



STATE OF RHODE ISLAND & PROVIDENCE PLANTATIONS
EXECUTIVE CHAMBER
PROVIDENCE

J. JOSEPH GARRAKEY
GOVERNOR

January 14, 1981

Mr. Boyce Grier, Director
Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Dear Mr. Grier:

I am enclosing for your information and consideration a variety of documents in response to questions raised by NRC and also in support of requests the State of Rhode Island has already or is herein making to NRC with regard to decommissioning of the UNC Recovery Systems plant in Wood River Junction.

A brief explanation of attachments and a number of specific action requests follow. We would appreciate your earliest possible response to and action on these.

1. Residential Well Testing: Affected communities have requested that they be notified of any future NRC well testing before it takes place. This can be coordinated through the Governor's Office. A number of additional residents have requested tests (See Attachment "A").
2. School Wells: Bud Crocker asked for state data on the testing history for the three schools located in the general vicinity of UNC Recovery Systems (See Attachment "B"). Also attached ("C") is an assessment of the potential of contamination of these wells by UNC derived contaminants prepared by Herb Johnston of the Geological Survey. As you will note, Mr. Johnston finds no potential for contamination due to major differences in hydraulic gradients and drainage basins.
3. Municipal Wells: Bud Crocker also asked for data on semi-annual state testing of Westerly's well fields. I have forwarded this request to appropriate officials.

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4. Deep Monitoring Well: As Attachment "D" indicates, the State is of the opinion that a "cable tool" type well should be driven to bedrock in the vicinity of the existing T-6 monitoring well. Again, as indicated in "D", we feel there are significant advantages to drilling a "cable tool" type well; advantages which would accrue to all parties to this situation. We urge NRC to insure that such a well is driven and that this is done as agreed at UNC expense.

As Attachment "E" indicates, there are compelling technical reasons for delaying the actual drilling of the well until after winter weather breaks in March. According to USGS hydrologists, present sub-freezing temperatures will have a significant negative impact on the quality of data that can be expected. They have assured us that a delay in drilling will not compromise the public health.

5. Additional Monitoring Wells Along Pawcatuck: We urge NRC to require UNC Recovery Systems to sink at least two additional monitoring wells within the presently defined contaminant plume along the banks of the Pawcatuck River. These need not be large diameter or sophisticated in design. One should be sunk to a depth below the bottom of the contaminant plume, while the other should extend about half way through the plume. The purpose of these wells would be to provide early warning of any contamination flowing at levels of sufficient depth to have a potential of flowing under the river and contaminating ground water on the other side. Wells of this sort should be an integral component of a public assurance program.
6. Hydrologic Modeling: The State requests a status report on the hydrologic evaluation being performed under NRC contract by Don L. Warner, Inc. We would also appreciate earliest possible notification of the results of Dr. Warner's investigations.
7. Examination of the Site for Additional Sources of Radiological Contamination: After extensive discussions, State officials came to the conclusion in December that the most efficient means of locating additional contamination sources, if any exist, would be to first identify anomalies in NRC overflight data. This data was obtained in August of 1979 under contract to the Department of Energy. Unfortunately, as indicated in Attachment "F", we have found such severe defects in the aerial data as to render it for all practical purposes useless. We strongly recommend, therefore, that at the very least NRC have this aerial survey done again properly. We would prefer, however, a ground level survey on the basis that it would produce more detailed and dependable data. We

urge NRC to conduct such a survey as soon as possible.

8. NRC's Draft Soil Decontamination Criteria: A number of State agencies and commissions have been asked to review and comment on the draft submitted to the State on December 2. We have also asked for comments from experts in our university system. We will be forwarding comments as they are received and would be aided in this effort if we had a clearer idea as to the comment deadline NRC has in mind.
9. Testing of the Pawcatuck River: The State Department of Environmental Management is sampling aquatic vegetation above and below the UNC plant site, but does not have the capability to perform similar tests of river bottom sediments. Since such testing would indicate whether the contaminant plume has had any cumulative impact on the river, it is important that it be done periodically. We, therefore, strongly recommend that NRC test sediment samples from above and below the plume site for radiological and nitrate contamination. The State will collect and transmit these samples if this would be helpful.
10. Indian Cedar Swamp: We do not believe that the potential for contamination of this off-site area is great. However, spot sampling and isotopic analysis of sediments and vegetation would confirm this conclusion and do much to allay public fears. We would urge NRC to perform necessary analyses. The State will obtain a limited number of samples, if this is acceptable.
11. Source of Fission Products: We are aware that NRC has conducted an investigation of the sources of fission contamination in UNC's lagoon wastes and the contaminant plume associated with lagoon leakage. We would appreciate a status report on this investigation as soon as possible.
12. Waste Processing and Packaging Investigation: We are also aware that NRC has conducted an investigation of problems with UNC's lagoon waste processing and packaging programs, particularly their quality assurance procedures. The State is extremely anxious that transfer of lagoon wastes to approved disposal facilities begin again as soon as possible. However, we cannot permit such transfer until we are satisfied that deficiencies which led to past problems have been identified and satisfactorily rectified. It is, therefore, critical that NRC's investigation of this matter be expedited and that the State receive earliest possible notice of its results. This request is of highest priority.

Mr. Boyce Grier
Page Four
January 14, 1981

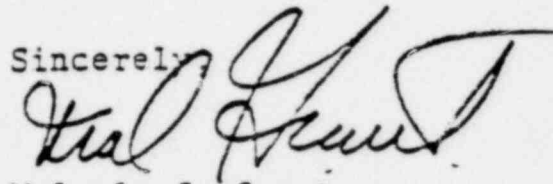
13. Illegal Pumping of Lagoon Wastes: The State has conducted an independent interview of the individual alleging illegal pumping of UNC lagoon waste out onto the ground. A transcript has been forwarded to NRC in support of its formal investigation of these allegations. We would appreciate early notice of the results of your investigation. We are also forwarding for your consideration (See Attachment "G") suggested testing procedures for obtaining physical evidence of pumping. As you will note, we feel that it will be most productive to test for ions of aluminum, calcium, potassium, sodium, flouride and nitrate, all of which we know to be present in high concentrations in the lagoons.
14. Development of a Long Range Decommissioning Strategy: As I have indicated in my letter of January 13, we have requested a meeting with UNC within the next month to discuss their long range decommissioning plans. We feel so strongly that such a meeting is necessary at this time as to have made it a precondition for further shipment of wastes off site. We strongly urge NRC to attend and participate in this meeting. We would also wish to discuss with NRC representatives long range testing, monitoring and quality assurance efforts which NRC and the State can and will implement as an integral part of a decommissioning program. It would be highly desirable in this regard to coordinate our efforts along compatible lines.
15. Scheduling of a NRC Hearing: The State does not believe that a formal NRC hearing on the UNC situation would be productive at this time. However, we are of the strong opinion that such a hearing should be scheduled in the not too distant future when we have a clearer picture as to the direction the decommissioning process is likely to take, but have not gotten so far into that process that we are too late to influence its outcome. In order to prepare in an orderly and cooperative fashion for a NRC hearing, we would appreciate it if NRC attorneys were made available to discuss the procedures necessary to initiate and conduct such a hearing with our Office of Attorney General. Dan Schatz, Esq. (401-274-4400) should be considered our contact point for this purpose.

