ORIGINAL

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

CITY OF ROCK ISLAND, Petitioner, v. ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, Respondent.	)	PCB 98- 164 (VARIANCE)

NOTICE OF FILING

TO: Dorothy M. Gunn, Clerk
Illinois Pollution Control Board
100 West Randolph Street - 11th Floor
Chicago, IL 60601

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Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794-9276

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Illinois Environmental Protection Agency
Division of Legal Counsel
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PLEASE TAKE NOTICE that on June 2, 1998, we filed with the Clerk of the Pollution Control Board a Petition for Variance, a copy of which is attached hereto and served upon you.

Respectfully submitted,

THE CITY OF ROCK ISLAND

By: _____
One of Its Attorneys

Roy M. Harsch
Thomas A. Hamilton (only admitted in Ohio)
GARDNER, CARTON & DOUGLAS
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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

CITY OF ROCK ISLAND,	)	
	)	
Petitioner,	)	
	)	PCB 98-164
v.	)	(VARIANCE)
	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
	)	
Respondent.	)	

PETITION FOR VARIANCE

The City of Rock Island ("City"), through its attorneys, hereby petitions the Board for a variance from 35 Ill. Adm. Code § 306.305 (d) and an exception approved thereunder by the Board on May 9, 1986 ("Exception") to the extent the rule as modified by the Exception requires that the City operate its main treatment plant at a maximum flow level of 16 million gallons per day ("MGD").

BACKGROUND

On December 26, 1985, the City and the Illinois Environmental Protection Agency ("Illinois EPA") filed a Joint Petition for Exception seeking relief from the requirements of 35 Ill. Adm. Code § 306.305 (a) and (b) to construct and operate certain combined sewer overflow ("CSO") transport and treatment facilities. (Exhibit 1). On May 9, 1986, the Illinois Pollution Control Board granted the City and Illinois EPA's Joint Petition for Exception. (Exhibit 2). The City requests a variance because a condition of the Exception requires the City's main treatment plant to have a 16 MGD maximum flow level, when its actual maximum flow level is 12 MGD.

More specifically, the Board adopted by reference Paragraphs 14, 15 and 16 of the Joint Petition for Exception in which the City agreed to perform modifications in order to obtain the

Illinois EPA's support for the Joint Petition. At Paragraph 15 of the Joint Petition, the modifications were described as "the construction of head works improvements to allow operation of the treatment plant at the design maximum flow level of 16 million gallons a day." The 16 MGD figure was derived from a report of the City's then consultant which was introduced before the Board as Exhibit 2 of the CSO Exception hearing (PCB-85-214).

Recently, the City learned that even with past improvements the design maximum flow is actually 12 MGD rather than 16 MGD. Accordingly, the City requests a variance to address this mistake while it moves forward to design and construct modifications to its sewage treatment plant which will allow it to treat 16 MGD maximum design flow.

INFORMATIONAL REQUIREMENTS

A. Statement of Relief (§ 104.121(a))

The City seeks such relief as may be necessary to allow it to construct modifications to the sewage treatment plant to increase the maximum design flow from 12 MGD to 16 MGD while remaining in compliance during design and construction with the Exception previously approved by the Board to the rule governing the treatment of overflows and bypasses.

The rule governing the treatment of overflows and bypasses is set forth at 35 Ill. Adm. Code § 306.305 which provides:

> All combined sewer overflows and treatment plant bypasses shall be given sufficient treatment to prevent pollution, or the violation of applicable water quality standards unless an exception has been granted by the Board pursuant to Subpart D. Sufficient treatment shall consist of the following:
>
> a) All dry weather flows, and the first flush of storm flows as determined by the Agency, shall meet the applicable effluent standards; and
>
> b) Additional flows, as determined by the Agency but not less than ten times the average dry weather flow for the design

year, shall receive a minimum of primary treatment and disinfection with adequate retention time; and

c) Flows in excess of those described in subsection (b) shall be treated, in whole or in part, to the extent necessary to prevent accumulations of sludge deposits, floating debris and solids in accordance with 35 Ill. Adm. Code 302.203, and to prevent depression of oxygen levels; or

d) Compliance with a treatment program authorized by the Board in an exception granted pursuant to Subpart D.

On May 9, 1986, the Board granted the City and Agency's Joint Petition for an Exception pursuant to 35 Ill. Adm. Code § 306.305 (d) from the requirements to construct and operate certain CSO transport and treatment facilities. However, one of the conditions of the Exception was the adoption of the 16 MGD maximum design flow which was erroneously included in the Joint Petition.

The City retained Huff & Huff, Inc. to study the main treatment plant due to problems attempting to treat 16 MGD. Huff & Huff, Inc. recently discovered that the actual maximum design flow of the main treatment plant is currently 12 MGD. (Exhibit 3 at page 4). To address this situation, the City is currently in the process of designing plant modifications to increase the maximum design flow from 12 MGD to 16 MGD. These modifications include an additional final clarifier and various piping modifications. Attached as Exhibit 4 is a tentative compliance program schedule to carry out this work which is currently estimated to cost $1,150,000.00.

This discovery leaves the City two alternative courses of action: (1) request that the 16 MGD maximum design flow figure adopted in the Exception be permanently corrected to the actual 12 MGD present maximum design flow capacity or (2) request a variance and design and construct modifications to the main treatment plant to enable it to treat 16 MGD maximum design flow. The City has elected to expend the additional resources to construct the

modifications necessary to treat 16 MGD maximum design flow, and therefore requests the present variance to enable the City to remain in compliance with the Exception to the CSO regulations during the design and construction period.

The tentative schedule attached as Exhibit 4 is contingent upon the City obtaining low interest loans from the State of Illinois as well as timely review by Illinois EPA of the necessary permits, design and construction plans. Accordingly, the City requests that a variance be granted until December 31, 2000 which is one year after the estimated project completion date.

B. Description of Business and Area Affected (§ 104.121(b))

The City is a municipality located in northwestern Illinois on the Mississippi and Rock Rivers, 186 miles west of Chicago. The City owns and operates its own sewer system and treatment plants. The City is served by two sewage treatment plants, but only the main treatment plant is the subject of this Petition for Variance.

C. Materials Used and Description of Process (§ 104.121(c))

The main treatment plant has an 8 MGD design average flow capacity and 12 MGD design maximum flow capacity. It consists of two parallel grit removal chambers, 8 primary settling tanks, a complete mix activated sludge process, two secondary clarifiers and chlorinating facilities. Treated effluent is discharged into the Mississippi River.

D. Materials Discharged (§ 104.121(d))

The Exception previously granted by the Board covered the main treatment plant bypass 001A which discharges combined sewer overflow.

E. Present Failure (§ 104.121(e))

The variance requested is somewhat unusual in that the City already obtained an Exception to the requirements of 35 Ill. Adm. Code § 306.305(a) and (b) on May 9, 1986. The present dilemma stems from the erroneous description in the May 1982 Combined Sewer Overflow Study by the City's prior consultant that the maximum design flow for the main treatment plant was 16 MG. The 16 MGD figure was mentioned in Paragraph 15 of the Joint Petition for Exception which was thereafter adopted by reference as a condition to the Board's Order granting the Exception. This error has been further perpetuated by the inclusion of the 16 MGD figure in the City's NPDES permit. If the Combined Sewer Overflow Study had contained the correct maximum design flow of 12 MGD, that figure would have been adopted as a condition to the CSO relief granted to the City and this Petition for Variance would be unnecessary. Nevertheless, the City is already moving forward to design and construct modifications to its sewage treatment plant which will allow it to treat 16 MGD design maximum flow.

F. Compliance Plan (§ 104.121(f))

The City is already proceeding to design and construct modifications to its sewage treatment plant which will allow it to treat 16 MGD design maximum flow. These improvements include an additional final clarifier and various piping modifications. Exhibit 4 is a tentative compliance program schedule to carry out this work which is currently estimated to cost $1,150,000.00. With the combination of the new sludge dewatering equipment installed in early 1997 and the proposed modifications to the treatment plant, the City will be able to treat design maximum flows of up to 16 MGD.

G. Environmental Impact (§ 104.121(g))

The granting of the requested relief should have no adverse impact upon the environment. If the correct design flow of 12 MGD had been included in the May 1982 Combined Sewer Overflow Study rather than the 16 MGD figure, the 12 MGD maximum design flow would have been adopted as a condition by the Board and incorporated into the City's NDPES permit. Moreover, based on two stream impact studies, the Board found in its May 9, 1986 Order granting the Exception that the CSOs from bypass 001A produce minimal impacts on the Mississippi River. The 16 MGD error does not affect the validity of the conclusion that the bypass produces minimal environmental impacts since the May 1982 Combined Sewer Overflow Study was based upon actual overflow monitoring and sampling data, and the Huff & Huff, Inc. study was based upon analyses of sediment and stream samples.

H. Past Compliance Efforts (§ 104.121(h))

The City constructed all modifications to the treatment plant required as conditions to the Exception consisting of improvements to the screening system, flow diversion by increasing weir elevations and interceptor chamber modifications. Further, the City installed new sludge dewatering equipment in early 1997.

I. Compliance Alternatives (§ 104.121(i))

The only compliance alternative for the City is to seek permanent corrections to the Exception and the City's NPDES permit to reflect the actual 12 MGD present design maximum flow of the main treatment plant.

J. Interim Measures (§ 104.121(j))

As discussed above, the Board has previously found that the CSOs from bypass 001A produce minimal environmental impacts on the Mississippi River. Accordingly, there is no adverse environmental impact to minimize. Furthermore, the City cannot treat flows over 12 MGD during the interim.

K. Statement of Hardship (§ 104.121(k))

The erroneous description in the Combined Sewer Overflow Study that the maximum design flow of the main treatment plant was 16 MGD was unfortunately adopted by the Board as a condition to the Exception and thereafter made a condition of the City's NPDES permit. Upon discovering this error, the City has no way of increasing the maximum design flow from 12 MGD to 16 MGD without undertaking the construction modifications described above in Section F. Without the requested variance, the City will be in violation of the Exception granted under 35 Ill. Adm. Code § 306.305(d) and its NPDES permit until completion of the modifications. Thus, the City would be subject to the requirements of 35 Ill. Adm. Code § 306.305(a) and (b) to construct and operate certain CSO transport and treatment facilities which were estimated in 1985 to cost $54.9 million in capital costs and $6.9 million in annual operating costs. (Exhibit 2 at page 7).

L. Consistency with Federal Law

The Board may grant the relief requested consistent with federal law. The granting of a variance would not violate any of the provisions of the Clean Water Act, 33 U.S.C. §§ 1251 to 1387. Assuming the Board grants this variance, the City will seek a modification of its NPDES

permit to correctly impose a 12 MGD design maximum flow until such time as these improvements are completed.

M. Waiver of Hearing

The City hereby waives its right to a hearing in this matter.

N. Affidavit

The affidavit of Mr. Robert T. Hawes, the Director of Public Works for the City, is attached as Exhibit 5 in support of the material facts asserted in this petition.

CONCLUSION

The City requests this variance to correct an error which was originally contained in a May 1982 Combined Sewer Overflow Study which stated that the design maximum flow of the City's main treatment plant was 16 MGD. The actual present design maximum flow of the City's main treatment plant was and is 12 MGD. Unfortunately, this error was adopted by reference as a condition to the May 9, 1986 Order by the Board granting an Exception to 35 Ill. Adm. Code § 306.305(a) and (b) and thereafter included in the City's NPDES permit. The Board previously found that CSOs from the main treatment plant produced minimal environmental impact on the Mississippi River. Nevertheless, the City is proceeding to implement improvements to its sewage treatment plant including an additional final clarifier and various piping modifications which will enable the main treatment plant to treat design maximum flows up to 16 MGD. Accordingly, the Board should grant the requested variance based upon the arbitrary and unreasonable hardship which would be imposed upon the City if it were not able to avail itself of the May 9, 1986 Exception due to the 16 MGD error. Without the relief granted in the Exception, the City would be subject to the requirements of 35 Ill. Adm. Code § 306.305(a)

and (b) to construct and operate certain CSO transport and treatment facilities which were estimated in 1985 to cost $54.9 million in capital costs and $6.9 million in annual operating costs.

WHEREFORE, the City respectfully requests that the Board grant the variance relief requested in this petition.

Respectfully submitted,

THE CITY OF ROCK ISLAND

By: _____
One of Its Attorneys

Roy M. Harsch
Thomas A. Hamilton (only admitted in Ohio)
GARDNER, CARTON & DOUGLAS
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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF THE JOINT PETITION OF THE CITY OF ROCK ISLAND AND THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY FOR EXCEPTION TO THE COMBINED SEWER OVERFLOW REGULATIONS	)))))	PCB 85-

PETITION FOR EXCEPTION

NOW COME the City of Rock Island ("City"), Rock Island County, Illinois, by its City Manager, J. Neil Nielsen and the Illinois Environmental Protection Agency ("Agency"), by its Manager of Environmenal Programs, Roger A. Kanerva, pursuant to 35 Ill. Adm. Code 306.363, and respectfully requests that the Illinois Pollution Control Board grant an exception to 35 Ill. Adm. Code 306.305(a) and (b) to relieve the City of the requirement to construct and operate certain combined sewer overflow ("CSO") transport and treatment facilities. The Petitioners submit that because existing overflows from the City of Rock Island have minimal impact on the water quality of the Mississippi River and do not restrict stream use, the construction of the required CSO facilities, estimated to cost in excess of $55 million, would be unreasonable. In support of this request, Petitioners state as follows:

1. The total population of Rock Island is 46,862, per U.S. census (1980). The City is located in Northwestern Illinois on the Mississippi and Rock Rivers, 186 miles west of Chicago. The City owns and operates its own sewer interceptor system and treatment plant.

