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9104203

September 4, 1991

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91-WOB-315

Mr. Timothy L. Nord
Hanford Project Manager
State of Washington
Department of Ecology
Mail Stop PV-11
Olympia, Washington 98504

Dear Mr. Nord:

TRANSMITTAL OF PROJECT C-018H WASTE WATER ENGINEERING ALTERNATIVES REPORT

Enclosed are copies of the *Project C-018H Waste Water Engineering Alternatives Report*. Transmittal of the engineering report satisfies a commitment made in the letter from Ms. C. O. Gregoire of the Washington State Department of Ecology (Ecology) to Mr. J. D. Wagoner of the U.S. Department of Energy Field Office, Richland (RL), dated May 16, 1991. The commitment requires RL to submit this engineering report by August 31, 1991.

Written comments received in a letter from Ecology dated August 13, 1991, are addressed in the engineering report. A summary of the responses to the written Ecology comments is contained in the attachment to this letter.

The engineering report will serve as a prototype for Best Available Technology (BAT) evaluations to be performed on all Phase I streams at Hanford. The BAT evaluations, along with the final C-018H engineering report, are also to be submitted to Ecology by February 29, 1992.

Any questions you may have should be directed to Ms. T. M. Hennig of my staff on (509) 376-6888.

Sincerely,

Steven H. Wisness
Hanford Project Manager

WMD:TMH

Attachment

cc w/att:
D. Sherwood, Ecology
P. Stasch, Ecology
P. Day, EPA
D. Rasmussen, EPA
T. Veneziano, WHC

Response to Ecology Letter, dated August 13, 1991, "Comments on the Draft Engineering Report for Project C-018H Waste Water Treatment"

Comment 1

The first comment we have is about the selected treatment alternative addressed in the report. The selected system uses UV/oxidation of organics control. After studying the report, we found that a smaller UV/oxidation unit and a granular activated carbon (GAC) unit for organics destruction and polishing preferable because the UV/oxidation and GAC combination should, at least, achieve better treated water quality, lower overall cost, and more flexibility for the following reasons:

- For the organics control, a combination system of a smaller UV unit of 95-99% removal efficiency with a GAC unit of 90-99% removal efficiency should achieve a better overall efficiency than a UV system of 99.9% removal efficiency. Some organics that can not be effectively destroyed by UV/oxidation will be removed by GAC unit, therefore, better treated water quality can be expected with a UV and GAC combination system.

- The capital cost and annual Operation and Maintenance (O&M) cost (Table 5-13) for UV/oxidation alone are predicted to be $4,100,000 and $1,154,000, respectively. Further, the capital cost and annual O&M cost (Table 5-7) for using GAC units alone are predicted $656,000 and $1,898,000, respectively. Alternatively, our estimated capital cost for the combination system of a smaller UV and a GAC will be approximately $2,500,000, which is much less than $4,100,000. Our estimated annual O&M cost will be no more than $960,000 for the combination system, which is also less than $1,154,000. The O&M cost reduction is due to a much lower generation of used GAC with the GAC unit only used for polishing.

- The proposed waste water treatment system will be used to treat different waste waters. The combined use of UV and GAC will be more flexible than the sole use of either of these two process units alone. In other words, the combined system gives three options (GAC/UV/GAC&UV) to control organics rather than just one.

Response to Comment 1

The use of UV oxidation in conjunction with Granulated Activated Carbon (GAC) to remove organics is a possible combination of treatment technologies that has not been ruled out. Note that the engineering report did not identify GAC as a treatment of choice. The reasons which can be found on pages 5-29, 5-31, 5-32, 6-4, and 7-2 include:

- Spent GAC may become a radioactive mixed waste,
- The large volumes of spent GAC will result in very high disposal costs which have not been figured into the Operation and Maintenance costs,
- GAC is susceptible to biofouling,
- The efficiency of GAC is very poor for low molecular weight water soluble compounds likely to be present in the waste water, and
- The collection efficiency of GAC is temperature sensitive which means temperature swings can cause the loss of captured organics if sufficient care is not taken.

An additional reason (not mentioned in the engineering report) concerns the adsorption characteristics of GAC at low concentrations. For some constituents, adsorption isopleths are non-linear, showing lower collection efficiencies at low concentrations.

GAC may yet be used as a backup or helper technology to UV oxidation as stated on page 7-4. Information generated during treatability testing will resolve any uncertainties concerning this issue. If UV oxidation proves to be inefficient in the destruction of organic compounds, then GAC will be considered as an addition to the treatment train. This will in part depend upon the ability of GAC to adsorb the organics not destroyed or partially destroyed by UV oxidation.

Comment 2

The report should also have covered the treatment options for all solid waste generated, such as the option of using filter presses for dewatering of waste sludges. We would like to see an evaluation of using filter presses for the dewatering process in greater detail, the rationale for rejection of this option should also be covered in this evaluation.

