GROUNDWATER QUANTITY WORKGROUP
Minutes of February 23, 2017 Meeting

Attendance

Present:

Workgroup Co-Chairs: Mike Carter, Skip Hansen, Andy Johnson

Facilitator: Don Last

Workgroup Members: Andrew Aslesen, Jake Barnes, Ken Bradbury, Andy Diercks, Patty Dreier, James Drought, Mike Fienen (guest), Adam Freihoefer, Scott Froehlke, Tamas Houlihan, Justin Isherwood, George Kraft, Bob Martini, Amber Meyer-Smith, Kara O’Connor, John Ramsden, Wally Sedlar, Allison Werner, Jim Wysocki, Louis Wysocki

Staff: Christina Anderson (recorder), Jim Matson (volunteer FLW project staff). FLW project staff prepared these minutes based on the recorder’s notes and audio recording.

Absent: Lawrie Kobza, Mike Koles, Jordan Lamb, Ben Niffenegger, Carl Sinderbrand

Groundwater Quantity Fundamentals in the Central Sands

Ken Bradbury (Director, Wisconsin Geological and Natural History Survey; UW-Extension; UW Madison Dept. of Geoscience)

Workgroup member Ken Bradbury presented a short paper entitled Groundwater Quantity Fundamentals in Wisconsin’s Central Sands Region, co-authored by Bradbury, James Drought, Michael Fienen, David Hart, Randall Hunt and George Kraft. Some key points:

- The 6 co-authors prepared the paper at the request of the Groundwater Quantity Workgroup, in order to provide a brief expert background summary for the Workgroup’s deliberations.
- All 6 co-authors are professional hydrogeologists with experience working in the Central Sands.
- All 6 co-authors agree on the content of the paper. Bradbury prepared a preliminary discussion draft. The other 5 co-authors reviewed the paper in detail, and made comments. The paper was revised in response to co-author comments, and reflects an agreement by all 6 co-authors.
- The paper focuses on science, not policy. It does not make any policy recommendations.
- The paper sets forth 12 basic component concepts, which should be read together.
Bradbury reviewed each of the 12 basic concepts in the paper, and invited Workgroup questions, comments and discussion. Workgroup members made a number of comments and editorial suggestions. The co-authors agreed to consider wording changes to address some of the comments made by Workgroup members.

Following the Workgroup meeting, the 6 co-authors prepared a revised, final paper (copy attached). The final paper includes changes that the 6 co-authors chose to make in response to Workgroup comments and reflects a unanimous agreement among the 6 named hydrology experts who co-authored the paper. It may or may not represent the views of other Workgroup members, or the full Workgroup.

**A New Approach to Central Sands Groundwater Allocation?**

**James Matson** (Retired Chief Legal Counsel, WI Dept. of Agriculture, Trade and Consumer Protection; volunteer staff member for FLW project).

At the request of the Workgroup facilitator and Co-Chairs, Jim Matson distributed a paper that he authored, entitled **Central Sands Groundwater: A New Approach?** The paper (copy attached) discusses the potential use of a price mechanism to manage growing Central Sands groundwater pumping demands, and protect base surface water levels that may be affected by groundwater pumping. Some key points:

