MEMORANDUM

TO: Water Resources Commission

FROM: Barry Norris, Administrator

SUBJECT: Water Resources Commission Meeting
Agenda Item E, June 26, 2003

Informational Report on the Unstable Ground Water Resource and Management Options for the Amity Hills/Walnut Hill Area

I. Issue Statement

As rural development increases in the Willamette Valley, there is growing concern over the ability of ground water supplies to support new and existing uses. This is especially true of aquifers in the highlands surrounding West Salem. Over the past five years, staff have been collecting and analyzing data in an effort to determine the need to establish a Ground Water Limited Area to the North of the existing Eola Hills Ground Water Limited Area. This report briefly summarizes the results of the Department's investigation, outlines management alternatives for addressing unstable ground water levels, and recommends a course of action for the Amity Hills/Walnut Hill area of Yamhill County. *This is an informational report only; no Commission action is required*.

II. Background

In 1992 the Commission adopted modifications to the Willamette Basin Program in response to concerns about the stability of ground water supplies. The modified Basin Program designated 11 Ground Water Limited Areas (GWLA) including the Eola Hills GWLA. The only allowable uses of ground water in the basalt aquifers in the Eola Hills GWLA are exempt uses, irrigation, and rural residential fire protection systems. All new water right permits in the GWLA are limited to five years and can only be extended if the Director determines that the ground water resource can support the extended use. New irrigation permits are limited to drip or equally efficient irrigation and further limited to one acre-foot per acre per year. Attachment 1 is a map of the Eola Hills GWLA.

In early 1995 the Department was contacted concerning the expansion of a quarry located in the Amity Hills/Walnut Hill area (just north of the Eola Hills GWLA) and its potential impacts to the ground water resource. The Department, with the help of several area

residents, correlated Water Well Reports to approximately 35 wells surrounding the quarry site. Ground water levels were measured in most of the wells and the data were inconclusive; therefore, the Department took no action at that time.

In December 1996 the Friends of Yamhill County requested that the Commission expand the Eola Hills GWLA to include the Amity Hills/Walnut Hill area (See Attachment 1). The request was made in order to protect ground water supplies and existing users from increased pressure from rural residential development and potential ground water depletion. The Commission directed staff to review the matter and return with a recommendation. Staff reported back to the Commission at its May 30, 1997, meeting and recommended that the GWLA not be expanded because ground water level data were varied and inconclusive. Staff also recommended that additional ground water level data be collected for the next three to five years to better document ground water conditions in the area. The Commission accepted the staff recommendation and directed staff to hold a public meeting to share and acquire information. That meeting was held on October 7, 1997, in Amity.

The results of the Department's data collection and analysis were presented to the Commission at its August 9, 2002, meeting. The data collected since 1997 indicate the following: (1) a strong connection between ground water levels and precipitation; (2) recharge occurs fairly rapidly to both the basalt and marine sediment aquifers; and (3) areas of instability in the ground water resource. Since the Commission's August meeting, staff have presented the results of the study to area landowners; the Commission's Ground Water Advisory Committee; and the Yamhill County Board of Commissioners.

III. Discussion

A. *Hydrogeologic Setting*

There are three main hydrogeologic units in the Amity Hills/Walnut Hill area. The oldest and deepest unit is composed of marine deposited claystones, siltstones, and sandstones. The marine sediments generally provide adequate water supply for limited domestic uses. Deeper wells are likely to encounter brackish or saline water.

Overlying the marine sediments are eastward dipping basalt flows of the Columbia River Basalt (CRB) Group. The basalts may be as thick as 900 feet in parts of the Willamette Valley, but are generally much thinner in the Amity Hills/Walnut Hill area. Basalt wells in this area generally produce adequate water supply for domestic uses.

Silt, sand, and gravel make up the basin-fill sediments that overlie the basalts as they extend eastward under the Willamette Valley. This aquifer was not part of the study.

