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26. 300 File
27. Yellow File

SPECIAL RE-REVIEW
FINAL DETERMINATION
DECLASSIFICATION CONFIRMED
BY AE Barber DATE 4-8-81
BY JW Jordan DATE 4-8-81

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To: BD D. Wilson

January 27, 19[illegible]

From: H. V. Clukey

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TBP WASTE DISPOSAL PROJECT CRITERIA FOR CRIBBING SCAVENGED RAW

Introduction

Nickel ferrocyanide scavenging of liquid waste containing radioactive material from the TBP plant is being planned so that the settled supernatant can be discharged to ground to conserve underground storage tank space. Laboratory and field test data obtained to date indicate that routine production cribbing of the scavenged liquid is permissible, and provide criteria for cribs, monitoring wells, and inventory of radioactive material discharged to the ground.

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Soil Capacity

Evaluation of results from soil experiments and the test cribbing of approximately 26[illegible]000 gallons of scavenged RAW supernatant are continuing, and with previous experience in ground disposal of radioactive liquids, permit recommendations at this time based on current radioactive waste disposal policy and the opinions of the Earth Sciences group, Biophysics Section.

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These results now show that for a soil column of 200-foot depth, about 6,000 gallons of scavenged RAW supernatant can be discharged per square foot of ground area without contaminating the ground water with detectable concentrations of cesium and strontium.

This figure is based on the activity densities for cesium^{137} of .08 to .10 μc/cc and for strontium^{90} of .08 to .10 μc/cc encountered in samples from the test scavenging. Significant increases in the respective activity densities from production wastes will require inversely proportional changes in the permissible volumes per square foot. It will be permissible to discharge scavenged supernatant containing cesium^{137} or strontium^{90} up to .2 μc/cc by reducing the volume per square foot proportionally, but the discharge should not be outside the range of 3000-6000 gallons per square foot because of scattering and percolation limitations.

No tankful of scavenged supernatant that averages more than .2 μc/cc of either cesium^{137} or strontium^{90} shall be discharged without prior approval of the Radiological Sciences Department.

Crib Sites

The disposal, ultimately, of 24-28 million gallons of scavenged RAW supernatant poses problems which highly recommend the use of 200-East area in preference to available 200-West area sites. Continued operation of the T-plant may well require additional expansion of the 241-T area disposal facilities into the 241-TX or TY disposal locations, and suggests that those locations be held in reserve. The soil structure in 200-West area includes a less permeable layer at about 100 ft. depth which causes lateral spread of liquids, and which would necessitate a crib site farther from the tanks, and hence longer piping, to prevent interference with adjacent disposal sites.

The most favorable site for disposal of liquid radioactive wastes in 200-East area is in the vicinity of the 241-C tank farm. Less favorable is a site near the 241-BX and BY farms where the first cycle supernatant liquid waste disposal trenches would have to be "leapfrogged" or otherwise avoided. A soil profile about 200 feet deep above the ground water table is available in both general sites, and is probably about the same in total exchange capacity at both sites.

Cribs

A grid of small, buried cribs is recommended, into each of which a measured amount of liquid can be discharged at a controlled rate, the stream being diverted to succeeding cribs as the total capacity of each in turn is reached. Cribs 20 ft. square with the tops 10 ft. below the ground surface are suggested. These may be the usual cross-braced timber structure about 5 ft. deep, with the waste pipe entering near the top and discharging onto the cross-bracing so the liquid will be scattered over the bottom of the crib. Any other design should be reviewed with the Radiological Sciences Department if void space scattering over the crib bottom, or percolation rate may be significantly less.

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On the basis of the previously discussed base soil capacity, each 20 ft. square crib may receive a maximum of 2.4 million gallons of scavenged PAW supernate. A total of 12 such cribs is thus indicated.

