

TRIP REPORT
TREE SURVEY IN SUPPORT OF
PHYTOREMEDIATION MONITORING AT J-FIELD
ABERDEEN PROVING GROUND, MARYLAND

JUNE 5, 1996



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DATE: 5 June 1996
TO: Harry Compton, U.S. EPA/ERT Work Assignment Manager
THROUGH: Rich Tobia, REAC Task Leader 
FROM: Michael Van Clef, REAC Sub-Task Leader 
SUBJECT: Tree Survey, J-Field Phytoremediation Monitoring Plan
WORK ASSIGNMENT 1-173 - TRIP REPORT

BACKGROUND

As part of a pilot-scale TreeMediation™ project, one hundred eighty two hybrid poplar trees were planted from 25 March - 3 April 1996 in a one acre plot above contaminated groundwater. The objective of the project is to remove volatile organic compounds (VOCs), primarily 1,1,2,2-tetrachloroethane (PCA) and trichloroethene (TCE), from groundwater at the J-Field Toxic Pits site, Aberdeen Proving Ground (APG), Maryland. This is a pilot study with two possible outcomes. One possibility is that groundwater contamination remains the same over time. This outcome could have three possible causes: 1) trees are not removing VOCs; 2) trees are removing VOCs, but the contaminant source (soil) is replenishing the groundwater; and/or 3) trees are removing VOCs at an undetectable rate. The second possibility is that groundwater contamination decreases over time. This outcome could result from one or a combination of the following causes: 1) trees are aiding in soil microbial biodegradation of VOCs in the rhizosphere; 2) trees are removing and metabolizing VOCs; 3) trees are removing and transpiring VOCs; and/or 4) trees are removing and accumulating VOCs.

Groundwater, soil, and plant tissue will be collected over five years to determine if the trees are successfully remediating the groundwater and to determine possible VOC reduction mechanisms. Transpirational rates of individual trees and transpirational gas analyses will be performed to estimate quantities of contaminant removed from the aquifer. Laboratory validation of the fate and transport of contaminants will be performed using [¹⁴C]PCA.

OBSERVATIONS AND ACTIVITIES

On May 22, 1996, Michael Van Clef (Roy F. Weston, Inc./REAC), Harry Compton and Kevin Finerman (U.S. EPA/ERT) traveled to the J-Field Phytoremediation site at the Aberdeen Proving Ground, Edgewood Area, Maryland. They were met on-site by Dr. Edward Gatliff (Applied Natural Sciences, Inc.). The visit was made to assess the health of the recently planted poplar trees. Visual observations of the health of each tree were recorded on a site map (Figure 1). Dead and dying branches (wilted leaves) were removed with pruning shears by Dr. Gatliff. Plant health was assessed for each tree by placing it into one of four categories based on extent of damage. The four categories were: healthy, significant damage, severe damage, and complete branch



death. Trees in the last category were cut with only a stump or short trunk remaining. It is possible that these trees will resprout from the ground. Healthy plants were those that required little or no pruning. Increasing amounts of pruning of dead branches were required on trees placed in the other categories. A total of 46 trees (25.3 percent) were classified as unhealthy. Trees with significant damage (23 trees or 12.6 percent), severe damage (7 trees or 3.8 percent), trees with complete branch death (16 trees or 8.8 percent), and healthy trees (136 trees or 74.7 percent) were mapped in an effort to determine problem areas.

Several hypotheses were formulated to explain the extent of damage to the newly planted trees. The primary concern is the saturation of surface soils in the northeast portion (lead pushout area) of the planting area. It is expected that many trees will recover as they become acclimated to the saturated conditions. Another source of damage may have resulted from misapplication of fertilizer causing 'fertilizer burn' that lead to wilting and leaf death in several trees. Insect damage was also apparent on several trees. Caterpillars completely defoliated two trees and were causing minor damage to two neighboring trees. Each affected tree was sprayed with a dilute (0.075 percent) diazinon solution to prevent a severe infestation of all trees. Insects were collected and submitted for positive identification to the Middlesex County Agricultural Cooperative in New Brunswick, New Jersey. In general, approximately 10 percent of the trees are expected to die from various causes in the first year of planting. It is expected that some of the plants that appear unhealthy will recover during the year as they become acclimated to site conditions.

In addition, water levels were measured in the ventilation tubes used to supply air to the plant roots (Table 1). Water levels were measured in a representative number of trees to construct a water level map of the planting area. The water level map and the data from the visual observations will be combined in order to determine if a clear relationship exists between soil saturation and individual plant health.

