

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

In the Matter of Remedial Action by:

Washington Department of Natural Resources)
9805 Blomberg Street Southwest) AGREED ORDER
Olympia, Washington 98504) No. DE 00 TCPSR-295

To: Washington Department of Natural Resources
9805 Blomberg Street Southwest
Olympia, WA

I.

Jurisdiction

This Agreed Order ("Order") is issued pursuant to the authority of RCW
70.105D.050(1).

II.

Findings of Fact

Ecology makes the following Findings of Fact, without admission of such facts by
Washington Department of Natural Resources (DNR).

1. DNR is the owner of the Webster Nursery located at 9805 Blomberg Street Southwest, in Olympia, Washington (Site).
2. In 1978, a concrete underground storage tank (UST) was installed to receive washwaters and spills from pesticide mixing operations. In 1982, this UST was removed and replaced with a metal UST.
3. In July 1996, the metal UST was removed. Contamination of soil and groundwater was confirmed in the vicinity of the UST. Approximately 70 cubic yards of pesticide contaminated soil was removed and later disposed.

4. Four monitoring wells were installed in the area of the former pesticide UST in August 1996. Several pesticides were detected in three (3) of the four (4) monitoring wells, some constituents were above cleanup levels established by MTCA.

5. In October 1996, DNR posted a public notice at the nursery explaining the pesticide UST release.

6. In April 1997, Thurston County was informed of the pesticide release during the process of applying for construction permits for the chemical mixing building. In two (2) separate sampling events Thurston County Health Department and Washington Health Department (DOH) sampled public water supply wells. No pesticides were detected above detection limits.

7. In April 1997, DNR initiated monthly public meetings to keep residents informed on site activity and began bottled water delivery to area residents. DNR approached Ecology requesting formal involvement.

8. In June 1997, DNR conducted sampling of the four pesticide UST area monitoring wells and twelve (12) domestic and public water supply wells near the site. The water supply wells showed no detectable pesticide concentrations. UST monitoring wells show three (3) of four (4) wells with detectable pesticide concentration.

9. In a letter dated October 27, 1997, DNR acknowledged their status as operators, being a Potential Liable Party (PLP) with regard to the Site.

10. In October 1998, DNR and Ecology entered into Agreed Order No. DE 98TC-S175 to conduct an RI/FS regarding the contamination caused by the release from the pesticide UST.

11. On June 30, 1999, DNR submitted a final RI/FS document which described the results of the RI/FS investigation and evaluated cleanup options for the site.

12. In September 1999, Ecology, using the evaluated cleanup options presented in the RI/FS document, drafted a Cleanup Action Plan (CAP).

13. June 27, 2000, negotiations for Agreed Order DE 00TCPSR-295 officially opened. As per WAC 173-340-530, DNR was notified that the negotiations for this Agreed Order must not exceed 60 days.

14. On August 22, 2000, Ecology was notified by DNR that they were unable to comply with the 60-day negotiation deadline as required by MTCA which was to expire on August 26, 2000. It was stated that additional time was necessary to bring various levels of management up to speed with the project and allow time for the Attorney General's office to review the Order. DNR requested a minimum of two months additional time to perform these tasks.

III.

Ecology Determinations

1. The DNR is an "owner or operator" as defined at RCW 70.105D.020(11) of a "facility" as defined in RCW 70.105D.020(4).

2. The facility is known as Webster Nursery and is located at 9805 Blomberg Street Southwest, in Olympia, Washington.

3. The substances found at the facility as described above are "hazardous substances" as defined at RCW 70.105D.020(7).

4. Based on the presence of these hazardous substances at the facility and all factors known to the Department, there is a release or threatened release of hazardous substances from the facility, as defined at RCW 70.105D.020(19).

5. In a letter dated October 24, 1997, DNR accepted their status as a "potentially liable person" under RCW 70.105D.040.

6. Pursuant to RCW 70.105D.030(1) and 70.105D.050, the Department may require potentially liable persons to investigate or conduct other remedial actions with respect to the release or threatened release of hazardous substances, whenever it believes such action to be in the public interest.

7. Based on the foregoing facts, Ecology believes the remedial action required by this Order is in the public interest.

IV.

Work to be Performed

Based on the foregoing Facts and Determinations, it is hereby ordered that DNR implement the attached Cleanup Action Plan (CAP) (Exhibit A) and that these actions be conducted in accordance with Chapter 173-340-WAC unless otherwise specifically provided for herein. Following is a list of deliverables due to Ecology:

1. Prepare a quarterly monitoring plan that addresses ground water monitoring in the area of the former pesticide underground storage tank (UST). This plan is due to Ecology within three (3) weeks after the effective date of this Order.
2. Implement quarterly monitoring plan as outlined in the approved plan. The analytical results, with accompanying laboratory data sheets, shall be submitted to Ecology as outlined in the schedule contained in the quarterly monitoring plan.
3. Conduct an evaluation of engineering alternatives to reduce the influence of surface water runoff and infiltration of precipitation in the area of the former pesticide UST and recommend an alternative. This analysis shall include a schedule for implementing the preferred option. This engineering analysis report is due to Ecology for comment within four (4) weeks after the effective date of this Order.

4. Implement Ecology preferred option determined by engineering analysis. This shall be completed in accordance with the schedule provided in the engineering analysis.
5. Implement institutional controls to restrict groundwater use in the area near the former pesticide UST to protect human health and the environment. DNR shall prepare a draft version of a restrictive covenant and submit it to Ecology for approval. This draft version shall be submitted to Ecology within five (5) weeks after the effective date of this Order. This draft restrictive covenant shall be prepared using Exhibit C.
6. File approved restrictive covenant with Thurston County.

V.

Terms and Conditions of Order

1. Definitions

Unless otherwise specified, the definitions set forth in Chapter 70.105D RCW and Chapter 173-340 WAC shall control the meanings of the terms used in this Order.

2. Public Notices

RCW 70.105D.030(2)(a) requires that, at a minimum, this Order be subject to concurrent public notice. Ecology shall be responsible for providing such public notice and reserves the right to modify or withdraw any provisions of this Order should public comment disclose facts or considerations which indicate to Ecology that the Order is inadequate or improper in any respect.

3. Remedial Action Costs

DNR shall pay to Ecology costs incurred by Ecology pursuant to this Order. These costs shall include work performed by Ecology or its contractors for investigations, remedial actions, and Order preparation, oversight and administration. Ecology costs shall include costs of direct

activities and support costs of direct activities as defined in WAC 173-340-550(2). DNR shall pay the required amount within 90 days of receiving from Ecology an itemized statement of costs that includes a summary of costs incurred, an identification of involved staff, and the amount of time spent by involved staff members on the project. A general description of work performed will be provided upon request. Itemized statements shall be prepared quarterly. Failure to pay Ecology's costs within 90 days of receipt of the itemized statement of costs will result in interest charges.

4. Designated Project Coordinators

The project coordinator for Ecology is:

Mike Blum
Department of Ecology
Southwest Regional Office
Post Office Box 47775
Olympia, Washington 98504-7775

The project coordinator for DNR is:

John Felder
Engineering Division
Post Office Box 47030
Olympia, Washington 98504-7030

The project coordinator(s) shall be responsible for overseeing the implementation of this Order.

To the maximum extent possible, communications between Ecology and DNR, and all documents, including reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed through the project coordinator(s). Should Ecology or DNR change project coordinator(s), written notification shall be provided to Ecology or DNR at least ten (10) calendar days prior to the change.

5. Performance

All work performed pursuant to this Order shall be under the direction and supervision, as necessary, of a professional engineer or hydrogeologist, or similar expert, with appropriate training, experience and expertise in hazardous waste site investigation and cleanup. DNR shall notify Ecology as to the identity of such engineer(s) or hydrogeologist(s), and of any contractors and subcontractors to be used in carrying out the terms of this Order, in advance of their involvement at the Site. DNR shall provide a copy of this Order to all agents, contractors and subcontractors retained to perform work required by this Order and shall ensure that all work undertaken by such agents, contractors and subcontractors will be in compliance with this Order.

Except where necessary to abate an emergency situation, DNR shall not perform any remedial actions at the pesticide UST area or the pesticide storage warehouse, or any adjacent areas impacted by a release originating from either of these two area, outside that required by this Order unless Ecology concurs, in writing, with such additional remedial actions. WAC 173-340-400(7)(b)(i) requires that "construction" performed on the Site must be under the supervision of a professional engineer registered in Washington.

6. Access

Ecology or any Ecology authorized representative shall have the authority to enter and freely move about the Site at all reasonable times for the purposes of, inter alia: inspecting records, operation logs, and contracts related to the work being performed pursuant to this Order; reviewing the progress in carrying out the terms of this Order; conducting such tests or collecting samples as Ecology or the project coordinator may deem necessary; using a camera, sound recording, or other documentary type equipment to record work done pursuant to this Order; and verifying the data submitted to Ecology by DNR. By signing this Agreed Order, DNR agrees that this Order constitutes reasonable notice of access, and agrees to allow access to the Site at all reasonable times for purposes of overseeing work performed under this Order. Ecology shall

allow split or replicate samples to be taken by DNR during an inspection unless doing so interferes with Ecology's sampling. DNR shall allow split or replicate samples to be taken by Ecology and shall provide seven (7) days notice before any sampling activity.

7. Public Participation

DNR shall prepare and/or update a public participation plan for the site. Ecology shall maintain the responsibility for public participation at the site. DNR shall help coordinate and implement public participation for the site.

8. Retention of Records

DNR shall preserve in a readily retrievable fashion, during the pendency of this Order and for ten (10) years from the date of completion of the work performed pursuant to this Order, all records, reports, documents, and underlying data in its possession relevant to this Order. Should any portion of the work performed hereunder be undertaken through contractors or agents of DNR then DNR agrees to include in their contract with such contractors or agents a record retention requirement meeting the terms of this paragraph.

