RECORD OF PROCEEDINGS
PUEBLO COUNTY PLANNING COMMISSION
WEDNESDAY, MAY 18, 2022
COMMISSIONERS' CHAMBERS AT PUEBLO COUNTY COURTHOUSE
215 WEST 10TH STREET, PUEBLO, COLORADO

ROLL CALL AND DECLARATION OF QUORUM

Commissioners Present: Richard Arko, Elizabeth Gladney, Kiera Hatton, Judy Leonard, Brad Lisac, Michael Schuster, Stephen Varela, and John Wark.

Commissioners Absent: Tari Colletti.

Staff Present: Carmen Howard, Director; Gail L. Wallingford-Ingo, Deputy Director; Emma Strong, Planner II; Meric Peters, Planner I; Terrence Birch, Assistant Planner; and Monica Grosso, Office Support Services IV.

Others Present: Marci Day, Assistant Pueblo County Attorney; and Dominga Jimenez-Garcia, General Services Engineer, Pueblo County Engineering and Public Works Department.

Chair Leonard called the Pueblo County Planning Commission meeting to order at 5:30 p.m.

The following roll call attendance was taken:

Mr. Arko--present.
Ms. Colletti--absent.
Ms. Gladney--present.
Ms. Hatton--present.
Mr. Lisac--present.
Mr. Schuster--present.
Mr. Varela--present.
Mr. Wark--present.
Chair Leonard--present.

APPROVAL OF MAY 18, 2022 AGENDA

Ms. Howard stated there was a change to the evening's agenda. Staff requested the Harvest Moon Subdivision, 2nd Filing, Preliminary Plan No. 2021-004, with the owner/applicant's concurrence, be continued until such time that the issues as outlined in the staff memorandum of May 11, 2022 are adequately addressed. Staff will then provide an updated public notice outlining the new public meeting and hearing dates and times for distribution, posting, and advertising once the application was ready to proceed.

Mr. Schuster motioned to approve the agenda of the May 18, 2022 meeting as amended. Mr. Lisac seconded the motion.

The following roll call vote was taken:

Mr. Arko--aye.
Ms. Gladney--aye.
Ms. Hatton--aye.
Mr. Lisac--aye.
Mr. Schuster--aye.
Mr. Varela--aye.
Mr. Wark--aye.
Chair Leonard--aye.

The motion carried unanimously.

APPROVAL OF APRIL 20, 2022 MEETING MINUTES

Mr. Arko motioned to approve the April 20, 2022 meeting minutes as mailed. Mr. Lisac seconded the motion.

The following roll call vote was taken:

Mr. Arko--aye.
Ms. Gladney--aye.
Ms. Hatton--abstain.
Mr. Lisac--aye.

Mr. Schuster--aye.
Mr. Varela--aye.
Mr. Wark--aye.
Chair Leonard--aye.

The motion carried unanimously.

CHAIRPERSON'S REPORT

Chair Leonard had nothing to report.

DIRECTOR'S REPORT

The Director's Report was presented by Ms. Carmen Howard. She requested the staff memorandums be made a part of the record of proceedings.

(a) Acceptance of Map Amendments and Planned Unit Developments:

- **Map Amendment No. 2022-003** on behalf of Diocese of Pueblo requesting a map amendment to rezone seven (7) lots from an R-2 Zone District to an R-4 Zone District.

- **Map Amendment No. 2022-004** on behalf of Viki Lynn Potestio, Alfred Dino Potestio, and Todd Potestio, as Personal Representative of the Estate of Bert Potestio, Jr. requesting a map amendment to rezone a 1.72± acre parcel of land (proposed Parcel A, Subdivision Exemption No. 2022-001) from an A-1 Zone District to an A-3 Zone District.

- **Map Amendment No. 2022-005** on behalf of Frank R. and Judith E. Urban Living Trust requesting a map amendment to rezone a 15.59-acre parcel of land from an A-4 Zone District to an A-2 Zone District.

(b) Correspondence--None.

(c) Continuances:

- Harvest Moon Subdivision, 2nd Filing, Preliminary Plan No. 2021-004, on behalf of Joseph P. Costanza and Frank J. Molinaro, Jr. (Owners/Applicants), Mangini & Associates, Inc., c/o Rocky Mangini (Representative) requesting preliminary plan approval to subdivide an 8.84± acre parcel into eight lots, varying between 1.0± acres and 1.21± acres in size, within an A-3, Agricultural Zone District. The lots are proposed to be accessed via two forty-foot private ingress-egress and public utility easements (tentatively named Costanza Court for Lots 1-4 and Molinaro Lane for Lots 5-8). The property is located at the west side of Lane 27 between Iris Road and County Farm Road in the St. Charles Mesa area.

  Continued until such time that the issues as outlined in the staff memorandum of May 11, 2022 are adequately addressed.

(d) Withdrawals--None.

(e) Board of County Commissioners' Action--Summary of actions taken on May 12, 2022 was distributed in the Commissioners' packet for informational purposes only. No formal action was required.

(f) Administrative Reviews:

- **Special Use Permit No. 2016-012**, Hudson Ranch, LLC (Owner/Applicant), c/o Dr. Marvin Hamann (Representative), 6675 Highway 78 West. This is an administrative review of a special use permit which allows several uses-by-review in an A-1 Zone District. The special use permit allows the establishment of the following uses: (1) Equestrian Arena, Commercial/Club; (2) Recreational Vehicle Park; (3) Shooting Range, Outdoor; (4) Educational Facility; (5) Rocketry; and (6) Shooting Range, Indoor.

  The Commission accepted the administrative review thereby approving the continuance of this permitted use with modified conditions and new Directive to Staff as outlined in Staff's Memorandum dated May 10, 2022.

- **Special Use Permit No. 2020-009**, Holcim, Inc., Red Creek Quarry (Applicant), Holcim, Inc. (Owner), Environmental Alternatives, Inc., c/o Dr. Angela Bellantoni (Representative). This is an administrative review of a special use permit allowing exploration for limestone by boring up to fourteen holes, two inches in diameter to a depth of approximately 200 feet. The project spans county lines between Fremont County and Pueblo County and will be accessed through Fremont County. The project is located in an A-1 Zone District.

  The Commission accepted the administrative review, thereby approving the continuance of this permitted use with modified conditions and a notation acknowledging that it is unnecessary to schedule this special use permit for further review *unless* the use and/or property does not maintain compliance as outlined in Staff's Memorandum dated May 3, 2022.

Ms. Howard requested the Commission take action to accept the map amendments for processing, request for continuance, and administrative reviews as presented.

Mr. Wark moved to accept the map amendments for processing, request for continuance, and administrative reviews as read into the record and make the Commission's comments a part of the record of the proceedings. Mr. Schuster seconded the motion.

The following roll call vote was taken:

Mr. Arko--aye.
Ms. Gladney--aye.
Ms. Hatton--aye.
Mr. Lisac--aye.
Mr. Schuster--aye.
Mr. Varela--aye.
Mr. Wark--aye.
Chair Leonard--aye.

The motion carried unanimously.

STATEMENT OF HEARING PROCEDURES BY CHAIRPERSON

Chair Leonard reported that the applicant and/or representative are called upon to speak, followed by any parties in favor and then those in opposition, with the applicant having the final say.

PUBLIC HEARING

Ms. Howard explained there were four items on the Consent Agenda and one item on the Regular Agenda for this evening's meeting. She requested the staff memorandums presented this evening be made a part of the record of proceedings.

CONSENT ITEMS:

- **Rescission of Special Use Permit No. 2018-002** on behalf of Marshall R. and Delaine M. Bulle, (Current Owners/Applicants) requesting RESCISSION of a special use permit that was originally approved on April 18, 2018. The special use permit allows the establishment of a motor vehicle retail sales use on a property located in an I-2 Zone District.

  The Commission approved the Rescission of Special Use Permit No. 2018-002 as outlined in Staff Memorandum, dated May 10, 2022. PCPC Resolution No. 22-009, dated May 18, 2022, was also approved.

- **Map Amendment No. 2022-003** on behalf of Diocese of Pueblo requesting a map amendment to rezone seven (7) lots from an R-2 Zone District to an R-4 Zone District in order to apply a conforming zone district designation to establish a "boarding house", more specifically a nun monastery, as a use-by-right.

  The Commission forwarded a recommendation of approval to the Board of County Commissioners for the map amendment with the findings as outlined in Staff's Memorandum dated May 11, 2022.

- **Map Amendment No. 2022-004** on behalf of Viki Lynn Potestio, Alfred Dino Potestio, and Todd Potestio, as Personal Representative of the Estate of Bert Potestio, Jr. (Applicants), Cardinal

Points Surveying, Inc. (Representative), c/o Randy Reeves requesting a map amendment to rezone a 1.72± acre parcel of land (proposed Parcel A, Subdivision Exemption No. 2022-001) from an A-1 Zone District to an A-3 Zone District designation to apply a conforming zone district designation to the property..

The Commission forward a recommendation of approval to the Board of County Commissioners for the map amendment with the findings as outlined in Staff's Memorandum dated May 15, 2022.

- **MAP AMENDMENT NO. 2022-005** on behalf of Frank R. and Judith E. Urban Living Trust requesting a map amendment to rezone a 15.59-acre parcel of land from an A-4 Zone District to an A-2 Zone District. The intent of the map amendment request is to apply a conforming zone district designation to the property so the establishment of a Boat and RV storage facility can be pursued.

  The Commission forward a recommendation of approval to the Board of County Commissioners for the map amendment with the findings as outlined in Staff's Memorandum dated May 11, 2022.

Mr. Varela moved to approve the Consent Items as presented with the recommendations of staff. Mr. Schuster seconded the motion.

The following roll call vote was taken:

Mr. Arko--aye.
Ms. Gladney--aye.
Ms. Hatton--aye.
Mr. Lisac--aye.
Mr. Schuster--aye.
Mr. Varela--aye.
Mr. Wark--aye.
Chair Leonard--aye.

The motion carried unanimously.

REGULAR ITEMS:

Statement of Conduct and Demeanor

Chair Leonard stated in order for the business of the Commission to be conducted in the most effective and expeditious manner, it is necessary that all persons maintain a demeanor of civility toward each other. Uncivil conduct will not be tolerated. Such behavior shall constitute the forfeiture of a person's right to remain in attendance and may result in them being asked to leave the meeting by the chairperson or, upon their refusal, being escorted out of the meeting by the proper authority.