2. The City is seeking relief from Section 306.305(a) and (b) which requires it to construct combined sewer overflow transport capacity, pumping, grit removal, storage, primary settling, disinfection and upgrade of existing

facilities to treat an additional excess storm flow consisting of first flush and ten times dry weather flow. The following paragraphs of the petition will summarize the City's CSO facilities which will be required if an exception is not granted, and the cost of those required facilities. The studies and investigations which showed existing CSO's have only minimal impact are summarized in the following paragraphs of this petition. The CSO facilities which the City will construct if an exception is granted are described in detail. A description of the Operation and Control Equipment both for existing and proposed treatment is included. Performance of the City's existing facilities is described. Finally, the justification for granting an exception is presented.

CSO FACILITIES REQUIRED BY THE RULES

3. The City has determined preliminary cost estimates for compliance with 35 Ill. Adm. Code 306.305(a) and (b). (For a detailed explanation, see Exhibits A and B, pp. 73-166). The City is presently required to provide complete treatment for the first flush of storm flows provided this request for relief is not granted. An additional ten (10) times the average design dry weather flow would receive primary sedimentation and disinfection. It would also involve the provision of below ground, covered, off-line storage facilities to capture and reduce the occurrence of overflows or plant bypasses. These storage facilities would operate in integration with the main treatment plant, and would allow for total capture and subsequent secondary treatment of first flush. Id. at 141.

[illegible] compliance proposal would upgrade the main treatment plant to [illegible]nment of current design standards for treatment plant components and hydraulic capacity. Primary treatment and disinfection for flows over and

above those either captured or taken through the main treatment plant would be provided. The proposal involves an optimum combination of upgrading the main treatment plant for secondary treatment of the captured flow and primary treatment and disinfection through sedimentation. Id. at 149, figure 47. All flows greater than the capacity of the main plant, storage and primary treatment facilities are discharged without treatment. The cost of the least expensive full compliance alternative was estimated in 1982 to be 25.2 million dollars, and the annual operation and maintenance costs were estimated to be 3.7 million dollars. Id. at 181. Later figures, as set forth in Exhibit A, would change the respective costs of the project to $54.9 million in capital costs and $6.9 million in operating costs, if treatment based upon total suspended solids (TSS) was required. The amounts would be slightly lower if treatment based upon biological oxygen demand (BOD) was required. It is assumed that these cost estimates would be revised upwards significantly if adjusted for the current value of the dollar.

NATURE OF ROCK ISLAND'S OPERATIONS AND CONTROL EQUIPMENT

5. Rock Island, like most older cities in the Midwest, originally constructed combined sewers to convey both municipal sewage and stormwater. Through the years, the City has embarked upon a sewer separation program which has left only 17% of the system still combined. There are five combined sewer overflows and one treatment plant bypass which discharge pollutants into the Mississippi River.

6. The City of Rock Island is served by two sewage treatment plants, but only the main treatment plant is the subject of this joint petition. The main plant's service area is delineated in Figure 2 of Exhibit A. The main treatment plant serves an area of 5,600 acres, 17% or 970 acres of which are

served by combined sewers. These areas are shown in Exhibit A, Figure 3. The sewer system is composed of approximately 170 miles of sewer. Pipe sizes range from five inch, to nine feet by eight feet outfall at the main plant. Shallow sewers lie at a depth of three feet, while the deepest are from thirty-five to forty feet below the ground. The average depth of the sewers is between eight and ten feet. The system uses two major interceptor sewers the "north slope" and "south slope."

7. The north slope interceptor is a ninety-six inch sewer with a full pipe capacity of 204 mgd. The south slope interceptor is a seventy-two inch sewer with a full pipe capacity of 136.8 mgd. The main treatment plant has an 8 mgd design average flow capacity and a 16 mgd design maximum flow capacity. It consists of two parallel grit removal chambers, eight primary settling tanks, the complete mix activated sludge process, two secondary clarifiers, and chlorination facilities. It was designed to treat a BOD loading of 62,500 PE. Treated effluent is discharged into the Mississippi River.

STREAM IMPACT ANALYSES

8. Two stream impact analyses were performed. The most recent (Exhibit C), performed by James E. Huff, P.E., on behalf of Rock Island, assessed the effect of CSO on bottom sediments. Mr. Huff assessed stream impact through independent sampling of the bottom sediments and by analysis of previous sampling data collected by the Agency in July, 1984 and by Missman, Stanely in May, 1985. Id. at 1. All samples were subjected to chemical analysis as well as physical inspection. Samples were analyzed for lead, zinc, oil and grease, volatile solids, and total solids. In addition, the samples were ranked blind by three individuals for odor intensity. The Huff study found that the discharge from the Rock Island outfall structure has resulted in a

limited area along the near shore of the river with elevated pollutant levels. Id. at 5. This area is approximately five hundred feet in length by fifty feet in width. The levels of pollutants are all below the mean values the Illinois Environmental Protection Agency found in its survey of sediments within one mile of wastewater treatment plant outfalls, with the exception of zinc. Id. at Appendix. All zinc values were within one standard deviation of the Illinois Environmental Protection Agency's mean value. There is no sedimentation below the CSO's, where the river bottom consists of solid rock. Thus, there is minimal impact in the receiving stream from the City's CSOs.

9. A study was also performed by Missman, Stanley & Associates, on behalf of the City in 1982 to determine the frequency, magnitude and impact of the combined sewer overflows into the Mississippi River. Exhibit B, §§5-8 and 10. The study involved 1) monitoring the combined sewer overflows in the system, 2) determining the quantity and quality of the sewer system overflows, and 3) assessing the impact of the overflows on the Mississippi River. The study concluded that although the City is not meeting applicable effluent limitations because of the pollutant overflow, the impact of the overflow on the Mississippi River is minimal.

10. The study was conducted using historical records as well as a field investigation which consisted of monitoring the five CSO discharge points and the treatment plant bypass, recording rainfall data and physically inspecting the receiving streams. In order to quantify the volumes and rates of flow discharging from the sewer system, six portable continuously recording flow meters were installed at the CSO locations to measure overflows to the Mississippi River. In addition, Rustrak event recorders were connected to the seven storm pumps at the Main Municipal Sewage Treatment Plant to continuously

record the length of time each pump operated during plant bypassing caused by storm events. To quantify the quality of flow being discharged from the CSO system during storm events, two portable, automatic samplers were installed and maintained at two locations within the system. Overflow samples from five typical storm events at each location were collected at preselected time intervals to provide basic data on effluent water quality. These samples were analyzed for the following constituents, 1) biological oxygen demand ("BOD"), 2) chemical oxygen demand ("COD"), 3) suspended solids, 4) total dissolved solids, 5) ammonia nitrogen, 6) phosphorus, and 7) lead. The impact of the overflows from the five CSO discharge points and the main treatment plant outfall were assessed through physical investigation.

11. The complexity of Rock Island's combined sewer system required the use of a mathematical model to project the overflow quantities associated with the various storm conditions. The simplied stormwater management model SSWMM developed by USEPA was used to get a reasonable picture of the characteristics of the overflows that occur from Rock Island's sewer system. SSWMM was used initially to describe the basic rainfall/overflow relationships for the study area based on the entire period of rainfall records available (29 years). The model was calibrated using data obtained from the twenty storm and overflow events monitored during the field investigation. In March, 1980, the City began to monitor and sample the five overflow locations on the Mississippi continuously for twenty-one (21) weeks. The purpose of the monitoring and sampling program was to collect basic data on the overflow quantity and quality from the CSO to the Mississippi during storm events. Any problems found were corrected immediately pursuant to a weekly maintenance program. Overflow quantity was analyzed in relation to rainfall for all of the CSO

monitored sites. Linear regressions of rainfall versus total overflow were developed for the entire system. Linear regression was also used to determine peak rates of combined sewer overflows. Based upon this model, it was determined that 820 million gallons per year of combined sewer flow is being discharged to the Mississippi River from CSO. Id. at ii and 36-37.

12. First flush analysis was performed by tabulating significant rainfall events which were flow recorded between March 16th and August 8, 1980. These events were monitored at two overflow locations. The first location indicated a need for complete first flush treatment of 12.2 million gallons based on TSS and 6.6 million gallons based on BOD; the second, 5.3 million gallons TSS and 3.9 million gallons BOD. The detailed analysis can be found in Exhibit B. During the 103 annual overflow storm events, the estimated total annual mass loadings were computed to be 610,000 pounds of BOD and 4,500,000 pounds of suspended solids from all CSO's. Over 80% of these mass loadings are discharged at the main treatment plant through plant bypass. Exhibit B, page 67. Because of the size of the Mississippi River and its high flows, it has considerable assimilative capacity to handle a substantial amount of pollutant mass loading. Based upon this capacity, CSO plume test results and the Illinois Environmental Protection Agency's own Mississippi test results (See, Water Quality Management Basin Plan for the Mississippi North River Basin and the Mississippi North Central River Basin 1975), it was concluded that the City's CSO impact is minimal. The mean daily flow of the Mississippi is 31,085 mgd. The ten year, seven day low flow is 8,900 mgd. The CSO overflow event based on a one year frequency storm event would discharge 52.7 mgd to the River which is insignificant when compared to the ten year, seven day low flow and the mean daily flow of the River noted above. Furthermore, because

of background concentrations in the Mississippi, reduction in mass loadings at the CSO points would generally not affect river water quality upstream or downstream. Thus, "the Rock Island CSO's by themselves have a negligible effect on the Mississippi River water quality." See, Exhibit A, page 176.

JOINT AGREEMENT

13. On September 26, 1985, the Agency issued a letter (Exhibit D) to the City agreeing to support this joint petition. The City in turn agreed to comply with certain stipulated conditions set forth in that letter. The City has agreed to fully comply with the listed conditions as an alternative to making the modifications to its system described in paragraphs 3 and 4 above.

14. By complying with the conditions of Exhibit D, the City will be able to avoid constructing the above-described CSO treatment facilities which would have a maximum capital cost of $54.9 million, and maximum operating costs of $6.9 million per year. The modifications which the City will now make if this exception is granted are described in detail in Exhibit E.

15. These modifications essentially involve the construction of head works improvements to allow operation of the treatment plant at the design maximum flow level of sixteen million gallons a day and to construct improvements to the north slope interceptor system to assure that maximum available transport capacity will be utilized prior to bypassing. The City will also implement a one year shoreline inspection program and improve operation and maintenance practices at the treatment plant so that sludge and debris are not washed out from the wet wells into the river.

16. The modifications will consist of 1) improvements to the screening system at a projected cost of $75,000, 2) flow diversion by increasing weir elevations at a cost of $3,000,and 3) interceptor chamber modifications at a cost of $23,000. The total cost of these modifications would be $101,000.

17. There is a minimal impact upon the Mississippi River from Rock Island's existing combined sewer overflows and there should be even less impact as a result of the jointly proposed modifications to the treatment systems. Granting the requested exception would provide a cost savings of over $55 million from the cost of Rock Island's compliance with the express terms of the rule. The grant of this petition is absolutely essential because Rock Island does not have the economic base to afford such a staggering sum.

WHEREFORE, Petitioners, Illinois Environmental Protection Agency and the City of Rock Island respectfully request that the Illinois Pollution Control Board hold public hearings upon this petition, and that the petition for an exception to the combined sewer overflow treatment regulations be granted.

Respectfully submitted,

CITY OF ROCK ISLAND

By: J. Neil Nielsen
Its Manager

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

By: [signature]
Manager, Environmental Programs

TF:sd/sp/3085e/1-12

ILLINOIS POLLUTION CONTROL BOARD
May 9, 1986

IN THE MATTER OF:	)	
	)	
THE JOINT PETITION OF THE CITY OF ROCK ISLAND AND THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY FOR EXCEPTION TO THE COMBINED SEWER OVERFLOW REGULATIONS	)	PCB 85-214

MR. ROY HARSCH APPEARED ON BEHALF OF THE CITY OF ROCK ISLAND

MR. THOMAS DAVIS APPEARED ON BEHALF OF THE ENVIRONMENTAL PROTECTION AGENCY

OPINION AND ORDER OF THE BOARD (by R. C. Flemal):

This matter comes before the Board upon a joint petition for a combined sewer overflow (CSO) exception filed pursuant to 35 Ill. Adm. Code, Subtitle C, Chapter I, Part 306, Subpart D, by the City of Rock Island ("Rock Island") and the Illinois Environmental Protection Agency ("Agency"). Petitioners specifically request exception from 35 Ill. Adm. Code 306.305(a) and 306.305(b).

The Board conducted a public hearing in Rock Island on March 3, 1986. In addition to testimony presented by the Joint Petitioners, testimony in support of the requested relief was presented by Ms. Emily Smith, chairperson of the Rock Island Facilities Study Jury of Experts. The Jury of Experts consists of thirteen citizens, representing a cross-section of community interests, who have followed the progress of all phases of the CSO program for several years.

