Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites

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1.0 INTRODUCTION

The purpose of this guidance is to explain the process for determining current and reasonably likely future beneficial uses of groundwater and surface water for environmental cleanup sites[1]. Under the state's environmental cleanup laws, these determinations are only appropriate for remedial action decisions at facilities where a release of hazardous substances has occurred. Guidance is provided on the types of information that should be collected and procedures for evaluation. Through this guidance, an effort has been made to provide useful technical assistance and specific tools for beneficial water use determinations. It should be noted that beneficial water use determinations and land use determinations are closely linked. For more information on land use determinations, consult the DEQ Guidance for Consideration of Land Use.

1.0 Scope and Applicability

Beneficial water use determinations are required only if a release of hazardous substances has impacted groundwater or surface water, or has the potential to impact groundwater or surface water, through contaminant migration. These determinations will be used for evaluating exposure pathways in human health and ecological risk assessments; for identifying hot spots of contamination; and for selection or approval of remedial actions at hazardous substance cleanup sites.

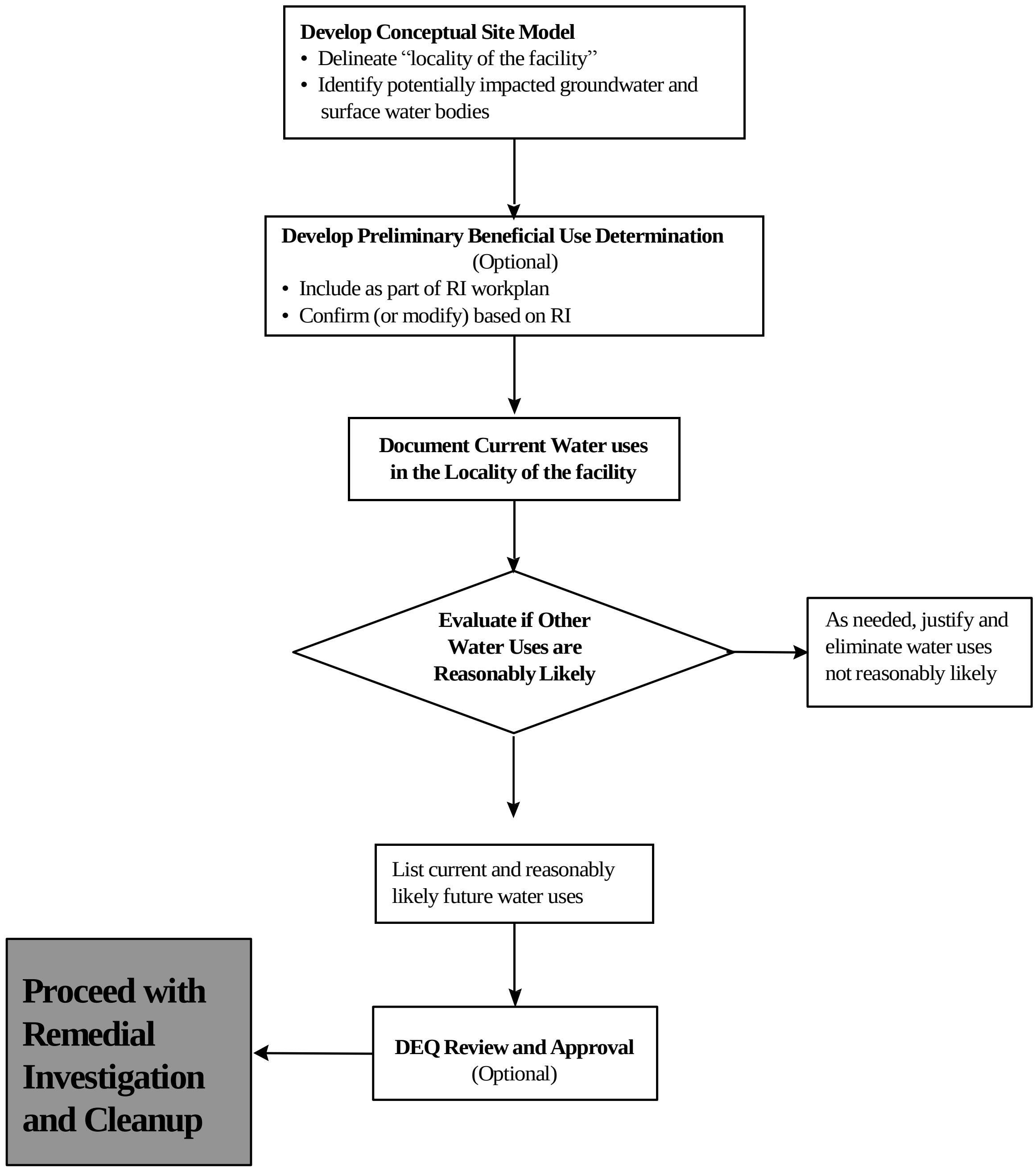
A schematic illustrating the overall process of making beneficial water use determinations is provided in Figure 1. The extent of information collection and analysis will vary by site. However, there are only two components of any beneficial water use determination:

- development of an understanding the hydrogeologic setting at the site, a task typically completed as part of the overall site characterization; and
- documentation and evaluation of the current and reasonably likely future beneficial water uses within the locality of the facility.

Guidance addressing evaluation of a facility's hydrogeologic setting is covered in Section 2. Section 3 discusses collection of current and reasonably likely future water use information. Section 4 concludes with information on the evaluation process.

[1] Additional DEQ guidance documents have been prepared for land use determinations, identification of hot spots, and conducting environmental cleanup feasibility studies.

Figure 1
Flow Chart for Determining Current and Reasonably Likely Future Beneficial Uses of Water



1.2 Regulatory Requirements

Oregon's regulatory requirements for beneficial water use determinations are found in OAR Chapter 340, Division 122 and the enabling environmental cleanup legislation (ORS Chapter 465). These requirements include, but are not limited to:

- information related to identification of current and reasonably likely future beneficial uses of groundwater and surface water that must be collected and evaluated during the Remedial Investigation (RI) under OAR 340-122-080(3)(f);
- the Remedial Investigation (RI) must identify hazardous substances having a significant adverse effect on beneficial uses of water pursuant to OAR 340-122-080(6);
- risk assessments must consider existing and reasonably likely future human exposures and significant adverse effects to ecological receptors in the locality of the facility under OAR 340-122-084(1); and
- the Feasibility Study (FS) must evaluate whether treatment is reasonably likely to restore or protect beneficial uses of water within a reasonable time as required by OAR 340-122-085(5).

Determinations of current and reasonably likely future beneficial uses of water discussed in this guidance apply only to hazardous substance releases and remedial action decisions under the Hazardous Substance Remedial Action Rules (OAR 340, Chapter 340, Division 122)[2]. Specifically, beneficial water use determinations are site-specific determination and do not imply classification of groundwater aquifers or surface water bodies.

1.3 General Categories of Water Uses

Water is used for a wide range of purposes throughout Oregon. To assist in the identification of current and reasonably likely future beneficial uses, general categories of potential water uses have been identified. These general categories of water use are presented in Table 1.

Water uses in Table 1 are not meant to be all-inclusive, but rather are meant to serve as a starting point for facility-specific beneficial use determinations. It should be noted that many types of uses, each with a different potential for exposure, may exist under each general category of water use. Each of these specific water uses may involve a different potential for exposure. For this reason, highly specific beneficial water use determinations may require specialized risk assessment or hot spot evaluations.

