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February 28, 2022

Mr. John Green
El Paso County Planning and Community Development Department
2880 International Circle, Suite 110
Colorado Springs, CO 80910
johngreen@elpasoco.com

Re: Falcon Acres Final Plat

Dear Mr. Green,

This firm represents the Upper Black Squirrel Creek Ground Water Management District ("the UBS District"). Falcon Acres is located within the UBS District's boundaries. The UBS District has reviewed the Applicant's application materials and submits the following comments:

Water Service for Falcon Acres:

Section 30-28-133(3)(d), C.R.S. requires counties to adopt regulations that require "adequate evidence that a water supply that is sufficient in terms of quantity, quality, and dependability will be available to ensure an adequate supply of water" for proposed subdivisions. The Falcon Acres property is located 5 miles southwest of Falcon, Colorado. The Falcon Acres property is approximately 49 acres. The property is planned to be subdivided into eight (8) residential lots. According to Applicant, there are two existing wells on the site and the Applicant proposes drilling new wells and developing septic systems. No connection to municipal water or sewer is proposed.

The Water Resources summary from Mr. Paul Anderson LLC states that the primary water supply plan is to serve the proposed eight lots through a centralized system supplied by a single well in one of two ways:

(1) through a new well constructed into the non-tributary Arapahoe aquifer; or
(2) using an existing well constructed into the Denver aquifer. However, use of the Denver aquifer well will require Commission approval of a replacement plan.

Mr. Anderson allocates the following amount of water to each lot from the Arapahoe aquifer.

- 4.54 AF / 8 lots = 0.5676 AF/lot, or ~ **0.57 AF/lot**

However, because these lots are located within a subdivision, and the use of the wells exceeds small capacity well limits, all existing or proposed wells are classified as "large capacity wells" and **must be metered. All meter readings must be sent to the Upper Black District monthly**. Further, the Upper Black District Rule 17 limits the production of large capacity wells inside subdivisions to **0.5 acre-feet per year**. Applicant should be required to acknowledge this limit prior to approval.

Wastewater Treatment – Septic Systems

A soil, geology and wastewater study was prepared for the subdivision by Entech. According to the Application, discharged wastewater will be treated through individual on-site wastewater treatment systems.

The Entech Report acknowledges that there are "seasonal shallow groundwater areas." The Entech Report further acknowledges that "Groundwater may also flow on top of the underlying bedrock or clay lenses. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at time of construction."

The attached memorandum from the UBS District's hydrogeologist, Mr. Mike Wireman, describes the UBS District's concerns with individual on-site wastewater treatment systems. Furthermore, the UBS District has enacted a policy which encourages the use of central wastewater systems, as opposed to the use of individual septic systems, to minimize the possibility of contamination of the alluvial aquifer in the basin.

Entech also reports that perimeter drains may be required to prevent seepage of water into areas located below grade. If drains are required around homes, a detailed recharge plan must be submitted to protect the groundwater from depletions associated with the drains.

The UBS District reserves the right to provide additional comments at a later date founded upon information not readily ascertainable from the above-referenced application.

Sincerely,

Lisa Thompson
for
TROUT RALEY

cc: UBSCGWMD Board of Directors

Encl.: Mike Wireman, Technical Memorandum, Issues/Concerns Related to Discharge of Wastewater Effluent to the Upper Black Squirrel Alluvial Aquifer from Densely Spaced Individual Sewage Disposal Systems (Feb. 16, 2021).

February 16, 2021

TECHNICAL MEMORANDUM

Prepared for: Upper Black Squirrel Creek Groundwater Management District

Prepared by: Mike Wireman,
Granite Ridge Groundwater
Boulder, CO

Issues / Concerns related to discharge of wastewater effluent to the Upper Black Squirrel alluvial aquifer from densely spaced Individual Sewage Disposal Systems

Water Quality Issues

As housing and commercial development increase within the Upper Black Squirrel Creek Designated Ground Water Basin (UBSCDGWB), many housing developments are utilizing Individual Sewage Disposal Systems (ISDS), also referred to as Onsite Wastewater Treatment Systems (OWTS), to provide wastewater treatment for homes within the development. There is a growing concern that discharge of wastewater from densely spaced ISDS will degrade the quality of groundwater in the Upper Black Squirrel (UBS) alluvial aquifer. The USB alluvial aquifer is a highly vulnerable surficial sand and gravel aquifer that underlies approximately 147 mi^2 within the 350 mi^2 Black Squirrel Creek watershed (Topper, 2008). Pumping from this aquifer from 1964-2004 resulted in a loss of more than 60,000 acre-feet from storage and declines in water levels of more than 40 feet (Topper, 2008). During the past 20 years water levels have stabilized over most of the aquifer except in areas with high annual withdrawals.

The UBS alluvial aquifer yields large quantities of water to municipal and irrigation wells and is the source of water for an estimated 1000-1500 domestic water supply wells. ISDSs are used for waste-water treatment in individual rural homes and in subdivisions that include hundreds of densely spaced homes. Water supply for drinking and other domestic purposes is obtained from the UBS alluvial aquifer and the underlying Denver Basin bedrock aquifers. It should be noted that UBSC Rule 3 prohibits any new wells in the UBS alluvial and the Dawson aquifer within the UBSCDGWB.

