Glossary Terms for Hydrological Parameter Analysis for AR-

Parameter name	Category	Notes
Horizontal hydraulic conductivity	Recharge	Primary factor for rate of recharge or production
Depth to water	**Storage**, Recharge	Defines potential storage volume and recharge delay
Dominant Lithology	Recharge	Accounts for aquifer texture/porosity. Parameter scoring also includes secondary porosity features associated with fractured rock and limestone or karst formations.
Sediment age	Recharge	A qualitative indication of aquifer induration.
Vertical hydraulic conductivity	Recharge	Proxy for infiltration rate
Topographic slope	Recharge	High slope areas limit above ground ponding potential
Specific yield	Storage	Relevant in unconfined portion of the aquifer

Note: Where multiple categories exist, the category for which the parameter contributes to scoring is bolded.

AR hydrogeological parameter score

A brief description of the parameters used to score AR hydrogeological suitability is provided below.

Horizontal Hydraulic Conductivity – Horizontal hydraulic conductivity is important for both recharge and recovery in AR. The parameter is positively correlated to suitability and score increases from 0.2, for values less than one foot per day to 1 for values greater than 30 feet per day. As with ASR, a 1 foot per day hydraulic conductivity is considered a marginal aquifer, while 30 feet per day or greater is consistent with aquifers having greater than 1,000 gallons per minute (gpm) wells, which are some of the highest producers in Texas.

Depth to Water – The depth to water table, which is the thickness of the vadose zone, impacts the suitability of AR both in terms of the available storage potential and the ability for the recharged water to maintain high saturation and therefore high infiltration rates. The score maximizes at thicknesses from 30 to 300 feet. Deeper than 300 feet decreases the score due to the increasing time and water volume required for recharge. The scoring approach for this parameter is primarily based on the direct experience of team members in constructing infiltration ponds and other AR systems.

Dominant Lithology – The type of aquifer and associated soils has a clear correlation to the suitability of AR. Sediments that are clastic, have high porosity (low induration), high vertical hydraulic conductivity and low anisotropy are most suitable for AR. The vertical hydraulic conductivity is discussed above. Anisotropy is very hard to characterize regionally. Soil data and underlying unweathered, parent aquifer material information can be used to characterize the dominant lithology. Aquifer dominant lithology was derived from a variety of literature sources, such as the *Aquifers of Texas* (TWDB, 2016), smaller reports focused on one or two aquifers, and other studies.

Sediment Age - Sediment age was incorporated to provide a qualitative indication of aquifer induration. The scoring approach was identical to that described in the previous ASR section. Aquifer age was determined as a companion parameter to aquifer dominant lithology, from the 2016 TWDB report, *Aquifers of Texas*. Aquifer age is assigned a single value for the unconfined and confined portions of the aquifer. Many of the aquifers had a range of ages. For dipping aquifers, the unconfined portion was assigned the average of the age range (since the outcrop likely represents the entire span of age ranges), while for non-dipping unconfined aquifers, the youngest age was used, since the aquifer material at the surface would trend younger.

Vertical Hydraulic Conductivity – Hydraulic conductivity is a property of an aquifer that describes the ease with which water can move through pore spaces. It depends on the pore structure of the aquifer deposits, the degree of saturation, and on the density and viscosity of the fluid in the pore space. Hydraulic conductivity orthogonal to aquifer bedding is called vertical hydraulic conductivity. Vertical hydraulic conductivity has a large influence on the rate at which water can be recharged from a spreading basin or other surface facility. A vertical hydraulic conductivity of less than 5 ft/day is considered low suitability, while greater than 20 ft/day receives the highest suitability score. The scoring approach for this parameter is primarily based on the direct experience of team members in constructing infiltration ponds.

Topographic Slope – Topographic slope is an important consideration for surface AR in the construction of impoundments. Infiltration ponds should be constructed in areas sloping less than 5 percent (Pedrero et al., 2011; Ahmadi et al., 2017). The natural competing runoff characteristics associated with high topographic gradients and high slope areas are more prone to seeps and levee bypass. In addition, costs are higher as the slope increases. Infiltration ponds should be constructed in areas sloping less than 5% (Pedrero and others, 2011; Ahmadi and others, 2017). The breaks used in scoring are based on analysis of statewide topography.

Specific Yield – Specific yield is a parameter that describes the storage potential, per unit volume of aquifer, of an unconfined aquifer. The scoring approach was identical to that described in the ASR section.

Groundwater Quality – Groundwater quality for 30 of the 31 aquifers was derived from *Aquifers of Texas* (TWDB, 2016), which includes maps of total dissolved solids (TDS) for all but the Cross Timbers Aquifer, which the TWDB recognized as a minor aquifer of Texas after publication of the 2016 report. These are spatially varying coverages. The water quality of the Cross Timbers Aquifer was estimated from measurements in the TWDB groundwater database.