NAVAL RESEARCH LABORATORY
WASHINGTON, D.C. 20375

IN REPLY REFER TO:
6180-96:HBP:bh
3 March 1977

Major B. Pease/DO
Air Force Civil Engineering Center
Tyndall AFB, FL 32401

Dear Major Pease:

In regard to progress on the Improved Environmental Properties for AFFF the following is reported:

1. The DCASMA Milwaukee, which is the contract administration office for the contract with the Ansul Co., investigated the reason for the delay in AFFF material originally scheduled for 29 December 1976. They found that the toxicity testing to be done by the Wisconsin Research Foundation was the cause of the delay. The new delivery date is now mid-March.

2. The Ansul Company has been conducting other studies under the contract with NRL. A copy of the most recent progress report in forwarded as enclosure (1).

3. The delay in delivery of material by Ansul necessitates a change in the original milestone chart. A revised chart is forwarded as enclosure (2).

Henry B. Peterson, Head
Fire Suppression
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Code 6180, Chemistry Division

Encl (1) and (2)

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CONTRACT NO0173-76-C-0295
Interim Progress Report

A series of three fluorochemical surfactants, three hydrocarbon surfactants and three binary solvent compositions were selected as the components for an environmentally improved AFFF model.

Initial screening at three dilutions showed insignificant concentration dependent so a check at dilutions of 1:12,500 and 1:5,000 was investigated for all candidate materials. The results of this investigation were as follows:

Material	Dilution	COD (mgms/l)
Lodyne S-105	1:12,500	776, 875
Lodyne S-105	1:5,000	780, 850
Lodyne S-110	1:12,500	498, 000
Lodyne S-110	1:5,000	539, 950
Lodyne S-116	1:12,500	368, 500
Lodyne S-116	1:5,000	509, 950
Deriphat D-160C	1:12,500	597, 625
Deriphat D-160C	1:5,000	669, 300
Conco EL-30	1:12,500	507, 750
Conco EL-30	1:5,000	533, 850
Tergitol 15-S-12	1:12,500	2,101, 500
*Solvent System A	1:8,333	2,064, 917
*Solvent System B	1:8,333	1,789, 429
*Solvent System C	1:8,333	1,922, 203

*Solvent System refers to a 50/50 mixture (wt. %) of the following:

A - Butoxy-ethoxy-propanol-2/Hexylene glycol
B - Propasol ^{R} B/Ethylene glycol
C - Butyl carbitol/Propylene glycol

The results of this concentration study led to the conclusion that at these dilution levels no concentration dependence occurred.

Twenty (20) day BOD* studies were undertaken on nine candidate materials with checks at intervals of 11, 15 and 20 days. The results are as follows:

*BOD is expressed in mgms O_2/mgm compound

Encl (1) to NRL Ltr
[illegible]

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Material	BOD_{11}	BOD_{15}	BOD_{20}
Lodyne S-105	.443	.409	.430
Lodyne S-110	.245	.272	.286
Lodyne S-116	.118	.059	.103
Deriphat D-160C	.336	.378	.431
Conco EL-30	.458	.423	.407
Tergitol 15-S-12	.150	.111	.121
Solvent System A	.444	.440	.517
Solvent System B	1.070	.716	.957
Solvent System C	1.109	.701	.899

Some problems have been encountered with the scheduling of fish toxicity studies using outside testing laboratories. The following compounds have been investigated and LC_{50}, values for fat head minnows at 96 hour exposure determined.

Material	LC_{50} (ppm)
Butyl carbitol	2,500
Propasol B	1,000
Propylene glycol	10,000
Hexylene glycol	1,700
Tergitol 15-S-12	4.0
Lodyne S-105	>1,000
Lodyne S-110	>1,000

The remaining compounds are under investigation and results will be available by March 15.