- Matson prepared this proposal on his own initiative, in order to present an idea that stakeholders on all sides of the groundwater pumping issue might wish to consider. He is not necessarily advocating this proposal, but merely inviting stakeholders to consider it as a possible solution to a complex and increasingly divisive resource allocation problem.
- Matson did not prepare the proposal for the WI Land and Water Conservation Assn., or any other person or organization. The proposal is his own, and does not necessarily reflect the views of any other person or organization.
- The proposal would use a price mechanism to “internalize” environmental costs, protect base surface water levels, and seamlessly allocate a limited resource among thousands of current and potential users. The proposal would not change or weaken Wisconsin’s historic water law structure, or reduce current DNR authority (either in the Central Sands or elsewhere). It would not “privatize” any shared public groundwater or surface water resource. The proposal would apply only in the Central Sands, and would address the unique challenges presented by Central Sands water use and hydrology. It would not change the current high capacity well permit system, but would help to manage use demands that are now straining that system.
- A carefully designed pricing system could promote conservation, keep groundwater pumping within sustainable target levels, allow for decentralized private decision making, reduce the need for administrative rationing, allow for a changing pattern of water use over time (rather than “locking in” existing uses or excluding new uses), provide reasonable certainty for planning and investment, and avoid the need to pick individual “winners” and “losers.” It would allow farms and businesses to continue, start up, change and grow, while protecting public water resources.
- Under this proposal, all high capacity well owners (including farmers, businesses and municipalities) would pay a “water bill” based on the amount of groundwater they actually pump. DNR would set a per-gallon water price that is reasonably designed to keep aggregate
pumping within sustainable target levels that protect base surface water levels. Well owners would be free to make their own decisions, but would have an economic incentive to conserve.

- DNR would set the price with advice from a stakeholder advisory council, subject to public comment and legislative committee review. All high capacity well owners would pay the same per-gallon price, except that DNR could set different prices for areas and seasons that have higher pumping impacts (comparable to electricity “time of day” pricing). DNR could adjust the price, as needed, to keep aggregate pumping within sustainable target levels.
- The pricing scheme would not invalidate or restrict any existing high capacity well permit in the Central Sands, nor would it limit the issuance of new permits. Existing permit holders could still pump water, to the extent authorized by their existing permits, subject to payment of the required per-gallon price. Well owners could continue to plan and invest with confidence, with less fear of arbitrary water shut-offs. The cost of water would be a manageable input cost, just like the cost of feed, seed, fertilizer, pesticides, energy, equipment and labor.
- Water payment revenues would be returned to the Central Sands, for the ultimate benefit of all Central Sands water users. For example, revenues could fund voluntary “buy-outs” of existing wells that have an especially heavy impact on surface waters.

**Next Meeting**

The final meeting of the Groundwater Quantity Workgroup is scheduled for June 15, 2017. Possible topics for discussion at that meeting include:

- Ways to manage groundwater pumping and protect surface water levels in the Central Sands, in the face of growing use demands. This could include discussion of groundwater pricing, well placement, and other potential management approaches.
- Recommendations for a final Workgroup Report to the FLW Project Steering Committee.

The Workgroup Co-Chairs and Facilitator will develop an agenda for the next meeting, with help from FLW staff. Workgroup members may offer suggestions to the Co-Chairs.

**Adjournment**

By unanimous consent, the meeting was adjourned.
Groundwater quantity fundamentals in Wisconsin’s central sands region


By Kenneth R. Bradbury¹, George J. Kraft², James Drought³, Michael N. Fienen⁴, Randall J. Hunt⁴, David J. Hart¹

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Purpose

This brief summary was requested by the Wisconsin Food, Land, and Water Project Groundwater Quantity Work Group during a meeting on November 10, 2016. The intent of this document is to summarize key concepts related to groundwater, high-capacity wells, and groundwater-surface water relationships in the central sands region of Wisconsin. The authors of this document are technical experts in hydrogeology with experience working in the central sands region of Wisconsin. This document is not meant to outline policy or specific solutions, but rather to summarize the state of the science on groundwater issues in the Central Sands.

Approach

This document presents fundamental concepts related to central Wisconsin’s water resources. For each concept a brief explanation is provided along with a description of its relevance to water resources decision making. The intent is to break down the issues into individual parts to facilitate clear understanding. In the end, these components are all parts of a whole and are tied together. The organization is as follows: We start with a review of the hydrogeology of the Central Sands (1, 2); then review the behavior of groundwater wells, regardless of their purpose (3,4,5); connect the use of wells to irrigation (6); review the importance of changes over time (transience: 7); summarize observations of stream and lake responses in areas with higher numbers of irrigation wells (8,9); discuss the use of groundwater flow modeling to tie all these parts together (10); summarize details of evapotranspiration (11); and finally discuss possible explanations for streamflow and lake level declines other than pumping (12).

