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The Domestic Well Exemption in the West: A Case Study of Santa Fe's Municipal Ordinance

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THE DOMESTIC WELL EXEMPTION IN THE WEST: A CASE STUDY OF SANTA FE'S MUNICIPAL ORDINANCE

ABSTRACT

In the case of Bounds v. State of New Mexico*, the New Mexico Supreme Court upheld the constitutionality of a statute that allows domestic wells to be permitted with less oversight than other water rights. The statute, known as the domestic well exemption, is common in various forms throughout the Western United States. Currently, there are an estimated 200,000 permitted domestic wells across the State of New Mexico, increasing at a rate of approximately 5,000 per year. Various scholars have argued for amendments to domestic well statutes or local regulations to make exempt well applications as rigorous as other water right applications. In consideration of local solutions, this study addresses one of few municipal ordinances and three important controversies in domestic well management: the interaction between domestic well pumping and other water uses, the longevity of groundwater sources, and the "development loophole." The City of Santa Fe's domestic well ordinance is found to indirectly address concerns related to aquifer use and conservation, however, policies restricting well uptake in threatened areas that speak to specific, measurable goals, aligned with accurate databases, may better serve municipalities and counties in New Mexico as they do in other states.*

INTRODUCTION

In July 2013, the New Mexico Supreme Court addressed a long-controversial aspect of western water law in *Bounds v. State of New Mexico,* upholding the constitutionality of the domestic well statute (DWS).[1] The statute is often referred to as an "exemption" from the prior appropriation regime as it allows domestic wells for individual household indoor use to be permitted with less

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1. Bounds v. State *ex rel.* D'Antonio, 2013-NMSC-037, ¶ 1, 306 P.3d 457.

restriction than other water rights. Such an exemption is commonplace in various forms throughout western, prior appropriation regime states.

The DWS and similar statutes in other states[2] have been at the center of a debate on how much control managers can and need to have over these abundant, small, groundwater uses. The New Mexico statute known as the exemption was originally enacted as a State Engineer order to ease development during the World War II era as domestic wells make household water accessible away from municipal water and surface-water sources.[3] However, concerns related to water availability have grown in recent decades, as many basins are over-appropriated and western populations continue to increase. The Director of the New Mexico Farm and Livestock Bureau summarized this fear of the impacts of domestic well proliferation in the following terms: "[t]hey're issuing water rights when there is no water left."[4] In 1999, the City of Santa Fe issued an ordinance limiting the proliferation of domestic wells.[5]

Due to climate change and population growth in the Western United States, policies such as Santa Fe's ordinance should be reviewed for their ability to supplement the domestic well exemption to address concerns of aquifer sustainability, interference between water uses, and responsible growth management. Most Western states have a domestic well exemption under the prior appropriation doctrine, including Alaska, Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, N. Dakota, Oklahoma, Oregon, S. Dakota, Texas, Washington, Wyoming, and New Mexico.[6] As a result, the *Bounds* decision may influence court decisions in exempt wells cases across the West,[7] where exempt wells may continue to be exempt and where their regulation may thus fall into the hands of local governments.

This article analyzes the domestic well ordinance in the City of Santa Fe, applying relevant policy and geological models as well as available well data to interpret the effectiveness of this municipal legislation in the context of the domestic well exemption and recent case law. To consider how various local and regional regulations might better address concerns regarding domestic wells, the

2. WASH. REV. CODE 90.44.050 (2016); ALASKA ADMIN. CODE tit. 11, §§ 93.035(b), 93.040(d), 93.100, 93.120(b)(1); ARIZ. REV. STAT. ANN. § 45-454 (2016); COLO. REV. STAT. §§ 37-90-105, 37-92-602 (2016); IDAHO CODE §§ 42-111, 42-227, 42-914 (2016); KAN. STAT. ANN. §§ 82a-705, 82a-703a, 82a-705a, 82a-728 (2016); MONT. ADMIN. R., 36.12.101 (2016); MONT. CODE ANN. § 85-2-306 (2015); NEB. REV. STAT. §§ 46-602, 46-714, 46-735, 46-740 (2016); NEV. REV. STAT. §§ 533.024, 533.370, 534.013, 534.180 (2015); N.M CODE R. § 19.27.5.14 (LexisNexis 2016); N.M. STAT. ANN. 1978, §§ 72-12-1.1, 72-12-3 (2016); N. D. CENT. CODE §§ 61-04-01.1, 61-04-02, 61-04-06.1, 61-04-06.3 (2016); OKLA. STAT. tit. 82 §§ 1020.1, 1020.3 (2016).

