



Palouse Basin Aquifer Committee

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June 19, 2007 Meeting Minutes

Pullman City Hall, East End (Large) Conference Room

Attendance

X	UI: Michael Holthaus (Vice Chair), Water Systems Manager	X	WSU: Keith Bloom Director, Const Servs, Cap Plan Dev
X	UI: Joe Kline, Director, Utilities and Engineering	X	WSU: Rob Corcoran, Asst Dir, Arch, Engr & Const Services
X	Moscow: Tom Scallorn, Water Dept Superintendent	X	Pullman: Mark Workman, Director of Public Works
	Moscow: Aaron Ament, City Council Member		Pullman: Art Garro, Maintenance & Operations Superintendent
X	Moscow: Les MacDonald, Director of Public Works	X	Pullman: Barney Waldrop, City Council Member
X	Latah County: Paul Kimmell Citizen and County Representative	X	Whitman County: Mark Storey (Chair), Director of Public Works
X	Latah County: Tom Stroschein, County Commissioner		Whitman County: Jerry Finch, County Commissioner
X	Colfax: Carl Thompson, City Administrator		Colfax: Andy Rogers, Public Works Supervisor

Visitors and Others

Jerry Fairley, UI/CAG; Bob Haynes, IDWR; Guy Gregory, WDOE; Alyssa Douglas, Golder; Steve Robischon, PBAC.

Call to Order

Mark Storey, PBAC Chair, called the meeting to order at 2:01 pm.

1) Approval of the May 17, 2007 Meeting Minutes

The May minutes were approved by consensus.

2) Unfinished Business

Project for WRIA Funding

Robischon reported that PBAC had contributed two project proposals to the WRIA 34 Planning Unit to be forwarded to WDOE for funding consideration. The top priority project is the "Framework" project first proposed in December by Jarry Fairley. In order to fit the format requested by DOE, the budget was re-categorized; otherwise the project scope remains as first proposed. The second project (3rd priority at the Planning Unit) involves the construction of 1 to 5 monitoring wells. Locations include the WSU

Cunningham Farm, Kamiak Gap, Fourmile Gap, Whitman County Landfill, and Staley (north and west of Bald Butte). Gregory reported that the WDOE Eastern Region will meet to prioritize projects from all Planning Units within the region. The regional list will then be forwarded to Olympia for further consideration.

FY07-08 Budget

Robischon handed out a draft FY07-08 budget based upon the assumption of approved administrative fee increases. Discussion ensued related to whether the individual entities plan to approve the increased funds. With the exception of Colfax and Moscow, general consensus was that all entities will approve the increases. Colfax and Moscow have not yet brought the issue to their councils. Thompson indicated that the Colfax council will likely be able to consider the request at their next meeting, and MacDonald noted that the Moscow budget hearings will be held the third week of July. A motion was approved to table voting on the administrative resolution until next month.

PBAC Funding Resolution

As indicated above, the group tabled voting on the proposed resolution until next month's PBAC meeting.

PBAC Research Funding Addendum

Five original copies of the research funding addendum were provided to Workman. The CEO of each entity will sign all five copies and circulate to the next entity until all four required signatures (Pullman, Moscow, WSU, UI) are obtained.

3) New Business

Supplemental Water Options

Kline presented a summary of a conceptual view of the aquifer system. An outline of his presentation is attached to this document. He also handed out a table updating an earlier one provided by Larry Kirkland. The updated table groups options at a higher level of aggregation than the earlier table and includes a column noting "issues" with each option.

Considerable discussion ensued amongst the group. Discussion was terminated by chairman Storey in the desire of moving forward with the remaining agenda items.

FY07-08 PBAC Research Projects

Members discussed further consideration of the preliminary project proposals: "Evaluating Falling Aquifer Levels in the Grande Ronde Aquifer", and "Decision Support for Developing a Water Supply and Use Plan". The group decided to not pursue either project at this time. In the event that the WRIA "Framework" project is not funded, PBAC may consider either issuing a new call for proposals or funding some portion of the "Framework" project.

North Fork Instream Flow

Storey reported on the process and its status. Discussions are centering upon water reservations and allocations, and the local group is attempting to work with the Washington DOE and DFW with the goal of arriving at mutually agreeable levels. The WRIA 34 Planning Unit will not include a recommendation in the Watershed Plan for now.

