.

Significance: This report is useful as a background document in the event that the Green Acres site Optionee elects to consider land treatment. However, the absence of site specific field data limits the usefulness of this document.

8. Discussion: Reference 8 is an expansion of earlier references 2 and 3. Little new material is presented on the wastewater treatment process. The subsurface disposal design assumptions are given and a sizing design computation is made.

   Significance: The error in relying entirely upon theoretical values without the benefit of field data is demonstrated. Dr. Hordon uses a groundwater depth assumption of greater than four feet, whereas Reference 9, as we shall see, uses a groundwater depth of 0 to 3 feet for the same soil. The two conditions are not possible.

   Without field data, the report adds no further justification to the onsite wastewater disposal proposal.

9. Discussion: Reference 9 presents an update of Bedminster Treatment Plant requirements and soils data on the proposed Green Acre site".

   Significance: On page 59, Wallace, Roberts and Todd contradict Dr. Hordon on depth to ground water (0 to 3 feet). The WRT interpretation would rule out the Dr. Hordon scheme.

10. Discussion: Reference 10 is a clarification of the March 21, 1984 Land Use and Mount Laurel II compliance package.

Significance: Presents discussions for future development of land parcels associated with the proposed Green Acres site, the Route 202/206 corridor, and the Village area of Bedminster. Expansion needs of the Bedminster Wastewater Treatment Plant can be established from the zoning proposal.

4.0 CRITIQUE OF TREATMENT

4.1 Discussion of Wastewater Treatment

Based on the Optionee's proposed land use plans, average wastewater flow is projected to be 278,400 gallons per day (gpd) of sanitary sewage composition (non-industrial). Dr. Hordon's reports include only generalized descriptions of the proposed wastewater treatment system. It is proposed, however, that wastewater disposal will be accommodated by an onsite tertiary treatment plant with a subsurface effluent disposal system. A reference was given for a similar system in Passaic County, in which, the plant employs primary settling, secondary rotating biological contactors, and tertiary denitrification treatment units. Similarly, the Optionee's plant is supposed to remove solids and organic carbonaceous and nitrogenous materials. The proposal, at this stage, lacks the necessary engineering details, and the expected overall effluent quality is not given.

In general, the Optionee's proposal should function as follows: A primary settling tank separates settleable solids and floatable solids from the sewage by gravity. Solids are collected and transferred to the sludge handling facility for further treatment. In general, sewage odor is emitted from the primary treatment unit, and its intensity is dependent upon the degree of septicity of incoming sewage. Dr. Hordon's reports do not mention any provision for odor control at the plant, but did claim an odorless system.

The proposed rotating biological disk system (RBC) is a secondary treatment unit, in which, an aerobic condition is maintained thus a less significant sewage odor is emitted into the atmosphere. The principal of the rotating biological disk system is an attached growth biological treatment system where organic materials in the sewage is biologically oxidized or

synthesized into cell mass. The system utilizes a tank and a series of partially submerged, closely spaced disks fixed to a common shaft. The disks are slowly rotated by a drive unit causing the biomass attached on the disk surfaces to come into contact alternately with the sewage and the atmosphere. A properly designed and operational RBC system can provide the equivalent of a secondary treatment such as the activated sludge process.

The system can also be designed to achieve nitrification of ammonia and organic nitrogen compounds into nitrate-nitrogen. The excess biomass produced in the process is removed from the sewage at the secondary clarifier and transferred to the sludge treatment unit.

The RBC system has been in use for wastewater treatment in this country and Europe for more than 10 years. Both the USEPA and NJDEP consider that the RBC system is an an acceptable alternative to the conventional activated sludge system trickling filter or oxidation pond. Therefore, our review emphasis will be on the adequacy of capacity of the proposed design, the reliability and flexibility of the system during emergency conditions, and the provision for satisfactory operation and maintenance of the facilities, and most critically, the constraints of effluent disposal site.

The Proposal did not address the method of effluent disinfection, but we assume that a means for effluent disinfection to meet the requirements of regulatory agencies will be included in the final design. Also, the proposal did not mention phosphorus removal at the proposed pre-treatment facilities, nor is the expected effluent quality given. We assume that phosphorus removal at the plant is not contemplated, but the capacity of soil for phosphorus fixation will be utilized for removing phosphorus compounds from the effluent. If the soils of the proposed effluent disposal site is of suitable physical and

chemical characteristics, and the depth to groundwater is of sufficient distance, a properly designed and operated effluent land application system can attain a high degree of phosphorus removal, on the order of 70 to 99%, by the soil.

We have inquired of the New Jersey Department of Environmental Protection, Bureau of Groundwater Discharge Permits for information concerning the referenced similar system in Passaic County. We were informed that the system is located at Bald Eagle Development in West Milford Township. The system includes a tertiary wastewater treatment facilities of 100,000 gpd capacity and a subsurface effluent disposal field similar in design to a septic tank system disposal field. We have also contacted the engineer for the West Milford Township Sewerage Authority regarding the status of the construction, and we found that the construction of the wastewater treatment facilities have been substantially completed.

Another Dr. Hordon reference to a major treatment plant using the rotating biological disk system is the North Bergen Township Central Treatment Plant in Hudson County. The plant is a 10 mgd secondary treatment plant, employs roto-strainers, rotating biological disks and Lamella gravity settlers. The rotating biological disks have been in operation for about three years at this plant. The plant is designed to meet the effluent limitations for a secondary treatment plant.

4.2 Summary

Although Dr. Hordon's process system description is vague and sketchy, it is possible to design a process system around Dr. Hordon's main units the

the RBC's. Nevertheless, before a meaningful review of Dr. Hordon's proposal could be carried forward, a substantial amount of engineering effort would be required to determine:

- all process systems to be used;
- operational parameters;
- reliability;
- staffing; and,
- testing and analysis.

5.0 CRITIQUE OF EFFLUENT DISPOSAL

5.1 Discussion of Proposed Effluent Disposal

Effluent is proposed to be disposed of onsite by means of a subsurface disposal field on 13.4 acres. The proposed design of the disposal field will be similar to a septic tank system effluent disposal field. It is intended that the effluent will be disposed in the areas overlayed by Birdsboro soils. The report does not include important site specific field gathered information relative to soil, permeability, depth to groundwater, quality and hydrology of groundwater. Site specific soil investigations and percolation tests have not been reported by the Optionee.

As presented in the Reference Document No. 6 "A sketch plan of a land treatment wastewater management alternative", the proposed Green Acres (Old Polo Grounds) had been considered for effluent disposal by spray irrigation previously by Allan-Deane Corporation. It was determined, at the feasibility evaluation level, that the site is suitable for effluent spray irrigation. It appears that only a very limited existing soil information from soil survey of Somerset County was used in their evaluation and no site specific soil investigation was conducted. Thus, this was only a very preliminary evaluation. Two other evaluated locations were considered suitable for effluent spray irrigation by the Allan-Deane Corporation. One was located east of Route 287 in the Allan-Deane Development as presented in the reference document No. 5, and the second Stevenson Farm site, was located south of the proposed Green Acres site as presented in the Reference Document No. 7.