I apologize for the considerable length of this letter, but feel that we have arrived at a juncture in dealing with this matter where clarification of relatively few issues will allow us to expedite the decommissioning process to the benefit of all involved. Where any of our questions or requests would be more properly directed to other NRC officials, I would request that you forward a copy of this letter to them. I am available at (401) 277-2074 if I can clarify or amplify any of our points.

Mr. Boyce Grier
Page Five
January 14, 1981

Thank you for your attention to this matter. I will look forward to hearing from you.

Sincerely,

A handwritten signature in black ink, appearing to read "Malcolm J. Grant". The signature is written in a cursive style with a large initial "M" and "G".

Malcolm J. Grant
Policy Associate

MJG/bs
Attachments

cc: Wayne Kerr
Bill Crow
Bob Gregg

Persons who wish to have their wells tested for radioactivity content.

Set No. 2

- Mrs. Barry Capalbo
Old Mill Road 364-3448
- Mike Rzewuski
Shamukaruck Hill Road 364-7505
- Cathy Savage 364-3037
- William Shockley
Old Mill Road 364-9742
- Renee Boiano 364-9657
- Bob Hammell 539-7852

Richard Evans
11 Kings Factory Rd.
Richmond

Box 65
Kingston, Rhode Island 02881

mail to:

Walter Malboy
14 Kings Factory Rd.
Wood River Junction, RI

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

INTER-OFFICE MEMO

TO : Malcolm Grant, Policy Associate
for Environmental Affairs
DEPT : Executive

DATE: 16 December 1980

FROM : Eugene A. Morin, Principal Sanitarian *EAM*
Division of Water Supply
DEPT : Health - Community Health Services

SUBJECT: Requested Analytical Data

DEC 16 1980

GOVERNOR'S OFFICE

As per your request at the meeting of 11 December 1980, I am submitting the analytical tabulations on the water systems of the three public schools mentioned in conjunction with the UNC ground water study. Since radiological monitoring of these systems was initiated only recently, little historical data is available.

Routine monitoring of the systems will continue, and the additional analytical data will be made available to your office.

EAM:lr

RHODE ISLAND DEPARTMENT OF HEALTH
DIVISION OF WATER SUPPLY

Requested Analytical Data

Chariho Regional High School

<u>Date of Sample Collection</u>	<u>Nitrate as N (mg/l)</u>	<u>Fluoride (mg/l)</u>	<u>Gross Alpha (pCi/l)</u>	<u>Gross Beta (pCi/l)</u>
30 Jan 1969	0.4	0.1		
29 Jan 1970	0.4	0.0		
28 Jan 1971	0.3	0.0		
28 Feb 1972	0.3	0.0		
30 Jan 1973	0.3	0.1		
29 Jan 1974	0.3	0.0		
4 Mar 1975	0.2	0.0		
3 Mar 1976	0.0	0.0		
22 Sep 1977	0.4	0.2		
21 Sep 1978	5.0*	∠0.1		
21 Sep 1979	0.6	∠0.2		
15 Jul 1980	--	--	∠0.44	∠1.49
16 Sep 1980	0.9	∠0.2		

*Based upon past analytical data, it is reasonable to assume that the indicated nitrate level was incorrectly transcribed and should instead represent the value for the Chariho Vocational School.

Requested Analytical DataCharlestown Consolidated School

<u>Date of Sample Collection</u>	<u>Nitrate as N (mg/l)</u>	<u>Fluoride (mg/l)</u>	<u>Gross Alpha (pCi/l)</u>	<u>Gross Beta (pCi/l)</u>
30 Jan 1969	1.0	0.1		
29 Jan 1970	0.8	0.2		
28 Jan 1971	0.2	0.0		
28 Feb 1972	0.3	0.1		
29 Feb 1972	0.3	0.0		
30 Jan 1973	1.0	0.1		
29 Jan 1974	0.5	0.0		
4 Mar 1975	0.5	0.0		
3 Mar 1976 (Well #1)	0.0	0.0		
3 Mar 1976 (Well #2)	0.0	0.0		
12 Sep 1977 (Well #2)	0.4	0.2		
14 Jul 1977 (Well #3)	0.0	3.0		
21 Sep 1978 (Well #2)	0.3	< 0.1		
21 Sep 1978 (Well #3)	0.1	0.2		
13 Sep 1979 (Well #2)	--	< 0.2		
13 Sep 1979 (Well #3)	--	0.33		
16 Sep 1980 (Well #3)	1.1	< 0.2		

16 December 1980

Requested Analytical Data

Chariho Regional Vocational High School

<u>Date of Sample Collection</u>	<u>Nitrate as N (mg/l)</u>	<u>Fluoride (mg/l)</u>	<u>Gross Alpha (pCi/l)</u>	<u>Gross Beta (pCi/l)</u>
4 Sep 1968	6.0	--		
30 Jan 1969	12.0	0.1		
30 Apr 1969	20.0	--		
29 Oct 1969	10.0	0.1		
28 Jan 1971	18.0	0.0		
28 Feb 1972	14.0	0.1		
30 Jan 1973	15.0	0.1		
29 Jan 1974	7.0	0.0		
4 Mar 1975	-- 2.0	0.0		
3 Mar 1976	1.0	0.0		
22 Sep 1977	0.0	0.2		
21 Sep 1978	0.0*	0.1		
21 Sep 1979	8.0	<0.2		
15 Jul 1980	--	--	2.63	7.13
16 Sep 1980	3.5	<0.2		

*Based upon past analytical data, it is reasonable to assume that the indicated nitrate level was incorrectly transcribed and should instead represent the value for the Chariho High School.

