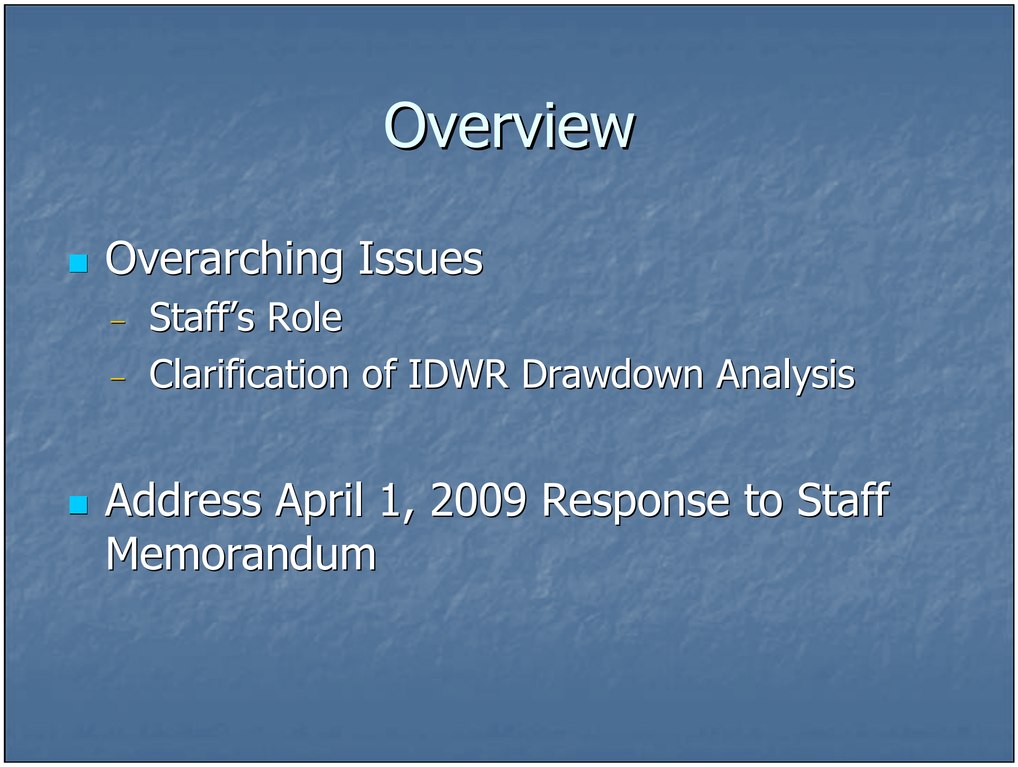
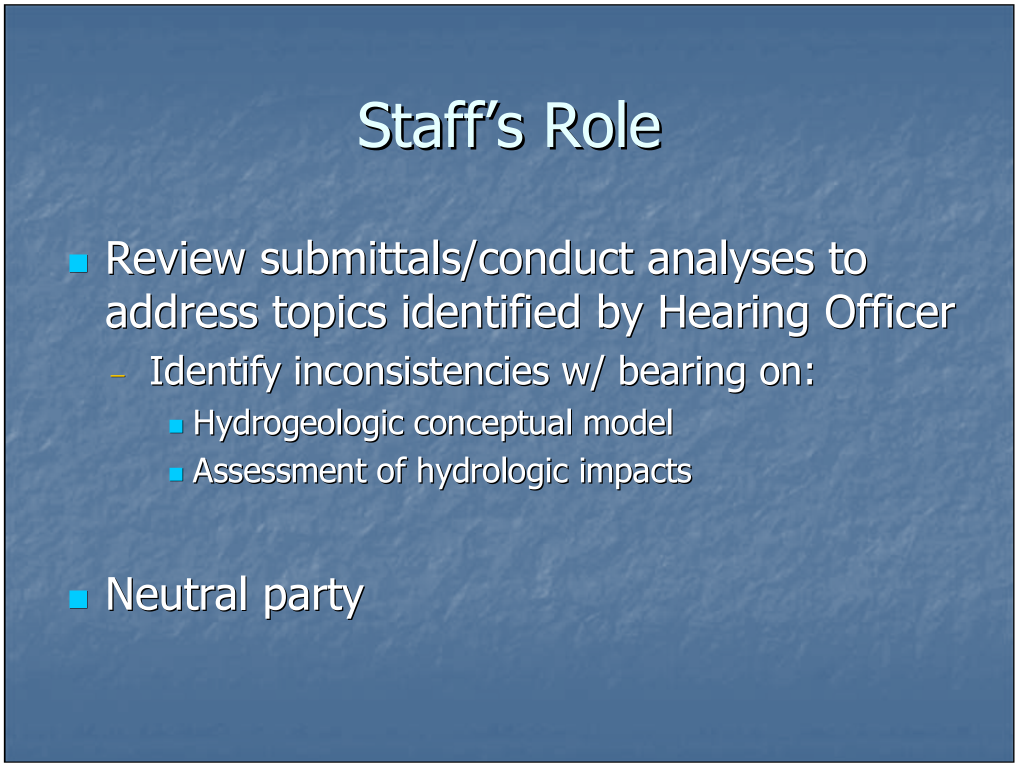
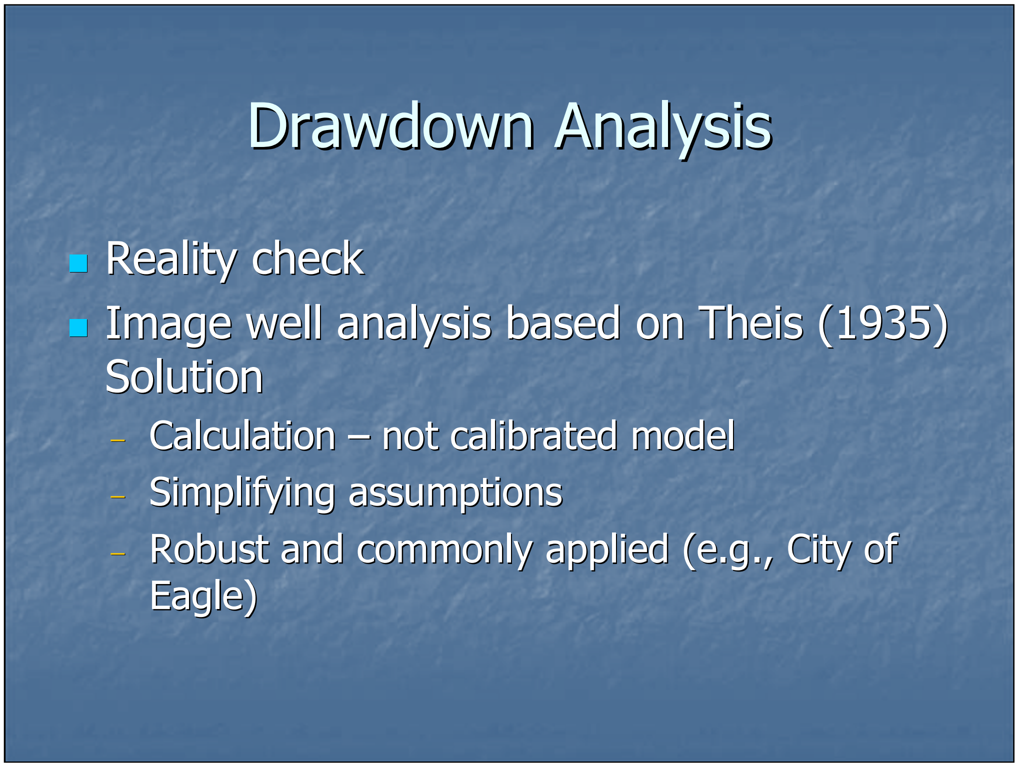


On behalf of Hydrology staff, I'd like to thank the Hearing Officer for giving us an opportunity to hopefully set the record straight on several topics where there appears to be confusion. I'll start by tying to clarify a few overarching issues and then I'd like to respond to some of the comments that were made by HLI in their Response to Our March 2, 2009 Staff Memorandum. I have a lot of information to cover today and I want to be accurate so I'm going to be reading my testimony.

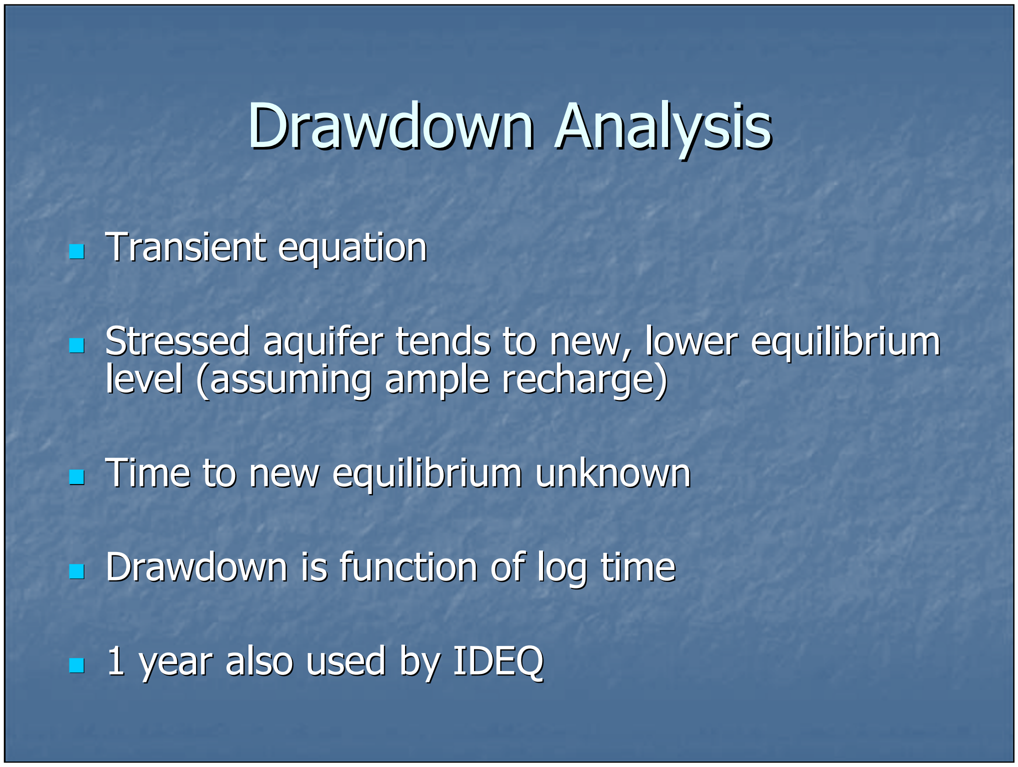


Let me start by clarifying what I perceive to be staff's role in the hearing process. In response to the Hearing Officer's written request, we performed a review of the technical documentation provided in support of M3's water right application. The breadth of our scope generally begins and ends with that assignment. The Hearing Officer has full access to the supporting documentation so a large part of our responsibility was to point out inconsistencies that we found in the data, analyses, and conclusions with respect to the topics that he identified for us to look at. Basically, we were looking for inconsistencies of a technical nature that have bearing either on the hydrogeologic conceptual model or the assessment of hydrologic impacts.

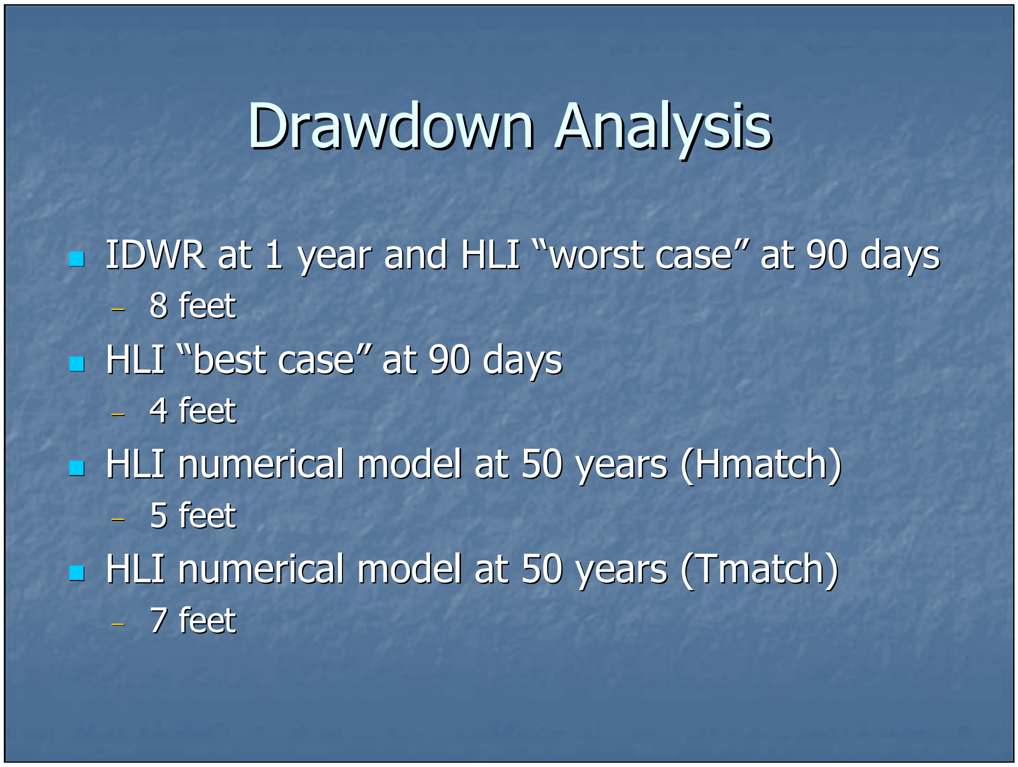
We are neither for nor against approval of M3's water right. And it wouldn't matter if we were because ultimately it's not our decision. I happen to agree with certain aspects of HLI's testimony and M3's holistic approach to water resource development but that is beyond the scope of my assignment and I won't be discussing those opinions today.



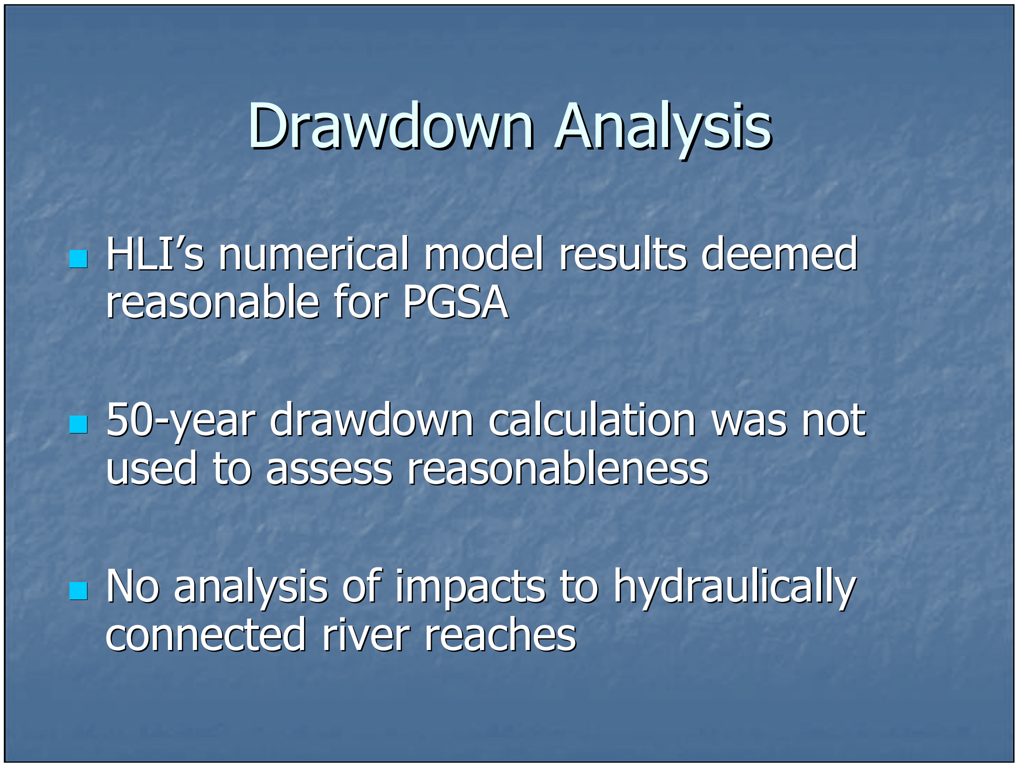
Before I address the HLI Response to our Staff Memorandum, I want to talk about something that has been bothering me about our write-up and I believe that it reflects a failure on our part to effectively communicate the intended significance of one of our analyses. It has to do with our drawdown calculation that is described in section 4a of the Staff Memorandum. The analysis was intended as a reality check to verify the reasonableness of the M3 model predictions. It's a calculation, not a calibrated flow model. As described in the Staff Memo, it's what's called an image well analysis and it's based on the Theis well hydraulics equation. The development of the Theis equation involved the use of a number of simplifying assumptions. Despite the fact that those idealized assumptions never occur in real aquifer systems, the Theis equation has proven to be a very robust and commonly applied predictor of the hydraulic response to pumping. It was used, for example, to evaluate the City of Eagle water right application.



Something that's important to understand about the Theis drawdown equation is that it is transient, which means that drawdown is a function of time. It's a directly proportional relationship: the greater the time, the greater the predicted water level drawdown at a given location. In reality, most aquifer systems that are subjected to new pumping stresses will eventually reach a new equilibrium in which water levels are lower but nonetheless stable with increasing time – provided, that is, that there is ample recharge, which is why staff was focused in part on understanding the mechanisms of recharge to the PGSA. The problem is that it's difficult to estimate when, if ever, equilibrium will occur and how much lowering of water levels will occur before that time. The saving grace here is that drawdown based on the Theis solution is a function of the logarithm of time so that the difference between the drawdown at say 90 days and 1 year, a difference of approximately 0.6 log cycles, isn't as significant as you might expect and it's not nearly as significant as the difference between the predicted drawdown at 10 minutes and 1000 minutes, because that represents a 2 log cycle difference in time. Department staff typically looks at a timeframe of 1 year in order to evaluate hydrogeologic impact predictions using the Theis solution. It has been argued that this is conservative, and certainly that's the case for some aquifer systems, but a little conservatism isn't a bad thing from our perspective. Our chosen timeframe of 1 year is the same as that used by the Idaho Department of Environmental Quality for projecting long-term drawdown for Public Water Supply Wells and the same timeframe that was chosen for evaluating the City of Eagle water right application.

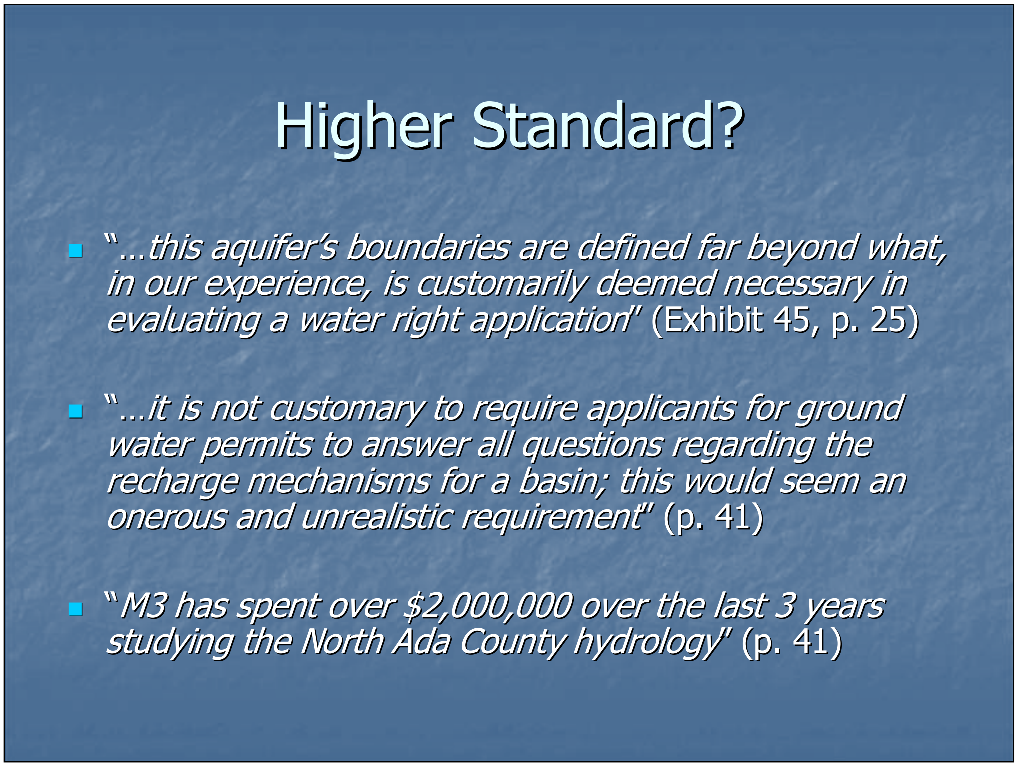


As explained in the Staff Memo, HLI performed and presented results of a nearly identical image well analysis in the Year 1 Progress Report, Exhibit 12, and got similar results for their "worst case" scenario for a time period of 90 days as we got using a 1-year time frame and aquifer properties from HLI's analysis of the SVR#7 aquifer test. We both predicted 8 feet of drawdown at the intersection of Floating Feather and Highway 16, a randomly chosen location several miles away from the M3 pumping center. They calculated only 4 feet for their "best case" at 90 days. For comparison, they calculated approximately 5 feet at the same location after 50 years with the Hmatch version of their numerical model and approximately 7 feet with the Tmatch version.

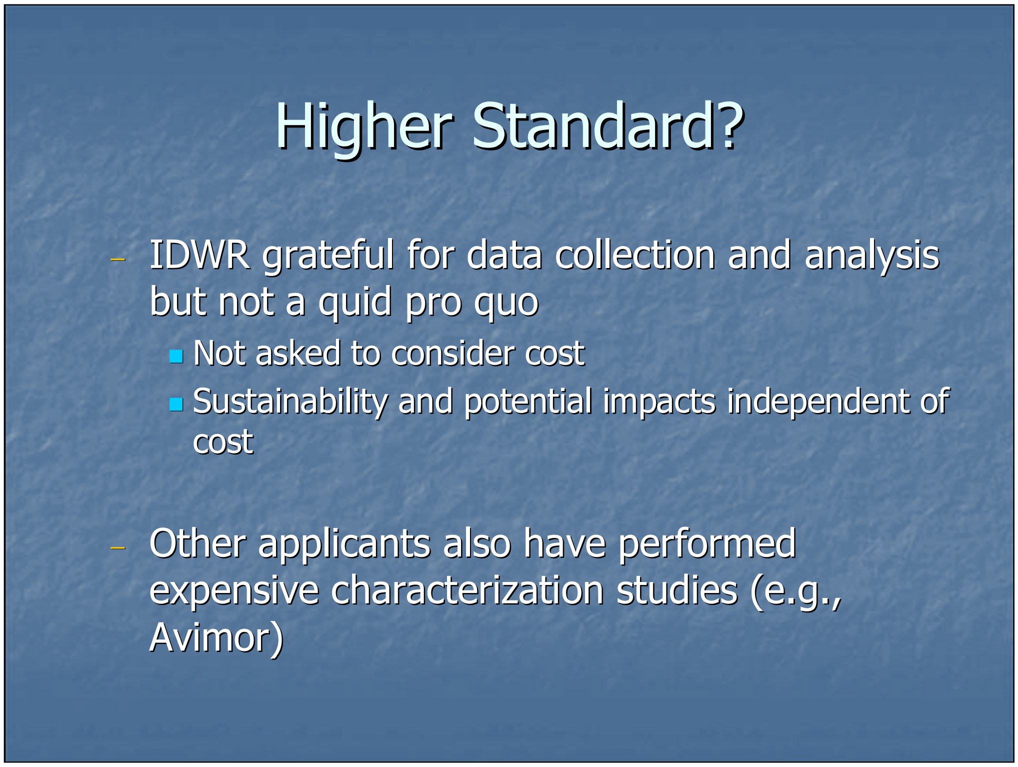


Based on the similar magnitude of these numbers, we judge their model-based prediction to be within the bounds of what is reasonable assuming a laterally continuous aquifer system that is hydraulically connected to one or more sources of recharge. That doesn't mean that their prediction is correct, but it does mean that's it's within the realm of reason given the underlying assumption of continuity. In retrospect, I regret that we chose to present the results of our intermediate calculation for a timeframe of 50 years because it more likely overestimates impacts than the 1-year snapshot – provided, that is, that there is hydraulic connection to the regional aquifer system from M3's pumping center. Although we pointed this out in the Staff Memorandum, we only presented the figure for the 50-year prediction and I think that unintentionally may have given the wrong impression to readers of our memo. If we had it to do over again and we could only show results for one timeframe, we would only present the graphic for the 1 year time period since that was what we used to assess reasonableness.

We also pointed out that neither our drawdown analysis nor HLI's numerical model was used to predict impacts on hydraulically connected reaches of the Boise River.



And now I'd like to address some of the major issues that were raised in HLI's Response to the March 2, 2009 Staff Memorandum, which is Exhibit 45. First, there are a couple of places in the Response where HLI implies that we are somehow holding M3's consultant to a higher standard. Specifically, HLI feels that "*this aquifer's boundaries are defined far beyond what, in our experience, is customarily deemed necessary in evaluating a water right application*" and concludes "*it is not customary to require applicants for ground water permits to answer all questions regarding the recharge mechanisms for a basin; this would seem an onerous and unrealistic requirement*". HLI also felt compelled to point out that "*M3 has spent over $2,000,000 over the last 3 years studying the North Ada County hydrology*".

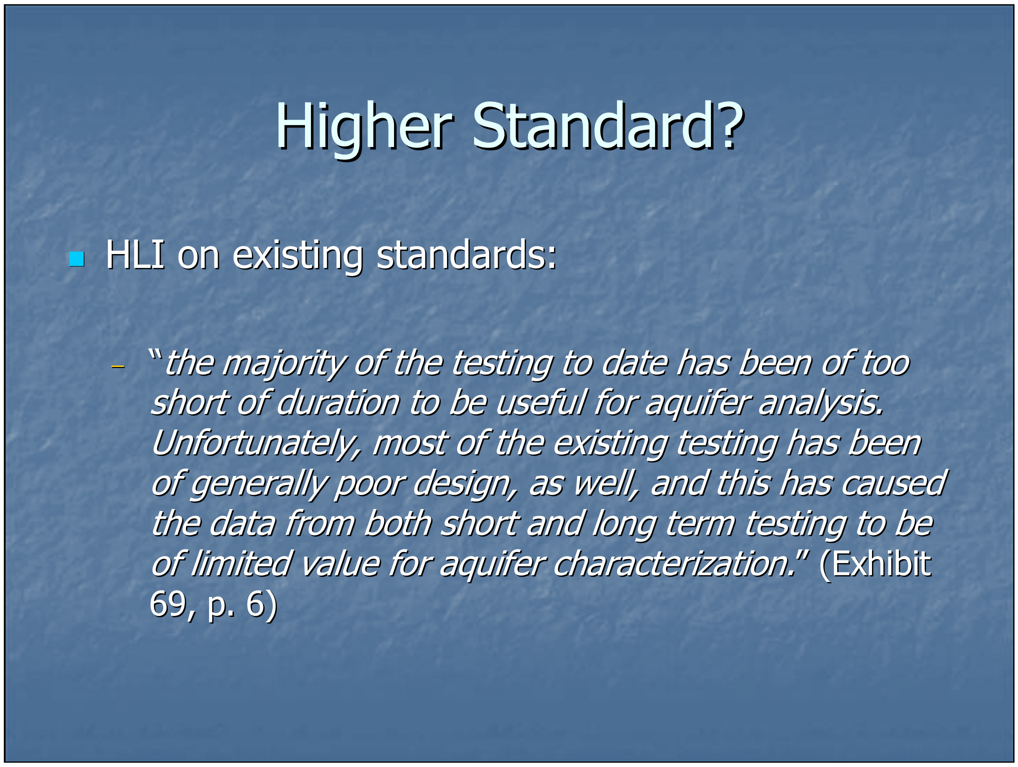


There are several points that I'd like to make with reference to these statements:

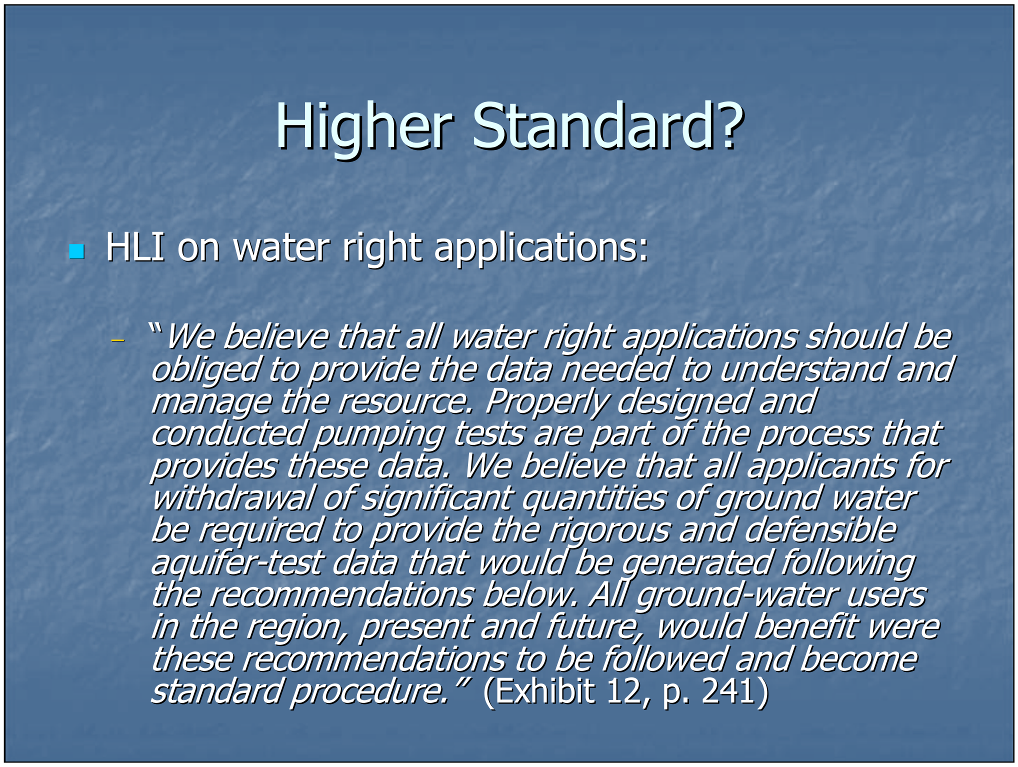
First, we are grateful for the data collection and analysis that was performed on behalf of the applicant and we think that it improves our understanding of the hydrogeology in North Ada County. This was one of the primary conclusions of our staff memorandum and those sentiments were expressed repeatedly. The data gathering and processing efforts were generally of high quality.

On the other hand, the application process is not a quid pro quo in which a water right is granted or denied based upon the amount of money that is spent on supporting studies. In case there is any confusion, Department staff was not asked by the Hearing Officer to consider how much money was spent in our technical analysis of the submitted materials. That's in part because the sustainability of the resource and the potential impacts to existing water right holders are independent of the amount of money spent on characterization.