3. Thomas Maddock III & Peggy W. Barroll*, Domestic Wells in New Mexico*, *in* WATER POLICY IN NEW MEXICO: ADDRESSING THE CHALLENGE OF AN UNCERTAIN FUTURE 209 (David. S. Brookshire et al. eds., 2012).

4. Justin Horwarth & Joey Peters, *Well, Well: What The State's Supreme Court New Water-Rights Ruling Means For New Mexicans*, SANTA FE REP., July 30, 2013, http://www.sfreporter.com/santafe/article-7604-well-well.html [https://perma.cc/5MQT-GXN6].

5. SANTA FE, N.M., CITY CODE § 25-1.10 (2016).

6. Nathan Bracken, *Exempt Well Issues in the West*, 40 ENVTL. L. 141, 145–46 (2010).

7. Jesse J. Richardson Jr. & Tiffany Dowell, *The Implications of Bounds v. State of New Mexico*, 148 J. CONTEMP. WATER RES. & EDUC. 17, 20 (2012).

City of Santa Fe's domestic well ordinance is analyzed to answer three questions associated with the exemption across the West:

(1) Does the City of Santa Fe's domestic well ordinance ensure protection for surface-water rights and other groundwater rights from domestic well pumping?

(2) Does the ordinance preserve aquifer levels and promote sustainable groundwater use?

(3) Does the ordinance help prevent the use of the "development loophole"?

The following section provides an overview of problems associated with domestic wells in Western, prior appropriation states. Part II then expands upon the impact of *Bounds* for domestic well management in New Mexico. Part III explains the domestic well ordinance in Santa Fe in the context of city, county, and state-wide regulation. Parts IV through VI provide relevant hydrologic context—an overview of surface-water–groundwater interactions and well interference, as well as a review of sustainable groundwater management—and answer the three study questions. Part VII is a review of various domestic well management policies in other Western states. Finally, Part VIII recommends ways to mitigate problems associated with domestic well management in Santa Fe, across New Mexico, and throughout Western states.

I. CONCERNS RELATED TO DOMESTIC WELL MANAGEMENT

During the current climatic period, Western states have experienced extreme drought conditions as low snowpack levels and high temperatures have increased concerns about the reliability of water resources,[8] and present drought conditions are expected to persist.[9] The rate at which permits for domestic wells are being issued in New Mexico against this climatic background provides reason for concern about the effect of these wells on water management strategies in the future.[10] In 2000, there were a recorded 137,000 domestic wells across the state, increasing at a rate of approximately 5,000 permits per year. Today, there are an estimated 200,000 plus domestic wells in New Mexico.[11]

The effect of localized domestic well pumping on surface-water uses as well as other groundwater uses[12] is of concern in New Mexico not only because potable water sources are relatively scarce, but also because they are often over-appropriated. There are fifteen basins currently being adjudicated, a process by which all water rights in a basin are quantified.[13] Adjudication has not yet started for Middle Rio Grande, the basin which accounts for the largest use of surface-

8. Greg Garfin et al., *Southwest, in* CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 464 (2014).

9. *Id.*

10. Frank Titus, *On Regulating New Mexico's Domestic Wells*, 45 NAT. RESOURCES J. 853, 854 (2005).

11. *See* Maddock III & Barroll, *supra* note 3, at 204; Paul Bossert, *Domestic Wells in* WATER MATTERS! 12-1, 12-5 (2015), http://uttoncenter.unm.edu/pdfs/water-matters-2015/2015-water-matters.pdf [https://perma.cc/FV4N-PFBF].

12. *See* Titus, *supra* note 10, at 854.

13. *Active Cases*, N. M. OFFICE OF THE STATE ENG'R, http://www.ose.state.nm.us/Legal/activeCases.php [https://perma.cc/3HG9-W2JM]

water in the state.[14] Therefore, in New Mexico, water rights are managed with a degree of uncertainty. Domestic wells comprise another source of water management uncertainty.

The power of the State of New Mexico to issue permits for domestic wells without regard to water availability will continue, in light of the recent *Bounds* decision. *Bounds* held that the domestic well statute does not facially cause senior water rights to be impaired by domestic wells.[15] According to *Bounds*, domestic wells do not necessarily threaten senior water rights in part because other legal controls, such as local or regional mechanisms—e.g., Critical Management Areas (CMAs)—are available and could be implemented.[16] The controversy surrounding the domestic well exemption, however, relates not only to priority enforcement and regulation but also to water management issues, and so current protections for senior water rights holders may not be as effective as the court asserts.