Chair Leonard opened the hearing.

Ms. Howard summarized the case.

- **Truxell Subdivision Preliminary Plan No. 2022-001** on behalf of Roger Truxell (Owner/Applicant), Mangini & Associates, Inc. (Representative), requesting preliminary plan approval to subdivide a 5.89± acre parcel into three (3) lots, varying between 1.70± acres and 2.12± acres in size, within an A-3, Agricultural Zone District. A twenty (20) foot road right-of-way dedication, containing 0.22± acre, for Lane 27 is also proposed. The property is located at the northeast corner of the intersection of Lane 27 and Brewster Road in the St. Charles Mesa area.

  Ms. Gail Wallingford-Ingo, Deputy Director, Pueblo County Department of Planning and Development, summarized Staff Memorandum, dated May 13, 2022. She stated as summarized in the brief by Ms. Howard this was a three-lot subdivision proposed by Mr. Truxell, represented by Mr. Mangini. Staff was recommending approval. They had provided some conditions relative to that approval, noting they had indicated that if the Colorado Geological Survey required an amendment to their suitability study that the case could not proceed. She spoke with the Geological Survey that day and they were not requiring an amendment at that time. Therefore, staff was recommending approval with the same conditions as outlined.

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IN FAVOR

Mr. Rocky Mangini, P.O. Box 8505, Pueblo, Colorado 81008, represented the preliminary plan. He stated he was representing the subdivision for Mr. Truxell. The property was located on the corner of Brewster Road and 27th Lane. The property had been previously subdivided in 1995 through a subdivision variance. This property was described as Parcel A of Subdivision Variance No. 471. When it was subdivided in 1995, there was an additional right-of-way dedicated on 27th Lane at ten feet and an additional right-of-way along the north side of Brewster Road. At that time, the County required Mr. Truxell to pave all Brewster Road and give the County the turnaround easement at the end. That was around a quarter of a mile long. Mr. Truxell did pave all that area. Mr. Truxell had not done anything with the property since 1995. Mr. Mangini was asked to submit a subdivision proposal to subdivide Parcel A into three parcels. Lot 1 would contain 2.12 acres, Lot 2 would contain 1.7 acres, and Lot 3 would be 1.85 acres. With the current subdivision, the County was requiring Mr. Truxell to dedicate an additional 20 feet along the east side of 27th Lane. The County was designating 27th Lane as an arterial roadway and they wanted 100-foot right-of-way. Each owner on each side of the street had to give the County 30 feet of their property so they could ultimately end up with the 100-foot right-of-way they were asking for. He had a letter from the St. Charles Mesa Water District stating they would serve the development with water. They also had a letter from the Pueblo Department of Public Health and Environment (PDPHE) approving the property for individual sewage disposal systems. The property was not in a flood hazard zone. He was glad Ms. Wallingford-Ingo said something about Item No. 1 on the conditions because he felt strongly that one professional should not critique another professional's work. Evidently, the State of Colorado was not requiring RGK Logistics, LLC to change their reports, noting he was glad to hear that. They agreed with all the conditions stated by staff.

Mr. Lisac questioned if Mr. Mangini had spoken with the Fire Department. Mr. Mangini replied he had spoken with them briefly. Typically, they did not get comments back from the Fire Department until after the final subdivision application was done. There were two fire hydrants in the area. He believed they were both within close proximity where they could serve the property. Typically, the fire department said they could go 900 feet from the fire hydrant. He believed the fire hydrants were in a location that met that distance requirement. Mr. Lisac stated there were not many hydrants out there. Mr. Mangini replied there were not. As a part of the application and each subdivision that was done, when the property was sold the buyers were required to pay a $750.00 fire impact fee. Those fees went into a fund which the fire department could use, as needed, to install fire hydrants.

There were no additional parties in favor of the special use permit.

IN OPPOSITION

Dr. Michael Bartolo, 902 South 27th Lane, Pueblo, Colorado 81006, spoke in opposition to the preliminary plan. He handed out packets for the Planning Commission to review. Ms. Day questioned if he wanted the packets entered into the record. Mr. Bartolo replied he would like them entered into the record. The Nitrate Comparison Packet was entered as Opposers Exhibit 1 and the United States Geological Survey (USGS) Study packet was entered as Opposers Exhibit 2. Dr. Bartolo stated the packets pertained to a lot of his concerns with septic tanks. He had talked about that subject over the years many times. As a background, his family had first recognized the problem with septic tanks with some of there pregnant cows. They were starting to spontaneously abort their calves. They had traced that to the high nitrates in the groundwater. That was a contributing factor. That was the same water they had been using for decades for watering their cattle. His family had been on the Mesa for a hundred years. His grandparents were out there in the 1920s. Over the years, they continued to test the wells for high nitrates and the presence of bacteria. Eventually, in 1997, 25 years ago, the County along with the USGS conducted a small survey of the potential contamination. That was the study Dr. Bartolo had provided the Planning Commission. At that time, they found definitive proof of septic tank contamination. They had no recommendations for mediating the issue and certainly no recommendations on how to proceed. Over the years, he had continued to bring this issue to the attention of Pueblo County. Nothing had been done about the issue he found in talking with former employees of the PDPHE. Mr. Mangini had said they didn't have to worry about it, as it was approved by the County. They had no idea of the cumulative effects of what the septic tanks were doing. PDPHE would go out, look at the percolation tests, look at the soils, and they would approve it. They had absolutely no idea of the cumulative effects of the septic tanks. Nothing had been done over the years. That was what really got him on the ball about the issue. After he talked with several neighbors, he said enough was enough. He had begun to do his own testing. He had spent around 32 years of his career doing

agricultural research. He had taken hundreds, if not thousands, of samples of soils all up and down that valley looking at agricultural soils. Some of those soils and some of those groundwaters ran underneath 10 to 20 thousand head feedlot operations. He then went back and did a sub-sample of the 1997 study and what they found was alarming. All the samples were in excess of two to three times higher than the average they found in 1997. There was no doubt in his mind that there was a problem. They were having a serious problem with groundwater and contamination that could no longer be ignored. As he had mentioned, he had brought this issue before the County numerous times. He was sure Mr. Mangini was going to testify they had talked about this issue in the past and it could be attributed to fertilizer or anything else. He had analyzed hundreds, if not thousands, of samples. Nowhere were nitrates as high as underneath the St. Charles Mesa. In the 1997 study, they had also found definitive proof of human induced problems as they found traces of caffeine. They now had other additional technologies available to them to help them definitively understand what that contamination did. That technology was used to determine the presence of things like human DNA, pathogens, and pharmaceuticals. That unequivocally showed human contamination. He had studied this for 30 years of his career. They were having a serious problem, yet they continued to put more and more septic tanks in the area. Another factor on the St. Charles Mesa was that they had notoriously high groundwater. Septic tanks and groundwater did not mix. As a result of all the information, on April 19, 2022, he set up a meeting with the Board of County Commissioners (BOCC) to review the results. He outlined the testing code and what the County would need to fully recreate the 1997 study. The study should only take around 60 to 90 days. In lieu of those results, he would ask that they delay any decisions on any land use cases that involved septic systems on the Mesa. The Commissioners were very supportive of that. He had recently talked to Commissioner Wiseman and was told they were moving in that direction. If the Planning Commission members wanted any verification of that, the meeting with the BOCC was recorded and was available on the Pueblo County Facebook page. It took place at the April 19, 2022 afternoon Work Session. They would be able to see all the results and what the Commissioners' responses were. His family had been good stewards of the land for 100 years and many of the other families that lived there had done the same. Before one more septic tank was approved, he believed they deserved and demanded to know if they were getting any contamination from them. They already knew there were high levels of nitrates, to proceed without that definitive knowledge was inexcusable and negligent. Not only did the development and other developments pose a threat to their personal health, they pose a threat to the health of their livestock and the salability of their crops. It was exposing the County to massive liability and a huge financial cost of implementing corrective measures. He had no doubt when he talked to the BOCC, they had a serious problem. They could only kick that can down the road so many times. He was not going to put up with it any longer. There was going to be some testing done, whether the County was a part of it or not. He had decided that on his last lap around the track in his life, he was going to make sure that they were not going to completely raid every square inch of the land by throwing in septic tanks. They were ruining their land and their groundwater.

Ms. Day questioned if Dr. Bartolo wanted the second handout entered into the record. Dr. Bartolo stated he did. Exhibit No. 1 was his own personal study. He had taken a subset of the 1997 study, took the nitrate samples and when he found the alarmingly high levels, he immediately set up a meeting with the County Commissioners to address the issue. He had spent 100 years taking care of their land and resources and being good stewards of the land. He thought waiting 60 to 90 days to verify they did not have a problem was not too much to ask. That was what he was asking of them that evening, to hold off until they had definitive information. He thought there were good techniques to mitigate the issue. Those mitigations may include changing the size of the lot they could have for new homes' use or using new septic tank technologies. He did not think they had to completely eliminate development. He thought they could do it better. He thought they deserved to have that information.

Mr. Lisac questioned if a typical leach field was a rock bed that went down to bed rock that leached into the ground, and if that was what he was talking about. He wondered if an infiltration system was any better since it dissipated upward. Dr. Bartolo replied it depended on the depth of the groundwater. There could be better septic systems available that could reduce the risk of contamination. They should also mandate the systems. They should have to be checked and inspected on a regular basis. He thought that might be a lot of the problem. Some of the septic tanks were older than the hills and they had never been checked or even pumped. They needed to know what was causing this issue. If it was being caused by a specific design flaw in the septic tanks, then they needed to know that. He thought they had earned that right. They had been there for 100 years. He thought asking for 60 to 90 days was not out of the ordinary so they could make some determinations. He personally urged the Planning Commission to do this. The BOCC was

very interested in the testing. He had talked to Commissioner Wiseman a few days prior, and he was very interested in getting the area tested. He wanted to get it done so they could go forward.