ATT. "C"



United States Department of the Interior

GEOLOGICAL SURVEY

224 J.O.Pastore Federal Bldg & USPO
Providence, R.I. 02903

December 12, 1980

Mr. Mal Grant
Governor's Office
Policy and Program Review
State House
Providence, R.I. 02903

Dear Mr. Grant:

This is a response to your request, made at a meeting at the State House on December 11th, for my comment on the possibility that well water supplies at three public schools might become contaminated by waste water that has leaked into ground water from lagoons at the United Nuclear Corporation plant at Wood River Junction. The schools in question are the Charlestown Elementary School on State Route 112 in Charlestown and the Chariho Regional High and Vocational Schools in Richmond.

The flow direction of contaminants in ground water in the area of concern can be approximated from water table maps prepared by the USGS. These maps, prepared in cooperation with the Rhode Island Water Resources Board, are available in the following publications:

"Ground Water Map of the Carolina Quadrangle"
Rhode Island Water Resources Board GWM 9 (1960)

"Availability of ground water in the lower Pawcatuck
River basin, Rhode Island"
USGS Water Supply Paper 2033 (1974)

Water level measurements made as part of an on-going USGS-WRB cooperative study of ground-water development alternatives in several major ground water reservoirs in the Pawcatuck River basin indicate that no significant changes in water table configuration have occurred since the above cited maps were done.

Ground water flows in the direction of the steepest hydraulic gradient (slope of the water table), from areas of high altitude to areas of low altitude. Natural gradients in the Pawcatuck River basin cause ground water to flow toward, and into, nearby streams. Although natural water table gradients can be altered (thereby changing flow direction)



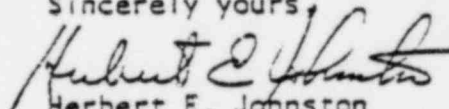
ONE HUNDRED YEARS OF EARTH SCIENCE IN THE PUBLIC SERVICE

by large withdrawals from wells, present net withdrawals from aquifers by wells in the Charlestown-Richmond area are far too small to have any significant effect on the configuration of the water table. (Most of the water pumped from wells in this area is returned to the ground nearby by way of septic systems, which results in little net withdrawal).

USGS water table maps show that the water table at the Chariho Regional schools is more than 10 feet above the nearby Pawcatuck River, and that the water table at the UNC lagoons is about 10 feet above the river. This means that ground water is flowing toward, and into, the river from both sides. Under the present regimen of pumping, there is no possibility that well water at the Chariho schools could become contaminated by waste that has leaked from UNC lagoons.

In the case of the Charlestown Elementary School, there is no possibility whatsoever that the well water supplies could be contaminated by wastewater from the UNC lagoons. The school is situated in a completely different drainage area, which has virtually no subsurface hydraulic connection with the UNC lagoon area.

Sincerely yours,


Herbert E. Johnston
Subdistrict Chief

ATT. D

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

INTER-OFFICE MEMO

TO: Mal Grant DATE: 5 January 1981
Policy Associate
DEPT: Executive/Governor's Office
FROM: Carleton A. Maine CAM
Assistant Director for Regulation
DEPT: Environmental Management
SUBJECT: United Nuclear Corporation Monitoring Well

It has been agreed by the committee to study groundwater monitoring at the United Nuclear Corporation site in Charlestown, Rhode Island that a monitoring well will be installed by UNC in the vicinity of existing well T-6. The new well will extend to bedrock or to a depth of at least 200 feet. There are at least two methods of installing this well (the hydraulic rotary method and the cable tool method); however, the committee did not recommend the method of construction.

Our objective with this well is to obtain approximately 1 gallon water samples and approximately 1 quart sediment samples that are representatives for the depth from which they are taken. The samples should be taken at about 10 foot intervals through the zone of contamination and at 15 to 20 foot intervals below the zone of contamination. The sampling intervals should be adjusted or additional samples collected at major changes in lithology.

Problems that are likely to be encountered with the hydraulic rotary method such as removing the drilling mud that invades the formation, plugging the sampling well point screen and preventing drilling mud from entering the sample pipe instead of the groundwater outweigh the speed and cost advantage of the rotary method. The cable tool percussion drilling method gives a better record of the formation and the minimum amount of water added should be relatively easy to pump out before sampling.

It is therefore requested that United Nuclear Corporation be required to install the groundwater monitoring well in the vicinity of existing well T-6 by means of the cable tool method. Mr. Kenneth L. Kipp, hydrologist for the U.S. Department of the Interior, has requested Michael Powers of Goldberg, Zoino and Associates, Geohydrological Consultant to UNC, to develop specifications for well recommending the cable tool method of construction. A copy of Mr. Kipp's letter is attached.

CAM/ar

Attachment



United States Department of the Interior

GEOLOGICAL SURVEY
BOX 25016 - M.S. 413
DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Water Resources Division

RECEIVED

U.S. DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
DIVISION OF WATER RESOURCES

December 17, 1980

IN REPLY REFER TO

Mr. Mike Powers
Goldberg-Zovno
293 South Main
Providence, RI 02903

DEC 26 1980

Dear Mr. Powers:

As agreed in our telephone conversation last week, I am sending this letter briefly describing our desires for the specifications for the well to be drilled by UNC at the Wood River Junction site. Our objective with this well is to obtain large volume (approximately 1 gallon) water samples that are representative of the ground water at the depths from which they are taken and to also obtain representative sediment samples (approximately 1 quart) at the same depths. We would like to have sediment and water samples from about 10 foot intervals down through the zone of ground-water contamination and 15-20 foot intervals below the zone. At those depths where it is not possible to pump a water sample, only a sediment sample would be necessary. Adjustment of the sampling depths or additional samples would be desirable at major changes in lithology.

Our preference is for a percussion or cable tool drilled hole over a hydraulic rotary hole with drilling mud. Although the drilling procedure is faster with a rotary rig, the difficulties in removing the mud that invades the formation, the possibility of plugging the sampling well point screen with drilling mud during installation, the problem of preventing drilling mud from preferentially entering the sampling pipe instead of formation water, and the possibility that bacteria in the drilling mud may reduce the nitrate concentration, outweigh the speed and cost advantage of rotary drilling. Cable tool percussion drilling gives a better record of the formations and the minimum amount of water added should be relatively easy to pump out before sampling. A preferred method of water sampling would be to insert a 2" well point below the bottom of the casing and use an inflatable packer to seal off the column of water in the well before pumping a ground water sample. The USGS could probably provide the packer for 8" and 6" casing. We would like to experiment with the addition of a tracer such as lithium chloride to the water which is added to the hole in order to get some idea of how much residual added water is present in a given sample. It would also be nice to perform conductivity and nitrate analyses at the drilling site to tell when we have emerged from the bottom of the contaminated zone.