Indeed, the expedited permitting of domestic wells, which can be regulated by the state and by local legislation, is a concern for responsible growth management strategies, aquifer sustainability, groundwater interaction between wells, and other water management efforts.[17] In some areas, domestic wells are feared to consume enough water to impact rivers because of the hydrologic-connection of ground water and surface flows.[18] Although it has been shown that a few domestic wells are unlikely to negatively impact groundwater resources due to generally low pumping rates, thousands of unregulated wells in a basin may interact with other groundwater uses.[19] The implementation of effective conjunctive management of ground and surface-water resources requires a greater understanding of hydrologic and policy conflicts related to domestic wells, as well as an evaluation of what limits are most appropriate for the proliferation of these wells.

Unfortunately, there are various hydrologic and administrative unknowns associated with the management of exempt wells that create challenges for water managers. Often, actual pumping rates are unknown as many wells across New

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14. *Id.*

15. Bounds v. State *ex rel.* D'Antonio, 2013-NMSC-037, ¶ 1, 306 P.3d 457.

16. *Id.* ¶ 34. Critical Management Areas are location-based restrictions on wells implemented by order by the State Engineer. They are implemented if it is determined that groundwater resources of the region are too scarce for sustained well production or may in the future be so. Both the Middle Rio Grande and Estancia Basins have CMAs. To illustrate, the Estancia Basin CMA includes aquifers that are being pumped too quickly (average water level declines of 1.5 feet per year) as well as those close to some depletion limit (80 feet of remaining saturation by 2040). The State Engineer can include stipulations for domestic well permits, including terms limiting well uptake. *See* N.M. OFFICE OF STATE ENG'R, AREA OF ORIGIN—CRITICAL MANAGEMENT AREAS 9–11 (2004), http://www.ose.state.nm.us/Planning/RWP/Regions/12_MRG/2004/App12-13-3-JyS-AreaOriginCriticalMgtArea.pdf [https://perma.cc/6DJF-KJ3Z].

17. CRAIG BELL & JEFF TAYLOR, WATER LAWS AND POLICIES FOR A SUSTAINABLE FUTURE: A WESTERN STATES' PERSPECTIVE 65 (2008), http://www.westernstateswater.org/wp-content/uploads/2012/10/laws-policies-report-final-with-cover-1.pdf [https://perma.cc/RE8R-FNNQ].

18. *See* Titus, *supra* note 10, at 854; *see also* BELL & TAYLOR, *supra* note 17, at 65.

19. W. Peter Balleau & Steven E. Silver, *Hydrology and Administration of Domestic Wells in New Mexico*, 45 NAT. RESOURCES. J. 807, 807–08 (2006); Titus, *supra* note 10, at 854–55.

Mexico are not metered,[20] and therefore, the cumulative effect of exempt well pumping on groundwater levels, riparian areas, and impairment of water levels in other wells is uncertain. Some hydrologic models show that domestic wells do not constitute a large source of depletion nor impact a groundwater source in a systematic way.[21] Other studies, however, have informed a recommendation that further hydrologic and policy evaluation is necessary in order to cultivate the most informed management decisions for these wells.[22]

Across New Mexico, domestic well use can also contribute to management problems associated with over-appropriation, rural development, and suburban growth.[23] A few municipalities and suburbs in New Mexico have experienced domestic well conflicts related to groundwater drawdowns, including Placitas, Santa Fe, and Truth or Consequences.[24] Placitas faced what is known as the "development loophole" in which housing developers used domestic well permits instead of community wells, which have more extensive construction and water quality standards than those imposed upon domestic wells.[25] And water levels near municipal wells in suburban Santa Fe County have declined in association with the combined effects of domestic and city well use.[26]

It is clear that domestic wells are an active concern across the state of New Mexico as part of conjunctive water management strategies. Some consider that the long term impacts of alternative pathways to statutory reform need to be explored more thoroughly. Local action, for example, is particularly relevant as the New Mexico statute conditions domestic well permitting on compliance with relevant municipal ordinances and county codes.[27] Such local initiatives can affect limits on groundwater withdrawals or the permitting of domestic wells through either local government regulation or policy efforts.[28] In contrast, in 2004 in Bernalillo County, the regional water plan committee recommended the establishment of a domestic well policy by the Office of the State Engineer (OSE). The committee sought to

20. As of 2002, 40 percent of known wells were non-compliant in metering reports. *See* Balleau & Silver, *supra* note 19, at 816.