Mr. Wark questioned if this was a large systemic problem that was 100 years old. Dr. Bartolo replied the problem on the Mesa was certainly ongoing. What happened was, when they got more and more septic tanks, they would get more and more accumulation of nitrates. The issue had not been around 100 years. It had been around since more and more of the septic tanks were added. The more septic tanks there were, the more pollution there was going into the groundwater. It was confounded by the fact that on the St. Charles Mesa they had a notoriously high groundwater situation. Mr. Wark questioned how many septic tanks he thought were out there. Dr. Bartolo replied he was not sure. Mr. Wark questioned if the Truxell Subdivision was insignificant. Dr. Bartolo replied it was not insignificant. It would set a precedence about how they were going to move forward. If they did not correct the issue now, they were just kicking the can down the road further. Mr. Wark questioned what the best way to resolve the issue was. Dr. Bartolo replied by waiting the 60 to 90 days to comprise a new study. He did not think that was out of the ordinary. Mr. Wark questioned what the study was going to do. Dr. Bartolo replied it was going to help them determine the next step. In the packet that was provided to them as Exhibit No. 1, he had set out a specific course. One they tested for nitrates to see if there was a background problem. If there was a problem, they would go to plan two. Plan two was to start looking at ways that they could immediately start mitigating that issue. Mitigation might include putting in new design systems for septic systems or it might be increasing the lot size. There could be a variety of different things to mitigate the issue. Mr. Wark questioned if in 90 days Dr. Bartolo could solve the problem. Dr. Bartolo replied in that time, they could at least determine if they had a problem. Mr. Wark wondered if he was the only one who could not understand how they could solve the problem in 90 days. Dr. Bartolo replied it was not going to solve the problem. They were going to have nitrates out there, but they needed to understand how significant the issue was. If you kept getting poked in the eye you don't keep doing it. You stop and do something different. Mr. Wark questioned if the Preliminary Plan was stopped for 90 days and they did not have a solution in that timeframe if it would be drug out another 90 days. He wondered if Dr. Bartolo thought there should be no other developments built until the issue was figured out. Dr. Bartolo replied it could take additional time. He wondered why they would sink their heads in the sand if there was an issue. If there was an issue why would they not take the opportunity to apprise themselves of that. The issues posed a threat to their health, livestock, and their livelihood. Why would they stick their heads in the sand just because it could delay things? Why was ignorance needed?

Ms. Howard stated she wanted to point out a couple of things. This case was for a preliminary plan not a final plat. In addition, the Planning Commission would be voting on a recommendation to the BOCC. The BOCC would also hear the case at the preliminary stage. It would then come back to the Planning Commission as a final plat and back again to the BOCC for final approval of the final plat. The action they took this evening was not a final action on the subdivision. There were many more steps that had to be gone through before it was finalized. The next step was to go to the BOCC.

Ms. Day stated she also wanted to note for the Planning Commission that she understood that there had been some conversation with the BOCC, and she appreciated that. The County had not taken any formal action to enact a moratorium on subdivision applications at that time.

Mr. Schuster questioned if they would look to tie into the sanitation district that was currently there. He thought the issue was in that area. Dr. Bartolo replied to tie into that sanitary system they were looking at a massive infrastructure cost that would involve tearing up all the roads, etc. He thought it would be easier to have people that were building in new subdivisions to put in a new type of septic tank rather than spend billions of taxpayers' dollars on digging up the road. They had to find a way. It would get done whether the County was a part of it or not. He was committed to doing it. He would either do it himself or find other partners. He first solicited the County and asked them partner up on it. He thought that was the right thing to do. To first recognize the problem 25 years ago and not do anything to follow up on that was negligent. He thought that by the furthest stretch of the imagination that was negligent. It was not that difficult to take samples and perform those types of tests. To wait 25 years, he thought was irresponsible. He was still committed to working with the County to make sure they could protect everyone. He was not going to risk his family's 100-year investment just because he was afraid of ruffling a few feathers. He was committed. His grandparents sacrificed a lot out there. He was not going to deny them or the fourth or fifth generation of his family of safe water.

Ms. Hatton questioned Ms. Howard. She stated she did understand the process of a subdivision but wondered what it actually looked like for a timeline. If this preliminary plan was approved by the Planning Commission this evening, when it would go to the BOCC and when would Planning Commission see it again. Ms. Howard replied that would depend, partially, on if there was anything else that needed to be changed after the preliminary plan went to the BOCC. Sometimes there were still some things that needed to be finessed. They tried to get everything done in the preliminary plan stage, however, that did not always happen. If there were no changes or corrections, the case would then go to the BOCC at the June 2022 meeting and she did not think there would be enough time to get it back to the Planning Commission by July. She thought August would be when it would come back to the Planning Commission at the earliest. Ms. Wallingford-Ingo stated they did have conditions that Mr. Mangini would have to comply with relative to the fire hydrants. Mr. Mangini would have to comply with those conditions before he could submit a final plat application. Ms. Howard stated August would be the soonest the application would come back to the Planning Commission, but it would likely be longer. Ms. Hatton stated that timeline would allow them enough time to gather the 90-day data before they heard the case again if they went through with the testing process relatively soon.

Mr. Lisac questioned what Dr. Bartolo's timeline was. Dr. Bartolo responded his timeline depended on the County. He did not think it was appropriate for him to do the study by himself. Mr. Lisac replied he understood that. He also lived in the area. Mr. Bartolo stated he thought it would be more appropriate to work together. He proposed to the County that they use an independent County employee to take the samples. It was an easy task. They just had to go to the wells and hold the cup. There was nothing to it. They would then need to take it to a reputable lab. He even offered to pay for the cost of the nitrogen testing. For him to do the testing would not be appropriate or be good analytical technique. He felt the County should be the one to perform the tests. If he performed the tests, people may say it was biased. He did not want that. He had been a scientist too long to know that. The County should participate in the testing and perform the sampling. They had to get the County Commissioners involved. Having the Planning Commission say it was appropriate would help as well. If the County did not want to be involved, Dr. Bartolo would move forward with testing and would have to have other partners involved. He thought other partners may not be as cordial to the outcome of the findings.

Ms. Day stated she wanted to remind the Planning Commission that what they were hearing was a preliminary plan for a particular subdivision. The role of the Planning Commission was to make a recommendation to the BOCC on that subdivision based on the requirements and the Pueblo County Code. It sounded to her, there may be another discussion the Planning Commission may want to have on the topic. The discussion could be in a different venue not related to the particular subdivision they were hearing this evening. It could be a general recommendation of the Planning Commission to the BOCC. She did not think it was appropriate to tie that recommendation to the hearing this evening. She understood why Dr. Bartolo had taken the opportunity to bring the information to the Planning Commission, but the Planning Commission's role in making a recommendation on the subdivision they were hearing had to be based on the factors they were required to look at under the current County Code. It sounded to her, Dr. Bartolo's testimony was opening up a secondary discussion. She thought it might be a more appropriate place to discuss that under new business and to possibly make some sort of recommendation to the BOCC separately. She wanted to caution the Planning Commission to make sure they were making a decision on the particular subdivision they were hearing and making recommendation on it based on the factors that they were required to consider and on the Code.

Ms. Gladney stated she believed the conversation should be at the State level with the Colorado Department of Public Health and Environment (CDPHE). The CDPHE should be the entity to make a recommendation to the Pueblo Department of Public Health and Environment (PDPHE). CDPHE was willing to go out on a lot of her projects to continually test. She could not believe that the issue had gone on that long without the State being aware of the issues. She did not know if the BOCC were who Dr. Bartolo should be talking with. She thought it needed to be at a higher level. All Eastern Colorado was full of septic tanks. If they were causing harm to humans or animals, she would think it would be more appropriate at that level. Dr. Bartolo replied out of courtesy, he respected the County Commissioners and the rule of local law. That was why he went to them. The BOCC had the opportunity and responsibility to call PDPHE and make them aware. He wanted to be fair to the County and did not want them to be blindsided. He did not want anyone to be blindsided.

Mr. Arko questioned if Dr. Bartolo had reached out to the Environmental Protection Agency (EPA) about the issue. Dr. Bartolo replied he had not. Mr. Arko stated he was looking up the nitrate standards on-line and found that the data from the reports provided by Dr. Bartolo were in excess of the Federal standards. He thought the EPA would be an entity Dr. Bartolo would want to reach out to. Dr. Bartolo stated he understood that. The issue could potentially open up a huge degree of other issues and that was why he went to Pueblo County to let them solve that issue inhouse. He was for local control. When the Federal agencies and entities that did not have a vested interest in the local community came in, they could get a whole set of regulations and consequences that were unwanted. His first step was to bring it to the attention of the Planning Department and BOCC and to go from there. He thought there were legitimate ways of handling the issues and there were a lot of good options for people who wanted to get value out of their land. He was working with an organization who looked at conservation easements as a way to conserve the land and increase the surface area to help absorb some of the nutrients. There were a lot of good options out there. To continue to slap in septic tanks and thinking the Health Department was protecting them was ludicrous, noting they did not have a clue. He had been studying this for 30 years and had worked on a lot of other things. They were looking at a few tests when their systems were first installed. To not do anything to correct the issue after 25 years was ridiculous.

Mr. Varela questioned why he was speaking in opposition to this project and wondered why he was speaking to this issue now. Dr. Bartolo replied Mr. Mangini knew him well. He had been harping on the issue since before he didn't have any gray hair. He and Mr. Mangini had been going at it and had been friends and nemeses forever. He had been studying the issue for 30 years. Mr. Mangini had heard the song and dance a thousand times. It had fallen on deaf ears and he had decided, now that he was retired, he would work on the issue full-time. With the next generation of his family deciding they wanted to take over the family farm, he wanted to address the issue now. Mr. Varela questioned if the subdivision would be close to his property. Dr. Bartolo replied that was correct. His property was on 27th Lane. All the groundwater moved with the slope of the land. Everything moved from south to north in that area. His property was downstream. Everything moved straight to the north or slightly to the east of the alluvial aquifer. Some of the water came out of the Bessemer Ditch on south edge of the alluvial aquifer and it percolated up. In some areas it was very shallow at just five or six feet.

Chair Leonard stated it was interesting to learn about. Dr. Bartolo replied they were going to hear a lot more about it and it was not going to go away.