[2] Under OAR 340-122-030(6), "[a]ny determination of current or reasonably likely future land uses or beneficial uses of water pursuant to these rules shall apply only for the purpose of selecting or approving removal or remedial actions under these rules."

This guidance relies upon the use of general categories of water uses, rather than highly specific water use determinations. For more information on potential water uses, see Appendix A.

TABLE 1
GENERAL CATEGORIES OF WATER USE

General Categories	Definition	Applicability
Drinking Water	Water used for drinking water purposes. May include private, municipal and industrial drinking water supplies.	Groundwater and surface water.
Irrigation	Water used for the irrigation of agricultural land, gardens or landscaping.	Groundwater and surface water.
Livestock	Water used to provide livestock such as cattle with drinking water.	Groundwater and surface water.
Industry	Water used for industrial purposes including non-contact water, as a solvent or as a raw material including use in food and beverage processing.	Groundwater and surface water.
Engineering	Water which is used for non-drinking water purposes that could serve residential, commercial or industrial properties. Includes heat exchange, de-watering and fire suppression.	Groundwater and surface water.
Aquatic Life (Aquatic Habitat)	Water which serves as, or contributes to, the habitat of aquatic organisms such as fish, macroinvertebrates and benthic organisms. Includes sediment pore water.	Surface water and groundwater discharging to surface water.
Recreation	Water which is used for hunting, fishing, swimming, boating or other recreational activities.	Surface water and groundwater discharging to surface water.
Aesthetic Quality	The inherent aesthetic appeal of water. Specific uses include viewing and religious ceremonies.	Surface water and groundwater discharging to surface water.

Beneficial water use determinations must be made for all water bodies currently impacted by contaminants of concern or reasonably likely to be impacted in the future. Specifically, the potential for migration of contaminants between aquifers or from groundwater to surface water must be addressed. For example, although a given aquifer may have no—or relatively few—current or reasonably likely future uses, any discharge of the aquifer to surface water bodies and/or migration from the aquifer to other ground-water bearing zones must be considered. In other words, beneficial water use determinations must be made for all water resources within the "locality of the facility".

1.4 Preliminary Determinations

Preliminary beneficial water use determinations may be useful in focusing the final beneficial use determination. These preliminary determinations may be presented in the RI work plan and used as a basis for planning the RI/FS. Preliminary determinations tend to be fairly conservative and all encompassing of potential beneficial water uses. They may be used to guide the scope of the RI and determine data collection needs.

Preliminary beneficial water use determinations should be based on information gathered in the preliminary assessment (PA) or during the development of the RI work plan[3]. They should consider site hydrogeology, regional data from published literature and, if applicable, the results of beneficial use determinations made at nearby environmental cleanup investigations conducted under ORS 465. A preliminary determination should also consider current land and water use in the locality of the facility, the potential for contaminant migration and other relevant and available facts.

In many instances, adequate data regarding the nature and extent of contamination, aquifer characteristics, or current and reasonably likely future water uses will not be available at the RI workplan stage. Consequently, an iterative approach is recommended to refine the preliminary beneficial water use determination based on data collected during the RI. As more detailed information is collected during the RI, the beneficial water use determination should be refined.

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[3] PAs typically identify groundwater and surface water uses within a specified radius of the site for the purpose of evaluating potential receptors. In addition, PAs often include a water well survey and may identify surface water bodies, recreational areas and fisheries.

Example of a Preliminary Beneficial Water Use Determination

Background: The preliminary assessment (PA) at a hazardous substance release site has identified a half dozen drinking water wells within a one mile radius. The drinking water wells are screened in the 50 - 150 foot range. In addition, a wetlands has been identified a quarter mile downgradient from the source of the release. Contaminants are known to be present in the shallow water bearing zone and the extent of contamination has not yet been fully characterized.

Results: A preliminary beneficial water use determination identifies aquatic habitat and drinking water as beneficial water uses. Given this determination, the RI workplan includes investigative tasks designed to: a) more fully characterize the extent of contamination; b) estimate the potential for impacts to the wetland from stormwater runoff and groundwater/surface water interactions; and c) determine whether the deeper drinking water aquifer has been, or is reasonably likely to be, impacted by contaminants.

1.5 Streamlined Process

Collection and evaluation of information related to current and reasonably likely future uses of water represents a critical component of most remedial investigations. At the same time, there will be specific situations and sites at which the effort will be relatively minimal or can be greatly simplified. Accordingly, the following checklist may be used to determine the appropriate beneficial use inquiry for a given facility, surface water body, or groundwater bearing zone.

CHECKLIST FOR A STREAMLINED BENEFICIAL USE INQUIRY

Y/N	
____	Are groundwater resources and surface water bodies within the locality of the facility currently contaminated, or reasonably likely to be contaminated in the future due to migration of contaminants from the facility? *If "no", a beneficial water use determination for this site (or, if applicable, for an individual water body) is not necessary*
____	Are groundwater resources reasonably likely to be used in the future considering the inherent natural water quality of the aquifer (e.g., low yield, salinity, total dissolved solids)? *If "no" (and the contamination is not expected to migrate to other water bodies), the beneficial water use determination may be streamlined.*
____	Are conservative assumptions factually appropriate (e.g., current uses of groundwater resources or surface water bodies include the most sensitive beneficial water uses, typically drinking water and aquatic life)? *If "yes", the beneficial water use determination may be streamlined.*
____	For any other reason, does the responsible party wish to assume relatively conservative or sensitive beneficial uses of water for the purposes of risk assessment and remedy selection? *If "yes", the beneficial water use determination may be streamlined.*

These streamlined approaches are discussed in more detail in the following sections.

No Potential for Contamination of Groundwater or Surface Water Bodies: Under the first approach, adequate site characterization is required. Fate and transport analysis, which may include fate and transport modeling, may be required to demonstrate that groundwater or surface water bodies will not be impacted by contamination[4]. For example, if it can be demonstrated through an appropriate contaminant fate and transport analysis that surface water is neither currently impacted, nor likely to be impacted by contamination in the future,

[4] Continued monitoring may be required to verify that fate and transport is consistent with any completed analysis.

no evaluation of beneficial uses of surface water is required. Under this scenario, the surface water fate and transport analysis should consider the potential for overland transport of contaminants and the potential for contaminant migration from groundwater to surface water.

Inherent Natural Conditions: Under the second approach, if there are no current uses of the aquifer or water bearing zone, the contamination is not migrating, and the resource is poorly suited for future uses, the beneficial use determinations can be simplified. For example, if it can be demonstrated there are no current use of groundwater in the locality of the facility; that the contamination will not adversely migrate to any surface water bodies; and that all impacted or potentially impacted aquifers have a yield of less than 0.5 gallons per minute (gpm) or a total dissolved solids (TDS) content greater than 10,000 mg/L[5], the evaluation of “reasonably likely future water uses” may be limited to uses, if any, that are suitable for the inherent natural conditions present in the locality of the facility. Exceptions to 0.5 gpm or 10,000 mg/L TDS threshold may be appropriate on a site by site basis, (e.g., local or regional site conditions and the limited availability of alternative water supplies may indicate that relatively low yield and/or poorly suited water bodies are reasonably likely to be used in the future).

Use of Conservative Assumptions: Under the third approach, conservative assumptions are used (at the request of the responsible party and if appropriate for the site). Specifically, current and reasonably likely future beneficial water use of groundwater may be assumed to be drinking water. Similarly, the current and reasonably likely future beneficial water use of surface water may be assumed to be drinking water and aquatic life. Since drinking water is usually considered the most conservative exposure scenario for the protection of human health and aquatic life the most conservative exposure scenario for protection of the environment, in most cases, full identification of water uses is not required.