CSO REGULATIONS

The CSO regulations are contained in 35 Ill. Adm. Code, Subtitle C, Chapter I, Part 306. They were amended in R81-17, 51 PCB 383, March 24, 1983. Section 306.305 provides as follows:

> All combined sewer overflows and treatment plant bypasses shall be given sufficient treatment to prevent pollution, or the violation of applicable water standards unless an exception has been granted by the Board pursuant to Subpart D.

Sufficient treatment shall consist of the following:

a) All dry weather flows, and the first flush of storm flows as determined by the Agency, shall meet the applicable effluent standards; and

b) Additional flows, as determined by the Agency but not less than ten times to average dry weather flow for the design year, shall receive a minimum of primary treatment and disinfection with adequate retention time; and

c) Flows in excess of those described in subsection (b) shall be treated, in whole or in part, to the extent necessary to prevent accumulations of sludge deposits, floating debris and solids in accordance with 35 Ill. Adm. Code 302.203, and to prevent depression of oxygen levels; or

d) Compliance with a treatment program authorized by the Board in an exception granted pursuant to Subpart D.

Subpart D allows the discharger to file a petition for an exception either singly, or jointly with the Agency, as Rock Island has done. A joint petition may seek an exception based on minimal discharge impact as provided in Section 306.361(a):

> An exception justification based upon minimal discharge impact shall include, as a minimum, an evaluation of receiving stream ratios, known stream uses, accessibility to stream and side land use activities (residential, commercial, agricultural, industrial, recreational), frequency and extent of overflow events, inspections of unnatural bottom deposits, odors, unnatural floating material or color, stream morphology and results of limited stream chemical analyses.

Rock Island and the Agency believe they have made the "minimal impact" showing pursuant to Section 306.361(a).

SUPPORT DOCUMENTS

Rock Island has undertaken several studies of its CSO situation, the reports of which have been submitted as exhibits in support of the petition. The principal among these is the Rock Island, Illinois Combined Sewer Overflow Study, prepared by Missman, Stanley & Associates, dated May, 1982, and submitted as Exhibit 2 (referenced as Exhibit B in Joint Petition). This document is augmented by two other Missman, Stanley & Associates studies, a response supplement to the IEPA review letter dated August, 1983 (Ex. 1; referenced as Exhibit A in Joint Petition),

and Proposed Plan for POTW and Transport Improvements for Joint CSO Exception dated September, 1984 (Ex. 5; referenced as Exhibit E in Joint Petition). These studies consider, among other matters, description of the Rock Island sewage transport and treatment system, characterization of alternate control mechanisms, determination of the quantity and quality of CSOs, and assessment of the impact of the overflows on the Mississippi River.

A fourth major document submitted as Exhibit 3 (referenced as Exhibit C in Joint Petition) was prepared by James E. Huff, P.E., and deals with CSO effects on stream bottom sediments. The record before the Board also contains several exhibits submitted in support of particular aspects of the testimony presented at hearing.

BACKGROUND

The City of Rock Island, which has a population of 46,862 (1980 census), is located in northwestern Illinois on the Mississippi and Rock Rivers. Rock Island owns and operates its own system of sewers and waste treatment plants. The system includes approximately 170 miles of sewers. It also includes two treatment plants, the Main Plain and the Southwest Plant. Only the Main Plant and its tributary sewer system are the subject of the joint petition. The Main Plant is served by two major interceptor sewers, the North Slope Interceptor and the South Slope Interceptor.

As with many older cities in the Midwest, Rock Island originally constructed combined sewers to convey both municipal sewage and stormwater. Between 1970 and 1979 Rock Island undertook a $6.9 million program to separate combined sewers serving about 2,830 acres of the 5,600 acres tributary to the Main Plant (R. at 10). At present approximately 17% of the area tributary to the Main Plant (970 of 5,600 acres) remains combined. The combined areas are located in the north-central section of the city (Ex. 10), and correspond with the principal commercial areas of the community (Ex. 2, Table 1) where separation would be most difficult and expensive (R. at 11).

The requested exception concerns six outfall structures: outfall 001A is a bypass located at the Main Treatment Plant; outfalls 002-006 are overflows from the North Slope Interceptor. Outfall 001A discharges directly to the Mississippi River. Outfalls 002-006 discharge in the lower reaches of Sylvan Slough, a high-velocity side channel of the Mississippi River which has been developed as a race-way for a hydroelectric plant located upstream from the CSO discharges (R. at 59).

The Main Treatment Plant consists of two parallel grit removal chambers, eight primary settling tanks, the complete mix activated sludge process, two secondary clarifiers, and chlorination facilities. The plant has an 8 million gallons per day ("mgd") design average flow capacity and a 16 mgd maximum flow capacity. The North Slope Interceptor is a ninety-six inch sewer with a full pipe capacity of 204 mgd.

As conditions associated with granting of the requested exception, Rock Island agrees to undertake certain modifications to its system. These involve the construction of head works improvements to allow operation of the treatment plant at the design maximum level of 16 mgd and improvements to the North Slope Interceptor to assure that maximum available transport capacity will be utilized prior to overflow events. The modifications consist of (1) improvements to the screening system at an estimated installation cost of $75,000, (2) interceptor chamber modifications at an estimated cost of $23,000, and (3) increase in elevations of diversion weirs at an estimated cost of $3,000. The agreed to improvements thus aggregate to a total estimated cost of $101,000. The improvements are further detailed in Exhibit 5.

DOCUMENTATION OF MINIMAL IMPACT

The Mississippi River in the reach of the CSO and the bypass outfalls has recreational use for boating and fishing (R. at 22); small boating use is characterized as "heavy" (R. at 28). Some water skiing does occur, but the amount of swimming which occurs is not addressed in the record (R. at 29). The river, but not Sylvan Slough, is also used for commercial barge traffic. The nearest downstream known withdrawal of water for public water supply is at Muscatine, Iowa, approximately 25 miles downstream.

Access to the river in the vicinity of the CSOs and bypass is limited. Through most of the reach in question the community is separated from the river by a levee which does not have any point of public access (R. at 21). Land between the levee and the river is variously barren sand flats, rock flats, and/or woods which range in width up to 150 yards, depending in part on river stage (R. at 21-8). Additionally, much of the landward side of the levee is occupied by industrial land of limited access.

From March to August of 1980, an overflow monitoring and sampling program was conducted to collect basic data on the quantity and quality of the CSO overflows. This program consisted of measuring flow at the six discharge points with continuous flow meters, monitoring of the length of time the Main Plant pumps directed discharge to outfall 001A, sampling of water quality, and physical inspection of the five CSO discharge points.

Data from the 1980 monitoring and sampling program was utilized, along with historical rainfall data, to estimate the number and volumes of overflow events that could be expected in an average year; the estimation was done utilizing the computer program, Simplified Storm Water Management Model (SSWMM). This analysis indicates the following number and volumes of events from each discharge point per year (Ex. 11):

OUTFALL	NUMBER OF EVENTS	VOLUME (mg/year)
001A	103	697.2
002	16	12.5
003	24	7.6
004	50	10.3
005	40	79.3
006	50	9.6

These data indicate that bypass 001A can be expected to discharge approximately 700 million gallons from 103 events during the average year. Similarly, the five other CSOs can be expected to discharge approximately 120 million gallons during approximately 50 events per year (R. at 36-7). The 120 million gallon figure would be reduced by 20% and the number of events decreased to 40 per year if the improvements as agreed to by Petitioners are implemented (R. at 43).

Not all of the 700 million gallons discharged at 001A is derived from the combined sewer system. Due to the particular configuration of the Main Plant (Ex. 19), some separated storm sewer discharges are directed through outfall 001A (Ex. 19). It is estimated that about 1/3 of the 700 million gallons derives from separated storm sewers (R. at 73).

Similarly, some of the 103 annual events estimated for outfall 001A are apparently triggered by infiltration into the separated storm sewer system rather than by storm surcharging of the combined sewer system (R. at 55, 61-71). The pumps at 001A are afixed to wet wells which receive flow from both the storm and sanitary sewer system (Ex. 19). The filling of these wet wells causes the pumps to activate and drain the wells via the outfall. The record is unclear as to what percentage of the 103 events are related to simple emptying of the wet wells. At one point it is surmised that infiltration is responsible for causing the wells to fill and discharge approximately 20 to 30 times per year (R. at 49-50). Later in the record it is indicated that these could constitute "the majority" of the pumping events at 001A (R. at 61), and that they constitute approximately half of the 103 events (R. at 76). Petitioners have presented testimony that during 1985 there were only seven occurrences of bypasses at 001A which were occasioned by flow to the Main Plant exceeding the plant's 16 mgd design maximum flow (R. at 105).

In comparing the volumes of the CSOs to the flow in the receiving stream, Petitioners note that the mean daily discharge of the Mississippi River at Rock Island is 31,085 mgd, and that the ten-year seven-day low flow is 8,900 mgd (Petition, par. 12). In contrast, an overflow event of a one-year frequency would discharge about 52.7 million gallons (Petition, par. 12). Thus, if the one-year recurrence interval discharge were to occur at the time of average flow in the Mississippi, it would be subject to a receiving ratio of 590:1; if it occurred at the time of the ten-year seven-day low flow it would be subject to a mixing ratio of 169:1.

Chemical analyses of the CSO discharges as conducted in 1980 included the following parameters: biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total dissolved solids (TDS), ammonia nitrogen, phosphorous, and lead. Volume analysis indicated that the six CSOs in combination make an average annual contribution of 0.6 million pounds of BOD and 4.5 million pounds of TSS to the Mississippi River. Over 80% of these contributions are discharged from at the Main Plant via 001A due to the larger volume, number of events, and pollutant loadings at that point (R. at 37). Given the high flows of the Mississippi River, Petitioners conclude that "the Rock Island CSOs by themselves have a negligible effect on the Mississippi River water quality" (Petition, par. 12; Ex. 2, p. 176).

In a more recent study (Huff Study, Ex. 3), assessment was made of the impact of Main Plant outfall 001A* on bottom sediments. The assessment was undertaken through independent sampling of the bottom sediments and by analysis of previous sampling data collected by the Agency in July 1984, and by Missman, Stanley & Associates in May, 1985. All samples were subjected to chemical analysis as well as physically inspected. Samples were analyzed for lead, zinc, oil and grease, volatile solids, and total solids. In addition, the samples were ranked blind by three individuals for odor intensity.

The Huff Study found that discharges from the bypass CSO has resulted in a limited area along the near shore of the river with elevated pollutant levels. This area is approximately five hundred feet in length by fifty feet in width. To provide perspective to the levels of pollutants as found, Huff compared the observed levels to those recorded in a general Agency study of bottom sediments collected from sites downstream of sewage treatment plants (Ex. 16). In the case of CSO 001A all mean values of observed constitutents are below the mean values found

.....

*There is no sedimentation below the five North Slope Interceptor CSOs, where the river bottom consists of solid rock.

by the Agency in the general survey of sediment collected within one mile of wastewater treatment plant outfalls. On this basis, Huff concludes that the "impact from the existing Rock Island combined sewer overflows on the Mississippi River is not discernible based upon these sediment results in the zone of impact" (R. at 84).

To further assure that the CSOs have minimal environmental impact, Rock Island has agreed, as a condition to granting of the exception, to implement a one-year shoreline inspection program. This program is intended to quantify and document the amount of debris attributable to the CSOs (R. at. 16).

ECONOMIC HARDSHIP

Rock Island has determined preliminary cost estimates for full compliance with Section 306.305(a) and 306.305(b). Under these rules Rock Island would be required to provide complete treatment for the first flush of storm flows. An additional ten times the average design dry weather flow would require primary sedimentation and disinfection. The Petitioners believe that these requirements would necessitate, as the least expensive option, the provision of below ground, covered, off-line storage facilities to capture and reduce the occurrence of overflows or plant bypasses. These storage facilities would operate in integration with the main treatment plant, and would allow for total capture and subsequent secondary treatment of the first flush. Additionally, full compliance would require upgrading the Main Plant to allow attainment of current design standards for treatment plant components and hydraulic capacity (Petition par. 4).

In aggregate the full compliance alternative was estimated in 1982 to cost $25.2 million, and the annual operation and maintenance costs were estimated to be $3.7 million (Ex. 2, p. 181). Later figures, as set forth in Exhibits 1 and 12, raise these figures to a total of $54.9 million in capital costs and $6.9 million in operating costs under the assumption that total suspended solids control would also be required. The latter amounts would be "slightly lower if treatment based upon biological (sic) oxygen demand (BOD) was required" (Petition, par. 4). At hearing Mr. Robert T. Hawes, City Engineer of Rock Island, further testified that the cost of full compliance is estimated to be $54,330,000, and if these costs were spread over a 20 year period at an interest rate of 8%, the average residential sewer use charge would increase from $3 charge would increase from $37.21 to $103.90 per quarter.