Effluent disposal on the land by spray irrigation differs in design and operation from a subsurface percolation system. Spray irrigation systems utilize larger land area, and are usually designed to operate in conjunction with a crop management plan. The criteria for site evaluation are also different.

The mechanisms of removal of wastewater constituents for both spray irrigation and subsurface disposal systems are generally the same except that the effect of crop uptakes is not associated with a subsurface disposal system. When the effluent percolates through the soil, additional removal of wastewater constituents can be attained by crop uptakes and by physical, chemical and biological processes taking place in the soil. Suspended solids and organics are removed from the effluent by straining, sedimentation, and adsorption. Volatile organics are further reduced by biological oxidation. Microorganisms are removed by the mechanisms of straining, predation, and die-off in the hostile environments. Heavy metals are retained in the soil by physical adsorption, chemical precipitation and ion exchange. Nitrogen removals are dependent upon factors of crop management, disposal system design and operating procedures. Nitrification and ammonium retention by soil's cation exchange capacity are generally excellent, but the degree of denitrification is generally poor. Therefore, nitrate concentration of the percolate usually is a limiting factor in the design of an effluent disposal system and the pretreatment facility.

Soluble phosphorus compounds can be retained in the soil by the processes of physical adsorption on the surfaces of soil particles and chemical precipitation and retention. The degree of phosphorus removal is site specific and depends on the properties of soil, such as, particle sizes, depth of soil. pH, and phosphorus adsorption capacity. The depth to groundwater is important since the long-term capacity for phosphorus removal of a disposal site depends on the total mass of soil of the disposal site.

In order to determine the suitability of the site for effluent disposal, Kupper Associates, in cooperation with Mr. John Cilo, Township Engineer, has conducted a test pitting program in the immediate vicinity of the proposed effluent disposal field. We have retained Melick & Tully and Associates as our

Soils Consultant field investigator to conduct subsurface investigation, percolation tests, sieve analysis and laboratory testing of soil samples for the parameters required by the NJDEP. Groundwater samples were analyzed by the New Jersey Testing Laboratory to determine the ambient groundwater quality. We have also retained S&D Engineering Services, Inc. to provide consultation services in the areas of groundwater hydrology and the environmental impact of effluent discharge on the groundwater quality. Appendix A presents the record of the field program. The NJDEP requires that the septic tank subsurface disposal field be constructed in areas where the seasonally high groundwater table or the bedrock be at least four feet below the bottom of the disposal bed, and the percolation rate of the soils shall range from 1 to 20 inches per hour.

Dr. Hordon's August 31, 1984 report presented an expanded version of soil data from earlier reports. Unfortunately, field gathered site specific data is still missing and has lead Dr. Hordon to unsupported favorable conclusions. Conclusions which our field data cannot support.

By not performing field investigations, serious errors have arisen in the optionee's proposal. Dr. Hordon's report of August 31, 1984 indicates that Birdsboro soils at the site have a depth to the seasonally high groundwater table of greater than four feet based upon generalized soil information from SCS maps. The ensuing design is based upon the generalized SCS data. The Wallace, Roberts and Todd Report on page 59 indicates the water table depth to be 0-3 feet, a conclusion undoubtedly based upon WRT interpretation of some existing data base such as SCS. Our field grab sample (see Section 5.2) indicates the depth to groundwater 2.6 feet on July 11, 1984. The obvious conclusion is that the designer (Dr. Hordon), did not use the optionee's expert (WRT) interpretation nor perform a field program to initiate the design of a system.

The New Jersey Department of Environmental Protection standard requires that the depth to the maximum groundwater table be four feet or more below the bottom of the disposal bed. Using a minimum disposal bed cover of 1-1/2 feet and 1/2 foot diameter pipe in the disposal field translates to a 6 feet requirement to the groundwater depth (4 + 1-1/2 + 1/2 = 6) below the ground surface.

The Dr. Hordon design does not meet the groundwater depth requirement; the WRT interpretation of the groundwater depth does not satisfy the DEP requirement, and our field grab sample does not satisfy the DEP groundwater depth requirement. We can find no evidence that the site can be used for subsurface disposal based upon groundwater depth.

Furthermore, Dr. Hordon's August 31, 1984 report presents Birdsboro soil ranges of percolation rates on Table 2, page 16. A range of 10-45 minutes per inch is shown. By using 45 minutes per inch, Dr. Hordon suggests 13.4 acres of disposal area as a design size (a lesser rate would reduce the acreage needed for the project). Our field grab samples (see Section 5.2), were taken in a Birdsboro soil and a non-Birdsboro soil with percolation rates of 67 minutes per inch and 420 minutes per inch, respectively. The State will not permit the installation of a subsurface disposal field in such poorly draining soils. (The State limit is 60 minutes per inch. When a percolation rate is over 60 minutes per inch, it is considered not acceptable. Whereas, when the percolation rate is under three minutes per inch, additional justification must be given before approval can be granted.) Dr. Hordon's apparent reliance on expected values has led to false conclusions. We can find no evidence that the site can be used for subsurface disposal of effluents based upon either percolation rates or depth to groundwater.

5.2 Results of Bedminster's Field Testing Program

Results of the field investigation indicate that the site has a high groundwater table and perched groundwater, and a shallow depth to the bedrock. The soils appear to have a low permeability. Appendix A contains the results of the field and testing program.

On June 27, 1984, Vlad Neoushoff of Kupper was accompanied by Tod Horowitz of Melick-Tully Associates to the project site. A backhoe operator and machinery were provided by the Township of Bedminster. Six test pits were dug as shown on the attached Figure 2. All pits were logged. Two soil samples and one water sample were collected for chemical testing. One temporary piezometer was set.

Initially, access to the site itself was not available so test pitting was confined to areas immediately adjacent to but outside of the property in question. Shortly after midday, however, the field party was informed that permission to enter the site had been obtained. Upon receiving this information, the field party entered the site and dug test pits. Much of the site was recently cultivated so test pitting was confined to the edges of cultivated fields.

Test Pit No. 1 was dug on the York property about midway up from River Road on the southwest property line of the project site. The soils at this location are mapped as Raritan on the Soil Conservation Service (SCS) maps. A soil sample for chemical analysis was taken here, and a temporary casing installed for water level recording.

Test Pits 2 and 3 were dug along River Road close to the interface between the Raritan and Birdsboro soils. Water samples were taken at Test Pit 3. A soil sample was taken from Test Pit 3 for chemical analysis. A percolation test was also conducted in the vicinity of Test Pit No. 3.