FUTURE ACTIVITIES

A follow up visit will be conducted the week ending 8 June 1996 to assess the effects of pruning on the effected trees. Identification to species of the caterpillar is expected within one week. A map indicating water levels and plant health will be finalized. In the autumn, dead trees will be replaced by Applied Natural Sciences, Inc.

cc: Central File WA 1-173

TABLE 1. Depth to Groundwater
J-Field Phytoremediation
Aberdeen Proving Ground, Maryland
May 1996

Tree Number	Groundwater Depth (feet)
11	1.6
13	1.2
14	1.1
17	0.8
58	3.2
59	4.9
67	5.7
70	4.8
81	2.0
83	2.8
85	1.5
88	3.4
90	3.7
94	1.4
99	3.3
106	1.7
111	4.7
114	2.3
129	1.9
133	4.0
134	2.2
138	3.0
139	3.0
141	1.9
143	1.1
146	2.5
158	1.7
160	1.2
161	1.3
173	4.4
174	4.8
180	4.3
184	4.5
186	4.5
190	5.4
193	4.6
197	0.8



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DATE: 20 June 1996
TO: Harry Compton, U.S. EPA/ERT Work Assignment Manager
THROUGH: Rich Tobia, REAC Task Leader 
FROM: Michael Van Clef, REAC Sub-Task Leader 
SUBJECT: Tree Survey, J-Field Phytoremediation Monitoring Plan
WORK ASSIGNMENT 1-173 - TECHNICAL MEMO

On 6 June 1996, Michael Van Clef and Richard Tobia (Roy F. Weston, Inc./REAC) traveled to the J-Field Phytoremediation site at the Aberdeen Proving Ground, Edgewood Area, Maryland. The visit was made as a follow up assessment on the health of recently planted poplar trees. A previous visit on 22 May 1996 showed a large percentage of trees (25.8 percent) were showing signs of stress. Additional observations on plant health were determined by the appearance or absence of new growth on previously unhealthy trees. Topping, or the removal of dead tree trunk above living branches, was performed on several trees during the visit in order to encourage the growth of a new leader.

The following is a summary of the observations from the 22 May 1996 visit. The status of several trees were incorrectly noted during the 22 May 1996 visit. Overall, the corrections resulted in the listing of one additional tree to the "unhealthy" groups. Plant health was assessed for each tree by placing it into one of four categories based on extent of damage. The four categories were: healthy, significant damage, severe damage, and complete branch death. Trees in the last category were cut with only a stump or short trunk remaining. Healthy plants were those that required little or no pruning. Increasing amounts of pruning of dead branches were required on trees placed in the other categories. A total of 47 trees (25.8 percent) were classified as unhealthy. Trees with significant damage (23 trees or 12.6 percent), severe damage (6 trees or 3.3 percent), trees with complete branch death (18 trees or 9.9 percent), and healthy trees (135 trees or 74.2 percent) were mapped in an effort to determine problem areas (Figure 1 - Corrected).

A minor caterpillar infestation was noted on five trees on the 22 May 1996 visit. Caterpillars were collected and submitted for positive identification to the Middlesex County Agricultural Cooperative in New Brunswick, New Jersey. The caterpillars were identified as the Spring Elm Caterpillar, which is the larvae of the Mourning Cloak Butterfly (*Nymphalis antiopa*). The Spring Elm caterpillar feeds on poplar, willow, and elm trees in mid-spring. A second generation sometimes appears in early August. The caterpillar can be found in both forested and suburban/park habitats. It is not considered to be a widespread pest in the region. Caterpillars were not observed on any of the trees on 6 June 1996.

Many of the trees previously labeled as unhealthy showed signs of improvement two weeks after pruning. There were 47 trees (25.8 percent) labeled as unhealthy on 22 May 1996. On 6 June 1996, 28 plants (15.4 percent of total) were considered unhealthy and showed no signs of improvement. The trees that showed no new signs of growth are unlikely to recover and will need to be replaced in the autumn. However, 19 trees previously labeled as unhealthy showed new growth in the form of buds, branches, and leaves. Four trees had declining health including two trees that were previously healthy that had all branches removed on 6 June 1996. The potential exists that recovering trees will continue to grow and will not need to be replaced.