FY07-08 PBAC Officers

The group unanimously approved Mike Holthaus as Chairman and Mark Workman as Vice Chairman for FY07-08.

4) PBAC Projects Progress Report

Robischon reported on research project progress. Chad Opatz has submitted a second draft of his thesis (UI #2 passive connector well). Aaren Fiedler continues to conduct Grande Ronde monitoring, has installed a new data logger in Palouse well #1, and will be analyzing the pump tests conducted earlier in the year. Hannah Hernandez (Wanapum monitoring/testing) is out of town for the summer and hopes to return in the fall to defend her thesis.

5) Citizens Advisory Group Report

Robischon reported that the CAG continues to focus on conservation and will invite representatives from Pullman, Moscow, Colfax and Palouse to their next meeting to discuss conservation efforts in their cities.

6) Budget Report

Robischon reported a continuing administrative budget deficit totalling approximately \$22K through May.

7) Other Reports and Announcements

Northern Idaho Adjudication Workshops

Kimmell reported that The Idaho Farm Bureau had teamed with IDWR to conduct two northern Idaho adjudication workshops. The first workshop, scheduled in Sandpoint, was postponed as the meeting location could not accommodate all who showed up. Over 100 people attended the second workshop (in Plummer). The Sandpoint workshop has been rescheduled for July 16.

WRIA 34 Planning Unit

This item was discussed under the first item of Unfinished Business (Projects for WRIA Funding)

2007 Water Summit

Robischon displayed the draft agenda for the October 2 Summit. A Planning Committee meeting to refine the agenda is scheduled for June 20. Committee co-chairman Stroschein invited all interested parties.

Environmental Science Senior Theses Posters

Robischon displayed items on the PBAC web site linked to two UI environmental science students' senior theses posters: "Stretch Potential With Data Loggers Reel Material" by Jon Jacobson and "Boundary Conditions Between Moscow and Pullman" by Chelsea Sherman

Landscape Architecture Moscow Reservoir Project Reservoir Design Presentations

Robischon reported that a UI landscape architecture class had conducted the final presentations of their multi-use reservoir designs. The participants are hoping to be able to present their work at the October 2 Water Summit.

Engineering Hydrology Reservoir Discharge Projects

Robischon reported that a UI civil engineering class had undertaken projects to determine design storage volumes and discharges for reservoirs at 4 different sites on the north and south sides of Moscow Mountain. The content of three of the four reports was not of high enough quality for distribution, but this coming year there may be an opportunity to enlist the efforts of a WoW graduate student to correct the deficiencies.

8) Next Meeting Date

The next regular meeting of PBAC is scheduled for

July 19, 2007

Moscow UI Facilities Services Center, Jack's Creek Meeting Room, 2:00 PM

9) Adjournment

The meeting was adjourned at 4:18 PM.

Reviewed and Approved at the August 16, 2007 PBAC meeting.

Steve Robischon, Executive Manager

Assessment Income				
	Administrative	Research	Total	
Whitman County	\$5,000		\$5,000	Whitman
Latah County	\$5,000		\$5,000	Latah
Pullman	\$20,000	\$20,000	\$40,000	Pullman
Moscow	\$20,000	\$20,000	\$40,000	Moscow
Colfax	\$5,000		\$5,000	Colfax
Washington State	\$20,000	\$20,000	\$40,000	WSU
University of Idaho	\$20,000	\$20,000	\$40,000	UI
	\$95,000	\$80,000	\$175,000	

Summary FY07-08 Budget

<i>Income</i>	Administrative	95,000	Income
	Research	80,000	
	Total	175,000	
<i>Expenses</i>	<i>Administrative</i>		Expenses
	Salaries	41,500	
	Fringes	15,000	
	Monitoring	16,000	
	UI Support Fee	3,500	
	Annual Report	4,000	
	Office Support/Supplies	1,200	
	Synoptic Logistics	4,500	
	Misc/Contingency	2,500	
	Subtotal	88,200	
	<i>Research</i>		
	Shallow System	12,000	
	Deep System	12,000	
	New Projects	50,000	
	Subtotal	74,000	
	Total	162,200	

Admin Balance	+ \$ 6,800
Research Balance	+ \$ 6,000
Total FY08 Balance	+ \$12,800