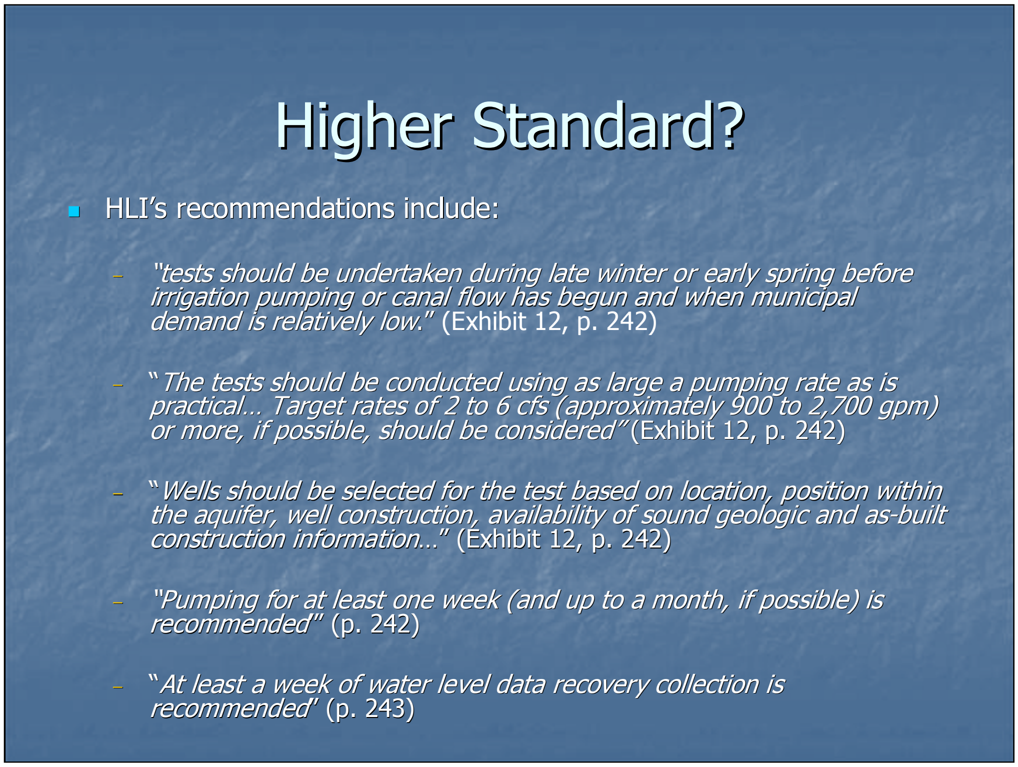
Other water right applicants have also decided to perform expensive aquifer characterization studies. Hydrogeologic work that was performed in support of the Avimor water right application, for example, included a well drilling and installation program, routine water level monitoring, a geochemical analysis, and aquifer testing and data analysis.



We are not holding M3 to a higher standard than other applicants. In fact, it is HLI that was compelled to point out where existing standards are too low. For example, in the *Aquifer Test Prospectus*, Exhibit 69, which was provided to staff for comments in November of 2007, HLI noted that "*the majority of the testing to date has been of too short of duration to be useful for aquifer analysis. Unfortunately, most of the existing testing has been of generally poor design, as well, and this has caused the data from both short and long term testing to be of limited value for aquifer characterization.*"



In Exhibit 12, the Reanalysis of 16 Aquifer Tests in the Eagle-Star Area, HLI stated "*We believe that all water right applications should be obliged to provide the data needed to understand and manage the resource. Properly designed and conducted pumping tests are part of the process that provides these data. We believe that all applicants for withdrawal of significant quantities of ground water be required to provide the rigorous and defensible aquifer-test data that would be generated following the recommendations below. All ground-water users in the region, present and future, would benefit were these recommendations to be followed and become standard procedure.*"

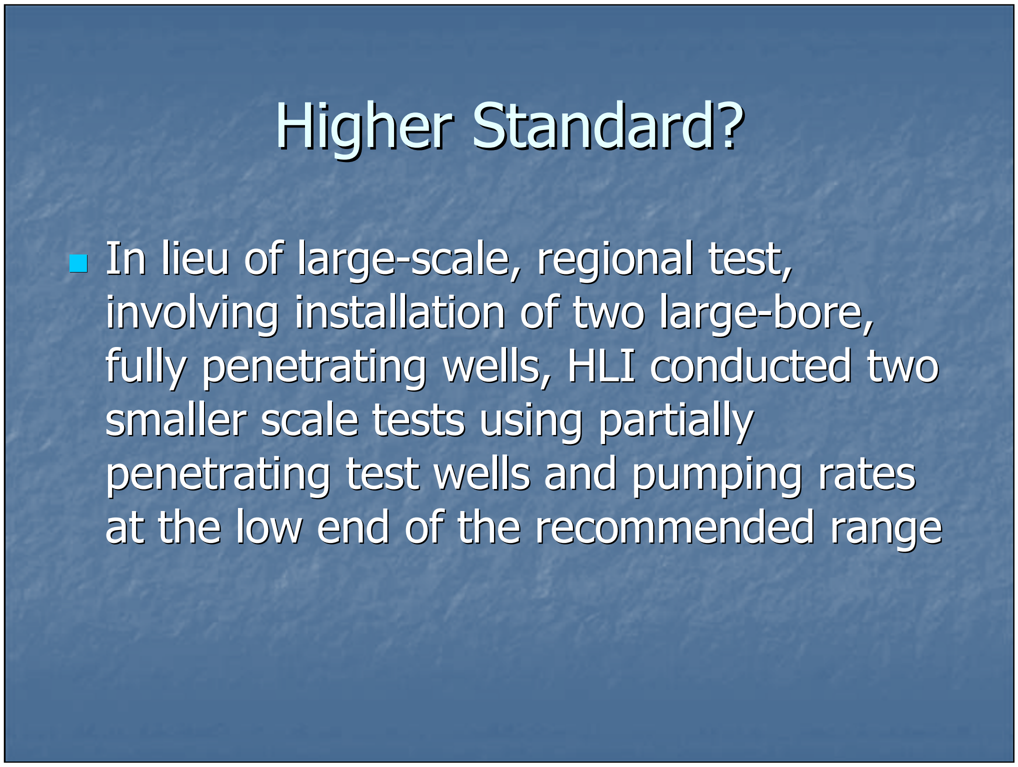


The list of recommended aquifer test procedures that follows this statement includes conducting the tests before the irrigation season, which it should be noted is less restrictive than the January-February timeframe that Mr. Utting described in his testimony. Other recommendations included using as a high pumping rate, from 900 to more than 2,700 gal/min, selecting test wells based upon well construction, pumping for a period of "*at least one week and up to a month if possible*", and collecting water level recovery data for at least a week.

Higher Standard?

- Staff agrees w/ need for quality data
- Staff did not stipulate:
  - Reanalysis of 15 aquifer tests performed by others
  - Construction of 7-layer flow model

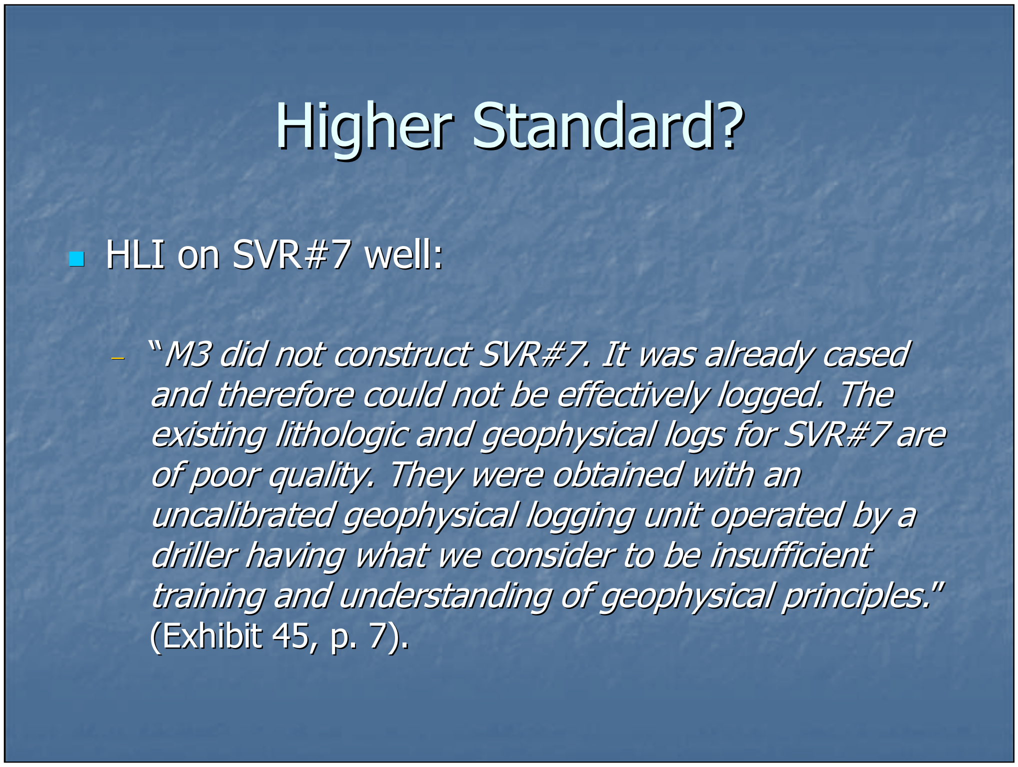
While we agree with HLI on the need for quality data, we also would point out that HLI offered these opinions without solicitation. Moreover, the Department never stipulated that HLI be required to reanalyze 15 aquifer tests that were performed by other investigators or to construct a seven layer flow model – they decided to take on those onerous challenges themselves.



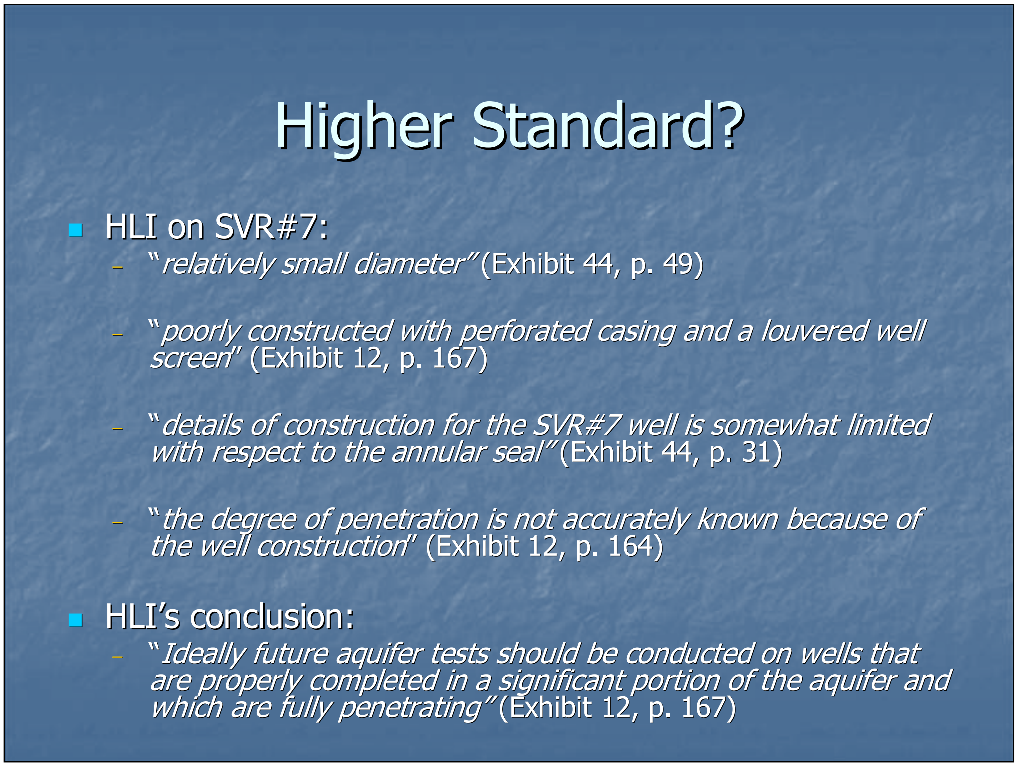
On the other hand, we did expect that HLI would make good on the testing that they scoped out in the *Aquifer Test Prospectus,* Exhibit 69, a document that was reviewed and commented on by Department staff. However, in lieu of the planned large-scale, regional test, which involved the design and installation of two large-bore, fully penetrating wells, HLI conducted two smaller scale, constant rate aquifer tests using pumping rates at the low end of their recommended range and test wells that are substandard by HLI's own assessment.

The first aquifer test conducted by HLI in support of this application was performed using the Kling Irrigation well. The well was pumped for 3,000 minutes, a little more than 2 days, at a rate of approximately 900 gal/min. HLI described the partially penetrating test well in the following passage from Exhibit 12:

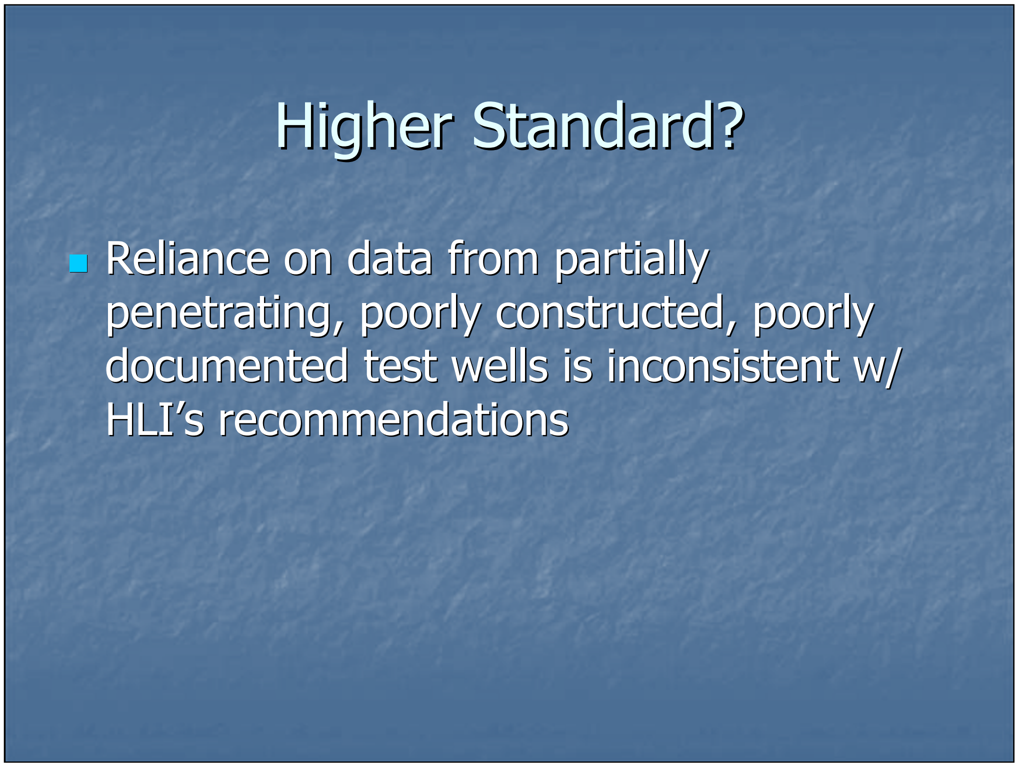
"*The Kling Irrigation Well is completed in the upper 109 feet of the Pierce Gulch Sand Aquifer which is about 275 feet thick at this location. The already small open-area of the well screen in the Kling Irrigation well is significantly and irreversibly clogged, is subject to sand production, and is not suitable for long-term use as a regional supply well. The Kling Irrigation well is poorly documented, poorly designed, and poorly constructed of marginal materials. Since the well was completed 19 years ago, a general deterioration of the well allowed by the marginal materials and caused partly by the inefficient design, has resulted in reduced well efficiency and yield. The proportion of water derived from various parts of the screen (and therefore the aquifer) is not known. The partial clogging of the well screen renders this analysis, and any future analysis, for aquifer coefficients uncertain*". You may recall that Mr. Squires described the Kling Irrigation well as "*a piece of crap*" during his testimony on April 24.



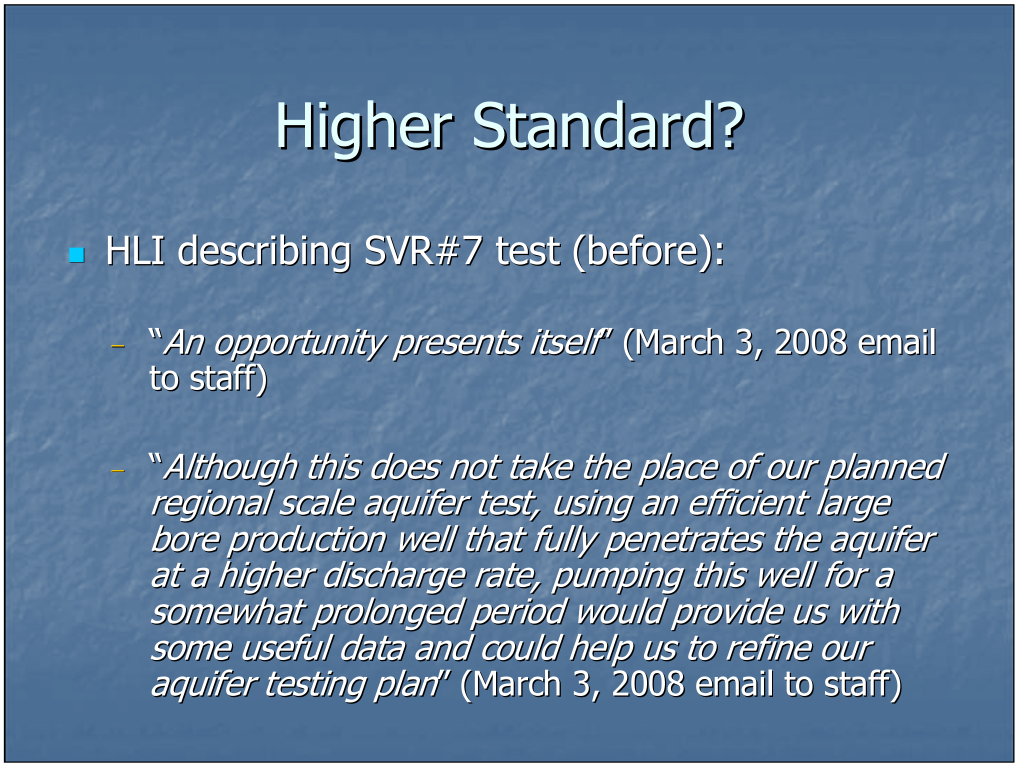
The second test was performed by pumping from the SVR#7 test well for a period of nine days, also at a rate of approximately 900 gallons per minute. HLI pointed out on page 7 of the Response to IDWR Staff Memorandum, Exhibit 45, that "*M3 did not construct this well. It was already cased and therefore could not be effectively logged. The existing lithologic and geophysical logs for SVR#7 are of poor quality. They were obtained with an uncalibrated geophysical logging unit operated by a driller having what we consider to be insufficient training and understanding of geophysical principles.*"



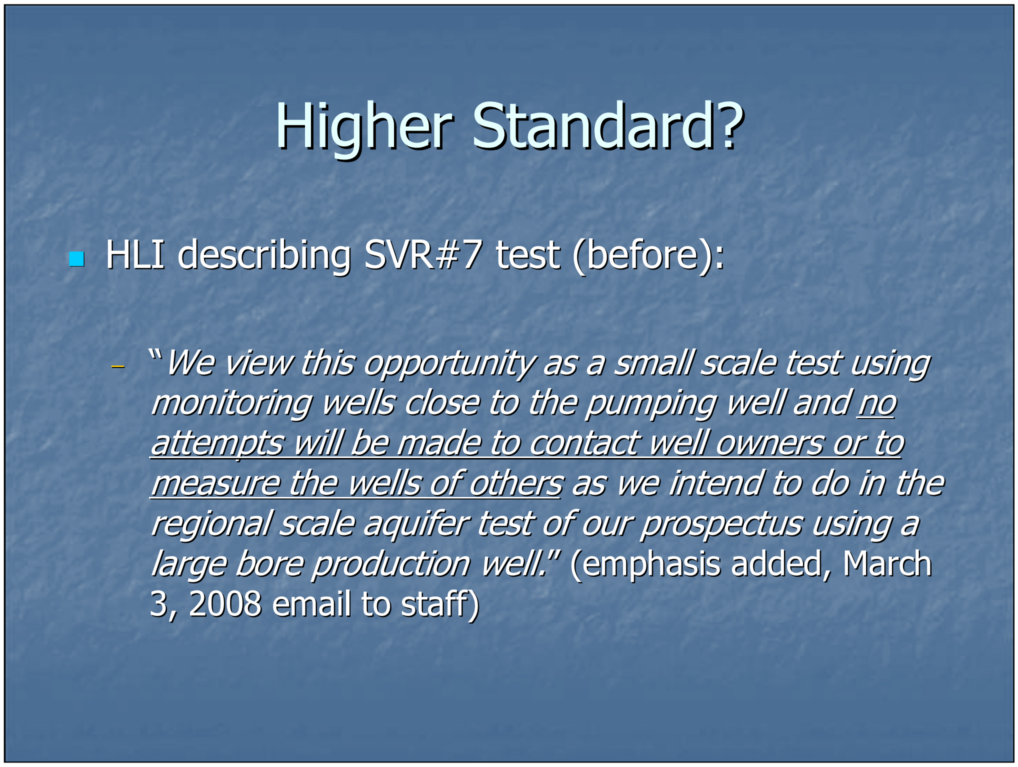
Elsewhere in Exhibits 44 and 12, HLI referred to the "*relatively small diameter*" well as being "*poorly constructed with perforated casing and a louvered well screen*". They also noted that details concerning the annular seal are "*somewhat limited*" and that "*the degree of penetration is not accurately known because of the well construction*". HLI concluded that "*Ideally future aquifer tests should be conducted on wells that are properly completed in a significant portion of the aquifer and which are fully penetrating*" .



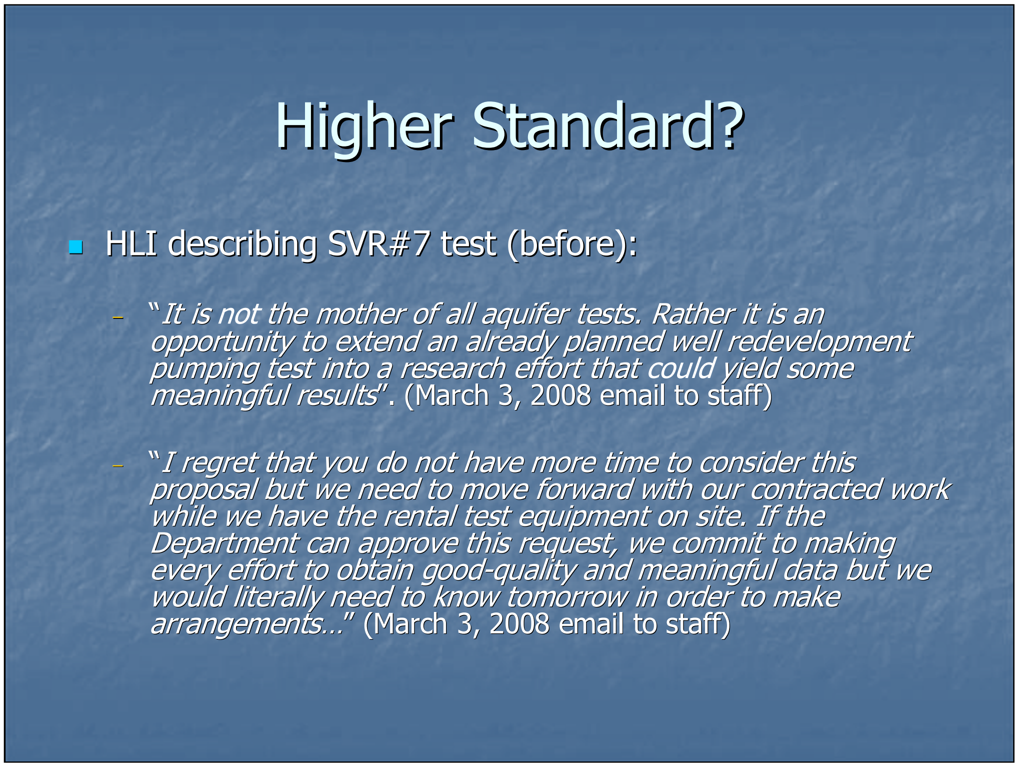
However, what we end up having to rely upon as the basis for the water right application is not data from the regional scale test that was proposed by HLI and reviewed by Department staff, but instead from two smaller-scale tests using existing wells that don't fully penetrate the target aquifer and, in the estimation of HLI, are poorly constructed and poorly documented. HLI's willingness to now rely upon aquifer test data from partially penetrating, poorly constructed wells is inconsistent with their recommendations and their tendency to ignore or discount data from poorly constructed wells elsewhere. Mr. Owsley is planning to further address this issue in his narrative.



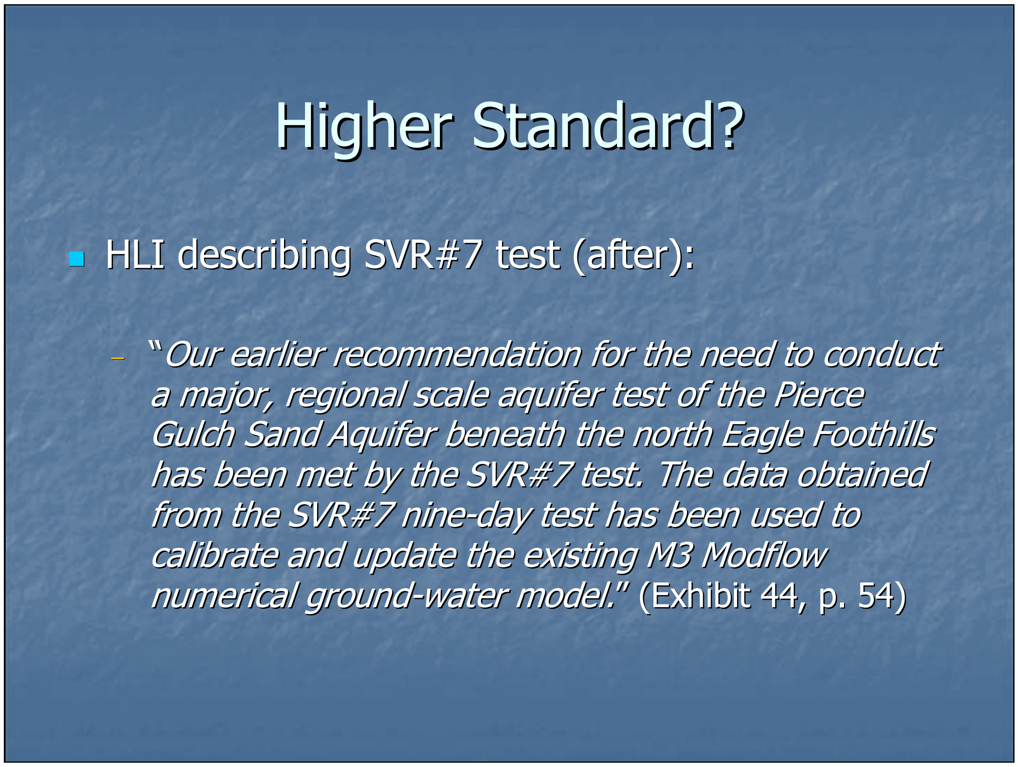
Moreover, HLI led staff to believe that the SVR#7 aquifer test would not be relied upon in a significant way for the M3 application. In an email to the Department dated March 3, 2008 that was submitted to the parties on the first day of the hearing, HLI described the SVR#7 aquifer test as merely "*an opportunity*" and indicated that "*Although this does not take the place of our planned regional scale aquifer test, using an efficient large bore production well that fully penetrates the aquifer at a higher discharge rate, pumping this well for a somewhat prolonged period would provide us with some useful data and could help us to refine our aquifer testing plan*".



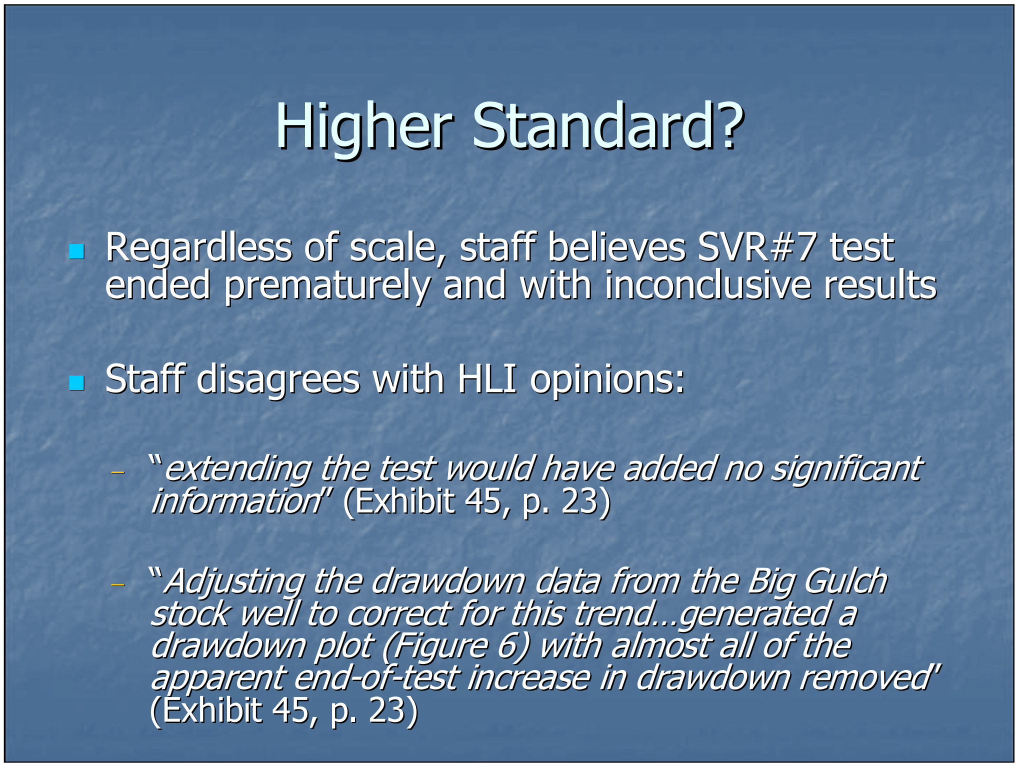
HLI also indicated "*We view this opportunity as a small scale test using monitoring wells close to the pumping well and <u>no attempts will be made to contact well owners or to measure the wells of others</u> as we intend to do in the regional scale aquifer test of our prospectus using a large bore production well.*"



HLI further downplayed the significance of the proposed SVR#7 test by concluding "*It is not the mother of all aquifer tests. Rather it is an opportunity to extend an already planned well redevelopment pumping test into a research effort that could yield some meaningful results*". Although the significance of the SVR#7 aquifer test was originally downplayed by HLI, the short timeframe given the Department for approval hinted otherwise. HLI's representative informed the Department "*I regret that you do not have more time to consider this proposal but we need to move forward with our contracted work while we have the rental test equipment on site. If the Department can approve this request, we commit to making every effort to obtain good-quality and meaningful data but we would literally need to know tomorrow in order to make arrangements.*"



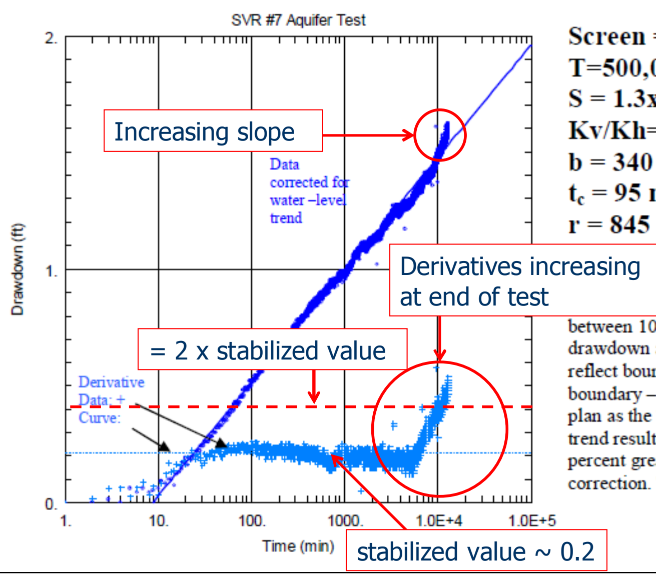
Based on HLI's correspondence, we were both surprised and disappointed to read in the SVR#7 Aquifer Test Report, which we did not receive until January of this year, that "*Our earlier recommendation for the need to conduct a major, regional scale aquifer test of the Pierce Gulch Sand Aquifer beneath the north Eagle Foothills has been met by the SVR#7 test. The data obtained from the SVR#7 nine-day test has been used to calibrate and update the existing M3 Modflow numerical ground-water model.*". Thus what had originally been described to us as a small scale test is apparently now being viewed as a major, regional scale test and the data from it have been relied upon for the prediction of long-term impacts from pumping.