Mr. Ted Lopez, P.O. Box 1876, Pueblo, Colorado 81002, spoke in opposition of the preliminary plan. He stated he did not attend the meeting that evening to address this particular case. What Dr. Bartolo was talking about reminded him of a similar problem the neighborhood in Salt Creek had in the late 1960s and 1970s. At that time, it was not septic tanks that were an issue, it was outhouses. The source of water those residence had come from wells dug on the properties. Over a period of time, as the population increased, the usage of the outhouse increased. Outhouses worked by digging a hole and putting an outhouse on it. When that hole filled up, another hole was dug next to it, and the outhouse was moved over the new hole. There were some young people in the neighborhood of Salt Creek that had gotten sick because the well water had become contaminated. The neighborhood of Salt Creek was able to get a grant. They dug a well and provided the residents their own water. There was one problem with the water, it was high in iron content. With another grant from the Department of Local Affairs the neighborhood was able to build and tax themselves for a sanitary sewer system. What Dr. Bartolo was talking about had reminded him of a problem they had decades prior. In the 1990s, there was some discussion about the high-water table and the concern with septic tanks. He thought that discussion related to 27th Lane closer to the Bessemer Ditch. He thought they should be aware that groundwater flowed towards the Arkansas River. If they drove on Santa Fe Drive east of Pueblo, they would see there were several areas where there was groundwater that came out towards the river. That was how it was in Salt Creek and he thought it was the same in this situation. He just wanted to give them some information about a similar problem he encountered. This problem may be a problem that had increased over a period of time that people were becoming more aware of.

REBUTTAL

Mr. Mangini rebutted the testimony. Over the years, there were three studies done of the water quality on the St. Charles Mesa, noting he did not have the studies with him. One was done in 1975. In the late 1990s, another was done and the study that was provided to the Planning Commission as Opposers Exhibit 2 was also done in the late 1990s. None of the

reports showed any contamination of the groundwater from septic systems. If they looked at the report provided by Dr. Bartolo, it talked about nitrate levels. In that study, they tested 25 wells. On the third page, the report stated, "Concentrations of nitrates in all the wells sampled were below the U.S. Environmental Protection Agency (USEPA) maximum contaminant level of 10(mg/L)." He had seen no proof over the years that any of the wells were contaminated through septic systems. There were other chemicals in the well water that they had tested. The chemicals that had been found could not be contributed to this issue, but they were not sure of the source. The chemicals could come from a number of sources such as the ground seeping certain chemicals into the soil. He had seen no proof of any of the wells being contaminated. He was not the kind of guy that wanted to harm the environment and would love to see the USGS come back and do another test to see exactly where the readings were at like Dr. Bartolo suggested. The last test was performed over 20 years ago. They had a ten-year lull in development in Pueblo County due to the economy. He thought they probably only had ten to twelve years of development over that 20-year period. He would not mind seeing a new study. He thought there were other types of engineered systems that could be done besides individual sewage disposal systems (ISDS). There were evaporative systems and systems that would not contribute any of the effluent to the groundwater. They could change that at any time. He did not think they needed a centralized sewage system worth billions of dollars. They could go through the Health Department or some other entity to start requiring the engineered systems and get rid of the ISDS systems. They had the technology to do those kinds of systems now and they worked well. He knew people in the mountains that he would go visit that had those kinds of systems. Those homes were near a lake and other counties required the engineered systems in those circumstances. There were other options to consider. Currently, he saw no evidence of contamination through ISDS systems. Dr. Bartolo and he had grown up together on the St. Charles Mesa. When they were young kids, they both drank water from the wells. He did not know anyone now that drank water from water wells. Everyone was on St. Charles Mesa water. He did not think there were any adverse effect on any people that did drink well water. Dr. Bartolo referred to the effect the water had on animals. He was not aware of any adverse effects to them, noting there could be adverse effects to them, he was not sure. He had gone through the subdivision process for the case being heard. Every time he did a subdivision, he tried to adhere to all the subdivision and zoning regulations. The subdivision they were hearing that evening adhered to both the zoning and the subdivision regulations, noting it also complied with the Pueblo County Comprehensive Plan. They had met all the requirements. They were not asking for any variances of any kind. If they had needed to request a variance, that might be a reason for the Planning Commission to question if they should forward a recommendation of approval. There was nothing to question with this case. When variances were needed it could bring up other issues. The bottom line was, he had not seen any publications that told him the water had been contaminated, or that the groundwater had been contaminated by ISDS systems. There were other alternatives to those systems, and he would welcome another study. He was not an environmental hazard proponent that did not care about the environment. He did care about the environment. If they could get the County Commissioners to pay USGS or another entity to do the testing, he would be okay with that. He agreed with Dr. Bartolo that he could not perform the study himself, noting it would be a conflict of interest. Some other entity needed to do the testing to give them a real report on where they stood with the ISDS systems. They could then decide what they needed to do to eliminate the ISDS systems and install some other kind of systems.

Chair Leonard closed the hearing and entered staff's comments into the record.

MOTION

Mr. Varela moved to approve Truxell Subdivision Preliminary Plan No. 2022-001 with comments, conditions, and notation, as outlined in Staff's Memorandum, dated May 13, 2022. Mr. Wark seconded the motion.

The following roll call vote was taken:

Mr. Arko--aye.
Ms. Gladney--aye.
Ms. Hatton--aye. (Noting she was hesitant)
Mr. Lisac--aye. (Noting he want to speak to the issue after the vote)
Mr. Schuster--aye. (Noting he thought they should have a discussion during New Business)
Mr. Varela--aye.
Mr. Wark--aye.
Chair Leonard--aye.

The motion carried unanimously.

UNFINISHED BUSINESS

None.

NEW BUSINESS

Mr. Schuster stated he thought Dr. Bartolo brought up some very good points. He thought they should consider making a recommendation to the County Commissioners to look into the issues that were brought up in the hearing. He questioned if they could make a motion to that affect.

Ms. Day advised the Planning Commission they could schedule a work session and invite Dr. Bartolo to present on the issue where they could ask him questions and go through his findings. Mr. Varela and Mr. Lisac expressed their support for that suggestion. Ms. Day stated that a work session could be scheduled either before of after the June 15, 2022 Planning Commission meeting, noting they could also schedule the work session for a date that did not already have a meeting scheduled. She knew that sometimes it could be difficult to come together outside of their normally scheduled meeting, but they could do that. Mr. Lisac stated he thought it was a great idea to add it to the regularly scheduled meeting. Mr. Schuster stated he would like to add that to his motion. Ms. Day replied they did not need a formal motion to do that. They could request that staff schedule a work session with Dr. Bartolo to learn more about the issues. Since there was nothing on that evening's agenda under new business, she preferred to have the discussion take place at a different meeting. That way, the public was given notice they would be discussing that issue. Mr. Schuster replied that would be fine, noting he wanted to know what process they should go through to hear and discuss the issue further. Ms. Day stated if the Planning Commission wanted to discuss the potential dates of that work session since they were all present, she would recommend doing that, or staff could send out an e-mail and coordinate on what date would work for everyone.

Ms. Howard stated she thought it might be better to have it at a separate date other than the Planning Commission meeting that way they would not be constrained with time. Mr. Lisac stated he would like Dr. Bartolo to be present at the work session. Ms. Day stated since Dr. Bartolo was present they could discuss potential dates with him, noting Ms. Howard could then send out the information in an email to get that scheduled. She thought it might be easier to have that discussion of the date then since they were only missing one Planning Commission member.

Ms. Gladney stated she thought if they were going to have a work session to discuss those issues that a representative of PDPHE should be present. The representative should be someone that did those kinds of water tests and collected samples. Whether the representative knew about the issue or not, they were the entity on record that went out and tested for contaminants. PDPHE did water testing currently, and she believed they needed to have a representative there. Ms. Day replied they could certainly request to have someone from that department come. Chair Leonard thanked Ms. Gladney as she was also going to make that suggestion. She thought Mr. Chad Wolgram might be a good representative as he was very informed on septic tanks.

Mr. Varela questioned if the discussion would be based solely on the data that Dr. Bartolo had put together. He wondered if they would also have someone from the County, as Dr. Bartolo had requested, go and perform testing prior to the work session. Ms. Day replied the work session would just be an informational session for the Planning Commission. There would be no formal action taken or motions made by the Planning Commission. Dr. Bartolo and anyone else they would like to invite could provide the Planning Commission with information, but they would not be taking any formal action at the work session. Mr. Varela replied he was just wondering if there would be any additional data besides the data that had been compiled by Dr. Bartolo. There may be different agencies beside the Health Department that may want to attend as well. He thought those agencies could potentially give them different points of view. Ms. Howard replied they could look into that. She thought it may be better if they tried to get that information first and then set the date. Staff would look into that. Mr. Varela stated he wanted to be sure other potential stakeholders were included.

Mr. Wark questioned if they were potentially looking at a work session that would determine if there would be a moratorium on development. Ms. Day replied they were not. A work session was just an informational session that was for someone who wanted to present information to the Planning Commission. If the Planning Commission wished to take some formal action, they could give notice to that on a future agenda. Dr. Bartolo had indicated he had already been in discussion with the Board of County Commissioners. She had not been party to those

discussions and did not know if there were further discussions he was planning on having with them. They would not be talking about taking any formal action or a moratorium. It would just be an informational session so the Planning Commission could get information from. Interested stakeholders, possibly the PDPHE or other agencies, may be interested in providing information they had. There would be no formal action taken by the Planning Commission. It would just be informational.

Mr. Lisac questioned if Dr. Bartolo would be interested in attending a work session to provide his information to the Planning Commission. Dr. Bartolo replied he would be happy to provide any information they wanted of him.

Chair Leonard questioned if, once Ms. Howard had the information, she would email the Planning Commission. Ms. Howard replied she would.

Mr. Wark questioned if Dr. Bartolo thought he could provide more information at the work session than he had already brought this evening. Dr. Bartolo replied he thought the Planning Commission would provide him with further questioning of what they wanted to know. He was hoping they would have time to analyze the data he had provided and do a bit of research on their own so that they could come up with their own specific questions that could be addressed. He could provide them with information on some of the analytical techniques. There were very good analytical techniques that could be used so they could determine if there was septic tank contamination. Caffeine could easily be detected with those techniques. They did not give their cows coffee; they gave them decaf. That was a proxy for a lot of different contamination. Those were the kinds of questions he could answer for them. He thought that would give them a chance to come up with some hard questions for him. They were looking at the issue through the lens of planning. They could look through those land use issues and provide him with some of those questions. The time that they had until the work session would allow them to digest all the information he provided, noting it was a lot of information to digest.