21. *See* Balleau & Silver, *supra* note 19, at 823–26.

22. *See, e.g.,* Titus, *supra* note 10, at 863; BELL & TAYLOR, *supra* note 17, at 61–65; AMY LEWIS, WATER RESOURCE INVENTORY OF THE ESPAÑOLA BASIN 43–48 (2013), http://www.santafenm.gov/document_center/document/791 [https://perma.cc/7LE5-AJMR]; Amy Lewis, ACL Consulting, *Water Use and Conservation Potential for Domestic Wells in the Santa Fe Area*, Address at 12th Annual Española Basin Technical Advisory Group Workshop, Santa Fe Community College (May 20–21, 2013) (abstract available at https://geoinfo.nmt.edu/publications/openfile/downloads/500-599/557/ofr_557.pdf [https://perma.cc/5HPF-XZYU]).

23. Richardson & Dowell, *supra* note 7, at 17–18, 21.

24. Jocelyn Drennan, *Lassoing the Loophole: The Need to Rope in The Use of The Domestic Well Loophole by Subdividers in New Mexico*, 37 NAT. RESOURCES J. 923, 934 (1997); *see* Maddock III & Barroll, *supra* note 3, at 203.

25. *See* Drennan, *supra* note 24, at 939.

26. Jon Shomaker, *Domestic Well Depletions in the Rio Grande Basin*, *in* WATER RESOURCES RESEARCH INSTITUTE, PROCEEDINGS OF THE 44TH ANNUAL NEW MEXICO WATER CONFERENCE 161, 163 (PDF pagination) (1999), https://nmwrri.nmsu.edu/wp-content/uploads/2015/ConfOneFile/1999%20Conference%20Proceedings%20(as%20one%20file).pdf [https://perma.cc/G48K-WWQN].

27. N.M. STAT. ANN § 72-12-1.1 (2003).

28. *See* BELL & TAYLOR *supra* note 17, at 65. Local regulations have been enacted that limit groundwater pumping and restrict domestic well permitting, to various extents.

reduce domestic well pumping and restrict the new well drilling where surface flows or groundwater levels could be impaired. In the view of community members at the time, "[t]he region [was] seen to be significantly increasing its draw upon water resources in many areas due to the installation of new domestic wells and their associated consumptions."[29]

Although the precise detrimental effects of domestic wells are often unclear, preventing adverse effects will likely be less costly in the long run than *ad hoc* conflict resolution and allowing unlimited domestic well proliferation. It is also more politically and administratively feasible.[30] Two opposing general strategies have been suggested, and both attempt to maintain aquifer sustainability and protect water rights. The Western Governors' Association has advocated for a broad approach that would include permitting and monitoring exempt wells within a state's normal water rights regulatory scheme.[31] This proposition could avert many problems associated with domestic wells as permitting necessitates an analysis of their impacts on other water uses.[32] However, state-wide analysis of domestic well impacts may be an inefficient method to address small scale domestic well impacts.[33] Others argue that local regulations that vary from region to region can comprise the more effective strategy due to their political and administrative feasibility and focus on areas of concern.[34]

Specific regulations have been recommended to avoid conflicts associated with exempt wells. These include:

- limiting uptake;
- requiring proper construction and testing;
- restrictions in specific geologic areas;
- requiring subdivisions to use community wells (in order to avoid exploitation of the loophole);
- requiring data collection;
- limits on consumptive use;
- mandatory connection to municipal water supply systems, when available,
- monitoring; and
- implementing public education programs.[35]

In contrast, approaches that tend to be rejected include:

29. *See Water Supply Threatened for Private Wells*, 13 CORRALES COMMENT 1-24 (Nov. 29, 2001), http://www.corralescomment.com/index.php/archive/25-corrales-comment-volume-xiii-no-1-24/44-water-supply-threatened-for-private-wells (the regional water plan under discussion at the January 29 meeting includes the noted recommendation).

30. Bracken, *supra* note 6, at 253.

31. BELL & TAYLOR, *supra* note 17, at 36.

32. *Id.* at 37.

33. Nathan S. Bracken, *Scalpels vs. Hammers: Mitigating Exempt Well Impacts*, 148 J. OF CONTEMP. WATER RES. & EDUC. 24, 28 (2012); Maddock III & Barrell, *supra* note 3, at 211.