9. Dispute Resolution

DNR may request Ecology to resolve disputes which may arise during the implementation of this Order. Such request shall be in writing and directed to the signatory, or his/her successor(s), to this Order. Ecology resolution of the dispute shall be binding and final. DNR is not relieved of any requirement of this Order during the pendency of the dispute and remains responsible for timely compliance with the terms of the Order unless otherwise provided by Ecology in writing.

10. Reservation of Rights/No Settlement

This Agreed Order is not a settlement under Chapter 70.105D RCW. Ecology's signature on this Order in no way constitutes a covenant not to sue or a compromise of any Ecology rights or authority. Ecology will not, however, bring an action against DNR to recover remedial action costs paid to and received by Ecology under this Agreed Order. In addition, Ecology will not take additional enforcement actions against DNR to require those remedial actions required by this Agreed Order, provided DNR complies with this Agreed Order.

Ecology reserves the right, however, to require additional remedial actions at the Site should it deem such actions necessary.

Ecology also reserves all rights regarding the injury to, destruction of, or loss of natural resources resulting from the releases or threatened releases of hazardous substances from Webster Nursery.

In the event Ecology determines that conditions at the Site are creating or have the potential to create a danger to the health or welfare of the people on the Site or in the surrounding area or to the environment, Ecology may order DNR to stop further implementation of this Order for such period of time as needed to abate the danger.

11. Transference of Property

No voluntary or involuntary conveyance or relinquishment of title, easement, leasehold, or other interest in any portion of the Site shall be consummated by DNR without provision for continued implementation of all requirements of this Order and implementation of any remedial actions found to be necessary as a result of this Order.

Prior to transfer of any legal or equitable interest, DNR may have in the site or any portions thereof, DNR shall serve a copy of this Order upon any prospective purchaser, lessee,

transferee, assignee, or other successor in such interest. At least thirty (30) days prior to finalization of any transfer, DNR shall notify Ecology of the contemplated transfer.

12. Compliance with Other Applicable Laws.

A. All actions carried out by DNR pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in paragraph B of this section.

B. Pursuant to RCW 70.105D.090(1), the substantive requirements of Chapters 70.94, 70.95, 70.105, 75.20, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals for the remedial action under this Order are binding and enforceable requirements of the Order. At this time no permits have been identified to be necessary to implement the remedial action.

DNR has a continuing obligation to determine whether permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order. In the event DNR determines that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify Ecology of this determination. Ecology shall determine whether Ecology or DNR shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, DNR shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by DNR and on how DNR must meet those requirements. Ecology shall inform DNR in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. DNR shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

Ecology shall ensure that notice and opportunity for comment is provided to the public and appropriate agencies prior to establishing the substantive requirements under this section.

C. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws referenced in RCW 70.105D.090(1) would result in the loss of approval from a federal agency which is necessary for the State to administer any federal law, the exemption shall not apply and DNR shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(1), including any requirements to obtain permits.

VI.

Satisfaction of this Order

The provisions of this Order shall be deemed satisfied upon DNR's receipt of written notification from Ecology that DNR has completed the remedial activity required by this Order, as amended by any modifications, and that all other provisions of this Agreed Order have been complied with.

VII.

Enforcement

1. Pursuant to RCW 70.105D.050, this Order may be enforced as follows:
 - A. The Attorney General may bring an action to enforce this Order in a state or federal court.
 - B. The Attorney General may seek, by filing an action, if necessary, to recover amounts spent by Ecology for investigative and remedial actions and orders related to the Site.
 - C. In the event DNR refuses, without sufficient cause, to comply with any term of this Order, DNR will be liable for:
 - (1) up to three times the amount of any costs incurred by the state of Washington as a result of its refusal to comply; and

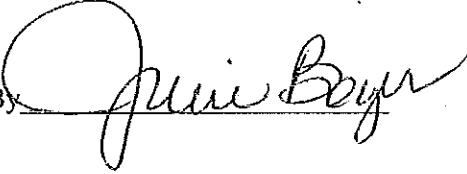
(2) civil penalties of up to \$25,000 per day for each day it refuses to comply.

D. This Order is not appealable to the Washington Pollution Control Hearings Board. This Order may be reviewed only as provided under Section 6 of Chapter 70.105D RCW.

Effective date of this Order: 1/8/01

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

By 

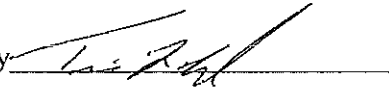
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EXHIBIT A

CLEANUP ACTION PLAN WEBSTER NURSERY OLYMPIA, WASHINGTON

This draft Cleanup Action Plan (CAP) has been prepared by the Washington State Department of Ecology (Ecology) to specify cleanup standards and identify the cleanup action to be implemented at Webster Nursery (also referred to as "the site"). As required by the Model Toxics Control Act (MTCA), Chapter 70.105D RCW, this CAP describes the alternatives for remediation of the site.

The alternatives and information described in the CAP are evaluated in detail in the Remedial Investigation / Feasibility Study (RI/FS) Report for the site.

SITE BACKGROUND

The L. T. "Mike" Webster Forest Nursery is the only state-owned forest nursery in Washington. Operated by the Department of Natural Resources (DNR), it was established in 1957, replacing the Capitol State Forest Nursery Operation. In the 1960s the nursery became self-funding, deriving all income from seedling sales. The approximately 300-acre nursery produces from 10 to 15 million seedlings per year on the 210 acres that are in production. The nursery also operates approximately 30,000 square feet of greenhouse space at the facility.

The Webster site was selected as a nursery for its capability to sustain seasonal irrigation requirements and for its permeable subsurface soils, which allow good drainage. Herbicides and fungicides are applied to soils and plants, respectively; in early spring, summer, and early fall to control weeds and protect new seedlings from disease. No insecticides have reportedly been used at the nursery since the early 1990s (Tetra Tech 1995).

The Webster Nursery site is located in Section 20, Township 17 North, Range 2 West of the Willamette Meridian, in Thurston County, near Olympia, Washington (Figure 1). The main nursery facility is located south of 93rd Avenue SW and is comprised of an office building, two warehouses, equipment storage, a cold storage building, three pumphouses, a house (used as offices), a field kitchen, a pesticide storage warehouse, and a pesticide mixing shed. The adjacent greenhouse area consists of two shelters, greenhouses, a service building, cold storage, and an office and lunchroom. The Webster Nursery is irrigated by 13 water supply wells, including seven wells located within the parcel south of 93rd Avenue SW, three wells located on the nursery property west of Jones Road, and three wells located north of 93rd Avenue SW.

Pesticide Storage Warehouse History and Operation

The pesticide storage warehouse is located in the southeast corner of the Webster Nursery property, adjacent to Blomberg Street SW (Figure 2) and oriented north/south. The pesticide storage building is shown in Figure 3. The building measures 180 feet in length by 40 feet in width. When the warehouse was built in 1978, a system of floor drains was installed and plumbed directly to a 750-gallon capacity pre-cast concrete UST. The pre-cast concrete UST was installed approximately 8 feet south of the south end of the warehouse structure.

The building is divided into three separate areas. A storage bay is located in the southern portion of the structure and is enclosed by concrete block walls on the north, south, and west sides; and with a chain-link fence securing the east side. The bay is approximately 80 feet in length and was constructed with two center floor drains that were connected by 3-inch metal piping directly to the former UST. Adjacent and north of the storage bay, is a seed and fertilizer storage room. This room is approximately 60 feet in length, and also includes two floor drains located through the center of the room, which were connected to the storage bay drain pipe and ultimately, to the former UST. The third portion of the warehouse, the northern-most section, is where chemicals are stored. This section of the building measures 40 feet in length and includes two floor drains within the central sections of the floor. The chemical storage room also formerly included a floor drain for a shower and a service sink, both of which were previously plumbed to the sub-floor drainage system and the former UST.

According to DNR personnel interviewed, there is no recollection of past spill incidents or releases of chemicals directly to the floor drain system. The primary source of materials to this pesticide UST was primarily rinsing and washing activities from the sinks and shower within the chemical storage portion of the pesticide storage warehouse. It has been suggested that from 1978 when the building was constructed until 1982, some mixing of pesticide solutions may have been conducted in this area as part of routine agricultural product applications during the various seasonal nursery operations. In 1982 a separate chemical mix building was constructed on the north side of the pesticide storage warehouse. This structure was built as a self-contained unit by nursery personnel and was not connected to the holding tank system.

History of Environmental Investigations

As part of the facility upgrades conducted in 1982, DNR elected to remove the concrete holding tank installed when the building was constructed and replace it with a single-walled steel UST. An environmental assessment was not required and therefore, not conducted. It is suspected that contamination was present.

In June 1996, the steel UST was removed. Approximately 70 cubic yards of contaminated soil was removed and stockpiled. Although screening information indicated that not all impacted soil had been removed from the former UST area, soil excavation activities were discontinued due to groundwater entering the bottom of the excavation. DNR was also concerned that further

excavation in the immediate vicinity of the pesticide storage warehouse would endanger the structural stability of the building.

At the time the soil was removed, both the excavated soil and the liquid tank contents were characterized. The contents of the tank were determined to be primarily composed of dicamba, 2-4-D, 2-4-5-TP (Silvex), and 2-4-5-T. The tank was determined to be completely full. Prior to removal, the contents of the tank were pumped off and contained in a temporary storage tank at the site. Efforts to treat the water removed from the tank using a chemical oxidation process were unsuccessful and the water was subsequently accepted for disposal at a waste water treatment and recycling facility.

Following the termination of excavation activities, soil samples were collected from the north, east, southeast, and south sidewalls, and from the bottom of the open excavation. These samples were analyzed for chlorinated herbicides using U.S. Environmental Protection Agency (EPA) Method 8150 and for chlorinated pesticides using EPA Method 1618 Modified. The highest concentrations of the compounds chlordane and heptachlor were detected within the bottom areas of the excavation.