B. *Data Collection*

The Department has compiled a substantial body of ground water data in the Amity Hills/Walnut Hill area. Since 1995 water levels in 30 wells have been measured annually. By August 2002, 65 wells had been located. In the past nine months, about 20 additional wells have been located. The well locations are shown in Attachment 2. Water level

recorders were installed on two wells in the study area – one well completed in the Columbia River Basalts and one completed in the marine sediments.

In addition to data collected in the Amity Hills/Walnut Hill area, the Department has been collecting data in the adjacent Eola Hills GWLA. As part of the Department and U.S. Geological Survey Willamette Ground Water Study, approximately 80 wells have been located in the ground water limited area. Since 1996, nine of these wells have been monitored; six on a bi-monthly schedule and three with water level recorders.

C. *Precipitation and Ground Water*

Water level data from wells are analyzed to determine whether the local ground water system is responsive to rainfall. In the study area water levels generally mimic the rainfall pattern and indicate the local flow systems are receiving some annual replenishment from precipitation. However, this does not mean the aquifer and/or wells are immune to water supply problems. In this case the response indicates these are low-storage aquifer systems reliant upon local rainfall to provide storage for use later in the year. In years of inadequate recharge, users of wells must make do with existing ground water in storage until substantial rainfall years replenish the ground water system. Consequently, consecutive dry years could have a significant adverse impact on ground water supply and users.

Attachment 3 compares November through March precipitation with hydrographs from the two recorder wells in the Amity Hills/Walnut Hill area. There is a strong correlation between ground water levels at these two wells and precipitation. Attachment 3b is a hydrograph of a well completed in the basalt aquifer located on the West Side of Walnut Hill. The ground water level responds rapidly to precipitation, and the magnitude of the annual fluctuation varies from four to fourteen feet. The rapid response of ground water levels to precipitation and the magnitude of the response indicate an efficient connection to the recharge source and a low storage aquifer – an aquifer that will experience water supply problems as a result of consecutive dry years.

Attachment 3c is a hydrograph of a well completed in the marine sediments and located on the East Side of Walnut Hill. The magnitude of seasonal change in water levels is considerably smaller – about one to three feet per year. (Note the difference in vertical scales between Attachment 3b and 3c). Recharge to the marine sediments is rapid, but occurs more slowly than to the shallow basalts as noted by the more rounded curve. These data indicate this well is farther from the source of recharge. Similar to the basalt aquifer, the marine sediment aquifer is subject to depletion following consecutive dry years.

D. *Current Ground Water Conditions*

Not all wells within the Amity Hills/Walnut Hill area respond in a manner similar to the wells described above. Variations in ground water responses to stress, such as drought, above-average precipitation, or development are probably related to variations in aquifer properties from place to place. Individual basalt flows are not continuous over large areas. The basalts have been faulted and folded creating barriers to ground water flow. Not only do these geologic factors result in different responses to stress, they can also affect the rate and amount of recharge.

In a portion of the study area basalt aquifer ground water levels responded to the 2001 drought by declining approximately 40 to 50 feet. Most of the water level decline was offset by recovery the next year in response to above-average precipitation. The hydrograph for well YAMH 7144, shown on Attachment 4a, is a representative graph for this area. The response to the drought and above-average precipitation the following year indicates that the aquifer in this area has very limited storage capacity. Homeowners with wells in this area would have had water supply problems if the drought had continued for a second year. Additional development of the resource in this area will exacerbate the situation.

Wells in the basalt aquifer near the intersection of Walnut Hill Road and Three Trees Lane are showing a slight decline (See Attachment 2 for general location.). The amount of decline varies from five to twelve feet over a six-year period. Some of the decline is related to reduced precipitation. Attachment 4 shows a representative hydrograph for the Three Trees Lane area. The hydrograph in Attachment 4b, YAMH 7094, declined approximately 20 feet in response to the 2001 drought and area ground water use. The water level had risen approximately 15 feet by the following February. Overall, the water level has declined approximately 12 feet since late 1995. These data suggest use is very close to, or is exceeding, the amount of recharge. Additional development in this area will likely exacerbate the rate of decline.