We would recommend a sampling device such as the Barcad porous cylinder be installed in the lower part of the contamination plume and in the uppermost water bearing zone below the plume, if present. Finally, I would like to be present during the entire drilling and sampling time to oversee the sample collection and make necessary adjustments in sampling locations based upon the conditions we encounter. In scheduling this work, it should be kept in mind that subfreezing temperatures will significantly hamper the sampling operations.

Sincerely,

Kenneth L. Kipp

Kenneth L. Kipp
Hydrologist

cc: D. Grove
E. Johnston

ATT. 'E'



United States Department of the Interior

GEOLOGICAL SURVEY

Rm 224, John O. Pastore Federal Building
and United States Post Office
Providence, Rhode Island 02903

January 12, 1981

Mr. Malcolm Grant
Governor's Office
Office of Policy and Program Review
State House
Providence, Rhode Island 02903

Dea Mr. Grant:

Specifications for drilling a deep test well at the United Nuclear Corporation plant at Wood River Junction are being prepared by UNC's ground-water consultant Mike Powers of Goldberg Zoino Associates. Mike says he is presently planning to request that the test well be completed during February, 1981, because of UNC's desire to complete the well as soon as possible.

Ken Kipp, a USGS research hydrologist who plans to be present to collect samples when the well is drilled, has expressed concern that snow storms and subfreezing temperatures may severely hamper sampling operations and adversely affect the quality of data obtained. If at all possible, he would prefer that the hole be drilled no sooner than March or April, 1981.

A substantial amount of time and money will be invested in this test well. In our judgment, this investment should not be compromised by doing the fieldwork in weather that is likely to affect the quality of information obtained. I have talked with Bob Gregg, UNC plant manager, about our concerns. He is willing to postpone drilling until after February as long as UNC is not held responsible for the delay.

The primary purpose of this well is to determine the depth of ground water contamination; a secondary purpose of the well is to determine whether contaminants are present in fine-grained sediments, where they may be moving more slowly than in coarser sediments. This information will enable us to better determine the total volume of contaminated ground water present and to better determine the time it will take for contaminants to flush from all sediments. If this well were not drilled, it would simply make it more difficult to predict flushing time. Delay in drilling the well, therefore, poses no additional risk with regard to public health.



ONE HUNDRED YEARS OF EARTH SCIENCE IN THE PUBLIC SERVICE

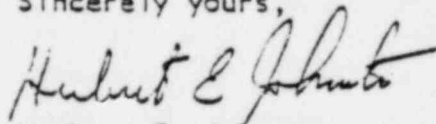
Mr. Malcolm Grant

-2-

January 12, 1981

Hopefully, you and others concerned with resolution of the problem at UNC would not object if drilling were to be delayed until March or April.

Sincerely yours,



Herbert E. Johnston
Subdistrict Chief

cc: Bob Gregg, UNC
Ken Kipp, Denver

111.1
STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

INTER-OFFICE MEMO

TO: Mal Grant
Policy Associate
DEPT: Executive/Governor's Office

FROM: Carleton A. Maine *C.A.M.*
Assistant Director for Regulation
DEPT: Environmental Management

SUBJECT: United Nuclear Corporation

DATE: 31 December 1980

The report of "Aerial Radiological Survey of the area surrounding the United Nuclear Corporation Recovery System Facility", prepared by the United States Department of Energy dated August 1979, has been reviewed. This aerial survey only included half of the UNC property. One portion of the report (abstract) is stated that the survey consist of flying north south, lines spaced 60 meters apart. Another portion of the report indicates the flight lines were oriented in a east west direction. These two statements are inconsistent. The report indicates that increase in levels of radioactivity were found in the northwest corner of the site. The levels of radioactivity found in the northwest corner were reported to be the lowest found, apparently below background for the area. Elevated activity appears to have been found near the gravel bank in the northeast corner of the area.

Because of these inconsistencies, it is felt that the report has little value. It is recommended that another survey be undertaken covering the entire property of United Nuclear Corporation.

CAM/ar

1111. 5

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
INTER-OFFICE MEMO

TO: Mel Grant
Policy Assistant
DEPT: Governor's Office

DATE: 22 December 1980

FROM: Carleton A. Maine *CAM*
Assistant Director for Regulation
DEPT: Environmental Management

SUBJECT: Soil testing for alleged United Nuclear Corporation discharge of wastewater lagoon contents to ground surface at its Charlestown, Rhode Island facility.

There has been an allegation that the United Nuclear Corporation on one occasion intentionally decanted wastewater lagoon contents to the ground's surface at a point approximately thirty feet south of the north corner of the inner east fence (indicated by a cross-hatched circle on the accompanying map of the wastewater lagoon system).

To substantiate or deny this allegation this office suggests that the U.S. Nuclear Regulatory Commission be requested to collect soil samples both within and outside the area of discharge and analyze these soil samples for constituents likely to be found in the wastewater lagoons. The sampling and testing procedure this office recommends have been attached herein.