DISCUSSION OF ORDER

The Board determines that Petitioners have shown pursuant to 35 Ill. Adm. Code 306.361(a) that exception to 35 Ill. Adm. Code 306.305(a), as it relates to first flush of storm flows, and to 35 Ill. Adm. Code 306.305(b) would produce minimal impact on the receiving stream. Accordingly, the Board will grant the exception. The Board further will accept the conditions as agreed to by Petitioners.

The Board notes that the Agency has emphasized that its support of this petition is predicated on the assumption that the relief is restricted only to those substantive requirements for effluent treatment of CSOs, and not to relief from water quality standards (R. at 94). Rock Island appears to have been aware of this condition, and has not objected to it. The Board itself notes that up to the present time, the United States Environmental Protection Agency has indicated that only variance (i.e. non-permanent) relief from water quality standards can be granted consistent with the Clean Water Act (see document entitled "Status Report on Discussions with USEPA", dated October 4, 1985; this document is part of the record of, and is cited in, Borden Chemical Company v. Illinois Environmental Protection Agency, PCB 82-82, ... PCB ....., December 5, 1985). To assure that this issue is clear, the Board will introduce into the Order, as proposed by Petitioners, language identifying the scope of the exception as granted.

ORDER

1. The City of Rock Island is hereby granted an exception from the treatment requirements of 35 Ill. Adm. Code 306.305(a), as such provision relates to first flush of storm flows, and from 35 Ill. Adm. Code 306.305(b), subject to the following conditions:

   a. Such exception shall be limited to combined sewer outfalls 002, 003, 004, 005, and 006 and to bypass 001A, as identified in this proceeding.

   b. The City of Rock Island shall implement all modifications to its sewer system as identified in paragraphs 14, 15, and 16 of the petition in this proceeding.

   c. The City of Rock Island shall implement the shoreline inspection program described in paragrpah 15 of the petition in this proceeding.

2. This grant of exception does not preclude the Agency from exercising its authority to require as a permit condition a) a CSO monitoring program sufficient to assess compliance with

this exception and any other Board regulations, including Section 306.305(c); and b) other controls if needed for compliance, including compliance with water quality standards.

3. This grant of exception is not to be construed as affecting the enforceability of any provisions of this exception, other Board regulations, or the Act.

4. Within forty-five days of the date of this Order, the City shall execute a Certification of Acceptance and Agreement to be bound to all terms and conditions of the exception granted. The Certification shall be submitted to the Agency at 2200 Churchill Road, Springfield, Illinois, 62706. The forty-five day period shall be held in abeyance during any period that this matter is being appealed. The form of said Certification shall be as follows:

CERTIFICATION

I, (We), ..._____, having read the Order of the Illinois Pollution Control Board, in PCB 85-214, dated May 9, 1986, understand and accept the said Order, realizing that such acceptance renders all terms and conditions thereto binding and enforceable.

.....
Petitioner

.....
By: Authorized Agent

.....
Title

.....
Date

IT IS SO ORDERED.

Board Members Joan Anderson and Jacob D. Dumelle concurred.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 9th day of May, 1986, by a vote of 7-0.

Dorothy M. Gunn
Dorothy M. Gunn, Clerk
Illinois Pollution Control Board

PRELIMINARY ENGINEERING REPORT

for

THE UPGRADE OF THE ROCK ISLAND WASTEWATER TREATMENT PLANT

December 1997

by

James E. Huff, P.E.

HUFF & HUFF, INC.
ENVIRONMENTAL CONSULTANTS
LaGRANGE, ILLINOIS

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1. INTRODUCTION

The City of Rock Island's Wastewater Treatment Plant was last upgraded in the early 1970's. The treatment plant was designed to process 8.0 MGD on average, with a peak flow of 16.0 MGD. The treatment process includes grit removal, primary sedimentation, activated sludge, and seasonal disinfection. Secondary sludge is currently wasted to the primary sedimentation basins. Sludge is processed through two anaerobic sludge digesters, then dewatered on sand drying beds or a new belt filter press. Excess flows, not processed through the treatment plant, are pumped around the plant and combine with the treatment plant effluent prior to discharge into the Mississippi River. Figure 1 is a simplified flow schematic of the treatment process.

During wet weather events, sludge wash out from the secondary clarifiers has been experienced. To minimize this sludge wash out, the City has historically limited the flow through the plant to levels below the design maximum flow (DMF) of 16 MGD. In essence, the plant is not currently capable of processing 16 MGD without significant sludge washouts from the secondary clarifiers.

Huff & Huff, Inc. was retained by Rock Island to review the design capacity of each unit operation. From this evaluation, several significant upgrades/modifications are proposed herein. In addition, a preliminary cost estimate is provided to serve as the basis for proceeding with upgrading the plant.

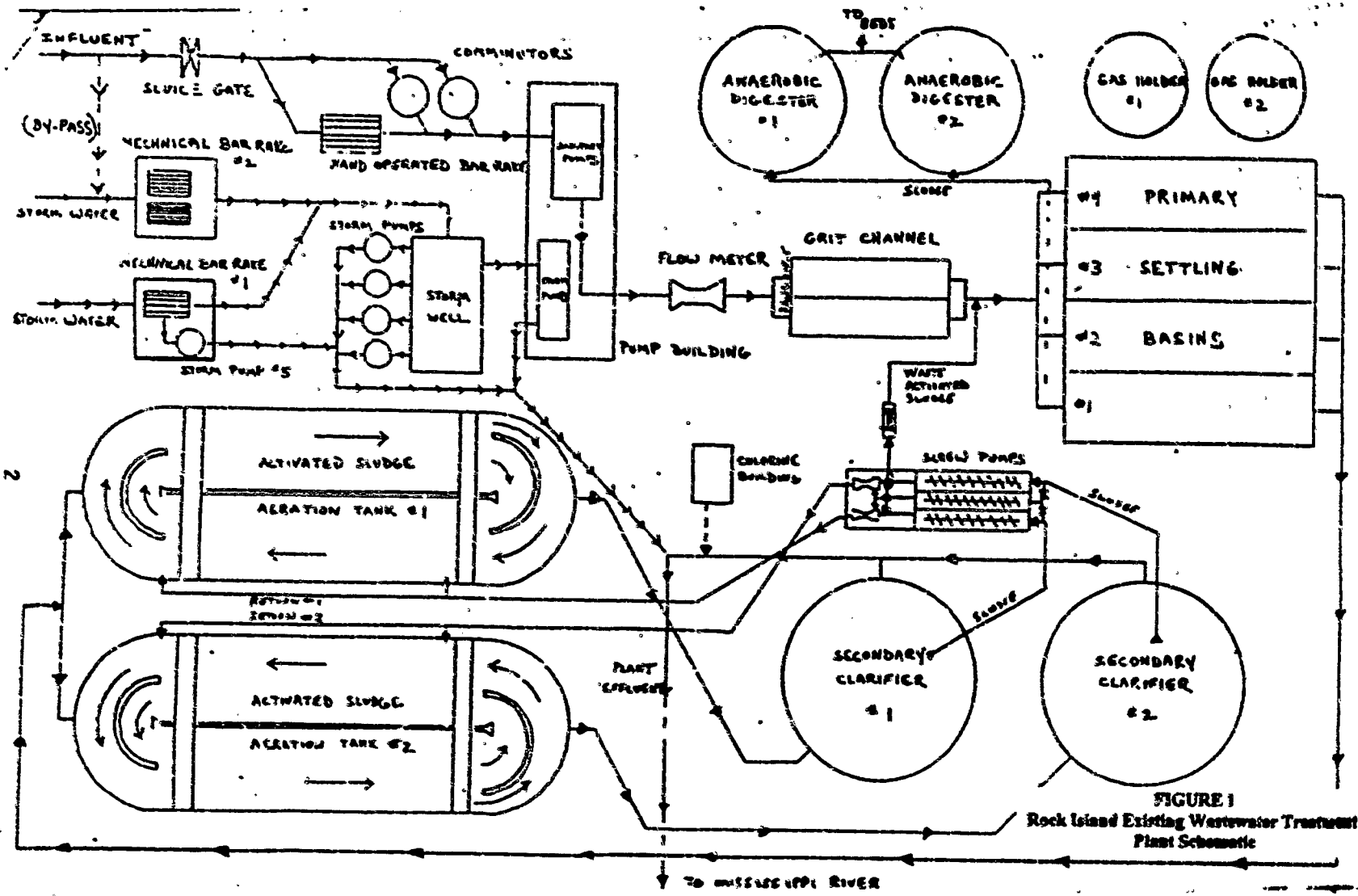

FIGURE 1
Rock Island Existing Wastewater Treatment Plant Schematic

2. EXISTING CAPACITY ANALYSIS

As the existing treatment plant was designed in 1970, the engineers likely used the "Recommended Standards for Sewage Works" by the Great Lakes - Upper Mississippi River Board of State Sanitary Engineers, or "Ten - States Standards," as it is referred to in the industry. As no change in the existing Design Average Flow (DAF) or Design Maximum Flow (DMF) is proposed, the Ten-States Standards is the appropriate guide for checking capacities. It should be noted that the 1978 Edition is utilized herein versus the 1968 Edition, which was most likely utilized during the actual design. The capacity of the existing unit operations under the Illinois Recommended Standards for Sewage Works (1980), are also included, where they differ. The supporting calculations are included in Appendix A.

2.1 Grit Chamber

Two-3 foot wide grit chambers are included at the head of the plant. At 16 MGD, the depth in each grit chamber was calculated to be 4.1 ft, versus a maximum depth of the chambers of 6.5 ft. Based on this comparison, the grit chambers should function properly at flows up to 16 MGD.

2.2 Primary Sedimentation

Rock Island's plant includes 4 - 2 train primary sedimentation basins, having a total surface area of 12,580 sq ft. When pumping waste activated sludge back to the primaries, generally lower surface overflow rates should be utilized. Ten-States Standards specifies surface overflow rates of 1000 gpd/sq ft at the DAF and 1500 gpd/ sq ft at the peak hourly rate. Thus, at 1500 gpd/sq ft, the primaries can theoretically handle 18.9 MGD, which is adequate.

Recognizing problems when waste activated sludge is returned to the primaries, the Illinois Recommended standards limits surface overflow rates to 1000 gpd/sq ft in this situation. This recognition would effectively limit the peak flow rate to 12.85 MGD. However, if the waste

activated sludge was not directed back to all of the primaries, the surface overflow rate of 1,240 gpd/sq ft would be acceptable under the Illinois Recommended Standards.

In summary, the primaries were adequately sized in 1970; however, the primaries can expect high solids carryover near peak flows so long as the waste activated sludge is pumped to all of the primaries.

2.3 Aeration Tanks

The aeration basins contain 2.67 million gallons of capacity. The design organic loading of 13,344 lbs BOD_5/day yields an organic loading of 37 pounds BOD_5/1000 cu ft/day, which is below the recommended maximum limit of 50 lbs BOD_5/1000 cu ft/day. Thus, these aeration basins have sufficient capacity for treating sewage up to the design flow rates.

2.4 Secondary Clarifiers

The treatment plant has 2 - 80 ft diameter clarifiers, providing a total surface area of 10,048 sq ft. Ten States Standards recommends 1200 gpd/sq ft at the peak hourly rate. This equates to a design maximum rate of 12.0 MGD, which is far short of the 16.0 MGD DMF.[1/]

In summary, the secondary clarifiers are not capable of processing 16 MGD, and it is easy to understand why solids wash out occurs at higher flow rates.

2.5 Sludge Digestion Capacity

The two anaerobic digesters, operated in parallel, have a total capacity of 102,430 cu ft. Loading to the anaerobic digesters is a function of the degree of mixing, with Ten States Standards

---

[1/] The current design was based upon 800 gpd/sq ft; however, the Design Average Flow of 8 MGD was utilized instead of the Design Maximum Flow.

recommending a loading of 40 lbs of VSS/1000 cu ft/day for moderately mixed to 80 lbs VSS/1000 cu ft/day for completely mixed systems.

Rock Island's digesters are not equipped with gas or mechanical mixers, relying on recirculation pumping. While the injection point for the recirculation sludge is varied during the day, every other day the mixing is switched to the other digester. Thus, Rock Island's operation can be characterized as moderately mixed, and is capable of handling approximately 40 lbs VSS/1000 cu ft/day (4100 lbs VSS/day total) or slightly more.

The current sludge generation rate at Rock Island is estimated at approximately 10,000 lbs VSS/day. Thus, the anaerobic digesters are currently operating at loadings over 2 times recommended levels.

3. PROPOSED UPGRADING

Based upon a review of the actual capacities of the existing unit operations, several additions and modifications are proposed herein to improve the overall operation. Appendix B contains a site layout of the treatment plant depicting the proposed upgradings.

3.1 Additional Secondary Clarifier

Space limitations at the Rock Island Treatment Plant are significant. There is room to add one-65 ft diameter secondary clarifier adjacent of the present two clarifiers. This would increase the total surface of the secondary clarifiers to 13,364 sq ft. Under Ten States Standards, a surface overflow rate of 1200 gpd/sq ft is acceptable, which equates to 16.0 MGD of capacity. Under the Illinois Recommended Standards, the peak rated capacity would be 13.3 MGD. However, flows above 13.3 MGD are typically of short duration at this treatment plant, so operating at surface overflow rates above 1000 gpd/sq ft for short periods of time is not expected to create any compliance issues.

