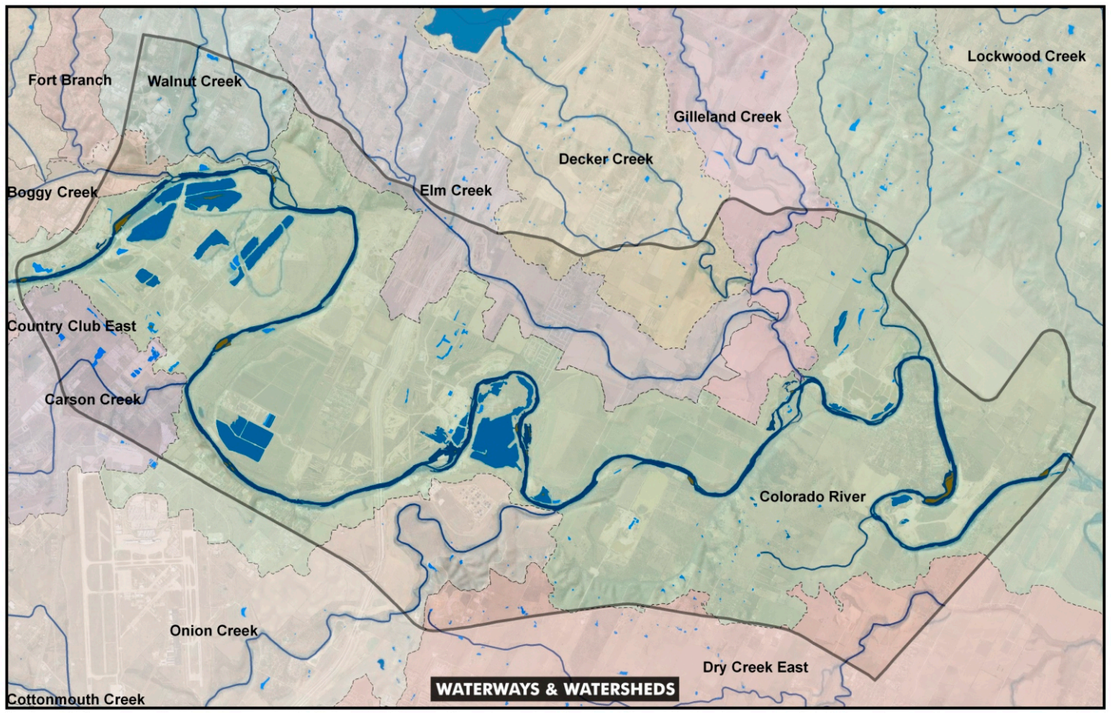

Water Quality 3

SURFACE WATER QUALITY

Existing Conditions

The water quality standards for the segment of the Colorado River occurring below Longhorn Dam (considered by TCEQ as Segment 1428) establish an "exceptional" aquatic life use for the river, meaning that aquatic habitats exhibit outstanding natural variability, exceptional assemblages of aquatic species, abundant species that are sensitive to pollution, and exceptionally high diversity and species richness. An aquatic life use of "high" is established for both Walnut Creek and Gilleland Creek, reflecting the attainability of high quality aquatic life. The high category is the predominant, most typical classification of aquatic systems by TCEQ. These standards set a quality for these water bodies with the goal to provide the habitat characteristics for aquatic species no longer locally present or now rare to rebound and return. The TCEQ also establishes statewide standards for the protection of human health that limit the concentration of disease-causing bacteria, contaminants, and toxic substances in surface water.



Opportunities and Constraints

Impact of Urbanization

The TCEQ, through implementation of the federal Clean Water Act, has primary responsibility over setting the water quality standards for the Colorado River and its tributaries in the Corridor. TCEQ partners with local jurisdictions, including the LCRA and City of Austin, to conduct ongoing, routine monitoring of water quality and to assess the results of the monitoring to determine if the water quality standards are being attained. When a reach of a stream or river does not attain one or more water quality standard, it is considered impaired. The State of Texas will then take one or more of the following actions to address the data results: 1) additional data collection may ensue, in order to verify the water quality conditions; 2) it may be determined that the water quality standard is not appropriate and a process will follow to revise the standard to the site-specific use of the waterway initially considered impaired; and 3) restoration actions are undertaken to establish a limit and curtail the load of the pollutant that can be discharged. When a reach of a stream or river is identified as a concern, it does not automatically trigger any of these three actions, but it does raise some awareness that a pollutant level is either approaching a level that would exceed a standard or there may not be a numeric standard established. Restoration is formally adopted in a plan called a Total Maximum Daily Load Implementation plan or TMDL I-Plan.