Ground water level data from aquifers within the marine sediments indicate they are fairly stable at this time. Aquifers within the marine sediments are the primary source of water in a large portion of the Amity Hills/Walnut Hill area. If wells in the basalt aquifer fail over time water users will, by necessity, be required to develop wells within the marine sediment aquifer.

E. *Ground Water Management Options and Tools*

The Commission and Department have several ground water management options and tools appropriate for addressing the ground water situation in the Amity Hills/Walnut Hill area. Options for managing ground water are listed below and are discussed in detail in Attachment 5:

a. Withdrawal of the ground water resource by order of the Commission;
b. Classify the ground water resource for specific uses through a rulemaking;
c. Declare a Serious Water Management Problem Area through a rulemaking;
d. Regulate ground water use for substantial interference; and
e. Declare a critical ground water area through a rulemaking and hearing process.

Given our current knowledge of the Amity Hills/Walnut Hill ground water resource, staff believe the resource can, under the current rural residential land use patterns (minimum of five acre lots), sustain some additional domestic uses. In order to protect existing ground water users and to minimize additional pressure on the resource, staff believe it is appropriate to initiate a rulemaking that would restrictively classify the Columbia River Basalt and marine sediment aquifers in the Amity Hills/Walnut Hill area (option "b" above). Specifically, staff believe it is appropriate to initiate a rulemaking to classify these two aquifers for exempt uses only. The restrictive classification will stabilize the resource;

provide for limited "new" domestic use; provide for future modifications if necessary; and will require Yamhill County to consider ground water as a Goal 5 resource when modifying their Comprehensive Plan.

IV. Summary

Staff have been monitoring ground water levels in the Amity Hills/Walnut Hill area since 1995. The wells are completed in aquifers within the marine sediments or the Columbia River Basalts. The data indicate a strong correlation between precipitation and ground water levels, and existing use is very close to a balance with natural recharge. There are two areas of concern for ground water stability in the basalt aquifers: (1) an area of low storage that showed significant declines related to the 2001 drought; and (2) an area of water level declines where water levels have dropped 5 to 12 feet despite above-average precipitation. Basalt aquifers adjacent to these areas of concern are likely to experience instability as development of the resource proceeds. In general, ground water levels in the marine sediments are stable at this time but should be preserved for limited new domestic uses.

Staff intend to initiate rulemaking to establish the Amity Hills/Walnut Hill Ground Water Limited Area. Staff will likely propose that new ground water uses within the area be limited to exempt uses only in both the Columbia River Basalt and marine sediment aquifers. Because this is a modification to a basin program, a Commissioner must conduct one public hearing in the affected basin. Staff anticipate returning to the Commission with final proposed rules for adoption at the Commission's November meeting.

Attachments:
1. Map Showing Eola Hills Ground Water Limited Area and General Location of Amity Hills/Walnut Hill Area.
2. Location of Study Wells
3. Precipitation at Salem and Hydrographs for YAMH 672 and YAMH 599.
4. Hydrograph for Wells YAMH 7144 and YAMH 7094.
5. Ground Water Management Options.

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Attachment 5

Oregon Water Resources Commission

GROUND WATER MANAGEMENT OPTIONS

Background

The general statutory policy with respect to ground water management is to maintain ground water resources as stable and renewable water supplies, while at the same time conserving maximum supplies for new beneficial uses. The Department seeks to strike a balance between these policy objectives. Development within the capacity of the resource defines the extent to which ground water development may occur. It is important to make certain that new development does not adversely impact existing ground water uses or compromise an aquifer's capacity to sustain itself. Because ground water is essentially a hidden resource, carrying out that goal is a challenging task.

The Department's goal is to prevent ground water supply problems before they become severe and difficult to resolve. Toward that end, staff expend considerable time in data collection and analysis to better understand ground water supplies and anticipate potential problems that may arise from existing uses and new development.

Discussion

Statutes provide several options for managing ground water supply problems. Some of these tools are proactive. Others are corrective in nature. Each tool has benefits and drawbacks, and some are better suited to address specific ground water problems than others. The Department has been working hard for the last dozen years to better understand ground water resources before overuse of an aquifer occurs. Hopefully, these efforts will help to avoid the problems that result in the need to designate critical ground water areas.