Example of a Streamlined Approach to Beneficial Water Use Determinations Use of Conservative Methods

A release of benzene has impacted an aquifer. In this case, readily-available information indicates the impacted aquifer is currently used as drinking water and that the aquifer discharges to the Willamette River. Under the streamlined approach, it is conservatively assumed that: a) the beneficial water use of the aquifer is drinking water; and b) the beneficial uses of the Willamette River include drinking water and protection of aquatic life. Consequently, remedial action objectives are developed that are designed to restore and protect “conservative” beneficial uses of water—specifically, drinking water and aquatic life.

[5] From USEPA Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy, December, 1986

2.0 HYDROGEOLOGIC SITE CHARACTERIZATION

The recommended first step in a beneficial water use determination is to develop an understanding of the site hydrogeologic setting. This information will be of value in establishing the locality of the facility, developing conceptual site models and evaluating the suitability of water resources for potential beneficial water uses.

2.1 Locality of the Facility

OAR 340-122-080(3) requires the facility characterization to identify current and reasonably likely future beneficial water uses in the “locality of the facility”. “Locality of the facility” is defined in OAR 340-122-115(34) and can be compared, or contrasted, to related terms used when characterizing hazardous substance releases.

Definitions

Property boundary: the recorded legal description of a property, typically for the property where the release has occurred.

Facility or site: any area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located.

Locality of the facility: any point where a human or an ecological receptor contacts or is reasonably likely to come into contact with facility-related hazardous substances. The locality of the facility takes into account the likelihood of the contamination migrating over time so is typically larger than the facility.

Region: a geographic area in proximity to the locality of the facility, having characteristics relevant to determining the current and reasonably likely future beneficial uses of water in the locality of the facility. The region is not bounded by either the extent of the contamination or a prescribed distance from the source property boundaries. Regional information, including development patterns and population projections, is considered when evaluating reasonably likely future uses of water. The region is not intended to be a city-wide, county-wide, or other geographically-broad area. The region may be an area bounded by some geographical feature shared by the locality (e.g., an industrial park bounded by three major streets and a river), but the key element is whether it is relevant to current or future uses in the locality of the facility.

Identification of the locality of the facility may useful in limiting the extent of the beneficial water use determination by identifying which surface water bodies or water bearing zones are likely to be impacted over time. For example, if the locality of the facility does not include surface water bodies, data regarding current and reasonably likely future surface water uses is not required.

Example of Locality of Facility Determination

Background: A release of hazardous substances has contaminated a shallow water bearing zone. The site characterization determined that the contamination was limited to the property boundary. The site characterization included the installation of monitoring wells between the contaminant plume and a downgradient surface water body and in a deeper water bearing zone. No contaminants were detected in these monitoring wells over four consecutive quarters of groundwater monitoring.

Case A: Contaminant fate and transport analyses have determined that the contamination is unlikely to migrate to the surface water body or the deeper water bearing zone under current site conditions.

Case A Results: The locality of the facility was determined to be limited to the shallow water bearing zone. Therefore, the beneficial water use determination is restricted to the shallow water bearing zone. However, because of the potential for site contaminants to migrate to the deeper water bearing zone or downgradient surface water body, the site remedy included restrictions on the installation of on-site water supply wells through the contaminant plume into the deeper water bearing zone and periodic monitoring downgradient of the contaminant plume and in the deeper water bearing zone.

Case B: Contaminant fate and transport analyses determine that the contamination is likely to migrate to the deeper water bearing zone.

Case B Results: The locality of the facility was determined to include the shallow and deep water bearing zones. Therefore, the beneficial water use determination was expanded to include each water bearing zone. Predicted contaminant concentrations in the deeper water bearing zone were found to represent a significant adverse effect on beneficial uses of water. As a result, the site remedy included long-term hydraulic containment to prevent the predicted contaminant migration from occurring.

The locality of the facility determination should be performed in conjunction with remedial investigation activities such as delineation of the nature and extent of contamination and evaluation of contaminant fate and transport. Although, the locality of the facility determination is dependent on the potential for exposure by human or ecological receptors, the lack of potential receptors does not preclude delineation of the extent of contamination and contaminant fate and transport analyses during the remedial investigation. Due to the inherent difficulties associated with evaluating contaminant fate and transport, the use of conservative assumptions is recommended. In addition, long-term monitoring may be required to ensure that water bearing zones or surface water bodies outside the locality of the facility remain unaffected. A summary of factors to be considered when evaluating contaminant fate and transport for the purpose of identifying the locality of the facility is presented in Appendix C.

2.2 Conceptual Site Models

DEQ recommends development of a Conceptual Site Hydrogeologic Model to assist in facility characterization and beneficial water use determinations. Conceptual Site Models, including Hydrogeologic Models, are traditional tools for environmental cleanup investigations. The Hydrogeologic Model also serves as a basis for identifying transport mechanisms and pathways for migration of contaminants. The Hydrogeologic Model presents information relevant to surface and groundwater hydrogeology and geology, usually including a geologic cross-section. The model identifies and describes aquatards, water bearing units and surface water features, especially water resources which may be impacted by a release of hazardous substances from the facility.

Example of a Conceptual Site Hydrogeologic Model

Background: A release of hazardous substances has occurred as a result of poor waste handling procedures. A primary source of contamination to groundwater from the facility is known to be present in the form of non-aqueous phase liquid (NAPL). In addition, contaminated soil areas may represent a potential secondary source. The facility is served by municipal water supply and is located in an industrial area. Based on a review of regional geologic and hydrogeologic information, the model hypothesizes that the uppermost water bearing zone discharges into the river and the two lower zones do not; that the two upper water bearing zones are separated by a discontinuous silt layer; and that a thick clay layer separates the middle water bearing zone from the lower water bearing zone. The uppermost water bearing zone is known to be heavily contaminated and may contain NAPL.

Results: The responsible party and DEQ agree to an RI workplan specifying that the beneficial water use determination should focus on the two upper water bearing zones and the river. In addition, DEQ and the responsible party agree that the RI should be designed to confirm that the lowermost water bearing zone is not likely to be impacted in the future. In the event it is subsequently determined that the lower zone has been impacted, or is reasonably likely to be impacted in the future, the site conceptual model should be revised and the beneficial water use determination should be expanded to include this third water bearing zone.

2.3 Regional Hydrogeology

Prior to initiating a beneficial water use determination, an understanding of the regional surface water system and groundwater hydrogeology should be obtained. Information should be gathered, including published literature, to develop an understanding of geologic features within the region and expected stratigraphy beneath the facility. This review should focus on regional hydrogeologic units, and for each identified unit, characterize the unit's geologic and hydrologic features.

For groundwater, this information typically includes data pertaining to background water quality; recharge and discharge mechanisms; available water yield; and other aquifer properties including transmissivity, leakage, storativity, groundwater flow direction, gradient, and the extent to which the aquifer is confined. Similarly, for surface water, the location and characteristics of regional surface water bodies should identified.

2.4 Hydrogeology in the Locality of the Facility

Appropriate information should be gathered on all water bearing zones and surface water bodies potentially impacted by the hazardous substances. This hydrogeologic information, typically collected during the preliminary investigation and remedial investigation activities, is applicable to a number of remedial investigation and feasibility study tasks and is often relevant to beneficial water use determinations. Hydrogeologic information appropriate for evaluation may include the following:

Background Water Quality: Collection of background water quality data requires analysis of water quality data obtained from one or more upgradient surface water sampling locations or upgradient monitoring wells. In areas where widespread contamination precludes collection of upgradient background water quality data, in some cases, regional water quality data may be utilized. Background water quality is defined as water that has not been impacted by a release of hazardous substances.