Test Pits 4, 5 and 6 were dug around cultivated areas in the southwesterly portion of the site. All of these test pits were located in the Raritan soils. A percolation test was conducted at Test Pit No. 5.

The preliminary soil logs of the test pits are bound in the Appendix.

5.3 Summary

A very large question was not answered by the Optionee as to the acceptability of onsite subsurface effluent disposal. The depth of the Optionee's investigations is not sufficient upon which to base an effective design or to determine if onsite disposal is feasible for 300,000 gpd. Our investigations find the site totally unsuitable for the proposed onsite subsurface disposal of effluents. Furthermore, the portion of the site where the depth to groundwater is less than five feet is also considered not acceptable for spray irrigation.

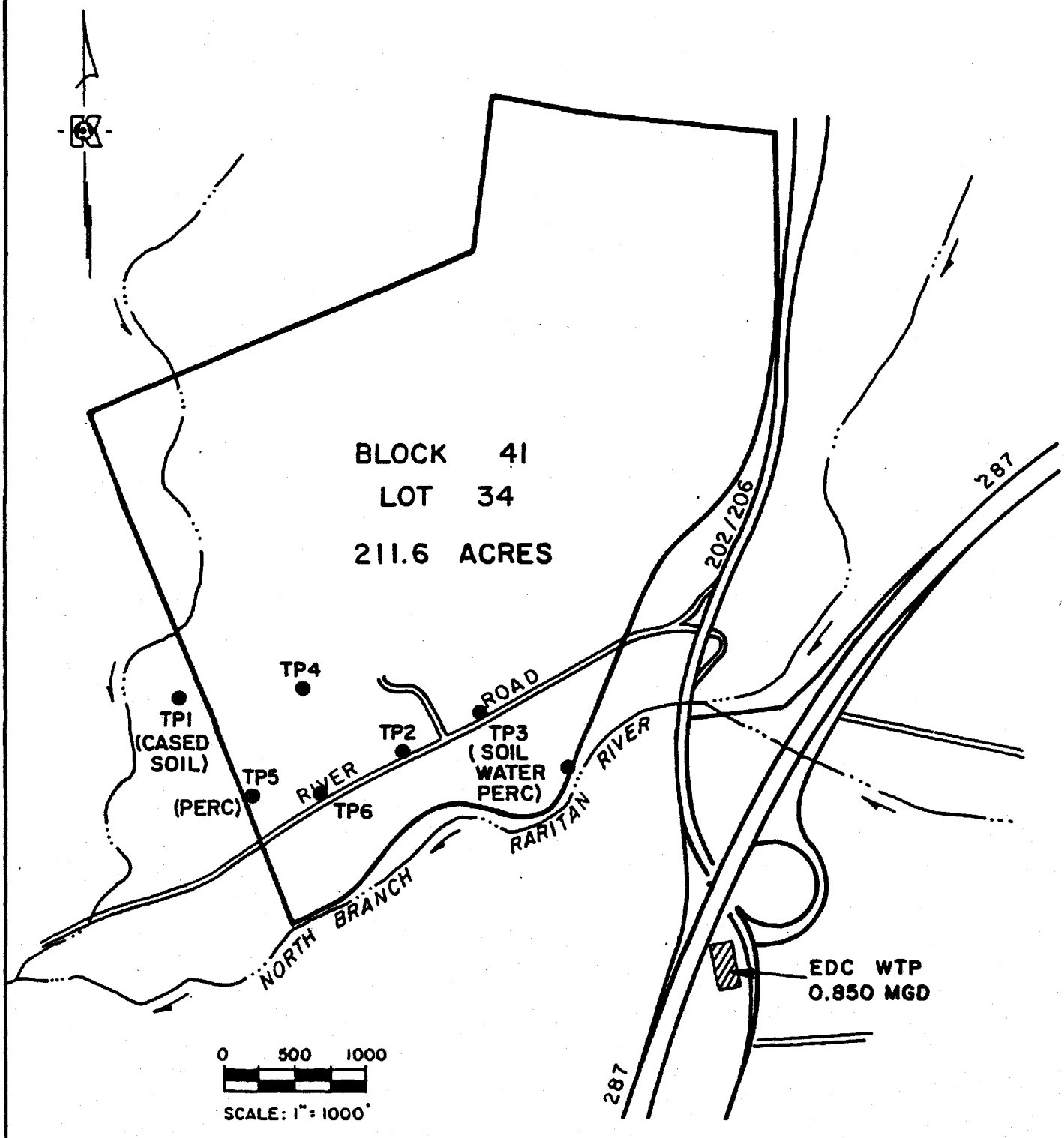
Furthermore, the developer's time table to obtain NJDEP approval of the proposed effluent disposal scheme is unrealistic. At a minimum, the following work tasks and time periods should be considered.

IMPLEMENTATION TIME SCHEDULE

	WORK TASK	TASK TIME PERIOD/ MONTHS	CUMULATIVE TIME MONTHS	
1.	Developer Concurrence with Initial Reports	0	0	
2.	Develop Feasibility Study Proposal	1	1	
3.	NJDEP Review	2	3	
4.	Field Work	1	4	
5.	Laboratory Testing and Analysis	2	6	
6.	Feasbility Report	1	7	No Go
7.	Review by NJDEP	3	10	Go
8.	Revisions	2	12	
9.	Review by NJDEP	3	15	No Go
10.	Preliminary Engineering	2	17	Go
11.	Review by NJDEP	6	23	
12.	Revisions to Preliminary Engineering	2	24	
13.	Review by NJDEP	3	27	
14.	Final Design	4	31	
15.	Review by NJDEP	6	37	No Go
16.	Public Hearing	3	40	Go No Go
17.	Issue Permit to Construct and Operate	3	43	Go
18.	Construction	18	61	
19.	Start-Up	3	64	
-	Slippage	50%	96	Operation

The above time schedule shows that 64 months, about 5-1/2 years, will be required and slippage could delay the project to 96 months, 8 years.

A related and very important time factor concerns the additional delays that would occur should parallel submissions go forward to NJDEP: one from EDC and one from the optionee. The 201 Facilities Plan approved by the NJDEP, which is the controlling wastewater management planning document in Bedminster, provides for a Bedminster WTP and an EDC WTP. By adding a third WTP in the planning area, the 201 Facilities Plan would require restudying, reevaluating, new public hearings and reapproval before constuction could begin. The optionee's project would be delayed and so also delay progress on EDC expansion permit. Assuming the optionee's WTP could be accommodated as a third WTP in Bedminster, the 201 Facilities Plan review process could easily take 2-3 years.