The cribs should be aligned in the north-south, east-west directions at either location in 200-East area. From observed crib performance in the 200-East area, the cribs should be spaced in the north-south direction on a minimum of 50 ft. between centers, and in the east-west direction on a minimum of 75 ft. between centers for discharge rates in routine operations up to 100 gallons per minute. If discharge rates are anticipated between 100 and 200 gpm, the spacings should be 75 ft. and 100 ft. respectively, and if somewhat greater than 200 gpm, 100 ft. and 125 ft. respectively.

It is suggested that the crib field be no closer to the tank farm fence than the minimum distances between crib centers.

Wells

Monitoring wells to the ground water, to a maximum depth of 250 ft. depending on the grade, will be required. The attached sketch shows a suggested layout of cribs and wells for the minimum spacing. First liquid disposal should be to the cribs with wells 10 ft. adjacent.

Sampling and Inventory

A requisite for liquid waste disposal is that adequate inventory of radioactive material released to the ground be reported to the Radiological Sciences Department. Samples are to be taken from the discharge line to each crib, on a frequency of at least one sample from each 50,000 gallons cribbed.

For the routine disposal of production wastes, it is recommended that the Manufacturing Department have the samples taken, analyzed, and the results correlated with respective volumes, dates, and disposal locations. The correlated summary should be reported in writing to the Radiological Standards Unit. The following analytical results should be included in the report:

(1) For each sample - pH

$\mu c\ Cs^{137}/cc$

$\mu c\ Sr^{90}/cc$

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(2) For combined aliquots of all samples from each tankful -

pH

μc Cs^{137}/cc

μc Sr^{90}/cc

μc Total beta/cc

μc Rare earth - yttrium/cc

μc Pu/cc

μc U/cc (@ 1.5 d/m/μg)

(3) For combined aliquots of all samples from each 5th tankful, in addition to the items in (2) above -

μc Ru^{106}/cc

μc Ce^{144}/cc

μc Sb^{125}/cc

It is suggested that the results in (1) above, received and audited promptly by the Separations Section, will permit close control of the amount of cesium^{137} and strontium^{90} going to each crib, without exceeding the calculated limit of 1820 curies for each isotope in each crib.

It is requested that copies of the detailed routine laboratory procedures and the methods of computation leading to the reported units be placed on file with the Radiological Standards Unit, together with all subsequent changes to the procedures and methods so that any questions in the future with regard to the comparability of the results can be resolved without recourse to laboratory workbooks or extensive literature searches.

