RESULTS: INFLUENCE OF GILSONITE VEINS

Core evaluation, evidence for barrier:
Near the bank's depocenter, several core sites recovered the saline residue. Most of these cores (e.g., C-2) show significant saline mineral dissolution. In fact, Andarake has begun flushing saline water into the Birds Nest to this area. However, there is one well (15X-1) with core slightly to the north, which shows largely preserved gilsonite that was very solid and transmitted no water. These observations suggest that gilsonite veins could act as both barriers or conduits for saline dissolution. This transitory node could have great significance in the absence of actual veins.

RESULTS: WATER CHEMISTRY

Chemistry of Birds Nest water (mostly acquired by Anadarko) in the north (averaging >10,000 mg/L TDS and down to near 1800 mg/L TDS). This abrupt change in water chemistry is most likely due to the differing amounts of saline mineral dissolution in the three areas; the northern areas may have been flushed clean, whereas saline minerals in the northern area are still actively dissolving. This transition is important because produced saline water can only be disposed into the aquifer where the water is currently 10,000 mg/L TDS and above (only north of the red line). In some areas, like near Anadarko's disposal wells, it seems that the presence of gilsonite veins has had an influence on the shape of the 10,000 mg/L TDS line. The gilsonite veins could be acting as barriers, creating underground channels of groundwater flow (see discussion above).

RESULTS: STORAGE VOLUME ESTIMATION

Gilsonite (a residual hydrocarbon) occurs in veins ranging in thickness from a couple inches to tens of feet and originates in the rich oil shale beds of the upper Green River Formation, continuing up to the surface, cross-cutting the Birds Nest aquifer. Questions remain as to how these veins might affect groundwater movement through the Birds Nest aquifer, whether they act as barriers to flow or whether they create vertical and/or horizontal pathways for water transmission.

RESULTS: INTERBURDEN - BIRDS NEST TO ECONOMIC OIL SHALE

The base of the lower Birds Nest aquifer is mostly between 70 and 100 ft (except in the north) above the top of the economic oil shale, picked at the top of the Big 3 oil shale beds (see panel 3). Saline water disposal could impact development of the underlying oil shale if vertical migration of water occurs via fractures or joints.

CONCLUSIONS / SUGGESTIONS

The Birds Nest aquifer has significant potential as a saline water disposal area...
- The aquifer currently contains highly saline water in some generally north of T-10; it has a large amount of potential storage space (see sections) in the development of saline resources and is easily accessible.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.

Additional Conclusions:
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The effective of saline water disposal into the Birds Nest aquifer can guide future saline water disposal in the development of saline resources and is easily accessible.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.
- However, disposal into the Birds Nest poses unique challenges...
- These include naturally long-term water supply and natural pathways for groundwater movement into the underlying oil shale beds.
- The effective of Birds Nest aquifer can guide future saline water disposal in the future.
- The pressure of a possible disposal area (e.g., it is currently a major source of long-term saline mineral dissolution.
- The salinity is relatively uniform (table values on graph).
- Most areas have shown significant natural and artificial activity.
- Disposal will be associated with laker oil shale deposit with minimal economic potential.