WASTEWATER TREATMENT AND DISPOSAL AT THE PROPOSED GREEN ACRES SITE

TEST PIT LOCATION MAP

FIGURE 2

6.0 CRITIQUE OF EXPANDING THE BEDMINSTER TREATMENT PLANT

6.1 Bedminster Plant Flows

The impact of anticipated flows upon the Bedminster Treatment Plant will be to either (1) require improvements to increase treatment plant capacity or (2) place a limitation upon growth to prevent flows from exceeding the present plant capacity.

We will first develop anticipated flows without restrictions; this will determine if the present capacity is sufficient. Second, we will evaluate the possibility of expanding the system if the present capacity is insufficient.

Bedminster has commitments with AT&T and the community of Far Hills to accept 100,000 gallons per day and 35,000 gallons per day respectively. Actual flows from AT&T during a typical week are approximately 528,000 gallons. Consequently, the average seven day daily flow is 75,400 gallons. However, a five day per week operation means that the waste treatment plant experiences 105,600 gallons per day five days per week and 0 gallons two days per week. Moreover, Far Hills delivers an average flow of 45,300 gallons per day seven days per week.

Bedminster's share of the plant flow is estimated to be 33,900 gallons per day seven days per week.

The table below summarizes present plant flow requirements:

PRESENT PLANT FLOW REQUIREMENTS

	AVERAGE FLOWS IN GALLONS PER DAY						
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
AT&T	105,600	105,600	105,600	105,600	105,600	0	0
Far Hills	45,300	45,300	45,300	45,300	45,300	45,300	45,300
Bedminster	33,900	33,900	33,900	33,900	33,900	33,900	33,900
Totals	184,800	184,800	184,800	184,800	184,800	79,200	79,200

The above flow conditions dictate that treatment plant design be based upon weekday flows.

Current planning indicates that anticipated growth in the Bedminster service area will occur in parcels known as C and D. The Town Planner, Richard Coppola has suggested the construction of 201 new units each having a flow contribution of 240 gallons per unit per day. A resulting anticipated flow of about 48,200 gallons per day is calculated (201 x 240 = 48,240)

The table below summarizes total anticipated flow requirements.

ANTICIPATED PLANT FLOW REQUIREMENTS

	WEEKDAY (5 DAYS)	WEEKEND (2 DAYS)
AT&T	105,600	0
Far Hills	45,300*	45,300
Bedminster Existing Connections	33,900	33,900
Bedminster Sites C&D Projected	48,200	48,200
	233,200	127,400

*Far Hills has a system leakage correction program which may abate the 45,300 gallons per day to the agreed upon flow of 35,000 gallons per day.

In summary, the Bedminster Plant will require a weekday capacity of at least 233,000 gallons per day to process anticipated flows. In recognition of the fact that plant capacity is only 203,750 gallons per day, a capital improvement expansion program will be required to permit the anticipated growth.

The next section will examine the possibility of expanding the plant in lieu of limiting growth to a total flow of 203,750 gallons per day.

6.2 Bedminster Treatment Plant Expansion

The existing Bedminster Wastewater Treatment Plant has a design capacity of 203,750 gallons per day (gpd) as shown on the schematic of wastewater flow Figure 3. Plant flow records discussed previously reveal that the present average weekday flow is almost 185,000 gpd, and the average weekend flow is almost 80,000 gpd. The difference in flow during weekday and weekend is due to five day work week schedule at the AT&T. In accordance with the 201 Upper Raritan Watershed Wastewater Facilities Plan, the existing Bedminster Wastewater Treatment Plant will need to be expanded to a capacity of 254,000 gpd in the future in order to serve its designated service area.

Assuming a weekend/weekday difference in flow will remain the same in the future, and if the weekday average influent flow increases from 185,000 to 254,000 gpd, the weekend flow will increase from the current average of 80,000 to 149,000 gpd. The annual average flow will be 224,000 gpd, about 10% above the plant design capacity.

If a total of 120,000 gallons of equalization capacity is made available at the plant by utilizing the existing chemical sludge storage tank, the influent flow can be equalized to an average flow of 230,000 gpd as shown on Figure 4 entitled "Equalization".

If tube or plate settlers are added to the existing secondary and tertiary clarifiers, it is possible that these clarifiers can handle an average flow of 230,000 gpd.

It should be noted that increasing the design plan to 254,000 gpd will affect other treatment plant components which may not have adequate capacities to handle the increased sewage flow. Additional engineering information and analysis will be required to determine the adequacy of the aeration tank and

air blowers chlorine contact tank and chlorination equipment, denitrification reactor, and sand filters.

By way of illustration, the possible need for additional treatment units may be observed by reviewing the existing aeration tank design which provides a detention time of 24 hours based on design flow of 203,750 gpd excluding return sludge flow. If the sewage flow increases to 230,000 gpd, the average detention time in aeration system will decrease to 21.3 hours, and the capacity of the aeration system, especially for nitrification, will require system enhancement.

In summary, it is consistent with the 201 Facilities Plan and appears cost effective to expand the plant to at least 254,000 gallons per day (weekdays) and 230,000 gallons per day (seven day week average) by making process modifications to the existing facilities. Additional engineering is required for all of the process systems to establish improvement requirements. Implementation of existing plant expansion generally can be accomplished in a shorter time than that of a new system.

Expanding the plant will enable the proposed development at sites C and D to discharge sewage of approximately 48,200 gallons per day to the Bedminster Plant.

