DATA ENTERED	8/24/88	Billy Chen

DATE RECEIVED	FACILITY NAME	COUNTY NO.	PROGRAM AREA CODE	FACILITY TYPE CODE	SUBJECT AREA CODE
3 8/24/88	4 Ossian	5 96	6 CP	7 305	8 356

RULE REFERENCE	DESIGN STANDARD REFERENCE	DECISION / DATE	APPEAL ACTION / DATE
9 64.2(9)C	10 18C, 3,6, 2	11 Approved w/ * conditions 10/5/88	12

ENGINEER	VARIANCE RULE
13 IIW Engineers & Surveyors P.C.	14 64.2(9)C

15. DESCRIPTION OF VARIANCE REQUESTED:

The city of Ossian is proposing an aerated lagoon to replace the existing trickling filter system. Portion of the lagoon will be located less than 10 feet (minimum 6.5 feet) from the carbonate bedrock formation. Our standards require that a synthetic liner shall be provided if a lagoon is less than 10 feet above a carbonate or sandstone formation. The city is requesting a variance from the synthetic liner requirement.

16. ENGINEERS JUSTIFICATION:

1. New aerated lagoon serves domestic wastes only.
2. Only portion of 2nd aerated cell is less than 10 feet apart. Primary aerated cell removes 75% of BOD and is more than 10 feet above the bedrock formation.
3. Lagoon will be constructed to meet ½0 of allowable leakage rate and should protect groundwater.
4. A layer of "lean to fat Clay" above the carbonate bedrock will provide additional protection.
5. Bentonite system is a lot cheaper but, in engineer's opinion, has a lower probability of failure in the future.

17. DEPARTMENTS JUSTIFICATION: We recommend the aerated lagoon be approved without synthetic liner for the reasons of:

1. Iowa Geological Survey (IGS) Bureau indicated no significant groundwater impact with the intended use of this site. IGS Bureau also indicated that the bedrock is not a water formation bedrock and the site is not in sink hole area.
3. Only a portion of lagoon is within 10' of bedrock, however it will not be logical to line only that portion of lagoon, but it is expensive to line the whole lagoon.
4. Natural soil should enable the lagoon to achieve ½0 of required maximum allowable leakage rate of ⅛ in/day. Addition of bentonite will reduce leakage rate further.
5. A layer of four (4) feet of "lean to fat clay" lies above the bedrock should provide additional protection.

18. PRECEDENTS USED:

None

19. a. STAFF REVIEWER: Billy Chen, 9/2/88
b. SUPERVISOR: 9/6/88
c. AUTHORIZED BY: Darrell K. Allen 10/5/88

Fred

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

October 13, 1988

IIW Engineers and Surveyors
3210 St. Joseph Drive
Dubuque, Iowa 52001

ATTENTION: Mr. Gary Sejkora

RE: Variance Request
Synthetic Liner Requirement
Ossian, Iowa

Dear Mr. Sekjora:

This letter is in response to your request of August 24, 1988 for a variance from the requirement of a synthetic liner when the proposed aerated lagoon bottom is to be located less than 10 feet above a carbonate or sandstone formation. We have reviewed the justification you provided in your letter and additional information from the Iowa Geological Survey Bureau of this Department. We consider your variance request based on the following factors:

1. The supplemental geotechnical information you provided shows only portion of the secondary aerated cell is less than 10 feet above rock. The primary aerated cell removes 75% of BOD and is more than 10 feet above the bedrock formation.

2. The Iowa Geological Survey Bureau has informed us that they would expect no significant groundwater impact with the intended use of this site, and that the bedrock is not a water formation bedrock and the site is not in sink hole area.

3. The project specifications will require that the lagoon interior soils be scarified and recompacted to at least 95% of the materials standard proctor maximum density. In addition, bentonite will be incorporated in the upper four to six inches of the lagoon interior at a rate of approximately two pounds per square foot.

4. There is a layer of about four feet of lean to fat clay material that will provide additional protection against any lagoon leakage into the carbonate bedrock.

The addition of bentonite to the already low permeability existing soil should reduce the leakage rate well below the required 1.8×10^{-6} cm/sec. We, therefore, grant a variance from the requirement for a synthetic liner in Chapter 18C.3.6.2 of the design standards with a condition that the city will retest the lagoon leakage rate after it is in operation for one full year. The City of Ossian will be required to reseal the lagoon and also to implement a groundwater monitoring program if the leakage rate fails to meet our standard of less than 1/16 inch per day.