Fundamental concepts and their implications

1. **Concept: A single groundwater flow system occurs throughout the central sands**

   **Details:** The central sands groundwater flow system occurs mainly in a single, interconnected sand-and-gravel aquifer that underlies virtually all of the region. It is highly permeable and ranges from very thin to nearly 200 feet thick. In places the sand and gravel aquifer is underlain by a sandstone aquifer, and in other places the sand and gravel is interrupted by a clayey layer
called the New Rome Formation. With the exception of some very small isolated locations, groundwater in the central sands flows through a connected large system that receives recharge from local precipitation. Groundwater naturally flows to streams where it discharges and leaves the watershed.

*Why relevant:* The groundwater flow system is well connected, wide-ranging, and the aquifer stores and transmits water to surface water and to wells.

2. **Concept: Groundwater and surface water are directly connected throughout the central sands.**

*Details:* Surface waters (lakes, streams, wetlands) in the region occur at places where the water table intersects the land surface. Streams in central Wisconsin are supplied by groundwater discharge. Lakes and wetlands, depending on their location in the landscape, can be groundwater discharge points or flow-through features.

*Why relevant:* Groundwater and surface water are well connected and should be thought of as a single resource. Groundwater discharge is the source of baseflow in streams. Groundwater controls lake levels. Changes to the groundwater system affect surface water and changes to surface water affect groundwater.

3. **Concept: Pumping wells affect groundwater levels**

*Details:* A basic principle of well hydraulics is that removing water from a well always reduces total hydraulic pressure, or head, in the aquifer near the well. This pressure change results in a lowering of groundwater levels near the well, known as drawdown. The amount of drawdown is directly related to the pumping rate, aquifer transmissivity, aquifer storativity, and distance from the well and can be predicted by well-established equations. The three-dimensional extent of drawdown is generally cone-shaped and is called the cone of depression; this cone grows larger the longer a well is pumped. A typical cone of depression for a high-capacity well in the central sands is measurable for a half a mile or more around a well. While a distinct cone of depression comes and goes as a well cycles on and off, it is important to realize there is always less water in the aquifer, and thus lower water levels, for a short period after a well is pumped. The complete recovery of the water table can take months or longer.

*Why relevant:* The effect of each well pumping is a reduction in groundwater levels. The distance, timing, and magnitude of the reduction depends on the properties of the aquifer and the amount, duration, and location of pumping.

4. **Concept: Pumping wells divert water from streams**

*Details:* Streams in the central sands are natural areas of groundwater discharge, and this groundwater discharge sustains streamflow throughout the year. By removing groundwater from the aquifer, well pumping modifies and interrupts natural groundwater flow and thus reduces the volume of groundwater discharge to streams. This reduction is called “diversion,” because water that would have discharged to a stream under natural conditions is diverted away from the stream. If a well is close enough to a stream or lake, it can also induce water directly from that surface-water feature. The amount of diversion caused by a well depends on the pumping rate, pumping period, distance from a stream, and local geology.
Why relevant: Each pumping well in the Central Sands impacts streams by diverting groundwater discharge and reducing streamflows. Even wells outside the surface-water basin of a particular stream can divert water away from the stream.

5. Concept: Cumulative impacts matter.

Details: Whenever a well is pumped, discharge is diverted from streams and water levels in an aquifer, lakes, and wetlands are lowered. Cumulative impacts refer to the additive effects as impacts from numerous wells in the same area overlap. When many wells in a region are being pumped, water level declines and streamflow diversions add to each other. So even though a single well may cause only a small decline or diversion, the additive effects of many wells can significantly impact lakes and streams.

Why relevant: Unless located immediately adjacent to a surface water feature or another well, any single well typically has modest impacts on water levels or streamflow. However, when many wells are located in the same area the cumulative impacts of all these wells can become significant.