Regardless of scale, it is our opinion that the SVR#7 test ended prematurely and inconclusively with the test data from the observation well with the greatest response to pumping suggesting, after applying all corrections, that a negative hydraulic boundary had been encountered. Because long term testing generally is performed to evaluate hydraulic boundary conditions and the test ended before boundary conditions could be established, we respectfully disagree with HLI's opinions in Exhibit 45 that "*extending the test would have added no significant information*" and "*Adjusting the drawdown data from the Big Gulch stock well to correct for this trend…generated a drawdown plot (Figure 6) with almost all of the apparent end-of-test increase in drawdown removed*"

EXHIBIT 45

Figure 6. Cooper-Jacob Analysis for the Big Gulch Stock Well with Water-Level Trend Corrections

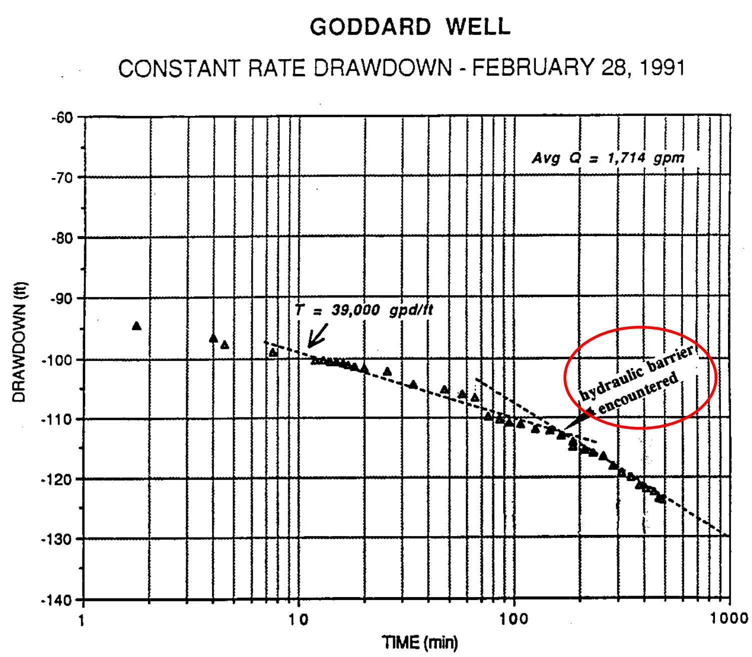


Screen = 180 ft bgl (open hole)
T=500,000 gpd/ft
S = 1.3x 10^{-3}
Kv/Kh=0.1
b = 340 ft
t_c = 95 min
r = 845 ft
gpm (at SVR #7)

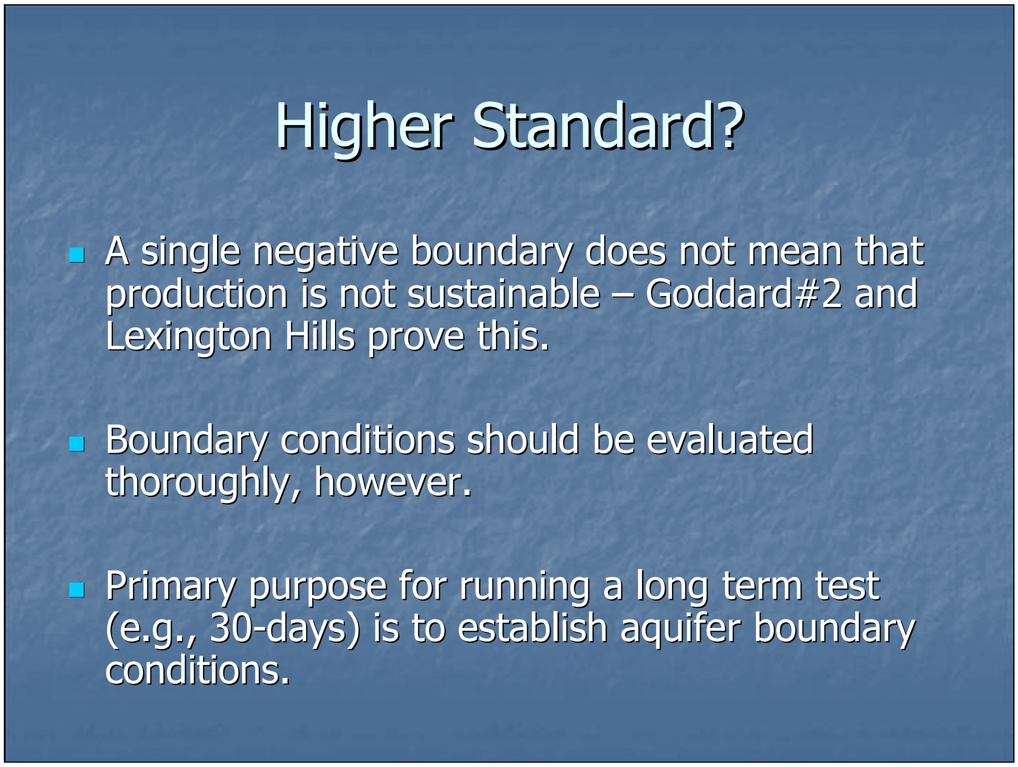
nalysis indicates method is valid for data between 100 and 6,000 min. Rise in apparent drawdown and derivatives after 6,000 minutes may reflect boundary effect of nearest known "no-flow" boundary – the edge of the aquifer shown in the site plan as the "green line." Correction for water-level trend results in an indicated storativity (S) about 8 percent greater than value indicated without this correction. Transmissivity remains unchanged.

Let me show you what I'm talking about. This is Figure 6 from Exhibit 45. It's a plot of trend-corrected drawdown versus the logarithm of time in the monitoring well closest to the test well. The increase in the slope of the data trend that I've identified with the upper red circle is diagnostic of the cone of depression encountering a negative hydraulic boundary, as is the increase in the value of the derivatives, which I've identified with the lower red circle. All external influences have already been removed from these data so there doesn't appear to be a more plausible explanation. The drawdown plot clearly shows that the aquifer test ended while the slope of the data was still changing and, equivalently, the value of the derivative was still increasing. Ending the test while those things are occurring is contrary to the goal of establishing boundary conditions in order to assess long-term performance of the aquifer. The fact that the derivative values have increased by more than a factor of two is cause for concern to staff because, although inconclusive, it suggests that the drawdown data possibly were being affected by more than one hydraulic boundary.

EXHIBIT 67

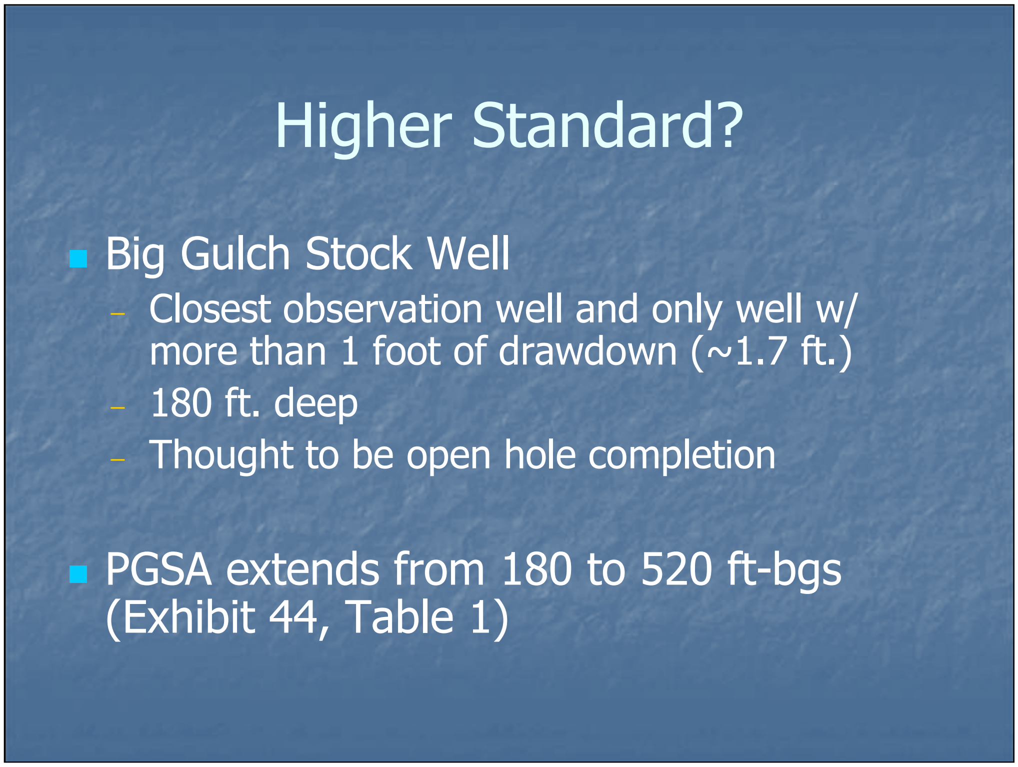


Here, according to Squires, Wood, and Osiensky, Exhibit 67, is a plot of data from a relatively short-term test in the Goddard #2 well, which also is completed in the PGSA. Drawdown is plotted as increasing with depth on this plot so the downward deflection is analogous to the upward deflection in the Big Gulch Stock well. In any event, the change in slope was interpreted, correctly in my estimation, to be a negative hydraulic boundary which affects groundwater flow in the vicinity of this PGSA well. Though short-term, this test was at least run long enough for the change in the slope to stabilize. Notice that the late time data do not deviate from the second linear trend. If presented, the derivative values would be unchanging along the second trend, which is not the case for the late data collected in the Big Gulch Stock well during the SVR#7 aquifer test.



It's my understanding that the Goddard #2 well has been producing water for more than 10 years so a single negative boundary does not mean that pumping is unsustainable, but it does cause there to be increased drawdown it can contribute to long-term water level declines. Also a negative boundary could contribute to a sustainability problem if, in combination with other boundaries, they collectively cause the aquifer to be compartmentalized. We don't necessarily think that this happens at M3, but because it's located at the basin margin, it is our opinion that boundary conditions should be thoroughly evaluated if at all possible.

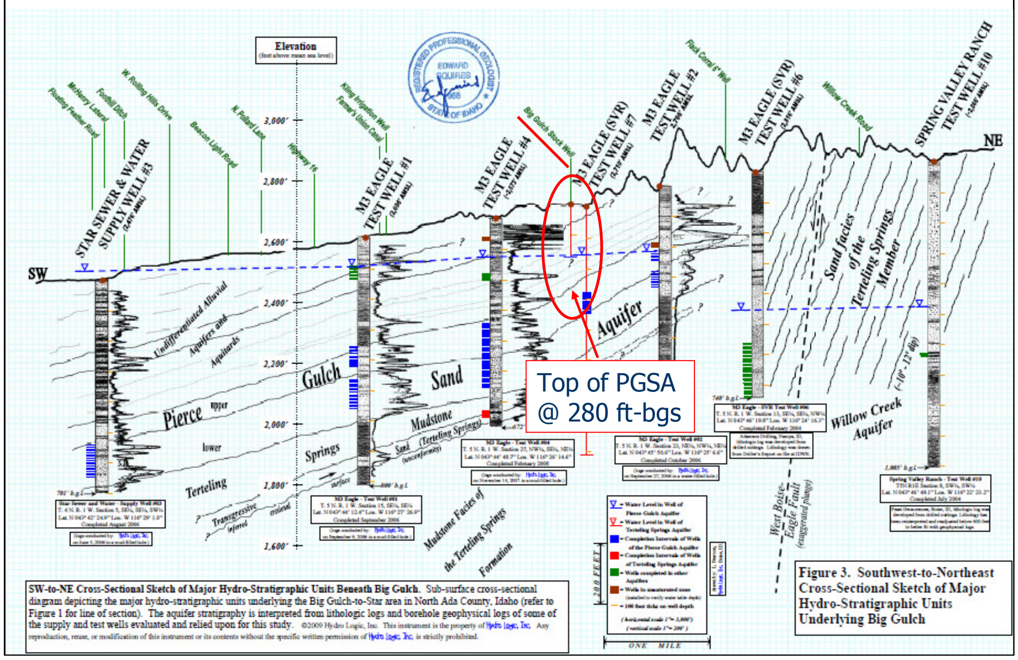
Mr. Squires testified that he conducted 30-day aquifer tests when he was an employee of United Water Idaho. Running a longer term test allows for better definition of aquifer boundary conditions, which is important when you're interested in assessing the long-term response to pumping like United Water Idaho is for their production wells. I think it's safe to say that everyone in this room would be interested in knowing the same thing for the PGSA and the overlying shallow aquifer system in the vicinity of M3.



Although we think continued pumping would have been worthwhile, I want to emphasize that interpretation of the drawdown data from the Big Gulch Stock well, which was the well closest to SVR#7 and the only observation well with more than 1-foot of drawdown, was made difficult by it’s well construction. It’s only 180 feet deep and, according to the Summary of Well and Aquifer Details Table in the SVR#7 report, Exhibit 44, the top of the PGSA is 180 feet deep at that location. HLI nonetheless considers it to be a PGSA well according to a notation in the Summary Table.

The indicated aquifer top depth of 180 feet in the Summary Table is contradicted in the text from the same report which indicates that the top of the PGSA is 240 feet deep at this location. That passage, which is based on the 240-foot top of aquifer depth, acknowledges that the Big Gulch stock well "*may be completed about 100 feet above the top of the Pierce Gulch Sand Aquifer*" but nonetheless concludes "*we believe it neither invalidates the analysis of data from this well nor our interpretation of aquifer properties*". Note that 100 feet deeper than the depth of the Big Gulch Stock Well is 280 feet, not 240 feet as suggested in the middle of the passage, and not 180 feet as indicated in the Summary Table.

EXHIBIT 44

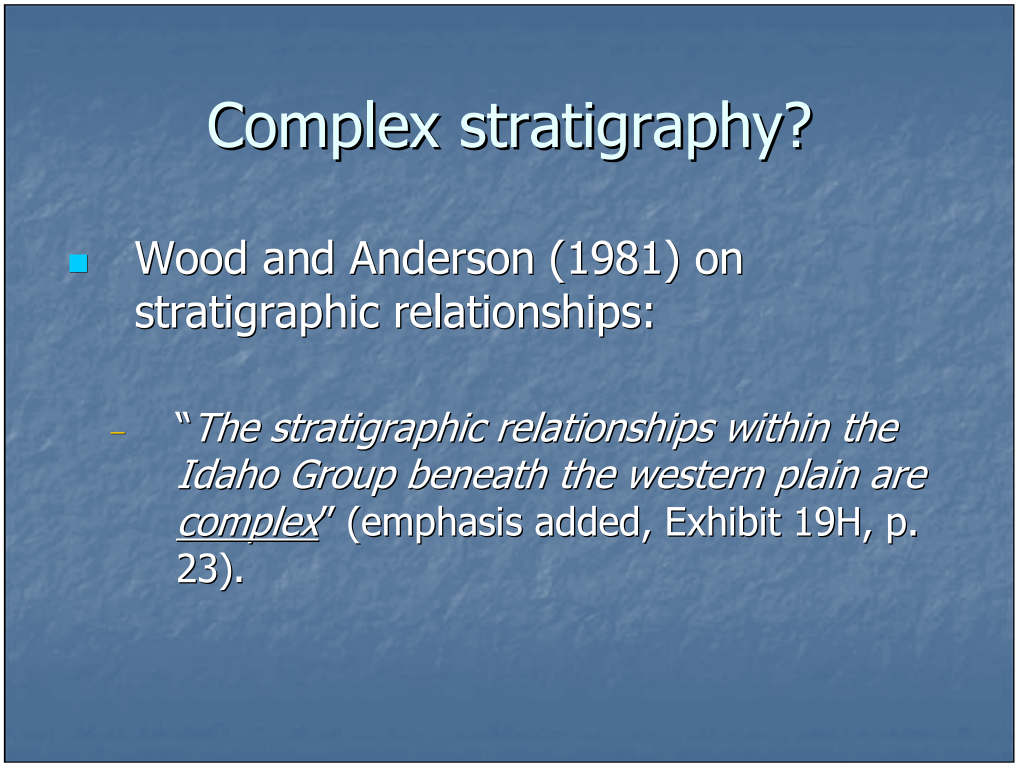


Here is Figure 3 from the same report. The PGSA beneath the Big Gulch test well on this cross-section is shown at a depth of 280 feet, which agrees with the reference in the text to there being a 100-foot difference between the total depth of the well and the top of the aquifer, which I've identified with a red arrow on the cross-section.

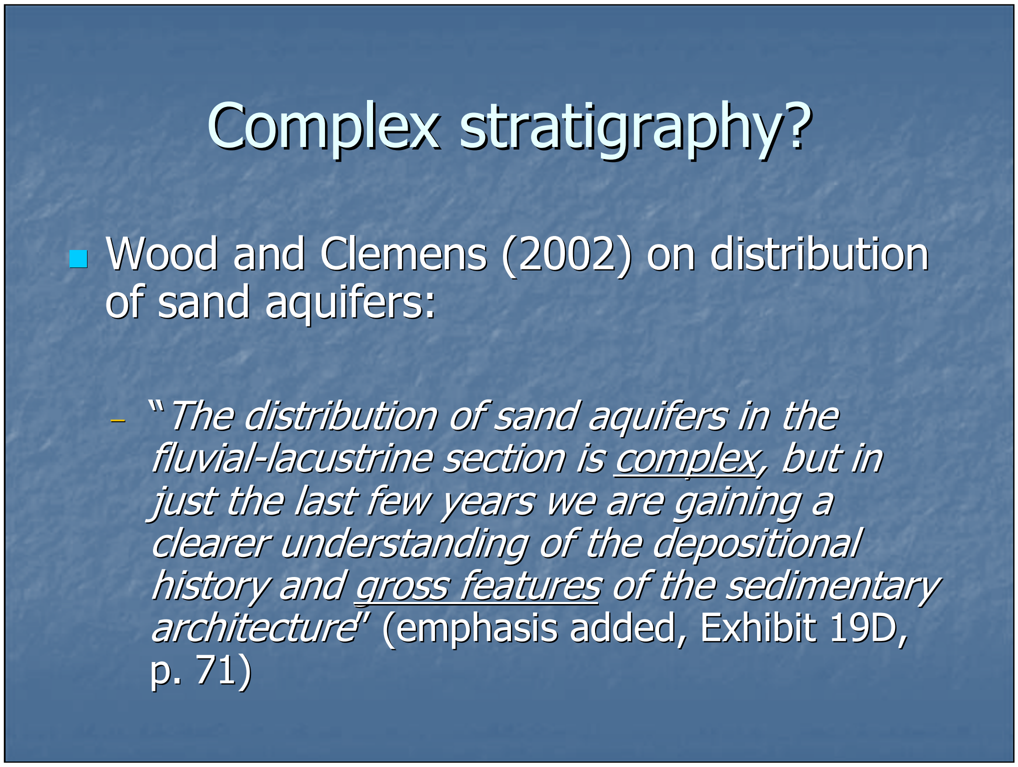
Complex stratigraphy?

- HLI took exception to staff's characterization of stratigraphy as being complex
- Numerous references to complexity and heterogeneity in supporting documentation

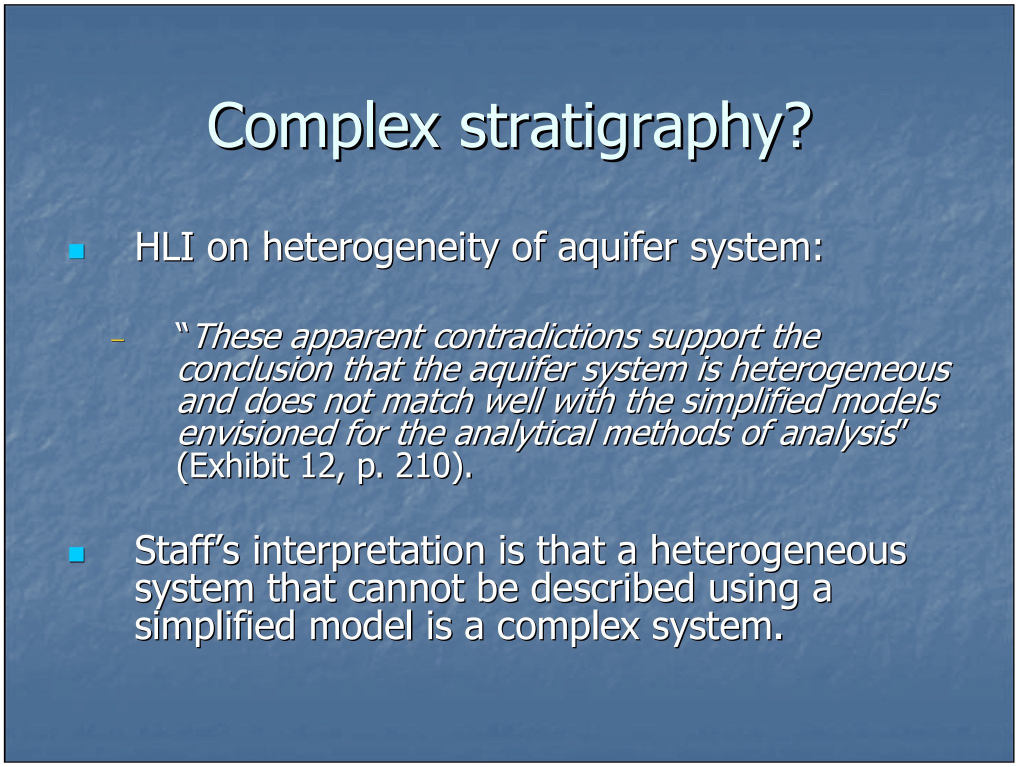
The next topic from the Response to the Staff Memorandum that I'd like to address is HLI's taking exception to our characterization of the stratigraphy in the study area as being complex. HLI's current stance on this issue is inconsistent with the fact that there are numerous references to complexity and heterogeneity in the package of information that was submitted in support of M3's water right application.



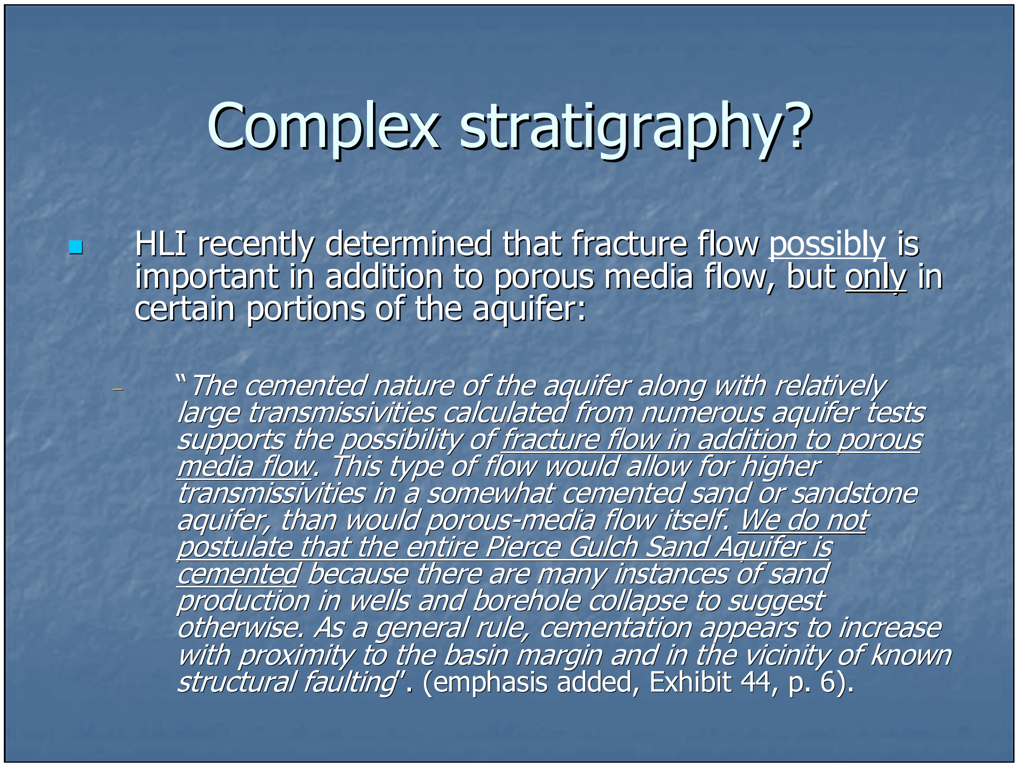
Going all the way back to 1981, Wood and Anderson, Exhibit 19H, stated "*The stratigraphic relationships within the Idaho Group beneath the western plain are* <u>*complex*</u>".



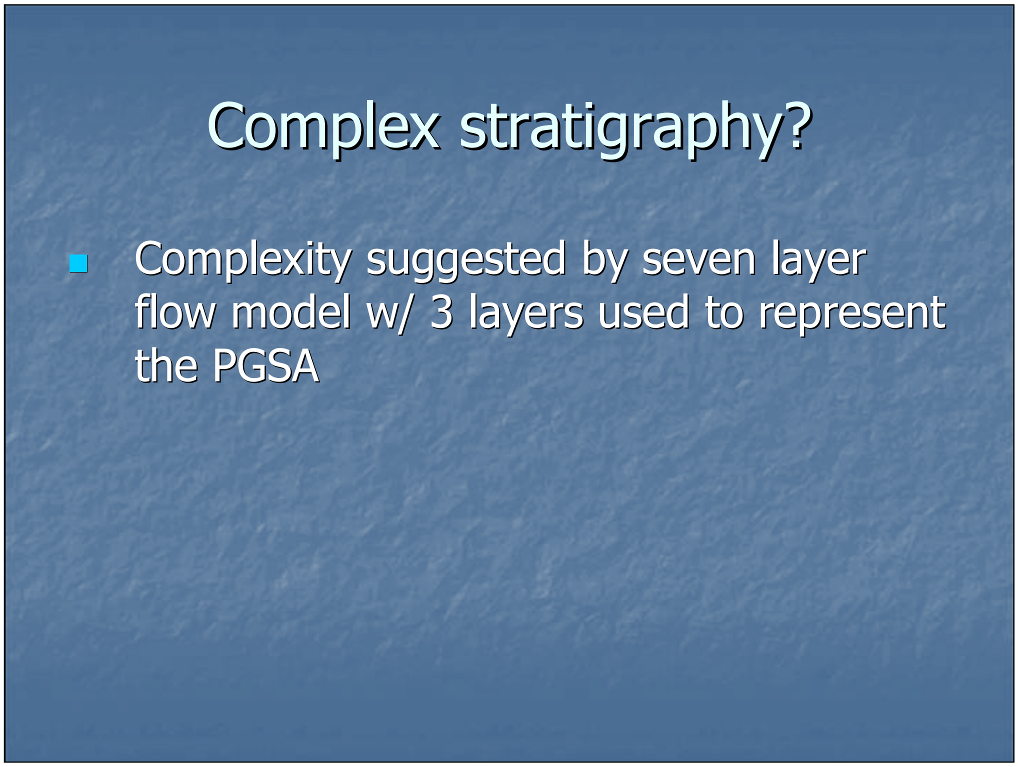
More recently, a 2002 report authored by Wood and Clemens on the geologic and tectonic history of the western Snake River Plain, Exhibit 19D, stated "*The distribution of sand aquifers in the fluvial-lacustrine section is complex, but in just the last few years we are gaining a clearer understanding of the depositional history and gross features of the sedimentary architecture*".



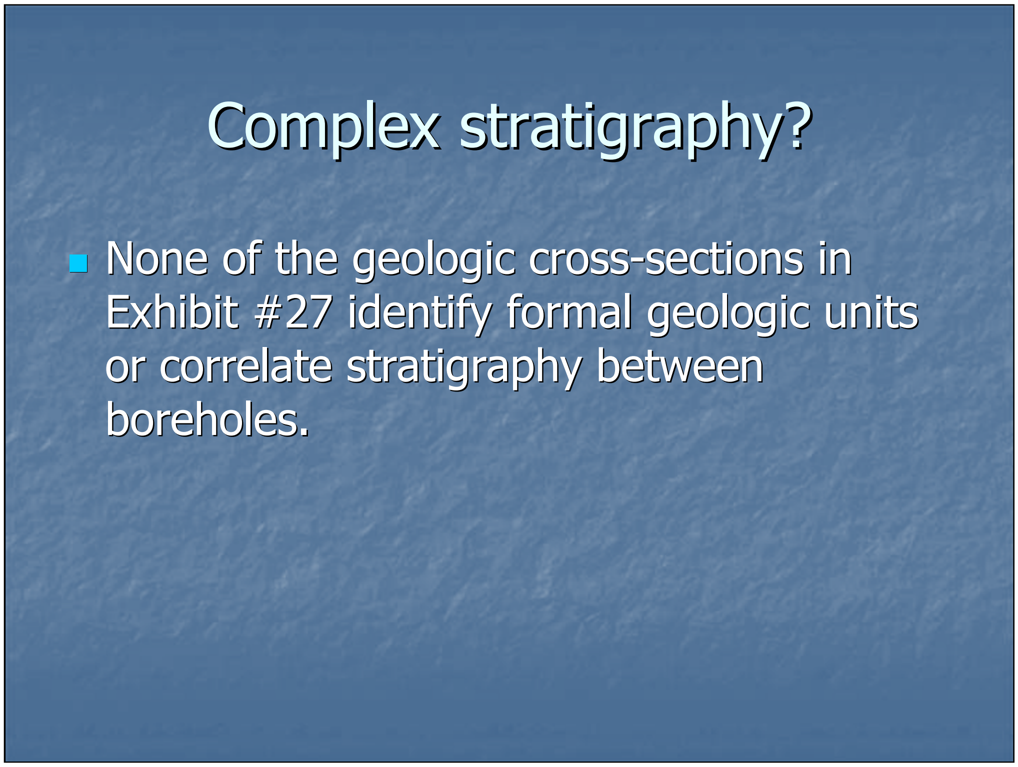
In a 2008 report, Exhibit 12, HLI attempted to explain what might have caused drawdown and water level recovery data to suggest very different aquifer boundary conditions in different monitoring zones within the PGSA at M3. They stated "*These apparent contradictions support the conclusion that the aquifer system is heterogeneous and does not match well with the simplified models envisioned for the analytical methods of analysis*". It is staff's interpretation that a heterogeneous system that cannot be described by a simplified model is a complex system.