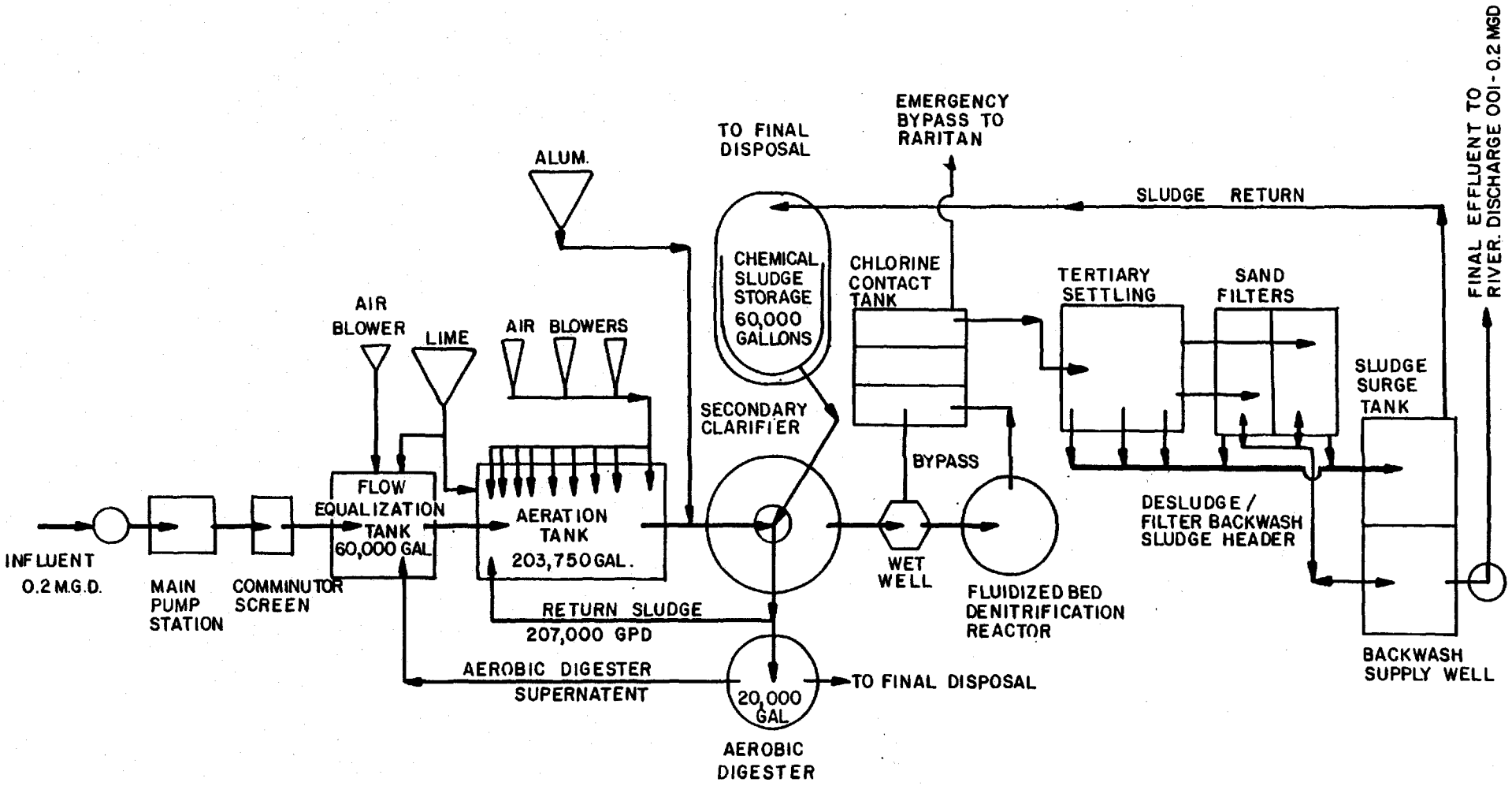


FIGURE 3

SCHEMATIC OF WASTEWATER FLOW
BEDMINSTER SEWAGE TREATMENT WORKS
BEDMINSTER, NEW JERSEY
DISCHARGE SERIAL NO. 001

AUGUST 1981
REVISED MAY 1984

SOURCE: JOHN HOGAN, TREATMENT PLANT OPERATOR

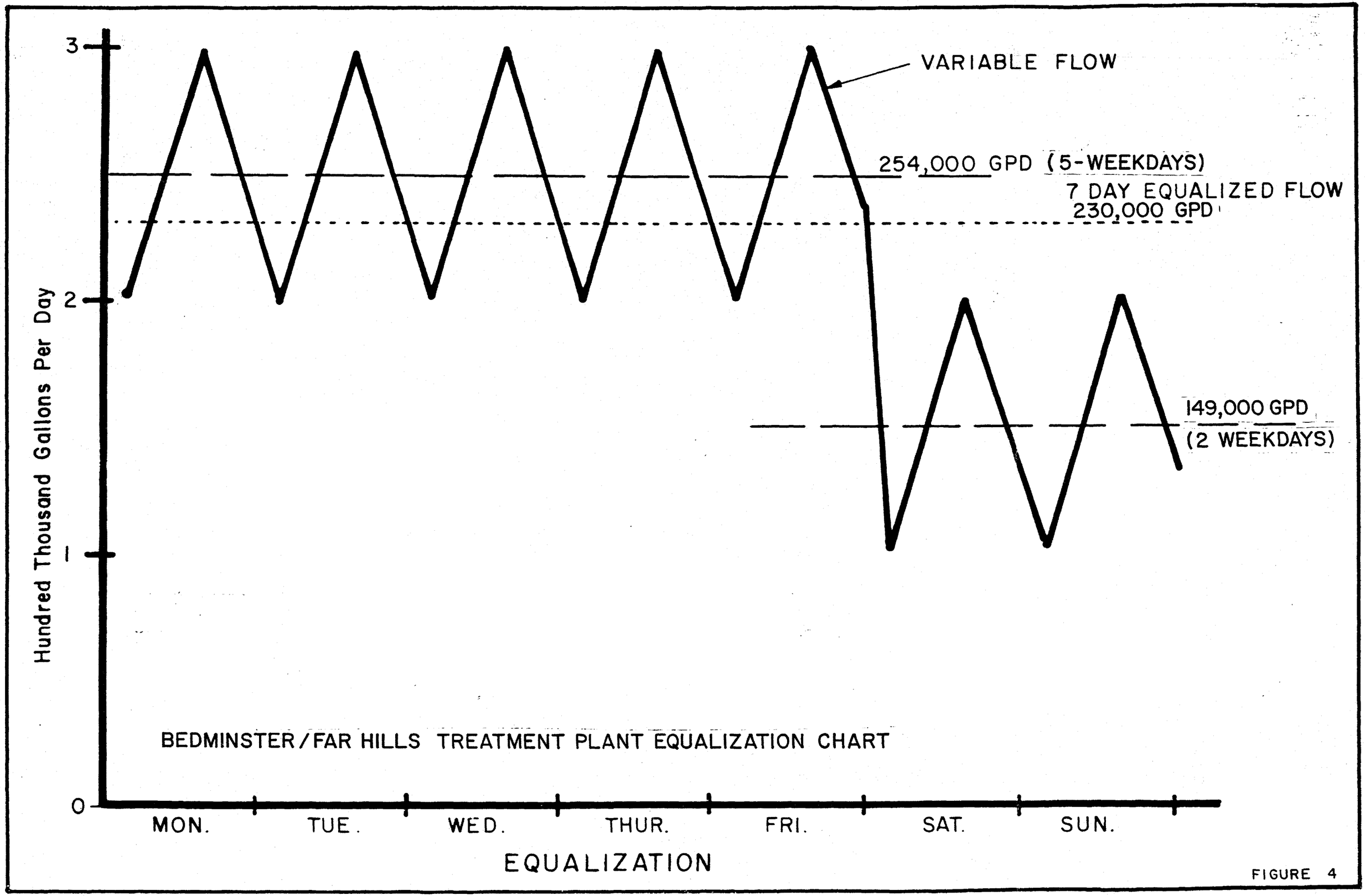

3
2
1
0
Hundred Thousand Gallons Per Day
VARIABLE FLOW
254,000 GPD (5-WEEKDAYS)
7 DAY EQUALIZED FLOW
230,000 GPD
149,000 GPD
(2 WEEKDAYS)
BEDMINSTER/FAR HILLS TREATMENT PLANT EQUALIZATION CHART
MON.
TUE.
WED.
THUR.
FRI.
SAT.
SUN.
EQUALIZATION

FIGURE 4

7.0 SUMMARY OF FINDINGS AND CONCLUSIONS

1. The Optionee has not demonstrated the acceptability of his proposed treatment/effluent disposal system on the proposed Green Acres site. Field work, laboratory testing, data analysis and system design is necessary and has not been performed.