34. Bracken, *supra* note 33, at 31.

35. Jesse J. Richardson, Jr., *Existing Regulation of Exempt Wells in the United States*, 148 J. OF CONTEMP. WATER RES. & EDUC. 3, 4 (2012), http://onlinelibrary.wiley.com/doi/10.1111/j.1936-704X.2012.03110.x/full.

- restricting domestic well use to indoor-use only,
- state-wide required metering, and
- granting blanket authority to the Office of the State Engineer to deny exempt wells.[36]

While Vinett and Jarvis[37] have aptly stated that no single approach will be effective across the West due to differences in availability of water and population models. Santa Fe's Domestic Well Ordinance may provide guidance for Western cities attempting to manage diverse water resources under the statutory exemption in a future impacted by climate change.

II. LEGAL CONTEXT OF LOCAL RULES

The majority of Western states' water rights legal regimes follow the doctrine of prior appropriation, colloquially known as "first in time, first in right." The oldest water uses have the superior water right. In New Mexico, as in other states, prior appropriation is based upon "beneficial use" of water. A person must apply to the State Engineer for a right to use a certain quantity of water for a specified use. Senior (older) users enjoy priority over junior (newer) users, which is a theoretical right to the entire quantity of their water before a junior user receives any water.[38]

Domestic wells represent an exemption from the prior appropriation regime, not because they cannot be included in priority enforcement, but rather because they are issued by the State Engineer with no hearing, impact evaluation, or public notice.[39] This exemption is grounded in statutory language that describes the permitting process, that the State Engineer "*shall* issue a permit" for domestic wells.[40] Such language was interpreted to require the State Engineer, in almost all cases, to issue domestic well permits regardless of water availability.[41] The Office of the State Engineer issues these permits for domestic wells with withdrawals of less than one acre-foot per year (AFY),[42] a relatively small amount.[43] In 2001,

36. *Id*. at 4.

37. Megan A. Vinett & Todd Jarvis, *Conflicts Associated with Exempt Wells: A Spaghetti Western Water War*, 148 J. OF CONTEMP. WATER RES. & EDUC. 10, 12 (2012), http://onlinelibrary.wiley.com/doi/10.1111/j.1936-704X.2012.03108.x/full; *see* Richardson & Dowell, *supra* note 7, at 18 (discussing the variation of domestic well exemptions among western states).

38. CAROL ROMERO-WIRTH & SUSAN KELLY, WATER RIGHTS MANAGEMENT IN NEW MEXICO AND ALONG THE MIDDLE RIO GRANDE: IS AWRM SUFFICIENT? 2 (2012), http://uttoncenter.unm.edu/pdfs/water_rights_mgmt.pdf [https://perma.cc/5UHH-L8AQ]. In New Mexico, this right to make a call on the river is more theoretical.

39. Bossert, *supra* note 11, at 12-1.

40. N.M. STAT. ANN. § 72-12-1.1 (2003) (emphasis added).

41. *See* Bossert, *supra* note 11, at 12-1 (explaining the holding of the New Mexico Supreme Court that domestic well permits, as any other water right, are conditional upon the availability of water, and as such, do not violate the doctrine of prior appropriation).

42. N.M. CODE R. § 19.27.5.9(D) (LexisNexis 2016).

43. *See* N.M. OFFICE OF THE STATE ENG'R, HOW MUCH WATER DO I NEED?, http://www.ose.state.nm.us/Legal/settlements/Aamodt/PDF/settlement_agreement_how_much_aamodt.pdf [https://perma.cc/LU96-X5CX] (providing examples comparing magnitude of water use, in different units of volume per time).

however, the state municipal code[44] was amended to give municipalities the authority to limit or restrict domestic well drilling.[45] Overall, domestic wells are more loosely regulated than other water uses, as applying for a domestic well permit is a quicker and easier process than applying for any other water right[46] and permit applications do not undergo the same consideration of impacts.

To understand the legal controversy over domestic wells, consider how the domestic well permitting process differs from the permitting process for community wells. A community well comprises water supply that provides multiple households with potable water for indoor and outdoor use. The applicant must give public notice, as well as describe the amount, source, proposed use and site, and show that the well will not impair existing water rights, waste water, or harm public welfare.[47] Significantly, a community well application to the Office of the State Engineer can be rejected. Domestic wells, in contrast, are considered exempt from the scrutiny that community well applications must undergo.[48] Although domestic wells are ultimately governed by the prior appropriation doctrine, the Office of the State Engineer may issue domestic well permits without consideration of the availability of water in the basin, the seniority of water users in the immediate area, or any of the aforementioned rules for small community wells.[49]