Concurrent with the collection of residual soil samples from UST excavation area, DNR collected a total of four samples from the stockpiled soils. As anticipated, these soils were determined to contain concentrations of the pesticide compounds chlordane, heptachlor, and heptachlor epoxide above the cleanup levels established by MTCA.

In October 1996, DNR hired a contractor to remediate the contaminated soil stockpile using a chemical oxidation and soil mixing process. However, due to wet weather conditions and other problems, the process was unsuccessful and the soil was later disposed in a RCRA Subtitle C Landfill facility in Arlington, Oregon.

Groundwater Investigations

Four shallow monitoring wells were installed adjacent to and surrounding the former UST tank excavation area in August 1996. Chlordane, heptachlor, and heptachlor epoxide in excess of MTCA Groundwater Cleanup levels were found in three of the four wells. To notify the public regarding the release, DNR posted information at the Nursery in October 1996.

Thurston County was informed about the pesticide release in April 1997 when DNR applied for construction permits for a new chemical mixing building. In response to concerns regarding the detection of pesticide-based compounds in shallow groundwater, residential wells were sampled independently by Thurston County Health and Washington State Department of Health in April 1997. No pesticides were detected in any of the wells sampled. DNR provided bottled water to residents while the analytical results of the sampling were pending.

In 1997, DNR conducted a comprehensive groundwater investigation at the site, which included sampling 12 privately owned and one public water supply well, located within one half mile

from the site. No impacts to groundwater quality were detected in areas away from the immediate location of the UST.

In October 1997, DNR and Ecology initiated the agreed order process to address remaining concerns regarding conditions at the pesticide storage warehouse. In October 1998, Agreed Order No. DE 98TC-S175, requiring DNR to conduct a Remedial Investigation / Feasibility Study (RI/FS), was signed by both Ecology and DNR. The order required a soil investigation to be conducted in the area of the former pesticide UST and an investigation of drain lines under the warehouse. A groundwater investigation was also required. Four new monitoring wells were constructed around the perimeter of the pesticide storage warehouse site to provide information and evaluate the potential for contaminant migration in the vicinity of the site. Groundwater monitoring was conducted in February 1999, which included the collection of water level and field parameter measurements, and sampling of the 16 monitoring wells at the nursery, as well as two adjacent residential water supply wells located at Los Cedros Mobile Home Park.

SITE CONDITIONS

Subsurface Soil

A total of 47 soil samples, including three field duplicate samples, were collected and analyzed for organochlorine pesticides and chlorinated herbicides in support of the pesticide storage warehouse RI/FS work effort. Six soil borings were advanced in the area of the former tank excavation. One soil boring was placed in the center of the former tank excavation. No chlorinated pesticide or herbicide based compounds were detected at concentrations exceeding their associated MTCA Method B soil cleanup levels during the remedial investigation.

The RI/FS investigation included a subfloor drainage assessment, which consisted of collecting soil samples directly under the abandoned floor drain system in the pesticide storage warehouse. A surface drainage soil quality assessment was also conducted in a low lying area that receives runoff water from the site. No chlorinated pesticide or herbicide based compounds were detected.

The highest concentration of soil contamination at the site was documented by the soil samples collected from the excavation during the removal of the pesticide storage tank in 1996. The highest detected concentrations of contaminants in soil compared to MTCA Method B Soil Cleanup levels are summarized in Table 1.

Groundwater

Groundwater occurs in two water-bearing units at the site. Groundwater flow in the shallow water-bearing zone appears to occur under unconfined conditions. Deeper water bearing zones may be semi-confined, but based on limited testing there appears to be a hydraulic connection between shallow (i.e. less than about 25 feet below ground surface) and deeper wells (i.e., approximately 50 to 115 feet below ground surface at the site (Tetra Tech 1995).

No pesticide or herbicide compounds were detected during the February 1999 groundwater monitoring effort in either the deep or shallow residential water supply wells sampled at the Los Cedros property, located approximately 0.1 miles southeast of the pesticide storage warehouse structure.

No pesticide or herbicide compounds were detected in the four monitoring wells recently installed along the perimeter of the nursery (property boundary) or in wells adjacent to the pesticide storage warehouse, with the exception of atrazine at an estimated concentration of 0.02 micrograms per liter (ug/L) in well SW-15. The detected concentration of atrazine was below the associated laboratory method detection limit and below the associated state drinking water standard and MTCA Method B groundwater cleanup level. Well SW-15 is located along Blomberg Street inside the 6 foot tall security fence that surrounds the Webster Nursery property. The location of well SW-15 is shown in Figure 3.

The detection of atrazine at low concentrations (i.e., below state screening levels) was also observed in three other facility monitoring wells located throughout the site, including wells SW-1, SW-3, and SW-5. Three of the four laboratory reported detections of atrazine were estimated concentrations reported below associated method detection limits. The detection of atrazine in groundwater samples collected from the nursery's monitoring well network is not necessarily directly attributable to the pesticide storage warehouse site due to its observed distribution.

A total of four chlorinated pesticide compounds, including gamma chlordane, technical chlordane, heptachlor, and heptachlor epoxide were reported at concentrations which exceed their associated MTCA Method B groundwater cleanup levels in monitoring wells SW-10 and SW-11, installed immediately adjacent to the former UST excavation area. The compound heptachlor epoxide was detected in both monitoring wells SW-10 and SW-11 at concentrations of 0.83 ug/L and 1.5 ug/L, respectively, which also exceed the associated state drinking water standard of 0.02 ug/L. A summary of the highest detected concentrations of contaminants in groundwater historically found at the site compared to MTCA Method B Groundwater Cleanup Standards and MCLs is given in Table 2.

Site Hydrology

Regional groundwater flow is estimated to be toward the west/northwest with a relatively low hydraulic gradient estimated at approximately 0.003 feet per foot based on review of available hydraulic information (Tetra Tech 1995). Facility-wide groundwater elevations and estimated direction of groundwater flow is shown in Figure 4.

Groundwater flow in the shallow groundwater zone in the immediate vicinity of the pesticide storage warehouse is variable, with seasonal mounding observed in the location of the former UST excavation area based on water level measurement data collected on 26 April 1999. Groundwater elevations and estimated direction of groundwater flow for the shallow aquifer is shown on Figure 4. The estimated average hydraulic gradient in the vicinity of the pesticide storage warehouse was 0.008 feet per foot, based on the 26 April 1999 water level data. The water table elevations in the immediate vicinity of the former UST excavation area are likely affected by preferential drainage and infiltration at this location during periods of heavy rainfall.

and high water table conditions. Ponding of water in this area is typically observed in the winter months in response to heavy precipitation.

MTCA CLEANUP STANDARDS

Constituents of Concern

The potential constituents of concern at the site are those hazardous substances that have been historically used at the site, based on a review of past site operations. The identified constituents are listed with their corresponding MTCA Method B cleanup level for soil and groundwater in Table 3. For the Webster Nursery site, Method B soil and groundwater cleanup levels will apply. MTCA soil cleanup standards require contaminant concentrations detected in soil to be protective of groundwater at the site. Specifically, the concentration of individual hazardous substances or mixtures shall be equal to or less than 100 times the associated MTCA Method B groundwater cleanup level, unless it can be demonstrated that a higher soil concentration is protective of groundwater.

Sampling data from soil and groundwater investigations at the site have confirmed the presence of the following chlorinated pesticides and herbicides.

- ◆ Chlordane
- ◆ Heptachlor
- ◆ Heptachlor epoxide
- ◆ 2, 4, -D
- ◆ 2, 4, 5, -T
- ◆ 2, 4, 5-TP
- ◆ Dicamba
- ◆ Picloram
- ◆ Atrazine
- ◆ Simazine

Applicable or Relevant and Appropriate Requirements (ARARs)

Cleanup levels developed under MTCA must comply with applicable state and federal laws. Following the receipt of the RI/FS analytical data, a comparative review of the findings of the pesticide storage warehouse investigation was performed to assess the observed environmental conditions at the site relative to applicable regulatory standards and guidelines. In support of this effort, the following references were used for screening and review purposes:

- **Washington State Model Toxics Control Act (MTCA) Method B Groundwater and Soil Cleanup Levels (WAC 173-340-720/740).** Soil and groundwater analytical results were compared to MTCA Method B cleanup levels as published in the Cleanup Levels and Risk Calculations (CLARC II) Update, dated February 1996. The cleanup level for chlordane has been updated to reflect the change in the chronic slope factor for this compound from 1.3 to

0.35 milligrams per kilogram per day (mg/kg-day)⁻¹ in the EPA Integrated Risk Information System (IRIS) subsequent to the February 1996 distribution of CLARC II.

- **Washington State Drinking Water Standards (WAC 246-290-310).** Groundwater analytical results were reviewed against established state drinking water standards as identified in WAC 246-290-310, and by reference, those published by the EPA Office of Water (EPA Publication 822-B-96-002), October 1996.
- **Toxicity Characteristics (TC) Assessment (Federal Register Vol. 53 No. 245, December 1988).** Analytical results were assessed to determine if a sample would be anticipated to fail the Toxicity Characteristics Leaching Procedure (TCLP) or Washington State toxicity characteristic criteria. The protocol states that if the waste is 20 times or less the maximum concentration of contaminants listed for the toxicity characteristic, the waste cannot be a characteristic hazardous waste and RCRA requirements would not be applicable.
- **Dangerous Waste Regulations (WAC 173-303-090/100, as amended February 1998).** Dangerous waste characteristics for toxicity were evaluated based on requirements of WAC 173-303. Information obtained during the RI/FS investigation was reviewed against the maximum concentration of contaminants for the toxicity characteristic as applicable to waste disposal and/or investigation derived waste management.

The evaluation criteria described above include chemical-specific requirements that set concentration limits for an element or chemical compound in soil and groundwater. As appropriate, the comparison of observed environmental conditions at the site with the specified evaluation criteria included consideration of site-specific factors (e.g., contaminant transport pathways and mechanisms, and anticipated exposure and future land use scenarios).