The flow for the new clarifier will be obtained equally from both aeration basins through stop gates in the overflow channels. Two 24-inch lines (one from each aeration basin) will run past both existing clarifiers, before combining into a single 30-inch line. Due to serious space constraints these 24-inch lines will be set on top of the existing 36-inch lines.

Wastage from the clarifiers will be limited to just the new clarifier. The other two clarifiers will return sludge to the two aeration basins without any modifications (except no sludge wastage). A new pump house with return sludge pumps will be constructed. Return sludge from the new clarifier will be directed into the existing influent line to the aeration basins, from the primaries.

A solenoid valve on a sludge wastage line will opened every hour for a preset (but adjustable) time period, sending sludge to thickening. Three return sludge pumps are proposed: one backup, one constant speed, and one on a variable drive. The variable drive pump would be adjusted up or down based upon the sludge blanket depth in the new clarifier.

3.2 Primary Sedimentation Modifications

Currently waste activated sludge is sent into all eight primary sedimentation bays. With the new sludge wastage line described above, 100 percent of the waste activated sludge would be directed to the furthest west primary sedimentation bay only. This bay would not receive any primary flow until the inlet flow reaches 14.4 MGD. At flows above 14.4 MGD, existing valves on the inlet to this bay would be manually opened. The opening between the two bays in the western most primary would be reduced to minimize cross flows between basins.

As sedimentation is a function of the surface overflow rate, the sludge level in the basin is theoretically not relevant. Assuming the flow in the sludge thickening primary is limited to 1000 gpd/sq ft due to the secondary sludge, this basin would handle.

$$\frac{1000 \text{ gpd}}{\text{sq ft}} \left| \frac{1,606 \text{ sq ft}}{} \right. = 1.6 \text{ MGD}$$

The remaining five would have the following surface overflow rates at peak flow:

$$\frac{16 \text{ mgd} - 1.6 \text{ mgd}}{11,246 \text{ sq ft}} = 1420 \text{ gpd/ sq ft}$$

From Appendix E of the Illinois Design Standards, this would yield approximately 28 percent removal of BOD_5 across the primaries.

3.3 Sludge Digestion

As noted in the previous section, the current anaerobic digesters are overloaded. A new aerobic digester primarily for the waste activated sludge is proposed.

The aerobic digester would be triangularly shaped and located, south of the new 65-ft diameter clarifier. The digester would have 36,000 cu ft of capacity, plus a 3,000 cu ft thickener/supernatant decant chamber. Assuming all of the waste activated sludge were directed to the aerobic digester, the loading would be 63 pounds of VSS/day/1000 cu ft. Illinois Recommended Standards for Sewage Works (1980) specifies loading less than 80 pounds of VSS/day/1000 cu ft. Note that the proposed aerobic digester is as large as can be built on the available land.

Sludge wastage to the aerobic digester would be with the existing sludge pumps from the primaries. When drawing off sludge from the primary bay utilized for thickening the waste activated sludge, a simple valving change would be necessary. This flexibility would allow the operator to direct sludge to either an anaerobic digester or an aerobic digester from each sedimentation bay. Sludge from the aerobic digester will be directed back to the sludge pumps for application to the sludge drying beds or the belt filter press.

4. PRELIMINARY COST ESTIMATE

Table 4-1 presents the preliminary costs for the proposed upgrading. The secondary clarifier is projected at approximately $400,000, including the piping and pumps. Modification of the primary sedimentation bay to a sludge thickener is estimated at only $15,000, and the aerobic digester at $217,000. With permitting, engineering and contingency, the budget cost is $822,000 for upgrading the Rock Island Wastewater Treatment Plant.

TABLE 4-1
CITY OF ROCK ISLAND
WASTEWATER TREATMENT UPGRADE COST ESTIMATE

Item	Cost, $	
SECONDARY CLARIFIER		
Equipment Purchase	116000	
Concrete Tank	158000	
Install Equipment in Clarifer	25000	
Slide gates on Aeration Basin Channels	2000	
New 24/30" line to clarifier	27000	
3 return sludge pumps& Control Panel	36000	
PLC with solencid valve for wastage	5000	
Bldg for pumps & Digester blowers	29000	
Return sludge piping, 16"	2000	
		400000
CONVERSION OF ONE PRIMARY TO SLUDGE THICKENER		
4" Feed Line	10000	
Modification to Bay opening	5000	
		15000
AEROBIC DIGESTER FOR 2NDARY SLUDGE		
Equipment		
Blowers	30000	
Diffusers	7000	
Sludge pumps	12000	
Concrete Tank, 37000 cu ft	123000	
Diffusers installed	8000	
Piping/Valves from Primary Sludge Pumps	12000	
Piping Supernatant to Primary Effl Line		
& Telescopic Valve	10000	
Piping Digested Sludge to Front of West Primary	15000	
	192000	217000
ENGINEERING & PERMITTING	90000	
		90000
CONTINGENCY, 15%	100000	
		100000
TOTAL		822000

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Environmental Consultants

CALCULATION SHEET

Project CAPACITY - POTW Client ROCK ISLAND

Title GRIT CHAMBER

Signature JEH Date 9-6-97 Sheet 1 of 7

GRIT CHAMBER - DESIGN BASIS - VELOCITY = 1 FT/SEC

PRESENT GRIT CHAMBER

2-3 FT WIDE, SUPPOSED TO BE CAPABLE OF 1 FT/SEC, FROM 4 MGD UP TO 16 MGD, WITH THE PROPORTIONAL WEIR

CHECK DEPTH AT 16 MGD:

$$\frac{16{,}000{,}000 \text{ GAL/DAY}}{\text{DAY}} \Big/ \frac{\text{DAY}}{1440 \text{ MIN}} \Big/ \frac{\text{FT}^3}{7.48 \text{ GAL}} \Big/ \frac{\text{MIN}}{60 \text{ SEC}}$$

$= 24.8$ cfs

DEPTH AT 16 MGD:

$$\frac{24.8 \text{ ft}^3/\text{SEC}}{\text{SEC}} \Big/ \frac{\text{SEC}}{1 \text{ FT}} \Big/ 6 \text{ FT WIDE}$$

$= 4.13$ FT

FROM 1969 HYDRAULIC PROFILE PAGE

GRIT CHAMBER 564.5

$- 558.0$

6.5' TOTAL DEPTH

OK - NEED TO CHECK WEIR

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Environmental Consultants

CALCULATION SHEET

Project CARROLLTON - POTW Client ROCK ISLAND

Title PRIMARY SEDIMENTATION

Signature JEH Date 9-6-97 Sheet 2 of 7

DESIGN BASIS: 1000 GPD/FT^2 (ALL FLOWS)

PRESENT PRIMARY SEDIMENTATION BASINS

4 - 2 TRAIN BASINS 12,852 square ft

AT 1000 GPD/FT^2 - PEAK HYDRAULIC FLOW (ALL FLOWS):

$$\frac{12,852 \text{ ft}^2 / 1000 \text{ GPD}}{\text{ft}^2}$$

= 12.8 MGD

NOW, IF REMOVE WASTE ACTIVATED SLUDGE FROM PRIMARIES

$$\frac{16,000,000 \text{ GPD}}{12,852 \text{ ft}^2}$$

= 1240 GPD/FT^2

WOULD YIELD ~30% BOD$_5$ REDUCTION WOULD BE OK W/O WASTE ACTIVATED SLUDGE.

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CALCULATION SHEET

Project CAPACITY POTW Client ROCK ISLAND

Title AERATION TANK

Signature JEH Date 9-6-97 Sheet 3 of 7

AERATION TANKS SIZED FOR < 50 LBS BOD_5/DAY PER 1000 cu ft

DESIGN FOR AVERAGE FLOW

VOLUME 2.67 MG = 357,000 ft^3

BOD_5 LOADING = (8 MGD)(8.34)(200 mg/l)

= 13,344 LBS BOD_5/DAY

LOADING = $\frac{13,344 \text{ LBS } BOD_5/\text{DAY}}{357,000 \text{ ft}^3}$

= 37 LBS BOD_5/1000 cu ft/DAY

OK

DESIGN GOAL: FINAL SETTLING TANKS, (TWO NITRIFICATION)

IEPA 1000 GPD/ft²
TEN STATES STDS 1200 GPD/ft²

$$\text{AREA } 80'\phi = \frac{\pi (80)^2}{4} = 5024 \text{ ft}^2$$

SURFACE OVERFLOW RATE

$$= \frac{16{,}000{,}000 \text{ GPAC / DAY}}{5024 \text{ ft}^2 \times 2}$$

$$= 1{,}590 \text{ gpd/ft}^2$$

OR 2-π 80' ϕ CLARIFIER at IEPA STDS

IS 10.0 MGD

AT 1200 GPD/ft², GOOD FOR 12 MGD

HAVE ROOM TO ADD 65' ϕ CLARIFIER

$$\text{AREA} = \frac{\pi (65)^2}{4} = 3{,}316 \text{ ft}^2$$

AT IEPA STDS = 3.3 MGD

AT 1200 GPD/FT^2 = 4.0 MGD

SO IF 2-80' + 1-65' Ø CLARIFIERS

CAPACITY:

IL DESIGN STDS 10 MGD + 3.3 MGD

= 13.3 MGD

10-STATES STDS = 12 MGD + 4.0 MGD

= 16.0 MGD

CONCLUSION: 1-65 FT Ø SECONDARY CLARIFIER ADDED WOULD ALLOW 16 MGD CAPACITY + STILL MEET EFFLUENT STANDARDS

ELEVATION DROPS

562.15
560.00
2.15 ft

DISTANCE ~80 FT

EFFECTIVE SLOPE 2.6% = 0.026

VELOCITY 16 MGD = 24.8 cfs

$$AREA = \frac{\pi D^2}{4} = \frac{\pi (3')^2}{4} = 7\ ft^2$$

$$VEL = \frac{24.8\ ft^3/sec}{7\ ft^2} = 3.5\ fps$$

MANNINGS

$$V = \frac{1.49\,(R^{.66})\,S^{0.5}}{n}$$

or

$$\text{Energy Gradient} = S = \frac{V^2}{(1.49)^2 R^{4/3}/(0.013)^2}$$

$$R = \frac{7\ ft^2}{\pi(3')} = 0.74\ ft$$

$$S = \frac{(3.5)^2}{(2.22)(0.74)^{4/3}/0.000169}$$

$$= \frac{12.25}{(2.22)(0.67)/0.000169} = \frac{12.25}{8800} = 0.0014'/ft$$

HUFF & HUFF, INC.
Environmental Consultants

CALCULATION SHEET

Project CAPACITY - POTW Client ROCK ISLAND

Title 36" SEWER - FOLLOWING GRIT CHAMBER

Signature JEH Date 9-8-97 Sheet 7 of 7

$$V = \frac{(1.49)(R^{.66})S^{.5}}{n}$$

$$S^{.5} = \frac{Vn}{(1.49)(R^{.66})}$$

$$S = \frac{V^2 n^2}{(1.49)^2 R^{4/3}}$$

$$= \frac{(3.5)^2 (0.013)^2}{(1.49)^2 (0.74)^{4/3}}$$

$$= \frac{(12.25)(0.000169)}{2.22\ (0.67)}$$

$$= 0.0014\ ft/ft$$

Check's Nomograph -

Conclusion - 36" LINE HAS ADEQUATE CAPACITY

HUFF & HUFF, INC.
Environmental Consultants

CALCULATION SHEET

Project STP EXPANSION Client ROCK ISLAND

Title CLARIFIER SPLITTER BOX FROM AERATION

Signature JEH Date 10-22-97 Sheet 1 of 4

AREA OF 80' ϕ CLARIFIER 5024 ft²
AREA OF 70' ϕ CLARIFIER 3846 ft²

FROM EACH AERATION BASIN
WANT TO SPLIT FLOW

5024 ft² TO 0.5 (3846) ft²

OR 5024 TO 1923

$\frac{5024}{1923} =$ 2.6 : 1

OR 72% TO 80' ϕ
28% TO 70'

INSTALL SLIDE GATES IN OVERFLOW CHANNEL
28% GOING TO OUTSIDE (SEE
ATTACHED DRAWING)

FLOW ALLOCATION $\frac{16 \text{ MGD}}{2(5024 \text{ ft}^2) + 3846 (\text{ft}^2)}$

= 0.00115 MGL/ft²
OR 1150 GPD/ft²

∴ TO EACH 80' ϕ 5024 ft² · 1150 gpd/ft²

= 5.78 MGD

TO 70' ϕ = 1150 GPD/ft² (3846 ft²)

FROM EACH AERATION TANK, OUTLET PIPE TO CARRY 50% OF THE 4.42 MGD, OR 2.21 MGD OR 1534 GPM

WEIR LENGTHS 18', 2 @ 5' FROM SHOP INSTALL SLIDE GATE

FOR CLARIFIERS - 80' Ø, USE 3' Ø LINES

$\pi r^2 = 7.06\ ft^2$

SIZE NEW LINE WITH COMPARABLE AREA PER UNIT FLOW

$$\frac{7.06\ ft^2}{5.78\ MGD} \text{ as } \frac{x\ ft^2}{4.42\ MGD}$$

$x = 5.4\ ft^2$

$x = 1.3\ ft$ radius

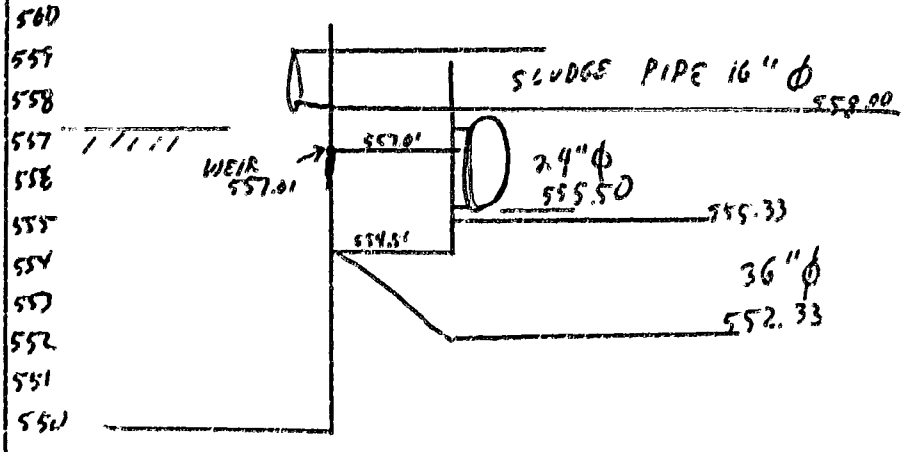
$\phi \cong 2.6'$ OR 30"

IF INDIVIDUAL LINES

$$\frac{7.06\ ft^2}{5.78\ MGD} \text{ as } \frac{Area}{2.21\ MGD}$$

Area = 2.7 ft²
r = 0.92 ft
ϕ = 1.85 ft = 22"

COMING ACROSS FRONT OF AERATION BASINS



RUN 2-24" ϕ LINES TO PAST SECOND
80' ϕ CLARIFIER - THEN GO TO
30" ϕ LINE.

