16-000278

58911

OFFICE MEMORANDUM

TO : E. Wilder

DATE: June 2, 1970

FROM : J. F. Baytos

SUBJECT: ANALYSIS OF SOIL SAMPLES FOR RESIDUAL EXPLOSIVES FROM DRAINAGE DITCHES AT THE SUMP EFFLUENT OUTLETS AT GROUP GMX-3 OPERATING BUILDINGS

SYMBOL : GMX-3

The soil samples taken from drainage ditches at the sump effluent outlets of Group GMX-3 operating buildings by the Sump Inspection Sub-Committee on April 29, 1970, were analyzed for residual explosives content. The results are presented in Table 1.

The data indicate that the soil in the drainage ditch at the sump effluent outlet from Building TA-16-260 has a high concentration of residual explosives, mostly HMX and RDX, and a low proportion of TNT. These values are believed to be representative of the soil in the drainage ditch.

Data for the 300-line of casting buildings show a very low residual explosives content, even though the 300-10 common outlet has a high acetone-soluble value. The plastics and solvents used in Buildings TA-16-306 and 304 would account for the high acetone-solubles and carbon tetrachloride-solubles.

The data for the remaining buildings show a low concentration of residual explosives with the exception of Buildings TA-16-430 and 478. Building 430 (pressing) has a high acetone and CCl_4 solubles, but this is not reflected in the TNT content. The CCl_4 insoluble content shows 1.5% HMX/RDX and this is not unexpected. The same could be said for Building 478 (high speed machining tests). Again the residual explosives show about 3.8% HMX/RDX.

For comparing the data on the 260-line, Table 2, taken from a report dated March 11, 1960, is attached. The data show that the overall residual explosives content is higher now, and this probably should be expected. This is especially true of the pond center.

A brief description of the analytical method worked out previously for this type of analyses follows. The wet samples were dried, crushed, and passed through a 14-mesh sieve. Each sample was then rolled and quartered. Ten grams were weighed and extracted with acetone in a Soxhlet apparatus for three hours. This extraction removed all the explosives, some soluble plastics, decomposition products, and other organic acetone-soluble materials. The acetone was evaporated, and the remaining filtrate was then treated with carbon

tetrachloride (CCl_4) to dissolve the TNT and leave the HMX/RDX materials as a residue. Only part of these residues are explosives. Weighed samples were dissolved in acetonitrile (CH_3CH), and scans were run on the Perkin-Elmer 350 ultraviolet spectrophotometer to determine the quantity of each explosive present. The shape and peak heights of the HMX/RDX curves showed that the explosives present were mostly HMX. In cases of doubt, the ratio of the HMX/RDX was determined on the Beckman IR-12 infrared spectrophotometer by the Analytical Unit, Quality and Process Control Section. Weighed samples are pressed into a potassium bromide matrix into a disc which is scanned. The resultant curve is then read. Results are tabulated as footnotes to the HMX/RDX column in Table 1.

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Attachments: Tables 1 and 2

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TABLE 1

ANALYSIS OF SOIL SAMPLES FOR RESIDUAL EXPLOSIVES FROM SUMP EFFLUENT OUTLET DRAINAGE DITCHES AT GROUP GMX-3 OPERATING BUILDINGS

Sample Description		Acetone[a] Solubles (w/o)	CCl_4[b] Insolubles (w/o)	CCl_4[c] Solubles (w/o)	HMX/[d] RDX (w/o)	TNT[e] (w/o)	Total Explosives (w/o)
260-1	under concrete effluent outlet	7.7	7.1	0.4	7.0	0.00	7.0
260-2	at pond center	33.2	25.9	6.8	20.5[f]	3.7	24.2
260-3	lip below dam	6.7	5.5	1.2	4.8[g]	0.07	4.9
260-4	halfway between dam lip and canyon	14.5	13.4	1.0	12.9	0.12	13.0
260-5	canyon lip	4.6	4.1	0.5	3.9[h]	0.10	4.0
301-6	at effluent outlet	1.7	1.1	0.6	0.8[i]	0.25	1.1
303-7	at effluent outlet	0.5	0.03	0.5	0.02	0.00	0.0
305-8	at effluent outlet	0.6	0.02	0.6	0.00	0.00	0.0
307-9	at effluent outlet	1.0	0.7	0.3	0.7	0.13	0.8
300-10	at common effluent outlet	4.8	0.3	4.3	0.2	0.86	1.1
340-11	at effluent outlet	1.0	0.2	0.8	0.1	0.5	0.6
380-12	at effluent outlet	0.5	0.1	0.4	0.04	0.01	0.0
400-13	at effluent outlet	0.9	0.04	0.9	0.01	0.08	0.1
430-14	Bay 1 effluent outlet	13.6	1.9	11.7	1.5[j]	0.12	1.6
478-15	P-Site effluent outlet	6.0	5.7	0.3	3.8[k]	0.02	3.8
460-16	uncontaminated soil	0.07	0.03	0.02	0.00	0.00	0.0