Proposed Point of Compliance

The points of compliance are the locations where cleanup levels are to be attained. The final points of compliance will be defined as throughout the site. The site shall be defined as that portion of the parcel of property owned by DNR where Webster Nursery is located that has been impacted by the release from the pesticide storage tank. As stated previously, neither soil nor groundwater contamination has been detected significantly beyond the limits of the excavation. This area of contamination lies within the property boundaries. Monitoring wells have been located at the property boundary specifically to monitor groundwater quality at these locations.

CLEANUP ACTION ALTERNATIVES

The following sections provide a focused evaluation of remedial alternatives appropriate for the observed environmental conditions at the Webster Nursery pesticide storage warehouse site. This discussion includes; 1) the development of remedial action objectives that are protective of human health and the environment and designed to address the identified nature and extent of contamination at the site, 2) the identification of general response actions and remedial technologies to satisfy specified media-specific remedial objectives, and 3) the development and

identification of appropriate remedial alternatives for the site. The identification and selection of appropriate cleanup actions at the Webster Nursery site has been conducted in general accordance with WAC 173-340-360, which specifies the criteria for approving cleanup actions, the order of preference for selecting cleanup technologies, policies for permanent solutions, and the process for making these decisions.

Soils Objectives

Pesticide compounds were detected above MTCA Method B Soil Cleanup Levels only during the removal of the pesticide storage tank and excavation of contaminated soils in 1996. No pesticide or herbicide-based compounds were identified in soils at concentrations exceeding their associated MTCA Method B soil cleanup levels during the pesticide storage warehouse RI/FS work effort. The soil sampling effort included the characterization of the facility's sub-floor drainage system, soils within and adjacent to the former UST excavation, and adjacent surface drainage pathways.

Soil remedial alternatives for the pesticide storage warehouse site is not warranted based on the following reasons:

- 1) The limited volume of contaminated soil in excess of the applicable cleanup level,
- 2) Remaining soil contamination is inaccessible, located under the pesticide warehouse building and excavation of the material will undermine the foundation of the structure, and
- 3) The low affinity of these compounds to leach to groundwater.

Groundwater Objectives

Pesticide-based compounds have been detected in the monitoring wells immediately adjacent to the former UST installation which exceed established state drinking water standards and MTCA Method B groundwater cleanup levels. However, this shallow groundwater contamination associated with the former UST area is localized in extent and has not affected groundwater quality adjacent to the Nursery.

The remedial objectives for groundwater at the pesticide storage warehouse site include the following:

- **Human Health:** Prevent exposure to groundwater exceeding contaminant-specific ARARs; in accordance with WAC 173-340-360 and WAC 173-340-700 through site-specific ARARs have been identified.
- **Environmental Protection:** Prevent migration of groundwater contamination at levels that could negatively impact Salmon Creek.

General Response Actions and Remedial Technologies

A preliminary evaluation of several remedial response actions and associated technologies applicable to the existing groundwater conditions at the site was conducted based on their reliability, relative cost, ease of implementation, and effectiveness. Table 4 identifies the groundwater general response actions and associated technologies which have been preliminarily identified as having applicability to the pesticide storage warehouse site.

The MTCA Cleanup Regulation (WAC 173-340-360), specifies preferences, in descending order, for site cleanup actions including: 1) reuse or recycling, 2) destruction or detoxification, 3) separation or volume reduction, 4) immobilization, 5) on-site or off-site disposal, 6) isolation or containment, and 7) institutional controls and monitoring. This regulation also states the preference for permanent solutions, including the use of treatment technologies, as practicable. However, several site-specific factors limit the potential benefits and/or applicability of groundwater treatment technologies at the pesticide storage warehouse site, including the following:

- Previous remedial actions, including UST removal and soil over-excavation activities, have resulted in the removal of potential pesticide source materials based on the findings of the RI/FS. Pesticide and herbicide based compounds exhibit physical and chemical characteristics that limit their mobility in the environment, including their potential for leaching.
- The extent of pesticide contamination detected in groundwater is very limited and has not been observed to migrate from the area immediately adjacent to the former tank excavation. A general reduction in contaminant concentrations has been observed over the three-year period in which groundwater has been monitored at the site. Table 5 summarizes historical groundwater data collected from the excavation area monitoring wells.
- Site controls, including fencing, which restricts uncontrolled access to the site, are already in place. A groundwater monitoring well network is present at the site, which is appropriate for monitoring contaminant migration and degradation.
- Chlorinated pesticide and herbicide compounds exhibit relatively low mobility and tend to be persistent in the environment. Many of these compounds can be difficult to treat effectively.

Based on an evaluation of remedial response actions and consideration of site-specific factors, ex situ groundwater treatment technologies were eliminated from further consideration for the pesticide storage warehouse site (Table 4). The rationale for precluding this action from further consideration is provided as follows:

The ex-situ treatment response action involves the installation of a "pump and treat" system to remove and/or destroy existing chlorinated pesticides compounds in groundwater. Groundwater would be pumped through canister(s) containing activated carbon to which dissolved organic contaminants may be adsorbed. Alternatively, or in conjunction with carbon filtration, an ultraviolet (UV) oxidation process could be used in an attempt to either detoxify or destroy organic contaminants in groundwater.

Implementation of adsorption and oxidation technologies in the removal of pesticides is extremely complex and would require bench-scale and/or pilot studies to predict performance on groundwater extracted from the site. The relatively high capital and operating costs associated with this technology are not commensurate with the extent of the groundwater contaminant plume at the site and observed contaminant levels. Therefore, implementation of pumping and treatment technologies is not considered for further evaluation; in accordance with WAC 173-340-360(5)(d). However, if there is an observed change in the environmental conditions at the site which indicate a threat to human health and/or the environment, this and other potential treatment alternatives will be re-evaluated.

Remedial Alternative Development and Identification

The remedial technologies and selected process options identified in Table 4 are considered separately and in combination in the development of remedial action alternatives which are appropriate with the existing groundwater conditions at the pesticide storage warehouse site.

Institutional controls (e.g., water use restrictions and/or deed restrictions) are considered applicable in support of limited action and containment alternatives in order to prevent or limit exposure to contaminants and protect the integrity of the cleanup action, in accordance with WAC 173-340-360(9)(d). A summary of remedial alternatives developed for the Webster Nursery pesticide storage warehouse site is provided as follows:

Alternative 1. No Action: Under the no action alternative the site would be left in its current state, with no activities to monitor, control, or mitigate potential exposure to groundwater contaminants. The no action alternative provides a baseline for comparing other remedial alternatives. However, it does not address potential exposure through groundwater contaminant migration and does not comply with MTCA threshold requirements [WAC 173-340-360(2)] or preferential cleanup technologies [WAC 173-340-360(4)(a)].

Alternative 2. Groundwater Compliance Monitoring: Under this alternative the existing groundwater monitoring network at the site would be used to evaluate potential groundwater contaminant migration and degradation. Groundwater samples would be collected on an established time schedule and analyzed for the identified contaminants of concern. Any reduction in concentration or volume would be the result of natural attenuation processes.

Alternative 3. Groundwater Compliance Monitoring with Hydraulic Controls and Restrictive Covenant:

Under this alternative the compliance monitoring program remains as stated in Alternative 2. Hydraulic controls would also be implemented at the site to reduce the potential influences of surface drainage and preferential infiltration in the vicinity of the former UST excavation on the localized groundwater table. Hydraulic control would include efforts to re-direct warehouse roof drainage away from the south end of the pesticide storage warehouse building. Additional hydraulic controls, potentially including the replacement of the existing tank backfill materials, site grading, and/or application of asphalt, may be implemented to minimize preferential infiltration through existing backfill materials placed at the site. General considerations regarding the application of these additional hydraulic controls are discussed in Table 4.

Ecology would require DNR to file a restrictive covenant associated with the pesticide warehouse. This restrictive covenant would consist of precluding the installation of water supply wells in the shallow aquifer in the areas immediately adjacent to the pesticide storage warehouse that may affect the groundwater flow patterns.

Three general remedial response actions, including no action, limited action, and containment, are incorporated in the alternatives identified to address the existing groundwater conditions at the site. Alternative 1 (No Action) does not comply with the MTCA threshold requirements, including provisions for compliance monitoring [WAC 173-340-360(2)], and does not address the potential for contaminant exposure through groundwater migration. Alternative 2 (Groundwater Compliance Monitoring) does not address the containment of groundwater which, based on identified hydraulic conditions at the site, is applicable for groundwater gradient control as necessary to minimize the potential mobility of contaminants in site groundwater WAC 173-340-360(7)(b)(ii)].

Based on this brief comparative review, the most appropriate remedial alternative for application at the Webster Nursery pesticide storage warehouse site is Alternative 3 (Groundwater Compliance Monitoring with Hydraulic Controls and Restrictive Covenant.) The primary benefit realized by implementing hydraulic controls at the site is to minimize the potential for off-site contaminant migration through groundwater gradient control. However, this benefit may be influenced by the following:

- The absence of significant soil contamination at the site;
- The effect of groundwater mounding at the site is likely intermittent;
- The limited extent of impacted groundwater and the relatively low groundwater gradients; and
- The general influence of area-wide surface drainage at the subject site.

ANALYSIS OF CLEANUP ALTERNATIVES

MTCA specifies criteria for selecting an appropriate cleanup action. Following is an analysis of how the evaluated alternatives satisfy the specified criteria.

Protection of Human Health and the Environment. All alternatives evaluated are protective of human health and the environment. The selected alternative is more protective because it combines monitoring of groundwater contamination with engineering controls to manage surface water during the winter months. This will prevent groundwater mounding in the area of contamination that may cause migration of the contaminant plume. A Restrictive Covenant will preclude the installation of water supply wells in the areas adjacent to the former pesticide UST that may influence groundwater flow patterns.

Compliance with Cleanup Standards

All alternatives are expected to comply with the appropriate cleanup standard.