It is commonly assumed that approximately 90% of the groundwater used for domestic purposes is "returned" to the aquifer via discharge from ISDS. Discharge occurs primarily into the vadose (unsaturated) zone in the upper part of the Black Squirrel alluvial aquifer. It is also assumed that all the water discharged from ISDS to the UBS alluvial aquifer reaches the water table via infiltration.

A properly operating ISDS can provide effective treatment for many wastewater constituents , however these systems are often not effective at removing organic nitrogen compounds, volatile organic compounds (solvents, paints, antifreeze, etc.), and pharmaceuticals and personal care products. Subsurface discharge of ISDS effluent into the UBS alluvial aquifer can result in attenuation of contaminants in the vadose zone and/or seriously degrade aquifer water quality. Recent sampling (Long-Term Groundwater Monitoring in the Upper Black Squirrel Basin, El Paso County, CO, 2018-2-21 – to be published in 2021) of 50 UBS alluvial aquifer wells by the USGS indicate that nitrate concentrations are elevated in the aquifer and that human/animal waste is a significant source of the nitrogen. The USGS sampling program also includes analysis of more than 100 pharmaceuticals and personal care products. Preliminary data indicate some presence of these compounds.

The Colorado Department of Public Health and Environment (CDPHE) and the Colorado Division of Water Resources (CDWR, including the Colorado Groundwater Commission (CGWC)) assume that there is negligible impact to aquifer water quality from discharge of effluent from ISDS. As development increases and more wastewater is being discharged to the alluvial aquifer, there is concern that the traditional assumptions, with respect to impacts from ISDS, may not be representative of actual conditions in the aquifer.

Specific issues that need to be considered when permitting /approving ISDS include:

1. Several proposed housing developments in the UBSCDGWB plan to use ISDSs for hundreds of new densely spaced homes. This will result in high density of ISDSs (one ISDS per 2.5 acres). Current CDPHE and CGWC policies do not adequately consider the cumulative impact of septic system discharges in a specific region of the aquifer. Densely spaced ISDSs can discharge hundreds of acre-feet per year to a localized part of the alluvial aquifer. The assumption that ISDS discharge results in negligible impact to aquifer water quality has not been proven under these conditions.
2. The annual discharge from the septic tank is not measured and is assumed to be 90% of in-house water use. The basis for this assumption is unknown. There has been no documented effort to verify this assumption with empirical monitoring data in the UBSCDGWB. In addition, estimates of annual in-house use (versus outdoor / irrigation use) are also subject to uncertainty if totalizing flow meters are not required on all wells.
3. Treatment effectiveness can vary significantly among ISDSs depending on the quality of wastewater delivered to the system and the installation and maintenance. Long-term maintenance of individual septic systems is often inadequate which also effects treatment effectiveness.

4. Little consideration is given to the location of septic systems within the alluvial groundwater flow system. Groundwater flow direction and velocity are influenced significantly by the degree of saturation which is spatially variable in the unsaturated zone. How will this effect subsurface flow of the discharged effluent?
5. ISDS are difficult to install and operate in areas where the depth to water is very shallow creating near-surface saturated conditions. It is very important to collect one year of seasonal data on depth to water to determine if near-surface saturated conditions will occur in the area where the use ISDS is planned.
6. ISDS are also difficult to install and use where the depth to bedrock is shallow. ISDS systems are designed to discharge effluent into unconsolidated sediments-not bedrock. This situation occurs over wide areas in the northern part of the UBSCDGWB.
7. There is significant uncertainty regarding the transport and fate of dissolved and suspended constituents in the ISDS discharge. Biological and geochemical conditions in the unsaturated and saturated zones will vary spatially and temporally. The potential for attenuation of selected contaminants in the subsurface that will become a source of residual contamination is unknown. An analysis of historical nitrate concentrations in the UBS alluvial aquifer by the USGS (Wellman and Rupert, 2016)) indicates that, in places, there is significant residual nitrogen stored in the aquifer. The median concentration value for nitrate concentration data from 51 alluvial wells sampled in 2013 was 5.4 mg/l. Twenty seven of the 51 wells had nitrate concentrations above 5 mg/l and 4 of the wells had nitrate concentrations above the MCL (10 mg/l). Wellman and Rupert report that, across the entire UBS alluvial aquifer, agriculture is likely the most significant source of nitrogen and discharge from septic tanks is the 2nd most significant source. This results in significant uncertainties regarding the impact of ISDS discharge effluent on nitrate contamination of the alluvial aquifer.
8. Due to the increasing nitrogen loading from anthropogenic sources (natural background nitrate concentrations in the UBS alluvial aquifer are less than 1 mg/l), it is strongly recommended that El Paso County and the CGWC require monitoring downgradient of subdivisions that include densely spaced ISDS and that the applicant provide an assessment of that part of the UBS alluvial aquifer that will receive the effluent discharge.