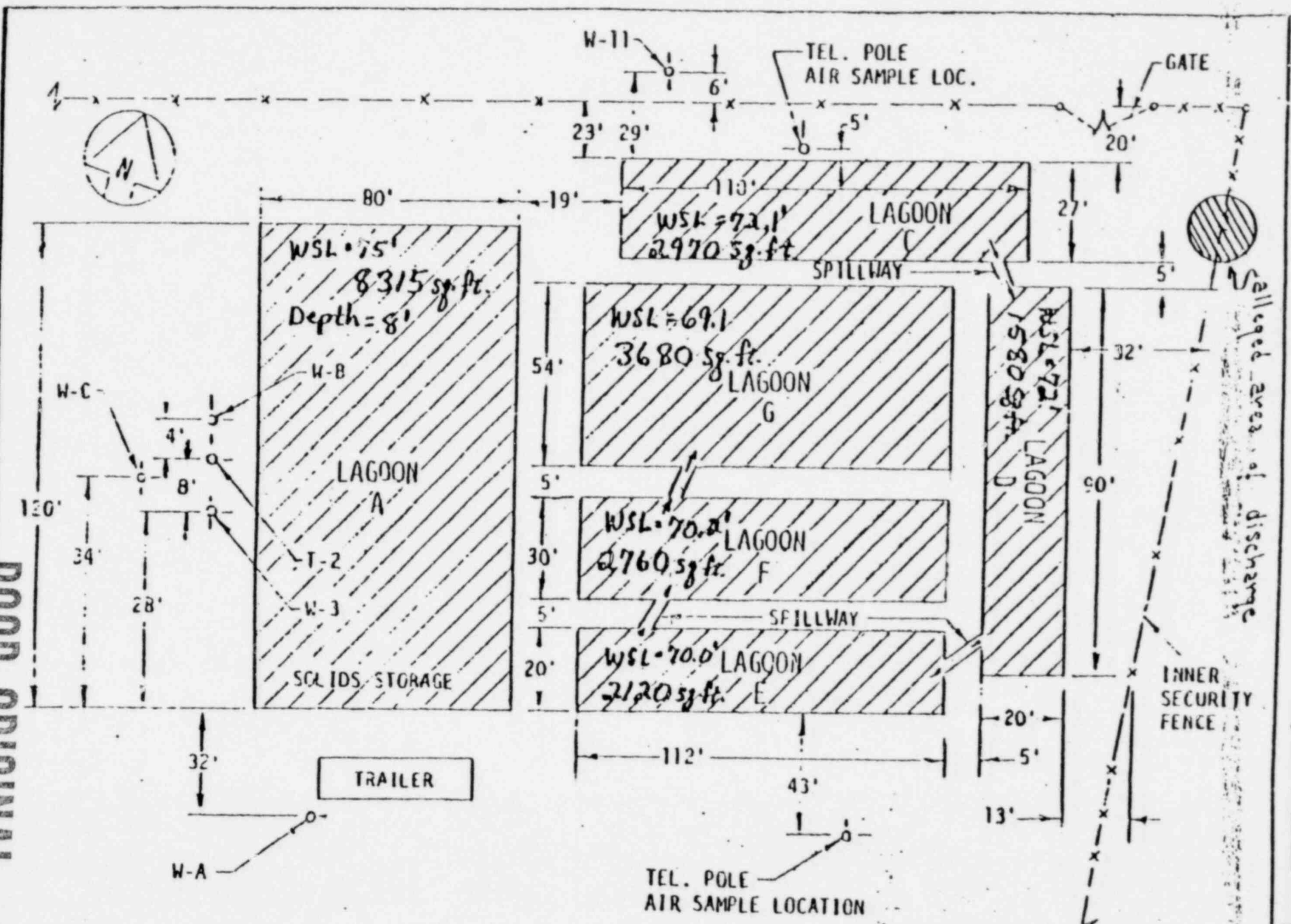
CAM/PMK/eh

RECEIVED
DEC 31 1980
GOVERNOR'S OFFICE

SECTION 9000
RECOVERY OPERATIONS

PART 721.11
WASTE LAGOONS

SNM 777 docket 70-6
Sketch No. 721.11-1
By KAH date JAN-1



POOR ORIGINAL

Top elevation of Lagoon A = 77' msl

Additional Info. obtained from

Procedures recommended for investigation of soil contamination resultant from alleged wastewater lagoon decantation to the ground's surface at the United Nuclear Corporation facility in Charlestown, Rhode Island.

I. For Non-radioactivity analyses

- (2) A representative number of soil samples are to be collected within the area of suspected discharge. Each soil sample will be collected at a depth below that of natural surface cover or subsequent fill with no sample collected less than 6 inches below ground surface.
- (2) For comparison an equal number of soil samples are to be collected in the same manner outside the suspect area and preferably in an area reasonably believed not to have been subject to suspect area contamination.
- (3) The EP Toxicity Test will be applied to each soil sample according to procedures presented in Appendix II of the Environmental Protection Agency's Hazardous Waste and Consolidated Permit Regulations. (Federal Register, Vol. 45, No. 98, May 19, 1980) which have been attached.
- (4) Elutriates from the EP Toxicity Tests will be analyzed for ions known to be present at high concentrations in the wastewater lagoons. These ions specifically are aluminum, calcium, potassium, sodium, fluoride, and nitrate.
- (5) Elutriate analyses from soil samples inside and outside the area of suspected discharge can be compared for significance and a judgement made for further action.

POOR ORIGINAL

Hazardous Waste No.	Substance ¹
U221	Toluene diisocyanate
U224	Toraxone
	2,4,5-TP see U223
U225	Trichloroethane
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethylene
	Trichloroethylene see U228
U229	Trichlorofluoromethane
U230	2,4,5-Trichlorophenol
U231	2,4,5-Trichlorophenol
U232	2,4,5-Trichlorophenoxyacetic acid
U233	2,4,5-Trichlorophenoxypropionic acid alpha, alpha-Trichlorotoluene see U223
	TRI-CLENE see U228
U234	Trinitrobenzene (R, T)
U235	Tris(2,3-dibromopropyl) phosphite
U236	Trypan blue
U237	Uracil mustard
U238	Urethane
	Vinyl chloride see U043
	Vinylidene chloride see U078
U239	Xylene

¹ The Agency included those trade names of which it was aware; an omission of a trade name does not imply that it is not hazardous. The material is hazardous if it is listed under its generic name.

Appendix I—Representative Sampling Methods

The methods and equipment used for sampling waste materials will vary with the form and consistency of the waste materials to be sampled. Samples collected using the sampling protocols listed below, for sampling waste with properties similar to the indicated materials, will be considered by the Agency to be representative of the waste.

Extremely viscous liquid—ASTM Standard D140-70 Crushed or powdered material—ASTM Standard D346-75 Soil or rock-like material—ASTM Standard D420-69 Soil-like material—ASTM Standard D1452-65 Fly Ash-like material—ASTM Standard D2234-75 [ASTM Standards are available from ASTM, 1916 Race St., Philadelphia, PA 19103]

Containerized liquid wastes—"COLIWASA" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods," U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460. [Copies may be obtained from Solid Waste Information, U.S. Environmental Protection Agency, 25 W. St. Clair St., Cincinnati, Ohio 45268] Liquid waste in pits, ponds, lagoons, and similar reservoirs.—"Pond Sampler" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods,"¹

This manual also contains additional information on application of these protocols.