OPTIONS FOR SUPPLEMENTAL WATER FOR THE PALOUSE REGION

Supplemental Water Sources:	Issues:	Pro's/Con's	Costs:	Data needed for Regulators
Snow Melt/Rain Water Capture	Water Rights, Real Estate, Venti Quantity Available, Water Balance			
North Fork Water	Water Rights, Quantity Available			
Snake/Clean Water	Water Rights, Quantity Available Water Rights, Technology to Treat to Acceptable Quality			
WWTP Effluent				

Storage and Recovery Options:	Issues:
Surface Storage (Lake/Ponds)	Real Estate, Treatment Requirements Extents of shallow aquifer/sub- basins, gradient, flow rate, treatment prior to injection/recharge, shallow capacity, shallow-deep connectivity
Shallow Aquifer Storage	Extents of deep aquifer/sub- basins, gradient, flow rate, treatment prior to injection
Deep Aquifer Storage	
* Passive recharge from Surface to Shallow	Ability of soils to clean water, identify or create recharge zones
* Recharge from Shallow to Deep	Quality of shallow water, Legal issues of cross connecting

* Includes requirements noted above for Surface, Shallow, or Deep

EVALUATING FALLING WATER LEVELS IN THE GRANDE RONDE AQUIFER
A research pre-proposal to PBAC
PI: Jerry Fairley, University of Idaho

1.0 PROBLEM STATEMENT

It is common knowledge that water levels in the Grande Ronde aquifer system have been falling for as long as records have been kept in the Palouse Basin [e.g., PBAC 1999, 2001]. Recently, however, water levels in some Grande Ronde wells have given the appearance of declining at a slower rate with time, raising the possibility that the aquifer may be stabilizing at current pumping rates. Unfortunately, the record of apparent stabilization is too short to draw defensible conclusions about the long-term behavior of the aquifer without a detailed statistical analysis. **The objective of the proposed study is to determine if the apparent change in Grande Ronde water levels is statistically significant; i.e., do recent patterns of aquifer water level declines differ from historic patterns sufficiently to indicate a sustained shift in trend?**

2.0 BACKGROUND

Little, if any, quantitative analysis has been done on Grande Ronde water levels. The large amount of noise in the available data (e.g., noise from pumping wells, well interference, barometric pressure changes), the complexity of the aquifer, and the ambiguity regarding what data from any one well actually represent (primarily due to the practice of screening individual wells in multiple aquifers) have made analysis using deterministic techniques difficult, if not impossible. To circumvent these difficulties we propose to use the ARIMA (AutoRegressive Integrated Moving Average, sometimes called “Box—Jenkins” models) family of stochastic (statistical) models to analyze time-series water level data from individual wells. The results from individual wells will be aggregated to evaluate the present and probable near-future state of the Grande Ronde water level declines.

ARIMA models are a well-known family of stochastic predictive models that are commonly employed in forecasting and trend analysis in economics, inventory control, hydrologic (surface water) modeling, and many other physical and social sciences. The first authoritative description of ARIMA models was published by Box and Jenkins [1976], who showed that ARIMA models produce “optimal” univariate forecasts, i.e., “...no other standard single-series model can give forecasts with a smaller mean-squared forecast error...” [Pankratz, 1983]. The optimal nature of ARIMA models, history of application to noisy data sets, and low computational overhead make them ideal for the analysis of Grande Ronde water levels.

3.0 METHODS

The general strategy for ARIMA model development as described by Box and Jenkins [1976] consists of three stages: model identification, parameter estimation, and diagnostic checking. In this section we describe the steps necessary to apply this methodology to the Grande Ronde aquifer data, along with some required preparatory work.

3.1 Preliminary Data Evaluation. Some water level data is available for about 16 wells in the Palouse Basin Grande Ronde aquifer; however, before these data can be analyzed it will be necessary to reformat the files and check the data for outliers, drop-outs (missing data points), and other irregularities. ARIMA models require regularly spaced data points; therefore, a weighted filtering scheme will be developed to map multiple data points and/or irregularly spaced points onto an appropriate time interval. Any data sets not appropriate to ARIMA modeling will be weeded out at this stage, so as to avoid wasted effort at a later date. Completion of this task is estimated to require three to four months of effort. **Product:** Checked, cleaned and sampled data sets for all appropriate wells (can be made an electronic deliverable at PBAC's request).