6. Concept: When crops are irrigated using groundwater, there is a net loss to the groundwater system.

Details: Irrigation replenishes soil moisture to maximize plant growth. Ideally, irrigation amounts would exactly match plant consumption (defined as water incorporated into the plant biomass, transpired through the plant, directly evaporated from plant surfaces and the ground or a small amount that evaporates while the water is sprayed through the air). In practice this is difficult to achieve. An estimated 70-90% of irrigation water is removed from the aquifer, while 10-30% may return to the aquifer, and this returned water is called irrigation return flow. The absolute amount of return flow varies from field to field, from crop to crop, and from year to year, and depends on many variables including soil type, crop type, crop maturity, irrigation rate, antecedent soil moisture, and weather patterns. Every current method for estimating return flow in the central sands contains significant uncertainty.

Why relevant: Understanding where the irrigation water goes is important for understanding the water balance of the central sands region. Averaged over the irrigated region, between 70% and 90% of the applied irrigation water is removed from the aquifer—lost from the groundwater system either by being released to the atmosphere through evapotranspiration or incorporated into the crops—while between 10% and 30% is returned to the groundwater system. Improving estimates of consumptive use is a recommended topic for continued research.

7. Concept: Groundwater, surface water, evapotranspiration, and high-capacity well use in the central sands have important transient components, meaning that conditions continually vary through time.

Details: The dynamics of the groundwater-surface water system vary seasonally. Natural groundwater recharge usually occurs mostly in the spring and fall, with little recharge in the summer or winter. Surface-water features respond to this pattern, with highest streamflows in the spring and fall and lowest streamflows during the dry summer months and into the fall. Native vegetation typically follows a similar pattern with higher evapotranspiration taking place.
in the spring and fall when more water is available. Irrigation pumping follows an opposite pattern, with almost no irrigation during the spring, fall, or winter and maximum irrigation during the dry summer months. In addition, there are often significant time lags on the order of months or years between pumping and the effects of pumping on lakes and streams. This lag time depends primarily on the distance from the pumping well.

Why relevant: The lack of synchronization between recharge, pumping, and streamflow means that annual averages, such as annual water budgets or annual pumping volumes, can be misleading and should be used with caution. A water budget that nearly balances at the end of a calendar year can be seriously out of balance during July through October, when the streams are most stressed and require sufficient groundwater inflow to support the fishery.

8. Concept: Groundwater levels have declined in parts of the central sands where a higher density of high-capacity wells occurs.

Details: Over the past several decades, groundwater levels have consistently declined in parts of central Wisconsin where larger numbers of high capacity wells occur, but these declines are subtle and are difficult to document without considering long water-level records and statistical analyses. In places where monitoring has occurred, long-term records document these water-level reductions. Groundwater levels measured by the USGS at a site (PT-23/08E/26-1464 and two previous wells at the same location) near Plover, for instance, with nearly 70 years of record, have declined below historical record lows previously only associated with extreme drought.

Why relevant: Groundwater levels in the central sands typically fluctuate by two to three feet annually in response to seasonal weather and pumping patterns. Accordingly, evaluation of possible long-term trends requires long-term water-level records. Evaluations of these records show declines in water levels near areas of multiple irrigation wells.

9. Concept: Streamflow and lake levels have declined in parts of the central sands where a higher density of high-capacity wells occurs.

Details: Streamflows and lake levels have declined in parts of central Wisconsin where large numbers of high capacity wells occur. For instance, recent flows in the early 2000s in the Little Plover River were below its 1959-1987 historic low, a period that contained some of the driest years on record. Lakes in the vicinity of large numbers of high-capacity wells are anomalously low. In places where water level or flow data do not exist, visual observations reveal declining water levels. For instance, for some lakes, beaches are wider than the historic norm and boat landings no longer reach the water even during modestly dry to wet years. Conversely, streamflows and lake levels have remained steady or have even increased in areas of the central sands having less groundwater pumping.