In the face of such expedited permitting, the uncertainty of unquantified domestic well pumping implicates water conservation because water rights have not been completely quantified in New Mexico, while it also magnifies existing hydrological uncertainties. For example, 24 percent of the population (43,500 residents) of the Española basin—the watershed inclusive of the City of Santa Fe—use domestic wells.[50] These wells contribute to the over-allocation of water in the upper Rio Grande watershed,[51] even as the Santa Fe stream system is being adjudicated.[52] Water rights in the Rio Grande basin as a whole are also over-allocated and the Rio Grande, like other river basins in New Mexico, exhibits a large flow variance, another source of uncertainty for water managers.[53] Shortages are frequent, with an average annual deficit in the Middle Rio Grande of 55,000

44. N.M. STAT. ANN. § 3-53-1.1 (2001).

45. Bossert, *supra* note 11, at 12-4.

46. A domestic well permit is itself a usufructuary water right, i.e., a right to use water. However, this right is circumscribed: it cannot be transferred, other than selling it with the property to which it is appurtenant.

47. N.M. STAT. ANN. § 72-12-3(A)–(F) (2001).

48. Bounds v. State *ex rel.* D'Antonio, 2013-NMSC-037, ¶ 22, 306 P.3d 457.

49. *Id.* ¶ 29.

50. LEWIS, WATER RESOURCE INVENTORY OF THE ESPAÑOLA BASIN, *supra* note 22, at 43–44.

51. *Id.* at 44.

52. *Santa Fe Water Rights Adjudication Process*, N.M. OFFICE OF THE STATE ENG'R & INTERSTATE STREAM COMM'N, http://www.ose.state.nm.us/Legal/Adjudication/Santa%20Fe/adju_Santa Fe.php [https://perma.cc/CB35-3N9Y].

53. Michael Pease, *Constraints to Water Transfers in Unadjudicated Basins: The Rio Grande as a Case Study*, 144 J. OF CONTEMP. WATER RES. & EDUC. 37, 37 (2010), http://onlinelibrary.wiley.com/doi /10.1111/j.1936-704X.2010.00072.x/pdf (this flow variance has been quantified: the standard deviation of annual flow at nearly half of the mean).

acre-feet per year.[54] Furthermore, there are examples within the past decade of domestic well use of over three AFY, the previous state-wide pumping limit, irrigating lands larger than one acre (the limit on outdoor irrigation use from a domestic well).[55]

In his lawsuit giving rise to the eponymous case, plaintiff farmer and senior water rights holder Horace Bounds challenged the domestic well exemption, alleging his prior appropriation-based state constitutional rights were violated.[56] The New Mexico Supreme Court disagreed with the facial challenge because domestic well permitting does not necessarily and in all cases constitute impairment of other water rights, senior or junior.[57] According to the Court, the issuance of new permits for domestic wells does not constitute impairment, even in a fully-appropriated basin.[58] In light of *Bounds*' definition of "impairment" and upholding of the domestic well exemption, domestic well permits will continue to be issued for the foreseeable future.

The State Engineer retains some power to regulate domestic wells, however, and local regulations are not the only pathway to curtail domestic well use and proliferation. In dicta, the *Bounds* court highlighted the ability of the State Engineer to impose regulations limiting domestic well uptake in order to "ensure senior surface-water users are not harmed by junior domestic wells."[59] The Court reasoned that current regulations allow the OSE to "[e]ffectively deal with some of the practical effects [of domestic wells] . . . including ways to mitigate the effects of domestic wells on water shortages."[60] The court stated four ways senior water rights can be protected from domestic wells: (1) State Engineer-mandated pumping limits;[61] (2) Domestic Well Management Areas (DWMAs)[62] and Critical Management Areas (CMAs);[63] (3) State Engineer curtailment of outdoor use in times of drought;[64] and (4) municipal ordinances.[65]

In addition to the *Bounds* holding, the Court's' discussion of these impairment-prevention methods encourages local regulation of such wells,

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54. *Id*. Note that one acre-foot of water is that amount which would cover one acre of land to a depth of one foot.

55. Balleau & Silver, *supra* note 19, at 815–16.

56. Bounds v. State *ex rel.* D'Antonio, 2013-NMSC-037, ¶ 1, 306 P.3d 457.

57. *See id.* ¶¶ 34, 44 (explaining that domestic well permits are conditional because they are subject to prior appropriation). Furthermore, lowering the water table is not directly defined as impairment.

