OCT 26 1994

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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT

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2. To: (Receiving Organization) 300 Liquid Effluent Facility	3. From: (Originating Organization) Liquid Effluent Process Engineering	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Liquid Effluents Services	6. Cog. Engr.: K.J. Hagerty	7. Purchase Order No.: N/A
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		10. System/Bldg./Facility: 310/TEDF
11. Receiver Remarks: None		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
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(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-L045H-TI-005	N/A	0	300 Area Treated Effluent Disposal Facility Essential Material Specifications Basis Document	E	1	1	1

16. KEY											
Approval Designator (F)		Reason for Transmittal (G)				Disposition (H) & (I)					
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)				1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged					
(G)	(H)	17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)						(G)	(H)		
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1	1	Cog.Eng. K.J. Hagerty		10/14/94	6-04	OSTI (2 copies) w/att		L8-07			
1	1	Cog. Mgr. D.W. Lindsey		10/14/94	L6-04						
		QA									
		Safety									
1	1	Env. R.W. Szelmeck		10/14/94	4-96						
18. K.J. Hagerty Signature of EDT Originator		19. D.W. Lindsey Authorized Representative Date for Receiving Organization		20. D.W. Lindsey Cognizant Manager		APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments					

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Document Number: WHC-SD-L045H-TI-005, Revision 0

Document Title: 300 Area Treated Effluent Disposal Facility
Essential Material Specifications Basis

Release Date: 10/17/94

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

M. Boston

10/17/94

M.N. Boston

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SUPPORTING DOCUMENT		1. Total Pages 10
2. Title 300 Area Treated Effluent Disposal Facility Essential Material Specifications Basis	3. Number WHC-SD-L045H-TI-005	4. Rev No. 0
5. Key Words EMS, Essential Materials, 300 Area TEDF	6. Author Name: K.J. Hagerty <i>[Signature]</i> 10/14/94 Signature Organization/Charge Code 86730/A2L99	
7. Abstract Several chemicals will be utilized in the treatment process at the 300 area Treated Effluent Disposal Facility, and include hydrogen peroxide, sulfuric acid, sodium hydroxide, and ferric chloride, and are designated essential materials per the applicable requirements of WHC-CM-2-1.		
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9. Impact Level E <div style="border: 1px solid black; padding: 5px;"> ☒ APPROVED FOR PUBLIC RELEASE <i>M. Boston 10/17/94</i> Information Release Administration </div>		

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ESSENTIAL MATERIAL SPECIFICATIONS
FOR THE
300 AREA TREATED EFFLUENT DISPOSAL FACILITY

Reference 1: ENGINEERING SUMMARY REPORT, WHC-SD-L045H-ER-002

BACKGROUND

The 300 area Treated Effluent Disposal Facility (TEDF) was designed and built to treat the waste water from the 300 area process sewer system. Several treatment technologies are employed to remove the trace quantities of contaminants in the stream, including iron coprecipitation, clarification, filtration, ion exchange, and ultra violet light/hydrogen peroxide oxidation of organics. The chemicals that will be utilized in the treatment process are hydrogen peroxide, sulfuric acid, sodium hydroxide, and ferric chloride and are designated "Essential Materials" by facility management, as they are essential to the continuity of operations.

This letter documents the required chemical characteristics and permissible contaminant limits in the essential materials, as well as the criteria that were used to establish these limits. Essential Material Specifications (EMS) will be generated from this information.

ESSENTIAL MATERIAL SPECIFICATION CRITERIA

The essential materials must meet the following basic criteria:

Concentration range - The chemicals must adhere to certain concentration limits in order to maintain proper process control in the treatment train. The facility was designed for the chemical concentrations as specified in ref. 1.

Contaminant limits - Concentrations of impurities must remain below specified levels, as the contaminants in the essential materials will also contaminate the TEDF waste stream. The effects of contaminants are reduced to somewhat from the treatment train itself, since the individual portions of the process will reduce contaminant levels (e.g. heavy metals in the ferric chloride feed material will be removed by the coprecipitation process), but will not be considered in the determination of allowable levels of contaminants.