Why relevant: Stream baseflow is a key measure of groundwater discharge, and reductions in stream baseflow indicate that the basin’s groundwater budget has changed. Likewise, lakes in the central sands reflect groundwater levels, and long-term lake-level declines are a symptom of lower groundwater levels. Observations that water bodies outside the more heavily irrigated
areas oscillate over time but do not trend downward are consistent with the conclusion that pumping has caused stressed water conditions.

10. **Concept:** Results of numerical groundwater flow models are consistent with observations of declines in streamflow and groundwater levels in areas of numerous high-capacity wells.

   **Details:** Groundwater-flow models combine the equations describing groundwater movement and well hydraulics with geology and boundary conditions to simulate groundwater movement and groundwater-surface water exchange in complex settings under both steady-state and transient conditions. Output of such models includes simulated groundwater levels, stream baseflows, lake levels, and a water budget that accounts for how groundwater moves through the system. Multiple recent independent models for the Little Plover River area suggest that high-capacity well pumping has reduced local groundwater levels by up to 5 feet and reduced Little Plover baseflow by up to 4.5 cubic feet per second.

   **Why relevant:** Numerical groundwater modeling is the accepted state of professional practice for addressing complex groundwater problems. The ability to reproduce field observations with calculations based on fundamental hydraulic and hydrogeologic principles is a key test of the validity of hypotheses and a predictive tool that helps use past observations to predict future conditions.

11. **Concept:** Evapotranspiration is related to land cover and influences water levels and streamflows.

   **Details:** Evapotranspiration refers to evaporation off plants, open water, bare ground and transpiration from plants. In the Central Sands transpiration is larger than evaporation. Plants remove water from the soil using their roots and pass it as vapor through stomata into the atmosphere; this flux can be appreciable on the basin scale. The amount of water transpired by plants is a function of the type, density, and size of the vegetation as well as amount of water available in the root zone and time of year. Native plants and trees typically transpire for more of the season than shallow rooted plants and irrigated crops. Evapotranspiration rates are related to plant type, where some wetland plants have appreciably higher rates than upland plants. Regardless of plant type, the highest rates of evapotranspiration occur during the summer months. Peer-reviewed research as well as empirical observations indicate that evapotranspiration is greatest under irrigated land cover, with differences among the various irrigated crops, followed by forest, non-irrigated agriculture, and grassland. Groundwater recharge follows an opposite continuum. Understanding the relative transpiration of native vegetation and irrigated crops is an active area of interest to stakeholders and thus merits greater study.

   **Why relevant:** All landscapes lose water to evapotranspiration. The effect of adding irrigation to a landscape increases evapotranspiration relative to the pre-existing land cover.

12. **Concept:** Proposed causes other than groundwater pumping have been unable to fully explain observed patterns of normal and depressed water levels and streamflows.
Details: Consideration has been (and should continue to be) given to other proposed causes of stressed groundwater and surface water conditions in the central sands. Common potential causes include drought, climate change, forestation, and the construction of drainage ditches. When examined, each of these potential causes has failed to fully explain observed conditions. For instance, weather has become wetter, not drier, in recent times, areas with more forest frequently have higher, not lower, water levels, and drainage ditches were in place for many years before currently-observed hydrologic stresses.

Why relevant: No mechanism other than groundwater pumping has been shown to align well with the locations, magnitude, and timing of observed changes in groundwater levels and surface-water flows.

Key references
Among the numerous peer-reviewed scientific and technical papers that address various aspects of central sands water issues we recommend the following, and references therein, for accessible and understandable discussions of the region’s water resources.


Water-Supply paper 1811, 78 p. (USGS report on the Little Plover River and potential impacts of irrigation pumping. A movie was produced illustrating field experiments from this work and can be viewed online at https://youtu.be/GW9cYdIT8iM).

Central Sands Groundwater: A New Approach?

The Problem

Streams and lakes in the Central Sands are closely connected to groundwater, making them vulnerable to groundwater pumping. Stream and lake levels depend on water levels in the top few feet of the groundwater aquifer. Groundwater pumping can have a big impact on those top few feet, without “depleting” the rest of the aquifer.