58. *Id.* ¶ 30 (the Court held that the exemption does not conflict facially with article XVI, section 2 of the NM Constitution). *Id.* ¶ 31.

59. *Id.* ¶ 24.

60. *Id.* ¶ 32.

61. *Id.* ¶ 33.

62. *Id.* ¶ 34; *see also* Bossert, *supra* note 11, at 12-4 (explaining that Domestic Well Management Areas allow domestic wells in a certain delineated area to have conditions imposed upon them by the Office of the State Engineer such as limiting pumping or requiring a transfer of a water right to drill).

63. Critical Management Areas (CMAs) are designated where groundwater resources may be insufficient for future well production. CMAs are located within a declared basin or subarea where, based on average well water columns, estimated future water-level decline is large. CMAs are in effect in the Estancia and Middle Rio Grande basins. *See* OFFICE OF THE STATE ENG'R, *supra* note 16, at 9−10.

64. Bounds v. State *ex rel.* D'Antonio, 2013-NMSC-037, ¶ 38–39, 306 P.3d 457.

65. *Id*. ¶ 21.

especially as management areas and statewide regulations are under-utilized by the OSE. [66] CMAs or DWMAs can address conflicts throughout a specific basin and few have been implemented and enforced across the state.[67] And outdoor use, which can be curtailed by the State Engineer, does not account for all domestic well use. Accordingly, local ordinances appear to be the best available method to address domestic well concerns within a small geographical area.

In contrast to this potential for customizing local regulations, the *Bounds* 'court's assurances that domestic wells should not impair senior water rights have not even been tested. Given this uncertainty surrounding domestic wells' prospective impairment of senior rights, New Mexico administrators must evaluate how to create and implement effective rules or ordinances within the extant statutory framework. In 1999, the City of Santa Fe passed its Domestic Well Ordinance, thus taking up the challenge to fill the governance gap, which would later be laid bare in *Bounds*, between New Mexico case law and the state's Domestic Well Statute.

There is no question as to whether cities can regulate domestic wells under NMSA 1978, Section 3-53-1.1 (2016), which permits municipalities to restrict the drilling of new domestic wells. Santa Fe's domestic well ordinance has been challenged twice, in *Smith v. City of Santa Fe* and *Stennis v. City of Santa Fe.* In both cases, the municipal restrictions on domestic wells were upheld.[68] In *Smith*, the plaintiffs obtained domestic well permits from the OSE and applied for concomitant permits from the City of Santa Fe, which were rejected.[69] They subsequently filed for declaratory relief in New Mexico state district court,[70] and the state's Court of Appeals eventually held the City of Santa Fe had authority under home rule powers[71] to prohibit the drilling of domestic wells within municipal boundaries.[72] The New Mexico Supreme Court concurred.[73] In *Stennis,* a very similar case, plaintiff Martha Stennis, a Santa Fe resident obtained a permit for a domestic well from the OSE.[74] She then filed a complaint in district court seeking a declaratory judgment that the City of Santa Fe did not have the authority

66. Statutes that give regulatory powers to bodies other than the OSE include N.M. STAT. ANN. § 3-53-1 (1965), which gives municipalities the power to regulate the use of wells, and N.M. CODE R. § 3-53-1.1 (2001), which restricts drilling of new wells in certain areas and with certain conditions.

67. N.M. OFFICE OF THE STATE ENG'R, *supra* note 16, at 10 (the State Engineer has restricted well drilling in both the Middle Rio Grande and Estancia Basin CMAs); *see also* Bossert, *supra* note 11, at 12-4 ("to date, the OSE has not designated any domestic well management areas").

68. Smith v. City of Santa Fe*,* 2006-NMCA-048, 139 N.M. 410, 133 P.3d. 866. The Court of Appeals in Smith decided, in tandem with Supreme Court, that the domestic wells statute is, in its simplicity, encouraging regulations from other levels of local government by comparing and interpreting the difference between "shall" and "shall only" language in various statutes. *Id.* ¶¶ 11–16; *see also* Stennis v. City of Santa Fe, 2008-NMSC-008, ¶¶ 3, 14–15, 143 N.M. 320, 176 P.3d 309.

69. *Smith*, 2006-NMCA-048, ¶ 3.

70. *Id.* ¶ 4.

71. "Under home rule, it is assumed that a municipality has a power unless it is expressly denied by state statute or constitution." DIANE LANG, DILLON'S RULE . . . AND THE BIRTH OF HOME RULE 4 (1991), http://nmml.org/wp-content/uploads/Dillon%E2%80%99s-Rule-The-Birth-of-Home-Rule.pdf [https://perma.cc/2QBY-6TKT].