[a] The filtrate comes from acetone Soxhlet extract on a dried, crushed, 14-mesh sieved, rolled, and quartered sample This filtrate includes explosives, decomposition products, plastic, and other natural acetone soluble materials.

[b] The residue from the CCl_4 treatment includes the RDX and HMX fractions and other decomposition products from the acetone extract.

[c] The filtrate from the CCl_4 wash includes the TNT fraction and other unknown decomposition products.

[d] These values were determined on the PE 350 ultraviolet spectrophotometer. The shape of the curves indicate that most of the residue is HMX rather than RDX. In cases of doubt that IR 12 spectrophotometer was used to verify HMX/RDX ratios.

[e] These values were determined on the PE 350 ultraviolet spectrophotometer.

[f] Ratio HMX/RDX by IR 12 spectrophotometer 50/50,

[g] 50/50, [h] 80/20, [i] 10/90, [j] 95/5, [k] 10/90, trace PETN.

March 11, 1960

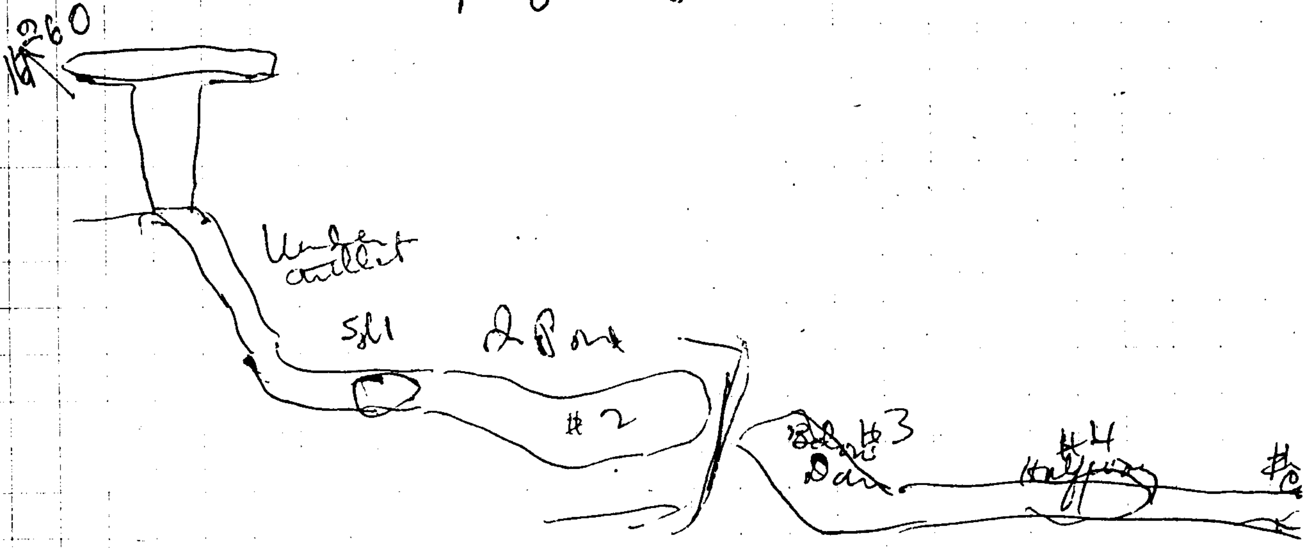
Sample Description	Sample Test Number	% Toluene/Acetone Extract	% Residue from Carbon Tetrachloride Extract	% Filtrate from Carbon Tetrachloride extract	% [illegible]	% [illegible]	% Total Bituminous
Pond [illegible]	No. 7	16.9	14.2	4.5	[illegible]	1.3	9.5
Pond [illegible]	No. 8	6.3	4.3	4.0	3.9	1.3	4.3
20 feet [illegible] crossbar	No. 1	9.0	6.6	2.3	[illegible]	1.7	6.0
30 feet below dam crossbar	No. 2	7.5	4.3	2.8	3.3	[illegible]	4.6
50 feet below dam crossbar All samples 2 to 3" from surface.	No. 3	4.9	[illegible]	1.1	*	[illegible]	*
100 feet below dam crossbar	No. 4	4.3	3.0	1.3	[illegible]	[illegible]	3.5
150 feet below dam crossbar	No. 5	1.0	[illegible]	.3	.5	[illegible]	.5
100 Feet. Same as No. 4	No. 6	4.4	3.4	.8	2.7	[illegible]	2.7

* Sample lost in analysis, data not available.