ESSENTIAL MATERIAL SPECIFICATION DETERMINATION

The basic premise used in development of the EMS at the 300 TEDF is to allow levels of contaminants in the feed chemicals up to the point where they will contribute 10% of the NPDES permit levels for a particular contaminant in the effluent stream. The 10% of permit limit is a value that will provide reasonable assurance that the essential materials will not contribute significantly to overall stream contaminant levels. Acceptable levels of these impurities in the essential materials are determined by performing a simple mass balance over the process streams. This mass balance will evaluate the amount of dilution taking place as the chemicals are utilized in the treatment process, but will not address the contaminant removal efficiencies of the treatment process itself. The allowable levels of contaminants in the essential materials are therefore directly proportional to the degree of dilution in the stream. For each of the essential materials, dilution levels have been calculated in appendix A. Allowable contaminant levels for each of the essential materials are contained in tables 1 through 5. Example calculations for EMS are also contained in App. A.

Essential Material Specifications (EMS) will be listed and controlled in the TEDF administrations manual, WHC-IP-1000.

EXCEPTIONS TO CRITERIA

Several contaminants in the Ferric Chloride will exceed the criteria as stated above. In particular, lead, manganese, copper, and nickel. While these contaminants exceed the stated criteria, they will also be readily removed in the co-precipitation process. If a new vendor of Ferric Chloride is located that can meet the criteria, then the EMS will be updated to reflect the change.

One of the metals listed in the permit is not routinely analyzed in the sulfuric acid. This metal is mercury, however, it is present only at trace levels, and is not a concern.

ATTACHMENT A CALCULATIONS

FERRIC CHLORIDE FEED TO FLOCCULATOR

Per ref. 1, the required Ferric dose to the chemical mix tank is 40 mg Fe^{+3} /liter, or 3.9 gph of 35 wt% FeCl_3 in a 300 gpm waste water stream.

$$\text{Dilution} = \frac{300 \text{ gpm}}{3.9 \text{ gph}} * \frac{60 \text{ min}}{\text{hour}} = 4,615:1$$

Contaminants present in the essential material will be diluted 4,615:1 in the waste water stream

SULFURIC ACID FEED TO ION EXCHANGE INLET

Per ref. 1, the quantity of sulfuric acid required to reduce pH in the ion exchange feed stream from 9.2 to 7 is 0.5 lb (98 wt%) H_2SO_4 /1000 gallons of waste water, or 0.66 gph of 93 wt% H_2SO_4 in a 300 gpm waste water stream.

$$\text{Dilution} = \frac{300 \text{ gpm}}{0.66 \text{ gph}} * \frac{60 \text{ min}}{\text{hour}} = 27,270:1$$

Contaminants present in the essential material will be diluted 27,270:1 in the waste water stream.

HYDROGEN PEROXIDE FEED TO ORGANIC DESTRUCT SYSTEM

Per ref. 1, hydrogen peroxide feed concentration to the UV/OX system is 0.33 lb (50 wt%) hydrogen peroxide/1000 gallons of waste water, or 0.6 gph of 50 wt% H_2O_2 in a 300 gpm waste water stream.

$$\text{Dilution} = \frac{300 \text{ gpm}}{0.6 \text{ gph}} * \frac{60 \text{ min}}{\text{hour}} = 30,000:1$$

Contaminants present in the essential material will be diluted 30,000:1 in the waste water stream.

CAUSTIC FEED SKID NO. 1

Per ref. 1, NaOH required from skid No. 1 is stoichiometrically equivalent to the Fe^{+3} in solution, or 2.1 gph 50 wt% NaOH in a 300 gpm waste water stream.

$$\text{Dilution} = \frac{300 \text{ gpm}}{2.1 \text{ gph}} * \frac{60 \text{ min}}{\text{hour}} = 8,571:1$$

Contaminants present in the essential material will be diluted 8,571:1 in the waste water stream.

ATTACHMENT A
CALCULATIONS

CAUSTIC FEED SKID NO. 2

Per ref. 1, NaOH required from skid No. 2 is the amount to neutralize the pH 6.5 waste water from the UV/OX system, or 0.11 gph 50 wt% NaOH in a 300 gpm waste water stream.

$$\text{Dilution} = \frac{300 \text{ gpm}}{0.11 \text{ gph}} * \frac{60 \text{ min}}{\text{hour}} = 163,600:1$$

Contaminants present in the essential material will be diluted 163,600:1 in the waste water stream.