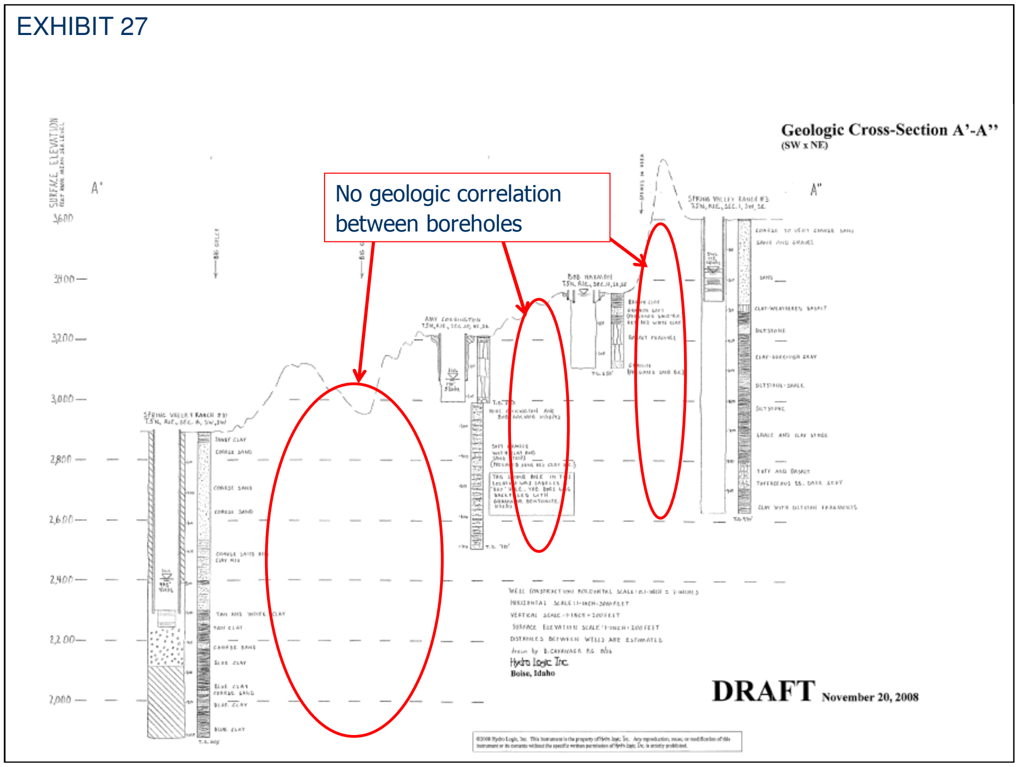
An indication that the stratigraphy is nonuniform and that the nature of groundwater flow is complex is the recent determination by HLI that fracture flow possibly is important in addition to porous media flow, but only in certain portions of the aquifer. On page 6 of Exhibit 44, the text states "*The cemented nature of the aquifer along with relatively large transmissivities calculated from numerous aquifer tests supports the possibility of fracture flow in addition to porous media flow. This type of flow would allow for higher transmissivities in a somewhat cemented sand or sandstone aquifer, than would porous-media flow itself. We do not postulate that the entire Pierce Gulch Sand Aquifer is cemented because there are many instances of sand production in wells and borehole collapse to suggest otherwise. As a general rule, cementation appears to increase with proximity to the basin margin and in the vicinity of known structural faulting*".



Beyond what's been written in the supporting documentation, I think the fact that the M3 flow model comprises seven layers, 3 of which are used to represent the PGSA, is, in and of itself, a fairly convincing argument that the hydrostratigraphy in the area is complex. Consider, for example, that the Department has implemented conjunctive management for the eastern Snake Plain using a 1-layer flow model and M3's model is used to describe groundwater flow in only a portion of the smaller western Snake Plain.



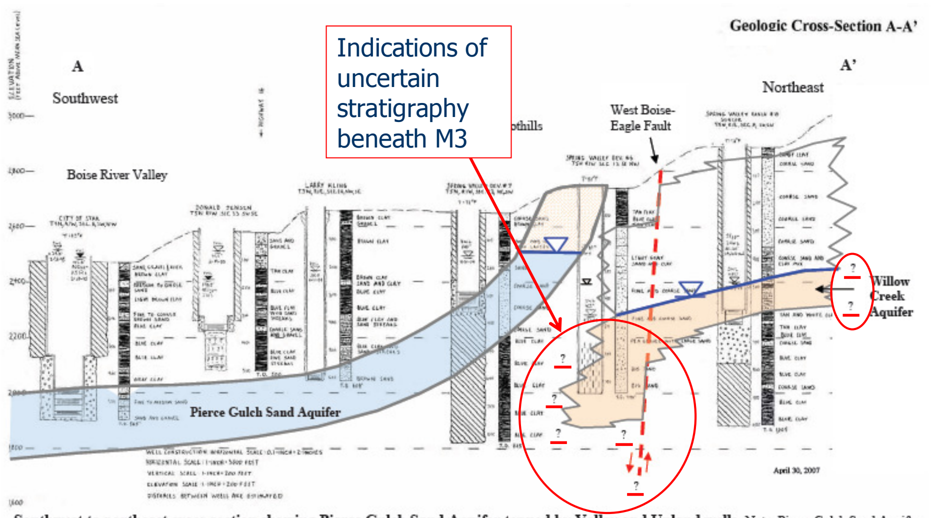
Complex stratigraphy also is suggested by the fact that none of the thirteen geologic cross-sections contained in M3 submittal #27 in support of the application identify formal geologic units, such as formations, or correlate stratigraphy between any of the boreholes.



Here's one of those cross-sections from Exhibit 27. If the stratigraphy is not particularly complex, as indicated by HLI in Exhibit 45, geologic correlation should be a relatively straightforward process, and one that would be worthwhile from the standpoint of developing an understanding of the subsurface.

EXHIBIT 2

Figure 5. Geologic Cross-Section through the M3 Eagle Site



Southwest to northeast cross-section showing Pierce Gulch Sand Aquifer tapped by Valley and Upland wells. Note: Pierce Gulch Sand Aquifer continues to northwest, west and south off figure. Spring Valley #6 taps Willow Creek Aquifer separated by contact of clay underlying the Pierce Gulch Aquifer. Clay *below* the Pierce Gulch Aquifer in Spring Valley #7 is believed to be equivalent to clay *above* the Willow Creek Aquifer in Spring Valley #6. The coarser-grained upper portion of the Willow Creek Aquifer is unsaturated at Spring Valley Ranch #10 because of relative uplift by West Boise-Eagle fault. The fault dips to the southwest at about 70 degrees but because of 10:1 vertical exaggeration (to allow well logs to be readable) true dip angle is not shown. The tops of the Willow Creek Aquifer and the Pierce Gulch Sand Aquifer in the northwest are defined by the water table. Unsaturated sands lie above the water table at these locations. The exact lateral extent of the Willow Creek Aquifer is not precisely known but is believed to be defined by a facies change to clay to the southwest and by granitic bedrock to the northeast. An accurate delineation of its boundaries was beyond the scope of this study and not considered to be critical to the assessment of the Pierce Gulch Aquifer. See Figure 1 for cross-section location.

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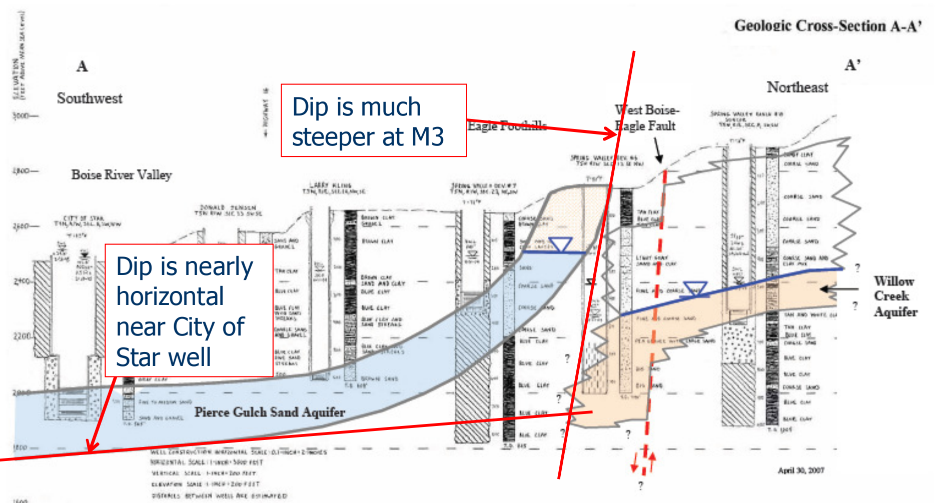
This geologic cross-section is Figure 5 from the Year 1 Progress Report, Exhibit 2. The section runs from the southwest to the northeast through Big Gulch on M3 property. Question marks are used between SVR#7 and SVR#6 to indicate uncertainty in the stratigraphic relationships between these wells, both of which occur on the same side of the West Boise-Eagle Fault. That indication of uncertainty suggests that the stratigraphy beneath M3 is complex.

EXHIBIT 2

Figure 5. Geologic Cross-Section through the M3 Eagle Site



Southwest to northeast cross-section showing Pierce Gulch Sand Aquifer tapped by Valley and Upland wells. Note: Pierce Gulch Sand Aquifer continues to northwest, west and south off figure. Spring Valley #6 taps Willow Creek Aquifer separated by contact of clay underlying the Pierce Gulch Aquifer. Clay *below* the Pierce Gulch Aquifer in Spring Valley #7 is believed to be equivalent to clay *above* the Willow Creek Aquifer in Spring Valley #6. The coarser-grained upper portion of the Willow Creek Aquifer is unsaturated at Spring Valley Ranch #10 because of relative uplift by West Boise-Eagle fault. The fault dips to the southwest at about 70 degrees but because of 10:1 vertical exaggeration (to allow well logs to be readable) true dip angle is not shown. The tops of the Willow Creek Aquifer and the Pierce Gulch Sand Aquifer in the northwest are defined by the water table. Unsaturated sands lie above the water table at these locations. The exact lateral extent of the Willow Creek Aquifer is not precisely known but is believed to be defined by a facies change to clay to the southwest and by granitic bedrock to the northeast. An accurate delineation of its boundaries was beyond the scope of this study and not considered to be critical to the assessment of the Pierce Gulch Aquifer. See Figure 1 for cross-section location.

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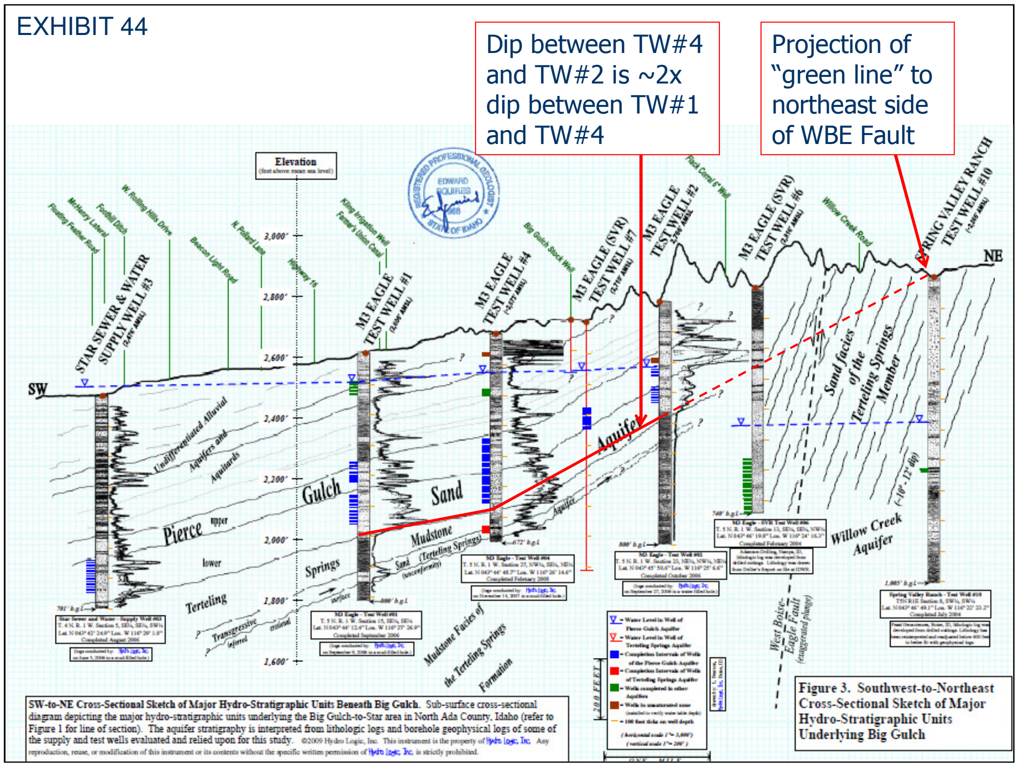
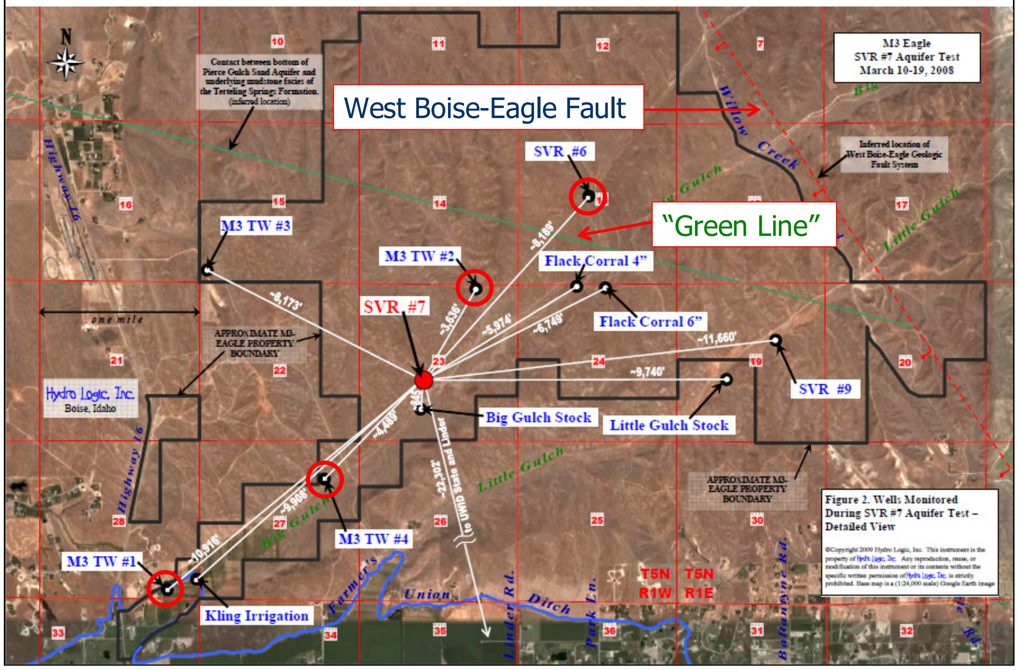
Also notice this depiction of the PGSA from Exhibit 2 as having concave upward top and bottom structures with a continuously increasing dip as you move further to the northeast, which is to the right on this diagram. I've added red lines to show how the dip of the contact between the PGSA and the underlying Terteling Springs Formation dramatically increases as you move further along section and away from the center of the basin. The nearly horizontal red line represents the dip of the contact near the City of Star well and the much steeper solid red line illustrates that the dip is thought to be much steeper near the intersection of the PGSA with land surface. As far as I know, this stratigraphic complexity is not discussed in the supporting documentation.



Notice now that the finalized version of this same section, Figure 3 from Exhibit 44, shows a somewhat different but also difficult to explain interpretation in which the dip of the PGSA bottom structure between TW#4 and TW#2 is more than double the slope of the bottom structure between TW#1 and TW#4. Note that the projection of the contact between the PGSA and the underlying mudstone using the steeper dip would cause the so-called green line to be located well to northeast side of SVR#6. In fact, the projection of the contact, which I've drawn on the figure using a dashed red line, intersects land surface near SVR#10, which is northeast of the West-Boise Eagle Fault.

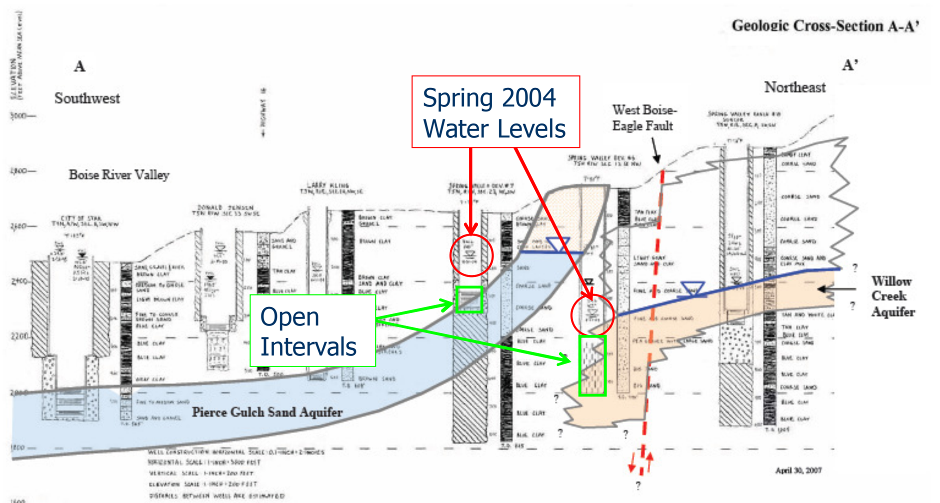
EXHIBIT 44



However, this is contrary to the inferred location shown on Figure 2 in Exhibit 44, the SVR#7 Aquifer Test Report. The green line is instead shown on the southwest side of the West Boise-Eagle fault which would require an even steeper dip between TW#2 and SVR#6 than the already increased dip that was shown on the last slide. A slight steepening might be expected as you move closer to the sediment source but the increase in dip necessary to keep the green line on the west side of SVR#6 is dramatically greater and, as I mentioned, the geologic mechanism that would cause this to occur is not explained in the supporting documentation.

EXHIBIT 2

Figure 5. Geologic Cross-Section through the M3 Eagle Site



Southwest to northeast cross-section showing Pierce Gulch Sand Aquifer tapped by Valley and Upland wells. Note: Pierce Gulch Sand Aquifer continues to northwest, west and south off figure. Spring Valley #6 taps Willow Creek Aquifer separated by contact of clay underlying the Pierce Gulch Aquifer. Clay *below* the Pierce Gulch Aquifer in Spring Valley #7 is believed to be equivalent to clay *above* the Willow Creek Aquifer in Spring Valley #6. The coarser-grained upper portion of the Willow Creek Aquifer is unsaturated at Spring Valley Ranch #10 because of relative uplift by West Boise-Eagle fault. The fault dips to the southwest at about 70 degrees but because of 10:1 vertical exaggeration (to allow well logs to be readable) true dip angle is not shown. The tops of the Willow Creek Aquifer and the Pierce Gulch Sand Aquifer in the northwest are defined by the water table. Unsaturated sands lie above the water table at these locations. The exact lateral extent of the Willow Creek Aquifer is not precisely known but is believed to be defined by a facies change to clay to the southwest and by granitic bedrock to the northeast. An accurate delineation of its boundaries was beyond the scope of this study and not considered to be critical to the assessment of the Pierce Gulch Aquifer. See Figure 1 for cross-section location.

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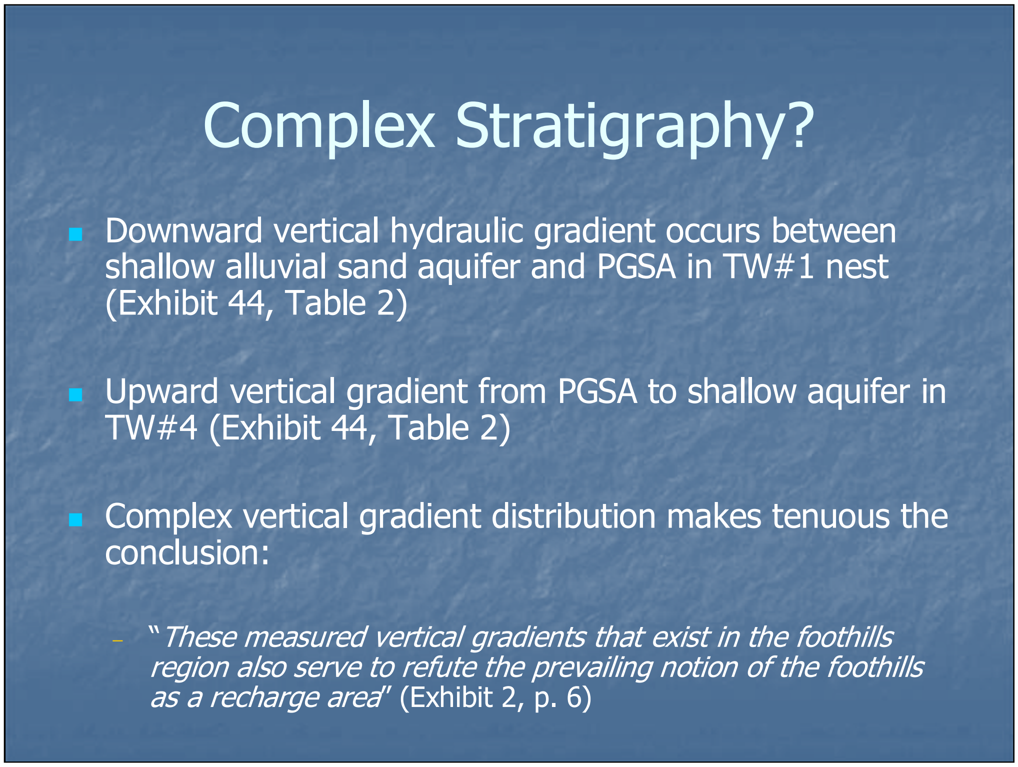
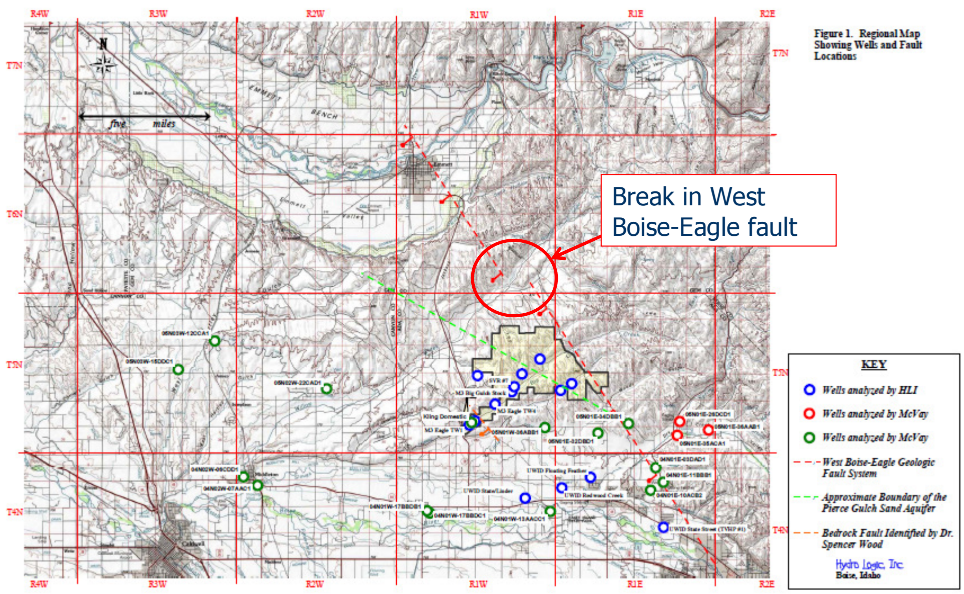
I'd like now to go back to Figure 5 in Exhibit 2, which is the Year 1 Progress Report. Notice that this figure shows an abrupt water level change between SVR#7 and SVR#6 – the water level in the shallower SVR#7 well is roughly 200' higher than in the well with a deeper completion interval, SVR#6. The fact that this significant water level difference appears to occur on the same side of the known West-Boise Eagle fault also is contrary to our expectations based on the information that we've been provided. A much lower water level in the deeper well might be expected on opposite sides of a no-flow barrier but it is not expected between wells on the same side of a fault, especially in an area where, as Mr. Squires testified, there is supposed to be an upward hydraulic gradient. The cause for the dramatic change in dip and apparent strong downward hydraulic gradient are not explained in the HLI submittals and suggests to staff that the hydrostratigraphy beneath the M3 property is complex. I should also point out that the pronounced downward vertical gradient is not explained by the so-called green line because the aquifer underlying the PGSA is laterally continuous in the southwest direction according to the conceptualization shown on this figure. Based on my experience characterizing and modeling faulted, fluvial-deltaic aquifers in Texas, a plausible explanation for what's going on between SVR#7 and SVR#6 is that the stratigraphic section is cut by an unidentified fault, which most likely parallels the West Boise Eagle fault. This possibility could dramatically change the significance of the so-called green line on the hydrogeology beneath M3.

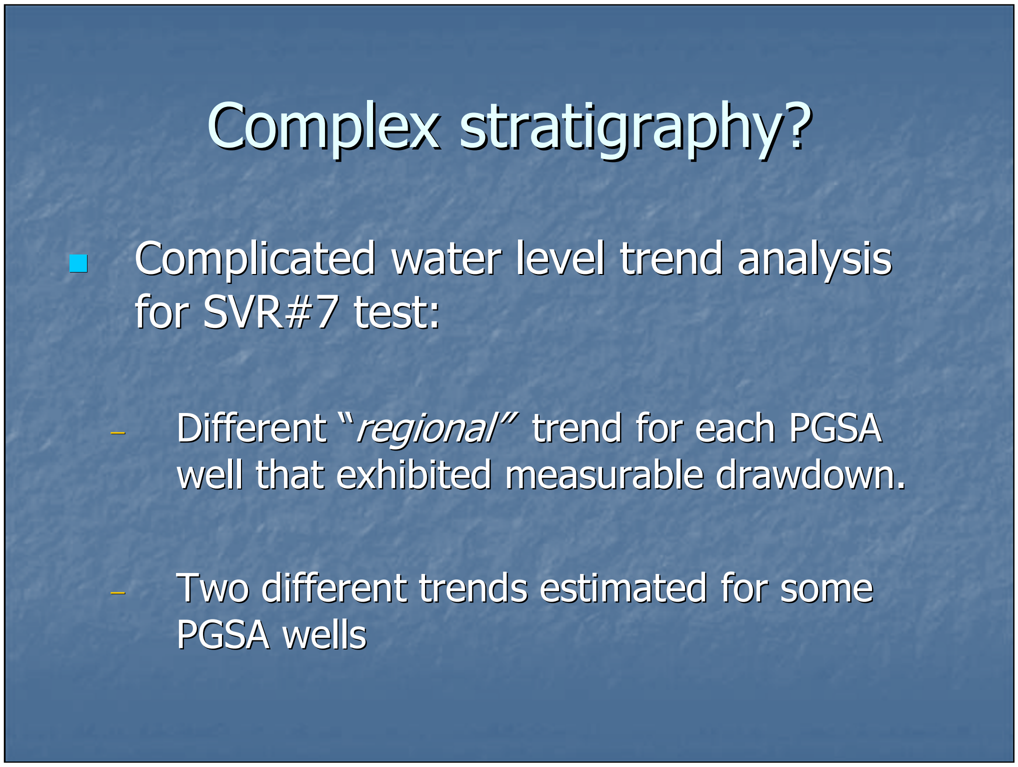


Since I'm on the topic of vertical hydraulic gradients, I should mention that there also is a downward vertical hydraulic gradient between the unnamed alluvial sand aquifer and the upper layers of the PGSA in the TW#1 piezometer nest based on the water level data that are presented in Exhibit 44, Table 2. However, the same dataset indicates that the gradient is upward toward the unnamed alluvial aquifer in the TW#4 piezometer nest. I have not seen the existence of a downward vertical hydraulic gradient in the TW#1 piezometer nest discussed in the supporting documentation or heard it described in any of the testimony. The complex vertical gradient distribution makes tenuous the Exhibit 2 conclusion "*These measured vertical gradients that exist in the foothills region also serve to refute the prevailing notion of the foothills as a recharge area*". Incidentally, TW#1 and TW#4 are located on opposite sides of the fault that was identified by Wood in his 2007 report, Exhibit 19B.

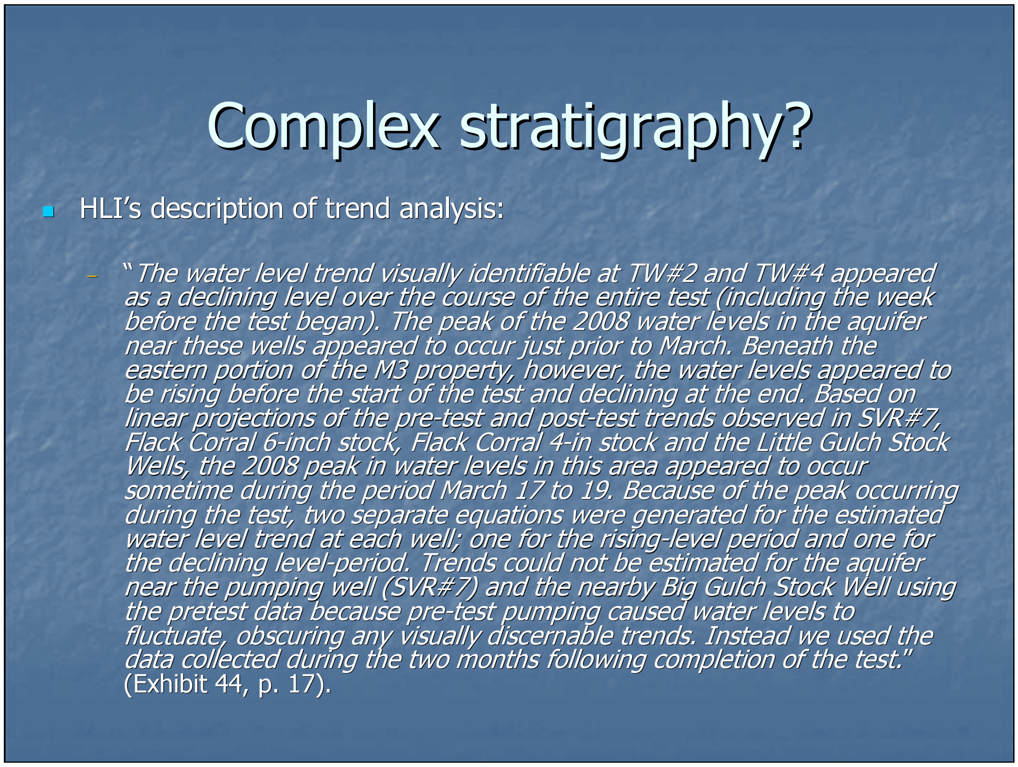
EXHIBIT 45



Additional complexity is revealed by looking at Figure 1 from the Response to our Staff Memorandum, Exhibit 45. There is a break in the West-Boise Eagle Geologic Fault north of M3 in the area that I've circled in red. I'm not sure whether the offset was caused by a transverse fault or some other mechanism but, whatever the cause, the nonlinearity of this feature complicates the hydrogeology of the PGSA since it transects both the shallow and deep strata.

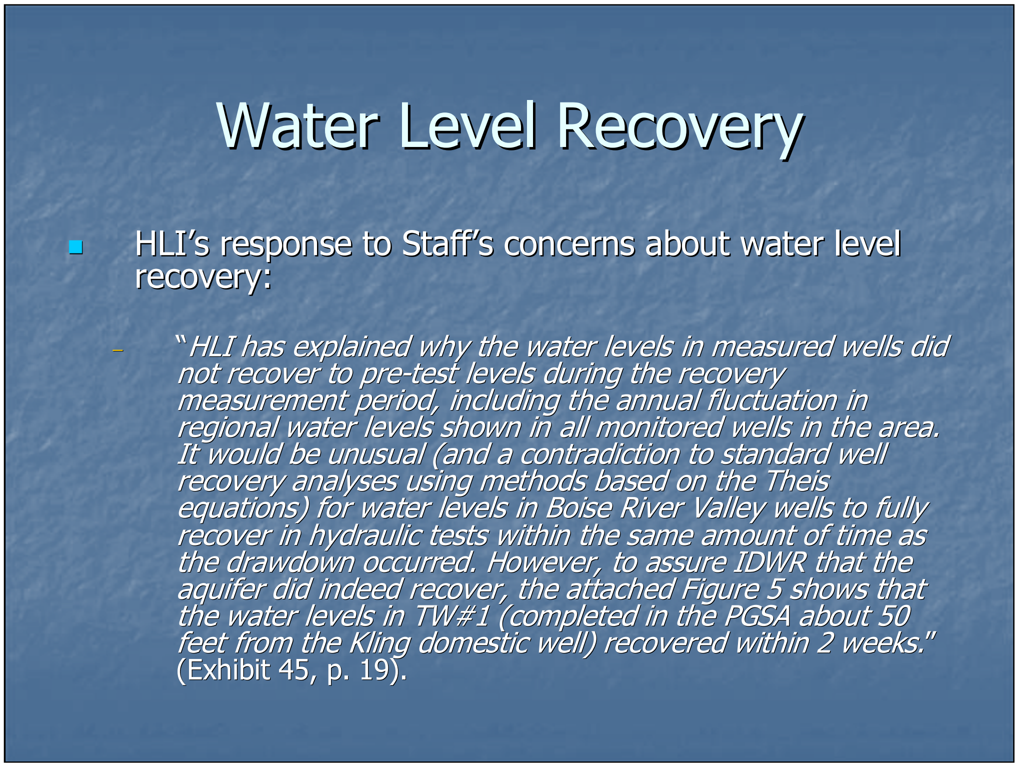


One last indication that there is complexity is the water level trend analysis that was performed by HLI for the SVR#7 aquifer test. The trend analysis was performed in order to correct drawdown and water level recovery data for regional water level trends, which is standard practice. However, HLI did not calculate a single water level trend for all of the PGSA wells on M3 property during the period of monitoring. Instead, and contrary to what you would expect for a trend that is "*regional*", a different trend was calculated for each and every well that exhibited measurable drawdown. In fact, two different water level trends were estimated for some of the wells.