Compliance with Applicable or Relevant and Appropriate Requirements

All alternatives would comply with all state and federal ARARs.

Restoration Time Frame

The restoration time frame for all alternatives would be the same since all alternatives involve passive remediation.

Short-Term Effectiveness

All alternatives are equally and fully protective in the short term, since there is currently no exposure to contaminated soils or groundwater at the site.

Long-Term Effectiveness

All alternatives are anticipated to be equally effective in the long term (five to ten years).

Reduction of Toxicity, Mobility, and Volume

All alternatives rely on the natural attenuation to reduce the toxicity, volume, and mobility of contaminants. The preferred alternative implements engineering controls to manage surface water runoff from the site and redirect runoff from the roof and other areas away from the former tank excavation which will reduce the possibility of contaminant migration.

Implementability

All alternatives are executable. The preferred alternative, since it requires some surface water controls, and requires DNR to file a Restrictive Covenant with Thurston County, takes more effort to implement than the other alternatives.

Cleanup Cost

Cleanup costs have not been calculated for this site.

Community Concerns

Community concerns will be solicited during a 30-day public review.

PROPOSED ACTION ALTERNATIVE

Alternative 3, the proposed remedial action, is based on the findings of the pesticide storage warehouse RI/FS work effort, which has been conducted in accordance Agreed Order No. DE 98TC-S175 and applicable MTCA Cleanup Regulations (WAC 173-340). The details of Alternative 3, Groundwater Compliance Monitoring, with Hydraulic Controls and Restrictive Covenant are presented below:

- Wells SW-14, SW-15, and SW-16; and adjacent facility monitoring well SW-1 will be monitored quarterly. These monitoring wells are located along the Nursery's property boundaries in the vicinity of pesticide storage warehouse, and will confirm compliance with cleanup levels at the property boundary and provide early detection of potential contaminant migration.
- Monitoring wells SW-10 and SW-11 will be monitored quarterly. These wells exhibited the highest concentrations of contaminants and are located near the backfilled UST excavation.
- An evaluation will be conducted to assess engineering alternatives for the implementation of hydraulic controls to minimize the influence of surface runoff and preferential infiltration in the vicinity of the former UST excavation area. Re-directing the discharge from roof drainage away from the south end of the pesticide storage warehouse building would reduce surface infiltration in the former UST area. In addition, surface controls such as grading and/or the replacement of excavation backfill materials with clean, finer-grained material would reduce the likelihood of preferential infiltration and associated groundwater mounding at this location. The primary goal of these hydraulic controls is to reduce the influence of surface runoff and infiltration on groundwater gradient(s) to minimize the potential for contaminant migration.
- Restrictive Covenants (e.g., water use restrictions and/or deed restrictions) will be implemented in conjunction with the groundwater monitoring program. This will be done to ensure that ongoing Nursery operational practices and any proposed construction activities in

the vicinity of the pesticide storage warehouse are conducted so as to retain the integrity of the selected remedy.

JUSTIFICATION FOR SELECTED ALTERNATIVE

The selected cleanup action complies with MTCA requirements, including protection of human health and the environment, compliance with cleanup standards, compliance with applicable state and federal laws, and provisions for compliance monitoring.

The extent of soil and groundwater contamination at the site is very limited. A general decline in contaminant levels has occurred since the tank was removed in 1996. The pesticide and herbicide based compounds present exhibit chemical characteristics that limit their mobility in the environment.

Monitoring wells located at the property boundary, in addition to monitoring wells located in the backfilled excavation, will be monitored quarterly to assure that seasonal groundwater mounding will not enhance off site migration.

REFERENCES

Tetra Tech, Inc., 1995; Hydrogeologic Investigation of Webster Nursery; Tetra Tech, Inc., September 22, 1995.

Tetra Tech, Inc., 1996a; Groundwater Quality Investigation Adjacent to Pesticide Storage Area at Webster Nursery; Tetra Tech, November 1996.

Tetra Tech, Inc., 1996b; Annual Groundwater Monitoring Well Sampling at Webster Nursery; Tetra Tech, Inc., November 1996.

Tetra Tech, Inc., 1998; Comprehensive Groundwater Investigation Report, Webster Nursery Site, Olympia, Washington; Tetra Tech, Inc., January 1998.

Tetra Tech, Inc., 1999; Remedial Investigation / Feasibility Study, Pesticide Storage Warehouse, Webster Nursery, Thurston County, Washington; June 1999.

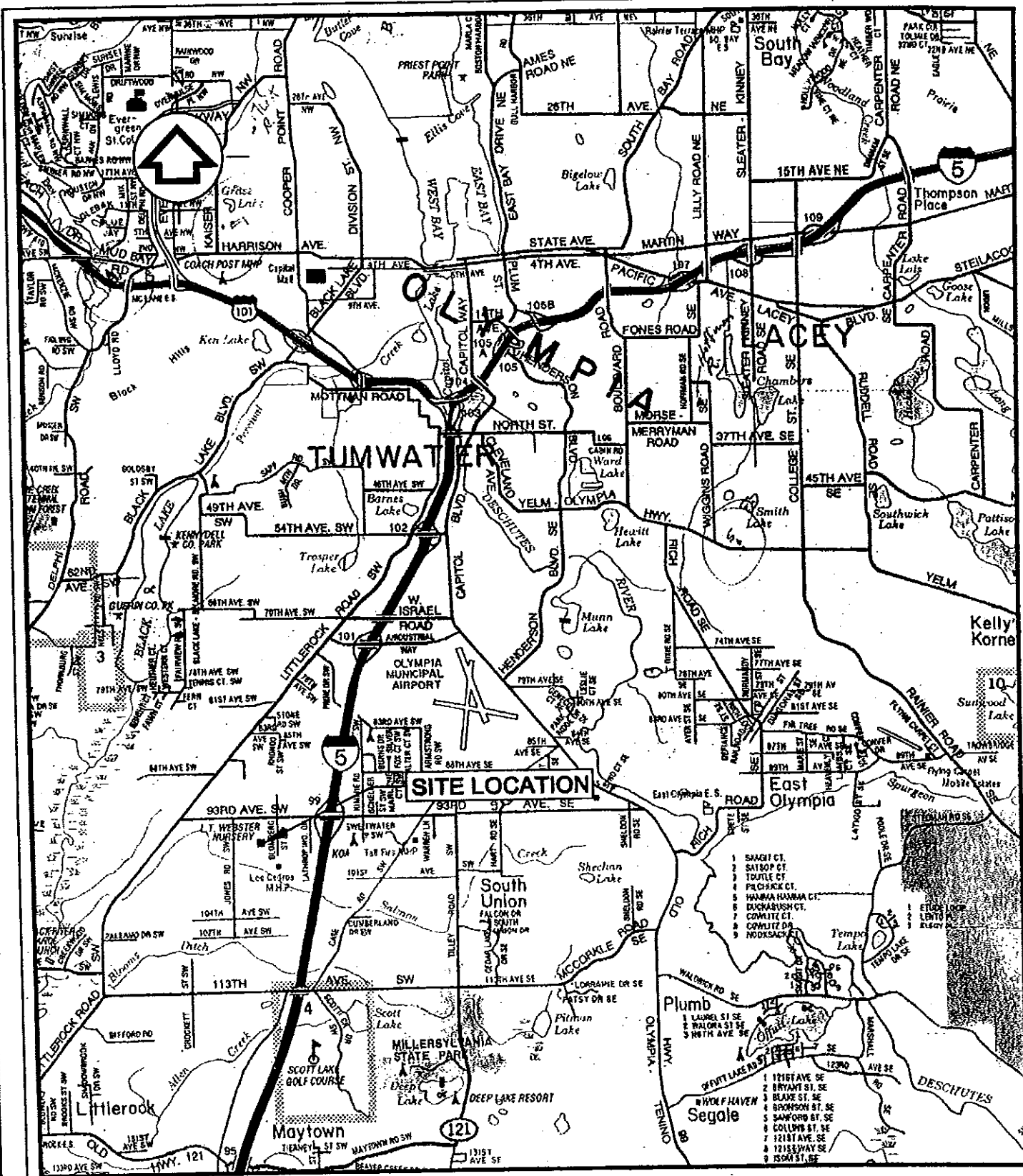
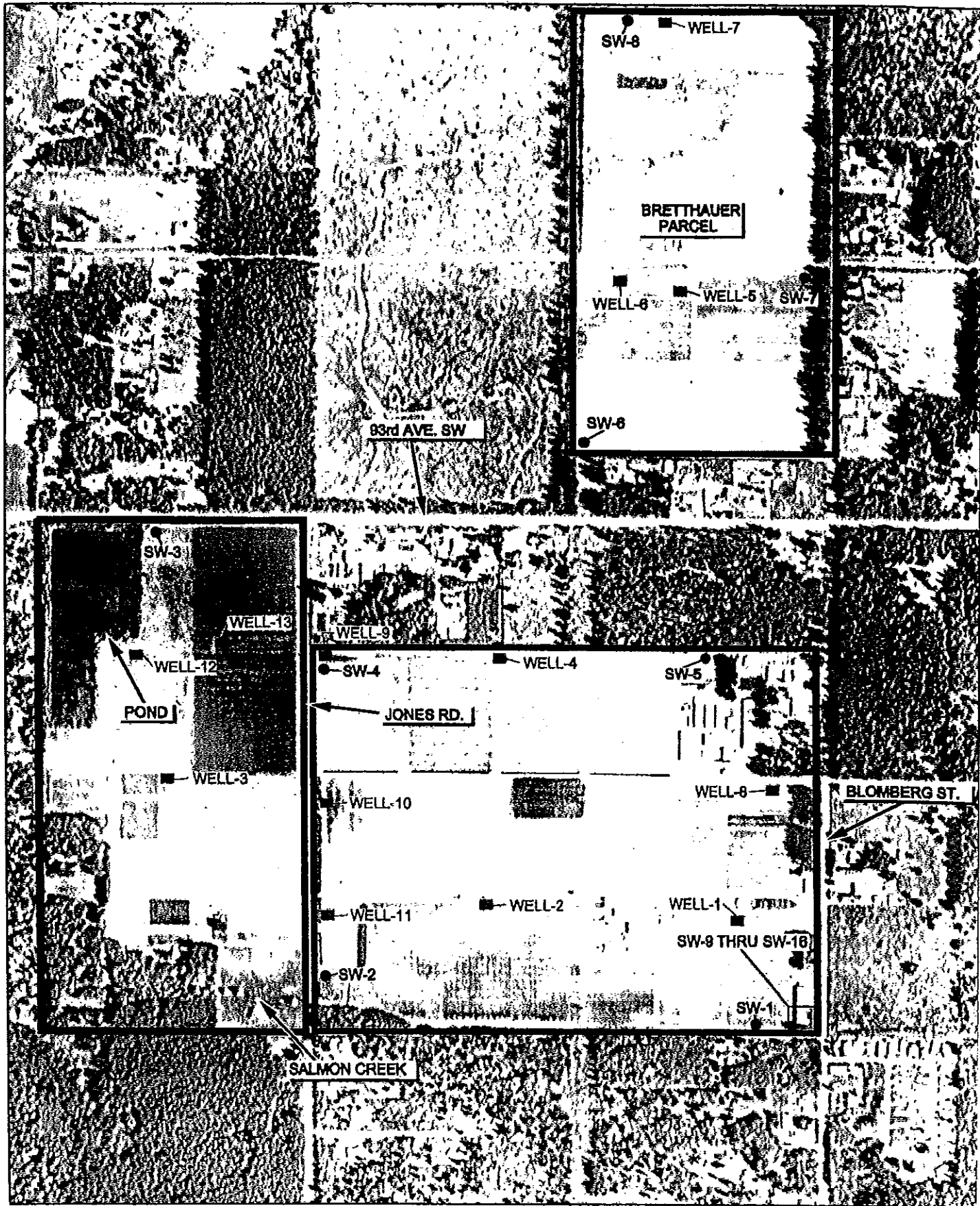


FIGURE 1.

SITE LOCATION MAP,
WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

TE TETRA TECH INC.

SOURCE: King of the Road Map Service, Inc. 1993-1994 Edition



NOTES:


-  APPROX PROPERTY BOUNDARY
-  MONITORING WELL LOCATION
-  WATER SUPPLY WELL LOCATION



FIGURE 2

**MONITORING AND WATER SUPPLY WELL LOCATION MAP
WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON**

(SOURCE: REPRODUCTION OF DNR 1999 AERIAL PHOTOGRAPH)

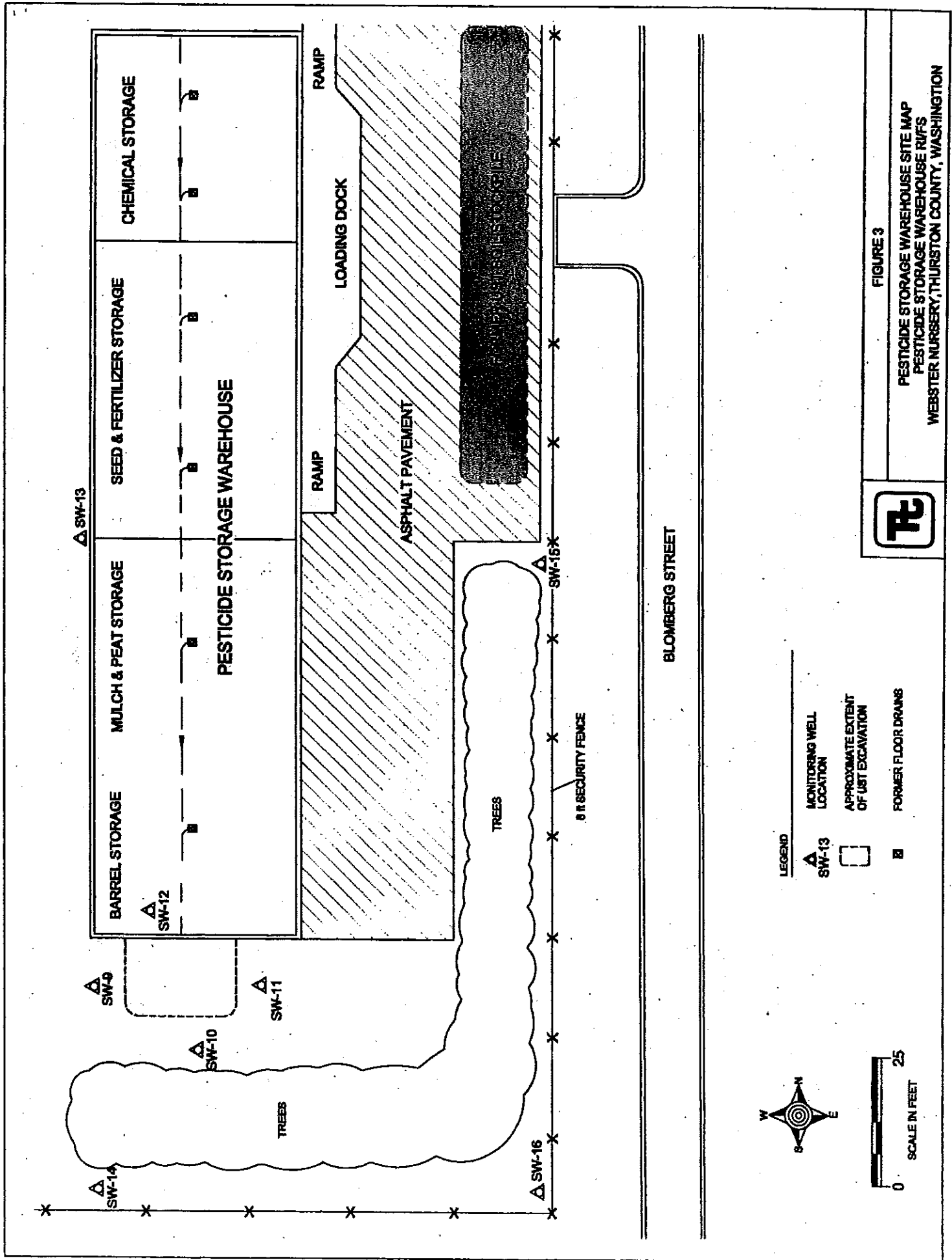
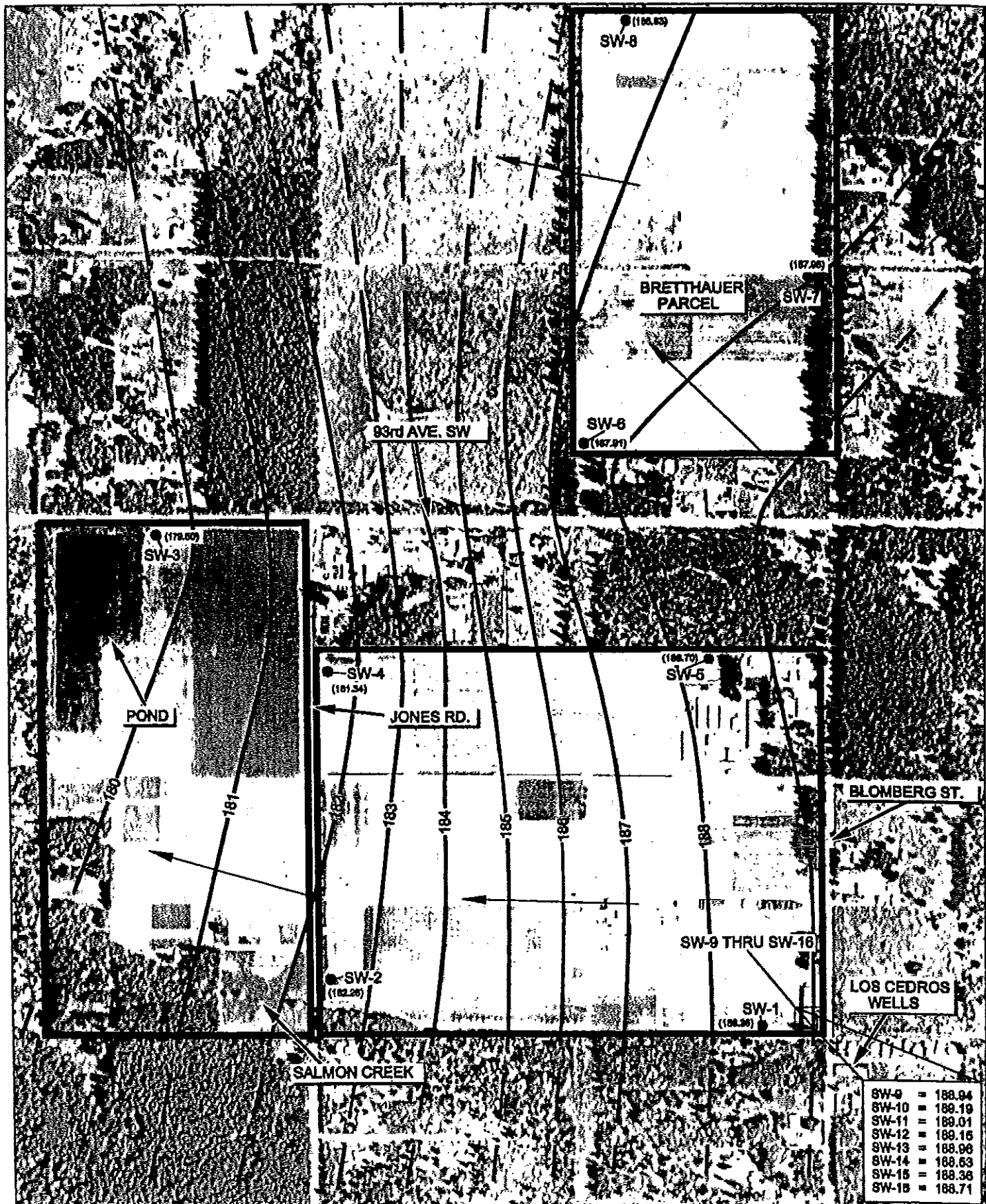


FIGURE 3

PESTICIDE STORAGE WAREHOUSE SITE MAP
 PESTICIDE STORAGE WAREHOUSE RIFS
 WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

LEGEND

- MONITORING WELL LOCATION
- APPROXIMATE EXTENT OF UST EXCAVATION
- FORMER FLOOR DRAINS



NOTES:





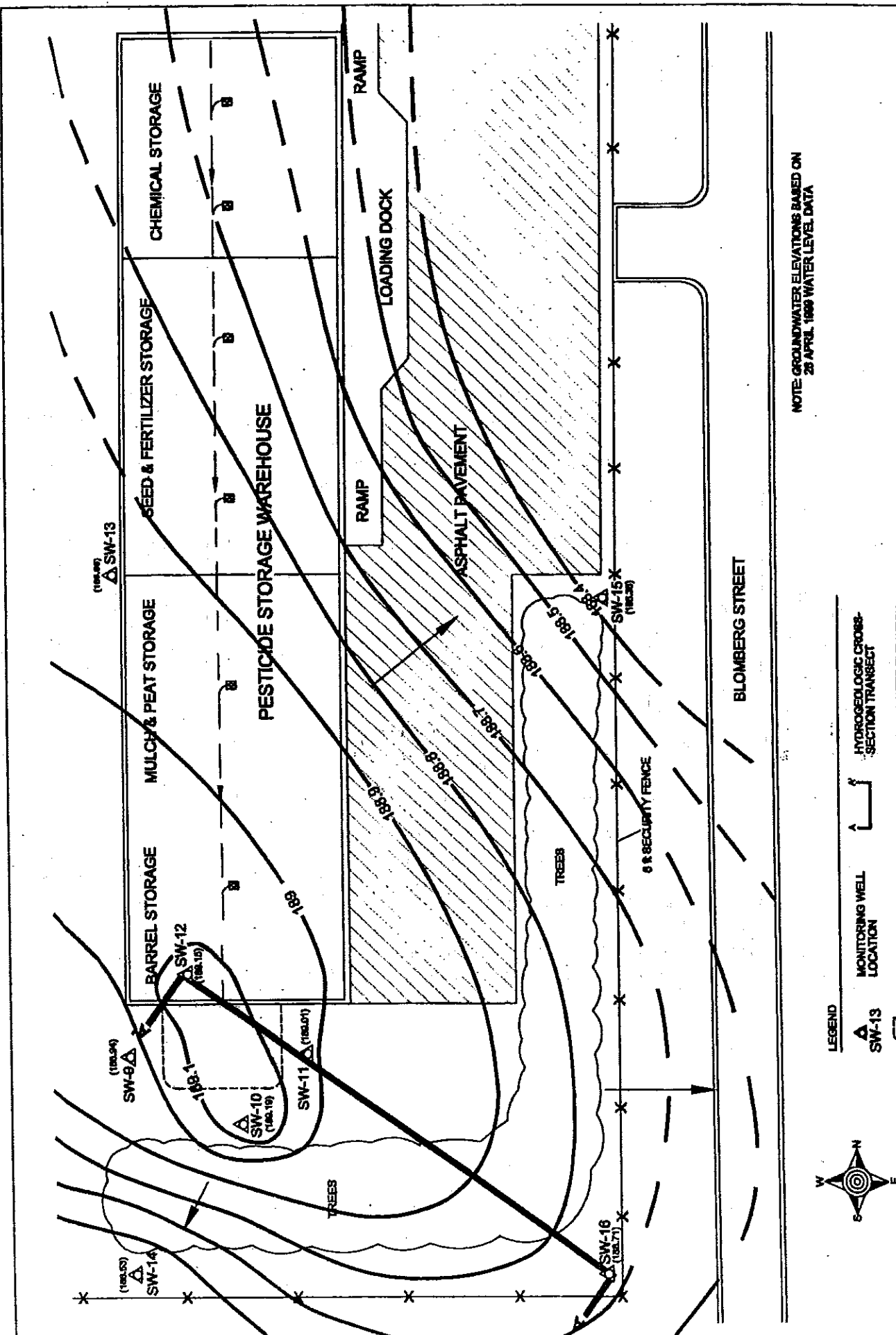
-  APPROX PROPERTY BOUNDARY
-  MONITORING WELL LOCATION
-  GROUNDWATER ELEVATION CONTOUR (INTERVAL = 1.0 FT)
-  ESTIMATED DIRECTION OF GROUNDWATER FLOW



FIGURE 4

FACILITY-WIDE GROUNDWATER ELEVATION CONTOUR MAP
WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

(SOURCE: REPRODUCTION OF DNR 1983 AERIAL PHOTOGRAPH)



NOTE: GROUNDWATER ELEVATIONS BASED ON
28 APRIL 1989 WATER LEVEL DATA

LEGEND

- MONITORING WELL LOCATION
- APPROXIMATE EXTENT OF LAST EXCAVATION
- FORMER FLOOR DRAINS
- HYDROLOGIC CROSS-SECTION TRANSECT
- GROUNDWATER ELEVATION CONTOUR (INTERVAL = 0.1 FT)
- ESTIMATED DIRECTION OF GROUNDWATER FLOW

SCALE IN FEET
0 25

North Arrow
N
S
E
W



FIGURE 5

STATIC GROUNDWATER ELEVATION CONTOUR MAP
PESTICIDE STORAGE WAREHOUSE RUFFS
WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

TABLE 1 SUMMARY OF MAXIMUM DETECTED CONCENTRATIONS OF PESTICIDE AND HERBICIDE COMPOUNDS IN SOIL AT THE PESTICIDE STORAGE WAREHOUSE WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

Sample Location	Sample Date	Organochlorinate Pesticides (mg/kg) ^d				Chlorinated Herbicides (mg/kg) ^b			
		Chlordane		Heptachlor	Heptachlor epoxide	2,4-D	2,4,5-T	2,4,5-TP	Dalapon
		Alpha	Gamma						
UST Soil Stockpile	June 1996	5.80	0.62	19.0	0.69	0.041	0.130	0.015	0.041
UST Excavation Soils	June 1996	4.20	0.60	17.0	0.47	0.07	0.097	ND ^c	ND
RI/FS Subsoil Characterization	April 1999	0.027	0.139	0.144	0.031	0.008	ND	0.030	ND
MTCA Method B Residential Soil Cleanup Levels ^d		2.86 ^e		0.222	0.110	800	800	640	2,400

- a Organochlorine pesticides were analyzed using EPA Method 1618 during 1996 UST removal activities and by EPA Method 8081A during the 1999 RI/FS work effort.
- b All soil samples were analyzed for chlorinated herbicides using EPA Method 8151.
- c ND = Not detected at or above the laboratory reporting limit.
- d The Model Toxics Control Act Cleanup Regulation [(Chapter 173-340-720(2)(b) WAC, as amended January 1996]; values based on MTCA Method B cleanup levels from the Cleanup Levels and Risk Calculations (CLARC II) update, February 1996; for those contaminants with both carcinogenic and noncarcinogenic state cleanup levels, the lowest value of the two is shown.
- e Chlordane cleanup level based on change in chronic slope factor from 1.3 to 0.35 (mg/kg-day)⁻¹, EPA Integrated Risk Information System (IRIS), on-line database search conducted 11 June 1998.

TABLE 2. SUMMARY OF MAXIMUM DETECTED CONCENTRATIONS OF PESTICIDE AND HERBICIDE COMPOUNDS IN GROUNDWATER, TANK EXCAVATION AREA MONITORING WELLS WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

Analytical Method	Detected Analyte	Analytical Results ($\mu\text{g/L}$)					ARARs ^a	
		August 1996	October 1996	June 1997	February 1999	Maximum Contaminant Levels ^b ($\mu\text{g/L}$)	MTCB Groundwater Cleanup Levels ^c ($\mu\text{g/L}$)	
Organochlorine Pesticides (EPA Methods 508/525.2)	Alpha-Chlordane	0.53	0.56	0.03	0.06		0.25 ^d	
	Gamma-Chlordane	2.27	2.37	0.07	0.31	2.00		
	Technical Chlordane	ND (0.15)	NA	NA	1.7 ^e			
	Heptachlor	1.39	0.35	0.29	0.16	0.40	0.019	
	Heptachlor epoxide	2.64	2.45	1.38	1.31	0.20	0.009	
Chlorinated Herbicides (EPA Method 515.1)	2,4,-D	ND ^f (0.50)	NA ^g	10.1	1.02	70.0	160	
	2,4,5-T	NA	NA	75.0	18.9	NA	160	
	2,4,5-TP	ND (1.00)	NA	7.19	4.67	50.0	128	
	Dicamba	NA	NA	0.46	0.21	NA	480	
	Picloram	ND (1.00)	NA	0.19	0.48	500	1,120	
Nitrogen and Phosphorus Pesticides (EPA Methods 507/525.2)	Triclopyr	NA	NA	36.3	15	NA	NA	
	Atrazine	0.12	NA	ND (1.00)	0.02	3.00	0.398	
	Simazine	0.28	NA	0.64 ^h	0.11	4.00	0.729	

a ARARs = Applicable or Relevant and Appropriate Requirements (chemical-specific).

b State drinking water standards as identified in WAC 246-290-310 and as published by the EPA Office of Water, (EPA 882-B-96-002) October 1996.

c The Model Toxics Control Act Cleanup Regulation [(Chapter 173-340-720(2)(b) WAC, as amended January 1996]. Values based on MTCB Method B cleanup levels from the Cleanup Levels and Risk Calculations (CLARC II) Update, February 1996. For those contaminants with both carcinogenic and noncarcinogenic State Cleanup Levels, the carcinogenic value has been applied.

d Chlordane cleanup level based on change in chronic slope factor from 1.3 to 0.35 (mg/kg-day)⁻¹. EPA Integrated Risk Information System (IRIS), online database search conducted, 11 June 1998.

e Technical chlordane concentration was empirically derived by the laboratory based on the detected concentration of chlordane isomers

f ND = Not detected at or above the laboratory reporting limit (shown in parentheses).

g NA = Not analyzed.

h J = Indicates an estimated concentration detected below the laboratory reporting limit but above the associated method detection limit.

TABLE 3. MTCA METHOD B CLEANUP LEVELS FOR SOIL AND GROUNDWATER^a

Contaminant	Soil (mg/kg) ^b	Groundwater (µg/l) ^c
Chlordane	2.86	0.25
Heptachlor	0.222	0.019
Heptachlor-epoxide	0.110	0.009
2, 4, D	800	160
2, 4, 5, T	800	160
2, 4, 5, T P	640	128
Dicamba	2400	240
Picloram	5600	1120
Atrazine	4.55	0.398
Simazine	8.33	0.729

^a Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARC II) Update, February 1996, Department of Ecology.

^b Milligrams per kilogram

^c Micrograms per liter

TABLE 4 SUMMARY OF APPLICABLE GROUNDWATER REMEDIAL TECHNOLOGIES
PESTICIDE STORAGE WAREHOUSE RI/FS
WEBSTER NURSERY, THURSTON COUNTY, WASHINGTON

General Response Action	Remedial Technology	Process Options	Description	Comments
No Action	Natural Attenuation	Natural Attenuation of Groundwater	Site left in current state, with no activities to monitor, control, or mitigate potential exposure to groundwater contaminants.	Reduction of contaminant concentrations in groundwater through the action of natural subsurface processes. Does not address potential contaminant exposure through groundwater migration.
Limited Action	Institutional Controls	Deed and Planning/Zoning Restrictions	Land use restrictions that address future use of contaminated sites. Deed restrictions and zoning limitations are examples of institutional controls.	Property deed restrictions to control future use of the property; planning/zoning to avoid conflicting land use. Likely applicable as adjunct to no action or limited action remedial response.
	Monitoring	Compliance Groundwater Monitoring	Compliance monitoring of groundwater for the early detection of downgradient contaminant migration	Groundwater samples collected from existing monitoring well network on an established time schedule and analyzed for contaminants of concern. Analytical results used to evaluate contaminant degradation and migration.
Containment	Hydraulic Controls	Asphalt Cap	Spray or rolled application of a layer of asphalt over a contaminated area.	May limit potential surface infiltration through existing excavation backfill materials. However, does not address overall site surface water drainage issues affecting the subject site.
		Roof Drainage Control	Redirect influence of roof drainage away from south end of pesticide storage warehouse.	Limits potential impacts of surface drainage from building on area of concern. However, does not address potential surface water drainage contribution from adjacent nursery fields.
Ex Situ Treatment	Physical/Chemical	Site Grading	Topographic low area(s) graded to redirect runoff away from area of concern.	May limit the potential for preferential surface drainage within the area of concern. Grading would likely result in required modifications to existing flush-mounted monitoring wells at this location. Would be difficult to influence area-wide drainage impacts.
		Excavation Backfill Material Replacement	Existing gravel/cobble fill material would be excavated and replaced with clean, fine-grained materials more closely matching existing formation.	Reduces potential for preferential infiltration through existing excavation backfill material. Over-excavation in the former UST location would likely require limited confirmation sampling to ensure proper disposition of original fill materials. Does not address overall site drainage issues affecting the subject site.
		Carbon Filtration/Chemical Oxidation	Pump and treat process including liquid-phase granular activated carbon filtration and/or physical/chemical oxidation.	Potentially reduces contaminant concentrations through organic adsorption (carbon filtration) and/or detoxification or destruction (physical/chemical oxidation).

TABLE 5. SUMMARY OF ANALYTICAL RESULTS OF TANK EXCAVATION MONITORING WELLS

WELL SW-9					
Contaminant	CONCENTRATION (µG/L)				MTCA cleanup levels
	8/14/96	6/27/97	2/199		
Chlordane	ND ^a	ND ^a	ND ^b		0.25
Heptachlor	ND ^a	ND ^a	ND ^b		0.019
Heptachlor-epoxide	ND ^a	ND ^a	ND ^b		0.009
2, 4, D	ND ^c	ND ^c	ND ^c		160
2, 4, 5, T	ND ^c	ND ^c	ND ^c		160
2, 4, 5, T P	ND ^c	ND ^c	ND ^c		128
Dicamba	NA	ND ^c	ND ^c		240
Picloram	ND ^c	ND ^c	ND ^c		1120
Atrazine	ND ^d	ND ^d	ND ^b		0.398
Simazine	0.2 ^d	ND ^d	ND ^b		0.729

WELL SW-10					
Contaminant	CONCENTRATION (µG/L)				MTCA cleanup levels
	8/14/96	10/8/96	6/27/97	2/199	
Chlordane					0.25
Alpha-Chlordane	0.526 ^a	0.558 ^a	0.005 ^a	0.021J ^b	
Gamma-Chlordane	2.27	2.37 ^a	0.20 ^a	0.094J ^b	
Technical Chlordane				0.5 ^b	
Heptachlor	1.39 ^a	0.345 ^a	0.132 ^a	ND ^b	0.019
Heptachlor-epoxide	2.64 ^a	2.03 ^a	0.927D ^a	0.83 ^b	0.009
2, 4, D	3.26 ^c	NA	6.70 ^c	1.02 ^c	160
2, 4, 5, T	NA	NA	77.7D ^c	18.9 ^c	160
2, 4, 5, T P	8.15 ^c	NA	6.63D ^c	4.67 ^c	128
Dicamba	NA	NA	ND ^c	0.21 ^c	240
Picloram	NA	NA	0.105 ^c	0.48 ^c	1120
Atrazine	0.12 ^d	NA	ND ^d	ND ^b	0.398
Simazine	0.28 ^d	NA	ND ^d	0.11 ^b	0.729

* Field duplicate

^a EPA Method 508

^b EPA Method 525.2

^c EPA Method 515.1

^d EPA Method 507

ND=Indicates the compound was not detected at or above the laboratory detection limit.

NA=Not applicable, no criterion exist for the specified analyte.

J=data flag indicating the compound was detected at an estimated concentration below the associated laboratory practical quantification limit of 0.1 µg/l, and in many cases below the reported method detection limit.

D=The sample was diluted to bring the analyte peak, or in some cases an interfering peak, into the calibration range of the instrument.

TABLE 5. SUMMARY OF ANALYTICAL RESULTS OF TANK EXCAVATION MONITORING WELLS
(cont.)

Contaminant	WELL SW-11					MTCA cleanup levels
	8/14/96	10/8/96	6/27/97	2/1/99	2/1/99*	
Chlordane						0.25
Alpha-Chlordane	0.0536 ^a	0.304 ^a	0.009 ^a	0.068J ^b	0.06J ^b	
Gamma-Chlordane	0.145 ^a	1.01 ^a	0.028 ^a	0.31 ^b	0.26 ^b	
Technical Chlordane				1.7 ^b	1.5 ^b	
Heptachlor	0.0425 ^a	0.131 ^a	0.026 ^a	0.06J ^b	0.06J ^b	0.019
Heptachlor-epoxide	1.85 ^a	2.45 ^a	1.77D ^a	1.5 ^b	1.31 ^b	0.009
2, 4, D	ND ^c	NA	10.1D ^c	ND ^c	ND ^c	160
2, 4, 5, T	ND ^c	NA	75.0D ^c	0.34 ^c	0.21 ^c	160
2, 4, 5, T P	8.15 ^c	NA	7.19D ^c	0.95 ^c	0.59 ^c	128
Dicamba	NA	NA	0.462 ^c	0.094J ^c	ND ^c	240
Picloram	NA	NA	0.187 ^c	0.21 ^c	ND ^c	1120
Atrazine	ND ^d	NA	ND ^d	ND ^c	ND ^c	0.398
Simazine	ND ^d	NA	ND ^d	ND ^c	ND	0.729

Contaminant	WELL SW-12					MTCA cleanup levels
	8/14/96	8/14/96*	6/27/97	6/27/97*	2/1/99	
Chlordane	ND ^a	ND ^a	ND ^a		ND ^b	0.25
Alpha-Chlordane				0.025 ^a		
Gamma-Chlordane				0.073 ^a		
Technical Chlordane						
Heptachlor	ND ^a	ND ^a	ND ^a	0.291 ^a	ND ^b	0.019
Heptachlor-epoxide	ND ^a	ND ^a	0.055 ^a	1.38D ^a	ND ^b	0.009
2, 4, D	ND ^c	ND ^c	ND ^c	6.71D ^c	ND ^c	160
2, 4, 5, T	ND ^c	ND ^c	2.48D ^c	97.4D ^c	ND ^c	160
2, 4, 5, T P	ND ^c	ND ^c	1.48D ^c	6.56D ^c	ND ^c	128
Dicamba	NA	NA	ND ^c	ND ^c	ND ^c	240
Picloram	ND ^c	ND ^c	ND ^c	ND ^c	ND ^c	1120
Atrazine	ND ^d	ND ^d	ND ^d	ND ^d	ND ^b	0.398
Simazine	ND ^d	0.14 ^d	ND ^d	0.330J ^d	ND ^b	0.729

* Field duplicate

^a EPA Method 508

^b EPA Method 525.2

^c EPA Method 515.1

^d EPA Method 507

ND=Indicates the compound was not detected at or above the laboratory detection limit.

NA=Not applicable, no criterion exist for the specified analyte.

J=data flag indicating the compound was detected at an estimated concentration below the associated laboratory practical quantification limit of 0.1 ug/l, and in many cases below the reported method detection limit.

D=The sample was diluted to bring the analyte peak, or in some cases an interfering peak, into the calibration range of the instrument.