There are now about 3,000 high capacity wells in the Central Sands, compared to just 100 in 1950, and the number of high capacity wells continues to grow. Most of the pumping demand is for irrigated agriculture, which plays a large role in the Central Sands economy. Municipal and industrial wells, where present, can also have a major impact. Evidence suggests that groundwater pumping is reducing stream flow and surface water levels in parts of the Central Sands— at least on a seasonal basis. Conflicts over water access and pumping rights are increasing, and current regulatory approaches do not seem to provide a clear solution.

The state has a clear and compelling interest in protecting surface water levels, and can regulate groundwater withdrawals for that purpose. Recent advances in groundwater modeling allow us to identify, with greater certainty, the impact of groundwater pumping on water levels in the Central Sands. It may now be possible to identify maximum local or regional pumping volumes that are consistent with the long-term protection of surface waters. But how would such target ceilings be implemented?

- DNR has authority to establish pumping limits for individual wells that may have a significant adverse impact on surface waters. But how do we account for the combined impact of many wells – all of which may contribute to the problem to some degree?
- How do we maintain a “fair” allocation of pumping rights between thousands of current and future users, whose needs are constantly changing and evolving?
- How do we allocate pumping rights between “existing” uses and “new” uses?
- How do we assess the relative value and impact of competing uses?
- How do we allow users to make their own day-to-day pumping decisions, while achieving overall conservation goals?
- If it becomes necessary to constrain overall pumping levels, how will the constraints be allocated? How will constraints affect existing permits, and investments made in reliance on those permits? Will “across the board” constraints hurt some users more than others? Will selective constraints favor some users over others?
- How do we provide reasonable flexibility and certainty, and avoid arbitrary or overly prescriptive regulation of individual uses?
- How do we avoid endless disputes and litigation?
- How do we encourage everyone to conserve groundwater, for the common good? Without “dollars and cents” incentives, how will voluntary conservation work? Is it realistic to imagine that thousands of users will agree on (and honor) a system of voluntary constraints?
- What will happen as the Central Sands population and economy expand, as agricultural intensification continues, and as pumping demands continue to grow?
A New Approach?

This paper invites you engage in a “thought experiment.” Suppose that we consider a new tool for protecting surface water levels, and allocating Central Sands groundwater resources in a fair, flexible and predictable manner. This approach would use a simple groundwater price mechanism to supplement – not replace or weaken – Wisconsin’s historic water law framework. DNR would retain all of its existing regulatory authority, and could still use that authority as needed. But a price mechanism could help to limit aggregate pumping demands, without undue administrative intervention or rationing.

The price mechanism would apply only in the Central Sands, and would be designed to address the unique problems of that region. It would be a limited regional “overlay” on the state’s underlying system of water regulation. The underlying system would remain in effect, in the Central Sands and throughout the state.

Why Consider a Price Mechanism?

Most of the goods and services that we consume on a daily basis (such as potatoes) are allocated by price. Prices reflect available supplies, and match aggregate consumption to aggregate supply, while leaving individuals free to make their own consumption decisions. When the price of a good or service is “low,” we tend to consume more; and when the price rises, we tend to consume less (the size of the consumption response may vary between consumers). The price mechanism seamlessly allocates scarce goods and services among large numbers of prospective consumers, without resort to administrative rationing.

But a pricing system cannot work where it does not exist, and there is no current pricing system for Central Sands groundwater. Groundwater, a shared public resource, is currently “free” to permitted users. That was fine when groundwater was abundant and use demands were few. But rapidly increasing groundwater withdrawals now pose a serious threat to surface water levels in the Central Sands. As demand continues to grow, groundwater withdrawals will come at an increasing “cost” to surface waters – affecting other resource users and the public at large. Central Sands groundwater is increasingly “underpriced” in relation to these real external costs. In the absence of regulatory controls, “underpriced” resources tend to be “over-used.”