Use of Effluent Discharge from ISDS as Source of Replacement Water

In addition to the water quality issues discussed above, there is concern about the use of ISDS effluent discharge as a source of water for replacement. Pursuant to CRS 37-90-107 appropriation of groundwater from the Denver Basin bedrock aquifers within Designated Groundwater Basins requires a water rights determination (basin determination, BD) be completed by the CGWC. Based on the determination the CGWC establishes an annual allocation from each underlying bedrock aquifer. Commission Rule 5.6.2 of the Designated Basin Rules requires replacement of depletions to the UBS alluvial aquifer associated with pumping not-nontributary bedrock groundwater.

For not-nontributary wells located more than one mile from the point of contact between the aquifer and the stream including its alluvium, 4% of the annual withdrawal must be replaced. For not-nontributary wells located within one mile of this point of contact, actual depletions must be replaced. All large-capacity wells within the UBSCDGWB that pump from the Dawson aquifer, and are located within one mile of the point of contact, are also required to replace actual depletions. Estimated depletions are calculated using a standardized model developed by the Colorado Division of Water Resources.

As required in water rights determinations, replacement plans must include, among other things, information on the proposed source of replacement water, the method of introducing the water to the stream or associated alluvial aquifer, and reporting submitted to the CGWC for approval. Currently the CGWC allows discharge of effluent from ISDS as a source of replacement water for both 4% replacement requirements and full replacement requirements.

Specific issues that need to be considered when evaluating / permitting the use of wastewater effluent from ISDS as a source of replacement water include:

1. There is uncertainty related to the calculation of the estimated annual depletions to overlying alluvial aquifers or streams that results from pumping the Denver Basin bedrock aquifers. The depletions are estimated using the CDWR groundwater model - AUG3. There currently no verification of the results of the modeling with empirical monitoring data. This uncertainty is a general concern for all Denver Basin pumping depletions regardless of the replacement source.
2. Flow away from ISDS can be complicated due to the inherent heterogeneity of the subsurface. Flow paths, flow velocities and saturation conditions can vary significantly. There is uncertainty as to whether the discharge from an ISDS will reach the nearby stream or alluvium. The Alluvial Water Accounting System (AWAS), developed by Colorado State University to calculate estimated volume and timing of accretions (recharge) to the stream or alluvial aquifer from ISDS discharge, is simplistic and is more appropriate for estimating stream depletions due to pumping from a well producing from the adjacent alluvial aquifer. The model is not capable of simulating the complexity of the stream-alluvial system nor the fate and transport of contaminants in the effluent discharge. This greatly constrains the ability to estimate the volume and timing of replacement to the stream-alluvial system. As development increases in the UBSCDGWB the use of ISDS is also increasing which results significant uncertainty regarding accuracy of the accounting for replacement requirements that rely on ISDS effluent discharge.
3. It is difficult to enforce the requirement that the bedrock well owners record annual withdrawal from the wells and report data to the CGWC and the UBSCGWMD.
4. There is an administrative assumption that once approved, the replacement plan will be adequate for replacing depletions. There is no safeguard aimed at determining if a particular septic system discharge is not complying with the replacement requirements nor is there any guidance for modifying a replacement plan if necessary.

5. As discussed above ISDS are not appropriate in areas where the depth to bedrock is shallow and the overlying UBS alluvial aquifer is thin or absent. Under these conditions the ISDS effluent discharge cannot recharge the UBS alluvial aquifer.
6. It is strongly recommended that the CGWC require the installation of groundwater monitoring wells at appropriate downgradient locations. Water level data from appropriately located and screened monitoring wells can be used to determine if the replacement amounts are being delivered as required.

Summary

As growth and development continue to occur within the UBSCDGWB, it is important for the CDPHE, the CGWC and the UBSCGWMD to recognize the potential for unwanted impacts to water quality and groundwater flow in the UBS alluvial aquifer due to discharge of wastewater from ISDS. Hundreds to thousands of acre-feet per year are discharged to the alluvial aquifer from ISDS. Even with effective maintenance of the ISDS the discharge wastewater will contain dissolved concentrations of nitrogen and organic compounds that are known contaminants. The discharged wastewater will mix with groundwater in the aquifer and geochemical and biological processes will affect the chemistry and contaminant concentrations in the mixture. It is important to monitor groundwater quality and groundwater levels downgradient of groups of densely spaced ISDS.

References

Topper, Ralf; 2008; *Upper Black Squirrel Creek Basin Aquifer Recharge and Storage Evaluation*; Colorado Geological Survey; Prepared for El Paso County Water Authority

USGS *, Long-Term Groundwater Monitoring in the Upper Black Squirrel Basin, El Paso County, CO, 2018-2-21* – to be published in 2021

Wellman, T.P., Rupert, M.G.; 2016, *Groundwater quality, age, and susceptibility and vulnerability to nitrate contamination with linkages to land use and groundwater flow, Upper Black Squirrel Creek Basin, Colorado, 2013;* USGS Scientific Investigations Report 2016-5020