Response to Comment 2

An evaluation of using filter presses in processing the secondary waste produced by the treatment facility was not made. However, it is mentioned on page 8-11 that it is a potential substitute for a centrifugal dewaterer. The Architect Engineer/Construction Company that is awarded the bid for Project C-018H will have the responsibility of evaluating such secondary waste unit operations. They will likely consult with vendors of such machinery and with WHC safety and technical personnel. Personnel at WHC are in contact with vendors of evaporator equipment and plan to perform some tests at vendor facilities. Recommendations from these tests will likely impact the choice of secondary waste handling equipment. Please note that there is a secondary waste treatment and disposal options study underway to supplement the engineering report.

Comment 3

Please address the reasons why the degassification unit is not located immediately after the acidification unit, but after the UV unit.

Response to Comment 3

The report explains on pages 5-3 and 5-4 that the degassifier follows UV oxidation. This is done for the following reasons:

- Organics which have been oxidized to carbon dioxide by UV oxidation must be removed to prevent the build-up of bicarbonates in the downstream evaporator equipment. Bicarbonate foulants (formed from dissolved carbon dioxide at near neutral pHs) can degrade the heat transfer performance of an evaporator. Dissolved carbon dioxide can also blanket the heat transfer surfaces of an evaporator, and therefore, reduce its efficiency.

- There is no need to remove carbon dioxide from solution prior to UV oxidation since the waste water will be adjusted to about pH 6 from an influent pH of about 9. At pH 6 and at relatively dilute concentrations (in comparison to the feed stream to the evaporator) bicarbonates should not form. If the waste water remains at pH 9 or above, then bicarbonates would coat the quartz sleeves in the UV oxidizer. This would degrade the effectiveness of UV oxidation.

- If the degassifier were to precede UV oxidation, then volatile organic carbons (VOCs) would be stripped out of solution. This would possibly require an extra air cleanup step to minimize VOC releases to the atmosphere.

- The UV oxidizer will heat up the waste water stream before it enters the degassifier. Since the degassifier will tend to cool the waste water, it will protect downstream reverse osmosis (RO) equipment from temperature extremes.

Comment 4

The report indicates that the effluent nitrate concentration from the selected treatment alternative will still be higher than Ecology's effluent limit. For better nitrate control, you should consider a better ion exchange system or a biological denitrification (BDN) for pretreating the PUREX distillate discharge (PDD) in order to reduce nitrate at first place (before mixing with other two streams of much lower nitrate conc.).

Response to Comment 4

Sections 5.1.2, 5.2.2, 5.3.2, 5.4.2, and 7.3 address the predicted quality of the treated waste water. Several potential problem constituents are identified. These include nitrate, acetone, dimethylnitrosamine, and ammonia. It is also noted that tritium will be untreated.

Mitigating factors involved in meeting the treatment targets include:

- The predictions are based upon historical maximum influent concentrations which may not be seen at the treatment facility for more than very brief periods.
- Some of the treatment targets used in this evaluation are below analytical detection limits.
- For most of the problem constituents, treatment targets are not exceeded by a great deal.
- Decontamination factors were assumed, using the best professional judgment of the professional engineer preparing this report. Treatability studies will better predict the decontamination factors that are to be characteristic of the treatment facility.
- If treatability studies show it necessary, the planned ion exchange columns can be filled with resins that target certain problem constituents.

Comment 5

The weight scores for criteria on Table 6-1, Evaluation of C-018H Treatment Alternatives, are not reasonable. Treated water quality was scored too low. Reliability, safety, technical, viability, and ease of maintenance were scored too high. Consequently, the results of this evaluation might not be reasonable.

Response to Comment 5

With regard to Table 6-1 on page 6-2, reducing the weight of Reliability, Safety, **Technical Viability**, and **Ease of Maintenance** by any fraction would have resulted in the same overall relative ranking of the four alternatives. The weight factors and the scores were assigned by Derrel W. Triplett, Professional Engineer, Ebasco, and reflect his biases.

Comment 6

The Hanford Section hand delivered a copy of the Liquid Effluent Current Comparative Limits for your use in the design of the waste water treatment system. The effluent limits should have been used as applicable permit

effluent criteria. Therefore, we disagree on the content of the first paragraph on the Section 10 of the report, Professional Engineering Assessment. In our judgment, the assessment is not acceptable.

Response to Comment 6

The statement on page 10-1 (Section 10.0, first paragraph) is an assessment by the professional engineer who wrote the report and is based on available information. Treatability studies will reduce the uncertainty in the information data base. The permit issued for the treatment facility will be based on the result of considering all known and available reasonable technologies, treatability studies, and proposed treatment limits.

Comment 7 (Handwritten in margin of letter)

Letter does not include earlier Ecology comment that report should cover planned PUREX Plant upgrades.

Response to Comment 7

This comment was interpreted to be in reference to the status of the J8 Neutralization Package at the PUREX facility. It is explained on page 2-20 that "... the J8 neutralization package has been abandoned in place and will not be included as part of any resumption of operations at the PUREX Plant."
effluent criteria. Therefore, we disagree on the content of the first paragraph on the Section 10 of the report, Professional Engineering Assessment. In our judgment, the assessment is not acceptable.

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