¹ These methods are also described in "Samplers and Sampling Procedures for Hazardous Waste Materials," EPA 600/2-80-018, January 1980.

Appendix II—EP Toxicity Test Procedure

A. Extraction Procedure (EP)

1. A representative sample of the waste to be tested (minimum size 100 grams) should be obtained using the methods specified in Appendix I or any other methods capable of yielding a representative sample within the meaning of Part 260. [For detailed guidance on conducting the various aspects of the EP see "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods," SW 646, U.S. Environmental Protection Agency Office of Solid Waste, Washington, D.C. 20460.]

2. The sample should be separated into its component liquid and solid phases using the method described in "Separation Procedure" below. If the solid residue² obtained using this method totals less than 0.5% of the original weight of the waste, the residue can be discarded and the operator should treat the liquid phase as the extract and proceed immediately to Step 8.

3. The solid material obtained from the Separation Procedure should be evaluated for its particle size. If the solid material has a surface area per gram of material equal to, or greater than, 3.1 cm² or passes through a 9.5 mm (0.375 inch) standard sieve, the operator should proceed to Step 4. If the surface area is smaller or the particle size larger than specified above, the solid material should be prepared for extraction by crushing, cutting or grinding the material so that it passes through a 9.5 mm (0.375 inch) sieve or, if the material is in a single piece, by subjecting the material to the "Structural Integrity Procedure" described below.

4. The solid material obtained in Step 3 should be weighed and placed in an extractor with 16 times its weight of deionized water. Do not allow the material to dry prior to weighing. For purposes of this test, an acceptable extractor is one which will impart sufficient agitation to the mixture to not only prevent stratification of the sample and extraction fluid but also insure that all sample surfaces are continuously

¹ Copies may be obtained from Solid Waste Information, U.S. Environmental Protection Agency, 25 W. St. Clair Street, Cincinnati, Ohio 45268.

² The percent solids is determined by drying the filter pad at 80° C until it reaches constant weight and then calculating the percent solids using the following equation:

$$\frac{\text{weight of pad + solid} - \text{tare weight of pad}}{\text{initial weight of sample}} \times 100 = \% \text{ solids}$$

brought into contact with well mixed extraction fluid.

5. After the solid material and deionized water are placed in the extractor, the operator should begin agitation and measure the pH of the solution in the extractor. If the pH is greater than 5.0, the pH of the solution should be decreased to 5.0 ± 0.2 by adding 0.5 N acetic acid. If the pH is equal to or less than 5.0, no acetic acid should be added. The pH of the solution should be monitored, as described below, during the course of the extraction and if the pH rises above 5.2, 0.5N acetic acid should be added to bring the pH down to 5.0 ± 0.2 . However, in no event shall the aggregate amount of acid added to the solution exceed 4 ml of acid per gram of solid. The mixture should be agitated for 24 hours and maintained at 20°-40° C (68°-104° F) during this time. It is recommended that the operator monitor and adjust the pH during the course of the extraction with a device such as the Type 45-A pH Controller manufactured by Chemtrix, Inc., Hillsboro, Oregon 97123 or its equivalent, in conjunction with a metering pump and reservoir of 0.5N acetic acid. If such a system is not available, the following manual procedure shall be employed:

(a) A pH meter should be calibrated in accordance with the manufacturer's specifications.

(b) The pH of the solution should be checked and, if necessary, 0.5N acetic acid should be manually added to the extractor until the pH reaches 5.0 ± 0.2 . The pH of the solution should be adjusted at 15, 30 and 60 minute intervals, moving to the next longer interval if the pH does not have to be adjusted more than 0.5N pH units.

(c) The adjustment procedure should be continued for at least 6 hours.

(d) If at the end of the 24-hour extraction period, the pH of the solution is not below 5.0 and the maximum amount of acid (4 ml per gram of solids) has not been added, the pH should be adjusted to 5.0 ± 0.2 and the extraction continued for an additional four hours, during which the pH should be adjusted at one hour intervals.

6. At the end of the 24 hour extraction period, deionized water should be added to the extractor in an amount determined by the following equation:

$$V = (20)(W) - 16(W) - A$$

V = ml deionized water to be added
W = weight in grams of solid charged to extractor
A = ml of 0.5N acetic acid added during extraction

7. The material in the extractor should be separated into its component liquid and solid phases as described under "Separation Procedure."

8. The liquids resulting from Steps 2 and 7 should be combined. This

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combined liquid (or the waste itself if it has less than 1/2 percent solids, as noted in Step 2) to the extract and should be analyzed for the presence of any of the contaminants specified in Table I of § 261.24 using the Analytical Procedures designated below.

Separation Procedure

Equipment: A filter holder, designed for filtration media having a nominal pore size of 0.45 micrometers and capable of applying a 5.3 kg/cm² (75 psi) hydrostatic pressure to the solution being filtered shall be used. For mixtures containing nonabsorptive solids, where separation can be affected without imposing a 5.3 kg/cm² pressure differential, vacuum filters employing a 0.45 micrometers filter media can be used. (For further guidance on filtration equipment or procedures see "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.")

Procedure:²

(i) Following manufacturer's directions, the filter unit should be assembled with a filter bed consisting of a 0.45 micrometer filter membrane. For difficult or slow to filter mixtures, a prefilter bed consisting of the following prefilters in increasing pore size (0.65 micrometer membrane, fine glass fiber prefilter, and coarse glass fiber prefilter) can be used.

(ii) The waste should be poured into the filtration unit.

(iii) The reservoir should be slowly pressurized until liquid begins to flow from the filtrate outlet at which point the pressure in the filter should be immediately lowered to 10-15 psig. Filtration should be continued until liquid flow ceases.

(iv) The pressure should be increased stepwise in 10 psi increments to 75 psig and filtration continued until flow ceases or the pressurizing gas begins to exit from the filtrate outlet.

(v) The filter unit should be depressurized, the solid material removed and weighed and then transferred to the extraction apparatus, or, in the case of final filtration prior to analysis, discarded. Do not allow the

²This procedure is intended to result in separation of the "free" liquid portion of the waste from any solid matter having a particle size >0.45µm. If the sample will not filter, various other separation techniques can be used to aid in the filtration. As described above, pressure filtration is employed to speed up the filtration process. This does not alter the nature of the separation. If liquid does not separate during filtration, the waste can be centrifuged. If separation occurs during centrifugation the liquid portion (centrifugate) is filtered through the 0.45µm filter prior to becoming mixed with the liquid portion of the waste obtained from the usual filtration. Any material that will not pass through the filter after centrifugation is considered a solid and is extracted.

material retained on the filter pad to dry prior to weighing.