Availability: Availability of groundwater should be measured in terms of hydraulic conductivity, sustainable well yield or well capacity. This information may be obtained from relevant published literature, records of historic or current use, aquifer tests or other pertinent sources. Availability of surface water should be measured in terms of streamflow, including seasonal variability in streamflow.

Flow Direction and Gradient: Information regarding groundwater flow direction and gradient often will be useful in determining the potential for contaminant migration. Information should be gathered characterizing the groundwater flow direction, vertical and horizontal gradients including, as appropriate, seasonal variations, tidal influences and the effects of groundwater withdrawal, and the rate of groundwater flow movement.

Aquifer Connectivity: The remedial investigation should be designed to identify and evaluate the integrity of any confining units or other barriers to migration of groundwater.

Wetlands and Surface Water Bodies: An understanding of the nature and extent of wetlands and surface water bodies in the locality of the facility is necessary for properly characterizing the site. For example, if results of the site characterization indicate contamination could be migrating to wetlands or surface water bodies, the flux of contaminants will need to be evaluated. For migration of contaminants from groundwater to surface water, contaminant concentration data, estimates of hydraulic gradient, hydraulic conductivity, thickness of the water-bearing zone entering the surface water body, and the physical characteristics of the surface water body including bathymetry, depth and flow rate will be important. In addition, concentrations of contaminants in sediments and sediment pore water concentrations may be used to assess the extent of migration of contaminants to wetlands and surface water bodies.

3.0 IDENTIFICATION OF CURRENT AND REASONABLY LIKELY FUTURE BENEFICIAL WATER USES

OAR 340-122-080(3)(f) specifies that current and reasonably likely future beneficial water use determinations consider the following information:

- (A) Federal, state, and local regulations governing the appropriation and/or use of water.
- (B) Nature and extent of current groundwater and surface water uses.
- (C) Suitability of groundwater and surface water for beneficial uses.
- (D) The contribution of water to the maintenance of aquatic or terrestrial habitat.
- (E) Any beneficial uses of water which the Water Resources Department or other federal state or local programs is managing in the locality of the facility.
- (F) Reasonably likely future uses of groundwater and surface water based on:
  - (i) Historical land and water uses;
  - (ii) Anticipated future land and water uses;
  - (iii) Community and nearby property owners' concerns regarding future water use;
  - (iv) Regional and local development patterns;
  - (v) Regional and local population projections; and
  - (vi) Availability of alternate water sources including, but not limited to, public water supplies, groundwater sources, and surface water sources.

Some of these specific considerations are discussed in the following sections.

3.1 Current Beneficial Uses

The process of identifying current (and historic) beneficial uses of water relies upon data collection. The first purpose in collecting this information is direct: to identify current water uses which have been, or reasonably are likely to be, impacted by contamination in the future. The second purpose is indirect: to inventory those water uses which may be relevant to determinations of "reasonably likely" future beneficial uses of water (See Section 3.2 for a discussion of reasonably likely future beneficial uses of water.)

Some techniques for gathering information on current (and historic) water uses are presented in the following sections. Also, Appendix B describes a variety of available sources of information on current water use.

3.1.1 Groundwater Use Surveys

A survey of wells within the study area is normally required as part of the Remedial Investigation process and should be conducted to identify current uses of groundwater. The chosen radius or downgradient extent of the groundwater survey will be particular to the facility under review and the nature of the surrounding environs.[6] Minimally, the groundwater use survey area must encompass the area identified as the "locality of the facility".

Specific suggestions for conducting groundwater use surveys include contact with affected public agencies and the use of door-to-door surveys and/or postcard surveys as discussed below:

Contact with Affected Water Suppliers: Municipal, public and private water suppliers should be contacted to gather information regarding domestic water supplies. Information should be collected regarding the nature of the water supply source, trends in the volume and nature of water use, plans for future expansion of water supply and options for additional water supply sources. Information should be gathered on both primary and back-up water supplies. Example questions for water suppliers are presented below.

Example Questions for Water Suppliers

- Does your agency own and/or operate any water supply wells or river diversions to provide water supply at or near this property?
- Does your agency plan to install any new water supply wells to provide water supply at or near this property?
- Does your agency have unexercised water rights at or near this property?
- Does your agency supply water to this property and/or to the following list of adjacent addresses (provide list)?
- If this property is redeveloped will your agency supply water to the redeveloped site?
- What other facilities owned or operated by your agency at or near this property might also need to be considered?

In addition, public water suppliers should be contacted regarding properties that are suspected of having unregistered water supply wells to determine whether they are connected to public water and whether their pattern of water use is consistent with households that are totally dependent on public water. It is recommended that water suppliers be contacted directly to obtain this information through phone or in-person interviews.

[6] As a general rule, DEQ recommends an initial study area radius of one (1) to three (3) miles to be modified as needed. EPA Guidance for Performing Preliminary Assessments Under CERCLA Specifies a four (4) mile radius.

The Drinking Water Protection Program is a program designed to protect the groundwater and surface water resources that supply public water systems from contamination. Through implementation of this program, a local community can determine the land surface area a specified distance from their drinking water source based on a time of travel analysis; identify what kind and how many potential contamination sources are within that area; and develop a management approach to reduce the risks of groundwater contamination from those sources. The Drinking Water Protection Program is implemented at both the state and local levels. On the state level, assistance is provided by DEQ, the Oregon Health Division, the Oregon Department of Agriculture, the Oregon Water Resources Department and the Department of Geology and Mineral Industries. For sites located within or near wellhead protection areas, any or all of the above mentioned agencies may be of assistance.

Oregon Water Resources Department (WRD) databases identify most wells installed after about 1970. There are two principal WRD databases which can be accessed. The Water Right Information System (WRIS) database archives water rights, and the Groundwater Resource Information Distribution (GRID) database provides well log information. WRD has information located in their Salem, Oregon office and in district offices. In general, inquiries should be made through district or regional offices. An advantage of using the regional WRD office is that water rights information obtained through regional offices may be more current than information obtained exclusively from WRIS. In addition, local Watermasters often are very knowledgeable regarding water use within their district or region.

Other records (e.g., United States Geological Survey (USGS) and municipal water service maps) can be searched to determine whether older and/or unrecorded wells exist. Additional data sources may include: local water districts and utilities; local planning and health departments; local irrigation districts; the Oregon Health Division, Drinking Water Program; and DEQ.

Door-to-Door Survey: If the study area contains older wells (pre-1970), privately-installed or driven wells, or if well survey information is not definitive, then a door-to-door survey should be conducted. Usually, this effort consists of systematic contacts with each property owner in a designated area. Initial contact should be documented with a contact record and with follow-up contacts, as appropriate. This type of survey may be best suited for residential areas. A door-to-door survey may be augmented by the use of mailed surveys and/or DEQ-approved fact sheets which are left at individual residences[7].

Postcard Survey: As with door-to-door surveys, postcard surveys are a potentially useful method of ensuring complete canvassing of water use within a given area, especially when used in conjunction with other traditional approaches such as water rights determinations through WRD. Postcard surveys also may be an effective means to obtain community input early in the process. This type of survey may be best suited for industrial and commercial areas. An example of a water use survey form is presented in Appendix D. As with door-to-door surveys, a postcard

[7] In most instances, water use and land use surveys should be conducted concurrently.

survey typically will be accompanied by a cover letter explaining the purpose of the inquiry and a DEQ-approved fact sheet about the project.