MAXIMUM ALLOWABLE CONTAMINANT CONTRIBUTION FROM ESSENTIAL MATERIALS

Example Calculation:

Given Aluminum permit limit is 215 ppb

Max. contribution from EMS = 10% * 215 ppb = 22 ppb

ESSENTIAL MATERIAL SPECIFICATIONS

Example Calculation:

Aluminum in caustic, feed skid No. 1

EMS = (22ppb)*(8,571)*(mg/1000 ug) = 184 mg/l (ppm)

TABLE 1
 ESSENTIAL MATERIAL SPECIFICATIONS FOR SODIUM HYDROXIDE No. 1

CONTAMINANT	PERMIT LIMIT (ug/l)	DESIGN SOURCE TERM (ug/l)	MAXIMUM ALLOWABLE CONTRIBUTION FROM EMS (ug/l)	ESSENTIAL MATERIAL SPECIFICATION (PPM)
Aluminum	215	418	21	184
Arsenic	3	10	0.3	3
Beryllium	2	30	0.2	2
Cadmium	2	10	0.2	2
Copper	3	80	0.3	3
Iron	846	600	85	725
Lead	2	60	0.2	2
Manganese	10	60	1	9
Mercury	0.9	3	0.09	0.8
Nickel	35	60	3.5	30
Selenium	5	6	0.4	4
Silver	6	20	0.6	5
Zinc	25	211	2	21

ATTRIBUTES:Concentration: 50 wt% $\pm$ 1 wt% Sodium hydroxide

Grade: Membrane grade

TABLE 2
 ESSENTIAL MATERIAL SPECIFICATIONS FOR SODIUM HYDROXIDE No. 2

Contaminant	PERMIT LIMIT (ug/l)	DESIGN SOURCE TERM (ug/l)	MAXIMUM ALLOWABLE CONTRIBUTION FROM EMS (ug/l)	ESSENTIAL MATERIAL SPECIFICATION (PPM)
Aluminum	215	418	21	3517
Arsenic	3	10	0.3	49
Beryllium	2	30	0.2	33
Cadmium	2	10	0.2	33
Copper	3	80	0.3	49
Iron	846	600	85	13800
Lead	2	60	0.2	33
Manganese	10	60	1	164
Mercury	0.9	3	0.09	15
Nickel	35	60	3.5	574
Selenium	5	6	0.4	82
Silver	6	20	0.6	98
Zinc	25	211	2	410

ATTRIBUTES:Concentration: 50 wt% $\pm$ 1 wt% Sodium hydroxide

Grade: Membrane grade

TABLE 3
ESSENTIAL MATERIAL SPECIFICATIONS FOR SULFURIC ACID

CONTAMINANT	PERMIT LIMIT (ug/l)	DESIGN SOURCE TERM (ug/l)	MAXIMUM ALLOWABLE CONTRIBUTION FROM EMS (ug/l)	ESSENTIAL MATERIAL SPECIFICATION (PPM)
Aluminum	215	418	21	586
Arsenic	3	10	0.3	8
Beryllium	2	30	0.2	5
Cadmium	2	10	0.2	5
Copper	3	80	0.3	8
Iron	846	600	85	2300
Lead	2	60	0.2	5
Manganese	10	60	1	27
Nickel	35	60	3.5	95
Selenium	5	6	0.4	14
Silver	6	20	0.6	16
Zinc	25	211	2	68

ATTRIBUTES:Concentration: 93 wt% $\pm$ 1 wt% Sulfuric acid

Grade: Electrolyte grade

TABLE 4
ESSENTIAL MATERIAL SPECIFICATIONS FOR FERRIC CHLORIDE

ATTRIBUTE	PERMIT LIMIT (ug/l)	DESIGN SOURCE TERM (ug/l)	MAXIMUM ALLOWABLE CONTRIBUTION FROM EMS (ug/l)	ESSENTIAL MATERIAL SPECIFICATION (PPM)
Aluminum	215	418	21	99
Arsenic	3	10	0.3	1.5
Beryllium	2	30	0.2	1
Cadmium	2	10	0.2	1
Copper	3	80	0.3	29
Lead	2	60	0.2	10
Manganese	10	60	1	600
Mercury	0.9	3	0.09	0.4
Nickel	35	60	3.5	24
Selenium	4	6	0.4	2
Silver	6	20	0.6	3
Zinc	20	211	2	12

ATTRIBUTES:

Concentration: 35 to 45 wt% Ferric Chloride

Grade: Technical grade

ESSENTIAL MATERIAL SPECIFICATIONS FOR HYDROGEN PEROXIDE

ATTRIBUTES:

Concentration: 50 WT% $\pm$ 1 wt% Hydrogen Peroxide

Grade: Technical grade

Stabilizer: Maximum 40 ppm (as tin)

Gasometric stability (ml O₂/min/25 ml H₂O₂): <0.3