(vi) The liquid phase should be stored at 4°C for subsequent use in Step 8.

B. Structural Integrity Procedure

Equipment: A Structural Integrity Tester having a 3.18 cm (1.25 in.) diameter hammer weighing 0.33 kg (0.73 lbs.) and having a free fall of 15.24 cm (6 in.) shall be used. This device is available from Associated Design and Manufacturing Company, Alexandria, VA, 22314, as Part No. 125, or it may be fabricated to meet the specifications shown in Figure 1.

Procedure:

1. The sample holder should be filled with the material to be tested. If the sample of waste is a large monolithic block, a portion should be cut from the block having the dimensions of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder. For a fixated waste, samples may be cast in the form of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder for purposes of conducting this test. In such cases, the waste may be allowed to cure for 30 days prior to further testing.

2. The sample holder should be placed into the Structural Integrity Tester, then the hammer should be raised to its maximum height and dropped. This should be repeated fifteen times.

3. The material should be removed from the sample holder, weighed, and transferred to the extraction apparatus for extraction.

Analytical Procedures for Analyzing Extract Contaminants

The test methods for analyzing the extract are as follows:

(1) For arsenic, barium, cadmium, chromium, lead, mercury, selenium or silver: "Methods for Analysis of Water and Wastes," Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268 (EPA-600/4-79-020, March 1979).

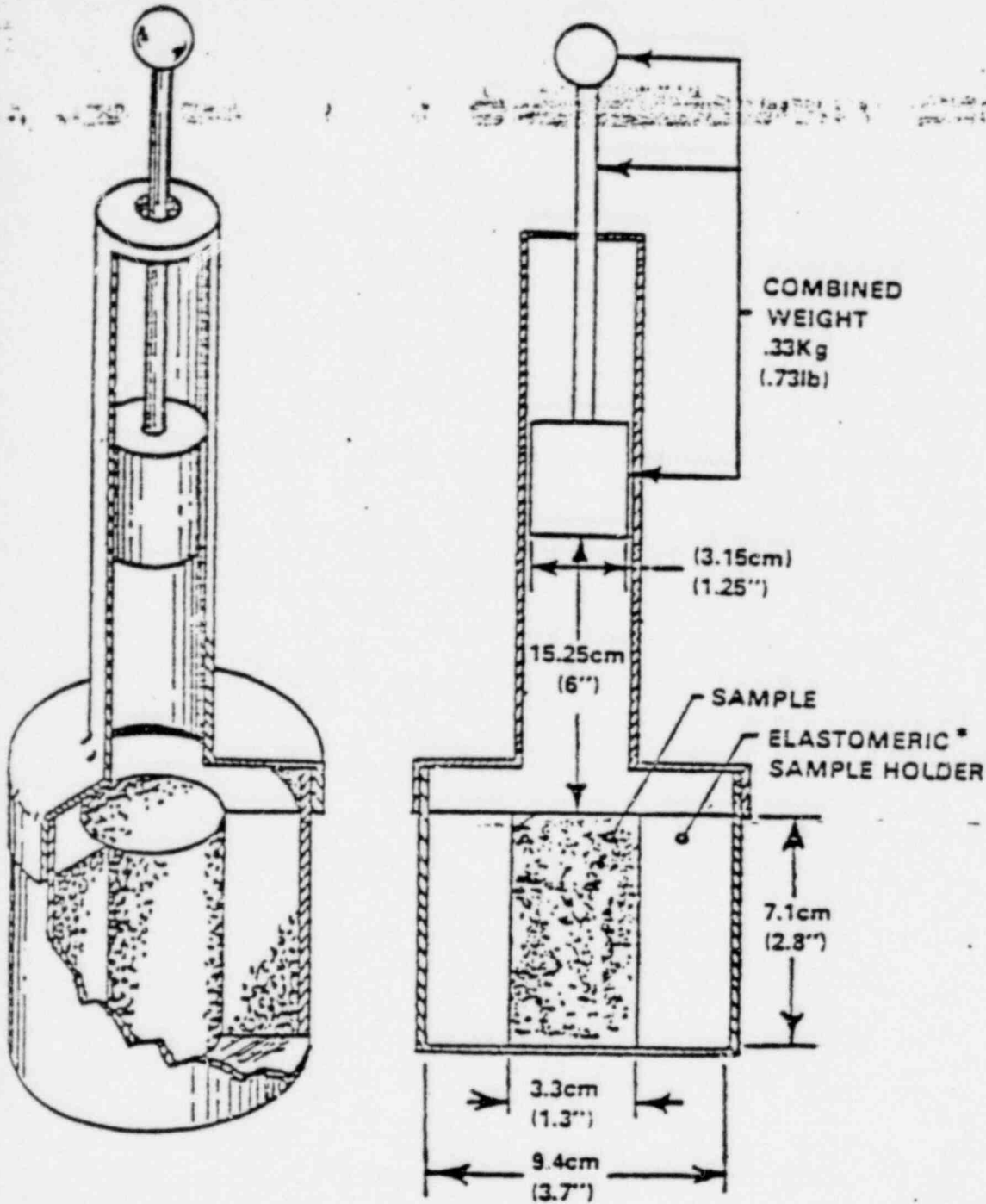
(2) For Endrin; Lindane; Methoxychlor; Toxaphene; 2,4-D; 2,4,5-TP Silver: in "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol and Pesticides in Water and Wastewater," September 1978, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods."

For all analyses, the method of standard addition shall be used for the quantification of species concentration.

This method is described in "Test Methods for the Evaluation of Solid Waste." (It is also described in "Methods for Analysis of Water and Wastes.")