Example of a Groundwater Use Survey

Background: A release of hazardous substances routinely used in agricultural land applications occurred at a bulk warehousing distribution center. The releases have impacted soils onsite and groundwater both onsite and offsite. Most nearby properties are very large agricultural operations, but there are also several residential dwellings in the locality of the facility.

Results: Local officials are interviewed about the status of water supply and water use in the region and, more specifically, in the locality of the facility. This information helped to identify which residents are supplied by public water, and identifies several downgradient residences that were thought or known to have shallow domestic water wells whose uses were not known. A door-to-door survey of residential domestic well use was conducted to identify all possible human exposures to contaminated groundwater. English and Spanish fact sheets were produced and distributed in the area. In addition, a water rights survey within a radius of one mile was completed using the state's Water Resources Department databases. Using WRD databases and the results of the door-to-door survey, sixty four water well rights and two surface water rights were identified within the one mile radius of the facility.

3.1.2 Surface Water Use Surveys

Approaches previously discussed for groundwater surveys are generally applicable for surface water surveys. Again, the chosen radius or geographic focus for the surface water survey will be particular to the facility under review. Minimally, the surface water survey should encompass the area defined as within the "locality of the facility".

As a first step in the identification of surface water uses, the beneficial water uses to be protected as specified in OAR Chapter 340, Division 41, Tables 1 through 19 should be consulted and evaluated as appropriate. Additional information specific to current surface water uses that should be considered includes:

Recreation: Recreational uses of surface waters can be determined through inquiry to various data sources such as federal agencies (e.g., Forest Service and Bureau of Land Management), state agencies (e.g., WRD, Department of Fish and Wildlife, Parks and Recreation), or local entities such as tourism bureaus, chambers of commerce, and parks/recreation commissions. All known recreational uses associated with surface waters should be identified.

Aquatic Life and Other Water Uses: It is likely that there will be other beneficial uses of surface water in addition to those described above, including aquatic habitat. In addition to consultation with federal, state and local agencies, consultation with tribal government(s) is recommended if applicable to the facility in question. In all cases, all surface water, marshland, wetland, and/or other water bodies that contribute to aquatic or terrestrial wildlife habitat areas within the locality of the facility should be identified. The DEQ guidance on ecological risk assessments should be consulted to evaluate potential impacts on aquatic or terrestrial wildlife

3.2 Reasonably Likely Future Beneficial Water Uses

Identification of reasonably likely future beneficial water uses requires collection of the information specified in OAR 340-122-080(3)(f). Typically, this information will be gathered from a variety of sources. A review of some of specific factors that must be considered in determining reasonably likely future beneficial uses of water follows:

Land Use: Land use is expected to be an important contributing factor in beneficial water use determinations. For example, in most cases, private residential drinking water use would not be considered reasonably likely in areas that are expected to remain industrial. Some exceptions to this include the potential for installation of municipal water supply wells in industrial areas or the use of groundwater to provide drinking water to workers at an industrial or commercial facility. This is exemplified by the Portland Well Field which includes industrial land uses. It should be cautioned that multiple land uses may exist within one area and that land use is subject to change. For more information on land use determination, consultation with DEQ Guidance for Consideration of Land Use is recommended.

Example of Land Use as a Factor

Background: A facility is located in an industrial area. An evaluation of land use information using DEQ's guidance on land use indicates that properties within the locality of the facility are reasonably likely to remain industrial. Water use in the locality of the facility is limited to industrial uses and the local municipality has indicated that they have no plans to install water supply wells in the area.

Results: In part because land use in the locality of the facility is expected to remain industrial, the current and reasonably likely future water use in the locality of the facility is considered to be industrial.

Current and Historic Water Uses: Current and historic water uses (including uses within the region) must be considered when evaluating reasonably likely future uses in the locality of the facility. WRD well logs, well abandonment records and water rights information should be consulted to identify historic water use. If possible, the evaluation of previously abandoned water use(s) should include inquiries into the rationale for discontinuation. For example, groundwater may have been used in the past for drinking water; however, once public water became available to properties in the area, private well drinking water use was discontinued due to poor yield and natural quality. In this instance, it is unlikely that water will be used in the future for drinking water purposes. In contrast, if the discontinuation was related to the presence of contamination, the historic use may be considered a reasonably likely future water use.

In evaluating the relevance of current and historic water uses in the region to uses within the locality of the facility, attention should be given to similarities and differences in geographic features such as land use, facility operations, aquifer productivity, and proximity to surface water bodies. These considerations often determine whether groundwater or surface water is reasonably likely to be used in the locality of the facility.

Example of Current and Historic Water Uses as a Factor

Background: A release of hazardous substances has impacted water, specifically a shallow aquifer underlying the facility and several adjacent properties. Based on groundwater sampling information and analysis of contaminant migration potential, the locality of the facility was determined to be confined to the source property and one adjoining property. Although a deeper aquifer was identified, contaminant fate and transport analysis indicates the deeper aquifer is not reasonably likely to be impacted. In the past, the adjoining property and all properties within a one-mile radius of the site have utilized the deeper aquifer for drinking water purposes; none have used the shallow aquifer, even though the shallow aquifer is a suitable drinking water source based on aquifer yield and natural water quality.

Results: Based on this information, the shallow aquifer is not reasonably likely to be used for drinking water based in part on patterns of water use (e.g., a demonstrated historic preference for use of the deeper aquifer). Therefore, in this case, remedial action objectives for the contaminated aquifer might include measures designed to address other beneficial uses of water, if present, and measures designed to prevent migration of the contaminants to the deep aquifer.

Trends in Land and Water Uses: Trends in land and water use should be identified by comparing historic uses with current uses, and by considering regional trends and patterns in water use. For example, if there is a trend away from the use of private industrial water supply wells towards the use of municipally-supplied water, then industrial water use may not be reasonably likely to occur in the future. Similarly, if there is a regional trend towards installation of irrigation wells for landscaping purposes (e.g., to replace or supplement an existing public water service), then the use of groundwater for landscaping purposes may be reasonably likely to occur in the future.

Example of Trends in Land and Water Use as a Factor

Background: Consultation with WRD records identifies a number of abandoned industrial water supply wells within a one-mile radius of a site. Use of the water wells was discontinued following the installation of a municipal water supply main to the area approximately 25 years earlier. According to WRD records, approximately half the water wells were subsequently abandoned. Three years ago, one of the industrial wells was reactivated. According to the owner, this reactivation was due to an anticipated increase in the cost of municipally-supplied water. Although there was an earlier trend towards the use of municipal water for industrial purposes, this trend has been reversed in at least one instance. In addition, many of the existing wells within the region have not been abandoned.

Results: Based in part upon this information, industrial use of groundwater in the locality of the facility is considered to be a reasonably likely future beneficial use of water.

Federal, State or Local Regulation and Management: In some instances, federal, state or local regulations may influence reasonably likely future water use. For example, some water uses may be expressly prohibited and are thus not reasonably likely to occur. Examples include requirements that water supply wells be located a minimum distance from septic systems or sewer lines and Water Resource Department special use requirements. In addition, local government regulations may be applicable. If, for example, local government restrictions or prohibitions have been adopted which impact installation or use of private water supply wells, the impact of these restrictions and prohibitions should be considered to the extent that the regulations are expected to remain in force.