H. V. Clukey

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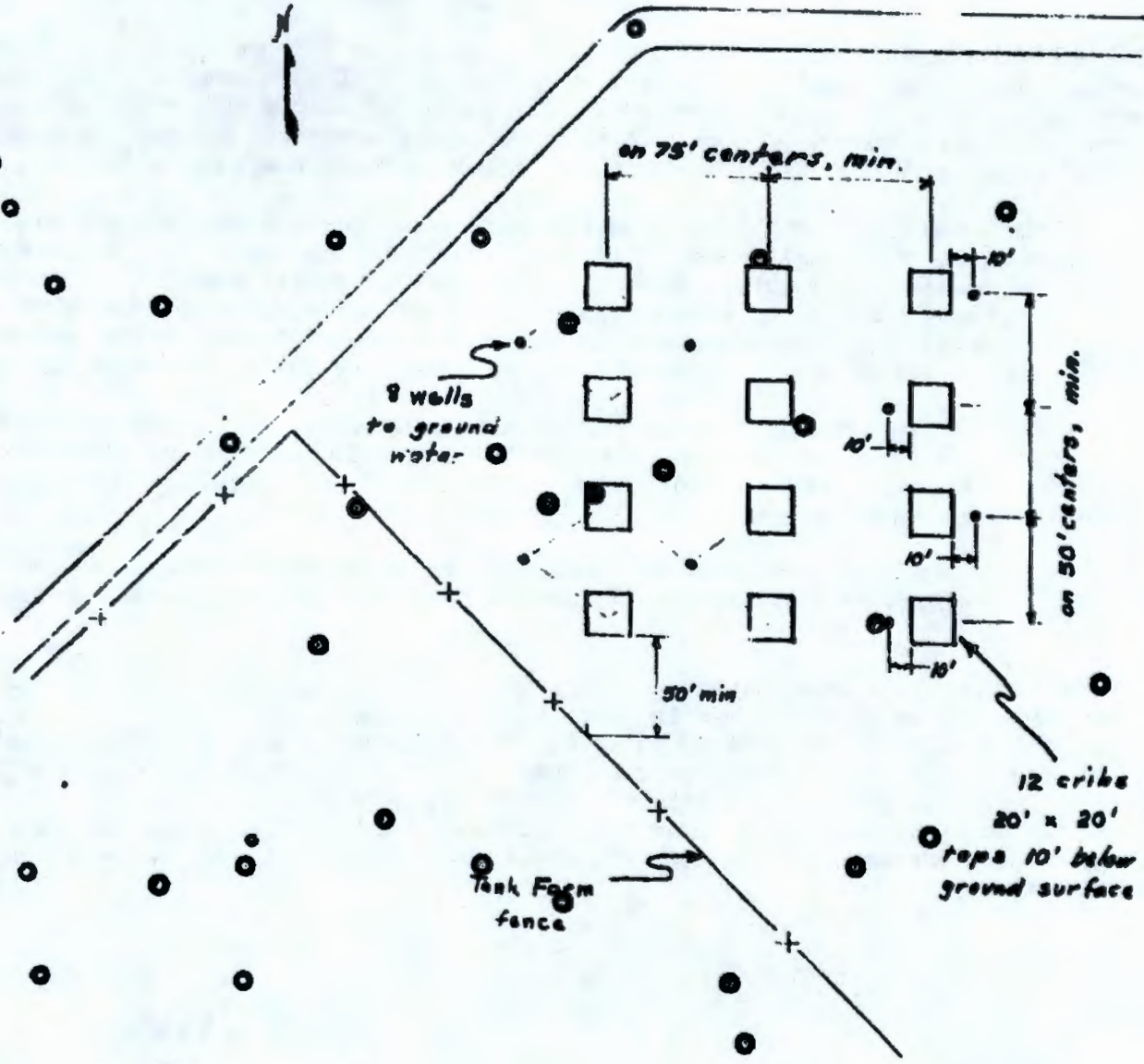

Sketch: SUGGESTED CRIB AND WELL LAYOUT

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Addendum, March 5, 1954

Two recent changes resulting from detail scoping of the TBP scavenged waste disposal project recommend addendum to the cribbing criteria. Allocation of underground storage tanks in the 241-BY farm resulted in choice of a crib site north of that farm. Refined estimates of TBP production and resultant waste volumes increased the required crib area to an uneconomical number of 20-foot square cribs.

It is suggested that eight 30-foot square cribs would take the anticipated volume of waste at the 6000 gallons per square foot criterion now known from the laboratory and field tests. The requirement of uniform discharge over the bottom of the crib might be met by properly perforated distribution piping on the diagonals of the square or forming an intermediate inner square, with one-half to one and one-half inch-sized gravel forming at least a two-foot deep layer on the bottom of the crib.

It is further pointed out that the crib should be excavated through the surface silt and sand layer, such as was encountered at the test crib, even if more than the previously suggested fifteen-foot depth, to the underlying gravelly soil to insure adequate percolation rates.

The maximum amount of cesium^{137} or strontium^{90} which may be discharged to such a 900 square foot crib at 6000 gallons/square foot and 0.1 μc/cc is 2000 curies of each.

A revised crib and well layout is suggested in the following sketch. This maintains the same edge-to-edge crib spacing for discharge rates up to 200 gpm, and the same monitoring well locations adjacent to the four cribs which are to be used first. Proposed locations are shown for the other four cribs and three monitoring wells to be installed later. If further waste movement data from the test cribbing and use of the first four cribs indicates that less than the eight cribs included in the project proposal need be dug, the three additional monitoring wells may be relocated.