Ms. Howard questioned if Dr. Bartolo had spoken with Mr. Lopez, noting he was the Chair of the Environmental Policy Advisory Committee (EPAC). She thought Mr. Lopez may want to invite him to make a presentation at the EPAC meeting. Dr. Bartolo replied he had met him and thanked her for some of the suggestions she had given to him on how to proceed.

Ms. Hatton questioned since she was attending the meeting via Zoom and did not have access to the documents provided by Dr. Bartolo, if someone could email them to her. Chair Leonard replied they would be sent to her.

REPORTS OF COMMITTEES

None.

ADJOURNMENT

There being no further business, Chair Leonard called for a motion to adjourn the May 18, 2022 Planning Commission meeting.

Mr. Varela motioned to adjourn the meeting. Mr. Wark seconded the motion.

The following roll call vote was taken:

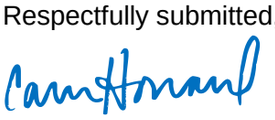
Mr. Arko--aye.
Ms. Gladney--aye.
Ms. Hatton--aye.
Mr. Lisac--aye.
Mr. Schuster--aye.
Mr. Varela--aye.
Mr. Wark--aye.
Chair Leonard--aye.

The motion carried unanimously.

RECORD OF PROCEEDINGS
PUEBLO COUNTY PLANNING COMMISSION
MAY 18, 2022

Chair Leonard adjourned the meeting at 6:36 p.m.

Respectfully submitted,



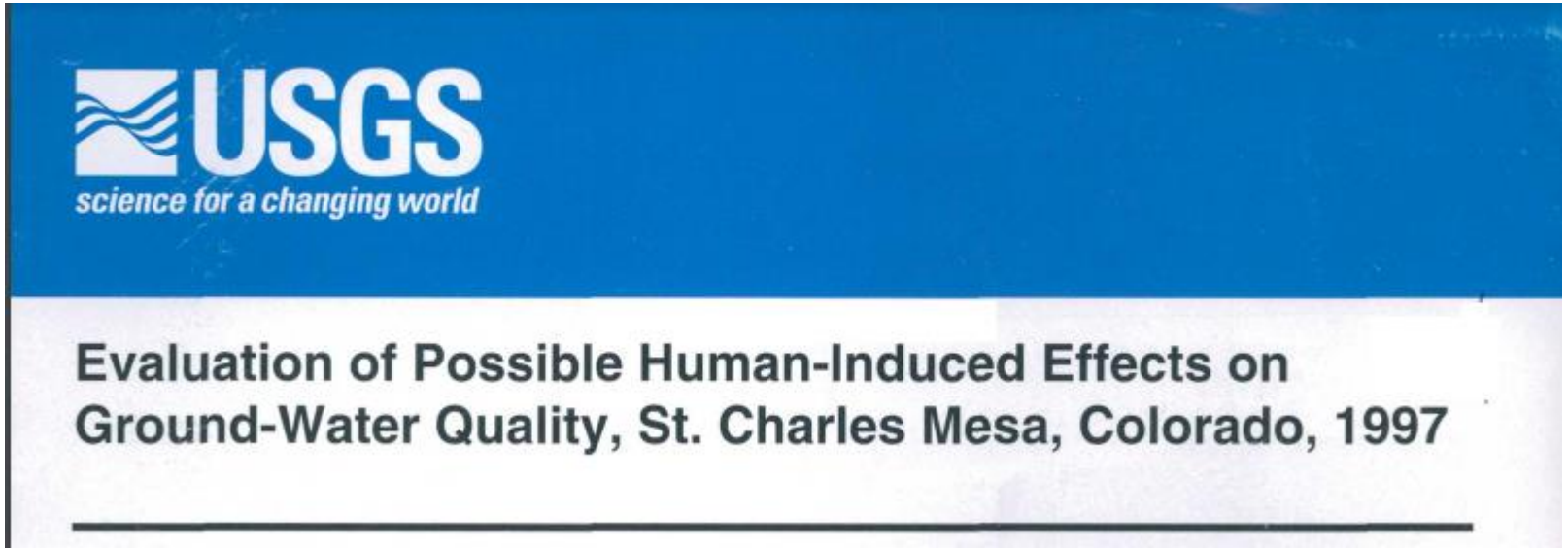
Carmen Howard, Director
Department of Planning and Development

MMG

Cumulative Impacts of Septic Systems on Groundwater Quality on the St. Charles Mesa

Prelim 2022-001
Opposer's Exhibit 1
May 18, 2022

Presented by Michael E. Bartolo Ph.D. to the Pueblo County Board of County Commissioners on April 19, 2022



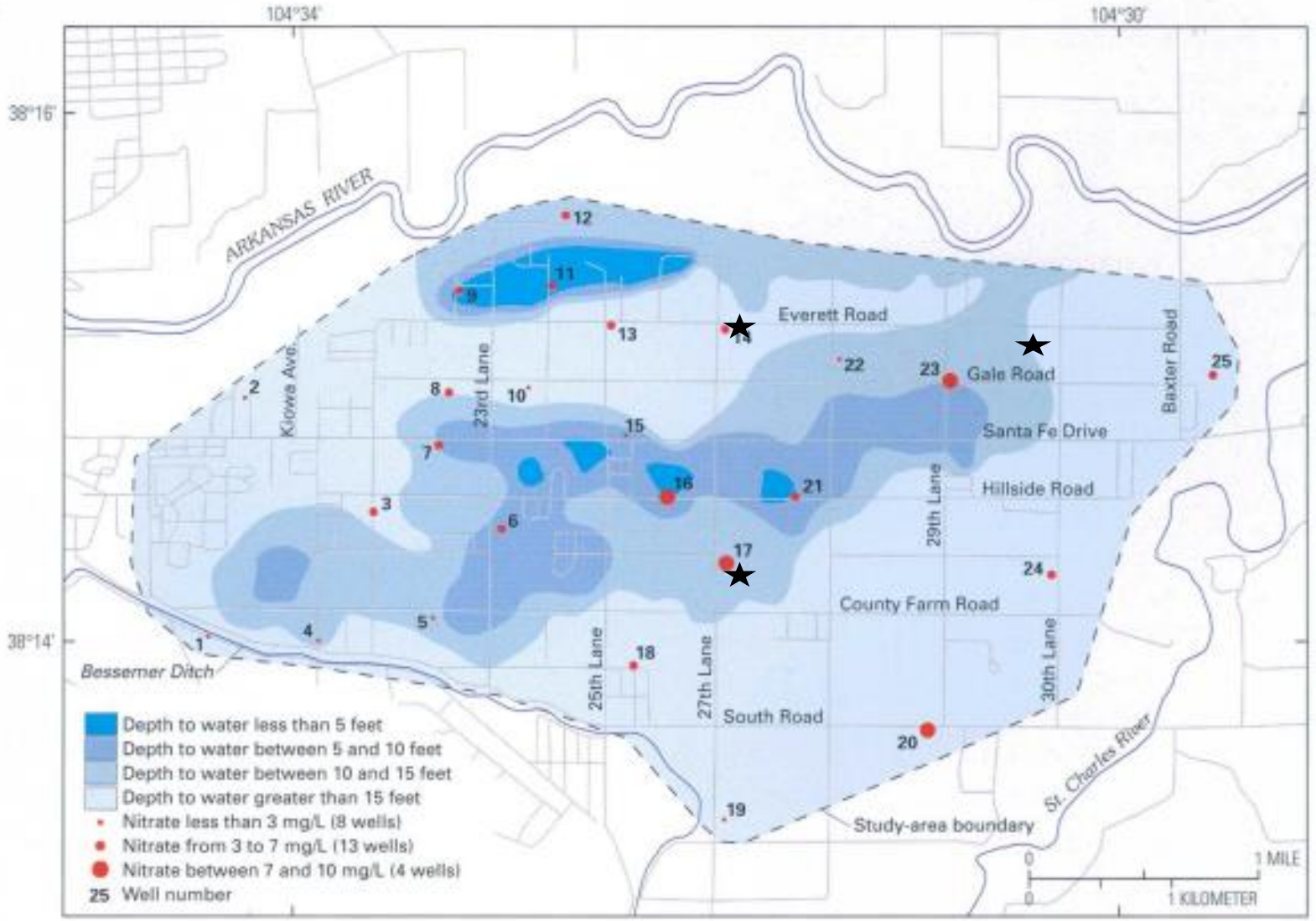


Figure 3. Nitrate concentrations in wells sampled on St. Charles Mesa during July and August 1997.

★ Sampled in 21/22

Nitrate Comparison-Preliminary Results

Sample	1997 Results	2021/2022 Results
27th and Everett	5.3 ppm	15.1 ppm
27th and County Farm	8.3 ppm	11.4 ppm
30th and Everett	4.7 ppm	19.4 ppm

Potential Next Steps

- 1. **TEMPORARY** Continuance/Moratorium on land use case that involve the approval of septic tanks on the St Charles Mesa

- 2. **Initiate** – Phase 1 of testing program in PARTNERSHIP with Pueblo County
  - Re-evaluate 1997 wells for nitrates only (to reduce cost)
  - Use County Employee to sample and reduce cost
  - Use certified lab or PBWW for testing at a cost of $10-$20 per sample (County or private)

- **Evaluate** Results
  - Lift moratorium and add regular testing onto development fees
  - Call in expertise and citizen advisory board to determine next steps

USGS
science for a changing world

WRIR 99-4085

Evaluation of Possible Human-Induced Effects on Ground-Water Quality, St. Charles Mesa, Colorado, 1997

Rec'd 8/4/99

INTRODUCTION

St. Charles Mesa (Mesa) is an upland terrace southeast of Pueblo that has an area of about 10 square miles (fig. 1). The Mesa has been irrigated for agricultural purposes since the late 1800's (Dumeyer, 1975). The unconfined sand and gravel aquifer, originally deposited by the Arkansas River, overlies an eroded shale-bedrock surface (Scott, 1969). Ground-water flow is generally from the southwest to the northeast, with the highest water-table elevations in the vicinity of Bessemer Ditch near County Farm Road [Dumeyer, 1975; U.S. Geological Survey (USGS) Ground-Water Site Inventory data base].