Water Rights: Water rights in Oregon are apportioned by the Water Resource Department (WRD). WRD should be contacted to identify all water rights (both instream and out of stream) and whether the facility is located in a critical groundwater use in which further appropriations may be temporarily or permanently limited or prohibited due to over allocation of the resource or other water resource concerns. It should be noted that WRD permits for water use are not required in all instances. For example, the installation of water wells for single or group domestic purposes which use less than 15,000 gallons per day, industrial or commercial use less than 5000 gallons per day or watering any lawn or noncommercial garden less than one half acre do not require permits from WRD.

Population Projections: Increases in regional and local population will place added demands on water resources. This may cause local water suppliers to consider alternate water supplies such as the installation of municipal well fields or surface water intakes. In addition, increased demand may result in an increase in water rates resulting in efforts to use alternate water sources (e.g., installation of landscape irrigation wells or conversion of industrial water users from municipal water to groundwater or surface water). The scope of inquiry into population projections necessary for determining reasonably likely future beneficial uses of water will vary by site. Potential sources of information on population projections, and their impact on water resources, include local government planning agencies and public drinking water supply system managers.

Development Trends and Patterns: Regional and local development trends and patterns may result in changes in land or water use. For example, agricultural land within a city's urban growth boundary may be transitioning to residential and mixed uses. Consequently, new agricultural water uses may not be reasonably likely. Other important trends to be considered, if applicable, may include: the transition of industrial waterfront property to other uses including residential developments; and the conversion of existing municipal water supply uses to private wells or surface water intakes (including, but not limited to, use of water for landscaping associated with parks and commercial and industrial properties). Again, the scope of inquiry into development trends and patterns will vary by site and local government planning agencies represent a starting point for inquiries.

Alternate Water Supply Availability: In many cases, more than one source of water will be available for use. For example, both publicly supplied water and groundwater may be available for use as a drinking water supply. In most cases, public water supply users would not reasonably be expected to consider alternate drinking water supplies (e.g., groundwater) in the absence of significant changes in land and water use patterns. In addition, users of a high quality, high productivity aquifer would not be expected to tap into an aquifer which is lower in natural water quality or productivity in the absence of outside influences.

Example of Alternate Water Supplies as a Factor

Background: A facility is located in an industrial area outside a small town. Contamination has spread beyond the source property to surrounding residential properties. The surrounding properties utilized groundwater for drinking water purposes until approximately 15 years ago when municipal water became available. Due to the naturally high iron and manganese content of the water, every residence within the locality of the facility elected to connect to the municipal water supply. As a condition of connection, the supply wells were disconnected from the household water supply. However, a number of the residents continue to use groundwater for irrigating lawns and gardens and outdoor cleaning (e.g., cars, decks, and lawn furniture).

Results: In part due to availability of municipally-supplied water, it is determined that domestic drinking water use is not reasonably likely to occur in the future. However, household irrigation and outdoor cleaning are determined to be current and reasonably likely future beneficial water uses.

Concerns of Community and Nearby Property Owners: The beneficial water use determination must consider concerns of the community and nearby property owners regarding future water use. This inquiry should be made on two levels: First, during the RI, an effort should be made to identify concerns of the community and nearby property owners regarding current and reasonably likely future water uses. In general, this should be accomplished through direct contact such as door-to-door survey or mailings.

Second, concerns of the community and nearby property owners should be addressed during the public comment period required at the time a remedy is selected or approved by the Director. Special efforts should be made to inform community representatives, water supply providers and nearby property owners of proposed beneficial water use determinations by ensuring that they receive copies of the Department’s staff report and/or proposed plan outlining the recommended remedial action. If new information comes forward during the public comment period, revision of the beneficial water use determination incorporating such new information may be required.

4.0 EVALUATION OF BENEFICIAL USES OF WATER

As previously discussed, beneficial water use determinations should be based on the site hydrologic setting and consideration of specific information relevant to current and reasonably likely future uses of water in the locality of the facility. This section provides a summary of documentation required for beneficial use determinations and guidance for evaluation of current and reasonably likely future uses of water.

4.1 Information Documentation

Collection and analysis of beneficial water use information typically will be performed by the responsible party and submitted to DEQ for review and approval. DEQ anticipates that responsible parties will provide adequate documentation to support current and reasonably likely beneficial water use determinations. For this purpose, Table 2 describes suggested information sources and documentation for various beneficial water uses.

Documentation should be in the form of written material whenever possible. For example, documentation of current beneficial water uses should include WRD well logs, health division records, and maps documenting the presence of surface water bodies, wetlands and sensitive environments. Written accounts of phone conversations may suffice. In some instances, follow-up by DEQ may be necessary to confirm information collected by the responsible party. In the absence of adequate documentation, DEQ may make its own beneficial water use inquiries.

4.2 Current and Reasonably Likely Future Water Use Determinations

Current and reasonably likely future beneficial water uses should be identified considering the information previously discussed and, more specifically, the requirements of OAR 340-122-080(3)(f). In general, current and reasonably likely future water uses in the locality of the facility will include: a) water uses that presently exist and b) water uses that are reasonably likely to occur in the future considering yield, natural water quality, current and reasonably likely land use, and regional patterns and trends in water use.

The following points are noted as generally applicable to evaluation of current and reasonably likely future uses of water:

- although all beneficial water uses may be thought of as theoretically possible for given facility, it is important to remember that, typically, only a subset will be identified as currently present or reasonably likely to occur in the future.

- although all of the information specified in OAR 340-122-080(3)(f) must be considered in determining current and reasonably likely future beneficial uses, as a practical matter, some facts and factors will be particularly pertinent to specific determinations. For example, in some cases, potential water uses may be readily eliminated. (e.g., agricultural water uses within urban areas usually will not be considered reasonably likely unless residents are currently withdrawing water for home garden or other agricultural uses).

- in many cases, individual pieces of potentially relevant evidence obtained may be in conflict with other collected information. In general, greater weight will be given to information representative of conditions close to the hazardous substance release and lesser weight to information that is more general in nature or is more geographically removed from the facility.

- existing uses of regional resources currently impacted or reasonably likely to be impacted in the future will be considered relevant in determining reasonably likely future uses of water in the locality of the facility.

- factual information will be given greater weight compared to wholly speculative information. For example, information regarding actual water use in the area, aquifer yield and natural water quality and restrictions on water use typically will be given more weight than speculative statements of planned water use by property owners.

- finally, as previously discussed, simplified or streamlined approaches to determinations of current and reasonably likely future water uses may be suitable for many facilities. Situations where a beneficial use may be simplified are discussed in Section 1.

To facilitate completion of a facility beneficial use evaluation, the checklist provided in Table 3 may be used to summarize conclusions and documentation for current and reasonably likely future beneficial uses of water.

TABLE 2
SUGGESTED WATER USE DOCUMENTATION

Water Use	Suggested Documentation and Information Sources
Drinking water	Output from WRD GRID and WRIS databases, Oregon Health Division Drinking Water Systems Section Database, EPA GIS database, and DEQ Oracle Database; field survey results; copies of relevant correspondence; and door-to-door or postcard survey results.
Irrigation	Output from WRD GRID and WRIS databases, EPA GIS database and DEQ Oracle Database, field survey results; and copies of relevant correspondence.
Livestock	Output from WRD GRID and WRIS databases' EPA GIS database, and DEQ Oracle Database; field survey results; and copies of relevant correspondence.
Industrial	Output from WRD GRID and WRIS databases; EPA GIS database; and DEQ Oracle Database; field survey results, copies of relevant correspondence; and door-to-door or postcard survey results.
Engineering	Output from WRD GRID and WRIS databases, EPA GIS database, and DEQ Oracle Database; copies of relevant correspondence; and door-to-door or postcard survey results.
Aquatic life	Summaries of Oregon Rivers Information System data, Oregon Natural Heritage Program data, DSL Wetlands Program data and DEQ Water Quality Basin Plans; Output from EPA GIS database; Oregon Department of Fish and Wildlife; National Marine Fisheries; Endangered Species Act listings; field survey results; results of ecological receptor surveys; and copies of relevant correspondence.
Recreation	Summaries of Oregon Rivers Information System data and Basin Reports; EPA GIS database output; field survey results; and copies of relevant correspondence.
Aesthetic quality	Summaries of Oregon Rivers Information System data, Oregon Natural Heritage Program data, DSL Wetlands Program data and Basin Reports; EPA GIS database output; field survey results; and copies of relevant correspondence.