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*ELASTOMERIC SAMPLE HOLDER FABRICATED OF MATERIAL FIRM ENOUGH TO SUPPORT THE SAMPLE

Figure 1

COMPACTION TESTER

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Table 1.—Analytical Characteristics of Organic Chemicals—Continued

Compound	Sample handling class/ fraction	Non-GC methods	Measurement techniques		
			GC/MS	GC	Conventional Detector
Pentachlorophenol	Extractable/A		8.25	8.04	ECD
Percol	Ext. stable/A		8.25	8.04	ECD, PID
Phenol	Extractable/BN			8.22	FPO
Phosphorothioic acid esters	Extractable/BN			8.06	ECD, PID
				8.09	ECD, PID
				8.22	FPO
Phthalic anhydride	Extractable/BN		8.25	8.06	ECD, PID
				8.09	ECD, PID
1-Picoline	Extractable/BN		8.25	8.06	ECD, PID
				8.09	ECD, PID
Pyridine	Extractable/BN		8.25	8.06	ECD, PID
				8.09	ECD, PID
Tetrachlorobenzene(s)	Extractable/BN		8.25	8.12	ECD
Tetrachloroethanol(s)	Volatile		8.24	8.01	HSD
Tetrachloroethane	Volatile		8.24	8.01	HSD
Tetrachlorophenol	Extractable/A		8.24	8.04	ECD
Toluene	Volatile		8.24	8.02	PID
Toluenediamine	Extractable/BN		8.25		
Toluene diisocyanate(s)	Extractable/nonaqueous		8.25	8.08	PID
Tosaphene	Extractable/P		8.25	8.08	HSD
Trichloroethane	Volatile		8.24	8.01	HSD
Trichloroethane(s)	Volatile		8.24	8.01	HSD
Trichlorofluoromethane	Volatile		8.24	8.01	HSD
Trichlorophenol(s)	Extractable/A		8.25	8.04	HSD
2,4,5-TP (Silver)	Extractable/A		8.25	8.04	HSD
Trichloropropene	Volatile		8.24	8.01	HSD
Vinyl chloride	Volatile		8.24	8.01	HSD
Vinylene chloride	Volatile		8.24	8.01	HSD
Xylene	Volatile		8.24	8.02	PID

¹ Analyze for phenanthrene and carbazole; if these are present in a ratio between 1:41 and 5:1, creosote should be considered present.

ECD = Electron capture detector; PID = Flame ionization detector; FPO = Flame photometric detector; HSD = Halide specific detector; HPLC = high pressure liquid chromatography; NSD = Nitrogen-specific detector; PID = Photoionization detector.

Table 2.—Analytical Characteristics of Inorganic Species

Species	Sample handling class	Measurement technique	Method number
Antimony	Digestion	Atomic absorption—lamps/flame	8.50
Arsenic	Hydride	Atomic absorption—flame	8.51
Barium	Digestion	Atomic absorption—lamps/flame	8.52
Calcium	Digestion	Atomic absorption—lamps/flame	8.53
Chromium	Digestion	Atomic absorption—lamps/flame	8.54
Cyanides	Hydrolysis	Atomic absorption—spectroscopy	8.55
Lead	Digestion	Atomic absorption—lamps/flame	8.56
Mercury	Cold Vapor	Atomic absorption	8.57
Nickel	Digestion	Atomic absorption—lamps/flame	8.58
Selenium	Hydride digestion	Atomic absorption—lamps/flame	8.59
Silver	Digestion	Atomic absorption—lamps/flame	8.60

Table 3.—Sample Preparation/Sample Introduction Techniques

Sample handling class	Physical characteristics of waste ¹		
	Fluid	Paste	Solid
Metals	Purge and trap	Purge and trap	Headspace
	Direct injection	Headspace	
Semi-volatile and non-volatile	Direct injection	Shake out	Shake out, Soxhlet, Sonication
	Shake out		
Organics	Direct injection		
	Digestion	Digestion	Digestion
	Hydride	Hydride	Hydride

Procedure and Method Number(s)

Digestion—See appropriate procedure for element of interest.

Direct injection—8.30

Headspace—8.82

Hydride—See appropriate procedure for element of interest.

Purge & Trap—8.83

Shake out—8.84

Sonication—8.85

Soxhlet—8.86

Appendix VII.—Basis for Listing Hazardous Wastes

EPA hazardous waste No.	Hazardous constituents for which listed
P001	tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorinated fluorocarbons, carbon tetrachloride
P002	tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-tetrafluoroethane, perchlorobenzene, tetrachlorofluoromethane
P003	N.A.
P004	acetic acid, acrylic acid, nitrobenzene
P005	methanol, toluene, methyl ethyl ketone, methyl isobutyl ketone, carbon disulfide, acetone, pyridine
P006	cadmium, chromium, nickel, cyanide (complexed)
P007	cyanide (salts)
P008	cyanide (salts)
P009	cyanide (salts)
P010	cyanide (salts)
P011	cyanide (salts)
P012	cyanide (complexed)
P013	cyanide (complexed)
P014	cyanide (complexed)
P015	cyanide (salts)
P016	cyanide (complexed)
K001	benzene, benz[a]anthracene, benz[a]pyrene, chrysene, 4-nitrophenol, toluene, naphthalene phenol, 2-chlorophenol, 2,4-dimethyl phenol, 2,4,6-trichlorophenol, pentachlorophenol, 4,6-dinitro-0-cresol, tetrachlorophenol
K002	chromium, lead
K003	chromium, lead
K004	chromium
K005	chromium, lead
K006	chromium
K007	cyanide (complexed), chromium
K008	chromium
K009	chloroform, formaldehyde, methylene chloride, methyl chloride, peracetic acid, formic acid
K010	chloroform, formaldehyde, methylene chloride, methyl chloride, peracetic acid, formic acid, chloroacetaldehyde
K011	acrylonitrile, acrylonitrile, hydrocyanic acid
K012	acrylonitrile, acrylonitrile, acrolein, acrylamide
K013	hydrocyanic acid, acrylonitrile, acrylamide
K014	acrylonitrile, acrylamide
K015	benzyl chloride, chlorobenzene, toluene, benzotrichloride
K016	hexachlorobenzene, hexachlorobutadiene, carbon tetrachloride, hexachloroethane, perchloroethylene
K017	epichlorohydrin, chloroethers (bis(chloromethyl) ether and bis (2-chloroethyl) ethers), trichloropropane, dichloropropane
K018	1,2-dichloroethane, trichloroethylene, hexachlorobutadiene, hexachlorobenzene
K019	ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, cyanide chloride

¹The purpose of the Table fluid refers to readily pourable fluids, and may or may not contain suspended particles. Paste-like materials, when fluid in the sense of how they can be poured, if in liquid form or plastic in nature, e.g., when they are heated, are those wastes which can be heated without a further p.p. can be poured without additional heating.

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