

Dale's testimony on May 29, 2009

1. Education and Professional Experience

2. Dr Ralston would you please state your full name and place of residence
3. Could you describe your educational background as it relates to your knowledge of hydrology, geology, hydrogeology, geophysics, geochemistry, groundwater data and geophysical data analysis, well construction and testing, and aquifer studies?
- 4.
5. Are you licensed to practice civil engineering and geology in Idaho?
- 6.
7. Could you describe your education and background as to modeling groundwater resources?
- 8.
9. Can you describe your education and experience in reviewing groundwater and geophysical data and analysis?
- 10.
11. Please describe your education experience in assessing the long term performance of an aquifer?

12. General Outline

- a. Analysis of the hydrogeologic conceptual model
 - i. General approach
 - ii. M3 Eagle approach
 - iii. Uncertainty analysis
- b. Analysis of the ground-water flow system
- c. Analysis of the numerical flow model
- d. Overall assessment of uncertainty
- e. Conclusions and recommendations

13. Analysis of the hydrogeologic conceptual model

- a. General development of Hydrogeologic Conceptual Model
 - i. Based on depositional environment for unconsolidated sediments
 - ii. Sequential steps of data collection and analysis and subsequent revision or modification of the hydrogeologic conceptual model
 - iii. Example would be valley sediments in the river valleys tributary to Coeur d'Alene Lake in northern Idaho – lower aquifer representing moderate to high energy sediments of the river valleys, a middle confining layer representing the extensive period of time when the lake level was considerably



higher than present day – and an upper aquifer composed of modern day alluvial sediments associated with the two rivers. Same hydrogeologic conceptual model in both valleys because of the similar depositional environments.

b. M3 Eagle hydrogeologic conceptual model

- i. Deposition of sand in a delta system – called the Pierce Gulch Sand Aquifer**
- ii. Described as a 150-275 foot thick sequence of stratified sand layers with inter-bedded thin and locally discontinuous layers of silt and clay – dips to southwest. The unit is shown in cross sections and in a plan map that shows contours of the bottom of the unit. No additional plan view maps are presented that show the lateral extent of the PGSA**
- iii. 2007 report says that the PGSA underlies the north Ada County Foothills and extends continuously from the Eagle-Star area of the Payette River Valley**
- iv. Bounded on the northeast by the West Boise – Eagle fault and north of the M3 Eagle area where the water-level elevation is equal to the bottom of the aquifer.**
- v. Some description of hydraulic connection to surface water systems is provided.**

c. Uncertainty relative to the hydrogeologic M3 Eagle hydrogeologic conceptual model

- i. I have not found any compelling discussion of a depositional environment that would result in the Pierce Gulch Sand unit extending and being laterally continuous from the M3 Eagle property to the Payette River Valley. Hydrogeologic data from wells also is not sufficient.**
- ii. The West Boise – Eagle Fault appears to form a boundary to the aquifer on the northeast.**
- iii. There is sufficient evidence to support the presence of an unsaturated aquifer boundary trending east-southeast to west-northwest within the Eagle property. Essentially no data are presented to support the boundary of the PGSA more than about one mile northwest of the M3 Eagle site.**
- iv. No information given relative to the southern and western boundaries of the PGSA.**
- v. I conclude that there is insufficient evidence to support the assumption that the PGSA is laterally continuous from the Boise River Valley to the Payette River Valley. The cross section prepared recently using geophysical logs does not**

decrease uncertainty relative to the present M3 Eagle hydrogeologic conceptual model.

- vi. I believe that construction of a numerical model based on the existing hydrogeologic conceptual model is flawed.**

14. Analysis of the ground-water flow system

a. General analysis of a ground-water flow system

- i. Delineation of a ground-water flow system is based on the hydrogeologic conceptual model.**
- ii. Flow system description includes identification of recharge areas and controls for recharge, identification of discharge areas and controls for discharge and identification of general ground-water flow lines based on water-level elevation data created obtained from wells with known completions.**
- iii. Key aspect of flow system analysis is a general understanding of impacts on the water balance of the ground-water system from the withdrawal of water from wells**
 - 1. Pumping well causes a water-level decline that propagates out from the pumping center toward the aquifer boundaries. The speed of propagation of the pumping effect is a function of the aquifer parameters (transmissivity divided by storativity)**
 - 2. Ground-water system will come back into equilibrium when the lowered ground-water levels cause either an increase in recharge (only when there is a saturated connection to a surface water system) or decrease discharge (springs or stream gains).**
 - 3. Withdrawal of water from wells must necessarily result in water-level decline and the depletion of the resource. The key to is gain an understanding of where and when the impacts will occur.**

b. Analysis of M3 Eagle ground-water flow system description

- i. Water-level contour maps have been created based on 2006 and 2007 data; maps indicate ground-water flow is to the west-northwest in the immediate M3-Eagle area with some flow to the north-northwest toward the Payette Valley west of the M3 Eagle area**
- ii. General descriptions are given relative to general ground-water recharge areas but with little detail relative to mechanisms and amounts of recharge. General descriptions are given relative to ground-water discharge as well. No**

description is given of how and where surface water systems will be impacted by the development.

- c. **Uncertainty relative to the hydrogeologic M3 Eagle ground-water flow system presentation**
 - i. **I conclude that there is insufficient evidence to support the concept that ground-water flow occurs from the Boise River Valley to the Payette River Valley**
 - ii. **There is considerable uncertainty relative to locations and mechanisms of both ground-water recharge and ground-water discharge. This uncertainty extends to how the withdrawal of water will either increase ground-water recharge or decrease ground-water discharge.**
 - iii. **I believe that construction of a numerical model based on the existing representation of the ground-water flow system is flawed.**

15. Analysis of the numerical model

- a. **General aspects of the construction and application of a numerical model**
 - i. **Based on the hydrogeologic conceptual model with calibration to ground-water flow system data collected for the site.**
 - ii. **Key aspect is to have sufficient knowledge of the both the ground-water flow system and the hydrogeologic conceptual model to minimize the uncertainty associated with the model results. Key aspects of the ground-water flow system are knowledge of the locations, amounts and mechanisms of ground-water recharge and the locations, amounts and mechanisms of ground-water discharge.**
- b. **Analysis of the M3 Eagle numerical model**
 - i. **The model is based on what I believe is a flawed hydrogeologic conceptual model and a very limited and perhaps flawed concept of the ground-water flow system.**
 - ii. **In my opinion, there is a very high degree of uncertainty associated with the model results.**

16. Conclusions

- a. **I conclude that there is insufficient evidence to support the hydrogeologic conceptual model put forward by M3 Eagle. In particular, there is insufficient evidence to conclude that the PGSA is laterally continuous from the M3 Eagle area to the Payette River valley.**

- b. I conclude that there is insufficient evidence to support the description of the ground-water flow system as presented by M3 Eagle. In particular, there is insufficient evidence to conclude there is ground-water flow from the Boise River drainage to the Payette River drainage. There is also insufficient evidence relative to the locations and characteristics of recharge and discharge areas.**
- c. Since the numerical model is based on the hydrogeologic conceptual model and the ground-water flow system described above, I conclude that the numerical model cannot be used to provide reliable predictions of water-level impacts from full project development**