TABLE 3
BENEFICIAL WATER USE CHECKLIST

Beneficial Water Use	Current Use	Future Use	Potential Justification May Include
Drinking Water	Y/N	Y/N	Land use; current use; use in geographically similar areas within the region; water rights; trends in water use; other information.
Irrigation	Y/ N	Y/ N	Land use; current use; use in geographically similar areas within the region; water rights; trends in water use; other information.
Livestock	Y/N	Y/N	Land use; current use; use in geographically similar areas; water rights; trends in water use; other information.
Industrial	Y/ N	Y/N	Land use; current use; use in geographically similar areas; water rights; trends in water use; other information.
Engineering	Y/ N	Y/ N	Land use; current use; use in geographically similar areas; water rights; trends in water use, other information.
Irrigation	Y/ N	Y/ N	Land use; current use; use in geographically similar areas; water rights; trends in water use; other information.
Aquatic Habitat	Y/ N	Y/N	Habitat evaluation, other information.
Recreation	Y/N	Y/N	Current use, other information.
Aesthetic Use	Y/ N	Y/N	Current use, other information.

Note: This checklist should be completed for all distinct water bearing zones and surface water bodies within the locality of the facility.

APPENDIX A: SUMMARY OF WATER USES

Groundwater Groundwater is defined in OAR 340-122-115 (27) as "any water, except capillary moisture, beneath the land surface or beneath the bed of any stream, lake, reservoir or other body of surface water within the boundaries of the state, whatever may be the geological formation or structure in which such water stands, flows, percolates or otherwise moves." Groundwater is a critical resource for the state of Oregon. It provides water for drinking, agriculture and industrial purposes. It also provides base flow for surface water. According to the Oregon Department of Water Resources, the demand for groundwater has doubled in Oregon within the last 20 years. This trend is expected to continue.

Surface Water Surface water is defined in OAR 340-122-115 (52) as "lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, wetlands, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon, and all other bodies, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters which do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction." Surface water use may be divided into two broad categories: instream and out-of-stream uses. Instream use refers to water left in the stream. Examples of instream uses include recreational use and aquatic habitat. Out-of-stream uses refers to uses that require withdrawal of the water from stream. Examples of out-of-stream uses include irrigation for agriculture or municipal and industrial water supplies.

Drinking Water Drinking water includes private water supply wells serving a single household, community wells which serve less than four households, water supply wells that serve businesses or schools, and public water supplies which have four or more service connections or are used by 10 or more individuals per day. Although many of the large public water suppliers in Oregon rely on surface water as their primary source, 88% of the approximately 3450 public water systems in Oregon rely on groundwater as a permanent or emergency source of drinking water. Approximately half of Oregon's population is dependent on groundwater as their primary source of drinking water.

Irrigation More water in Oregon is used for irrigation purposes than any other use. Irrigation use occurs throughout the state and includes large agricultural operations that produce crops for human consumption, city parks, small private gardens, and commercial landscaping. Many individuals that are connected to public water supplies have private wells that are used for irrigating gardens or landscaping. Many of these wells are shallow, hand dug wells which are not registered with the Oregon Water Resources Department (WRD). Surveys of property owners may be required to identify the location of these wells.

Livestock Livestock watering may be an instream or an out-of-stream use. Examples include streams and isolated livestock watering wells. Groundwater and surface water throughout the state are used to water livestock such as cattle and horses. This beneficial use includes other domestic or commercially raised animals, if applicable (e.g., mink, ostriches, rabbits, etc.)

Industrial The volume of water used for industrial purposes in Oregon is second only to irrigation uses. Manufacturing operations such as the production of semi-conductors requires the use of large volumes of high quality water. Although industries often obtain their water from public water suppliers, many industries obtain their water directly from surface water or groundwater. The use of water for industrial purposes varies widely. Industrial uses may be subdivided into the following categories:

- **Non-contact water:** Industry frequently uses water for non-contact purposes such as heating or cooling water.
- **Solvent:** Industry uses water for the steam-cleaning of parts, the cleaning of vehicles and vessels and as a solvent in industries such as the electroplating or semi-conductor industry.
- **Raw material:** Industry uses water as a raw material in the preparation of a variety of goods ranging from water-based paints to processed food and bottled water products.

Engineering The use of water for engineering purposes includes water uses that are not specific to industrial, commercial or residential purposes. An example of an engineering water use is the use of water for heat exchange. Residential homes that use heat pumps require water for heat exchange purposes. In addition, numerous heat exchange wells are located in downtown Portland serving both commercial and industrial properties. Other engineering uses may include de-watering operations and fire suppression.

Aquatic Life Water is critical to the health and viability of aquatic life. Both surface water and groundwater (in the form of surface water recharge) contribute to the overall health of aquatic systems. Examples of aquatic habitat include migratory fish passage, resident fish habitat and benthic habitats. When evaluating aquatic habitat, it is critical to also consider sediments since groundwater often flows through the sediments before discharging into surface water and because of the potential for food chain effects which begin at the benthic organism stage and work their way up to larger sport fish.

Recreation Water is critical to many recreational uses ranging from hunting and fishing to boating and swimming. Many parks and other recreational areas are located adjacent to or encompass surface water bodies.

Aesthetic Quality Surface water has an inherent aesthetic beneficial use. Aesthetic quality may be measured in terms of color, taste, clarity and temperature. Almost all surface water has an aesthetic use. Groundwater also may have aesthetic beneficial use. For example, many secondary water quality standards are based on aesthetic qualities such as taste and odor.

APPENDIX B: INFORMATION RESOURCES

This appendix discusses some of the information sources identified in Section 3 of this guidance. All data bases should be consulted with caution since information may be incomplete or inaccurate.

Two key sources of water use information are the Water Resource Department (WRD) well logs and water rights data bases. WRD requires the submittal of well logs for all wells installed in Oregon after about 1970. This includes monitoring wells, drinking water wells, irrigation wells and industrial process wells. WRD also tracks water rights in Oregon and should be consulted regarding the location of surface water intakes for drinking water, irrigation or other purposes. This information may be accessed through the WRD Water Rights Information System (WRIS) and Groundwater Resource Information Distribution (GRID) data bases. Local WRD Watermasters are may also serve as a source of water use information. The Water Resource Department can be contacted at (503) 378-8455 or toll free at 1-800 624-3199. WRD may be reached via the internet at: www.oregon.gov/OWRD/pages/index.aspx.

The Oregon Health Division is an excellent source of information on the more than 3450 public water supply systems in Oregon (public water systems are defined as those having four or more connections or are used by 10 or more individuals at least 60 days a year). The Oregon Health Division also has information on water use in the vicinity of these public water supply systems. The Health Division can be contacted at (503) 731-4000 or via the internet at www.oregon.gov/oha/ph/pages/index.aspx.