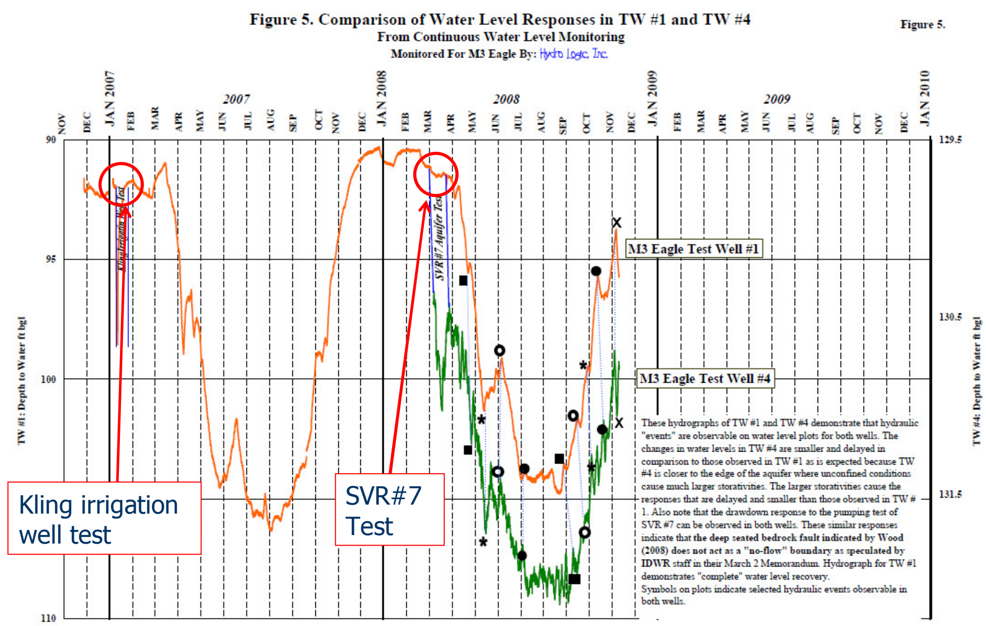
The trend correction is described on page 17 of the SVR#7 Aquifer Test Report, "*The water level trend visually identifiable at TW#2 and TW#4 appeared as a declining level over the course of the entire test, including the week before the test began. The peak of the 2008 water levels in the aquifer near these wells appeared to occur just prior to March. Beneath the eastern portion of the M3 property, however, the water levels appeared to be rising before the start of the test and declining at the end. Based on linear projections of the pre-test and post-test trends observed in SVR#7, Flack Corral 6-inch stock, Flack Corral 4-in stock and the Little Gulch Stock Wells, the 2008 peak in water levels in this area appeared to occur sometime during the period March 17 to 19. Because of the peak occurring during the test, two separate equations were generated for the estimated water level trend at each well; one for the rising-level period and one for the declining level-period. Trends could not be estimated for the aquifer near the pumping well, SVR#7, and the nearby Big Gulch Stock Well using the pretest data because pre-test pumping caused water levels to fluctuate, obscuring any visually discernable trends. Instead we used the data collected during the two months following completion of the test*" .

I want to point out to the Hearing Officer that calculating a different regional trend, or multiple trends, for each well using data that span the period of testing is not common practice - typically an analyst picks a single well outside the area of pumping influence to determine a single pre-test trend for the entire aquifer or perhaps calculates an average pre-test trend using a couple of wells. HLI's trend analysis, however, suggests that the background trend in the PGSA beneath M3 varies with both depth and location - and the need for that unusually complicated analysis suggests complexity to us. I also want to point out that attempting to calculate a different trend for the pumping and recovery period in each and every well that has been impacted by pumping is a difficult undertaking and makes analysis of all the aquifer test data uncertain, especially analysis of the water level recovery data.



I want to talk some more about the trend correction, but this time it's in the context of water level recovery rather than stratigraphic complexity. Specifically, we noted in the Staff Memorandum that the Kling domestic well did not appear to recover from the Kling Irrigation well test and that water levels in the Big Gulch Stock well also seemed to indicate delayed or incomplete recovery from the SVR#7 9-day aquifer test. HLI's response to these concerns included the following statement: "*HLI has explained why the water levels in measured wells did not recover to pre-test levels during the recovery measurement period, including the annual fluctuation in regional water levels shown in all monitored wells in the area. It would be unusual , and a contradiction to standard well recovery analyses using methods based on the Theis equations, for water levels in Boise River Valley wells to fully recover in hydraulic tests within the same amount of time as the drawdown occurred. However, to assure IDWR that the aquifer did indeed recover, the attached Figure 5 shows that the water levels in TW#1, completed in the PGSA about 50 feet from the Kling domestic well, recovered within 2 weeks.*"

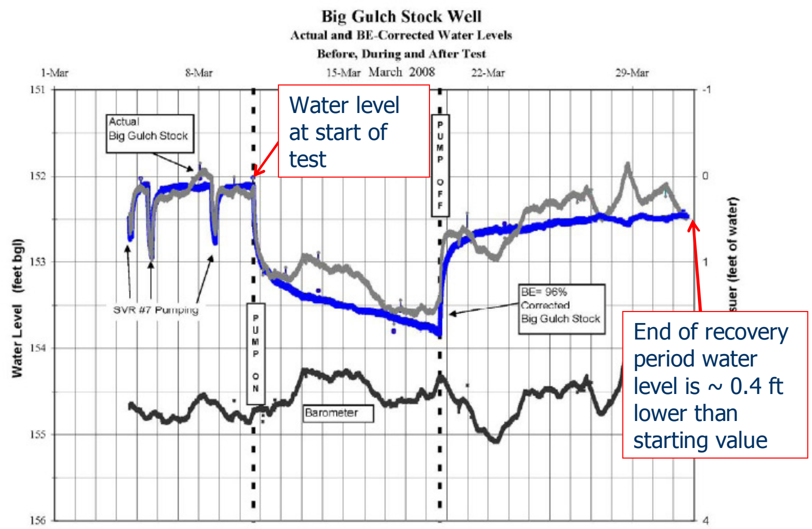
EXHIBIT 45



Here is Figure 5 from HLI's Response to the Staff Memorandum. The labeling by HLI indicates that the water levels in TW#1 are the orange data and that the water levels in TW#4 are the green data. I've identified the water levels in TW#1 during the Kling Irrigation and SVR#7 tests by drawing red circles around those data. Note that the maximum water level change is such a small fraction of 1 foot that it's almost imperceptible during both the Kling irrigation and SVR#7 aquifer tests. It's therefore difficult to determine based on looking at this figure whether or not there was any drawdown in TW#1 during either test. Further complicating interpretation of this figure is the fact that TW#1 is a nested piezometer, which monitors water levels at 5 different elevations. According to Table 1 in Exhibit 44, which is the SVR#7 aquifer test report, none of the five zones responded to pumping during the SVR#7 test. And according to page 200 of Exhibit 12, the shallowest piezometer, Zone 5, "*<u>did not react at all to pumping</u>*". The text on page 205 from the same report indicates that the <u>minimum</u> end-of-test drawdown among the other four TW#1 piezometers was 6.5 ft in Zone 1. Because Figure 5 from the Response to the Staff Memorandum indicates almost imperceptible drawdown during the Kling irrigation test and the smallest drawdown in any of the four zones that did respond to pumping was 6.5 ft, the only logical interpretation is that the orange line represents the water levels in Zone 5 of TW1, which like the Kling domestic well, is identified by HLI as being completed in the shallow alluvial aquifer system. It's difficult to reconcile HLI's conclusion that the water level in TW#1 recovered within two weeks with indications that the water level in Zone 5 did not respond to pumping in either of M3's aquifer tests. The indication from the aquifer test reports is that there was no water level decline from which to recover.

EXHIBIT 44

Figure C-3. Actual and BE-Corrected Water Levels for Big Gulch Stock Well

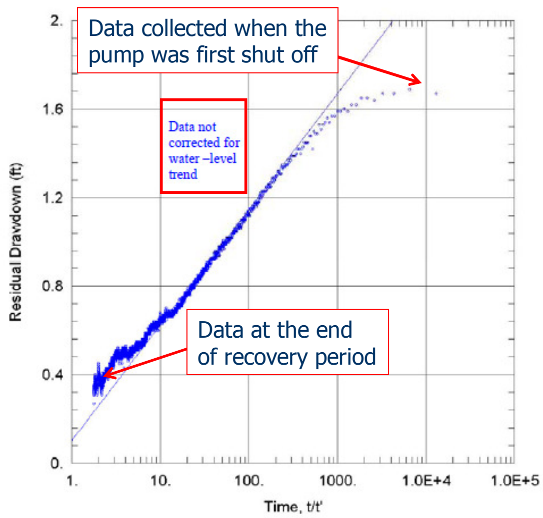


Distance from Pumping Well SVR #7 = 845 ft
Screen Depth = 180 to 180 ft ("open hole," no well screen)

I want to focus now on the SVR#7 aquifer test. This hydrograph is Figure C-3 from Exhibit 44, which is the SVR#7 Aquifer Test Report. It's an arithmetic plot of water level versus time. The blue colored data are the water levels after correcting for barometric pressure fluctuations. The period of monitoring encompasses the period of pumping and water level recovery. You can see that the water levels decline quickly in response to the onset of pumping on March 10, 2008 and they partially recover in response to the pump being shut off on March 19. In our Staff Memorandum, we expressed concern with the fact the water levels in the Big Gulch Stock well, which again was the closest monitoring well to the SVR#7 test well, and the only observation well to have more than 1-foot of drawdown during the 9-day test, did not appear to be trending toward full recovery. Note that the water level at the end of the water level recovery period, twelve days after the pump was shut off, was approximately four tenths of a foot lower than the water level that was measured immediately prior to turning on the pump. Incomplete or delayed water level recovery are concerns to staff because they can be indications that the aquifer is of limited extent.

EXHIBIT 44

Figure 26. Theis Recovery Analysis for the Big Gulch Stock Well with no Water-Level Trend Correction



Screen = 180 ft bgl (open hole)
T=450,000 gpd/ft
S/S' =0.6
Kv/Kh=0.1
b = 340 ft
r = 845 ft
Q = 917gpm (at SVR #7)

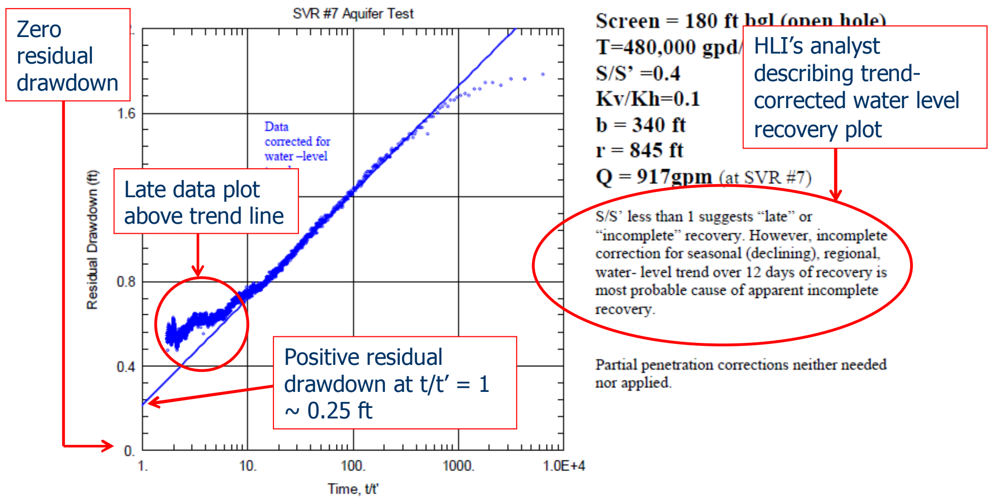
S/S' less than 1 suggests "late" or "incomplete" recovery. However, seasonal (declining), regional, water- level trend over 12 days of recovery is most probable cause of apparent incomplete recovery.

Partial penetration corrections neither needed nor applied.

This is Figure 26 from Exhibit 44, the SVR#7 Aquifer Test Report. The water level recovery data from the previous figure have now been plotted in the standard format for quantitative analysis, which is as residual drawdown, the difference between the original pre-test water level and the water level during recovery, versus the logarithm of the ratio t, the time since pump was turned on, divided by t', the time since the pump was turned off. Note that the data on this plot have not yet been corrected for the regional water level trend. The main thing I want to point out about this plot is that the first data to be collected after the pump shut off are the blue colored dots in the upper right hand part of the plot and the data in the lower hand portion of the plot are the last recovery data that were collected so the recovery time increases to the left. Also note that the ending residual drawdown values are approximately four-tenths of a foot which means the water levels at the end of the recovery period are four-tenths of a foot lower than the pre-pumping level. That's the same determination that I made for the previous slide because these are the same water level data - they've just been plotted differently to facilitate analysis.

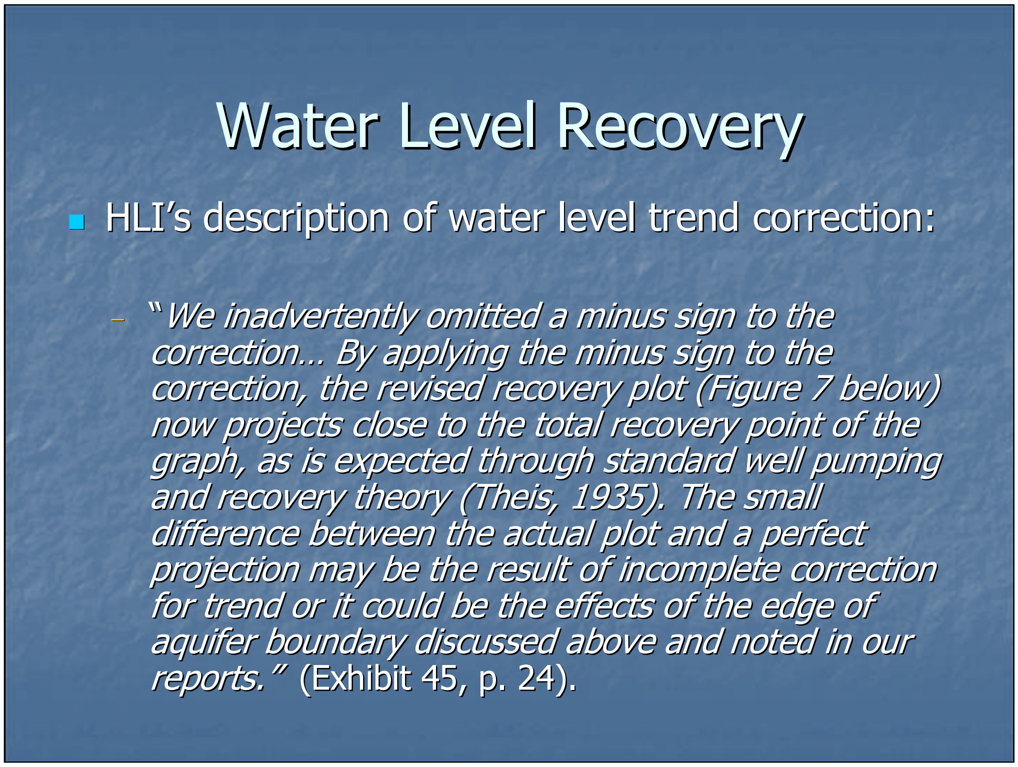
EXHIBIT 44

Figure 27. Theis Recovery Analysis for the Big Gulch Stock Well with Water-Level Trend Corrections

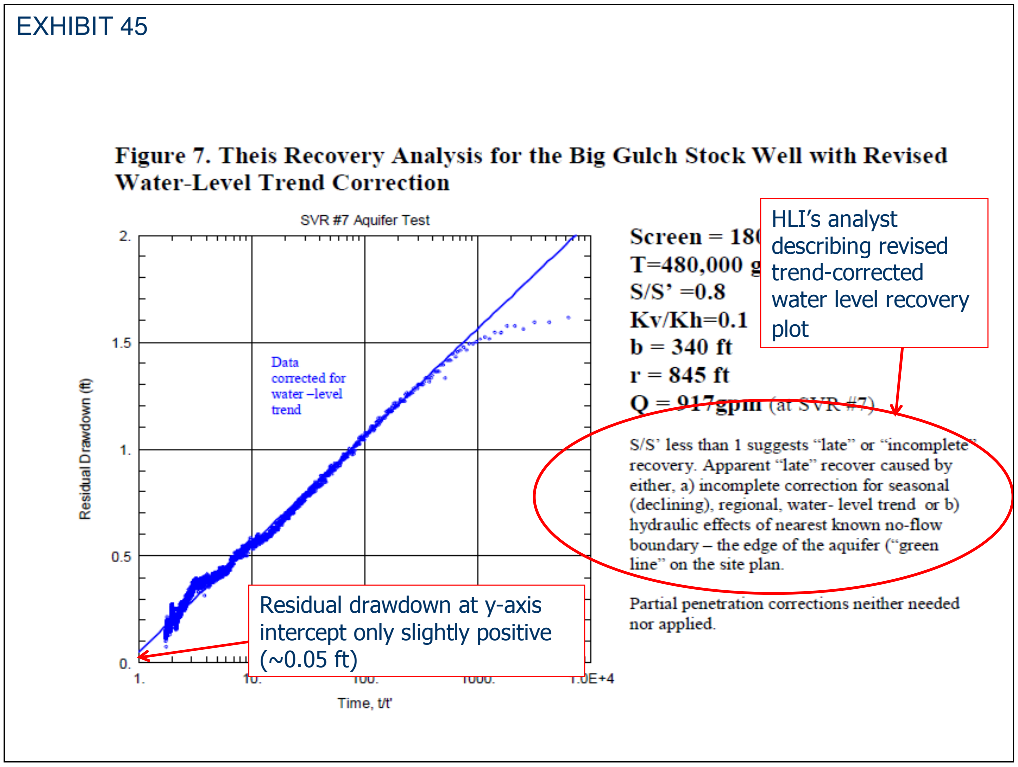


This is Figure 27 from Exhibit 44, the SVR#7 aquifer test analysis report. This plot is of the same data one more time, only now they have been corrected for the water level trend. Our review of this diagram was the basis for our comment about the apparent failure to achieve water level recovery in the Big Gulch Stock well. That conclusion was based not only on the ending residual drawdown values, which are slightly more than half of a foot on this diagram, but the fact that the data trend is <u>not</u> toward zero residual drawdown but instead is toward a positive residual drawdown of approximately one-quarter of a foot. The positive, non-zero intercept is diagnostic of an aquifer of limited extent and that is a major concern for staff in the context of evaluating the sustainability of the resource. HLI's analyst acknowledged the possibility of late and/or incomplete recovery in the caption on the right side of the figure. It says "*S/S' less than 1 suggests late or incomplete recovery. However, incomplete correction for seasonal, declining, regional water-level trend over 12 days of recovery is most probable cause of apparent incomplete recovery*."

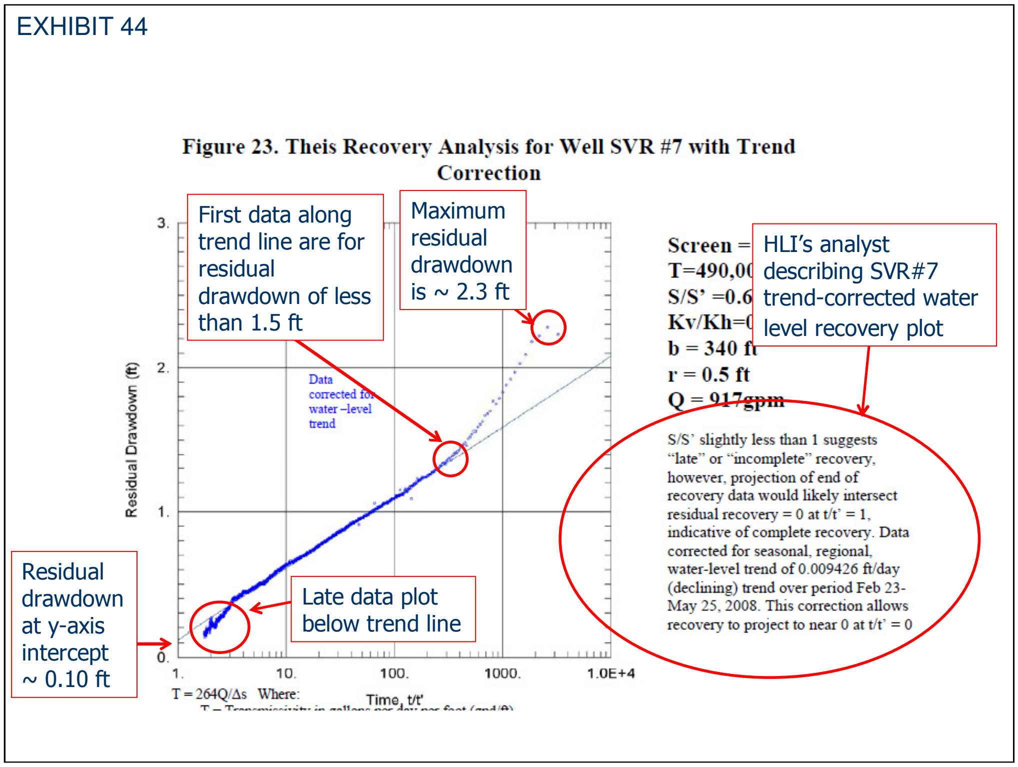
We also noted that the late time recovery data, which are the blue dots in the lower left hand corner of the plot, are located above the trend line. That was not commented on by HLI's analyst, however.



As it turns out, HLI had misapplied the trend correction for the Big Gulch Stock well. As described on page 24 of their Response to the Staff Memorandum, Exhibit 45 – ""*We inadvertently omitted a minus sign to the correction… By applying the minus sign to the correction, the revised recovery plot, Figure 7 below, now projects close to the total recovery point of the graph, as is expected through standard well pumping and recovery theory. The small difference between the actual plot and a perfect projection may be the result of incomplete correction for trend or it could be the effects of the edge of aquifer boundary discussed above and noted in our reports."*

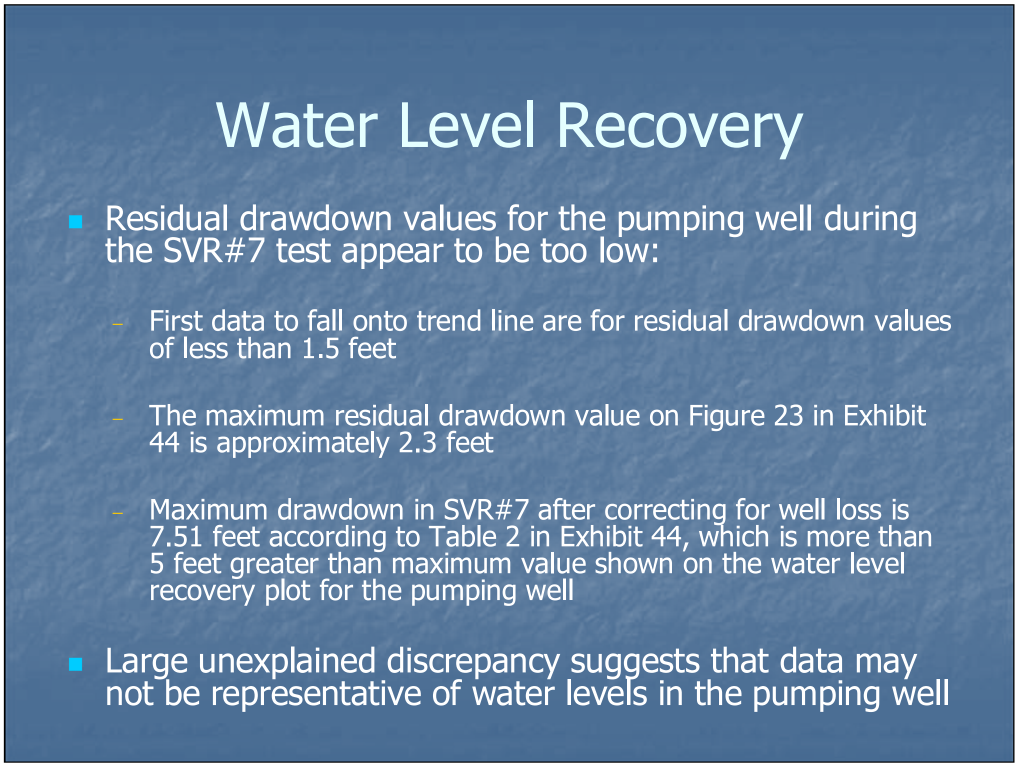


Here then is Figure 7 from the Response to the Staff Memorandum, Exhibit 45. This figure is a plot of the water level recovery data from the Big Gulch Stock well after applying the revised correction, which you'll recall is based on analysis of data that were collected in this same well after the test had been conducted. With the revised correction, the residual drawdown at the y-intercept is only slightly positive, approximately five hundredths of a foot. Nonetheless, HLI's analyst again acknowledges the possibility of late or incomplete recovery but this time indicates that it was "*caused either by: a) incomplete correction for seasonal, declining, regional water-level trend, or b) hydraulic effects of nearest known no-flow boundary, the edge of the aquifer green line on the site plan.*"

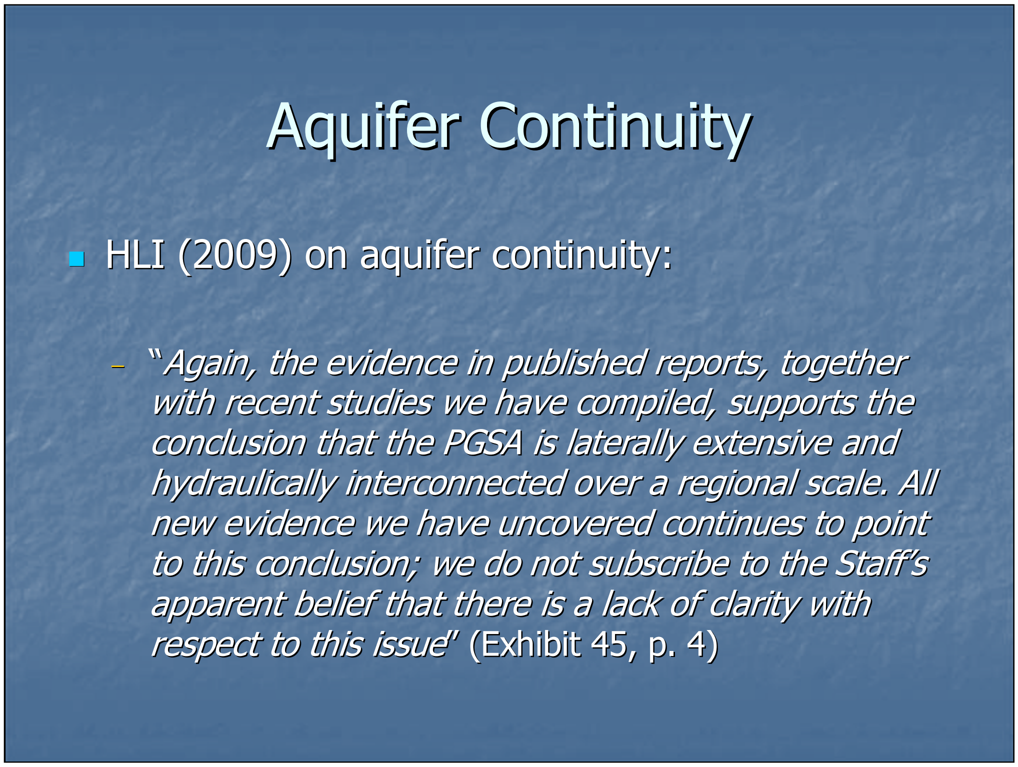


This is Figure 23 from Exhibit 44, which purportedly is a plot of trend-corrected recovery data from the SVR#7 pumping well. Note that the trend-corrected residual drawdown at t/t' = 1 for the pumping well is approximately one-tenth of a foot, which is somewhat larger than for the Big Gulch Stock well. Again the caption acknowledges that the recovery appears to be late or incomplete based on the trend line but, unlike in the case of Figure 27 for the Big Gulch Stock Well, the analyst considers late data that don't plot along the trend line in concluding "*projection of the end of recovery data would likely intersect residual recovery = 0 at t/t' =1, indicative of complete recovery.*" Beyond pointing out this inconsistency in the treatment of the late recovery data, the reason that I wanted to drag everyone through this rather difficult material is to emphasize that the regional water level trend corrections that were applied to the recovery data effectively mask the true response of the aquifer. In other words, the drawdown that was caused by pumping in the two wells with the most drawdown, SVR#7 and the Big Gulch Stock well, is not of sufficient magnitude in relation to the various water level correction factors to definitively assess whether or not the aquifer recovery was delayed or possibly even incomplete. The fact that uncertainty about the regional water level trend was used to explain residual drawdown intercepts of both 0.05 feet and 0.25 feet in the Big Gulch Stock well and 0.1 feet in the nearby SVR#7 well supports the idea that, in the case of the SVR#7 test, where the maximum recoveries are only on the order of a foot or two, a well-specific regional trend analysis based on data that were collected after the test makes evaluation of aquifer boundary conditions using the water level recovery data tenuous. Based on this figure, it is our opinion that the aquifer was not stressed enough by pumping at 900 gal/min for 9 days to facilitate a more definite analysis of the recovery data.