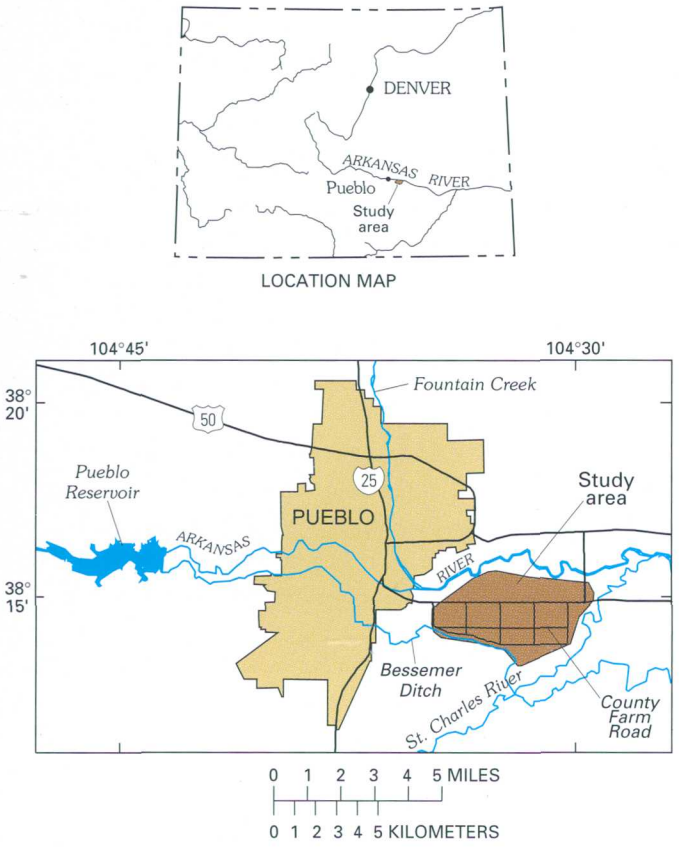


Figure 1. Location of study area.

During the last 25 years, the Mesa has become increasingly urbanized as cultivated fields have been converted to residential areas. However, much of the Mesa is still dedicated to agriculture and animal husbandry, both of which are potential sources of contaminants to the ground water. Septic systems are another potential source of contaminants to the ground water; all wastewater treatment on the Mesa is provided by septic systems. Because there has been a high water table on much of the Mesa, with ground-water levels within 10 feet of the land surface, the potential exists for septic-system flooding. As the vertical distance between the water table and a septic-system's leach field decreases, the treatment efficiency of the septic system can be decreased due to thinning of the unsaturated zone below the leach field (fig. 2). The extent of the high water table on the Mesa is described by Brendle (1999).

The U.S. Geological Survey, in cooperation with Pueblo County, collected ground-water samples on the Mesa during July and August 1997 to evaluate whether ground-water quality has been affected by the byproducts of human activities, including septic-system effluent. Samples were obtained from 24 domestic and irrigation wells and 1 spring. The samples were analyzed for chemical constituents and bacteria that can be indicative of the byproducts of human activities: nitrate, ammonia, dissolved organic carbon (DOC), methylene blue active substances (MBAS) (detergents and other natural and synthetic substances), total coliform and *Escherichia coli* (*E. coli*) bacteria, and caffeine.

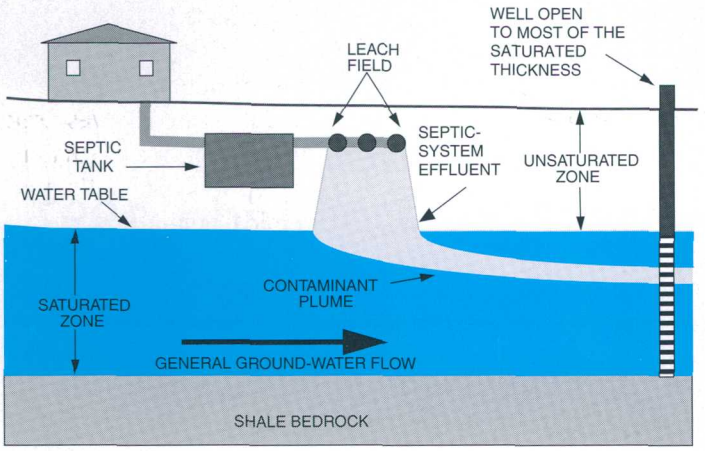


Figure 2. Diagram of a septic-system installation, the general direction of ground-water flow, and the configuration of a plume of ground water that has been degraded by septic-system effluent.

POTENTIAL SOURCES OF CONTAMINANTS TO THE GROUND WATER

Human-related activities that could potentially contribute contaminants to the ground water include agriculture, animal husbandry, lawn and garden maintenance, and the use of septic systems. Potential sources of contaminants to the ground water on the Mesa include fertilizers applied to lawns, gardens, and farm lands; animal waste from cattle, horses, and other livestock; and septic-system effluent. Water that recharges the ground water and that has been in contact with inorganic fertilizers could be enriched in nitrate or ammonia; water that has been in contact with organic fertilizers could be enriched in nitrate, ammonia, or DOC; and water that has been in contact with animal waste or manure could be enriched in nitrate, ammonia, DOC, and fecal-indicator bacteria. Septic-system effluent could be enriched in nitrate, ammonia, DOC, detergents and other household chemicals, fecal-indicator bacteria, and caffeine. In addition, soils are a potential source of total coliform bacteria.

The evaluation of possible human-induced effects on ground-water quality is the broad focus of this report, but many residents of the Mesa are concerned about the effects of septic-system effluent on ground-water quality. Therefore, a discussion of the geochemical processes affecting septic-system effluent follows to provide residents with an understanding of the processes that occur to decrease the concentrations of contaminants in septic-system effluent. Although this discussion focuses on chemicals and bacteria in septic-system effluent, the geochemical processes work in similar fashion to decrease the concentrations of potential contaminants originating from animal wastes or lawn, garden, and agricultural chemicals.

REMOVAL OF CHEMICAL AND BIOLOGICAL CONSTITUENTS FROM SEPTIC-SYSTEM EFFLUENT IN THE SUBSOIL

Several processes occur in the subsoil (unsaturated zone above the water table and the saturated zone below the water table) to decrease the concentrations of chemical and biological constituents in septic-system effluent (fig. 2). Most of the potential contaminants in septic-system effluent are removed in the unsaturated zone below the leach field and above the water table by oxidation or filtration (Wilhelm, Schiff, and Cherry, 1994). When effluent reaches the unsaturated zone above the water table, it flows through the pores between the particles, such as sand and clays, that make up the subsoil. Large particles and bacteria in the effluent can be filtered by the subsoil, leaving mostly dissolved compounds in the effluent. As the effluent flows through the subsoil, ammonia is oxidized to form nitrate. When nitrate reaches the water table, and if DOC is present and dissolved-oxygen concentrations are low, the nitrate and DOC may be consumed by denitrifying bacteria to produce nitrogen gas. Thus, the concentration of nitrate increases beyond the leach field but then decreases as it travels through the saturated zone (Robertson and others, 1989).

Caffeine and MBAS can be degraded to other compounds by bacteria in the saturated zone in the vicinity of the leach field where the compounds originated, or they can persist in ground water if bacteria are not present or the efficiency of treatment within the saturated zone has been reduced.

Biological constituents in septic-system effluent that can cause disease (pathogenic organisms) include bacteria and viruses. These microorganisms have different survival rates and transport properties in the saturated and unsaturated zones below a leach field. Total coliform and *E. coli* bacteria can be removed from septic-system effluent by filtration as the effluent flows through the unsaturated zone (Viraraghavan and Warnock, 1976). However, if the water table becomes closer to the land surface, the unsaturated zone thins and more of the bacteria in the effluent can potentially reach the ground water (Canter and Knox, 1985).

COMPARISON OF MEASURED AND EXPECTED BACKGROUND CONCENTRATIONS OF CHEMICAL AND BIOLOGICAL CONSTITUENTS

The 25 water samples collected in July and August 1997 were analyzed for chemical and bacterial indicators to determine whether Mesa ground water has been affected by the byproducts of human activities, including septic-system effluent. If contaminants from septic-system effluent are reaching the ground water, a long, narrow contaminant plume can be expected to form in the direction of ground-water flow, with little dispersion of the contaminants vertically or horizontally (fig. 2) (Robertson and others, 1989). Thus, because the concentration of chemical and biological constituents may vary with depth in the aquifer and the wells that were sampled are open to most of the saturated thickness of the aquifer (fig. 2), the water samples represent a composite of the ground-water quality in the aquifer.

The ground water of the Mesa is recharged by precipitation and water originating in Pueblo Reservoir, which is delivered to the Mesa and to the St. Charles Mesa Water District through Bessemer Ditch. Chemical analyses of Bessemer Ditch water and precipitation were not available for comparison with ground-water-sample analyses. Data from analyses of water collected from Pueblo Reservoir were assumed to be representative of water reaching the Mesa through the Bessemer Ditch (table 1). Additionally, it was assumed that water that was conveyed from Pueblo Reservoir to the Mesa through Bessemer Ditch did not become enriched in any of the chemical or biological constituents considered in this study.

To determine whether the ground water of the Mesa has been affected by the byproducts of human practices, each chemical or biological constituent was compared to the expected maximum background concentration (concentrations from Pueblo Reservoir) or to the applicable U.S. Environmental Protection Agency (USEPA) maximum contaminant level (MCL) or maximum contaminant level goal (MCLG) (U.S. Environmental Protection Agency, 1995). The MCL and MCLG values are listed in table 1. If the concentration of a chemical or biological constituent in a sample exceeded the expected maximum background concentration or the USEPA MCL or MCLG, that sample was considered to have been affected by the byproducts of human practices. It was not possible to differentiate the particular practice that may have caused the concentration of a constituent to be higher than the expected background concentration, except for caffeine or MBAS, both of which are strong indicators that the ground water has been affected by septic-system effluent.

Additionally, an assessment was made to determine whether there was evidence to indicate widespread degradation of the ground water that could be attributed to septic-system effluent. For this assessment, an approach was used that considered multiple lines of evidence. For a particular sample to be considered affected by septic-system effluent, concentrations of several of the chemical and biological constituents had to be higher than the expected maximum background concentrations or USEPA MCL or MCLG, and there needed to be constituents present, such as caffeine or MBAS, that most likely originated from septic systems. This multiple-lines-of-evidence approach was used because all of the chemical and biological constituents, except caffeine and probably MBAS, can originate from multiple sources.

