



Kerry Howe, *Chair*
Russell Pederson, *Vice-Chair*
Suzanne Busch
Julia Maccini
Roland Penttila

John Pietz
Roberto Roibal
Caroline Scruggs
Jennifer Thacher

Water Protection Advisory Board
c/o ABCWUA
P.O. Box 568
Albuquerque, NM 87103

Minutes: September 14, 2018
Location: Bernalillo County Public Works Division, 2400 Broadway SE, Bldg. N Conf. Room
Time: 8:30 to 10:30 a.m.

Board Members Present: Chair Kerry Howe, Vice Chair Russell Pederson, Roland Penttila, John Pietz, Roberto Roibal, and Caroline Scruggs

Board Members Absent (excused): Suzanne Busch, Julia Maccini, and Jennifer Thacher

PIC Members Present: Bart Faris, Ken Ziegler, Diane Agnew, Kate Mendoza, Mark Kelly, Liz Anderson, Dan McGregor, Kali Bronson, and Kathleen Verhage

Guests: Steve Glass, Stuart Norton (USGS), Alex Rinehart (NMBGMR), and Ron Broadhead (NMBGMR)

I. Call to Order

Chair Dr. Kerry Howe called the meeting to order at 8:30 a.m.

II. Approval of Agenda

Chair Howe requested a motion to approve the agenda. Mr. Roland Penttila motioned to approve the agenda and Mr. Roberto Roibal seconded the motion. Motion to approve the agenda carried unanimously.

III. Approval of August Minutes

Chair Howe asked board members if there were any comments on the August meeting minutes. Vice Chair Mr. Russell Pederson moved to approve the August minutes with no changes and Chair Howe seconded the motion. Motion to approve the August meeting minutes carried unanimously.

IV. Board Business

a. New Member Welcome and Outgoing Member Recognition

Chair Howe welcomed new board members Mr. John Pietz and Mr. Roberto Roibal to the Water Protection Advisory Board and asked that each new member provide a brief introduction about themselves for the board. Mr. Roibal shared that he works with the Southwest Organizing Project (SWOP) and the South Valley Coalitions of Neighborhood Associations. Mr. Pietz shared that he has worked in environmental consulting for 30 years.

Chair Howe recognized Mr. Steve Glass as an outgoing board member having served two full terms for a total of six years on the board. Ms. Diane Agnew presented Mr. Glass with an award for his service on the board. Mr. Glass said that it has been a privilege to work with the board on water quality issues and that he will continue to work in that realm.

b. PIC Agency Updates

Mr. Bart Faris, PIC member, told the board that the City of Albuquerque (City) is working on preparing the Los Angeles Landfill site for recreational vehicle parking for the 2018 International Balloon Fiesta. Mr. Ken Ziegler, PIC Member, shared that the City installed new water lines around the Los Angeles Landfill to avoid using water lines installed inside the landfill and to provide water for vehicles parked for the Balloon Fiesta.

Mr. Faris told the board about the Technical Working Group meetings for the Kirtland Air Force Base (KAFB) Bulk Fuels Facility (BFF) project that were to be held the week of September 17th. He added that the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) report is available and ready for comment on the New Mexico Environment Department's website. Mr. Faris also told the board about the upcoming New Mexico Environmental Health Conference that will be held in Albuquerque on October 23-24, 2018. He said the conference would include discussions about stormwater, landfills, and air and water quality.

Ms. Kali Bronson, PIC member, told board members that Bernalillo County (County) and other members of the Multiple Separate Stormwater Sewer System (MS4) watershed-based permit are working on their annual report. Ms. Bronson told the board that the annual report is due in December and the board will be reviewing the annual report in October. Ms. Bronson told board members that the Land and Water Summit will be in Albuquerque in February 2019 and will include discussions about stormwater. Ms. Bronson also told board members that the Sandoval County Arroyo Flood Control Authority, Albuquerque Metropolitan Arroyo Flood Control Authority, and the County were invited by the Environmental Protection Agency (EPA) Region 6 to give a presentation on their collaborative approach to decrease *Escherichia coli* (*E. coli*) concentrations in the Rio Grande. Mr. Glass asked if the Rio Grande was still impaired for *E. coli* concentrations in the Angostura reach and Ms. Bronson said that although the *E. coli* impairment has been removed from the Angostura reach, there is still a total maximum daily load (TMDL) requirement for *E. coli* concentrations.

Mr. Dan McGregor, PIC member, told board members that Ms. Bronson had applied for a grant to do stormwater improvements on 2nd Street and that the County was awarded a grant to do the transitional development work for the Sunport Extension project.

Ms. Agnew, PIC member, told the board that she and Ms. Kate Mendoza will be presenting the Groundwater Source Water Assessment (GW SWA) to the Water Authority Governing Board on September 19th. She explained that the GSWA examines potential sources of contamination throughout the service area and analyzes a well's susceptibility to contamination. For the assessment, the Water Authority identified source water protection areas (a half-mile buffer around each well) for the analysis and will be delineating future source water protection areas using models to identify capture zones for each well. Ms. Agnew told the board that only one well had a high susceptibility ranking and it has been flagged for replacement. Additionally, the GW SWA includes discussion and analysis about local contamination sites and a review of oil and gas wells in the area. Ms. Agnew added that the Water Authority is continuing to follow the oil and gas developments in Sandoval County.

Ms. Agnew informed the board that the Water Authority is still working on the update to the Water Quality Protection Policy and Action Plan (WQPPAP) and has renamed the plan the Rivers and Aquifers Protection Plan (RAPP). She told the board that there has been discussion about the policies in the plan and the current WQPPAP policies are written for all three agencies; City, County, and Water Authority. The Water Authority reviewed the plan discussed how the policies in the RAPP duplicate policies from the *Water 2120* document (the Water Authority's 100-year water resources management strategy). To address the policy duplication issue, the RAPP will serve as the Water Authority's source water protection plan and will include protection measures rather than policies. She said that the PIC will continue to discuss policies and actions that are appropriate for the City and County.

V. Presentation: Tijeras Arroyo Nitrate Study

Mr. Stuart Norton, hydrologist with the United States Geological Survey (USGS), provided the board with an update on the ongoing Tijeras Arroyo Nitrate Study (Study). Mr. Norton started his presentation by thanking the funding agencies that made the Study possible. Mr. Norton then told the board that the Study objective is to provide an independent and comprehensive assessment of the sources and fate of nitrate on the KAFB and the surrounding regional area. For the Study, the USGS will be compiling many historical nitrate sampling results into a database for an extensive technical review. Mr. Norton said that the USGS is currently analyzing the data and interpreting the results. Mr. Norton added that they have two peer-reviewed publications planned in addition to the USGS technical report they expect to publish for the project. Mr. Norton then briefly explained the peer-review and publication process for the USGS.

Mr. Norton showed the board a map with the various sample locations extending from Carnuel to the South Valley with nitrate concentrations displayed for each location. Mr. Roibal asked about the 1990's cases of blue babies born in the South Valley and how those cases may be connected. Mr. Faris explained that those incidents were connected with the Mountain View Nitrate plume and he would be happy to discuss that matter with Mr. Roibal after the meeting. Mr. Norton said that there are many different sources of nitrate in the area, including atmospheric sources typically from lightning strikes. Mr. Norton told the board that the Study included 60 sampling sites that were spread from Tijeras to

the South Valley and Isleta Pueblo. From examining the maps, the USGS noticed that the Tijeras Arroyo runs through the KAFB and they wondered if the arroyo was contributing to the nitrate observed in groundwater. To obtain “background” samples for nitrate, the USGS decided to sample Hell’s Canyon Arroyo on the Isleta Pueblo which stems from the nearby Manzano Mountains as an analogous background sampling location.

Mr. Norton then discussed the geochemical analyses the USGS did for the Study. The USGS performed stable isotope analyses to determine the sources and age of the groundwaters. Additionally, the USGS developed a new method for the Study to look at the age of contaminants, using compounds such as aspartame, and when those contaminants showed up in the water supply. Mr. Norton said the results of the Study are available to the public on the National Water Information System (NWIS) website and the site is updated when lab results are received. Mr. Norton cautioned about looking at the NWIS web data because some data posted has not been reviewed and approved by the USGS. He added that the USGS reports potential concentrations below instrument long term detection limits and explained how the USGS is analyzing the data with considerations for detection limits. Mr. Norton told the board that one of the sampling locations near the river on the Isleta Pueblo had a nitrate concentration of around 100 milligrams per liter. He noted that there were cattle present, but not many, and they suspect that it is an atmospheric source of nitrate at that location.

Mr. Norton provided an update on the status of the report for the Study and told board members that data interpretation is ongoing. He said that initial interpretations of the results indicated that additional samples should be collected for the analysis. Mr. Norton showed the board a chart of nitrate versus chloride to show the sources of nitrate in water. He pointed to the chart and said that rainwater is very low in chloride and consistent with atmospheric sources that show evaporation of nitrate. Mr. Norton added that they know from other studies that desert soils are typically very high in nitrate at shallow depths and could potentially be a source of nitrate in groundwater. After reviewing the initial geochemistry results and with the understanding that desert soils can be high in nitrate, the USGS requested additional funds to drill soil cores in the area to support their working hypothesis that the nitrate may be from an atmospheric source. The USGS identified 13 additional sampling locations in the Tijeras Arroyo on KAFB. He added that the USGS wanted to sample other locations but were ultimately restricted by site access and proximity to groundwater monitoring well locations.

Mr. Norton concluded his presentation and indicated that the USGS will continue to work on publications and the technical report for the Study in 2019. Audience member Mr. Dave McCoy asked if the USGS sampled for munitions and Mr. Norton said that they did not because they did not think it would be a significant enough of a source to show in sampling. Board member Mr. John Pietz asked about the nitrate source from the atmosphere and Mr. Norton said that nitrate falls from the sky as rain during a storm and can be concentrated during lightening strikes. Mr. Norton added that the USGS believes that high nitrate concentrations found at Hell’s Canyon Arroyo are a result of the watershed receiving the nitrate via rainfall and funneling it down to the arroyo where it is concentrated. Mr. Howe asked about the use of artificial sweeteners to characterize waters and Mr. Norton said that specific artificial sweeteners became available to the market at different times and can help

indicate the age of the water based on the specific artificial sweetener that may be present in the water.

Mr. Mark Kelly, PIC member, asked about the potential sources of nitrate and Mr. Norton explained that he was not able to further discuss the results until they are released to the public. Ms. Agnew asked Mr. Norton to expand on how the soil core locations were chosen, wondering if it would have been beneficial to have locations away from the potential contributing land uses. Mr. Norton responded that the decision to drill the additional soil cores was made very quickly. Mr. Norton said that they received the funding in July and drilled the soil cores in August. He added that they really wanted to stay near the groundwater monitoring well locations where they have additional data for the Study.

VI. Presentation: Oil and Gas Potential of Sandoval County

Mr. Ron Broadhead and Dr. Alex Rinehart of the New Mexico Bureau of Geology and Mineral Resources (NMBGMR) presented findings from their study of the oil and gas potential of Sandoval County. Mr. Broadhead showed the board a map of the Sandoval County geology and explained that most of the oil and gas activities occur in the San Juan Basin which is in the northwest corner of the county. Mr. Broadhead pointed out that the Albuquerque Basin in the southeast corner of the county has a different geologic potential than the San Juan Basin. Chair Howe asked about the extent of Sandoval County geographically and Dr. Rinehart said that the northern boundary of Sandoval County is roughly 15 miles north of Cuba and the western edge is about 30-40 miles west of Cuba. Mr. Broadhead showed the San Juan Basin geologic cross section with an insert of the Albuquerque Basin to show for comparison. He explained that the colored units on the map are the geologic units that typically produce oil and gas. He said that the Mancos C section that sits on top of the Lower Mancos section in the San Juan and Albuquerque Basins are the zones that produce the most oil and gas. Dr. Caroline Scruggs asked about the location of the aquifers in comparison to the oil and gas producing zones and Mr. Broadhead pointed out the aquifer locations on the cross section and explained that they are very shallow in comparison to the location of the oil and gas production zones. The aquifers are thousands of feet above the oil and gas production zones. Mr. Broadhead added that the production zone, the Mancos shales, are barriers to flow and act as “seals” which is why the oil and gas remains in those sections and water does not flow upward through them.

Mr. Broadhead showed the board maps of the locations of productive oil and gas wells in the Upper Mancos shale, Lower Mancos shale, and the areas where the Mancos C section is in Sandoval County. Mr. Broadhead then showed the board a picture of a highly magnified piece of Mancos shale that showed the organic matter trapped in between the grains of rock. He explained that if the organic matter is buried deep enough and for long enough, it heats up and is converted to oil. Mr. Broadhead then showed the board figures of the thermal maturation profiles of the Mancos C from four locations in Rio Arriba County, Sandoval County, and Bernalillo County. The thermal maturation profiles show the evolution of oil and gas production over increasing time and temperature. Mr. Broadhead explained that biogenic methane is produced first (younger, cooler rock) followed by wet gases (e.g., ethane, propane, butane etc.), then oil is generated, and lastly dry gas (i.e., methane) is produced (older, warmer rock). He added that for shales, most oil is produced when the rock reaches the peak oil generation window where there are favorable

temperatures and pressures for oil production. Mr. Broadhead said that shales typically have the most economic production of oil and gas. Mr. McGregor asked what Mr. Broadhead meant by “economic production” and Mr. Broadhead said that economic production included both traditional and horizontal drilling methods. Dr. Scruggs asked where the data came from for the analysis and Mr. Broadhead said that it comes from the NMBGMR. He explained that the NMBGMR has a library of drilling cuttings from wells all over the state available for analyses. He added that the samples do not come from Shell Co., but they mostly have been collected as part of NMBGMR studies or from donations from other drilling operations. Mr. Broadhead told the board that the NMBGMR analyzed the vitrinite reflectance for samples in the San Juan and Albuquerque Basins. He said that the optimal vitrinite reflectance for oil production in the Mancos shale of the San Juan Basin is 0.9 and usually falls between 0.8 and 1.0, the peak oil generation window, in the basin. Mr. Broadhead said that this method of analysis is relatively new in the world of geology and provides much more insight to the location of oil and gas plays than has previously been available. He said that the NMBGMR has cuttings from previously drilled wells that did not have these analyses previously done and they are able to run this analysis now to get a better understanding of many sites.

Mr. Broadhead explained that wells drilled in Sandoval County, north of the Albuquerque area, drilled by Shell Co. in the 1970s have vitrinite reflectance values of roughly 0.5 to 0.6 and there is potential for oil and gas production, but would not produce nearly as much oil and gas as the shales of the San Juan Basin. For wells in Bernalillo County, the vitrinite reflectance of cuttings range from 1.7 to 1.9 which means that the shales in Bernalillo County have passed the peak oil generation window and contain natural gas (methane). He explained that the national price of methane is roughly \$2-3/cubic foot and the extraction wells would cost 15-20 million dollars to drill and construct, making it economically tough to justify. Chair Howe asked what the price of methane would be for drilling to become economical and Mr. Broadhead said that when methane prices rise to about \$6-8/cubic foot, drillers begin to seek shallow areas to drill for natural gas to capitalize on the benefits. Mr. Broadhead said that these higher prices for natural gas occurred before horizontal drilling was used and suggested that horizontal drilling has lowered the price of natural gas in the nation. He explained that with the invention of horizontal drilling, drillers were able to expand drilling operations in highly productive areas such as Pennsylvania and effectively lowered the price of natural gas because it became much more accessible. Mr. Broadhead told board members that the location of the gas in Bernalillo County is far too deep (roughly 20,000 to 28,000 feet below ground) to be economical for any type of drilling (vertical or horizontal) because the wells would be so expensive to install. He added that the western side of the Albuquerque Basin has some potential for natural gas and the eastern side of the basin has some potential for oil. Mr. Broadhead said that the geology of the basin is extremely complicated and has had a lot of erosion. He also pointed out the location of the aquifers in comparison to the location of the Mancos shale in the Albuquerque Basin.

Dr. Rinehart started his section of the presentation by telling the board he would discuss the risk and susceptibilities for groundwater contamination in Sandoval County. He said he would discuss both susceptibility and risk to the water supply and explained the differences between the two terms. Dr. Rinehart told the board about the upward transport susceptibility and risk factors for both vertical and horizontal drilling operations. He added that there has been a lot of work to determine how large fractures can get and mentioned

that the largest fractures extend roughly 600 meters from the well. Dr. Rinehart said the susceptibility of Sandoval and Bernalillo County aquifers is low because the fracking is occurring in the shales and clays far below the aquifers and are sealed rock sections. Mr. McGregor asked about the sealing of the fracks in the clay layers and Dr. Rinehart explained that shales are ductile enough so that the fractures become sealed with the clay particles in the shales both vertically and horizontally. Dr. Rinehart said that in other basins with different rock, the fracks can have open-failures because the rock is more subject to shearing. He added that there is a very low chance of upward leakage through faults in the Mancos shale. Dr. Rinehart said that the primary susceptibility factor in the San Juan and Albuquerque Basins is leaking wells. He explained that we are in a corroding environment and wells are particularly at risk for corrosion. He added that older wells are more susceptible to leakage because of their age. Dr. Rinehart said that impacts from well leakage could impact the aquifer up to a mile radius from the well. Chair Howe asked about the corrosion of wells and Dr. Rinehart said that older wells were not constructed as well and do tend to age more poorly than newly constructed wells which makes them further susceptible to well leakage from corrosion.

Dr. Rinehart told the board that a risk factor for contamination is the downward transport of oil and gas products. He said that the primary risk factor identified by the Environmental Protection Agency (EPA) is the transport of oil and gas products to refineries. Spills result in fluid movement on the surface to surface water bodies and could result in fluid movement downward into groundwater. He added that the susceptibility factors are the distance to surface water and the depth to water. Dr. Rinehart told board members that they considered the location of wells, type of water well uses, and the number of people relying on the water supply in their risk assessment for Sandoval and Bernalillo Counties. Dr. Rinehart explained that the upward flow risk is minimal because there is a large vertical separation between oil and gas producing sections and the aquifers and added that the oil and gas production potential is regionally limited. He said that there are few transmissive faults for upward flow. Dr. Rinehart said that there are several old wells that could be leaking in the San Juan Basin, but those wells are located far from towns and domestic water supplies. Dr. Rinehart told board members that Sandoval County has a low susceptibility and a low risk of upward contamination, but risk does increase near cities, towns, and homesteads. Dr. Rinehart told the board that Sandoval County has a low susceptibility and a low risk of downward contamination. He said that susceptibility and risk is moderate to high in alluvial valleys and in the Rio Grande valley. Dr. Rinehart said that drilling should not occur in arroyo beds where the risk of contaminate transport is much higher.

Dr. Rinehart showed a cross section of the Albuquerque Basin aquifers and said that there is a clay unit that acts as a seal at the bottom of the main aquifer. He added that there is an aquifer located below the main aquifer, however it is tightly sealed from above and below and is known to have poor water quality because of high salinity. Dr. Rinehart said that the groundwater located below the Placitas area is moderately to highly susceptible to contamination, but there is no oil and gas production in the area, so they have a low risk for contamination. Dr. Rinehart concluded his presentation by showing the board a summary slide for the susceptibilities and risks to contamination for different areas of Sandoval and Bernalillo Counties and told board members that the results of the study are available

online on Sandoval County's website: <http://www.sandovalcountynm.gov/wp-content/uploads/2018/06/NMBGMR-SandovalAssessment-June2018.pdf>

Ms. Bronson asked about the plugging of wells and Dr. Rinehart said that most of the well leakage issues occur in the Marcellus shale in Pennsylvania and they have problems because the aquifer does not have much vertical separation from the Marcellus shale. Dr. Rinehart added that the western U.S. typically has much more vertical separation between the oil and gas producing layers and the aquifers and therefore results in very few incidences of well leakage. Mr. Broadhead added that well plugging was not previously required by regulation in some places and regulations have since been changed to require wells to be plugged and properly abandoned. Mr. Roibal asked about the incidences of oil and gas spills and Dr. Rinehart suggested a review of the New Mexico Environment Department's EnviroMap website (<https://gis.web.env.nm.gov/oem/?map=egis>) to examine spill locations.

Chair Howe asked what suggestions Dr. Rinehart and Mr. Broadhead would have for drafting oil and gas ordinances and Dr. Rinehart replied that he has tried not to be involved with those type of discussions, however, the group in Sandoval County working on the groundwater contamination prevention ordinance has identified many items in line with the NMBGMR study. Dr. Scruggs said that Mr. Bob Wessely has worked on creating ordinances that aim to minimize groundwater contamination. Chair Howe asked about the potential for abandoned wells to contaminate the aquifers and Mr. Broadhead added that there are only a few deep wells in Bernalillo County, one of which is the Shell Co. well located on the west mesa where it was discovered that there is oil in the Albuquerque Basin. Ms. Agnew added that wells in Bernalillo County have all been abandoned according to their permits and there are no active permits for wells. She added that abandoned wells can pose a risk to groundwater, but the risk is minor. Dr. Rinehart said that abandoned wells in our regional basin are under pressure because they are so deep and that if horizontal fracking were to occur nearby, there would be potential for upward movement through these abandoned wells. Chair Howe asked about the analysis in the Groundwater Source Water Assessment and Ms. Agnew replied that the Water Authority reviewed all the wells and permits near the service area and found that the few permits near the source water protection areas were either abandoned or held by companies that no longer exist, making those permits no longer viable. Mr. Broadhead added that he found a number of permits in Sandoval County and reviewed those permits as part of their study. Dr. Scruggs asked about the overall potential for contamination in the Albuquerque Basin and Dr. Rinehart said that the overall risk is low in Bernalillo County from operations occurring in Sandoval County. Mr. Broadhead said that it is difficult to get background data prior to production and Chair Howe added that we have lots of water quality samples for the region from both the Water Authority and the City.

VII. Other Board Business

Mr. Roibal asked if the board has ever requested the Santolina development plans from the Water Authority and Chair Howe informed him that they have not.

VIII. Public Comment Period

Mr. Dave McCoy, Citizen Action New Mexico, suggested that the board push their resolution on the Kirtland Air Force Base Bulk Fuels Facility jet fuel leak project forward to the Water Authority's Governing Board. He said that the Air Force frequently cancels meetings and do not invite the public which is disappointing. Mr. McCoy said that he has looked at the new Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) report and mentioned that there are three previous RFI's that have many data gaps. He said that some of the same data gaps are present in this new Phase I RFI and asked why these problems are not being addressed before these documents are produced. Mr. McCoy said that the Air Force has not publicly responded to the comments made by the public, Water Authority, and the New Mexico Environment Department (NMED) on the 2017 RFI. Mr. McCoy added that the NMED has still not responded to comments submitted on the 2018 Strategic Plan either. Mr. McCoy told board members that the Air Force has not done a mass-balance of the plume contaminants and said that it must be a cover-up for something. He said that there is still a lot of work to be done. Mr. McCoy said that the Air Force has not produced an organizational chart and the NMED is doing all of the work on the project under Mr. Dennis McQuillan. Mr. McCoy said that there are maps in the Phase I RFI that show much of the benzene plume is moving off-base. Chair Howe said that the board's resolution is posted and available online on the Water Authority's Water Protection Advisory Board portal. Mr. McCoy said that there was a joint-memorial in the state Legislature and that the Air Force should be held accountable.

IX. Adjourn

Chair Howe asked for a motion to adjourn. Mr. Roibal motioned to adjourn the meeting and Mr. Pietz seconded the motion. Motion to adjourn the meeting passes unanimously. The meeting was adjourned at 10:24 a.m.