CHECK MANNING'S 24" ϕ @ 2.21 MGD OR 3.420 cfs
0.0063 SLOPE, NEGLIGIBLE
30" ϕ @ 4.42 MGD OR 6.84 cfs

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CALCULATION SHEET

Project STP UPGRADE Client ROCK ISLAND

Title FLOW FROM AERATION BASINS

Signature JEH Date 10/22/97 Sheet 9 of 9

LINES CONSERVATIVELY SIZED. WHERE SPACE LIMITATIONS REQUIRE REDUCE DOWN STREAM PIPING.

24"ϕ to 21"ϕ

30"ϕ to 27"ϕ

ROCK ISLAND, ILL. SEWAGE PLANT REVISIONS

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CALCULATION SHEET

Project EXPANSION OF STP. Client ROCK ISLAND

Title SLUDGE WASTAGE

Signature JEH Date 10/22/97 Sheet 1 of 3

CAN'T TELL FROM MONITORING SHEETS QUANTITY OF SECONDARY SLUDGE WASTED

ASSUME 7.0 MGD
INF BOD5 120 mg/l

LB BOD5 /DAY = (7.0)(8.34)(120 - 20 mg/l)

= 5,800 LB/DAY

ASSUME SLUDGE YIELD 0.5

∴ NEED TO WASTE 2900 LB/DAY

RETURN MLSS TYPICALLY 5500 mg/l

VOLUME = $\frac{2900 \text{ LB/DAY}}{(8.34)(5500 \text{ mg/l})}$

= 0.063 MGD

= 63,000 gpd

= 44 GPM

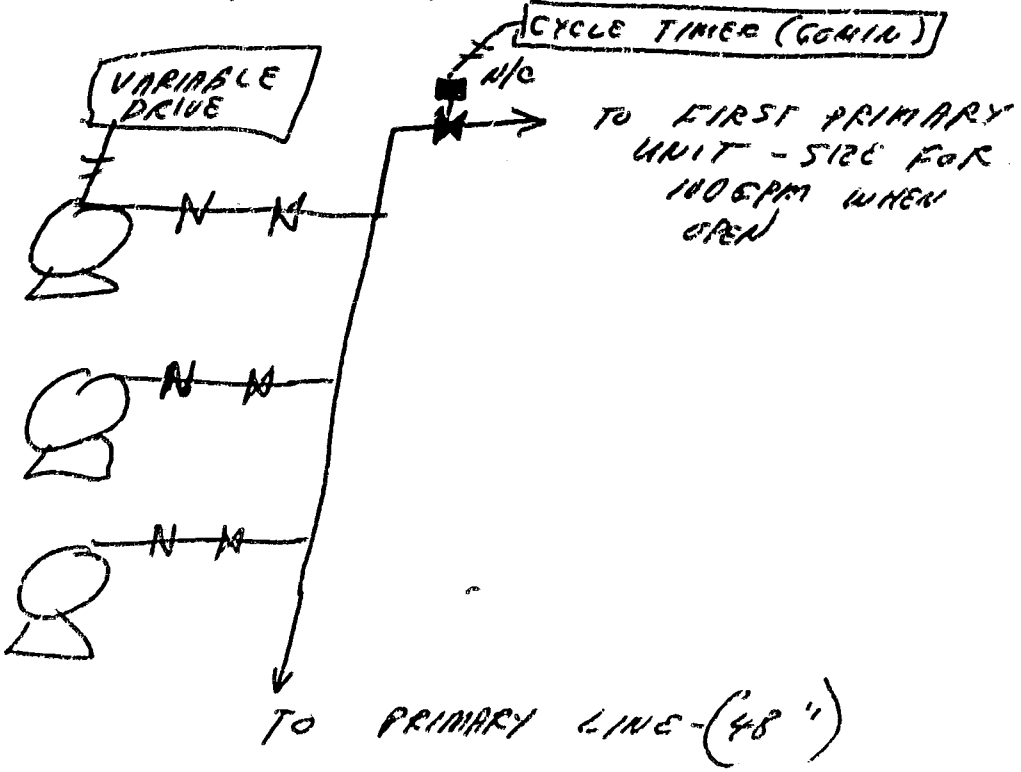
RETURN PUMP - SIZE FOR 50% OF PEAK FLOW (4.42 MGD)(50%)

= 2.21 MGD

- DO WITH 2 PUMPS OK

765 gpm

USE 3 SLUDGE RETURN PUMPS PUT ONE ON VARIABLE DRIVE- ONE BACK-UP, AND ONE FULL ON. WASTE SLUDGE WITH NORMALLY CLOSED SOLENOID VALVE ON HOURLY CYCLE TIMER WITH KEYPAD FOR CHANGING



48" 16 MGD + 2.21 MGD = 18.21 MGD MAX
28cfs

LINE LOSS 0.03'/100' OKAY - ADEQUATE CAPACITY

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CALCULATION SHEET

Project _____ Client Rock Island

Title SLUDGE THICKENER SIZING

Signature JEH Date 10/22/97 Sheet 3 of 3

1 TRAIN OF 1 PRIMARY
CAPACITY

$$\frac{12,852 \text{ ft}^2}{8 \text{ TRAINS}} = 1600 \text{ ft}^2$$

ASSUME PUMP CONTINUOUSLY AT
100 GPM @ 5500 mg/l

MAX SOLIDS LOADING = (0.144 MGD)(8.34)(5500 mg/l)

= 6,605 LBS/DAY

MAX SOLIDS LOADING = $\frac{6,605 \text{ LBS/DAY}}{1600 \text{ sq ft}}$

= 4.1 LB/sq ft/day

FOR WASTE ACTIVATED SLUDGE
THICKENERS TYPICALLY SIZED
FOR 4 TO 8 LB/sq ft/day
(METCALF & EDDY)

SO OK

IF ADD IN RAW SOLIDS

(2 MGD)(200 mg/l)(8.34) = 3,336 LB/[illegible]/day

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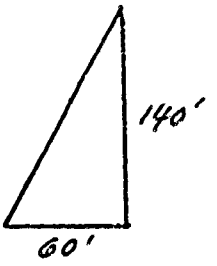
CALCULATION SHEET

Project STP UPGRADE Client ROCK ISLAND

Title AEROBIC DIGESTER

Signature JEH-II Date 10-31-97 Sheet 1 of 3

I. AVAILABLE SPACE SOUTH OF PROPOSED SECONDARY CLARIFIER



BUILD MAXIMUM SIZED AEROBIC DIGESTER TO FIT IN THIS SPACE

ASSUME

50' (ID) × 130' × 12' DEPTH

VOLUME : (0.5)(50')(130')(12')

= 39,000 cu ft

USE 2000 cu ft (15,000 GAL) FOR CLARIFIER TO RECAST OFF SUPERNATANT

THEREFORE AEROBIC DIGESTER

37,000 cu ft

II CHECK LOADING

SLUDGE WASTAGE FROM ACTIVATED SLUDGE PREVIOUSLY ESTIMATED AT 2,900 LBS/DAY

ASSUME 80% OF SOLIDS ARE VOLATILE

∴ VSS WASTED = (0.80)(2,900 LBS/DAY)

= 2,320 LBS/DAY

AEROBIC DIGESTER LOADING = $\frac{2320 \text{ LBS/DAY}}{37,000 \text{ cu ft}}$

= 63 LBS VSS/DAY/1000 cu ft

OK - 10 STATES STDS RECOMMENDS 30 LBS VSS/DAY/1000 cu ft

OR AT 80 LBS VSS/DAY/1000 cu ft, CAN HANDLE
2960 LBS VSS/DAY = 3700 LBS TSS/DAY
OR ~ 37% OF DAILY SOLIDS LOADING

DESIGN SYSTEM SO SLUDGE FROM PRIMARIES & SECONDARIES CAN GO TO EITHER EXISTING ANAEROBIC DIGESTERS OR AEROBIC DIGESTER TO PROVIDE MAXIMUM FLEXIBILITY.

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CALCULATION SHEET

Project	STP UPGRADE	Client	Rock Island
Title	AEROBIC DIGESTER		
Signature	JEH	Date	10-31-97

Sheet 3 of 3

BLOWER SIZING

$$\frac{30 \text{ cfm}}{1000 \text{ cuft}} \Big/ 37{,}000 \text{ cuft}$$

= 1100 cfm

PRESSURE 12' H_2O
= 5.2 psi

- INSTALL 3 - CENTRIFUGAL BLOWERS - EACH @ 650 cfm, WITH VARIABLE DRIVES

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CALCULATION SHEET

Project	Rock Island	Client			
Title	Sludge handling				
Signature	JMK	Date	10/24/97	Sheet	1 of 3

10 State Standards - Anaerobic Tank Capacity (90-100°F)

- Completely-mixed system loading rate = 80 lb. VS / 1000 ft³ day
- moderately-mixed system loading rate - 40 lb VS / 1000 ft³ · day
- Rock Island Digester tank capacity (M,S+F report p 12)
  = 102,432 ft³ (+/-1) 57,816 Ft³/tank
  Height = 18 ft.

Range of Mass Flowrates (for Rock Islands tank as per 10 State Stds)

$$\frac{80 \text{ lb VS}}{1000 \text{ ft}^3 \cdot \text{day}} (102{,}432 \text{ ft}^3) - \frac{40 \text{ lb VS}}{1000 \text{ ft}^3 \cdot \text{day}} (102{,}432 \text{ ft}^3)$$

range of mass flowrates @ RI: 8,194.56 lb VS/day − 4097.28 lb VS/day

- Rock Island's mass loading = 0.8 lb SS / capita · day (p. 11)

population potential (p.1) = 62,500 people

Assume VS = 0.8 SS

mass flowrate = 62,500 (0.80) 0.8 lb SS / day = 10,000 lb VS / day

mass flowrate is exceeded

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CALCULATION SHEET

Project	RI	Client	
Title	Sludge handling		
Signature	TmK	Date 10/24/97	Sheet 2 of 3

Tank Capacity Needed: (as per 10 State Stds)

$$10{,}000 \frac{\text{lb VS}}{\text{day}} \times \frac{1000 \text{ ft}^3 \cdot \text{day}}{80 \text{ lb VS}} = 125{,}000 \text{ ft}^3$$

$$10{,}000 \frac{\text{lb VS}}{\text{day}} \times \frac{1000 \text{ ft}^3 \cdot \text{day}}{40 \text{ lb VS}} = 250{,}000 \text{ ft}^3$$

Using more current Data: to calculate mass flow rate

flowrate to digesters = 60,000 gallons/day

2.5% solids (80% volatile) = 2% by weight is VS

$$\text{loading rate} = 60{,}000 \frac{\text{gallons}}{\text{day}} \times 0.02 \frac{\text{lb VS}}{\text{lb. water}} \times 8.34 \frac{\text{lb. water}}{\text{gal}}$$

loading rate = 10,008 lb VS/Day

= need small vol as above

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CALCULATION SHEET

Project	Rock Island	Client			
Title	Sludge Handling				
Signature	JMK	Date	10/28/97	Sheet	3 of 3

Anaerobic Tank Sizing:

if existing loaded @ 8,200 lb VS / day, still need

to account for 1,800 lb VS / day

$$\frac{1800\ lb\ VS}{day} \times \frac{1000\ ft^3 \cdot day}{80\ lb \cdot VS} = 22,500\ ft^3$$ (completely mixed)