If you have any questions, please do not hesitate to contact Mr. Billy Chen of this office at 515/281-4305.

Sincerely,

Darrell McAllister

DARRELL McALLISTER, CHIEF
WASTEWATER PERMITS SECTION

DM:BC:pla/OSSIAN

cc: City Clerk, Ossian, IA
Field Office 1

IIW ENGINEERS AND SURVEYORS P.C.

3210 St. Joseph Dr. • Dubuque, IA 52001 • (319) 556-2464

Carl B. Shoenhard, L.S.
Dennis F. Waugh, P.E., S.E.
Charles A. Cate, P.E.
Gary D. Sejkora, P.E.
Warner R. Wright, P.E., L.S.
Ronald J. Turner, L.S.
Ross K. Abbott, L.S.I.T.

August 24, 1988

Mr. Billy Chen, P.E.
Wastewater Permits Section
Iowa Department of Natural Resources
Henry A. Wallace Building
900 East Grand Avenue
Des Moines, IA 50319

Re: City of Ossian, Iowa
Wastewater Treatment Facilities
Supplemental Geotechnical Information
IIW Project No. 87122

Dear Billy:

Terracon Consultants in a report dated August 1, 1988, presented the results of subsurface explorations for the proposed wastewater treatment facilities at Ossian, Iowa. A copy of the report was previously forwarded to you. Based on the findings of the subsurface explorations, Terracon concluded that the current DNR design standards for wastewater treatment ponds would require the installation of a synthetic liner. Terracon observed perched groundwater at the Ossian lagoon site, "weathered limestone with clay seams" within four feet of the proposed bottom of the lagoon and auger refusal within 10 feet of the proposed bottom of lagoon.

Subsequent to review of the report, test pits were dug at the Ossian lagoon site to better define subsurface conditions. Enclosed are three (3) copies of a letter from Terracon Consultants dated August 18, 1988, regarding their observations of the test pits. We ask that you note that Terracon has, as a result of their field and laboratory observations, reclassified the material underlying the proposed lagoon, to "lean to fat clay with numerous chert nodules". Terracon indicates that this residual soil is not part of the bedrock formation. As a result of this reclassification, the top of the bedrock has been established as the depth of auger refusal. Bedrock is therefore 6.5 feet below the lagoon bottom at boring 1, 8.0 feet below the bottom at boring 2 and 13 feet below the bottom at boring 3. The top of bedrock is thus more than four feet (4 ft.) below the proposed bottom of the lagoon. However, the bedrock is apparently of the carbonate type and the separation distance is less than 10 feet.

Item 18 C.3.6.2 of the current DNR design standards for wastewater treatment ponds states that a synthetic liner shall be required if the lagoon bottom is to be located less than 10 feet above a carbonate or sandstone formation. In accordance with item 18 C.1.2 of the DNR lagoon design standards, on behalf of the City of Ossian, we request your consideration of a variance from the requirement for a synthetic liner for the Ossian lagoon. For your consideration, our justification for the variance is as follows:

1. If the variance is granted, the project specifications will require that the lagoon interior (bottom and sides) soils will be scarified and recompacted to at least 95 percent of the material's standard Proctor maximum density. In addition, bentonite will be incorporated in the upper four to six inches of the lagoon interior at a rate of approximately two pounds per square foot. Testing performed by Terracon indicates that when existing soil is compacted to 95% maximum density, the coefficient of permeability is 3.0×10^{-8} cm/sec which is 1/3 the amount of leakage allowed by state standards. The addition of bentonite to these already low permeability soils could decrease the permeability to as little as 1/100 of allowable. It is our opinion, based on many successful projects, that a soil/bentonite liner will provide substantial leakage control and protection of groundwater. Please note that Terracon has indicated in their August 18, 1988, letter that the soil/bentonite design concept should provide the required leakage control.

2. It is only in the more recent DNR lagoon design standards that the reliance upon synthetic liners has become so significant. Under previous standards the situation at Ossian would not have required a synthetic liner or a variance. Obviously many lagoons have been constructed under previous design standards. We are not aware of any groundwater contamination problems resulting from the use of a soil/bentonite sealing method for previous applications when rock was more than four feet but less than 10 feet below the lagoon bottom.