There are several potential impacts to water quality in the Corridor. Nearly all of the impacts are associated with the urbanizing trend of the Austin metropolitan area. Among them are:

- Pollutant discharges of treated effluent from sewage treatment facilities,
- Storm water runoff from urban, resource extraction, and agricultural areas of all kinds,
- Unmanaged or illicit discharges of pollutants and toxins from industrial, institutional, and commercial operations or households,
- Overflows of untreated sewage from collection lines, lift stations, and septic tank drainfields, and
- Improperly managed pet or animal waste.

In addition to pollutant discharges, other changes to the landscape may negatively influence surface water quality:

- Physical alteration of stream channels,
- Diversion of natural flowing surface waters for municipal and irrigation use,
- Alteration of the natural variability of stream flow regimes due to upstream impoundments,
- Reduction or elimination of riparian corridors,
- Scouring of stream beds during storm events, and
- Introduction of exotic species of aquatic flora and fauna.

Sewage Treatment Discharges

In recognition of the threats to water quality from sewage treatment facility discharges and the exceptional water resource that the Colorado River is, the Texas Water Commission (now TCEQ) also established a Colorado River Watershed Rule to require advanced secondary treatment for discharges into the Colorado River and even more stringent treatment that includes phosphorus removal for wastewater discharges to tributaries of the Colorado River below Longhorn Dam. Affected discharges of relevance to the Corridor include those into the Onion Creek, Gilleland Creek, and Walnut Creek watersheds.

The standard limits for discharge into this segment of the Colorado and tributaries currently do not include any limits on total nitrogen, only ammonia nitrogen. This does not address the potential for nitrogen limited tributaries to experience algae blooms which contribute to water quality and ecological problems in the immediate receiving waters and cumulative impacts in the Colorado. Phosphorous limits are set at 1 mg.L when present which also may not be sufficient to avoid algae blooms especially in

smaller tributaries and in the Colorado River Corridor Study area under conditions of low release from Longhorn Dam. Standard permit limits can be addressed through changes in TCEQ water quality standards for nutrients that are currently under development, or through implementation of Total maximum Daily Loads (TMDLSs).

Assessment of Water Quality

In 2010, the TCEQ adopted its most recent statewide assessment of water quality and submitted it to U.S. Environmental Protection Agency for approval. The report includes assessment of surface waters in the Corridor based on monitoring, sampling, and analyses accomplished. Overall, most assessed uses and standards are fully supported.

The Colorado River between Longhorn Dam and the confluence with Walnut Creek is impaired and exceeds the standard for E. coli bacteria, an indication that the water may be unsuitable for swimming. The Colorado River below the confluence of Walnut Creek to the Bastrop County line attains the standards for plant nutrients like nitrate and ortho-phosphate, but TCEQ indicates it is concerned with the levels as being close to failing standards. There is also a concern that the macrobenthic and fish communities in the Colorado River below Gilleland Creek are nearing non-attainment of the exceptional aquatic life use standard.

Walnut Creek achieves all of the standards that have been assessed, except that the uppermost reach, upstream of Mopac in northwest Austin, is impaired due to elevated E. coli bacteria. The remaining reaches, downstream of Mopac to the Colorado River, also exhibit elevated E. coli, but only at a level of concern short of being considered impaired.

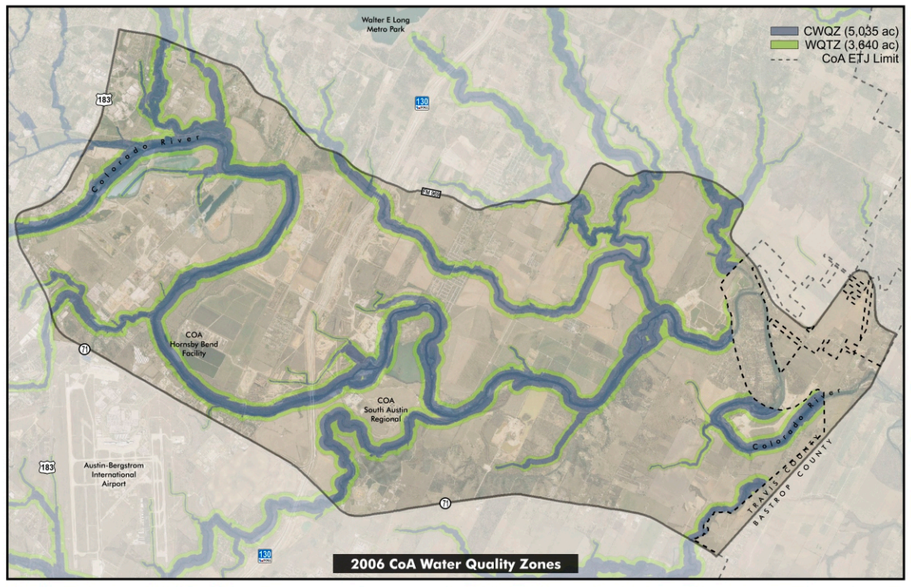
Gilleland Creek, in the reach downstream from Taylor Lane to the Colorado River, is also impaired due to elevated E. coli bacteria. Additionally, the TCEQ is concerned that plant nutrients like nitrate and ortho-phosphate are elevated, but at a level short of being considered impaired.