Concentrations of nitrate in all the wells sampled were below the USEPA maximum contaminant level of 10 milligrams per liter (mg/L) (U.S. Environmental Protection Agency, 1995); concentrations ranged from 0.07 to 9.2 mg/L (table 2), with a median concentration of 4.2 mg/L. Three of the four samples in which the nitrate concentration was higher than 7 mg/L were outside the area identified as having a high water table (depth to water less than 10 feet from the land surface) (fig. 3). The observation that 80 percent of the ground-water samples exceeded the expected maximum background concentration for nitrate of less than 1 mg/L (table 1) indicates that human practices probably have contributed to these concentrations being higher than the expected background concentration.

Ammonia was detected in 18 samples. The range of ammonia concentrations was from <0.01 to 0.08 mg/L (table 2), with a median concentration of 0.03 mg/L. There is no USEPA maximum contaminant level for ammonia. The expected maximum background concentration of ammonia, based on samples obtained from Pueblo Reservoir, was 0.17 mg/L (table 1). All the detections of ammonia were below the expected maximum background concentration. The concentrations of ammonia do not indicate that human practices have contributed ammonia to the ground water.

Dissolved organic carbon was detected in 24 samples, ranging from 0.8 to 9.5 mg/L (table 2), with a median concentration of 1.8 mg/L. There is no USEPA maximum contaminant level for DOC. The concentration of DOC was below the expected maximum background concentration of 3.2 mg/L in 23 samples (table 1). Only one ground-water sample (9.5 mg/L) exceeded the expected maximum background concentration. The concentrations of DOC in 23 of the samples, which were below the expected maximum

background concentration, indicate that human practices generally have not contributed significantly to DOC in the ground water.

MBAS were detected in 18 samples. MBAS concentrations ranged from <0.05 to 0.15 mg/L (table 2), with a median concentration of 0.05 mg/L. There is no USEPA maximum contaminant level for MBAS. All wells in which MBAS were detected were in the eastern part of the Mesa, from just west of 23rd Lane to east of Baxter Road, and from just south of South Road to the northern part of the study area (fig. 4). The expected maximum background concentration for MBAS was set at 0.05 mg/L, the detection limit of the method of analysis (table 1). The test for MBAS is not definitive for detergents because the test

Table 1. Chemical and bacterial indicators, expected maximum background concentration, and range of concentrations of the indicators in Mesa water samples

[USEPA, U.S. Environmental Protection Agency; <, less than; >, greater than; mg/L, milligrams per liter; µg/L, micrograms per liter; MCL, USEPA maximum contaminant level; MCLG, USEPA maximum contaminant level goal; --, constituent has no USEPA drinking-water MCL or MCLG; DOC, dissolved organic carbon; TOC, total organic carbon; %, percent; POC, particulate organic carbon; mL, milliliters; MBAS, methylene blue active substances; *E. coli*, *Escherichia coli* bacteria]

Chemical or bacterial indicators	Expected maximum background concentration	USEPA drinking-water MCL or MCLG[1]	Range of concentrations in Mesa water samples	Samples exceeding maximum background concentration		Notes
				Number	Percent	
Nitrate plus nitrite, as nitrogen	<1 mg/L	10 mg/L (MCL)	0.07–9.2 mg/L	20	80	Expected maximum background concentration based on concentration of nitrate plus nitrite, as nitrogen, for Pueblo Reservoir, from which Bessemer Ditch water originates (Edelmann and others, 1991).
Ammonia	0.17 mg/L	--	<0.01–0.08 mg/L	0	0	Expected maximum background concentration based on assumption that total ammonia is approximately equal to dissolved ammonia and the maximum concentration for total ammonia for Pueblo Reservoir, from which Bessemer Ditch water originates (Edelmann and others, 1991).
DOC	3.2 mg/L	--	0.8–9.5 mg/L	1	4	Expected maximum background concentration based on maximum observed TOC values (approximately 10% POC, 90% DOC, (Thurman, 1986) for Pueblo Reservoir, from which Bessemer Ditch water originates (Edelmann and others, 1991).
MBAS	0.05 mg/L	--	<0.05–0.15 mg/L	18	72	Methylene blue active substances are detergents and natural and synthetic chemical compounds. Expected maximum background concentration is 0.05 mg/L, which is the detection limit of the method. Therefore, a detection of MBAS is considered as an exceedance of the expected maximum background concentration.
Total coliform	0 colonies per 100 mL	0 colonies per 100 mL (MCLG)	<1–>2,700 colonies per 100 mL	15	60	Expected maximum background concentrations of total coliform and *E. coli* bacteria are based on USEPA MCLG for those biological indicators. A detection of *E. coli* bacteria indicates some form of fecal contamination, whether from animal or human sources.
E. coli	0 colonies per 100 mL	0 colonies per 100 mL (MCLG)	<1– 9 colonies per 100 mL	2	8	
Caffeine	0.04 µg/L	--	<0.04–0.28 µg/L	1	6	Caffeine does not occur naturally in Colorado ground or surface waters. Expected maximum background concentration is 0.04 µg/L, which is the detection limit of the laboratory method. Therefore, a detection of caffeine is considered as an exceedance of the expected maximum background concentration.

[1]U.S. Environmental Protection Agency, 1995

Table 2. Chemical and bacterial data for ground-water samples from St. Charles Mesa

[mg/L, milligrams per liter; DOC, dissolved organic carbon; µg/L, micrograms per liter; MBAS, methylene blue active substances; mL, milliliter; *E. coli*, *Escherichia coli* bacteria; <, less than; >, greater than; --, sample not analyzed for this constituent]

Map number (figs. 3, 4, and 5)	Local identifier	Nitrate, as nitrogen (mg/L)	Ammonia, as nitrogen (mg/L)	DOC (mg/L)	Caffeine (µg/L)	MBAS (mg/L)	Total coliform (colonies per 100 mL)	*E. coli* (colonies per 100 mL)
1	SC02106407DACC1	0.2	<0.01	0.8	--	<0.05	<1	<1
2	SC02106405DAAC1	2.0	.02	1.9	--	<.05	31	<1
3	SC02106409BAAD1	5.7	<.01	1.4	<0.04	<.05	>82	<1
4	SC02106409CB1	.2	.04	1.6	--	<.05	>2,700	<3
5	SC02106409DBAA1	.9	<.01	.9	--	<.05	<1	<1
6	SC02106410BBCB1	3.7	.04	2.2	--	.10	9	<3
7	SC02106404DDBB1	3.1	.03	2.5	.28	<.05	10	<3
8	SC02106404DABB1	5.2	.04	1.8	<.04	.05	<1	<1
9	SC02106404AABD1	5.2	.04	2.0	<.04	.1	130	2
10	SC02106403CBAB1	2.3	.06	1.9	--	.05	<3	<3
11	SC02106403BABC1	3.2	.04	1.9	<.04	.05	12	<3
12	Spring	3.7	.04	2.8	<.04	.1	7	<10
13	SC02106403ABCC1	5.9	.05	2.3	<.04	.1	55	<3
14	SC02106402CBBB1	5.3	<.01	2.2	<.04	.05	<1	<1
15	SC02106403DBCD1	.07	.08	9.5	<.04	.15	<3	<3
16	SC02106403DDCC1	7.1	<.01	1.6	<.04	.1	<1	<1
17	SC02106411BCBB1	8.3	<.01	2.0	<.04	.15	50	9
18	SC02106410DBCD1	4.3	.03	1.3	--	.1	23	<3
19	SC02106414BCCB1	.4	.05	1.8	<.04	<.05	470	<3
20	SC02106414AAAB1	7.7	.04	--	<.04	.15	120	<10
21	SC02106402DCDC1	5.9	<.01	2.0	<.04	.1	<1	<1
22	SC02106402DBCB1	2.7	.02	1.3	<.04	.05	<3	<3
23	SC02106401BCCC1	9.2	.02	1.8	<.04	.15	<3	<3
24	SC02106412ACBC1	4.2	.02	1.6	--	.05	100	<3
25	SC02106306BCD1	4.7	.02	1.7	<.04	.1	300	<3

indicates a positive result when detergents and other natural and synthetic substances are present in the sample (Greenberg and others, 1985). Therefore, the fact that 18 samples were positive for MBAS indicates that human practices may have contributed to MBAS in the ground water, but the source, whether septic-system effluent or natural or synthetic chemical compounds, cannot be identified.

Total coliform bacteria were detected in 15 samples, and *E. coli* bacteria were detected in 2 samples (fig. 5) (table 2). The USEPA rule for total coliform bacteria in public drinking-water supplies (U.S. Environmental Protection Agency, 1995) (table 1) does not apply directly to the private wells that were sampled for this study. Nonetheless, the rule can be generally used as a guideline for determining the suitability of the water from these wells for human consumption. The concentrations of total coliforms in the ground water exceeded the USEPA maximum contaminant level goal for bacteria in drinking water of zero colonies per 100 milliliters. Eleven samples in which bacteria were detected were obtained from wells in areas of the Mesa where the water table is more than 10 feet below land surface (fig. 5), whereas four samples containing bacteria were in areas where the water table is within 10 feet of land surface. The

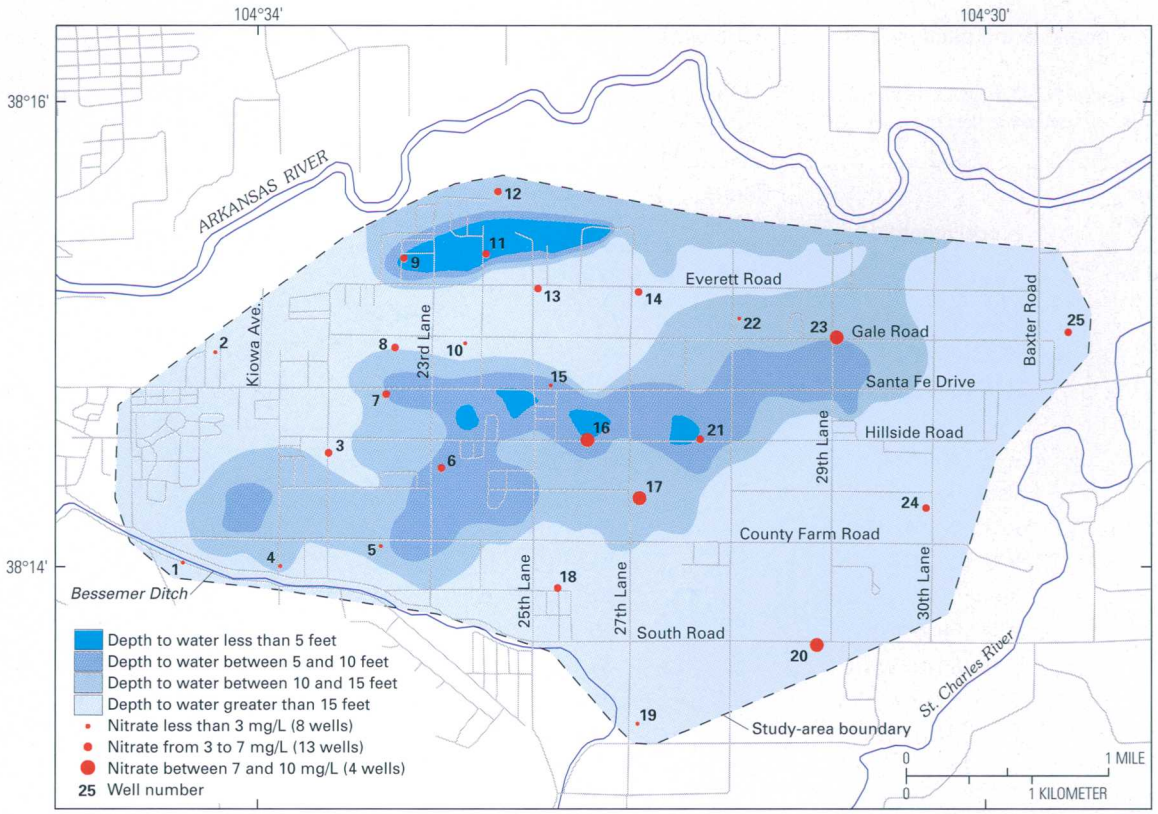


Figure 3. Nitrate concentrations in wells sampled on St. Charles Mesa during July and August 1997.

presence of bacteria in the ground water may be due in part to the coarseness of the subsoil material and the rate at which recharging water containing bacteria, whether precipitation, canal diversions, or septic-system effluent, can flow to the water table. The detections of total coliform bacteria do not necessarily indicate that septic-system effluent has degraded ground-water quality because total coliform bacteria can originate from animal fecal matter and soil organisms. The detections of *E. coli* in two wells indicate degradation of the ground water by fecal matter at those locations, but whether the source was septic-system effluent or animal waste cannot be differentiated in these samples.

Caffeine was detected in one sample, which contained 0.28 microgram per liter (µg/L) (table 2). There is no USEPA maximum contaminant level for caffeine. The expected maximum background concentration for caffeine was set at 0.04 µg/L, the detection limit of the method of analysis (table 1). The presence of caffeine in the sample from well 7 may indicate septic-system contamination of ground water in the vicinity of the well because septic-system effluent is the only source of caffeine to the ground water. However, the single detection of caffeine indicates that either caffeine is not generally present in the ground water or, if caffeine is present, concentrations are decreased through chemical or biological processes. Therefore, the caffeine data do not indicate widespread degradation of the ground water by septic-system effluent.

When the concentrations of all the constituents for each well are compared using the multiple-lines-of-evidence approach, the data indicate that there is insufficient evidence to indicate a widespread presence of septic-system effluent in Mesa ground water.

Concentrations of nitrate, MBAS, bacteria, and caffeine in some ground-water samples collected from the Mesa were higher than would be expected for ground water that was not affected by the byproducts of human practices. Detections of MBAS and caffeine indicate that septic-system effluent may be present in the ground water on the Mesa. Evidence indicates that degradation of ground water on the Mesa that could be associated with septic-system effluent is not widespread, but human practices have affected the quality of Mesa ground water.

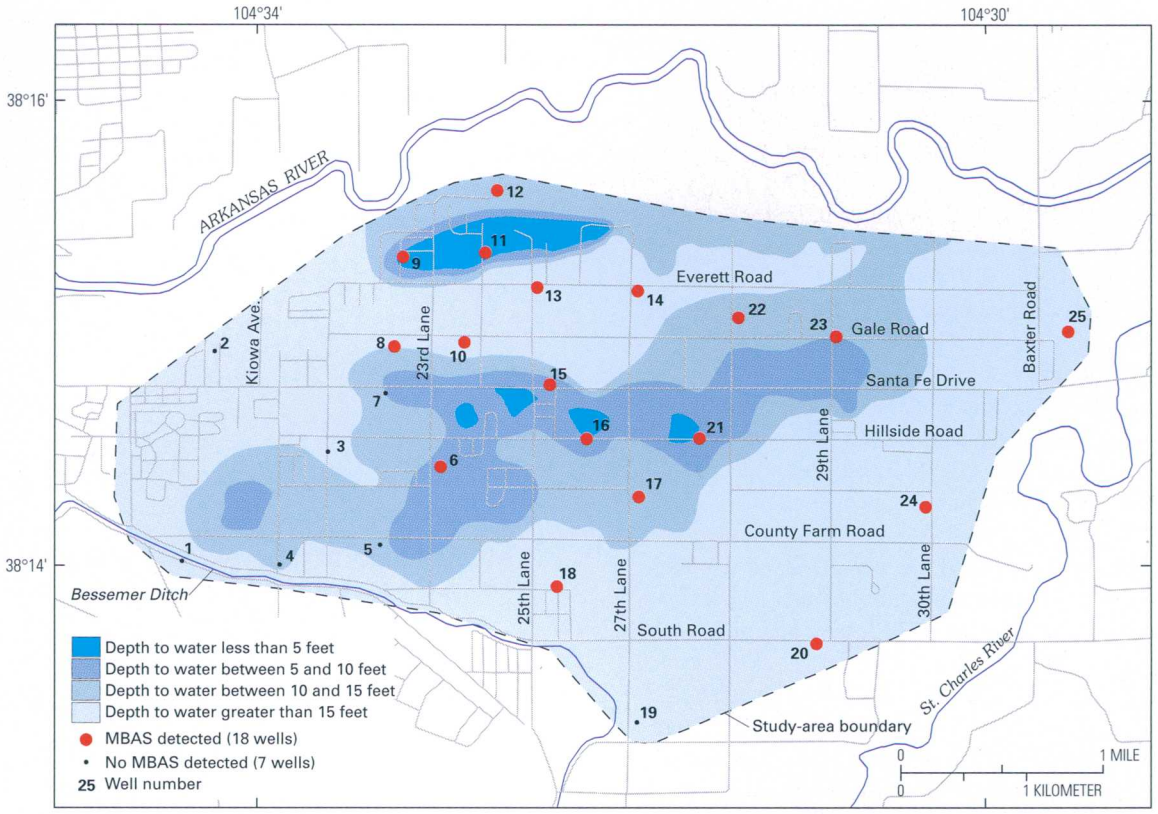


Figure 4. Detections of methylene blue active substances (MBAS) in samples obtained from wells on St. Charles Mesa during July and August 1997

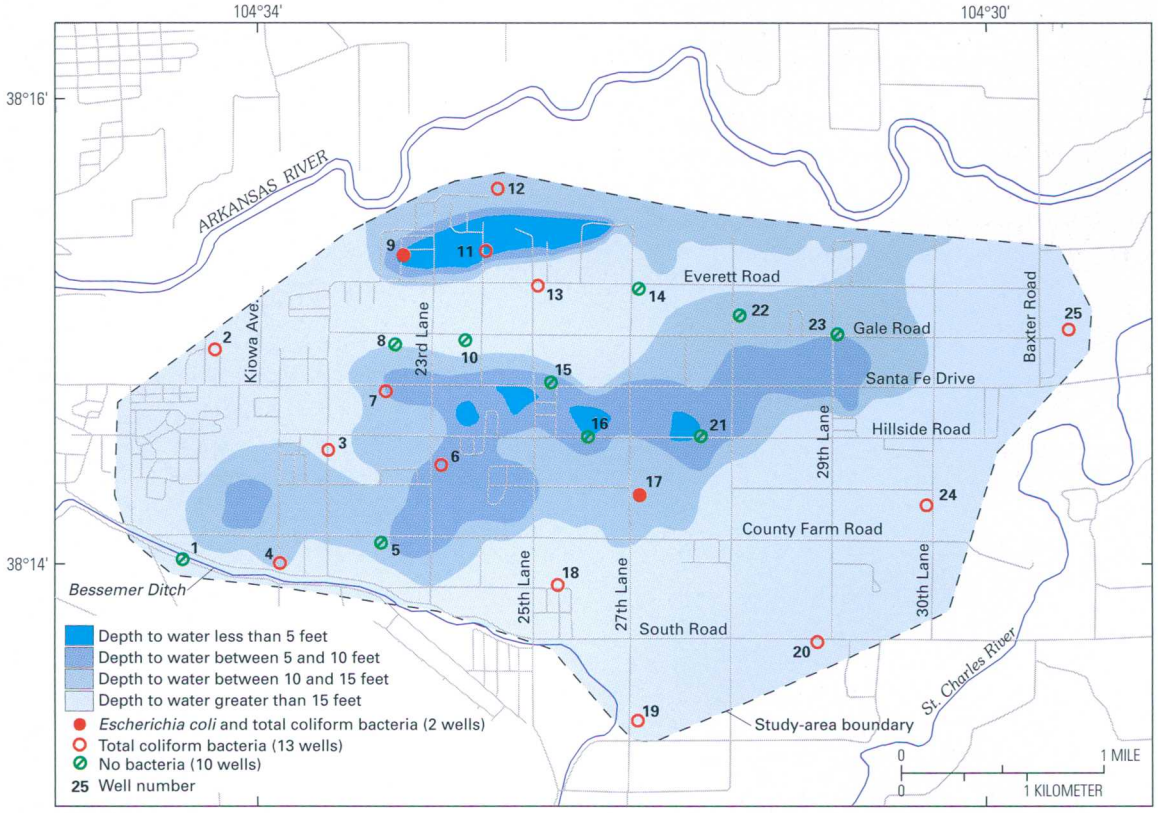


Figure 5. Detections of bacteria in samples obtained from wells on St. Charles Mesa during July and August 1997

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–D.L. Brendle

Many thanks to the well owners on the St. Charles Mesa.

Information on technical reports and hydrologic data can be obtained from:

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