↳ vol. of anaerobic needed if upgrades made to existing tank

Anaerobic Tank Size (#3) = 22,500 ft³

If running @ 40 lb VS / 1000 ft³·day ⇒ tank size = 45,000 ft³

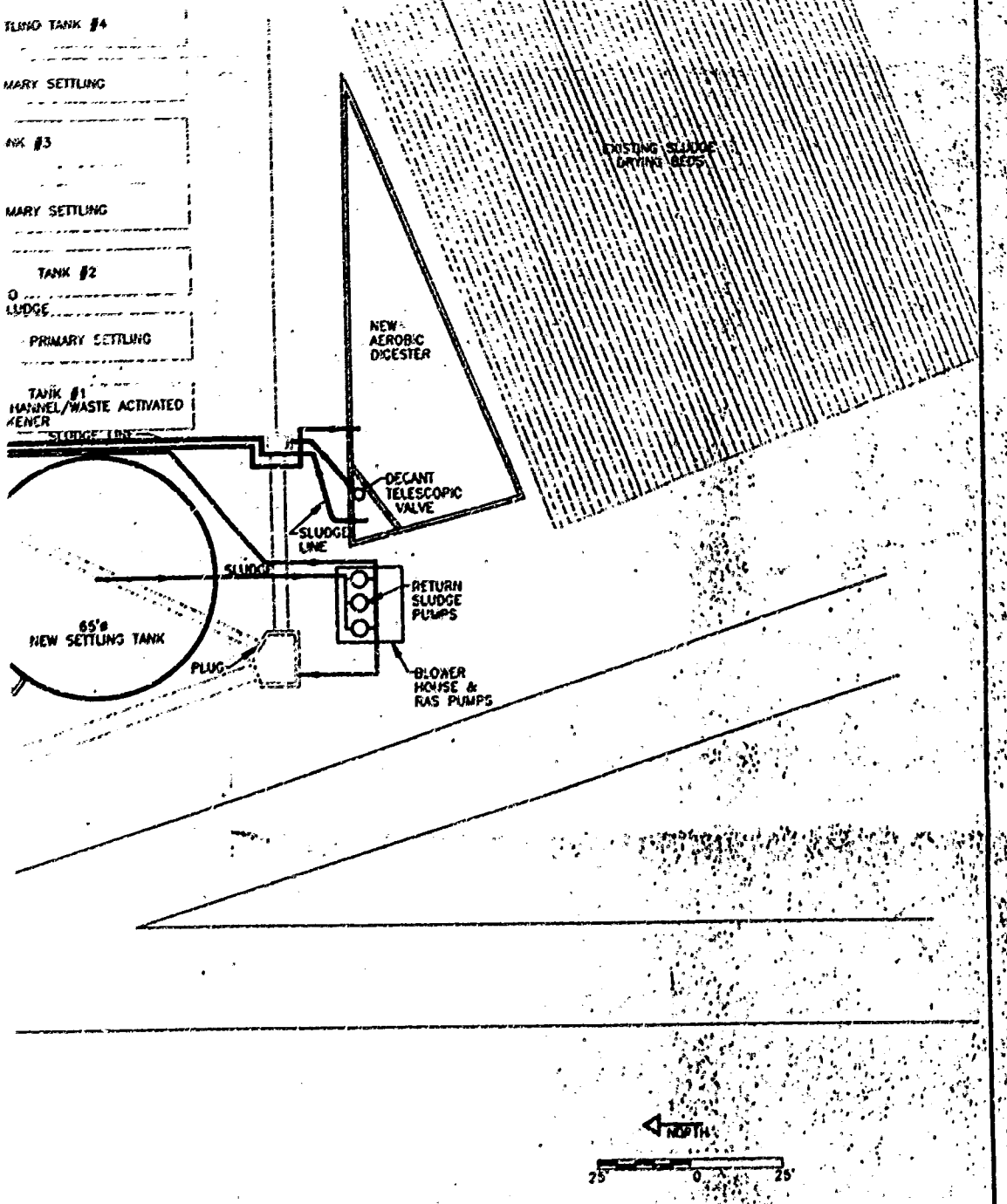
If others loaded @ 40 lb VS / 1000 ft³·day · 5

would've been in this

#3 @ 40 lb VS / 1000 ft³·day : 5908.78 lb VS / day × 1000/40 = 147,568 ft³ (1,103,956 gal.)

#3 @ 20 lb VS / 1000 ft³·day = 73,784 ft³ (551,978 gallons)

✓ Vol. of anaerobic tank needed w/o upgrades to existing tanks (assumed this 3rd tank will be completely mixed)