The TCEQ has not yet established numeric standards for nutrient constituents. However, it has been the practice of TCEQ to identify water bodies with nutrient concerns, as has also been used to describe some conditions in the Corridor. It is not likely that these concerns will result in additional actions by the TCEQ to address the causes and sources of these nutrient concerns. Recently, considerable focus has been on freshwater mussels as indicators of water quality conditions. Additionally, Texas Parks and Wildlife Department has placed many mussel species on the state threatened list and the U.S. Fish and Wildlife Service is considering adding five central Texas candidate mussel species for listing as threatened or endangered. Urbanization and resulting changes in hydrology and sediment composition are the primary factors limiting mussel abundance and diversity in the central Texas area including the study area. These changes have resulted in a shift to more tolerant, generalist freshwater mussel taxa. Surveys of the Colorado have been conducted in the study area to locates extant mussel beds and quantify if adequate recruitment is occurring for recolonization of nearby tributaries. Follow-up measures may be required if endangered.

Water Quality Restoration

In all but one of these cases, continued monitoring and evaluation of these problems are predicted to help planners determine sources of pollution problems that can result in restoration through a TMDL I-Plan or by other means. In one case, however, a TMDL I-Plan has already been established for Gilleland Creek. The TMDL I-Plan was prepared and adopted on February 9, 2011 by TCEQ with the extensive input and commitments from local jurisdictions and interested citizens. Among the solutions now scheduled for implementation include stepped up enforcement to stop discharges of raw sewage from failing septic tank systems and setting stringent effluent quality standards for E. coli in the permits for sewage treatment facilities that discharge to Gilleland Creek. The City of Austin and Travis County have committed to expanding setback distances between water courses and development in unprotected headwater areas of the watershed. By means of overland flow, the undisturbed vegetation in such stream buffers will facilitate die off and reduction of bacteria and sediment out of storm water before it flows into Gilleland Creek. Current stream COA 200 foot buffers for water quality and bank erosion protection are not as extensive and protective in the Corridor as in some other areas of Travis County or the City of Austin. The City of Pflugerville and volunteers are conducting public education and undertaking efforts to reduce pet waste in areas close to Gilleland Creek.

Complementing the TCEQ assessments, the City of Austin has established a monitoring program for several of the smaller streams of local importance. The City of Austin has developed an Environmental Integrity Index (known as the EII, see http://www.austintexas.gov/department/environmental-integrity-index) which assesses water quality, aquatic life, aquatic habitat, aesthetics and sediment quality in the Elm, Decker, Gilleland, Onion, Carson, Walnut and Boggy creek watersheds on a rotating, biennial basis. Based on comparison of the most recent EII scores, out of the 50 assessed watersheds citywide, Onion Creek ranked in the top three best watersheds for overall quality while the other Corridor watersheds generally fell in the middle (rankings ranged from 12 thru 28 out of 50 assessed watersheds). Nutrient enrichment from wastewater effluent in the Gilleland and Harris Branch watersheds is one of the most significant concerns in Corridor tributaries.



Summary of Critical Issues

- Water quality degradation has resulted from urbanization.
- Future growth or proliferation of sewage treatment facilities alters the hydrology and quality of streams in the Corridor.
- Established monitoring shows emerging water quality issues that need attention.
- Local governments and private individuals need to fully implement the Gilleland Creek TMDL I-Plan to restore water quality in Gilleland Creek.
- City of Austin and Travis County permitting and inspection programs should continue and be increased to oversee development so that stormwater and other discharges reduce or eliminate impacts to water quality.