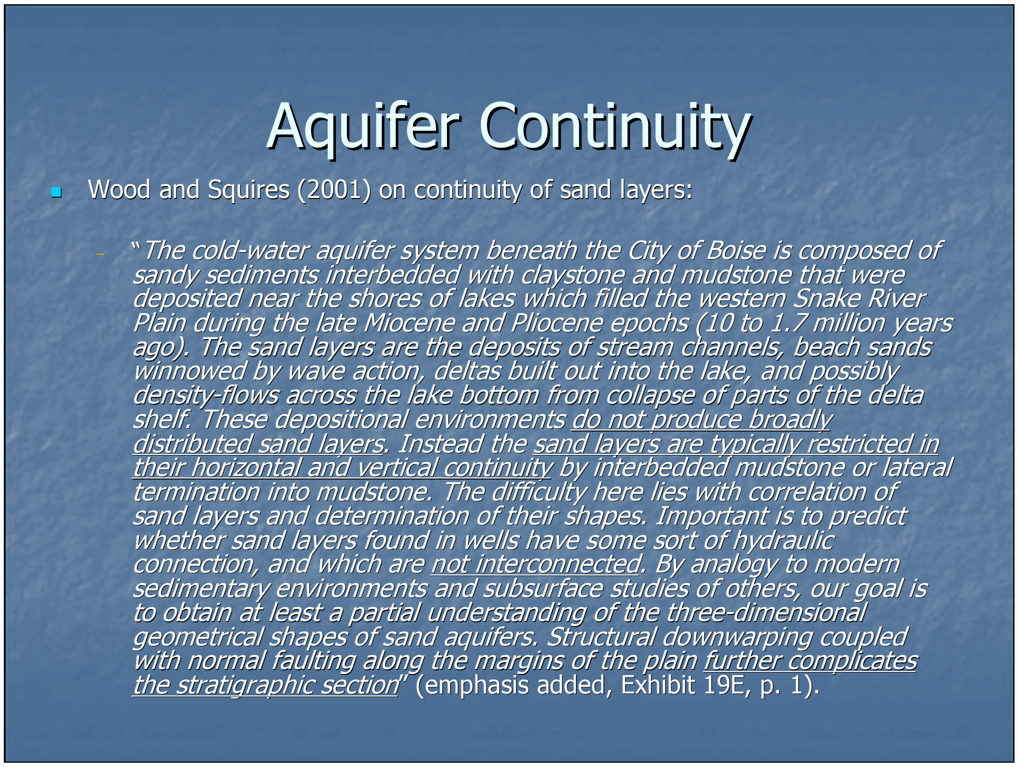
Before we move on from Figure 23, I want to point out that the first data points to plot along the trend line, which I've circled in red, are for residual drawdown values of slightly less than 1.5 feet and the maximum residual drawdown value of any data point is approximately 2.3 feet, which I've also circled in red.



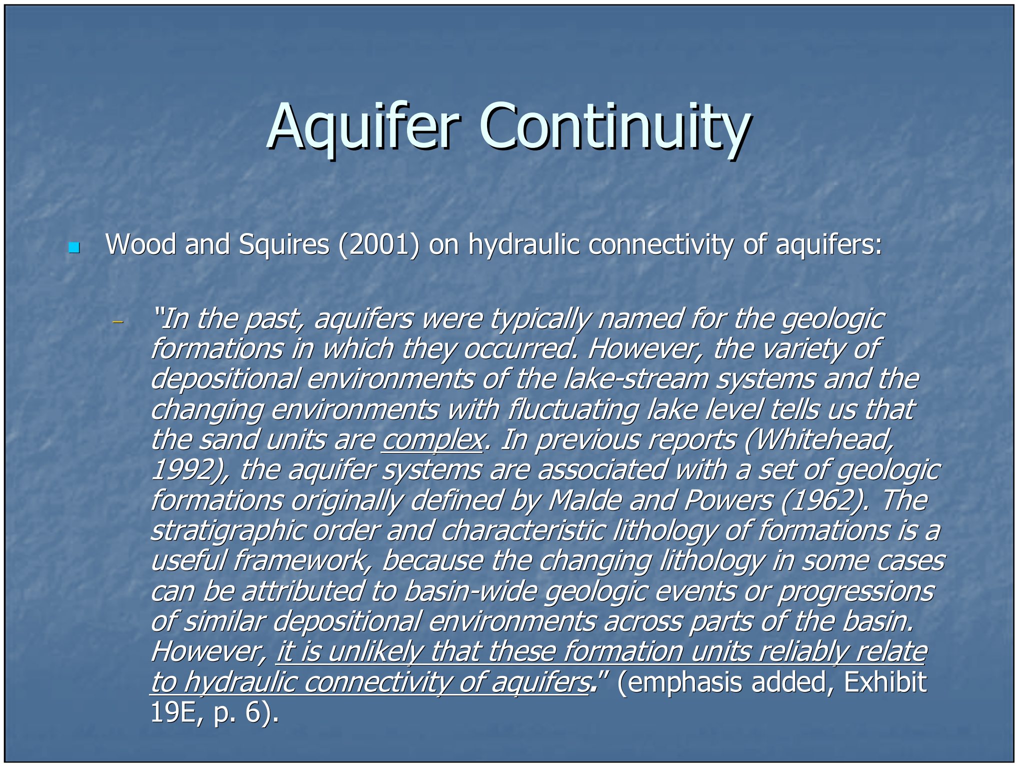
The 2.3-foot maximum residual drawdown suggests that there may be a problem with Figure 23, which again is the trend-corrected water level recovery plot for the pumping well during the 9-day SVR#7 aquifer test. Table 2 from Exhibit 44, the SVR#7 aquifer test report indicates that the maximum measured drawdown in the pumping well was 29.79 feet and that, after correcting for well loss, the maximum drawdown in the pumping well was 7.51 feet. The 2.3-foot maximum residual drawdown on Figure 23 is therefore more than 5 feet less than the maximum drawdown after correcting for well loss. This rather large and unexplained discrepancy suggests to staff that the data shown are Figure 23 may not be representative of water levels in the pumping well during recovery.



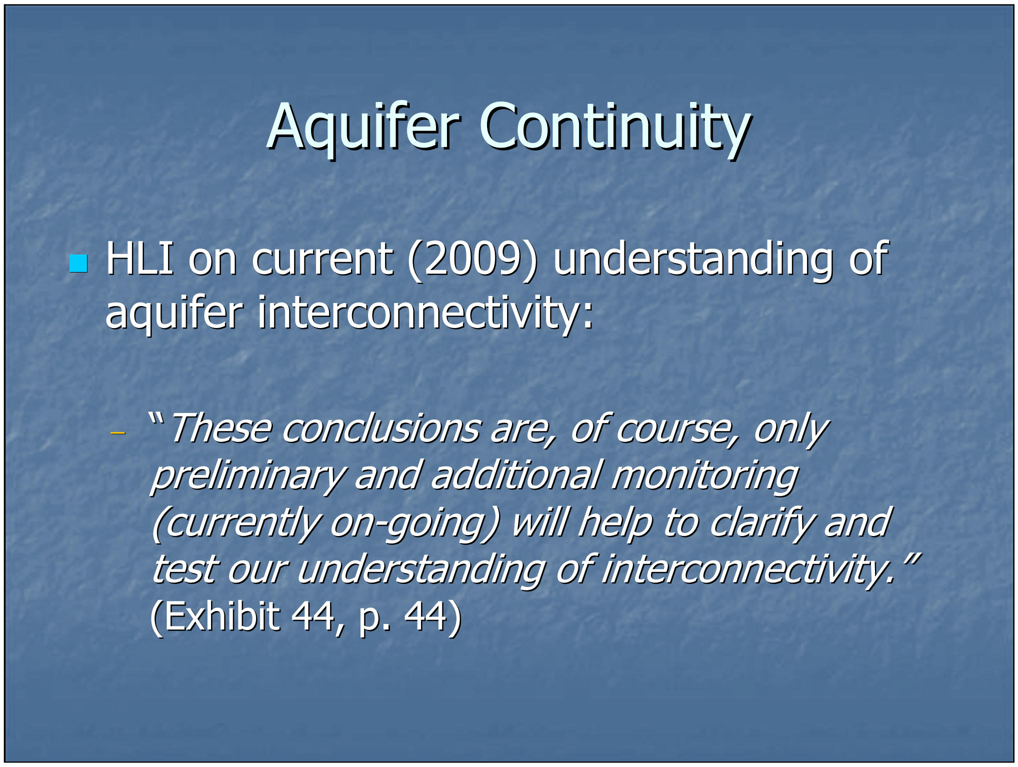
The next topic that I'd like to address is that of aquifer continuity. On page 4 of their response to Staff Memorandum, HLI stated "*Again, the evidence in published reports, together with recent studies we have compiled, supports the conclusion that the PGSA is laterally extensive and hydraulically interconnected over a regional scale. All new evidence we have uncovered continues to point to this conclusion; we do not subscribe to the Staff's apparent belief that there is a lack of clarity with respect to this issue*".



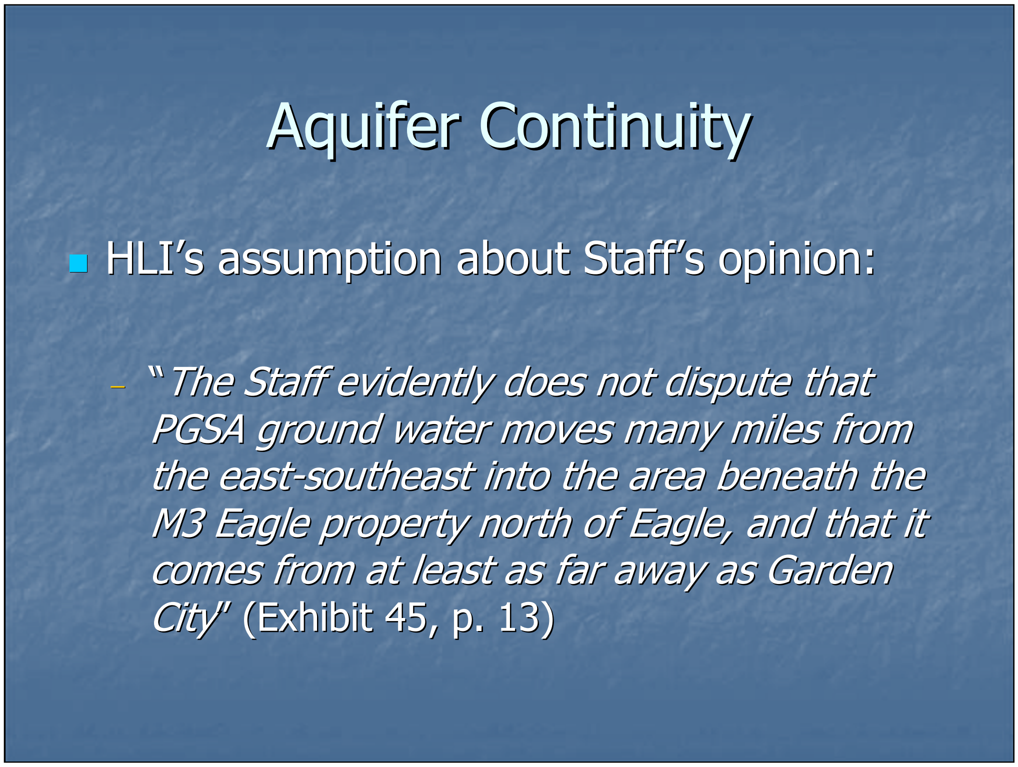
Staff cannot reconcile this statement with findings from a previous study that was conducted for the Treasure Valley Hydrologic Project by two of M3's experts, Mr. Ed Squires and Dr. Spence Wood. That study was documented in a 2001 report, Exhibit 19E, that was submitted as part of seven-document package entitled Documentation provided by S.H. Wood, PhD., Professor Emeritus. The first excerpt from the 2001 report speaks both to the complexity and lateral extent issues for sedimentary aquifers in the Boise area, which according to the HLI numerical model, is located between the PGSA recharge area and M3. The Introduction to the report is a nice summary of the hydrogeologic setting southeast of M3. It begins "*The cold-water aquifer system beneath the City of Boise is composed of sandy sediments interbedded with claystone and mudstone that were deposited near the shores of lakes which filled the western Snake River Plain during the late Miocene and Pliocene epochs (10 to 1.7 million years ago). The sand layers are the deposits of stream channels, beach sands winnowed by wave action, deltas built out into the lake, and possibly density-flows across the lake bottom from collapse of parts of the delta shelf. These depositional environments* <u>do not produce broadly distributed sand layers</u>*. Instead the sand layers are typically* <u>restricted in their horizontal and vertical continuity</u> *by interbedded mudstone or lateral termination into mudstone. The difficulty here lies with correlation of sand layers and determination of their shapes. Important is to predict whether sand layers found in wells have some sort of hydraulic connection, and which are* <u>not interconnected</u>*. By analogy to modern sedimentary environments and subsurface studies of others, our goal is to obtain at least a partial understanding of the three-dimensional geometrical shapes of sand aquifers. Structural downwarping coupled with normal faulting along the margins of the plain* <u>further complicates the stratigraphic section</u>".



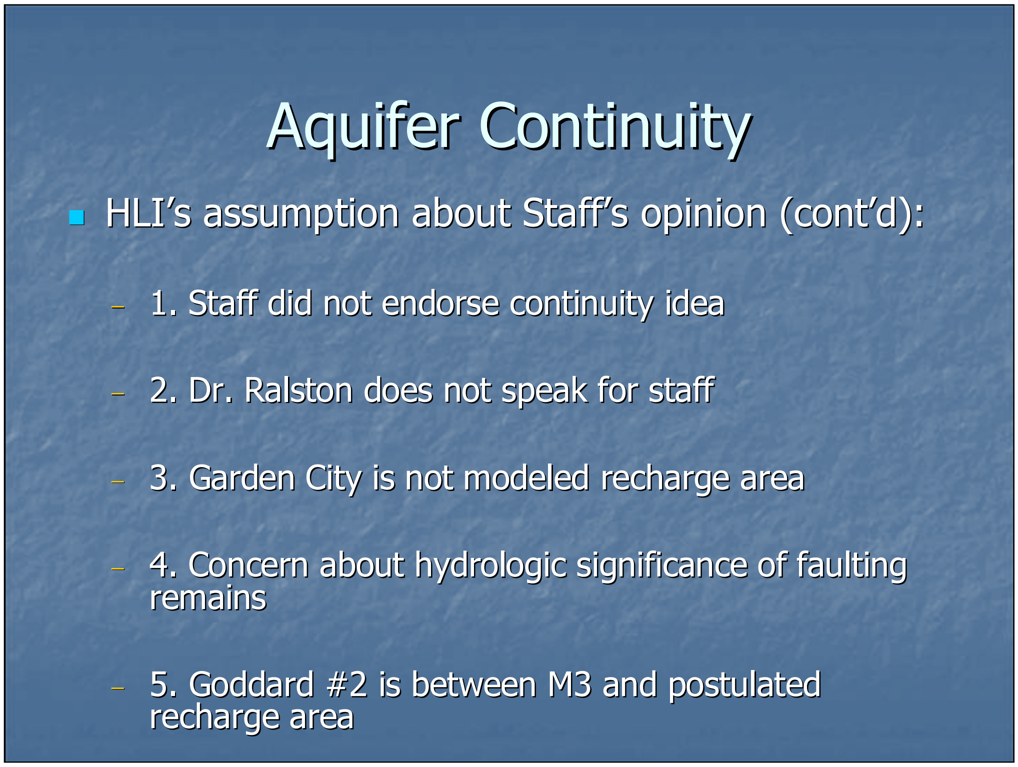
This next excerpt also touches on both complexity and continuity issues and appears later in the same document. That statement reads "*In the past, aquifers were typically named for the geologic formations in which they occurred. However, the variety of depositional environments of the lake-stream systems and the changing environments with fluctuating lake level tells us that the sand units are complex. In previous reports, the aquifer systems are associated with a set of geologic formations originally defined by Malde and Powers. The stratigraphic order and characteristic lithology of formations is a useful framework, because the changing lithology in some cases can be attributed to basin-wide geologic events or progressions of similar depositional environments across parts of the basin. However, it is unlikely that these formation units reliably relate to hydraulic connectivity of aquifers.*"



Next, on page 44 of the 2009 report for the SVR#7 aquifer test (Exhibit 44), HLI explains that "*These conclusions are, of course, only preliminary and additional monitoring (currently on-going) will help to clarify and test our understanding of interconnectivity.*" For the benefit of the Hearing Officer, I'd like to emphasize what's been said here. In the rebuttal to our Staff Memo, HLI implies that staff is somehow misguided in thinking there is a lack of clarity with regard to the scale of aquifer interconnectivity, but in their last supporting submittal based on the most recent data that they've collected, they indicate that additional monitoring is needed to help clarify their preliminary conclusions regarding aquifer interconnectivity. Suffice it to say that hydraulic interconnectivity is a concern to staff because the assumption of connectivity to an off-site source of recharge is the basis for the numerical model that was applied to predict hydrologic impacts.



Lastly, in the response to our Staff Memorandum, Exhibit 45, HLI asserts "*The Staff evidently does not dispute that PGSA ground water moves many miles from the east-southeast into the area beneath the M3 Eagle property north of Eagle, and that it comes from at least as far away as Garden City*". HLI appears to have arrived at their conclusion about what staff thinks based on the affidavit of Dr. Dale Ralston, a portion of which is presented later in HLI's Response to our Staff Memorandum.



HLI’s assumption about what staff thinks about the scale of aquifer interconnectedness is wrong on several counts.

One, just because staff does not specifically state opposition to an HLI concept, does not indicate our endorsement of the idea.

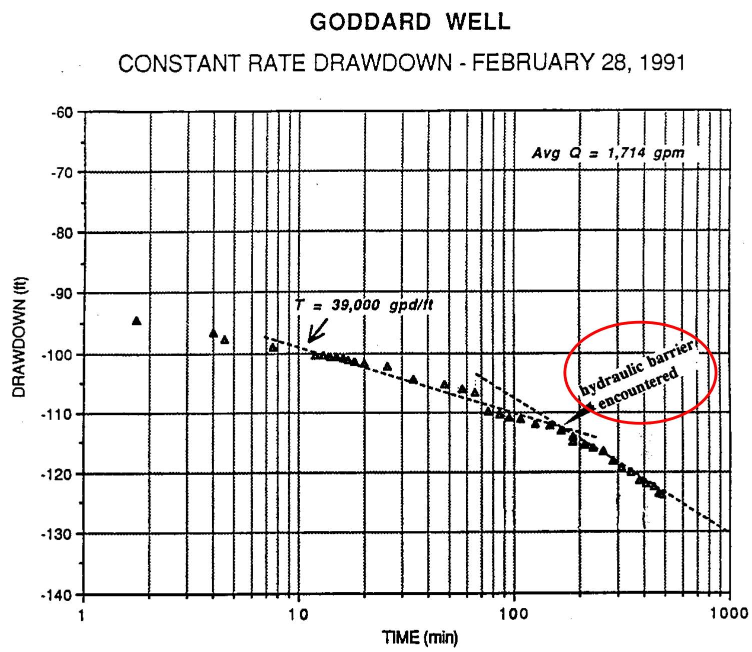
Two, with all due respect to Dr. Ralston, he does not speak for Hydrology Staff and we don’t speak for him. He is not a neutral part in this matter. None of my staff has had any communications with Dr. Ralston relative M3’s pending water right application.

Three, whether the PGSA beneath M3 is hydraulically connected to PGSA wells in Garden City is significant in that there are historical data for production wells in the Garden City area and, if those wells are hydraulically connected to M3, it is an argument against aquifer compartmentalization. However, demonstrating hydraulic connection to the primary recharge sources is equally important in the context of validating M3’s conceptual and numerical models. According to the numerical modeling report (Exhibit 16), these include the New York Canal and the Boise River above Capitol Bridge, not the Boise River in Garden City.

Four, we have documented our concerns about faulting near M3 and the possibility that it may limit hydraulic communication with the PGSA elsewhere. The indication by HLI on page 18 of Exhibit 45 that we offered “*no-lines of evidence*” in our Staff Memorandum to justify such a concern is not correct. I’ll further address this issue in a moment.

Five, the Goddard Street #2 well is located between M3 and the postulated recharge source areas.

EXHIBIT 67



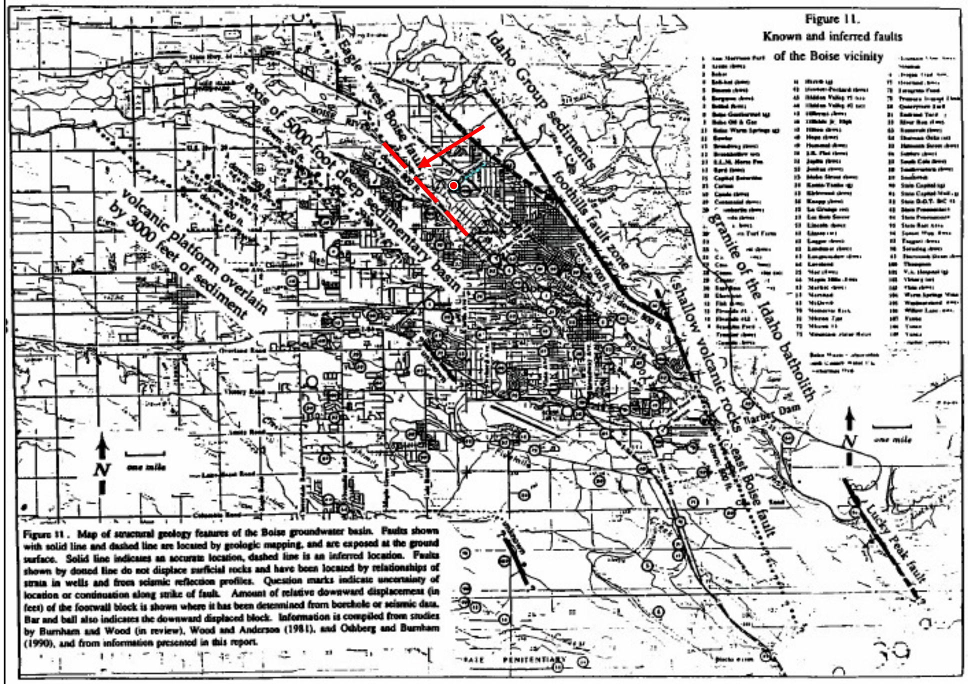
Squires, Wood, and Osiensky documented that the 551-foot deep Goddard #2 well is impacted by a hydraulic barrier (i.e., no-flow) boundary in their 1992 report entitled Hydrogeologic Framework of the Boise Aquifer System, Ada County, Idaho (Exhibit 67). They also presented an aquifer test data plot for the Goddard #2 well and identified the point on the curve where there was an increase in the slope of the drawdown trend as indication of a negative hydraulic barrier. According to HLI's Response to our Staff Memo, Goddard No. 2 is a PGSA well (Exhibit 45, p. 27) so there apparently is some sort of flow barrier in the PGSA between M3 and the postulated recharge area. As I mentioned earlier, Goddard #2 nonetheless has been in production for more than a decade so my concern is not that this well taps into a hydraulically isolated portion of the aquifer, but rather that M3's numerical model might not be an accurate predictor of impacts since it does not simulate this hydraulic barrier.

Aquifer Continuity

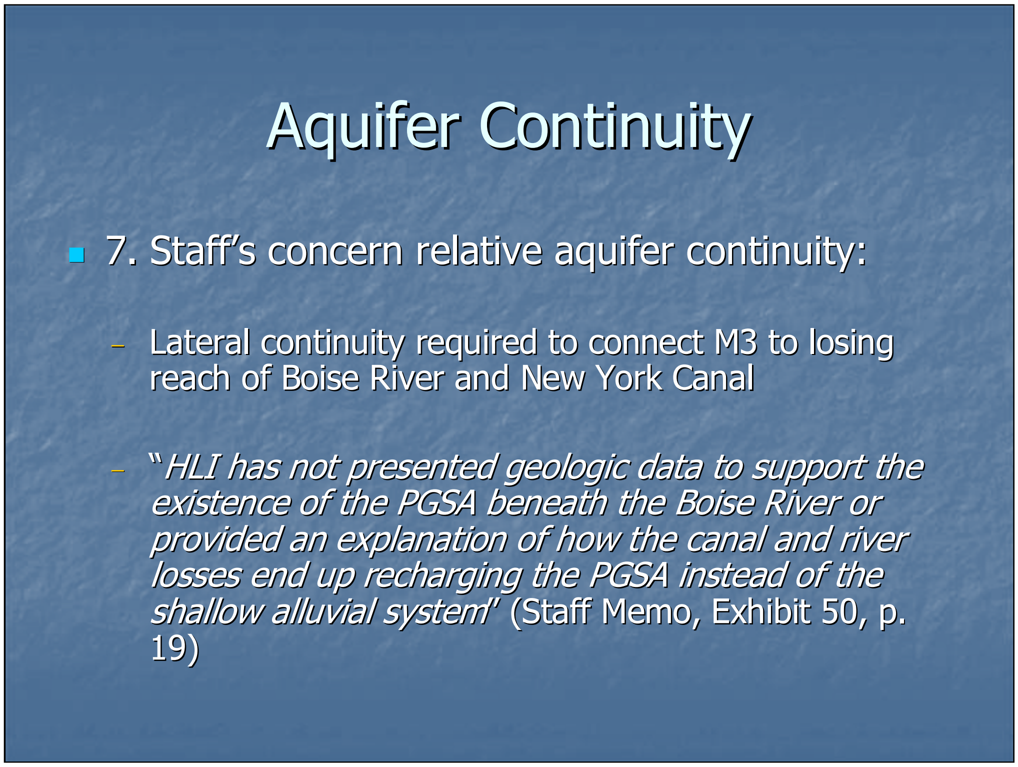
- 6. HLI has proposed new, modern day recharge area:
  - "*where the PGSA rises up dip to the present-day Boise River gravels east of the United Water Idaho (UWID) Swift well*" (Exhibit 45, p. 25).

Six, on page 25 of the Response to Staff Memorandum, HLI specifically identifies several new, <u>also modern day</u> recharge sources that were not simulated as areas of concentrated recharge in the M3 numerical model. One of these is "*where the PGSA rises up dip to the present-day Boise River gravels east of the United Water Idaho Swift well*".

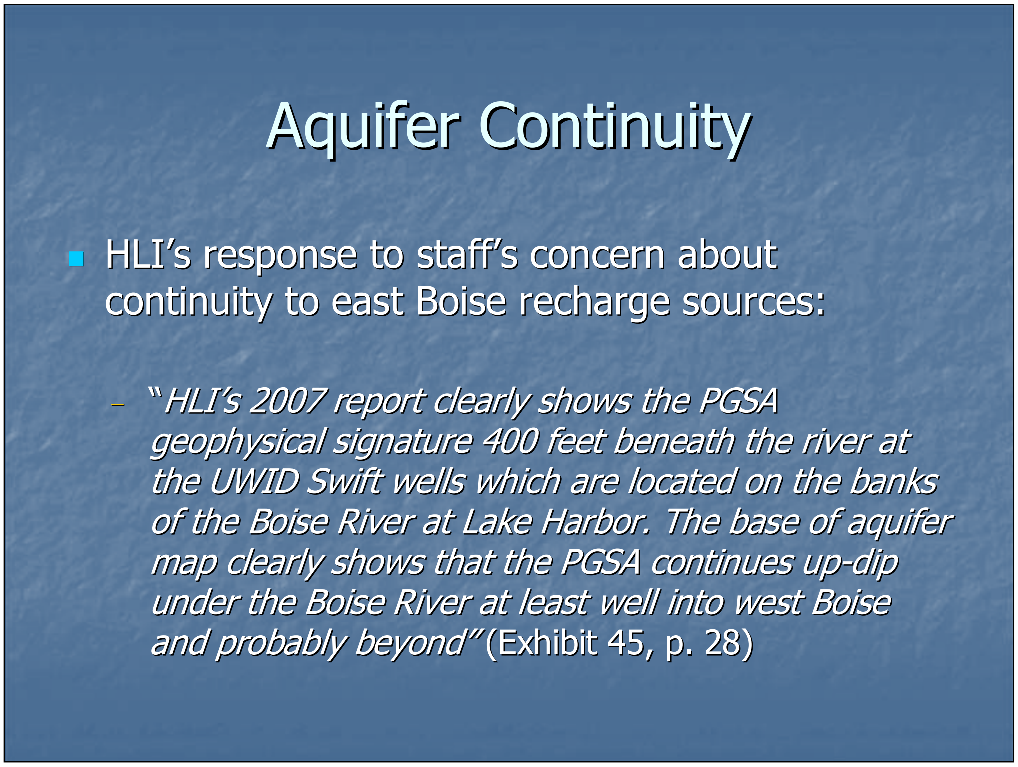
EXHIBIT 67



However, inspection of Figure 11 within the 1992 report, Exhibit 67, suggests that the Swift well, which I've identified with a small red dot, is on the upthrown side of the West Boise/Eagle fault, which I've emphasized with a dashed red line. The estimated offset across the fault is 800 feet, which is indicated on the left side of the fault trace below the large red arrow. If this is the case, hydraulic communication between this newly identified recharge area near the Swift well and the PGSA at M3 likely is limited by the fault.



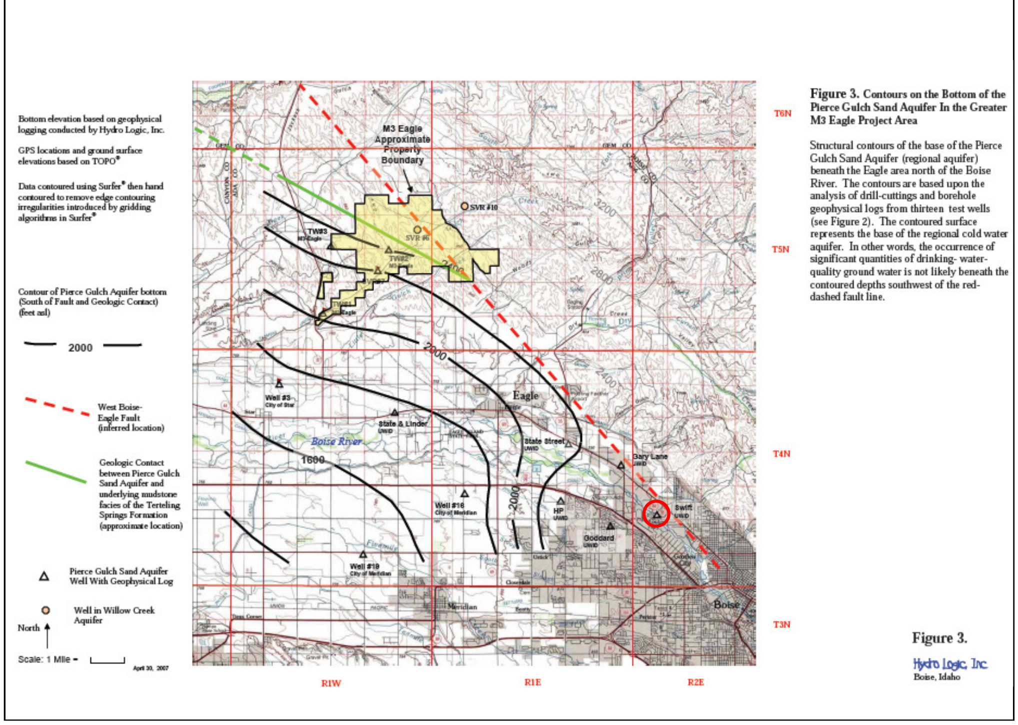
Seven, as indicated in our staff memorandum, we are concerned about lateral continuity because, for the M3 numerical model to be an accurate representation, it is required to connect the PGSA beneath M3 to assumed recharge sources in east Boise (i.e., the Boise River upstream from Capitol Bridge and the New York Canal). We noted in the Staff Memorandum that "*HLI has not presented geologic data to support the existence of the PGSA beneath the Boise River*". In retrospect, we probably should have stated, "*Beneath the Boise River above Capitol Bridge*", since that's the postulated recharge area, but I think that the intended meaning was clear enough because this statement was in the context of a discussion of recharge from the Boise River and New York Canal.



HLI offered the following response to our statement in Exhibit 45 - "*HLI's 2007 report clearly shows the PGSA geophysical signature 400 feet beneath the river at the UWID Swift wells which are located on the banks of the Boise River at Lake Harbor. The base of aquifer map clearly shows that the PGSA continues up-dip under the Boise River at least well into west Boise and probably beyond"* . There are several points that I'd like to make with reference to HLI's response to our statement about the extent of the PGSA southeast of M3:

1 - HLI is correct in pointing out that they identified the PGSA near Lake Harbor. We stand corrected.
2 - Lake Harbor is not a recharge area in the M3 numerical model.
3 - the phrase "*probably beyond*" does not constitute geologic evidence that the PGSA is present upstream from Capitol Bridge.