A. Withdrawal of Unappropriated Waters

Authority:

ORS 536.410; OAR Chapter 690, Division 80

What it does:

The Commission may withdraw unappropriated water from further development for all or any uses under ORS 536.410. The withdrawal is created by order of the Commission after public hearing held by the Commission. The Commission may take such action if it determines that it is necessary to ensure compliance with state water policy, or in the public interest to conserve water resources.

A withdrawal order must specify the waters to be withdrawn from appropriation, as well as the uses for which the waters are withdrawn. Uses subject to a withdrawal include exempt ground water uses. The order must also state the reason for the withdrawal and its duration. The Commission may subsequently amend or revoke the order.

Strengths and limitations:

The net effect of a withdrawal is to prevent future development of the resource, unless the Commission identifies exceptions to the order. A withdrawal does not affect existing rights. A withdrawal essentially prevents a problem from getting worse, but it does not serve to correct a water supply problem. The effects of a withdrawal may be similar to that of a basin classification but the process is substantially different.

Use of program/authority:

This authority has been used sparingly. It was most recently used to temporarily stabilize demands on ground water resources in Victor Point, Parrett Mountain, and the Fort Rock Basin until other administrative actions could be implemented.

B. Classification of Water

Authority:

ORS 536.340; OAR Chapter 690, Division 500 through 520

What it does:

Ground water and surface water resources may be classified for specific uses under ORS 536.340. The effect of a classification is to designate the purposes for which unallocated water may be developed subsequent to the classification within specific river basins. Classification requires a rulemaking action involving a modification to the basin program. Whenever a basin program is amended, the Commission must conduct at least one public hearing in the affected area.

A classification may be broad, allowing a wide variety of types of use, or it may be restrictive. A very restrictive classification can prevent further development of a

ground water resource. In that regard it is similar to a withdrawal order (discussed above). The Commission may restrictively classify ground water for the "highest and best use and quantities of use thereof for the future in aid of an integrated and balance program for the benefit of the state as a whole." ORS 536.340(1)(a).

Classification can also be used to restrict new exempt uses, although the statute requires that extraordinary review measures be taken before those uses are affected. Those measures include a notice and review opportunity for legislators representing districts where the proposed action would take place, and a recommendation from the Ground Water Advisory Committee.

Strength and limitations:

A classification does not affect rights in existence at the time the rule is adopted. As such, this administrative tool can be used to stabilize the demand on a resource and prevent a problem from getting worse, but it cannot solve a water supply shortage for existing users.

Use of program/authority:

Every basin program adopted by the Commission classifies ground water. Some basin program classifications do not distinguish between surface and ground water. Others deal more specifically with ground water in parts of the basin to deter significant increases in pumping.

C. Serious Water Management Problem Area Designation

Authority:

ORS 540.435; OAR Chapter 690, Division 85

What it does:

The Serious Water Management Problem Area (SWMPA) program authorizes the Commission to require, by rule, the installation of measuring devices and the submission of an annual report by water users. The Commission may initiate a SWAMPA designation on its own motion or upon receipt of a petition from a water right holder in the area, or the Director of a state or federal agency. Before implementing a SWAMPA designation, the Commission must hold a hearing in the affected area to determine whether a problem exists, and allow affected persons an opportunity to present alternative actions.

SWAMPA designations may be made for a number of reasons, including significant ground water decline, substantial interference between wells, or frequent occurrences of ground water shortages. If the Commission determines there is a serious water management problem, it must adopt a rule that specifies the nature of the problem, boundaries of the area

involved, who is required to install measuring devices, specification for the types of measuring devices and annual reports, and timelines for implementation.

Strength and limitations:

This administrative tool does not directly resolve water supply problems; however, it can be helpful in developing better information about aquifers and the impacts of uses. The measurement data obtained through a SWAMPA designation can provide technical information needed to support subsequent management actions.