GROUND WATER QUALITY

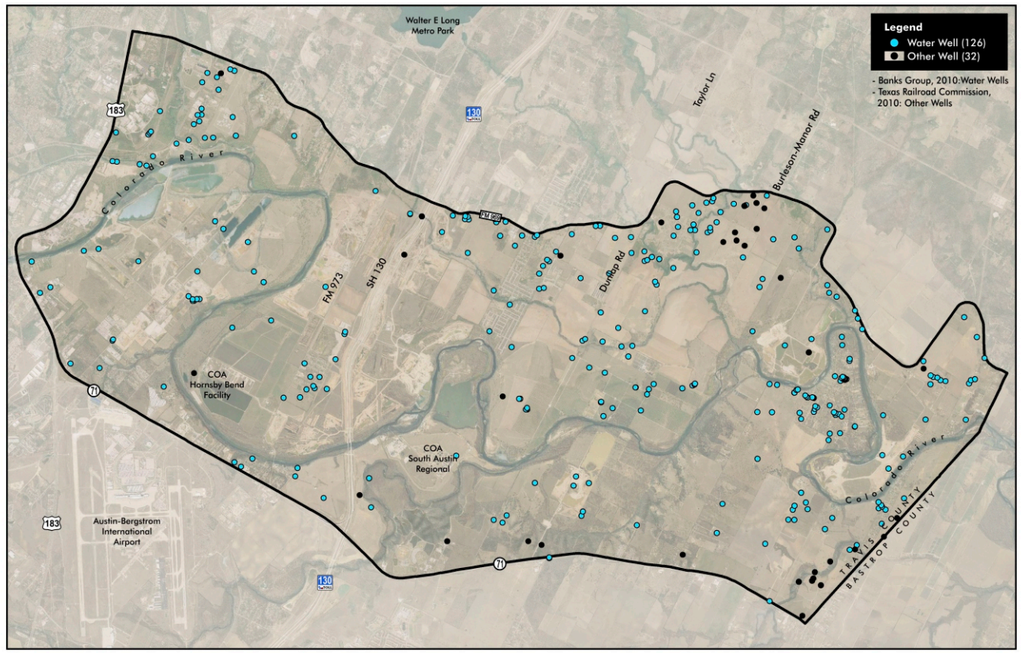
Existing Conditions

The Colorado River alluvial aquifer is not defined by the Texas Water Development Board (TWDB) as either a major or minor aquifer and therefore lacks the prominence that results in study or monitoring by state agencies. Readily available data to comprehensively describe the quality of groundwater from the aquifer are lacking. A general discussion and data are available in a 1983 publication from the Texas Department of Water Resources, including a delineation of the aquifer.[5] This generally corresponds to the geology as mapped by Garner and Young.[6] Additional unpublished data are available from studies conducted by students from The University of Texas at Austin.

There have been few formal or published scientific studies to characterize the quality of groundwater from the aquifer. The Austin Water Utility commissioned a 1994 study conducted by hydrogeologic consultants that examined and characterized the quality of groundwater at its Hornsby Bend wastewater sludge treatment facility. Among the conclusions were that several chemical constituents including aluminum, iron, fluoride, and manganese exceed concentrations that raise aesthetic concerns (non-health related concerns) that could adversely affect taste, odor, or plumbing fixtures (staining). The report concluded that these conditions were noted up-gradient and not associated with operations of the site.[7]

Of more significant importance, the report indicates that concentrations of nitrate-nitrogen and fecal coliform bacteria were elevated in wells throughout the Hornsby Bend facility. Additional water quality and water level data in the study area may be available from the Texas Water Development Board well sampling, although a complete assessment of these data over the period of record has not been compiled. Recently a study of hydrogeology and elevated ammonia and nitrate levels in wells around the Hornsby Bend site has been initiated through the University of Texas (Markovich et. al). Preliminary results indicate that "Both ammonia and nitrate contamination at Hornsby Bend are potentially related to legacy contamination from past agricultural activities Levels of both nitrate-nitrogen and fecal coliform bacteria are in excess of drinking water maximum contaminant levels (MCLs) established by the US Environmental Protection Agency (USEPA)." The report suggests treatment lagoons for wastewater at the site may be a source of these conditions. Excessive nitrate is a known toxicant that affects the health of infants. Groundwater normally flows in a radial pattern from higher elevations at the Hornsby Bend site towards the Colorado River but flows sub-parallel to the river's flow during wet weather. Recently, renewed interest has occurred with respect to elevated ammonia and nitrates in monitoring wells at the Hornsby Bend facility (Markovich et. al). In response, Austin Water Utility is undertaking an assessment of its liquid stream management processes at the facility through including a water, sludge, and soil sampling and analysis program. This study should inform the City as to any changes that may be needed to address concerns about groundwater quality.

It is also known from discussions with residents in the area that some private wells in the Corridor near Hunters Bend Road exhibit elevated concentrations of nitrate-nitrogen that approach or even exceed the MCL of 10 mg/l. Outside of the Hornsby Bend facility, other probable sources of nitrate contamination include past fertilizing practices related to crop production and use of septic tank systems for sewage disposal in the Corridor area. Electrical resistivity surveys reveal large channels of sand and gravels incised into underlying Taylor Clay that provide high permeability conduits for groundwater flow. (Markovich et. al) Hydrology of the study area affecting pollutant transport has been investigated through water level monitoring, water chemistry, and dye studies indicating rapid response of alluvial aquifer to precipitation events and stage levels in the Colorado (Hibbs and Sharp, 1992).



Opportunities and Constraints

As a component of the CRCP, it is recommended that available data be gathered from private and public groundwater well owners. Data on groundwater quality is collected by Public Drinking Water

suppliers under the requirements of the federal Safe Drinking Water Act. Some regulatory permits require groundwater monitoring and it is likely that some well owners have data logs. Together, available data may help planners better understand the extent and severity of the nitrate issue.

In 2005, TCEQ evaluated whether areas of the Corridor north of the Colorado River should be designated as a Priority Groundwater Management Area (PGMA). A PGMA designation would reflect a conclusion that groundwater resources are insufficient to supply the present or future water demands of a geographical area. If designated as a PGMA, State law requires that a Groundwater Conservation District (GCD) be established. A GCD would result in permitting of new non-exempt groundwater wells, regulate spacing of wells to prevent interference on nearby wells, and would conduct research to assess the quality and quantity of the resource. However, in the report (footnote 8) TCEQ concludes a PGMA not be designated because future water demands are expected to be satisfied by expansion of water utilities from surface water sources.

A GCD can be established without designation as a PGMA, so long as there is public support to vote in favor of it and accept the modest taxation increase necessary to fund the district. In the recent past, Travis County has investigated whether a GCD should be established. Meetings and discussions with citizens and existing retail public water providers have been undertaken. It was concluded that there is not the necessary public or institutional support for establishing a GCD. Given the future expansion of surface water sources in the Corridor to replace or supplement groundwater withdrawals from the Colorado River alluvial aquifer, and given the small quantity of this resource, a GCD may not be a viable recommendation. Instead, it may be more appropriate to focus local investment and resources in a program for funding research and assessment of the Colorado River alluvial aquifer. The initiative could focus on assessment of water quantities reliably available for pumping and to determine the extent of water quality degradation due to elevated nitrate-nitrogen in the groundwater.

Summary of Critical Issues

- Lack of a systematic monitoring network of wells.
- Lack of fundamental hydrogeological studies to determine such factors as:
    - Porosity, permeability, and saturated thickness variations,
    - Recharge and discharge from the aquifer,
    - Effects of droughts and floods on this system,
    - Pumping history and expected future water extractions, and
    - Effects on the aquifer from surface alterations and land use changes.

- Extent and severity of excessive nitrate-nitrogen in the aquifer is not well known.
- Private well owners do not need to test the quality of their water or comply with drinking water quality requirements.
- Establish a program to fund research on the quality or water supply limitations of the aquifer.
- No local studies on the impact of aggregate mining on water quality.

---

[5] Brune, Gunnar, and Duffin, G. L. 1983. Occurrence, Availability, and Quality of Groundwater in Travis County, Texas: Texas Department of Water Resources Report 276. 219 p.

[6] Garner, L. E., and Young, K. P. 1976. Environmental Geology of the Austin Area: an Aid to Urban Planning: The University of Texas at Austin Bureau of Economic Geology Report of Investigations 86. 39 p.

[7] Preliminary Engineering and Environmental Considerations Report, City of Austin Hornsby Bend Ground-Water Monitoring Well System Improvements (C.I.P. #455-237-8134). RMT/Jones & Neuse, Inc. December, 1994.

[8] Markovich, Katherine, K. Befus, R. Forster, D. Reyes, M Robertson, and J. Sharp. 2011 Hydrogeology of an alluvial aquifer system with high levels of nitrate and ammonia. 2011 Geological Society of America Annual Meeting. Minneapolis, MN . (9-12 October 2011). Paper No. 187-8.

[9] Hibbs, B.J. and J.M. Sharp Jr. 1992.Hydrodynamics of the bank storage effect – an integrated tracer and modeling study. 1992 Geological Society of America Annual Meeting. Cincinnati, OH (26-29 October 1992). Journal Volume 24:7.