EXHIBIT 2



4 - in HLI's 2007 report (Exhibit 2), the Swift well, which I've circled in red, is located on the downthrown side of the West Boise-Eagle fault on the map showing the extent of the bottom of the PGSA. Note that the fault is located on the northeast side of the Boise River near the Swift well on this figure. This indeed suggests that there may be hydraulic continuity between the PGSA at M3 and beneath Garden City, but, as previously discussed, this fault location is different than shown on the map in the 1992 Report (Exhibit 67).

EXHIBIT 19D

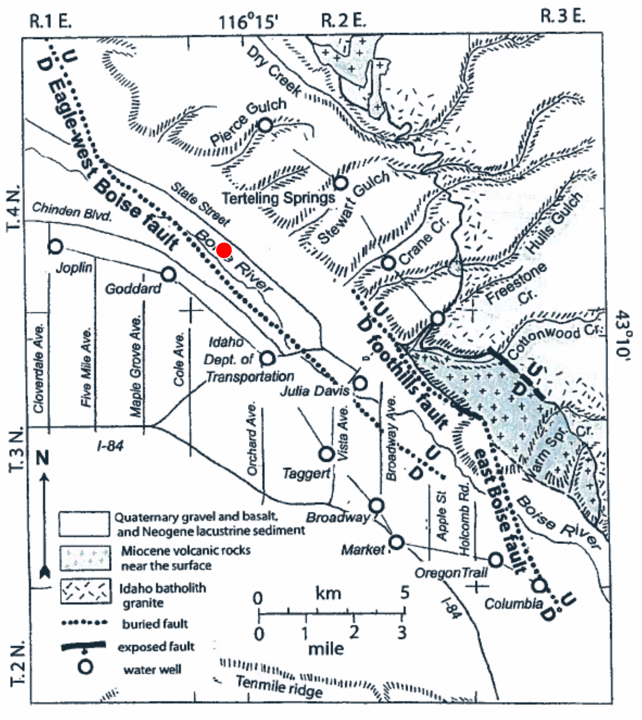
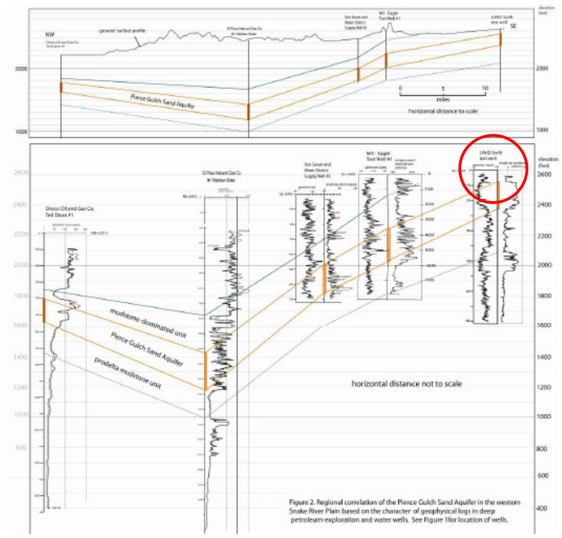


Figure 10. Geologic map of the Boise area showing locations of stratigraphic cross sections of Figure 11 and Figure 12.

Like the 1992 report, the Wood and Clemens 2002 Report, Exhibit 19D, shows the Eagle-West Boise fault to be on the southwest side of the Boise River near the Swift well, which I've identified on Figure 10 with a red dot. We are not aware of any new data that justify relocating the West-Boise Eagle fault from its mapped location, albeit approximate, in the 1992 and 2002 reports.

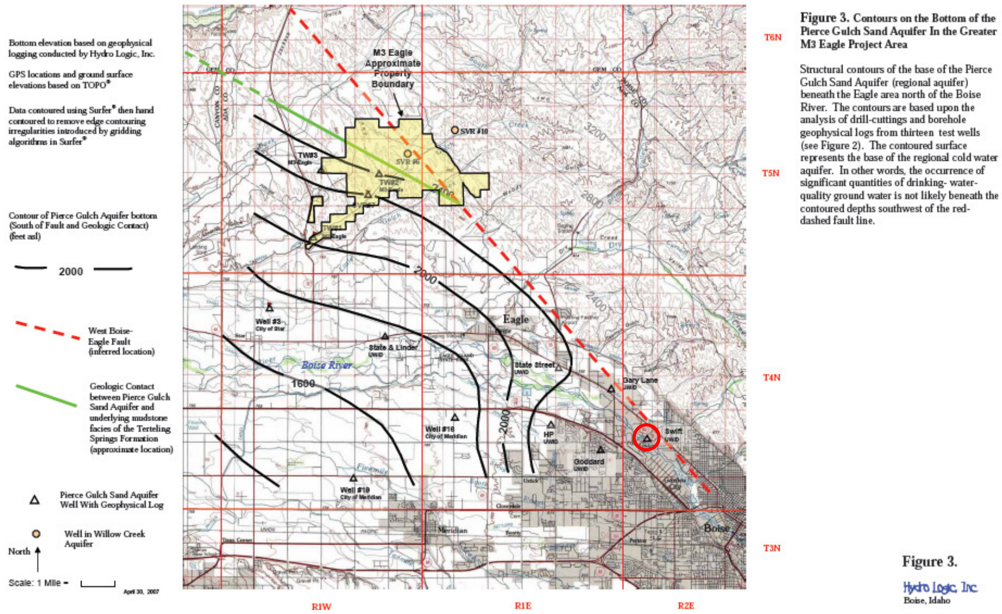
EXHIBIT 45

Figure 4. Hydrogeologic Cross Sections based on Deep Exploration Well Borehole Geophysical Analyses (from Wood)



5 - the driller's log, and the near-surface geophysical signature for the Swift well, which I've circled in red in the upper right corner of Figure 4 from Exhibit 45, indicate that there is at least 30 feet of blue clay on top of what HLI identified as the PGSA. The surficial clay layer shows up as a kick to the right on the gamma log, which is the left strip chart in the area that I've circled, and a deflection to the left on the resistance log, which is the strip chart on the right. If laterally continuous, that clay layer would limit hydraulic communication between the PGSA and the alluvial aquifer system. As discussed by Mr. Glanzman, the geochemistry data indicate that PGSA groundwater has not had much contact with clay, which also suggests that communication with the Boise River is not significant in the vicinity of the Swift Well.

EXHIBIT 2



6 - the figure showing the bottom of the PGSA in HLI's 2007 report, Figure 3 from Exhibit 2, does not show contour lines east of the Garden City Fairgrounds or south of Cloverdale Avenue. The contours also do not extend west beyond the Canyon/Ada County line or into Gem County. The lateral extent of the PGSA shown on this figure based on geologic data is therefore considerably smaller than the modeling domain of the M3 numerical model.

Aquifer Continuity

- 7. Continuity of hydrogeology from Lake Harbor through Boise to recharge area is assumed but not justified
  - Negative boundaries indicated in west Boise PGSA well
  - Squires, Wood, and Osiensky (1992) describing lateral extent of deeper cold-water aquifers:
    - "*the west Boise deep artesian aquifers should be truncated to the north or northeast by down-to-basin normal faults such as the West Boise/Eagle Fault and/or beveled off updip by an erosional angular unconformity. Virtually all well-completion/pump capacity tests of production wells in this region have shown indications of such negative hydraulic boundaries in the subsurface.*" (Exhibit 67, p. 58)

7 - extrapolation of hydrogeologic conditions at Lake Harbor through west Boise and beyond is not justified based on the information contained in HLI submittals. The 1992 Squires, Wood, and Osiensky report, Exhibit 67, indicates, not only that there are negative boundaries in the PGSA, but also that there is a major discontinuity in the underlying cold-water aquifer system - "*the west Boise deep artesian aquifers should be truncated to the north or northeast by down-to-basin normal faults such as the West Boise/Eagle Fault and/or beveled off updip by an erosional angular unconformity. Virtually all well-completion/pump capacity tests of production wells in this region have shown indications of such negative hydraulic boundaries in the subsurface.*".

Faulting

- HLI response to Staff's concerns relative faulting:
  - *"with perhaps one exception, there is no evidence that the major faulting in the deep volcanic basement rocks, including that detected by the magnetometer survey conducted by M3 Eagle in 2007, offsets, or even breaks, the shallower water bearing units including the PGSA. The available evidence actually shows the opposite, that the deep-seated faults do not propagate to land surface or penetrate the younger sediments above. An exception is the mapped, basin-bounding, West Boise-Eagle ("WBE") fault extending into, and apparently truncating, the sedimentary section"* (Exhibit 45, p. 3)

Next topic - HLI seems to take exception to our assertions that the PGSA might be faulted and that this faulting could serve as a partial or complete aquifer boundary. Specifically, HLI concludes in Exhibit 45 that "*with perhaps one exception, there is no evidence that the major faulting in the deep volcanic basement rocks, including that detected by the magnetometer survey conducted by M3 Eagle in 2007, offsets, or even breaks, the shallower water bearing units including the PGSA. The available evidence actually shows the opposite, that the deep-seated faults do not propagate to land surface or penetrate the younger sediments above. An exception is the mapped, basin-bounding, West Boise-Eagle fault extending into, and apparently truncating, the sedimentary section"* .

Faulting

- HLI response to Staff's concerns relative faulting (cont'd):
  - *"Major faulting that formed the western Snake Plain generally does not significantly cut or offset the younger sedimentary units (shallower than 1,000 ft) in the basin on the north side of the plain"* (Exhibit 45, p. 9)
  - "*HLI did commission seismic reflection and magnetometer surveys, mainly to determine deep structural features.*" (Exhibit 45, p. 10)

They also wrote in Exhibit 45 that "*Major faulting that formed the western Snake Plain generally does not significantly cut or offset the younger sedimentary units (shallower than 1,000 ft) in the basin on the north side of the plain*" and mentioned "*HLI did commission seismic reflection and magnetometer surveys, mainly to determine deep structural features.*"

EXHIBIT 19B

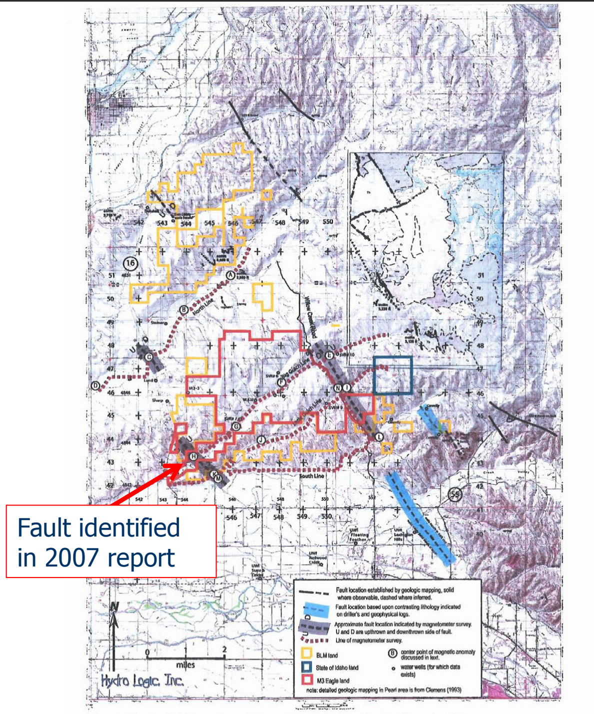
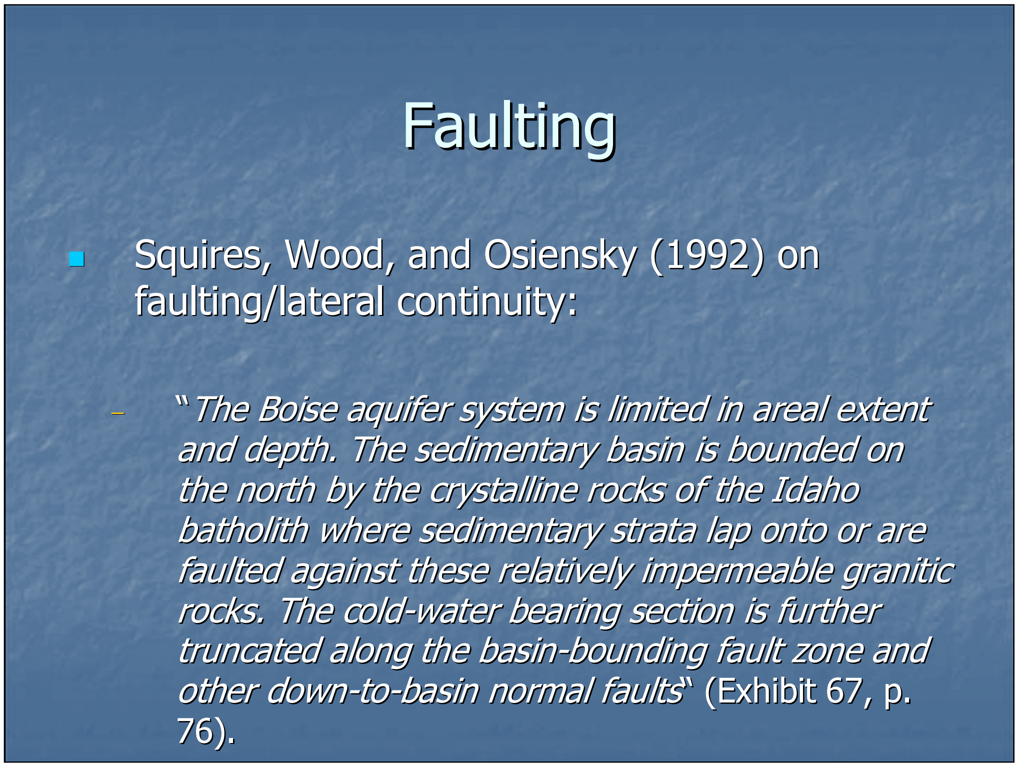


Figure 1. Map showing M3 property, geologic mapping in progress, and location of magnetometer lines.
Center point of magnetic anomalies are circled - refer to text for discussion.

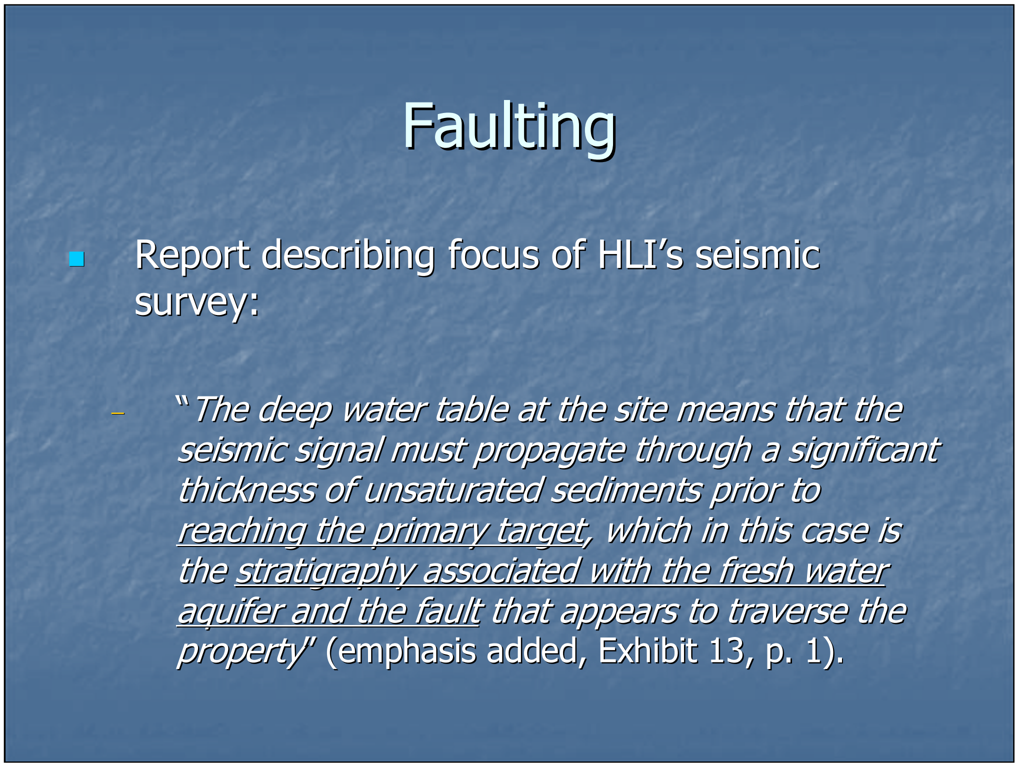
10

Let me be clear on this point, Hydrology Staff does not know whether there is fault gouge, or fine-grained sediments infilling the fault plane, or offset of the PGSA across the fault that was mapped by Wood in his 2007 report, Exhibit 19B, and we also don't know whether and, if so, how much any of those factors affect groundwater flow. We do know, however, that faults can and do exert control on groundwater in aquifers beneath the western Snake Plain and elsewhere, acting as partial, and in some cases, more-or-less complete barriers to flow. That's why we're so interested in understanding the location and hydrologic functioning of faults in North Ada County and why we've commissioned BSU's Center for Subsurface Geophysical Investigation to conduct a seismic study using a larger seismic source than was previously used. BSU's lead investigator would like to get started within the coming month.

We are grateful to M3 for allowing us access to their property



Another thing that we know about faults is that they don't typically occur in isolation. In the 1992 report, Exhibit 67, Squires, Wood, and Osiensky used the term "*zone*" to describe the faults that truncate and serve to limit the areal extent of the Boise aquifer system which separates M3 from the Boise River recharge area. They stated "*The Boise aquifer system is limited in areal extent and depth. The sedimentary basin is bounded on the north by the crystalline rocks of the Idaho batholith where sedimentary strata lap onto or are faulted against these relatively impermeable granitic rocks. The cold-water bearing section is further truncated along the basin-bounding fault <u>zone</u> and <u>other</u> down-to-basin normal faults*". The implication of the last sentence is that there are normal faults that are located away from the basin margin that also cut through the cold-water sedimentary aquifers.



We also know that HLI convinced their client that a study of the deep structural features was pertinent to this water right application, which involves pumping from an overlying sedimentary aquifer. The rationale for HLI commissioning a geophysical survey that, according to Dr. Wood, is not relevant to the PGSA Groundwater study, is unclear to staff. The rationale for submitting a non-relevant, but site-specific study in support of the water right application also is unclear to staff. Moreover, a focus on deep structural features is not apparent in the report documenting the inconclusive seismic reflection survey that was commissioned by HLI. That report, Exhibit 13, included the following statement "*The deep water table at the site means that the seismic signal must propagate through a significant thickness of unsaturated sediments prior to reaching the primary target, which in this case is the stratigraphy associated with the fresh water aquifer and the fault that appears to traverse the property*".

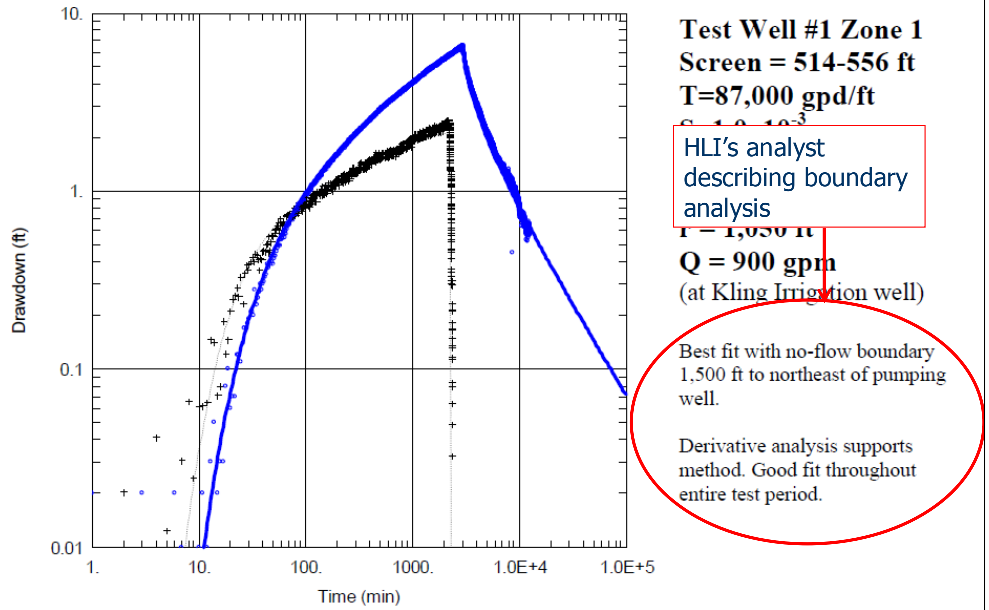
Faulting

- HLI on newly identified fault:
  - "*the deep-seated bedrock fault indicated by Wood (2008) does not act as a no-flow boundary as speculated by IDWR staff*" (Exhibit 45, p. 8)
  - "*Since the Aqtesolv® analyses used to generate a curve match <u>required the use of a fault acting as a no-flow boundary</u>, and because other subsurface geophysical mapping by HLI suggests a buried fault trace, it appears likely that <u>such a fault</u> may be present in the vicinity of the Kling well and that it <u>may control ground water movement</u> in the aquifer to some extent.*" (emphasis added, Exhibit 12, p. 212).

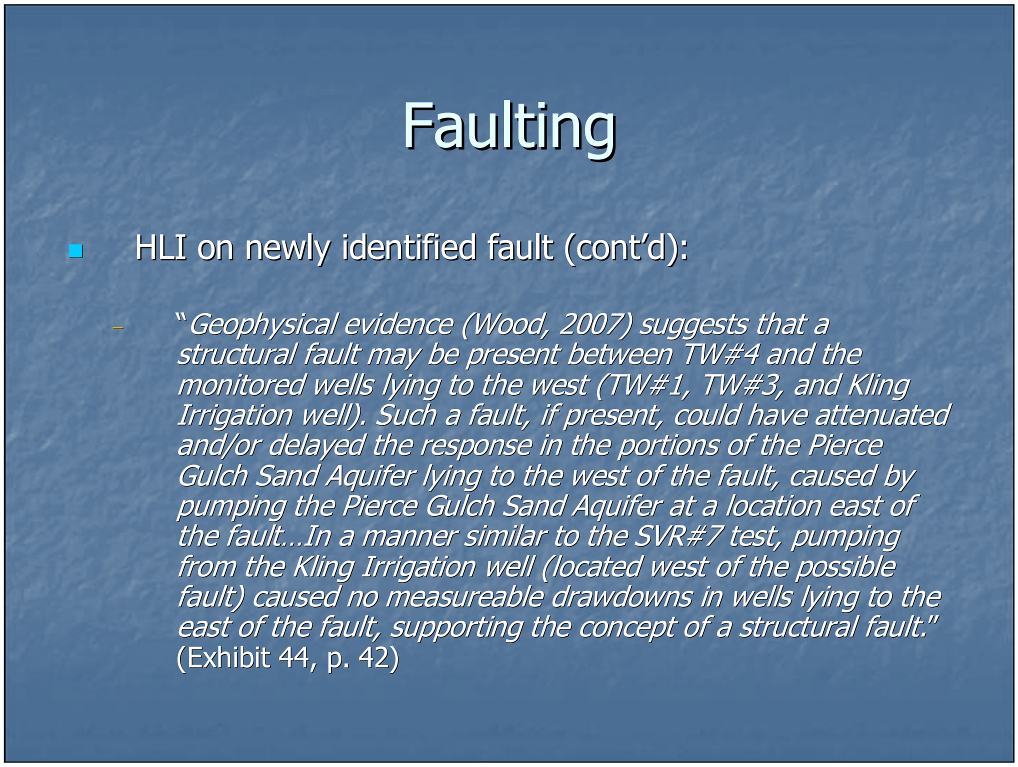
Also unclear to staff is why HLI now believes that the fault mapped by Wood using a magnetometer survey "*does not act as a no-flow boundary as <u>speculated</u> by IDWR staff*" when, in their analysis of aquifer test data from the Kling Irrigation well test, they concluded "*Since the Aqtesolv® analyses used to generate a curve match required the use of a fault acting as a no-flow boundary, and because other subsurface geophysical mapping by HLI suggests a buried fault trace, it appears likely that such a fault may be present in the vicinity of the Kling well and that it may control ground water movement in the aquifer to some extent.*"

EXHIBIT 12

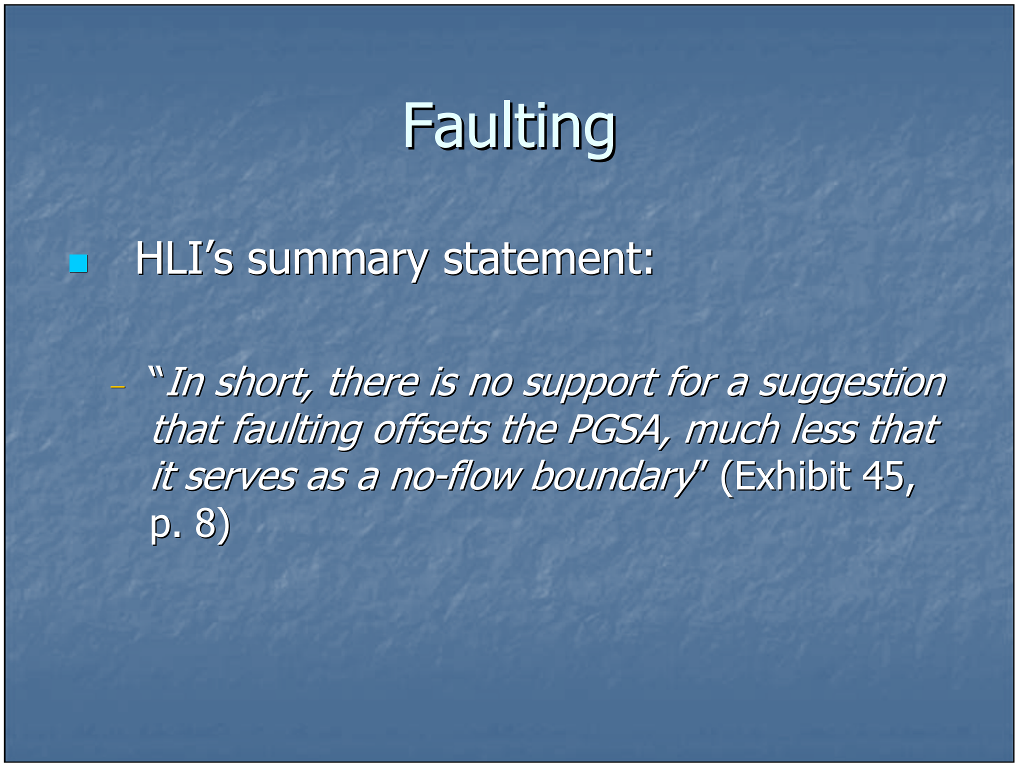
Figure 88. Theis Analysis for TW#1 Zone 1 – Kling Irrigation Two-Day Test
Test Conducted: January 9-11, 2007



Here's a copy of a drawdown data plot from the Kling irrigation well test. It's Figure 88 from Exhibit 12. I want you to notice the notation that's been highlighted with a red circle. It says "*Best fit with no-flow boundary 1,500 feet to northeast from pumping well*". And then below that it says, "*Derivative analysis supports method. Good fit throughout entire test period*". I really don't see how it can be considered speculative on the part of staff to think that the fault that was identified by Wood in the panhandle of M3's property approximately 1,500 feet northeast of the Kling irrigation well acts as a no-flow boundary, when it was HLI's own analyst that first proposed the idea in a submittal to the Department.



Before I go on, I want to point something out to the Hearing Officer. Staff does not appreciate being accused of being speculative or the implication that we are unaware of "*basic principles of hydrogeology*" (Exhibit 45, p. 20) when all we have done is to review and try to make sense of the information that we have been provided by M3's consultant. That the fault mapped by Wood in his 2007 report might exert some level of control on groundwater flow in the PGSA is not an idea that we came up with on our own. HLI was compelled to identify the panhandle fault on four different well location maps in the report documenting the Reanalysis of 16 Aquifer Tests (Exhibit 12 - p. xiii, p. 10, p. 169, and p. 219). They also used the fault package in the computer-aided aquifer test analysis program Aqtesolv in order to analyze test data from the Kling Irrigation well test. It was HLI, not the Department, that pointed out "*Geophysical evidence (Wood, 2007) suggests that a structural fault may be present between TW#4 and the monitored wells lying to the west (TW#1, TW#3, and Kling Irrigation well). Such a fault, if present, could have attenuated and/or delayed the response in the portions of the Pierce Gulch Sand Aquifer lying to the west of the fault, caused by pumping the Pierce Gulch Sand Aquifer at a location east of the fault…In a manner similar to the SVR#7 test, pumping from the Kling Irrigation well (located west of the possible fault) caused no measureable drawdowns in wells lying to the east of the fault, supporting the concept of a structural fault.*".



Given this statement and the previously discussed aquifer test analysis, it's inconsistent for HLI to accuse the Department of being speculative and to now assert that "*In short, there is no support for a suggestion that faulting offsets the PGSA, much less that it serves as a no-flow boundary*" (Exhibit 45, p. 8). Dr. Wood's testimony that he doesn't believe that the magnetometer survey was relevant to the PGSA groundwater study seemingly is at odds with the fact that this work was commissioned by HLI and performed by Dr. Wood in the context of a study of PGSA groundwater.

Faulting

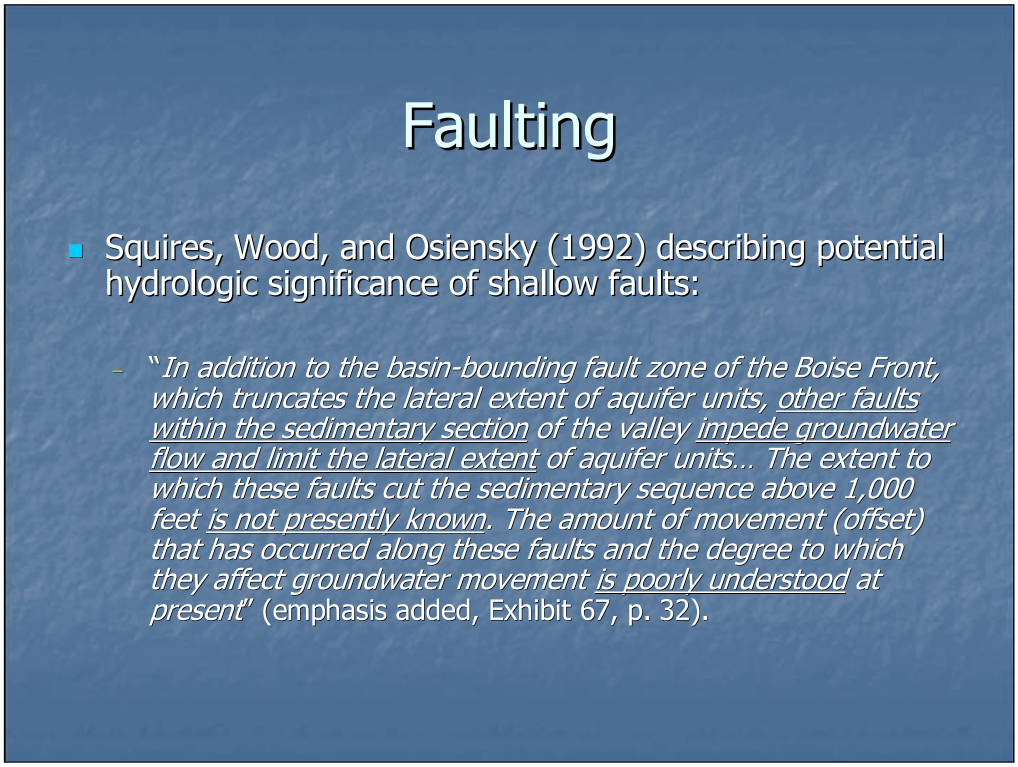
- Another statement about faulting:
  - "*Negative hydraulic boundaries can be confirmed by pumping tests of properly constructed wells in the aquifer under investigation when they are evidenced by an increased rate of drawdown. Significant negative hydraulic boundaries <u>did not show up in the 9-day SVR#7 aquifer test or in the 30-day Lexington Hills test</u>, both of which we consider to be of sufficient duration to have revealed boundaries. Indeed, as our previously-submitted reports show, positive (recharge) boundaries were evident in those tests.*" (emphasis added, Exhibit 45, p. 25)

Let me give an example of another place where conclusions by HLI are inconsistent with their analysis concerning negative (i.e., barrier or no-flow) boundaries. The following statement appears in Exhibit 45, the Response to our Staff Memorandum "*Negative hydraulic boundaries can be confirmed by pumping tests of properly constructed wells in the aquifer under investigation when they are evidenced by an increased rate of drawdown. Significant negative hydraulic boundaries <u>did not show up in the 9-day SVR#7 aquifer test or in the 30-day Lexington Hills test</u>, both of which we consider to be of sufficient duration to have revealed boundaries. Indeed, as our previously-submitted reports show, positive (recharge) boundaries were evident in those tests.*". I happen to disagree with that statement but its meaning is pretty clear. According to HLI, there was no indication of negative (i.e., barrier or no-flow) boundaries during the SVR#7 and Lexington Hills aquifer tests – rather there were indications of recharge boundaries in both tests. Now I've already discussed the analysis of data from the SVR#7 aquifer test, but I haven't yet talked about HLI's reanalysis of the Lexington Hills test.