3. Field testing by Kupper discloses a very high groundwater table, very shallow depth to rock, and a very tight low permeable soil in the area of the proposed subsurface effluent disposal field. These findings indicate the optionee's proposal is not feasible.

4. The time for proposal implementation if it were possible, would take between 5-1/2 to 8 years.

5. The Bedminster Municipal Plant may be increased in capacity by as much as 50,000 gallons per day by minor plant modifications involving equalization of weekdays and weekend flows and related process systems enlargements.

CONCLUSION

It is not possible to provide an acceptable onsite treatment plant. Any attempt to build and operate an RBC treatment plant with subsurface disposal will lead to a violation of NJDEP groundwater discharge criteria.

APPENDIX A

Subsurface Investigation Data

- Test Pit Location Sketch - 1 page
- New Jersey Laboratories: Soil Samples Report - 1 page
- New Jersey Laboratories: Report on Water Samples - 2 pages
- Logs of Test Pits by Melick & Tully - 6 pages
- Percolation Test Results by Melick & Tully - 1 page
- Field logging of test pits by Melick & Tully with water levels and elevations by Kupper Associates - 6 pages


TP-1
TP-4
TP-3
TP-5
TP-2
TP-6
RIVER ROAD

NEW JERSEY LABORATORIES

222-226 EASTON AVENUE
P. O. BOX 748
NEW BRUNSWICK, NEW JERSEY 08903
TELEPHONE: (201) 249-0148

ANALYTICAL TESTING
SINCE 1939

Divisions:
NEW JERSEY DAIRY LABORATORIES
PHARMETICS LABORATORY

July 9, 1984

MELICK-TULLY ASSOC.
10 Cherry Street
South Bound Brook, N.J. 08880

Samples Submitted: June 27, 1984

Sample Identifications: 1. Soil Sample - TP-1 4 1/2'
2. Soil Sample - TP-3 7 1/2'

RESULTS

	Sample 1.	Sample 2.
pH	6.7	7.5
Conductivity	80 micromhos/cm	42 micromhos/cm
Total Organic Carbon	8.4 ppm	0.8 ppm
Total Nitrogen	24.5 ppm	0.7 ppm

NEW JERSEY LABORATORIES

Report No's 6738, 6739

NEW JERSEY LABORATORIES

222-226 EASTON AVENUE 201 249-0148

P O BOX 748 NEW BRUNSWICK, N. J. 08903

NALYTICAL TESTING
SINCE 1939

REPORT ON WATER SAMPLES

Divisions:
NEW JERSEY DAIRY LABORATORIES
PHARMETICS LABORATORY

MELLICK-TULLY ASSOC.
10 Cherry Street
South Bound Brook, N.J. 08880

DATE July 16, 1984 NO. 6737

COPY

IDENTIFICATIONS:

Ground Water Sample

SAMPLES:

Received on:	Delivered by:	Refrigerated:	Taken by:	On:	Refrigerated:
6/27/84	Submitted	No	Your Agent	6/27	No

In Glass Container:	Sterilized by:	Thiosulfate Added:	At Site: ppm Chlorine	At Site: pH reading	At Site: Water Temp.
Gallon H_2SO_4, 16 oz. H_2SO_4 1/2 gallon					

BACTERIAL DATA:

TOTAL AGAR PLATE COUNTS Colonies per ml.: 35°C. Incub.	20°C. Incub.	COLIFORMS in Five 10, 1 and 0.1 ml. Tubes Presumptive Test: Tubes "POSITIVE"	Confirmed Test: Tubes "POSITIVE"	Equivaleney, or "MPN per 100 ml."	Pertinent Bacterial Standards SATISFIED

CHEMICAL DATA

(See Attached Report)

Charles F. Molino, Manager

BACTERIAL STANDARDS:

1. To be "satisfactory", five 10 ml. (thus 50 ml.) portions of properly representative samples of drinking waters and swimming pool waters must show the complete absence of coliforms, by the codes of both the U. S. Public Health Service and the N. J. State Department of Health.
2. Coliforms in waters from natural bathing places are reported as "Most Probable Number in 100 ml." The American Public Health Association classifies bathing areas whose samples show MPN values below 1000 as "suitable" for use: those between 1000 and

NOTES:

1. We certify that our analyses of water samples are made in full conformance with the appropriate procedures specified in "Standard Methods for the Examination of Water", and are accurate to within the experimental errors of these techniques.
2. We certify that samples of water, taken by our representatives, have been prepared and transported to the laboratory in full conformance with the procedures prescribed in the SMEW manuals.
3. We do not certify to the authenticity of samples prepared by other than our own representatives. Such samples' identities are detailed

CHEMICAL DATA

B.O.D., ppm	30
pH	6.9
Alkalinity, ppm	20
ABS (Detergent), ppm	<0.01
Conductivity, micromhos/cm	275
Sulfates, ppm	10
Chlorides, ppm	35
Fluorides, ppm	0.5
Ammonia Nitrogen, ppm	0.3
Nitrates, ppm	6.9
C.O.D., ppm	50
Total Suspended Solids, ppm	1,050
Total Dissolved Solids, ppm	175
Iron, ppm	5.8
Manganese, ppm	0.33
Total Organic Carbon, ppm	4.5
Aluminum, ppm	0.31
Copper, ppm	<0.02
Zinc, ppm	0.04
Chromium, ppm	0.06
Kieldahl Nitrogen	14.7
Phosphorous, ppm	0.11

< = Less Than

LOG OF TEST PIT NO. TP-1

LOCATION _____ SURFACE ELEV. Not Available

DEPTH (FEET)	SAMPLES	STANDARD PENETRATION RESISTANCE	SYMBOL	DESCRIPTION	Boundary Depth (Inches)	Munsell Soil Color Symbol
0				Topsoil - Dark brown silty loam	8	
				Brown to dark-brown loam (moist)(firm)	37	7.5yr (4/4)
5			*	Dark reddish brown mottled sandy loam (firm)	66	5 yr (3/4)
				Dark brown mottled gravelly sandy loam (hard)	102	7.5yr (3/4)
10				Dark reddish brown gravelly clay loam (moist) (firm)	120	2.5yr (3/4)
				Dark reddish brown shaley silty clay loam (hard)(saprolite)(decomposed shale)	150	2.5yr (3/4)
15				TEST PIT COMPLETED @ 12'-6" ON 6/27/84 SLIGHT GROUNDWATER SEEPAGE @ 8'-6" MODERATE GROUNDWATER SEEPAGE @ 10'-0" *SOIL SAMPLE FOR CHEMICAL TESTING COLLECTED @ 4'-6"		
20						
25						
30						
35						
40						