3.2 Initial Model Identification, Estimation, and Diagnostic Checking. One to three of the most promising data sets will be selected as test cases for ARIMA model development. Initial (demonstration) data sets will be identified during the preliminary data evaluation (task 3.1 above), and selected on the basis of completeness, demonstration of apparent change in trend, and relevance to groundwater management goals (e.g., wells located in or near a pumping center, screened in a primary aquifer unit, etc.). ARIMA models will be developed for each of the demonstration data sets following the Box-Jenkins methodology (identification of an appropriate ARIMA model type, parameter fitting based on conditioning data, and diagnostic checking for statistical adequacy, e.g., uncorrelated residuals, *pseudo-ex ante* forecasting, etc.); fitting parameters for the model(s) will be developed from data points prior to the apparent change in trend, leaving the most recent data (i.e., those demonstrating the hypothesized change in trend) free for significance testing (described in following section). Completion of this task is estimated to require approximately four to six months of effort. **Product:** One to three ARIMA models of Grande Ronde aquifer levels in selected wells, accompanied by a brief, non- to moderately-technical description of model development, parameterization, and performance on statistical checks.

3.3 Trend Deviation Significance Testing. A large number (between 100 and 1000) of ARIMA simulations will be run using the model(s) developed in task 3.2, beginning from the last data point used in model calibration and continuing for a time-span equal to the available data record. These simulations will form a statistical sampling of possible water level trends, (*pseudo-ex ante*) forecast on the basis of the conditioning data; this proposed methodology is a variation on the well-known "Monte Carlo" method of statistical analysis. The actual, measured water levels will be tested against the statistical distribution of simulated water levels to test the hypothesis that the measured water levels are significantly different than the predicted ones, and thus represent an actual change in the rate of water level decline in the Grande Ronde aquifer (specific to the well analyzed). It is estimated that two to four months will be necessary to complete this task. **Product:** A written report summarizing the ARIMA modeling and describing the results of trend significance testing and likely implications for water management in the Palouse Basin.

4.0 TIMING OF DELIVERABLES

We anticipate that the work outlined in tasks 3.1 – 3.3 above can be completed by 30 June, 2008, and suggest a due date for the final report to PBAC of 30 August 2008, assuming a 15 August 2007 start date. Should the analyses described above require less time than expected, work will begin on extending the analysis to the remaining data sets. For a defensible analysis we suggest that all appropriate data sets be analyzed; because the methodology will already be established, we estimate the complete analysis will require an additional four to six months. This additional work is not considered part of the present proposal, but may be negotiated as additional scope at the discretion of PBAC and the PI.

5.0 PRELIMINARY BUDGET ESTIMATE

The following budget reflects the estimated costs of supporting a graduate student to complete the majority of the work described above. It does not include F&A, costs for report production, dissemination, oral reporting to PBAC or the PI's investment of time and effort in the project; reasonable costs of this nature will be born by the PI. If significant expenditures of this type will be necessary, PBAC may make their requirements clear to the PI, and a revised budget will be prepared for PBAC's review.

Personnel	Description	Cost
Graduate student stipend	12 months, \$1,500/month	\$18,000
Graduate fees & health ins	2 semesters, \$2,966/sem	\$5,932
Total		\$23,932

6.0 References

- Pankratz, A., 1983. *Forecasting with Univariate Box-Jenkins Models: Concepts and Cases*. Wiley Series in Probability and Statistics, John Wiley and Sons, New York. 576 p.
- Box, G.E.P., and G. M. Jenkins, 1976. *Time Series Analysis: Forecasting and Control*. Holden-Day Publishers, San Francisco. 575 p.
- PBAC, 1999. *Annual Water Use Report*. Palouse Basin Aquifer Committee. 40 p.
- PBAC, 2001. *2000 Annual Report of the Palouse Basin Aquifer Committee: Water Use in the Palouse Basin*. Palouse Basin Aquifer Committee. 20 p.

preliminary proposal:

Decision Support for Developing a Water Supply and Use Plan

Fritz R. Fiedler*, Chuck Harris

Water Resources Program, University of Idaho

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Introduction

Consistent with the concept of sustainability, PBAC has adopted a goal of balancing water supply and water use in the Palouse Basin, which calls for the creation of “an action plan for aquifer system enhancement and alternate water supply development by 2010.” Over the years, many disparate solutions to declining aquifer water levels have been proposed, including artificial and enhanced recharge, connector wells, reservoirs in the basin, importing water from other basins, changes in agricultural practices, rainwater harvesting, wastewater re-use, and conservation. The complexities of the natural water resources system will in part determine which of these solution approaches will be feasible, and where in the basin they might work. Additionally, the geopolitical situation, with multiple entities involved in decision making, will also affect how basin water resources are managed. For example, Pullman is currently in the initial planning phase of an Aquifer Storage and Recovery project, and Moscow is considering potential surface reservoir sites. Finally, current and future water uses, demand, and related human activities will affect the feasibility, cost-effectiveness, and social acceptability of possible actions that could be taken to meet water resources needs identified.

Given these realities, it is likely that a number of different solutions eventually will be implemented. Analysis of the cumulative effects of numerous and interacting decisions (or potential decisions) is possible with a decision support tool, one that provides a “best-determination” of the efficiency, cost and effectiveness of combined solution-packages or action programs. The work described in this pre-proposal would allow PBAC to support and play an active role in the development of such a decision support tool and its use for coordinated, integrated basin-wide decision-making.

Proposed Work

We propose to develop a decision support tool that would help PBAC better understand the integrated sustainability of water resources in the Palouse Basin, given our current understanding and projections of water supply and use in the basin. This tool would be configured, using input from PBAC, to evaluate several “what if” scenarios regarding water resources development and long-term sustainability. For example, a scenario *might* include:

- A current best estimate of the basin water balance;
- A 3% population growth rate;
- Decreasing per capita water demand 20% in 10 years in Moscow because of an aggressive domestic conservation effort;
- Decreasing water demand in the municipal water districts due to increased price of water using price elasticity estimates;
- ASR implemented in Pullman in the year 2015;
- Projected increase in economic activity of 40% every 10 years due to additional major industrial users and associated water use; and
- A 5% increase in dispersed recharge through a change in farming practices (no-till).

The combined effects of future activities are difficult to visualize, given the multiple, interacting factors and feedbacks involved. The decision support tool would integrate the estimated effects of various combinations of factors on basin water resources, based on supply and demand projections for, say, 10 years, 25 years, and 50 years into the future.

In addition to scenario analysis, this tool will help focus and direct future research efforts, reducing uncertainty in key areas. For example, one simple yet important characteristic of our aquifers that is highly uncertain is the volume of water that they contain: the greater the volume of water available now, even if recharge is negligible, the longer the period of time available to plan and implement solutions. Current estimates of water volume vary over orders of magnitude, and our preliminary models (based on existing research, much of it funded by PBAC) indicate that the basin's aquifers could be depleted any time from tens of years to several hundred years. These differences have major implications for decision making and planning. The decision support tool would clearly and graphically show the effects and the assumptions on which they are based, and could be used, for example, to support aquifer studies that improve our understanding the volume of water they contain.

In supporting this project, PBAC would be instrumental in:

- Conceptualizing and defining a basin water resources balance (both supply and demand), which forms the foundation for the tool, based on best available knowledge and previous PBAC research,
- Developing and defining scenarios analyzed with the decision tool, and
- Using the tool to help guide development of a Water Supply and Use Plan.

Budget and Timeline

We propose a highly collaborative, two-year effort between PBAC and the interdisciplinary team of researchers conducting the Water of the West (WoW) Strategic Initiative at the University of Idaho. In this preliminary proposal, we suggest that PBAC assist WoW in funding one to two MS students contributing to an interdisciplinary team for tool development. When adequate funding exists, we are providing excellent MS students with a \$20,000/year stipend, and tuition/fees are approximately \$5000 per year. At a minimum, we would expect PBAC to contribute 50% support for one student. If invited to submit a full proposal, we will work with PBAC to more clearly define the appropriate funding level, depending on availability of such funding. Second year funding will be contingent upon adequate progress and approval to continue by PBAC.

Year one tasks would include completion of a basin-wide water balance model of supply and demand, as well as meetings with PBAC on development of the model and preliminary scenarios for inclusion in the impact analysis process; the results of that analysis and the decision tool would be presented both as a written report and in a presentation to PBAC. Year two would include further tool development, training and applications sessions with input from PBAC, as well as a report on the results of this process that would include the implications of those results for future water resources action planning.