3. Terracon reported "perched" groundwater at the Ossian site. Based on the test pits we have found that the perched groundwater is in the soil profile above the reclassified "lean to fat clay with numerous chert nodules". Thus we and Terracon have concluded that it is this lean to fat clay that holds the water in the upper soil profile. This same lean to fat clay material will provide significant additional protection against any lagoon leakage into the carbonate bedrock.

4. The Ossian facilities provide treatment for municipal wastewater. There are no industries in Ossian that discharge priority pollutants into the Ossian sewer system. In a "Report to Congress" regarding Municipal Wastewater Lagoons dated November, 1987, the U.S. EPA concluded that the potential for groundwater contamination from municipal wastewater lagoons is low, that human health risks associated with groundwater contamination from domestic lagoons are generally low and within an acceptable range, and that the concern for groundwater should be directed to lagoons receiving significant industrial waste. When properly constructed the proposed Ossian lagoon will have no significant leakage and thus groundwater would not be contaminated from domestic wastewater.

5. We are concerned about the reliability of a synthetic liner. Obviously a synthetic liner system will have many seams, any of which could fail. Further, the synthetic liner would be subject to damage due to normal operation of the facilities or possible future sludge removal. As indicated in item 4 above, the U.S. EPA is primarily concerned about

industrial waste contamination of groundwater. As a result the EPA apparently requires the installation of leachate collection and removal system between a flexible membrane liner and a compacted low permeability soils when industrial waste treatment lagoons are constructed. The requirement for the leachate collection system below a synthetic liner causes us to question reliability of a synthetic liner. We understand that the Illinois EPA only allows the use of synthetic liners under very special circumstances and then a duplicate sealing system is required. This is one of those rare occasions where we find we are in agreement with both the U.S. EPA and the Illinois EPA that synthetic liners might leak.

6. The area where auger refusal was encountered with 10 feet of the bottom of the proposed bottom (boring 1 at 6.5 feet and boring 2 at 8 feet), is to be beneath the second aerated cell. Under normal circumstances the screened wastewater will be pumped to the first cell where 75% or more of the BOD will be removed. Therefore a very dilute wastewater will be treated in the second cell.

7. The existing 38 year old treatment facilities discharge inadequately treated wastewater to a drainage ditch adjacent to the site. Obviously the fact that the existing plant cannot adequately treat Ossian's wastewater is the reason DNR has ordered the City to build new facilities. However, there have been no reported groundwater contamination problems due to the level of treatment at Ossian. We believe that the existing natural soils have safeguarded the underlying bedrock and would continue to do so with a new lagoon. Please note that the drainage ditch elevation near the south end of the first cell is 2.5 feet below proposed bottom of the lagoon thus we are adding to the protection in this area.

The DNR has, by Administrative Order, required the City of Ossian to build a new wastewater treatment facility. However, the DNR and the U.S. EPA have not provided any financial assistance. Although the City did receive a CDBG, the grant amounts to about 37% of the estimated project cost. The installation of a synthetic liner would add substantially to the project cost for a community already deeply in debt.

It is our opinion that a soil/bentonite liner system for the Ossian lagoon would provide sealing substantially equivalent to a synthetic liner. We also believe that the soil/bentonite liner system has a lower probability of failure in the future.

With regard to the perched groundwater, we plan to require the installation of a perimeter drain to effect the permanent lowering of the level of the soil water table. The water level would be lowered to at least two feet below the bottom of the lagoon. Construction of the drain would be as recommended by Terracon except that the pipe will be of corrugated polyethylene.

On behalf of the City of Ossian, we ask you to consider this variance request. We hope that you can agree that the bedrock and groundwater are more than adequately protected by the proposed bentonite sealing.

Thank you for your prompt review of this request. We hope to start construction yet this Fall.

Sincerely,

IIW ENGINEERS AND SURVEYORS, P.C.

Gary Sejkora, P.E.

GS/rw

Enc.

Copy: Joyce Bakewell, City Clerk
Mary Manning, UERPC
Steve Baumgarn, DNR, Manchester

Terracon
CONSULTANTS NE, INC.
5855 Hatmischfeger Drive S.W.
P.O. Box H
Cedar Rapids, Iowa 52406
(319) 366-8321

Gerald R. Olson, P.E.
James A. Cunningham, P.E.
Larry K. Davidson, P.E.
Ronald G. Gillette
Diane E. Joslyn
Thomas A. Salm

August 18, 1988

IIW Associates, P.C.
3210 St. Joseph Drive
RR #2
Dubuque, Iowa 52001

Attention: Mr. Gary Sejkora, P.E.