Use of program/authority:

To date, the Commission has considered pursuing a SWAMPA designation only once, in the Umatilla Basin in 1990. Rather than undergo the SWAMPA process, the affected water users developed their own water management plan.

D. Regulation for Substantial or Undue Interference

Authority:

ORS 537.775, 537.777 and 537.780; OAR 690, Divisions 8 and 9

What it does:

Whenever ground water is extracted from a well, the head—or pressure—distribution around the well is affected. The effect is conical in shape with the well being at the center of the cone. This "cone of depression", as it is called, grows both deeper and wider with time. As it does so, it eventually encounters other wells causing a drop in water level in those wells. That drop—called interference—reduces the ability of the other wells to produce water.

Interference is generally unavoidable. However, when the interference becomes undue or substantial, some form of management is necessary. Under ORS 537.775, when any well, including any well exempt under ORS 537.545, is unduly interfering with another, the Commission "…may order discontinuance of the use of the well, impose conditions upon the use of such well to such extent as may be necessary to remedy the defect or order permanent abandonment of the well…" OAR 690, Division 8, defines interference as undue or substantial when the senior appropriator cannot satisfy his or her right. However, it precludes the finding of undue interference unless the senior well fully develops the aquifer and is reasonably efficient.

Interference may also occur with surface waters. As the cone of depression caused by a ground water use spreads, it may encounter a surface water source and begin capturing some of that surface water. ORS 537.775 offers the same regulatory remedy for the interference of a ground water use on a surface water right.

ORS 537.777 requires that ground water be distributed as much as possible in the same manner as surface water. When a ground water user complains of inadequate water supply,

Department staff make a determination as to the cause of the shortage. If the cause is undue or substantial interference, junior ground water rights are regulated to the benefit of senior rights.

Strengths and limitations:

Regulation for substantial interference provides an effective means to respond to specific instances of ground water supply problems between water users. This tool may not be as effective in responding to larger-scale ground water supply problems.

E. Critical Ground Water Area Designations

Authority:

ORS 537.730 to 537.742

What it does:

Sometimes ground water problems become severe enough that a reduction in existing water use is necessary to preserve the resource or protect senior rights. Apart from regulation due to substantial interference as discussed above, the only other tool that allows the Department to cut back on existing use of ground water is the Critical Ground Water Area (CGWA) designation.

A CGWA designation may be used when some aspect of the ground water supply is out of balance and the imbalance can be corrected by controlling the rate or amount of ground water pumpage. ORS 537.730(1) lists the conditions that merit CGWA designation:

- Excessive ground water level declines;.
- Pattern of substantial interference between wells;.
- Pattern of actual or potential interference with geothermal production;
- Pattern of substantial interference with surface rights or with a surface water source whose further development is restricted when that restriction has an effective date earlier than the ground water priority date;
- Overdraft;
- Ground Water purity deterioration; or
- Potential or actual significant ground water temperature alteration.

Critical area designation is a two-step process. The first step is rule development to establish the boundaries within which one or more of the above conditions exist. The rule may also close the area to any additional appropriation, specify how much water may be appropriated from within the boundary and impose any additional

requirements the Commission deems necessary consistent with the intent of the Ground Water Act.

After rulemaking, the Commission may initiate a contested case to which all affected water right holders are party. The purpose of the contested case proceeding is to determine limitations to the types and amounts of ground water uses that may continue under the CGWA designation. Examples of measures that may be considered include limiting use by order of priority, establishing preferences for specific types of uses, reducing or stopping the use of water for specific users or wells, or requiring a rotation of use system. After the contested case, if the Commission finds that the problems that resulted in the designation can be resolved by corrective measures, the Commission must issue an order specifying the measures that will be taken to limit water use.

Strengths and limitations:

A CGWA designation serves as a corrective tool. It can redistribute and reduce ground water use. It can permanently reduce or eliminate certain types of uses or use by certain water rights. Because of these outcomes, a CGWA designation can be very disruptive to local economies and individual water users and is often resisted by ground water users. A CGWA designation requires significant staff time in rulemaking, a contested case proceeding, and implementation and management of the critical area.