In addition to WRD records, all surface water bodies in the locality of the facility should be identified and their uses determined. In addition to site visits, the Oregon Rivers Information System (ORIS) data base maintained by Oregon Fish and Wildlife (OFW) is a useful source of information. Oregon Fish and Wildlife may be reached at (503) 872-5272 or via the internet at: www.dfw.state.or.us/. Of particular concern is the location of sensitive aquatic environments such as wetlands. Surface water bodies such as rivers and lakes and groundwater discharge points such as springs and wetlands can be identified on USGS topographic maps. Additional wetlands data may be compiled from National Wetland Inventory Maps or through the Oregon Division of State Lands (DSL) Wetlands Program.

The EPA Geographic Information System (GIS) data base may provide water use information. The data base taps into number of other compatible data bases in order to gather information on water use including the identification of wetlands, fisheries and endangered species habitat. EPA’s GIS data base can be accessed by contacting EPA Region 10 at 1-800-424-4EPA or (206) 553-1200.

Existing well surveys may be found in DEQ, EPA, the United States Geological Service (USGS) and WRD files and reports; these agencies have all performed well surveys for once purpose or another. If a well survey has been performed in the vicinity of the site in question, this may prove to be a valuable resource. Although DEQ envisions that beneficial use determinations will be a site specific determination, the information contained in DEQ approved beneficial use determinations for nearby sites will often be relevant and may result in a considerable savings in time and money.

APPENDIX C: LOCALITY OF THE FACILITY FACTORS

OAR 340-122-080(3) requires the facility characterization to identify current and reasonably likely future beneficial water uses in the locality of the facility. The locality of the facility is defined in OAR 340-122-115(34) as any point where a human or an ecological receptor contacts, or is reasonably likely to come into contact with, facility-related hazardous substances considering:

(a) The chemical and physical characteristics of the hazardous substances;
(b) Physical, meteorological, hydrogeological, and ecological characteristics that govern the tendency for hazardous substances to migrate through environmental media or to move and accumulate through food webs;
(c) Any human activities and biological processes that govern the tendency for hazardous substances to move into and through environmental media or to move and accumulate through food webs; and
(d) The time required for contaminant migration to occur based on the factors described in(a) through (c).

A brief introduction to these factors and their relevance in defining "locality of the facility" at individual sites follows.

Chemical and Physical Characteristics

The mobility of hazardous substances is controlled primarily by their chemical and physical characteristics. For organic chemicals, mobility is primarily governed by solubility, vapor pressure, abiotic and biotic degradation, sorption processes and ionization. Some properties such as solubility, vapor pressure or organic carbon partitioning coefficients (Koc) are easily found in many reference materials. In some cases, site specific information may be required. Retardation factors may be estimated through site specific measurements of the organic carbon fraction (foc) and literature estimates of Koc or site specific measurements such as batch, column or field tests. Estimates of abiotic or biotic degradation rates will typically require site specific data. Certain organic chemicals such as phenols may also be present in an ionic form and consequently more mobile than the parent compound. Under these circumstances, site specific pH measurements in conjunction with chemical specific dissociation constants will be required to estimate the mobility of ionizable organic chemicals.

For inorganic chemicals, mobility is primarily governed by chemical speciation, dissolution/precipitation reactions, oxidation/reduction, adsorption/ion exchange reactions and particle transport. Unlike organic chemicals, metals tend to exist in many forms. This is controlled by the nature of the subsurface environment. Site specific factors such as pH or redox potential (Eh) often control the ionic state of the metal and the types of precipitates that may form. Metals which form insoluble complexes are typically immobile while metals present in their ionic state are highly mobile. Due to the complex nature of subsurface environment, the chemical and physical characteristics which govern the mobility of inorganic chemicals must often be determined through site specific measurements.

Physical, Meteorological, Hydrogeological and Ecological Characteristics

The site characterization should attempt to define the physical, meteorological, hydrogeologic (hydrologic) and ecological factors at the site. These factors are likely to influence the ability of a hazardous substance to migrate or degrade once released into the environment. Physical factors of the surrounding environment include organic carbon content, pH and proximity to surface water bodies. Meteorological factors include precipitation and infiltration and the potential for flooding. Hydrogeological factors are those factors related to groundwater flow and discharge to surface water. Examples of hydrological factors include vertical and horizontal hydraulic conductivity, hydraulic gradient and flow characteristics of nearby surface water bodies. Evaluation of ecological characteristics for the purpose of identifying the locality of the facility requires an understanding of the ability of a contaminant to bioaccumulate or biomagnify in aquatic or terrestrial organisms, or be subject to microbial degradation, and whether these processes are likely to occur.

Human Activities and Biological Processes

In some cases human activities or biological processes may impact migration of contaminants of concern. For example, the installation of an water supply well or remedial groundwater system may alter the natural hydraulic gradient of the system and change the direction of contaminant migration or the rate of contaminant migration. In addition, poorly constructed and improperly decommissioned wells may serve as a conduit for contaminant migration. Biological processes should be evaluated as discussed in the previous section.

Time for Migration to Occur

When assessing the potential for contaminant migration, the time it takes for the contamination to migrate from one point to another must be considered. The assessment should consider the length of time for a contaminant plume to achieve “steady state.” For on-going releases of environmentally persistent contaminants, the length of time to achieve steady state may be quite long. For small sources of readily biodegradable contaminants, the time to achieve steady state may be relatively short. The time for migration to occur should be considered in all modeling approaches (See below).

Modeling Approaches

Modeling approaches may vary from sophisticated groundwater modeling efforts to simple leaching procedures. In some instances (e.g., old releases of relatively immobile contaminants) an assumption that the contaminant plume has achieved "steady state" (e.g. no longer migrating) may be appropriate if verified through groundwater monitoring. For sites with no surface water or groundwater contamination, leaching models may be used to determine whether the contamination is likely to migrate from soil to groundwater through subsurface infiltration or to surface water through infiltration and subsequent groundwater transport. For surface soil contamination, an evaluation of the potential for overland transport through surface run-off should be performed.

For sites with groundwater contamination and potential downgradient receptors, groundwater flow and contaminant transport modeling approaches may be necessary. Models will typically require a substantial data set including aquifer properties, physical and chemical properties of contaminants to be modeled soil data such as moisture content and organic carbon content, and spatial and temporal distribution of rates of evapotranspiration, groundwater recharge; surface water-groundwater interaction, groundwater pumping, and natural groundwater discharge. Modeling of contaminant transport results typically includes a sensitivity analysis.

Modeling may also be necessary to estimate groundwater migration to surface water. Although many models are available for the purpose of modeling discharges to surface water, most of these models were developed for the modeling of point sources and may not appropriate for estimating the impact of contaminated groundwater on surface water. Modeling groundwater impacts to surface water should consider the flux of contamination to surface water and an appropriate exposure point. It is beyond the scope of this document to provide guidance on the selection or use of groundwater models. If the use of groundwater models is contemplated, early consultation with DEQ is strongly recommended.

APPENDIX D: EXAMPLE WATER USE SURVEY FORM

Property:

Your Telephone Number for Contact by DEQ:

Check all of the boxes below that apply to your property and return by mail to the address listed below.

Historic	Current	Planned	Land activity or Use
			Residential
			Commercial
			Industrial
			Agricultural
			Recreational
			Other (Describe)
			Water Use
			Drinking Water
			Farm Crop Irrigation
			Livestock
			Vegetable Garden
			Landscape Irrigation
			Industrial Process
			Other (Describe)
			Water Source
			Public Water Supply
			Community Well
			On-Site Well
			Surface Water
			Other (Describe)

Additional Comments:

For more information contact: