



Projects

Mining-Related Hydrologic Studies

Fort Knox Project, Fairbanks, Alaska



During the permitting phase of the Fort Knox Project, JCHA assisted in the development of a surface water and ground water baseline monitoring program, as well as evaluating the proposed operation and retirement aspects of the project. In addition, parametric operational studies of potential reservoir sites were used to identify a location for a water supply reservoir to provide sufficient water supplies for the mine.

San Luis Gold Project Near San Luis, Colorado

JCHA has been involved with surface and ground water issues associated with the San Luis Gold Project from the permitting stage through operations, and during the post-closure period. JCHA designed and implemented a surface water and ground water monitoring program to collect sufficient baseline data to support the application for a mining permit. This data collection program resulted in not only getting the permit for the gold mining operation, but also has been used during operations and during the post-closure period to evaluate pre-mining flow and water quality conditions from potential impacts caused by the mine.

Rock Creek Mine, Nome, Alaska

JCHA personnel performed a long-term pumping test of dewatering wells around the proposed pit. Results from the test were used to make estimations of required dewatering pumping rates and determine how many wells would be needed to pump the required rate. The long-term test results were also used to make recommendations for pumps to be used in the dewatering wells long-term. JCHA also assisted in the permitting process for the proposed injection well system. Also performed were hydraulic tests on over 30 boreholes to determine which holes would be incorporated into the injection well system.



DeLamar Mine Closure Plan, Silver City, Idaho

JCHA has conducted ground water evaluations at the DeLamar and Stone Cabin mines to evaluate potential ground water flow and quality issues which may arise as part of the closure of the DeLamar Mine. Of particular interest was the potential ground water discharge to surface streams that flow through, or near the mine, and the potential for ground water inflows to impact overall water quality in these streams.

Evaluation and Application of Geohydrologic and Geochemical Data at the Mount Hope Project, Eureka County, Nevada

JCHA was asked to evaluate the geohydrologic and geochemical setting of a molybdenum deposit located in Eureka County, Nevada. The project included the development of an open-pit mine, low-grade and non-mineralized material storage areas, a process plant complex, and a tailings materials disposal site. JCHA focused on the development, quality and use of a database to support the alternative site selection, pre-feasibility-level design, fatal flaw analysis, operational issues, and closure requirements of the tailings disposal system.

Review of Water Resources Documents for the San Cristobal Project, Nor Lipez Province, Republic of Bolivia



JCHA was asked to review water resource documents for the San Cristobal silver mine project. The review focused on the development of a database to be used in various models to project the viability of identified aquifers to meet projected water demands of the mine. In addition to the review, JCHA provided a work plan required to bring on line two well fields, including a timeline, level of effort, and costs associated with preliminary studies to the start up of the mine.

Evaluation and Application of the Geohydrologic and Geochemical Data at the Mt. Hope Project, Eureka County, Nevada

JCHA was asked to evaluate the Geohydrologic and geochemical data for the Mt. Hope molybdenum mining project. The evaluation focused on the development of a database to support pre-feasibility designs for the project, as well as site selection, fatal flaw analysis, operational issues, and closure care requirements of the tailings disposal system.

Spring Creek Mine, Decker, Montana

JCHA personnel designed, installed, and monitored a surface water and ground water monitoring system to demonstrate non-degradation of surface water and ground water quality in the vicinity of the proposed coalmine. Additional studies were also conducted by JCHA to evaluate the effects of the coal mine on the alluvial valley floor.

Parachute Creek Project Near Parachute, Colorado

JCHA personnel were involved in evaluating hydrologic issues related to surface and ground water

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monitoring associated with a proposed oil shale project and the hydrology of the retort shale pile. Surface water monitoring was conducted to measure flows in the East Fork of Parachute Creek and to collect sediment data related to pre-mining sediment loading in the creek and to collect water quality data. To evaluate the hydrology in the retort pile, JCHA personnel used an unsaturated flow model to evaluate seepage through the retort pile and the resulting water quality that would issue from the pile.

Surface Water Hydrologic Studies

Operational Studies for a Surface Water Supply Reservoir Near Parker, Colorado

Due to the limited water supply availability in Parker, and the heavy reliance on non-renewable Denver Basin aquifer water, the Parker Water and Sanitation District wanted to develop a surface water reservoir to fully utilize available flows in Cherry Creek. JCHA conducted operational studies to evaluate the optimum sizing for the water supply dam and to estimate yields from the reservoir. In addition, JCHA developed operating criteria for the reservoir to maximize use of available surface water supplies and to minimize peak day demands on Denver Basin aquifer wells.



JCHA was awarded the ACEC Colorado Merit Award for its research into this innovative water management project, which included an off-stream surface water supply reservoir, a water reuse plan associated with wastewater treatment, and deep well injection.

Surface Water Quality Monitoring of Cherry Creek for the Cherry Creek Basin Water Quality Authority, Arapahoe and Douglas Counties, Colorado



JCHA designed and installed a surface water monitoring system over an approximate 20-mile reach of Cherry Creek to evaluate water quality changes in the urbanized corridor above Cherry Creek Reservoir. The Cherry Creek Basin Water Quality Authority is charged with protecting water quality in the reservoir so that eutrofication does not occur. Therefore, our principal charge has been to evaluate nutrient changes in the creek from both point and non-point sources. These data have been input to the total maximum daily load (TMDL) process and the development of a control regulation for Cherry Creek Reservoir.

Evaluation and Application of Hydrologic and Reservoir Modeling, Grand Mesa Water Project, Delta County, Colorado

The Grand Mesa Water Project proposes to build a water management system consisting of an upper level storage reservoir, a mid-level off-stream storage reservoir, hydroelectric plant(s) and penstocks, a pumping station, and pipelines. JCHA provided the Grand Mesa Water Task Force with an initial level of understanding of what the project might yield from a water availability standpoint. Specifically, JCHA estimated the amount of water available to be managed for the benefit of the project when all senior decrees are satisfied, using a combination of stream gaging data, diversion records, water right summaries, and assumed exchange capabilities.

Provide Monitoring and Testing of the Implementation of a Well Operational Efficiency Program

JCHA is currently working with Parker Water and Sanitation District to develop a set of protocols, priorities, and operational efficiency criteria by which to create a system to operate its wells through the SCADA system. Research has indicated that similar programs have saved water suppliers between 10 to 25 percent of their electrical costs per year.

JCHA created an initial testing and modeling program to simulate well operations under the agreed upon protocols, priorities, and operational efficiency criteria. JCHA has completed the necessary program code writing and testing and the system is currently online. JCHA continues to review, modify, and optimize the system to minimize power cost while maintaining necessary service levels.

Ground Water Hydrologic Studies

Installation of "Superwells" for the Willows Water District, Englewood, Colorado

Willows Water District relies entirely upon Denver Basin ground water to supply potable water to more than 17,000 people. Since it is mainly a residential community, Willows Water District experiences an extremely skewed demand, whereby more than 60 percent of the demand is required in a four-month summertime period. Because of this, Willows Water District is required to have a larger installed well capacity just to satisfy the summertime demands. Since 1985, JCHA has installed two "superwells", which are capable of producing 2,000 gallons per minute each. This is almost twice the production capability of any other Denver Basin aquifer well, and the large capacity that has been achieved through special care exercised in the design and drilling of these wells.

Test Drilling Program with Subsequent Well Installation, Parker, Colorado



The Parker Water and Sanitation District obtains part of its water supply from the Cherry Creek alluvial aquifer. However, production rates from wells

along Cherry Creek are extremely variable spatially. Therefore, a series of five test holes were installed perpendicular to the stream flow to evaluate the presence of old, buried channels, which would produce favorable aquifer hydraulic characteristics. Based on the results of the test drilling program, one site was selected and an alluvial production well was installed.

Test Drilling Program and Installation of Production Well, Upper Eagle Valley Water and Sanitation District, Vail, Colorado

The Upper Eagle Valley Water and Sanitation District wished to install an additional production well in the Gore Creek alluvial aquifer to supplement their existing water supply. However, the alluvium was quite variable and the location of the well was crucial. Therefore, a test hole drilling program was designed and implemented to initially evaluate the best site for a production well. Based on the results of the test hole drilling program, a production well was installed and has the highest production capability of any of the District's alluvial production wells.

Hydrologic Investigations to Evaluate Ground Water Supply Potential, Sagauche County, Colorado

A private landowner of an undivided Spanish land grant, encompassing over 125,000 acres, asked JCHA to evaluate the ground water supply potential for development of municipal water supplies. JCHA conducted extensive ground water well installations, aquifer testing, water quality sampling, and surface water evaluations to assess the long-term potential for ground water supply development.

Denver Basin Aquifer Ground Water Demonstration Project, Englewood, Colorado

The U.S. Bureau of Reclamation funded the *High Plains States Ground Water Demonstration Project* to evaluate new, innovative means to recharge aquifers to extend their useful life. JCHA designed a deep bedrock aquifer injection program, which was accepted for funding, and subsequently a six-year research and development project was conducted in the Arapahoe aquifer in the Denver Basin. This study resulted in the development of recharge technology and also the promulgation of extraction rules by the Colorado State Engineer's Office to regulate programs, which use deep bedrock injection and recovery.

JCHA was awarded the American Consulting Engineer's Council Engineering Excellence Award for this research related to the deep bedrock injection of excess surface water to create a conjunctive use project that would maximize the beneficial use of both limited surface water and ground water supplies.

Water District Well Field Equipment Evaluation, Parker, Colorado

JCHA personnel compared currently-installed pumping equipment and its recommended range of operation to currently-existing condition in the well field.

Results of this comparison were recommendations to remove and replace some of the existing equipment, along with relocating some equipment to other wells.

Parker Water and Sanitation District, Well Efficiency Program



JCHA is currently providing services to Parker Water and Sanitation District (PWSD) to program the automation of PWSD supply operations. JCHA has designed and developed a FORTRAN simulation model written specifically for PWSD's system operation, which includes using data from tank levels, booster station capabilities, movement of water among three pressure zones, and pumping from 26 wells. The simulation adjusts the system on a

30-minute schedule based on system demand taking into account the variation in both diurnal demand and seasonal demand. The simulation predicts the next five days demand based on current weather conditions and adjusts system operation accordingly. JCHA is assisting PWSD in programming the automation system into their SCADA system.

Environmental Studies

Manage and Conduct Ground Water Modeling and Preparation of a Ground Water Corrective Measure for a Ni-Cd Battery Manufacturing Facility, Colorado Springs, Colorado

JCHA personnel were asked to model the flow and chemical transport of nitrate in a near surface alluvial aquifer used as a municipal water supply. Tasks included collection and evaluation of publicly available data, design and implementation of a site investigation to determine site-specific geohydrology, which included installation of monitor wells and the conduct of short-term and long-term pumping tests. A conceptual site model was developed and implemented using MODFLOW for the hydrodynamic modeling and MT3D for the transport modeling. The calibrated model was used in transient mode to design the ground water remediation system. The system was approved by the Colorado Department of Public Health and Environment, installed, and is successfully operating.

Eagle-Picher Thermal Battery Manufacturing Facility, Pittsburg, Kansas

JCHA was responsible for obtaining the Environmental, Health and Safety Permits and compliance for a new Thermal Battery Facility to be constructed near Pittsburg, Crawford County, Kansas. Activities included Air Quality Permitting, Hazardous Waste Management, Hazardous Materials Management, Storm Water Management, Oil

Pollution Prevention (SPCC Plan), and Industrial Wastewater Management. JCHA prepared the plan to acquire the necessary permits, prepared the permit applications, prepared the plant environmental procedures, and coordinated with the various federal and state authorities.

Background Phosphorus Study, Upper Cherry Creek, Colorado

JCHA personnel performed a one-year study in the upper reaches of the Cherry Creek watershed to evaluate background, non-anthropogenic concentrations of phosphorus in the ground and surface water of the basin. The study consisted of monthly sampling of West Cherry Creek and a monitoring well screened in the alluvium and subsequent analysis of the analytical data.



Brunswick Corporation, Lincoln Nebraska

The site review required for a RCRA Part B permit identified six solid waste management units, including ground water with elevated TCE concentrations, at this site. An EPA approved correction action consisting of soil remediation by passive soil bio-venting, source removal by ground water pumping, and ground water cleanup with natural attenuation was completed. JCHA prepared a site specific Risk Assessment, which evaluated the risk posed by TCE and its degradation products in the ground water, both on and off site. The risk assessment included consideration of exposure pathways, including the ground water to indoor air pathway. Specific work items included modeling the transport of TCE in the ground water with MODFLOW and MT3D, modeling the movement of TCE from the ground water to indoor air using the Johnson and Ettinger Model, and calculating the risk using the appropriate TCE slope factors.

Climax Molybdenum, Fort Madison, Iowa Plant Ground Water Evaluation



During a 1995 construction project, Climax discovered water of a greenish color in an excavation. The water contained elevated ammonia-nitrogen and molybdenum concentrations. JCHA installed ten monitoring wells in the vicinity of the excavation to characterize the soils and to evaluate the ground water quality. Based on the results obtained from the monitor wells, JCHA designed and conducted additional site characterization by collecting soil and ground water samples using a geoprobe to determine the areal

and vertical distribution of molybdenum in the alluvial ground water system. Based on the results of the geoprobe testing, permanent monitor wells were sited and installed.

Denver Basin Bedrock Aquifers Model Report for the Rueter-Hess Reservoir Environmental Impact Statement

The Parker Water and Sanitation District was pursuing construction of an off-stream dam and water supply reservoir, called the Rueter- Hess Reservoir, near Parker, Colorado. JCHA was asked to perform the hydrologic and hydrogeologic analyses to be used for an independent evaluation in the NEPA process.

JCHA prepared a Denver Basin Model to assess whether current and proposed future pumping would cause impacts to stream systems and their associated alluvium, as well as other Denver Basin bedrock users. The Denver Basin Model addressed these two issues by comparing the difference in flow or head between a base-case model and models simulating action. The results of this study supported the conclusion that if the reservoir was built, there would be less pumping required from the bedrock aquifers, which would result in a beneficial impact to rivers, as well as nearby bedrock aquifer users.

JCHA was also asked to assess the hydrogeologic effects of the proposed reservoir on the stream flow and alluvial ground water flow of Cherry Creek in the vicinity of the project structures and to points downstream. The objective of the Interaction Model was to assess the viability of alluvial pumping to meet the needs of the reservoir project and the potential effect of the pumping program on various elements of the stream hydrogeology; to assess changes in water levels downstream on Cherry Creek that could result from PWSD's surface and ground water diversions; and to evaluate potential effects of the alluvial pumping program on private ground water users who draw their water from shallow Denver Basin bedrock in the vicinity of Cherry Creek. JCHA found that the water levels within the shallow bedrock aquifer were not significantly affected by any of the operational scenarios.



JCHA was awarded the ACEC Colorado Merit Award for its research into this innovative water management project, which included an off-stream surface water supply reservoir, a water reuse plan associated with wastewater treatment, and deep well injection.

Evaluation of Contaminant Releases to a Stream System, North Carolina

JCHA was asked to evaluate the potential water quality impacts of contaminant releases to a stream system in North Carolina. JCHA used the QUAL2E Model to set up initial flow and water quality conditions, then super-imposed a discharge to the stream system to evaluate the changes to water quality in the stream.

Water Rights, Adjudications, and Expert Testimony

Technical Assistance Related to Salt Water Releases to an Alluvial Aquifer, Lyons, Kansas

A salt mine has historically released salt water into an alluvial aquifer in an area used extensively for farming, thereby diminishing the water usefulness for irrigation. JCHA was asked to evaluate the impact to specific farmers and the resulting damage claims. JCHA was able to show that the high chloride levels in the alluvial aquifer were detrimental to crop production and, through expert testimony in Kansas District Court, were able to successfully show damage to the farmers from the chloride contamination.



Evaluation of Potential Terms and Conditions on Denver Basin Aquifer Pumping Related to the Grange Property, Douglas County, Colorado

Douglas County Open Space was potentially purchasing the Grange Property and planned to set up reserves for potential future use on the property. JCHA was asked to evaluate potential terms and conditions to be imposed on production to minimize interference effects on future wells to be drilled. A special evaluation of the water supply availability was also performed.

Technical Assistance to Legal Counsel in a Third Party Lawsuit, Jefferson County, Colorado



Due to extensive damages to homes in a southwestern Denver suburb, homeowners brought a class action suit against the homebuilder, alleging negligence in the construction of the homes on expansive soils. In turn, the homebuilder sued the water district, alleging that water main breaks were the cause for the home damage, not inadequately engineered foundations. JCHA conducted extensive hydrogeologic investigations to

evaluate changes in the hydrogeologic environment, which happened as a result of residential development. The hydrogeologic investigations focused on the sandstones providing conduits for water flow from lawn irrigation and natural precipitation, and creating varying swell potentials in the interbedded claystones. The development of this technical database by JCHA resulted in a pre-trial settlement of the case.

Adjudication of Denver Basin Aquifer Water Rights and Augmentation Plan for a Water District, Parker, Colorado

A water district in the southeast Denver metropolitan area was experiencing very rapid growth, where the principal water supplies were from the deep bedrock Denver Basin aquifers. JCHA assisted the District in adjudicating all of the Denver Basin aquifer water rights beneath the District and in adjudicating an augmentation plan. The augmentation plan allows maximum re-use of Denver Basin water in an area where water levels are declining rapidly.

Technical Assistance Related to Ground Water Degradation from Salt Brine Evaporation Ponds, Lindsay, California

Farmers in the vicinity of salt brine evaporation ponds operated by the City of Lindsay complained of high salt concentrations in their wells, which, when used for crop irrigation, were causing damage to their crops. JCHA was retained to develop a technical database to defend the farmers' position against the City of Lindsay and the Lindsay Olive Growers. JCHA provided expert testimony in California District Court, and the farmers were successful in obtaining damages from the plaintiffs.

Review of the Lower Guadalupe Water Supply Project

JCHA was asked to conduct a review of the Lower Guadalupe Water Supply Project, as well as the Guadalupe-Blanco River Authority's structures, water rights, and historic activities in the Lower Guadalupe River Basin to evaluate whether an Environmental Impact Statement should be required as part of the Section 404 permit review process. Also included was a review of the Water Availability Modeling (WAM) for the Guadalupe and San Antonio Rivers.



Review Water District's Well Field Production, Arapahoe County, Colorado

JCHA was asked to provide an assessment of a water district's current and future production capabilities to aid in the planning of future improvements to provide a reliable water source. This assessment included all historical databases and well reviews. JCHA provided recommendations on the long-term reliability of their production capabilities based on the current infrastructure, changing aquifer characteristics, and future water demand projections.

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