H. V. Clukey

RADIOLOGICAL ENGINEERING

Revision November 19, 1954

HV Clukey:mw

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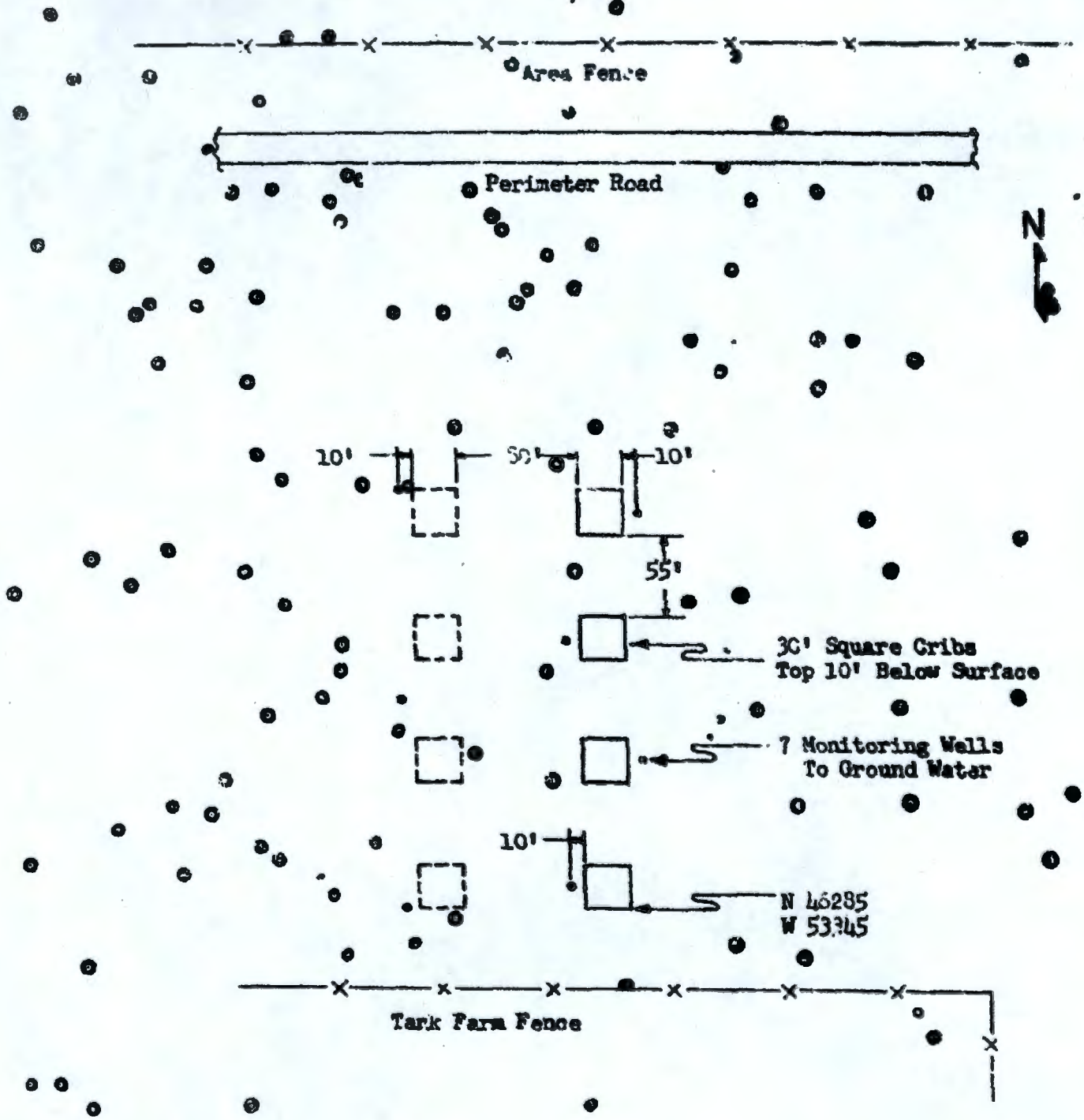

Sketch: SUGGESTED 30 FT CRIB AND WELL LAYOUT

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