$\bar{x} = 7.7$

April 29, 197

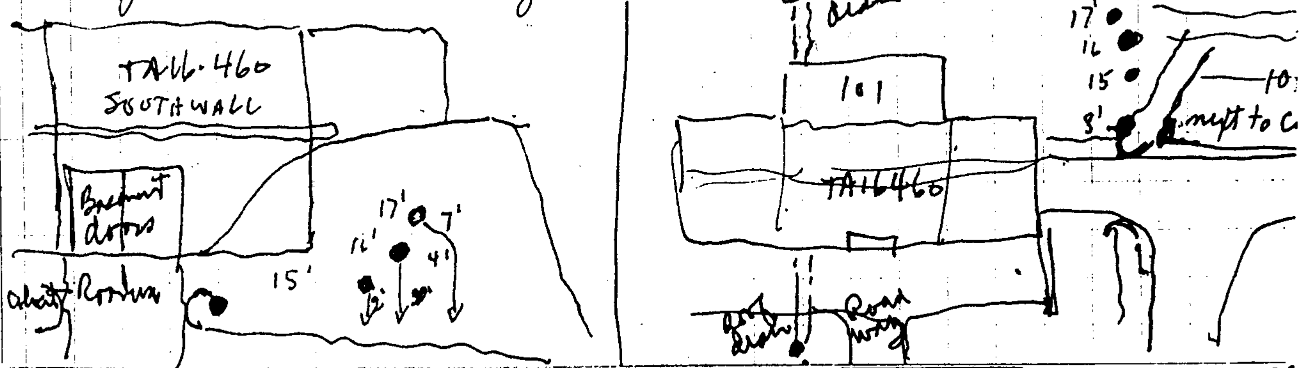
The sump outlet inspection committee organized at Group meeting of February 9, 1970, composed of E. Wilder, Ch. TF Harris, Herb Keller, Verdie Roper, John Baytos, and who is substituting for E. Wilder on ~~retirement~~ met at Bldg and inspected the sump outlet at back of 260, and on down to the lip of canyon.



Samples were taken at the following spots

260-1	Under concrete ~~outlet~~ raceway outlet
260-2	In Pond Center
260-3	From lip below dam
260-4	Halfway point from lip
260-5	At Canyon Lip.

Outfall locations at Bldg TA-16-460



April 29 1970

After lunch we inspected the sump outlets at 460, 410, 430, 400, 340, 430, 280, 465, 463, 301, 303, 305, 307, 300-2-4-6, Pants and Bldg 400. Samples were taken only from the following places.

#6	301 –	Exit of raceway ~~sewer~~ effluent outlet
#7	303 –	" " " " "
#8	305 –	" " " " "
#9	307 –	" " " " "
#10	300-2-4-6)	Common exit effluent outlet
#11	340 –	at effluent outlet
#12	380 –	at effluent outlet
#13	400 –	at effluent outlet
#14	430 –	Day settling tank, effluent outlet
#15	478 P site	– at effluent outlet
#16	460	– uncontaminated soil

The samples were taken to the lab and dried out in room 105 (which is warm). After drying, the samples were crushed and sieved through a 14 mesh sieve, and this dried sample is the material from which work is to be done.

5-1-70

The procedure to be used will be that used in status report of November 15, 1969. Analysis of Soil from TA-9 Anchor Site, East Stream Bed, for Residual Explosive. A 10g sample from each sampled area was subjected to 43 hrs acetone soxhlet ~~Analyzer~~ extraction, and the percent acetone solubles are determined.

The acetone ~~[illegible]~~ solubles will be separated with 50cc CCl_4 and the TNT fraction determined. The CCl_4 residue should be RDX-HMX. The quantitative values will be determined on the UV-350 spectrophotometer after the dried residue is taken up by 50cc acetonitrile. The percentage of TNT and RDX-HMX can be calculated from Beer law curves for these materials at 225 mu. RDX and HMX also have another peak at 19.5 mm and this may be used to get ratio of RDX to HMX. The IR-12 Beckman spectrophotometer also can give a ratio for the RDX and HMX.