Re: Proposed Wastewater Treatment Facilities, Ossian, Iowa
Job No. 06885060

Gentlemen:

In accordance with your request, a representative of Terracon Consultants NE, Inc. visited the site of the proposed wastewater treatment facilities in Ossian, Iowa on August 16, 1988. The purpose of the site visit was to observe the excavation of test pits in areas of the proposed lagoon where close bedrock proximity to the lagoon bottom elevation was indicated by the test borings.

Two test pits were excavated with a backhoe. One pit was located south of the existing treatment plant in the vicinity of Boring 2 and the other was located east of the plant in the vicinity of Boring 1. Subsurface materials encountered in the test pits generally confirmed the results of our subsurface exploration as reported to you on August 1, 1988. However, one revision to classifications presented on our boring logs is in order following examination of the in situ materials. Borings 1 through 4 encountered "Weathered Limestone" at the respective approximate depths of 16 feet, 15 feet, 12 feet, and 10 feet below existing grade. These depths correspond to elevations ranging from 9 to 12.5. The material observed in the test pits was a residual soil derived from the parent bedrock, but a more appropriate classification would be "Lean to Fat Clay with Numerous Chert Nodules (Residual Limestone)". We would not consider this material part of the bedrock formation and believe that the top of the bedrock formation could be assumed at the depth where auger refusal was achieved in

the borings. In Borings 1, 2, and 3, this depth would correspond to the respective approximate elevations of 8.5, 7, and 2. Auger refusal was not encountered in Boring 4.

With a proposed cell bottom elevation of 15, this results in separations between bedrock and cell bottom of 6.5 feet, 8 feet, and 13 feet in the areas of Borings 1, 2, and 3.

It is our understanding that the project specifications will require scarification and recompaction of the pond bottom soils to at least 95 percent of the material's standard Proctor maximum density. In addition, we understand that bentonite will be incorporated in the upper 4 inches of the lagoon interior at a rate of approximately 2 pounds per square foot. While the bedrock proximity to the lagoon bottom in at least two boring locations is closer than allowed by Iowa Department of Natural Resources' guidelines without use of a synthetic liner, the proposed design concept should provide the required leakage control.

With regard to the water table proximity to the lagoon bottom, we understand that the project plans are being revised to incorporate a perimeter drain to effect permanent lowering of perched water at the site. We understand that a trench drain extending to a depth of at least 2 feet below the lagoon bottom will be constructed around the north and west sides of the facility to intercept perched water. The trench will have a 4-inch perforated PVC pipe in the bottom and will be backfilled with clean, free draining crushed stone to within 2 feet of final surface grade. Material meeting the requirements of Section 4131 in the IDOT Standard Specifications for Highway and Bridge Construction is recommended for the granular backfill. The upper 2 feet of the trench will be backfilled with compacted cohesive soil to minimize infiltration of surface water into the drain. The drain will outlet into the creek south of the facility. This should eliminate the necessity of using a synthetic liner due to groundwater proximity.

Should you have questions concerning the above information or if you require additional services, please contact us.

Very truly yours,

TERRACON CONSULTANTS NE, INC.

Diane E. Joslyn

Larry K. Davidson, P.E.
Iowa No. 9241

DEJ/LKD:amd

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

July 18, 1988

Mr. Wayne Farrand
Surface and Groundwater Protection Bureau
Wallace Building
900 East Grand
Des Moines, Iowa 50319

RE: Wastewater Site -- Ossian, Winneshiek county

Dear Mr. Farrand:

A review of available information does not appear to indicate that significant groundwater impacts will accrue relative to the intended use of this site.

The dominant soils at the site are silt loams which have developed in about 15 feet of loess. They have moderate permeability and shrink/swell potential, and leakage may be a problem unless they are handled properly. The loess underlain by 40 to 50 feet of till and carbonate bedrock. Private wells in the area may draw water from these limestone and dolomite units. The till beneath the site should be impervious enough and thick enough to protect groundwater of this source.

Ossian draws its water supply from an 1017 foot Jordan well that is constructed such that it will not be impacted. If you have any questions about the above information, please let me know.

Sincerely,

Donivan L. Gordon
Supervisor, Water Resources

DLG:mph

Discuss with Gordon on 8/1/88. — Bilyeu
Bedrock is not a water formation bedrock @ the site is not in a sink hole area.