PLATE 2A

LOG OF TEST PIT NO. TP-2

LOCATION _____ SURFACE ELEV. Not Available

DEPTH (FEET)	SAMPLES	STANDARD PENETRATION RESISTANCE	SYMBOL	DESCRIPTION	Boundary Depth (Inches)	Munsell Soil Color Symbol
0				Topsoil - Dark brown silty loam	12	
				Light brownish gray silty clay loam (moist)(firm)	40	10 yr (6/2)
5				Reddish brown and pale brown clay loam (moist)(firm)	60	5 yr (4/4) / 10 yr (6/3)
10				Dark reddish brown gravelly loamy sand with occasional thin lenses of light brownish gray clayey silt (wet)(loose)	108	5 yr (3/3) / 10 yr (6/2)
15				Dark reddish brown fractured platy shale - grading to relatively sound shale (horizontal bedding) @ 10'-6"	126	5 yr (3/3)
20				TEST PIT COMPLETED @ 10'-6" ON 6/27/84 SLIGHT GROUNDWATER SEEPAGE @ 6'-0"		
25						
30						
35						
40						

PLATE2B

LOG OF TEST PIT NO. TP-3

LOCATION _____ SURFACE ELEV. Not Available

DEPTH (FEET)	SAMPLES	STANDARD PENETRATION RESISTANCE	SYMBOL	DESCRIPTION	Boundary Depth (Inches)	Munsell Soil Color Symbol
0				Topsoil - Brown silty loam	15 to 18	
				Dark reddish brown gravelly loam (moist) (firm)	54	5 yr (3/4)
5				Dark reddish brown gravelly sandy loam (moist)(firm)	78	5 yr (3/3)
			** *	Dark brown fine to coarse sand (loose)(wet)	138	7.5yr (3/3)
10				TEST PIT COMPLETED @ 11'-6" ON 6/27/84 MODERATE GROUNDWATER SEEPAGE @ 7'-0" WATER LEVEL @ 8'-6" ONE HOUR AFTER COMPLETION OF TEST PIT *GROUNDWATER GRAB SAMPLE COLLECTED @ 8'-6" FOR CHEMICAL TESTING **SOIL SAMPLE FOR CHEMICAL TESTING COLLECTED @ 7'-6"		
15						
20						
25						
30						
35						
40						

PLATE 2C

LOG OF TEST PIT NO. TP-4

LOCATION _____ SURFACE ELEV. Not Available

DEPTH (FEET)	SAMPLES	STANDARD PENETRATION RESISTANCE	SYMBOL	DESCRIPTION	Boundary Depth (Inches)	Munsell Soil Color Symbol
0				Topsoil - Brown silty loam	18	
				Mottled brown silty loam (moist)(firm)	60	7.5yr (5/4)
5				Brown mottled gravelly silty loam (moist)(firm)(fragipan)	90	7.5yr (5/4)
10				Yellowish red gravelly loamy sand (wet) (loose)	132	5 yr (4/6)
				TEST PIT COMPLETED @ 11'-0" ON 6/27/84 VERY SLIGHT GROUNDWATER SEEPAGE @ 7'-0" SLIGHT GROUNDWATER SEEAPGE @ 8'-0"		
15						
20						
25						
30						
35						
40						

PLATE 20

LOG OF TEST PIT NO. TP-5

LOCATION _____ SURFACE ELEV. Not Available

DEPTH (FEET)	SAMPLES	STANDARD PENETRATION RESISTANCE	SYMBOL	DESCRIPTION	Boundary Depth (Inches)	Munsell Soil Color Symbol
0				Topsoil - Brown silty loam	12 to 18	
				Mottled strong brown silty clay loam (firm)	42	7.5yr (5/6)
5				Dark reddish brown gravelly silt loam (hard)	90	2/5 yr (3/4)
				Dark reddish brown gravelly silt loam with platy shale fragments (hard)(saprolite)	120	2/5yr (3/4)
10				TEST PIT COMPLETED @ 10'-0" ON 6/27/84 SLIGHT GROUNDWATER SEEPAGE @ 7'-6" WATER LEVEL @ 9'-0" FIFTEEN MINUTES AFTER COMPLETION OF TEST PIT		
15						
20						
25						
30						
35						
40						

PLATE 2E

LOG OF TEST PIT NO. TP-6

LOCATION _____ SURFACE ELEV. Not Available

DEPTH (FEET)	SAMPLES	STANDARD PENETRATION RESISTANCE	SYMBOL	DESCRIPTION	Boundary Depth (Inches)	Munsell Soil Color Symbol
0				Topsoil - Brown silty loam	12	
				Dark reddish brown silty clay loam (firm) - hard @ 3'-6"	60	2.5yr (3/6)
5				Dark reddish brown mottled silt loam, with platy shale fragments (hard)(saprolite) (decomposed shale)	114	2.5yr (3/4)
10				Dark reddish-brown weathered shale - grading to relatively sound shale @ 10'-6"	126	2.5yr (3/4)
15				TEST PIT COMPLETED @ 10'-6" ON 6/27/84 SLIGHT TO MODERATE GROUNDWATER SEEPAGE @ 7'-0"		
20						
25						
30						
35						
40						

PLATE 2F

PERCOLATION TEST RESULTS

TEST NO.	LOCATION	DEPTH	STRATA	PERCOLATION RATE
1	TP-3	47 inches	Gravelly Sandy Loam	67 minutes/inch
2	TP-5	42 inches	Silty Clay Loam	*2½ inches/ 17½ hours

* Initial Saturation Cycle

REVISED BY _____ DATE _____

FILE _____

CHECKED BY _____ DATE _____

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
02345-001	TWSP OF BEDM	BEDMIN.