PLOT DATE: 11/21/97

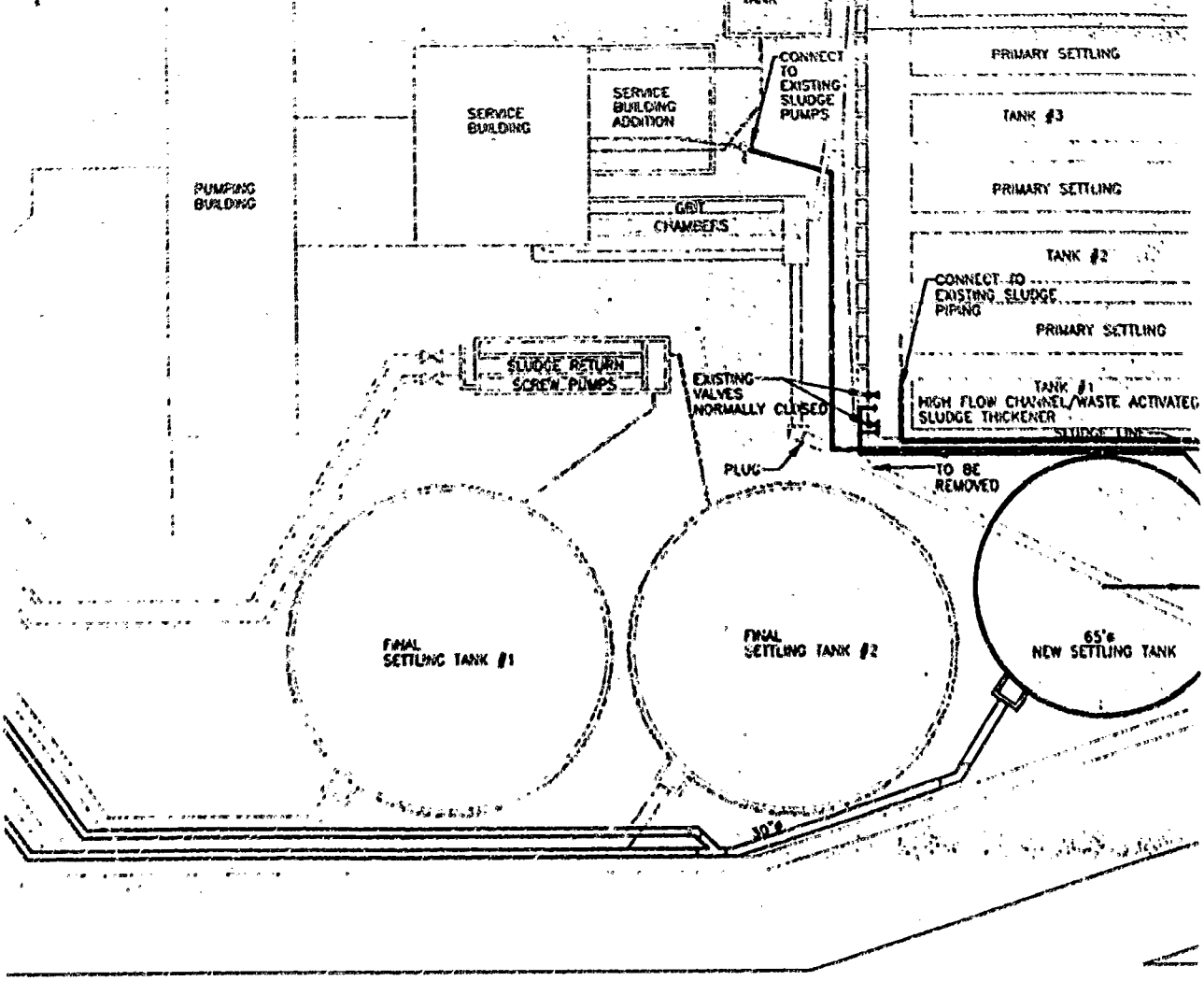
REV	DESCRIPTION	BY	DATE

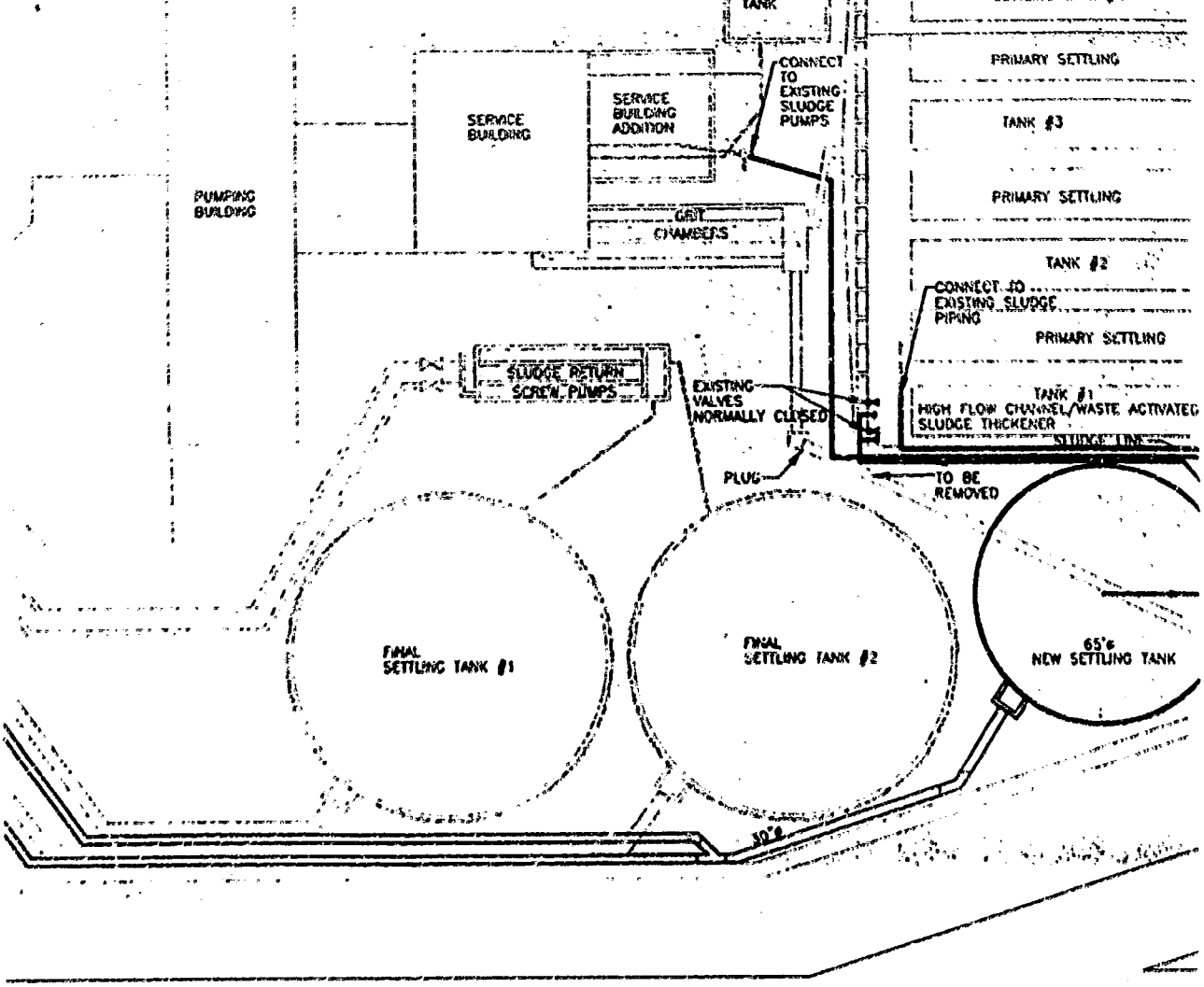
ROCKISLAND
SITE LAYOUT
PROPOSED UPGRADING CHANGES

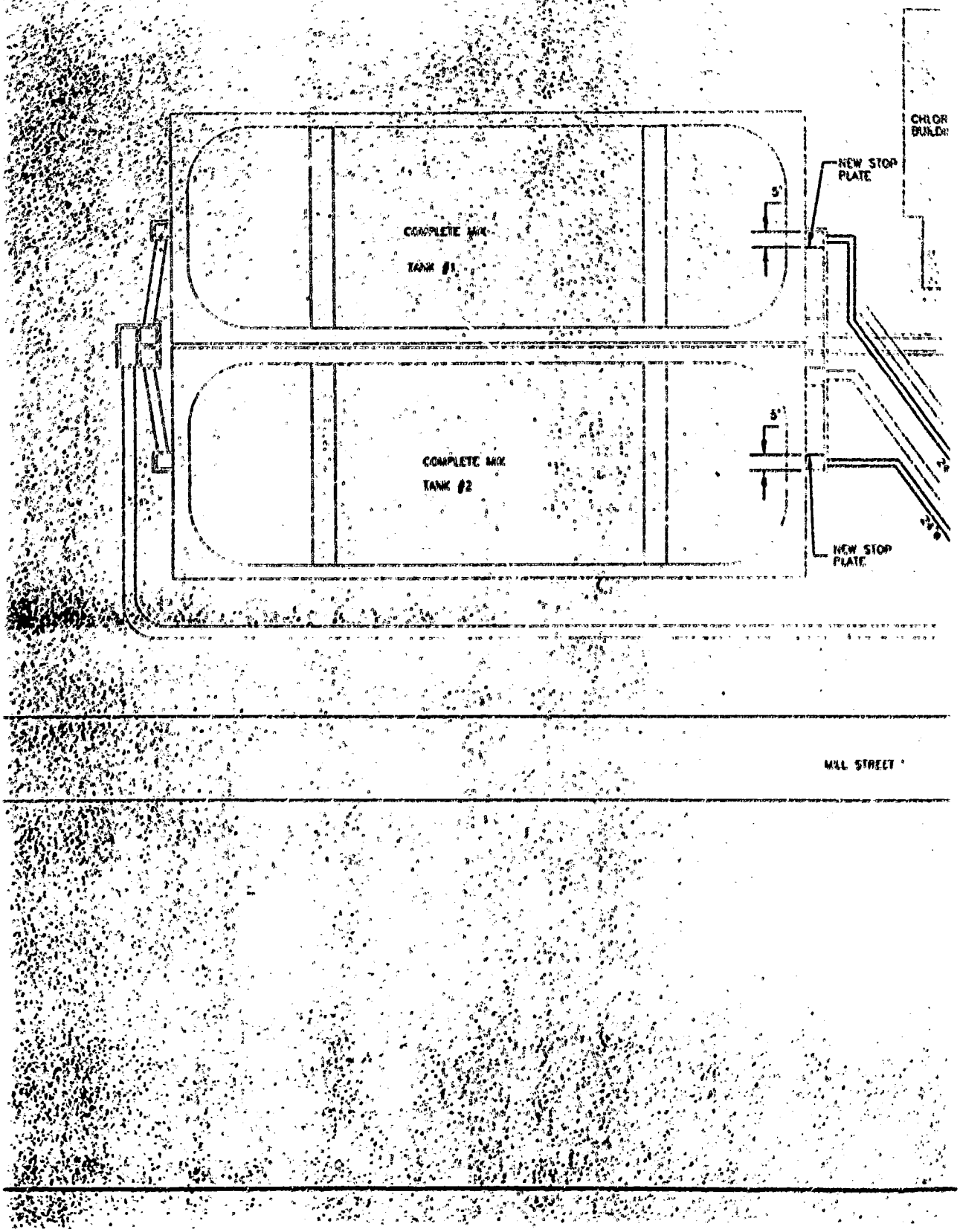
DRWN BY DLA
DSN'D BY JEH
CHK'D BY JEH

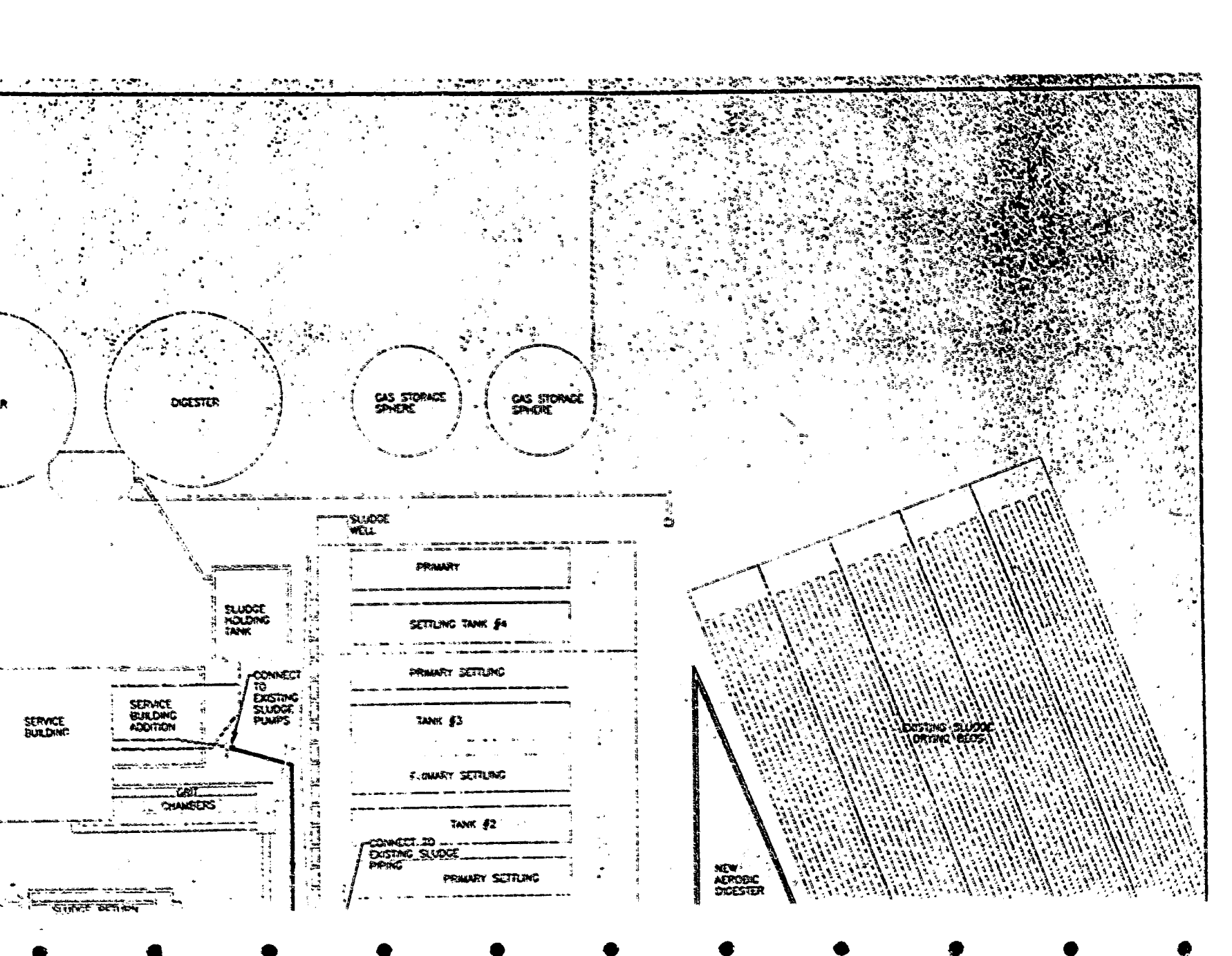
HUFF & HUFF, INC.
CARMEL, IN © 1997

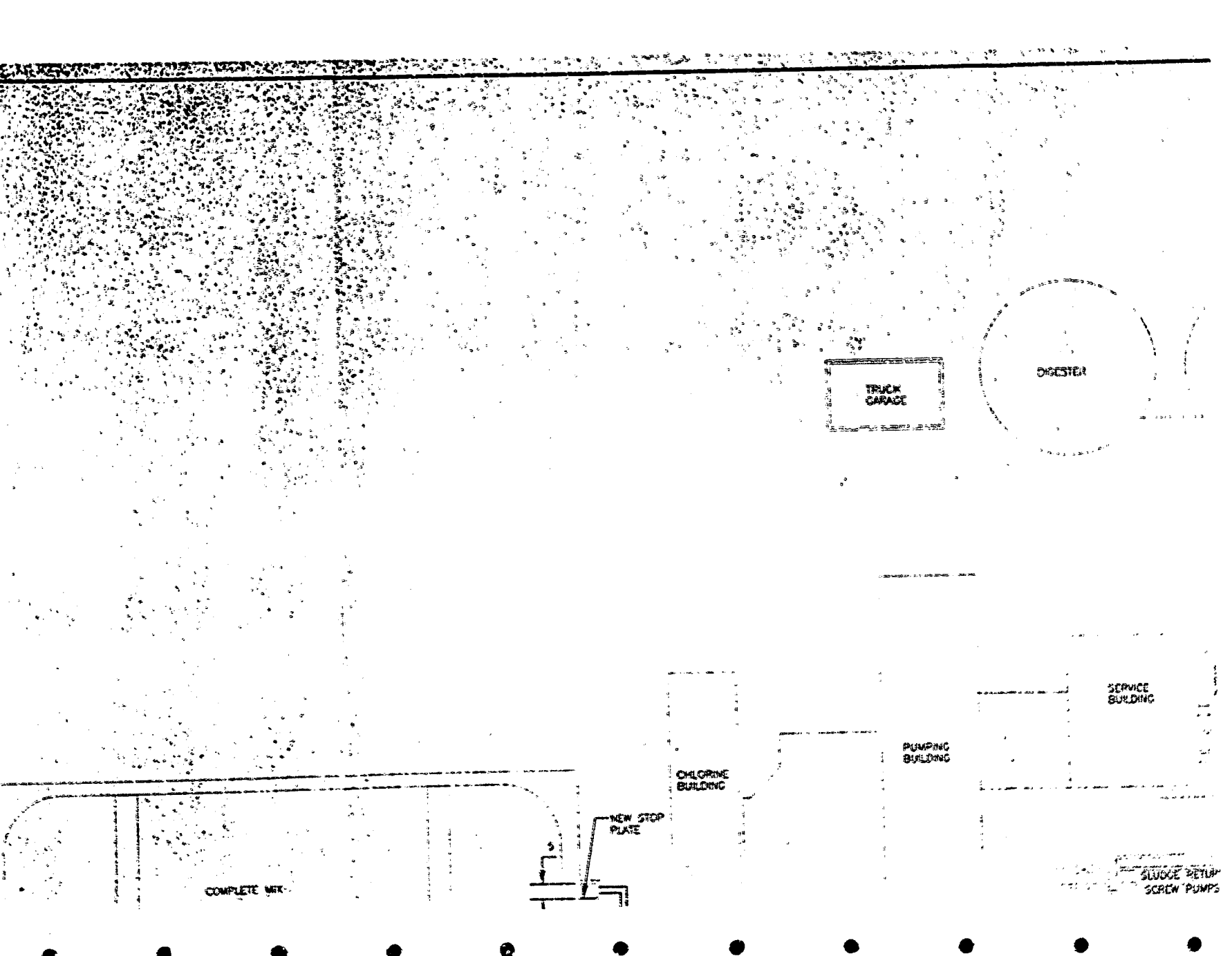
DATE 11/21/97
SCALE AS NOTED
DWG ROCK-8
SHEET 1


PUMPING BUILDING
SERVICE BUILDING
SERVICE BUILDING ADDITION
CONNECT TO EXISTING SLUDGE PUMPS
GBT CHAMBERS
PRIMARY SETTLING
TANK #3
PRIMARY SETTLING
TANK #2
CONNECT TO EXISTING SLUDGE PIPING
PRIMARY SETTLING
TANK #1
HIGH FLOW CHANNEL/WASTE ACTIVATED SLUDGE THICKENER
SLUDGE RETURN SCREW PUMPS
EXISTING VALVES NORMALLY CLOSED
PLUG
TO BE REMOVED
FINAL SETTLING TANK #1
FINAL SETTLING TANK #2
65'ø NEW SETTLING TANK
JAMES E. HUFF
32933
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS


PUMPING BUILDING
SERVICE BUILDING
SERVICE BUILDING ADDITION
CONNECT TO EXISTING SLUDGE PUMPS
GRIT CHAMBERS
PRIMARY SETTLING
TANK #3
PRIMARY SETTLING
TANK #2
CONNECT TO EXISTING SLUDGE PIPING
PRIMARY SETTLING
TANK #1
HIGH FLOW CHANNEL/WASTE ACTIVATED SLUDGE THICKENER
SLUDGE LINE
SLUDGE RETURN SCREW PUMPS
EXISTING VALVES NORMALLY CLOSED
PLUG
TO BE REMOVED
FINAL SETTLING TANK #1
FINAL SETTLING TANK #2
65'ø NEW SETTLING TANK
JAMES E. HUFF
32933
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
REV


CHLOR BUILDI
NEW STOP PLATE
5'
COMPLETE MIX
TANK #1
COMPLETE MIX
TANK #2
5'
2"
2½"
NEW STOP PLATE
MILL STREET


DIGESTER
GAS STORAGE SPHERE
GAS STORAGE SPHERE
SLUDGE WELL
PRIMARY
SETTLING TANK #4
PRIMARY SETTLING
TANK #3
PRIMARY SETTLING
TANK #2
CONNECT TO EXISTING SLUDGE PIPING
PRIMARY SETTLING
SLUDGE HOLDING TANK
CONNECT TO EXISTING SLUDGE PUMPS
SERVICE BUILDING ADDITION
SERVICE BUILDING
GRIT CHAMBERS
EXISTING SLUDGE DRYING BEDS
NEW AEROBIC DIGESTER


TRUCK GARAGE
DIGESTER
SERVICE BUILDING
PUMPING BUILDING
CHLORINE BUILDING
NEW STOP PLATE
COMPLETE MIX
SLUDGE RETURN SCREW PUMPS