Faulting

- Another apparent contradiction:
  - "*As noted in the Hydrogeologic Overview section of this report, the West-Boise-Eagle Fault lies approximately one-half mile to the northeast of the Lexington Hills Well #1. Review of Well Driller's Reports and the hydraulic data included in the CH2M-Hill report indicate this fault acts as a no-flow barrier and edge to the Pierce Gulch Sand Aquifer. We incorporated the effects of this no-flow boundary into all the log-log type-curve analyses*" (Exhibit 12, p. 59)

So here's what's written in Exhibit 12, the only submittal that discusses the Lexington Hills 30-day aquifer test - "*As noted in the Hydrogeologic Overview section of this report, the West-Boise-Eagle Fault lies approximately one-half mile to the northeast of the Lexington Hills Well #1. Review of Well Driller's Reports and the hydraulic data included in the CH2M-Hill report indicate this fault acts as a no-flow barrier and edge to the Pierce Gulch Sand Aquifer. We incorporated the effects of this no-flow boundary into all the log-log type-curve analyses*".



It's reasonable to assume that the understanding of the role of faults in the Boise basin has evolved over the years. If so, however, I've not seen where changes in that understanding are explained in HLI's submittals. All we know for sure is that HLI's current stance is much more definitive than previously offered by M3's team of experts. Consider, for example, the following quote from the 1992 report that was authored by Squires, Wood, and Osiensky, Exhibit 67 -- "*In addition to the basin-bounding fault zone of the Boise Front, which truncates the lateral extent of aquifer units, other faults within the sedimentary section of the valley impede groundwater flow and limit the lateral extent of aquifer units… The extent to which these faults cut the sedimentary sequence above 1,000 feet is not presently known. The amount of movement (offset) that has occurred along these faults and the degree to which they affect groundwater movement is poorly understood at present*".

Faulting

- HLI describing potential hydrologic significance of shallow faults:
  - "*Major faulting that formed the western Snake Plain generally does not significantly cut or offset the younger sedimentary units (shallower than 1,000 ft) in the basin on the north side of the plain…Figure 2 shows in detail the nature of faults in the basin*" (Exhibit 45, p. 9).

More recently, HLI offered Figure 2 in their Response to our Staff Memorandum, Exhibit 45, as evidence that "*Major faulting that formed the western Snake Plain generally does not significantly cut or offset the younger sedimentary units (shallower than 1,000 ft) in the basin on the north side of the plain…Figure 2 shows in detail the nature of faults in the basin*"

EXHIBIT 45

Figure 2. Subsurface Seismic Reflection Profiles (from Wood)

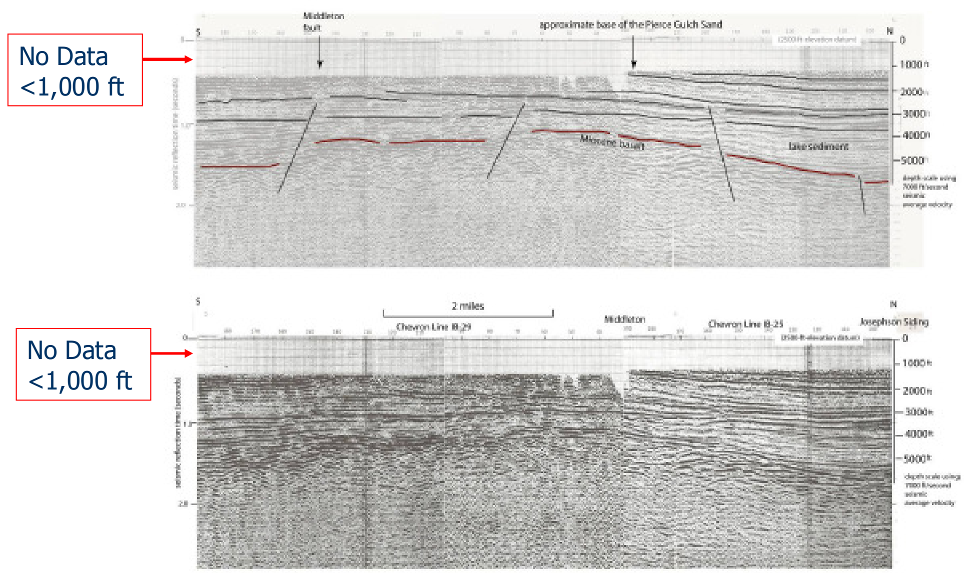
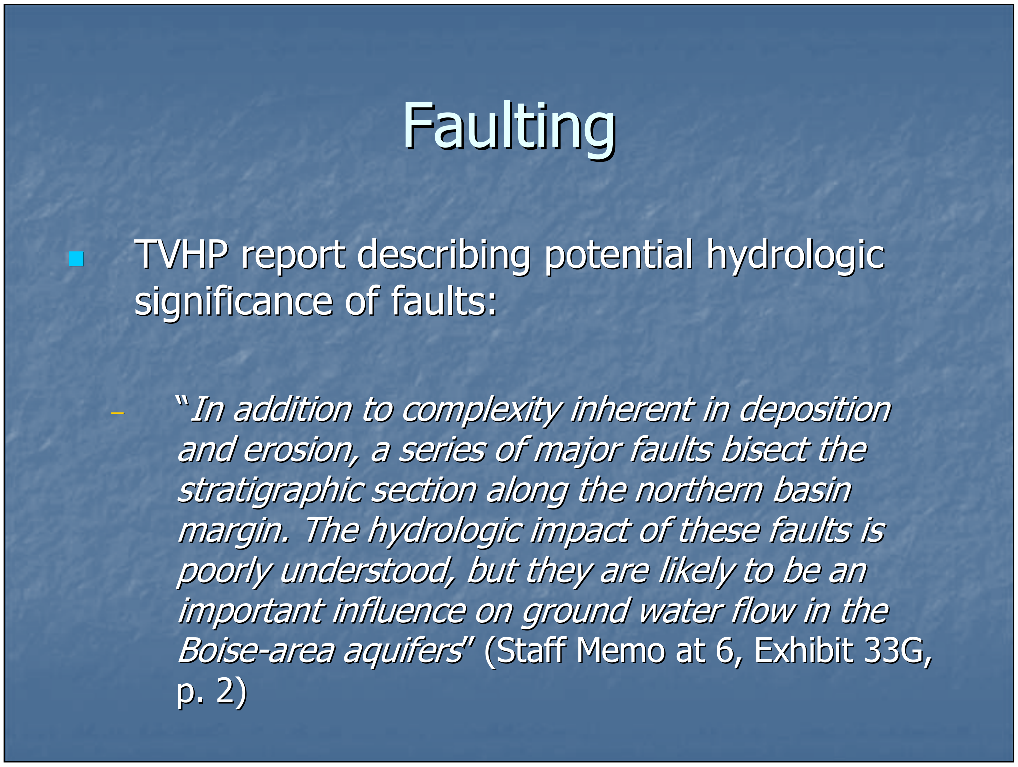
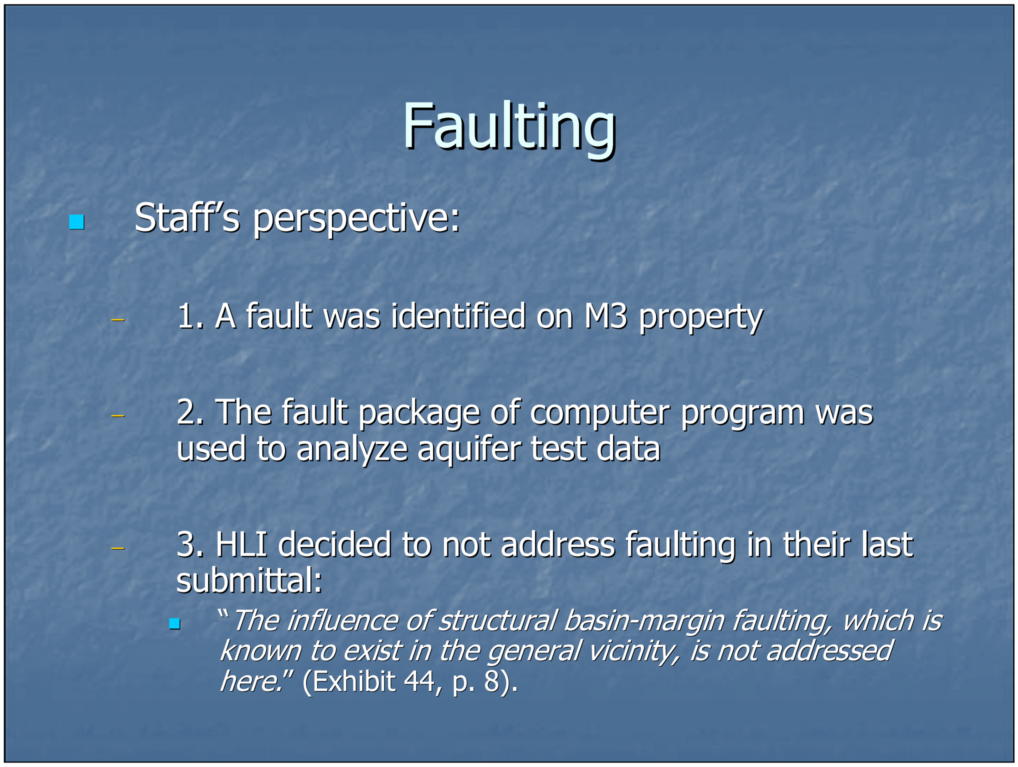


Figure 3. Interpretation of a north-south seismic reflection line through Middleton, Idaho to Josephson siding. Seismic section shows the deep basin north of Middleton that likely extends to the Eagle area. Faulting does not extend to the level of the upper sedimentary section where the Pierce Gulch Sand regional aquifer is situated. Location of seismic line shown on Figure 1 of this report.

Inspection of Figure 2 reveals that it can't be used directly to support that argument since the beginning depth of the profile is greater than 1,000 ft. There simply are no data in the shallow section that includes the target aquifer. Indeed, the deep faults aren't shown as propagating to land surface on this figure but, based on the information in one cross-section that doesn't extend into the shallow section, it's unclear whether the understanding of the hydrogeologic significance of shallow faults has improved since the 1992 report, which, at that time, described the level of understanding as poor.



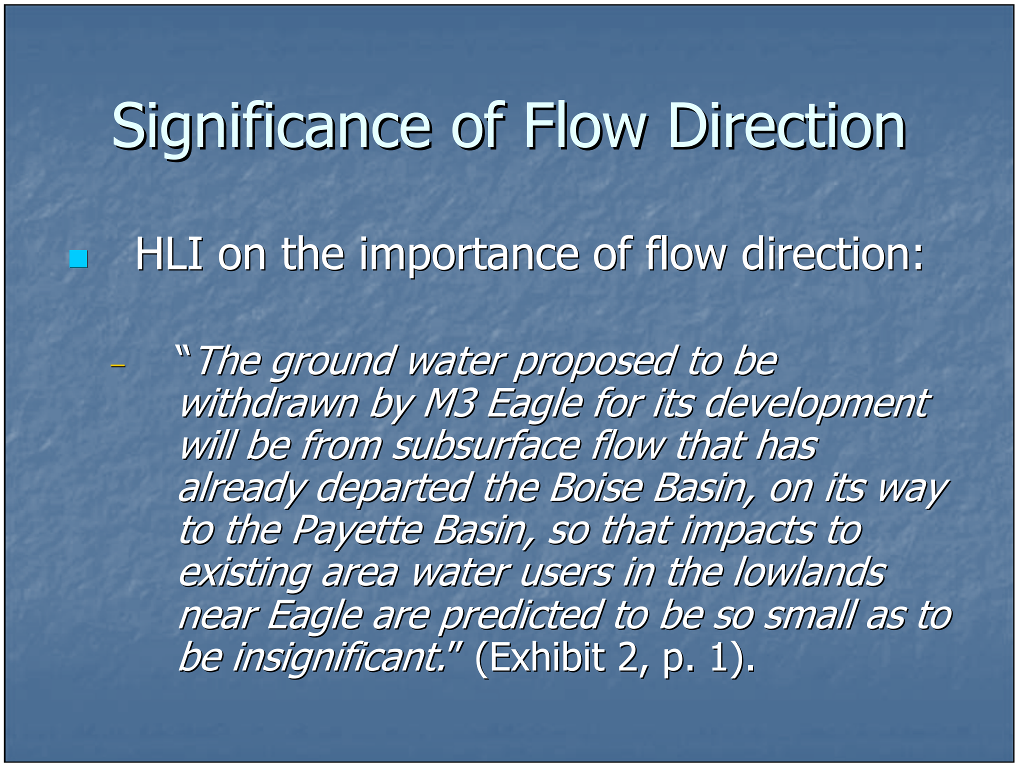
As explained in our Staff Memorandum, the authors of Exhibit 33G, a 2002 report that was prepared for the Treasure Valley Hydrologic Project and offered as supporting documentation by M3, indicated that faulting along the basin margin adds complexity and uncertainty to the hydrogeologic setting. They stated "*In addition to complexity inherent in deposition and erosion, a series of major faults bisect the stratigraphic section along the northern basin margin. The hydrologic impact of these faults is <u>poorly understood</u>, but they are likely to be an important influence on ground water flow in the Boise-area aquifers*".



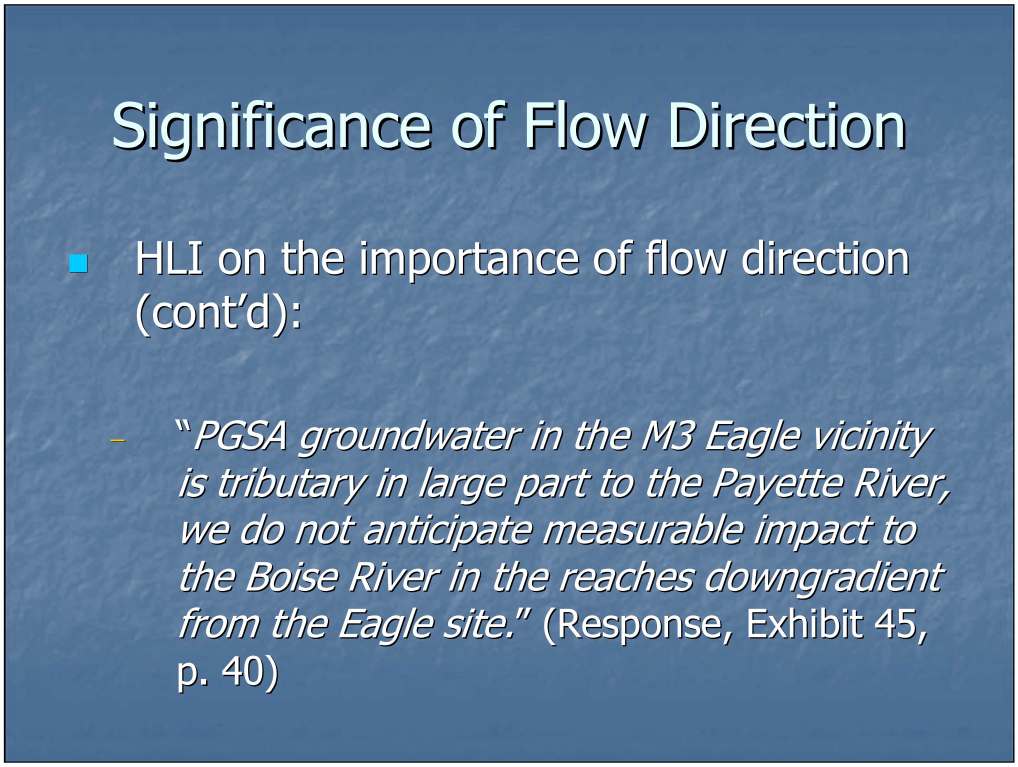
As mentioned previously, the sustainability of the target aquifer at M3 is a function of whether there is strong hydraulic connection with a significant source of recharge. In this case, primary sources of recharge are thought to be distant from M3. As such, it should come as no surprise to M3's experts that we are concerned about faulting. Here then is how the fault issue looks from our perspective:

1) a basin-margin fault was identified by HLI which conceptually might limit hydraulic connection to the primary off-site recharge sources.
2) HLI then used the fault package of an aquifer test analysis software program to analyze the test data based on their understanding of the hydrogeologic setting and the goodness of fit of the test data to the theoretical response of a no-flow boundary, and then
3) HLI dismissed the potential implications of faulting in their last submittal by saying "*The influence of structural basin-margin faulting, which is known to exist in the general vicinity, is not addressed here.*".

The rationale for not addressing the fault issue is unclear to staff.



I'd now like to touch on an issue which I think serves to distract us from the central issue and that is the issue of groundwater flow direction. While I would agree that our ability to accurately predict hydrologic impacts is directly related to our knowledge of aquifer boundaries and these ultimately impact flow direction, the magnitude of the actual impacts that would be caused by pumping are insensitive to whether groundwater flow is northwest from M3 toward the Payette River or west toward the Boise River. I agree with Mr. Fereday and Mr. Squires on that point. That's because the primary impact of pumping is water level decline and, in accordance with the principle of superposition, the distribution and amount of water level decline that occurs is independent of the flow direction. However, HLI implied otherwise in Exhibit 2 when they stated "*The ground water proposed to be withdrawn by M3 Eagle for its development will be from subsurface flow that has already departed the Boise Basin, on its way to the Payette Basin, so that impacts to existing area water users in the lowlands near Eagle are predicted to be so small as to be insignificant.*". Though intuitively appealing, this assertion is contradicted by HLI's own modeling, which predicts water level declines of approximately 5 feet extending several miles in the upgradient direction for both versions of the M3 model. In other words, there is no reason to expect that the hydrologic impacts will be less significant if groundwater flow is to the Payette basin. The more important issue in terms of long-term impacts is whether there is strong hydraulic communication between the PGSA beneath M3 and a significant source of recharge.



HLI makes essentially the same argument as the basis for concluding in Exhibit 45 that "*PGSA groundwater in the M3 Eagle vicinity is tributary in large part to the Payette River, we do not anticipate measurable impact to the Boise River in the reaches downgradient from the Eagle site.*" The bottom line is that drawdown in the alluvial aquifer along hydraulically connected reaches of the Boise River will reduce flow in the river. As stated in our Staff Memorandum, neither HLI nor the Department has evaluated the impacts of pumping on senior, surface water right holders.

Residence Time Issue

- HLI on the source of water in transmissive and "strongly recharged" aquifer:
  - Water chemistry "*indicates that the PGSA groundwater originated almost exclusively from ancestral Boise River surface water*" (Exhibit 43, p. 4)
  - "*geochemistry analytical results indicate that the PGSA is a distinct regional aquifer containing ground water originating from the geologically ancestral Boise River*" (Exhibit 43, p. 5)
  - "*From this model, they estimated the PGSA groundwater from the Goddard No. 2 and HP wells to be about 2,960 years old. These sealed production wells are located about one mile south of the Boise River and have been pumped for at least a decade, so the estimated age should be accurate*" (Exhibit 45, p. 27)

Before I finish, I would like to go on record that Department staff does not particularly enjoy the role of adverse witness and having to get up here and defend ourselves. Staff is unanimous in believing that part of the reason that we are in this situation is because two of HLI's most important submittals were late and their submittals and testimony have inconsistencies.

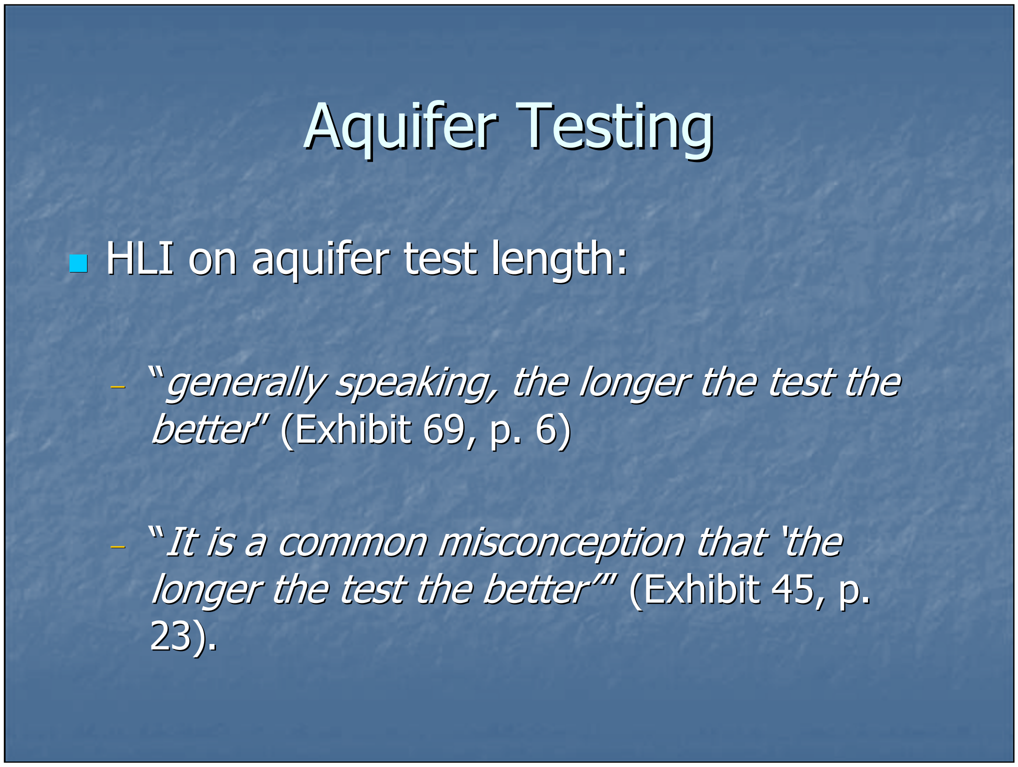
Having said that, some contradictions are unavoidable and admittedly many of these are not significant in the context of M3's water right application. Others, however, are more critical and an attempt should be made to resolve them. An apparent contradiction still needing resolution is how the PGSA could be so transmissive and strongly recharged by water from both surficial aquifers and leakage from the modern day Boise River and New York Canal, as asserted by HLI and assumed in the M3 flow model, when, according to Mr. Glanzman's testimony, the PGSA has no connection to shallow aquifers and, according to his geochemical analysis, the water beneath M3 is almost exclusively sourced from the "*geologically ancestral Boise River*" (Exhibit 43, p. 5).

The terminology that Mr. Glanzman used to describe the source of PGSA water is geologically ancestral, not pre-modern. The geologic time scale extends back more than 4 billion years so when a Registered Professional Geologist like Mr. Glanzman speaks using the terms geologically ancestral, he or she is talking about something that happened a very long time ago. Now I heard Mr. Glanzman testify that he understands "geologically ancestral" to apply to something that is <u>more than 1,000 years old.</u> Less than a minute later, however, he testified that he understands geologically ancestral to mean "*as much as 1,000 years old*". Having listened to that testimony, I'm really not sure what geologically ancestral means to him. By his second definition, something more than 1,000 years old would be classified as <u>older than geologically ancestral</u> which is a difficult concept to fathom since 1,000 years isn't even a blip on the geologic time scale.

Mr. Glanzman also indicated that carbon age dating can't be used for water that's less than 5,000 years old and that the only thing that he can say for sure about the age of PGSA groundwater is that it's somewhere between 0 and 5,000 years old. The problem with that is that he used carbon age dating as the basis for describing PGSA water as being sourced, not from the Boise River, but from the geologically ancestral Boise River. He made that distinction, staff did not.

To further the confusion, HLI was compelled in their response to our Staff Memorandum to point out "*From this model, they estimated the PGSA groundwater from the Goddard #2 and HP wells to be about 2,960 years old. These sealed production wells are located about one mile south of the Boise River and have been pumped for at least a decade, so the estimated age should be accurate*". Thus despite Mr. Glanzman's testimony, HLI feels that 2,960 years, an age that's intermediate between 0 and 5,000 years, is not only accurate but should be reported in a document that was addressed to the Hearing Officer using three significant digits.

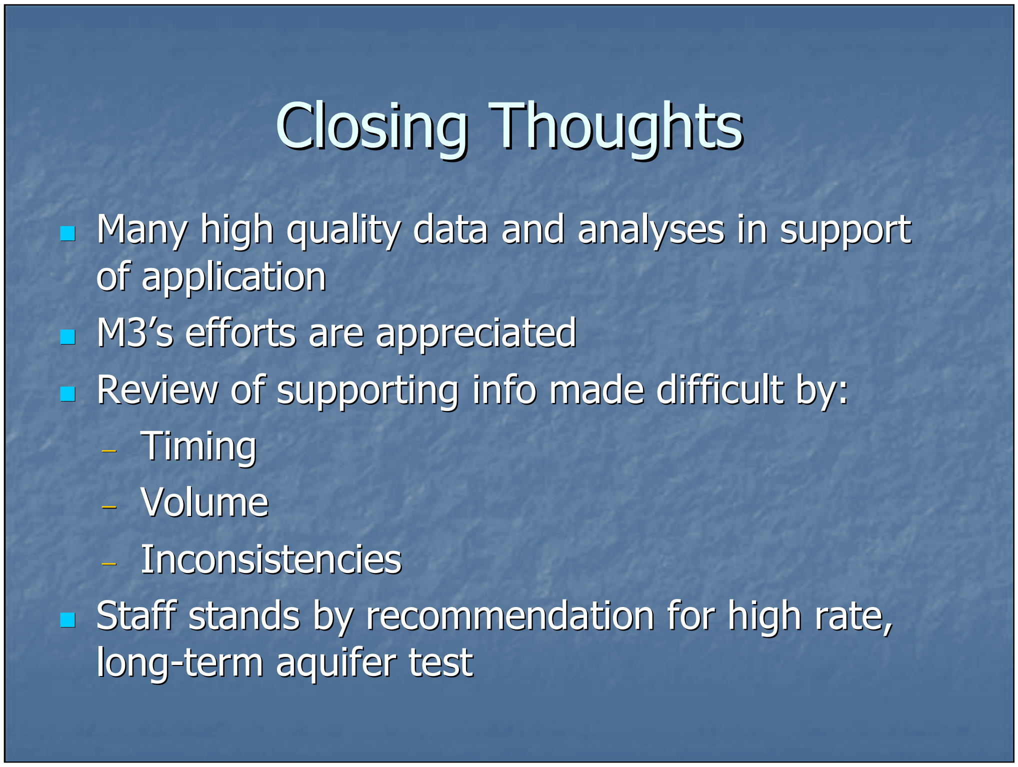
While there remains a serious disconnect regarding the residence time issue, the similarity in major ion chemistry between UWID wells and M3 wells is support, though certainly not conclusive support, for hydraulic connection to wells in the Boise valley. Having said that, I'm not an expert on geochemistry.



It's not just inconsistencies with complicated technical issues that we've struggled with in our review of M3's submittals - it's inconsistencies with seemingly straightforward concepts. It's difficult, for example, to reconcile HLI's statement in the Aquifer Test Prospectus - "*generally speaking, the longer the test the better*" with the statement in their Response to our Staff Memorandum "*It is a common misconception that the longer the test the better*".

One more set of observations before I close. I've spent a fair amount of everyone's time this morning trying to address some of the major technical issues that were raised in HLI's Response to the Staff Memorandum. It needs to be recognized, however, that there simply is not enough time to respond to all of HLI's criticisms. HLI accused staff of being incorrect on six different occasions, inaccurate on three occasions, speculative on three occasions, misleading on three occasions, and inappropriate on two occasions. Our analyses were described as being "*deeply flawed*" (p. 21) and our rationale as having "*no scientific basis*" (p. 20). HLI criticized staff for not discussing something from Dr. Ralston's affidavit, which is a document that we were not assigned to review (p. 16). Staff also was criticized for not evaluating and discussing a series of cross-sections that are clearly labeled "*Draft*", which were given to us without a location map, which are not referenced by HLI in any of their own submittals, and which are devoid of both formal geologic interpretation and stratigraphic correlation between boreholes - Despite these factors, HLI's opinion of the cross-sections on page 10 of Exhibit 45 is that "*all are significant to our analysis and support our conclusions about the nature of hydrogeology in the area and the lack of any PGSA-truncating faults here other than the WBE fault*". HLI accused staff of incorporating unintentional bias and significant errors (p. 30), and implied that we were cursory or incomplete in our review of their information on three occasions. We were criticized for not addressing uncertainty that's inherent in the use of data from wells that have unknown and/or questionable well construction (p. 40), even though the aquifer test data provided by HLI as the basis for M3's application comes from two test wells that are, by their own estimation, partially penetrating, poorly documented, and poorly constructed. Moreover, I'm not aware that Staff ever committed to performing a well construction uncertainty analysis of M3's data or that that should be our responsibility. I suggest that HLI might address the inconsistencies in their submittals rather than trying to pin additional responsibilities on staff.

Review of M3's supporting materials is already a large responsibility. By our count, M3's submittals in support of this application includes 9 different technical reports prepared by HLI, 3 geologic submittals containing a total of 19 separate "*geologic cross-sections*", 11 composite diagrams, 9 maps, 1 Master's thesis, 7 publications that were authored or coauthored by Dr. Spence Wood, 10 Treasure Valley Hydrologic Project reports, 22 miscellaneous data submittals, the rebuttal to our Staff Memorandum, and 8 different submittals dealing with the qualifications of M3's hydrogeologic experts. A frustration for me as a reviewer is that there are important aspects of the hydrogeologic conceptual model that are uniquely located in at least five different documents: 1) The Reanalysis of 16 aquifer tests (Exhibit 12), 2) the SVR#7 9-day aquifer test report (Exhibit 44), 3) the Geochemical Characterization Report (Exhibit 43), 4) the Groundwater Flow Modeling Report (Exhibit 16), and 5) the Year 1 Progress Report (Exhibit 2). Moreover, important information such as the fact that the Goddard #2 well produces 3,000 year-old PGSA groundwater, was only recently introduced to us via the Response to our Staff Memorandum (Exhibit 45).



In closing, there are a lot of high quality data that have been collected and analyzed on behalf of M3, and it seems to me, based upon some of the early testimony, that M3 is doing the right thing both in trying to minimize consumptive use of water and in helping to develop a better understanding of the hydrogeology in North Ada County. Frankly, however, our job as technical reviewers has been made difficult by the timing and the sheer volume of the submittals and by the numerous and difficult-to-resolve inconsistencies within them. Staff feels that there remain several unresolved issues that are germane to making a reasonably confident assessment of long-term hydrologic impacts and we stand by our initial recommendation for a high rate, long term pumping test to help better evaluate aquifer boundary conditions in the vicinity of M3. We agree with Mr. Utting that the best way to predict the long-term response to pumping, particularly in a complicated hydrogeologic setting such as that in North Ada County, is to measure it rather than to simulate it.

That's all I have – I'll be glad to stand for questions.