DRILLING METHOD: JD 310A BACKHOE — BORING NO. TP-1

SAMPLING METHOD: — SHEET 1 OF 1

DRILLING

					START TIME	FINISH TIME
WATER LEVEL	SEEPAGE	2.6				
TIME						
DATE	6/27	7/11			DATE	DATE
CASING DEPTH						

DATUM — ELEVATION 107.53

SURFACE CONDITIONS: LEVEL, MODERATELY WOODED

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER		DEPTH IN FEET	SOIL GROUP	
					GROUND	0		
					A FEW TENTHS ▲ TOP OF CASING			8" DK BR SILT - TOPSOIL (ROOTS EXTEND TO 3'12')
						1		
						2	ML	LT BR CLAYEY SILT AND f. SAND, TR. SILT (M. STIFF)
					7-11	3		
						4		GRADING WITH OCC. COBBLES, GRADING TO
					Sample for Chemical Testing @ 4½'	5		LT. BR & GRAY MOTTLED SILT & f SAND (DENSE)
						6	SM	GRADING TO BR MOTTLED f-C SAND & SILT S f-C GRAVEL NUMEROUS COBBLES (DENSE)
						7		
						8		SLIGHT GW SEEPAGE @ 8'6"
						9	ML	RED BR MOTTLED CLAYEY SILT, S f-c SAND, S GRAVEL & cobbles
						10		MOD GW SEEPAGE @ 10'
						11		GRADING TO RED BR SHALE FRAGMENTS & CLAYEY f
						12		½ TO 1½" PLATY FRAG @ 10' TO INCL. 3" FRAG @ 12'
						13		T.P. COMP @ 12.5' IN COBBLES
						14		
						15		
						16		
						17		
						18		
						19		
						20		

DATE ____ CH'D BY ____

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
02845-001	TWSP OF BEDM	BEDM

DRILLING METHOD: JD 310A

SAMPLING METHOD:

BORING NO. TP-2

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH						

DATUM ELEVATION 95.26

SURFACE CONDITIONS: HIGH GRASS & WEEDS

SAMPLER TYPE	BLOWS/FT. DRIVEN / RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	DEPTH IN FEET	SOIL GRAPH	
					0		
					1		12" DK BR SILT - TOPSOIL
					2		MOTTLED GR. & LT. BR CLY SILT, TR f. SND (M. STIFF)
					3	ML	
					4		GRADING S. RD. BR f-c SAND
					5		
					6		RED BR f-c SAND, S. SILT WITH THIN
					7	SM	LENSES of GR-LT BR. CLY SILT (WET) SLIGHT GW SEEP @ 6'
					8		GRADING S. GRAVEL & COBBLES @ 8' (M. DENSE)
					9		
					0		RED BR DECOMPOSED SHALE (SATTOLITE) PLATY 1"- 4" FRGS
					1		GRADING TO SOUND SHALE @ 10.5' - HORIZONTAL BEDDING
					2		
					3		TP COMPLETED @ 10.5' on 6/27/84
					4		
					5		
					6		
					7		
					8		
					9		
					0		

DRILLING CONTR. _____

DATE _____ CHK'D BY _____

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
02845-001	TWSP OF BEDM	BEDM

DRILLING METHOD: JD 310A

BORING NO. T7-3

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING START: TIME / DATE — FINISH: TIME / DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION 97.39

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. HAMMER		DEPTH IN FEET	SOIL GROUP	SURFACE CONDITIONS: GRASS & WEEDS
						0		
						1		15-18" OF LT BR SILT - TOPSOIL
						2		
						3		LT BR SILT & F-C SAND, S. GRAVEL (DENSE)
						4	ML	GRADING TO INC MORE GRAVEL
						5		
						6		GRADING TO RED BR (MOIST)
						7		MOD GW SEEP @ 7'
		SAMPLE FOR CHEMICAL TESTING				8	SP	GRADING TO RED BR F-C SND, S GVL, TR SILT
						9		GRADING S COBBLES @ 8'
						0		
						1		
						2		TP COMPLETED @ 11.5' ON 6/27/84
						3		WATER LEVEL @ 8 1/2' 1 HR AFTER COMPLETION OF TEST PIT
						4		OBTAINED GRAB SAMPLES OF GW @ 8 1/2'
						5		
						6		
						7		
						8		
						9		
						0		

DATE CHK'D BY

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
02845-001	TWSP OF BEDM	BEDM

DRILLING METHOD: JD 310 A

SAMPLING METHOD:

BORING NO. TP-1

SHEET 1 OF 1

DRILLING START TIME / DATE: FINISH TIME / DATE:

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION 108.13

SURFACE CONDITIONS: Lt. Grass - Edge of Plowed Field

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	BLOWS PER 6" / SAMPLE DEPTH	BLOWS/FT. SAMPLER		DEPTH IN FEET	SOIL GROUP	
						0		
						1		18" Br. SA TOPSOIL
						2	ML	Lt. Br-Gy Cly Silt, S t. Sand, Tr Gvl
						3		(Med Stiff)
						4		
						5		
						6		
						7		V. Slt. Gw seep @ 7'
						8	SP	Red Br f-c SNI & Gvl, Tr. Silt, S Cobbles
						9		Slight seepage @ 8'
						0		
						1		T.P. Completed @ 11.0' on 6/27/84
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DATE _____ CHK'D BY _____

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
02BAS-001	Town of Bedn	Bedn

DRILLING METHOD	BORING NO.
JD 310 A	TP-5
SAMPLING METHOD	SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH						

DATUM ELEVATION 104.41

SURFACE CONDITIONS: Level Grass - Edge of Planted Field

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	BLOWS TO METRIC DEPTH	BLOWS/FT. SAMPLER		DEPTH IN FEET	SOIL GROUP	
						0		
						1		12 - 18" Lt Br. Silt - TOPSOIL
						2	ML	Mottled Lt. Br & Gr. Clay Silt, S. F. Snd S. f-c Gvl & Cobbles (M. Stiff)
						3		
						4	SM	Red Br f-c Snd & Silt, Little Gvl with Cobbles (Dense)
						5		
						6		
						7		Caved in with Slight GW Seepage 7'6 - 8½'
						8	ML	Gravelly to Red Br Silt and f-c Gvl and Stone Frag. (Hard)
						9		
						0		
						1		TP Completed @ 10'0" on 6/27/04
						2		Water Level @ 9' = 15 min after
						3		Completion of Excav.
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DATE _____ CHK'D BY _____

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
D2845-01	TWSP OF BEDM	BEDM

DRILLING METHOD: JD 310A

BORING NO. TP-6

SHEET OF

SAMPLING METHOD:

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH						

DATUM ELEVATION 102.20

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER		DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS
								EDGE of Mowed Field, 10' off River Rd - Level
								Top of Slope (±2½') to RD
						0		12" Br Slt Topsoil
						1		
						2		Red Br Cly Slt, S. f. Snd (M. Stiff)
						3	ML	
						4		Grad. to S Cyl & cobbles @ 3½' (Moist)
						5		Grading to Highly Deformed Shale, f.g. Cly Slt
						6		Platy Shale Frag up to 3"
						7		Slight to Mod Cly Seams @ 7' (Saturated)
						8		Grading to Cay Mottling
						9		
						10		Weathered, Easily Excavated Shale
						1		1-6", ± 1-2" Thick Frags
						2		Relatively Sound Shale @ 10.5'
						3		TP Completed @ 10.5' on 6/27/04
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DATE CK'D BY