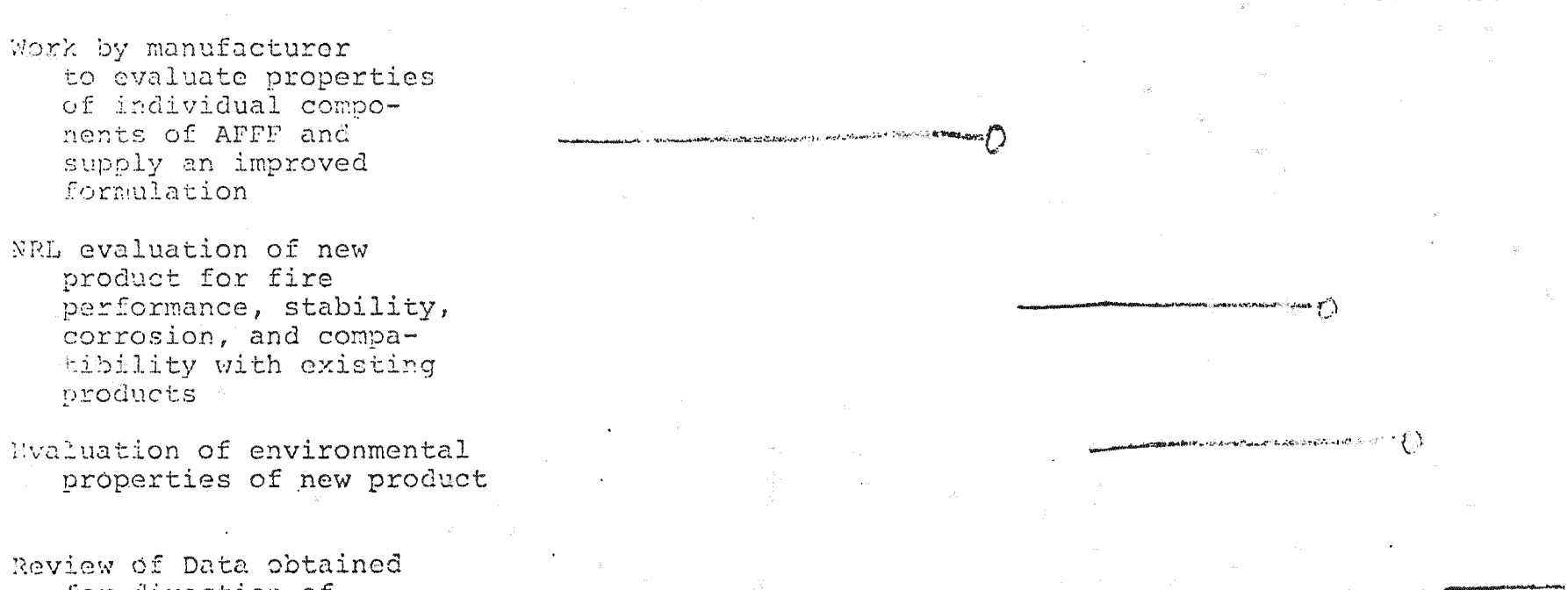
An alternative method for determining AFFF solution composition is being investigated. This would replace the existing refractive index method which persently is used and requires solvent levels of 15-20% (wt.) for the required accuracy. The new method is based upon chemical indicators in the ppm range used with the AFFF concentrate and capable of being detected in dilute solutions of AFFF spectrophotometrically. To date the accuracy of this method is significantly better than the refractive index method. Commercially available, portable UV-visible spectrophotometers are being evaluated along with competitive QPL approved AFFF concentrates to determine the applicability of this method.

Final AFFF formulation evaluation has been delayed due to the fish toxicity scheduling problem as well as the problem of conducting reproducible fire performance tests due to the unusually cold weather. This project will be delayed approximately 90-120 days beyond the scheduled completion date.

JFR:dms
2/21/77

IMPROVED ENVIRONMENTAL IMPACT PROPERTIES FOR AFFF MATERIALS

FY YEAR 1977



Encl (2) to NRL ltr
6180-96:HDP:bh