Well permits and other legal restrictions can limit groundwater pumping in individual cases. But they are clumsy instruments for allocating a scarce resource among thousands of current and potential users, whose needs are constantly changing and evolving. Administrative rationing schemes also present a host of challenges related to fairness, efficiency, and administrative complexity.

But what if Central Sands groundwater could be “priced” to keep aggregate consumption within sustainable bounds? A carefully designed price mechanism could work to protect Central Sands surface waters, and provide a real incentive for groundwater conservation. It could allow for a changing pattern of water use over time, rather than “locking in” existing uses or excluding new uses. It could allow individual farming and business operations to start up, change and grow, while keeping regional groundwater pumping within sustainable limits. There would be less need for DNR to pick individual “winners” and “losers,” and there might be less haggling and litigation over individual well permits.
How It Might Work

Under this approach, the State of Wisconsin would establish a price for groundwater in the Central Sands. All high capacity well owners would pay a specified price per gallon of groundwater pumped, just as they pay a price for other scarce and valuable commodities. Effective demand for groundwater would presumably respond to price, just as it does for other goods and services. The extent of the aggregate response would, of course, depend on the price level and the “price-elasticity” of user demand. For example, field corn irrigation might be more “price-elastic” than potato irrigation; and lawn watering might be more “price-elastic” than sanitation use.

The state would strive to set a price that is “just high enough” to keep aggregate groundwater withdrawals from exceeding an amount that is consistent with sustainable surface water levels. The price would be set according to transparent criteria. All high capacity well owners would pay the same price (except that different uniform prices could be established for different drainage basins or seasons, based on different local or seasonal pumping impacts). The price could be adjusted over time, as necessary, in light of tracking data that show actual use volumes compared to sustainable target volumes.

Revenue from the water payments would be earmarked for a fund that DNR could use for groundwater monitoring, or for voluntary “buy-outs” of existing wells that have an especially heavy adverse impact on surface waters. The money would thus stay in the Central Sands, and would ultimately benefit all Central Sands water users.

DNR would set the groundwater price with advisory committee input, subject to legislative committee review. New legislation would be likely be needed to create the overall price-setting scheme, which DNR would then administer according to transparent criteria (see hypothetical legislative outline below).

Potential Advantages

This approach has a number of potential advantages:

- It could work to keep overall groundwater pumping within environmentally sustainable target levels, while leaving business decisions in the hands of groundwater users.
- It would allow farmers, businesses and local communities to get the water they need, but at an appropriate “price” that internalizes the surface water impact “cost” of cumulative withdrawals and keeps cumulative withdrawals within sustainable bounds.
- It would allow well owners to plan and invest with confidence, without fear of arbitrary water shut-offs. Their cost of water would be a manageable input cost, just like their cost of feed, seed, fertilizer, pesticides, equipment and labor.
- It would be more flexible and economically efficient than a centralized “command and control” allocation system. Farmers and business owners could make their own water use decisions, based on their own cost-benefit calculations. There would be less need to impose “one-size-fits-all” use restrictions, or choose between competing users.
- It would encourage water conservation. Water users would have a real “dollars and cents” incentive to reduce non-essential water uses, and curtail uses whose marginal value to the user is less than the price of water.
• It would reduce case-by-case litigation and arguments over water.
• It would be fair, transparent and predictable, and relatively simple to administer. There would be less need for DNR to “pick winners and losers,” or to decide between existing users and new users. There would be fewer “all or nothing” dilemmas. Administrative costs would be relatively low.
• It would harness a market-like pricing mechanism to protect public rights in surface water, and minimize the need for intrusive “command and control” regulation. However, current regulatory authority would remain available for use as needed. Current well permit requirements would remain in effect.
• It would return water payment revenues to the Central Sands region, for the ultimate benefit all water users in the region. A share of the revenues could be used to cover the program’s (expected low) administrative cost, so as to avoid any state budget impact.
• It would not disrupt, replace or weaken Wisconsin’s historic framework of water law, either in the Central Sands or in other parts of Wisconsin. It would leave DNR’s current legal authority entirely intact. It would be a supplementary localized “overlay,” designed to address a localized problem.
• It would allow for a changing pattern of water use over time, rather than “locking in” existing uses or excluding new uses. It would allow individual farming and business operations to start up, change and grow, while still protecting the public’s overarching interest in the preservation of surface waters.