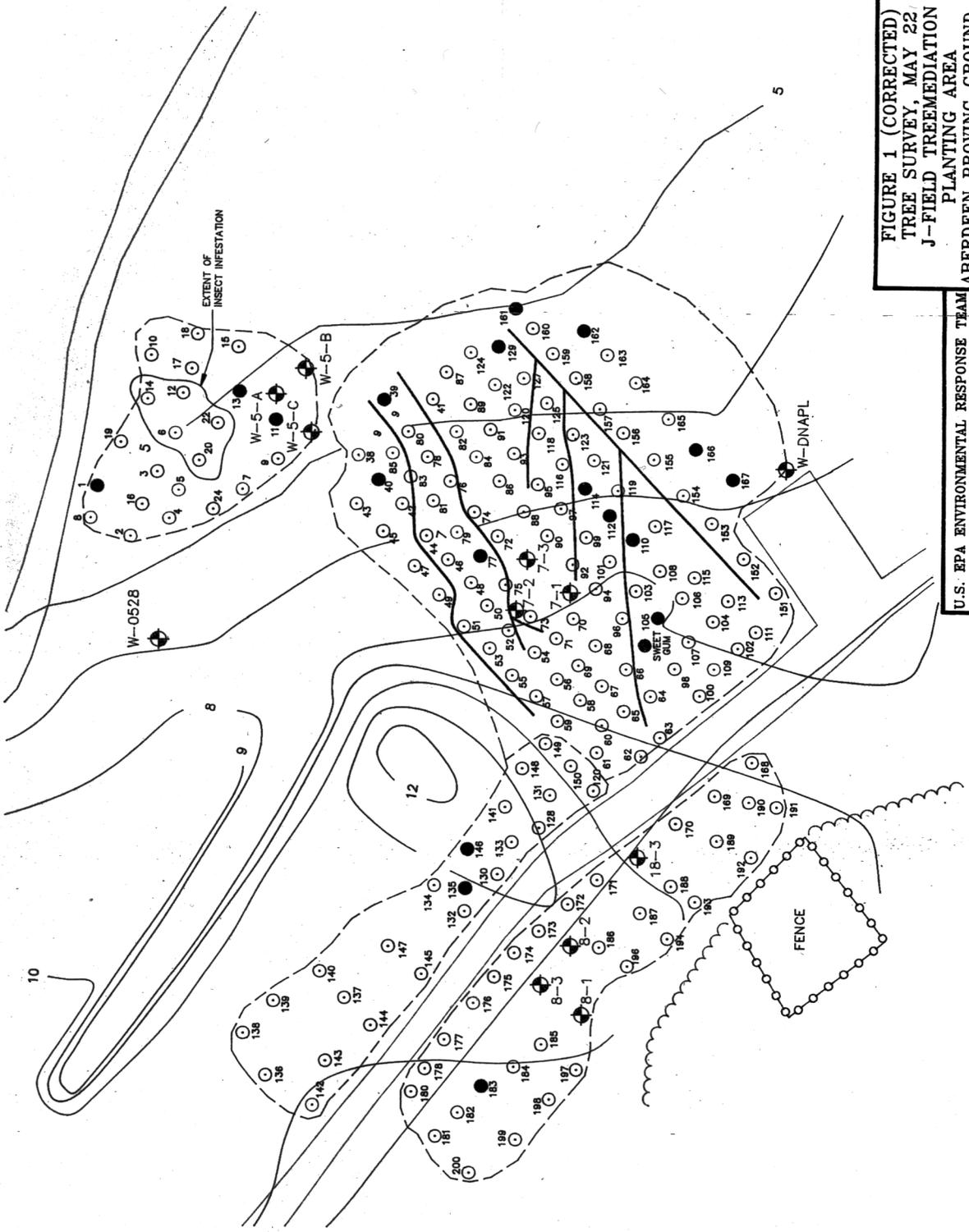
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FIGURE 1 (CORRECTED)
TREE SURVEY, MAY 22/
J-FIELD TREEMEDIATION
PLANTING AREA
ABERDEEN PROVING GROUND, MD
MAY 1996

U.S. EPA ENVIRONMENTAL RESPONSE TEAM
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
NO. 8327-811-001-112-0



LEGEND:

- HYBRID POPLAR TREE
- ⊕ WELL
- TREE PLANTING AREA
- 8 - CONTOUR INTERVAL
- ~ TREE LINE
- DRAINAGE CULVERTS

TREE STATUS KEY

- HEALTHY
- ALL BRANCHES REMOVED, TRUNK CUT
- SEVERE DAMAGE
- SIGNIFICANT DAMAGE