Coverage

The pricing scheme would apply only to a specifically delineated Central Sands region (see map below), and would address the unique circumstances of that region. It would create a region-specific overlay on existing statewide statutes, and would not affect the rest of Wisconsin. The enabling legislation would be clearly drafted to state that it does not repeal or alter any existing statutes, or any existing common law rights or duties, related to groundwater withdrawals in the Central Sands or other parts of Wisconsin. The pricing scheme would not alter the state constitutional “public trust” doctrine.

The pricing scheme would apply only to “high capacity wells,” as currently defined by statute. It would apply to all high capacity wells in the Central Sands region, including agricultural, business, industrial, community and utility wells. The same per gallon water price would apply to all high capacity wells (except that different uniform prices could be established for different drainage basins or seasons, based on different local or seasonal pumping impacts). The scheme would not apply to private drinking wells or other non-high capacity wells.
The pricing scheme would not invalidate or restrict any existing high capacity well permit in the Central Sands. Existing well permit holders could still pump water, to the extent authorized by their existing permits, subject to payment of the required per-volume price. The pricing scheme would not alter or eliminate any existing well permit requirement or condition, or any existing DNR rule or order. Nor would it alter or eliminate DNR’s existing authority to deny or withdraw a well permit, or to impose or modify permit conditions. DNR would be authorized to withdraw a well permit if the permit holder failed to make full, timely payment for groundwater withdrawals.

Implementing the Pricing Scheme

This pricing scheme would likely require new legislation. The legislation would:

- Create a Central Sands Groundwater Pricing District, with boundaries specified in the legislation.
- Direct DNR to establish by rule, in consultation with a statutory advisory committee, a per-volume price for all groundwater withdrawn from high capacity wells located in the district. The same price would apply to all high capacity wells in the district, except that different uniform prices could be established for different local drainage basins or seasons, to reflect different local or seasonal pumping impacts. DNR could adjust the price over time, as needed, by rule amendment.
- Specify that the price schedule must be reasonably designed to avoid aggregate groundwater withdrawals that are inconsistent with the long-term maintenance of base surface water levels in the district.
- Authorize DNR to spell out measurement criteria, time frames and other technical details by rule, consistent with the basic statutory directive.
- Require owners of high-capacity wells to report pumping volumes, and pay the required per-volume price, as a condition to holding any new or existing high-capacity well permit (permit holders are already required to report pumping volumes). The legislature could prescribe penalty fees for late payment and false reporting, and DNR rules could prescribe payment deadlines.
- Require DNR to review the efficacy and appropriateness of its pricing scheme on a regular periodic basis, and consider price adjustments (up or down) as necessary.

Current statutes spell out the procedures that state agencies must follow when adopting, amending or repealing rules. Those procedures would apply to this pricing scheme. The DNR rulemaking process would likely take about 2 years, and would involve substantial public input. Rules must be approved by the DNR Board, and are subject to legislative committee review. If necessary in an emergency, DNR may adopt a temporary rule using abbreviated emergency rulemaking procedures (this emergency process is rarely used, and is subject to strict legislative committee review).

The legislation would require DNR to consult with an advisory committee that includes stakeholder representatives and technical experts. Advisory committee recommendations would carry significant weight, but would not be binding on DNR. The legislation could outline the general size and makeup of the advisory committee, as well as membership terms and an appointment process. The advisory committee would include a representative range of stakeholder perspectives (including agriculture, business, local community and environmental perspectives). It would also include qualified academic and technical experts, including hydrology and economic experts who could help evaluate groundwater pumping impacts and pricing proposals.  

(END)