72. *Smith*, 2006-NMCA-048, ¶ 26.

73. Smith v. City of Santa Fe*,* 2007-NMSC-055, 142 N.M. 786, 171 P.3d. 300.

74. *Stennis*, 2008-NMSC-008, ¶ 2.

to regulate domestic wells by municipal ordinance.[75] The court concluded again, in light of the City ordinance, that the state statute allowing for municipal ordinances requires individuals who want to have a domestic well drilled on their property to obtain a City permit before commencing drilling.[76]

There is direction in these cases regarding the need to regulate domestic wells. *Stennis* and *Smith* both reaffirmed municipalities' authority to regulate new wells. According to this case law and the New Mexico statute, an ordinance such as Santa Fe's is one of the few current administrative options to manage domestic groundwater diversions from a limited water supply.[77]

As courts urge local governments to take up the mantle of domestic well regulation, the Santa Fe region may be facing a governance gap, which has been defined as "a lack of integration in planning processes and a failure to examine and communicate the consequences of both land use and water choices at various levels of government."[78] The Santa Fe area does not have Office of the State Engineer administrative guidelines required to establish a Critical Management Area, which could restrict domestic well uptake and construction. Accordingly, no formal CMAs have been designated or implemented in Santa Fe since their inception in 2006.[79] *Stennis*, *Smith*, and *Bounds*, however, each called for local administration of domestic wells in order to curtail domestic well uptake. Santa Fe's ordinance can be viewed as an attempt to fill this regulatory gap, both to protect water rights and to regulate other domestic well concerns.

III. SANTA FE'S DOMESTIC WELL ORDINANCE

Few cities have taken up the power to regulate domestic well drilling under NMSA 1978, Section 3-53-1.1 (2016). The City of Santa Fe, however, has often been at the forefront of adapting water management to climate change in the West[80] and issued its domestic well ordinance in 1999.[81] The ordinance, which set various constraints on new domestic wells within the city limits, was subsequently amended in 2004.[82] Between 2013 and 2015, the City's Water Conservation

75. *Id.* ¶ 2.

76. *Id.* ¶ 26.

77. *Compare Smith*, 2006-NMCA-048, *and Stennis*, 2008-NMSC-008, *with* N.M. STAT. ANN. § 3-53-1.1 (2001) *and* N.M. STAT. ANN. § 72-12-1.1 (2003).

78. Sarah Bates, *Bridging the Governance Gap: Emerging Strategies to Integrate Water and Land Use Planning*, 52 NAT. RESOURCES J. 61, 61 (2007).

79. N.M. OFFICE OF THE STATE ENG'R, INTERSTATE STREAM COMM'N, JEMEZ AND SANGRE REGIONAL WATER PLAN 158 tbl.8-1, http://www.ose.state.nm.us/Planning/RWP/Regions/03_jemezysangre/2016/Reg%203_Jemez%20y%20Sangre%20Regional%20Water%20Plan%202016_November%202016.pdf [https://perma.cc/ZM7V-QVB5].

80. Santa Fe has been at the forefront of diversification of drinking water sources as well as water conservation. For example, the City is a "WaterSense" partner with USEPA—a function of its water conservation credit program—and ""has a long-range water supply plan which includes the use of multiple above and below ground sources for the city water utility. *See 10 Places to Watch in 2010: Santa Fe, New Mexico*, BUILDING CODES ASSISTANCE PROGRAM, http://bcapcodes.org/tenplaces/santa-fe [https://perma.cc/P3CE-RECB].

81. SANTA FE, N.M., CITY CODE § 25-1.10 (2016).

82. *Id*. § 25-1.10(F)(4).

Committee conducted a thorough review of domestic well management in Santa Fe.[83]

A. Water Resource Management and Conservation in Santa Fe

As with its recent review of its domestic wells, historically Santa Fe' has actively managed its water scarcity. Having diversified its potable and non-potable water sources,[84] the City's potable sources now include:

- two small reservoirs in the Sangre de Cristo Mountains fed by the Santa Fe River;
- two well fields in the Tesuque Formation aquifer (one within the heart of the city and one near the Rio Grande northwest of the municipal boundary); and
- surface-water from the San Juan–Chama Project, which pipes water under the continental divide to the Rio Grande.

On average, fifty percent of Santa Fe's water is sourced from surface-water from the Buckman Direct Diversion (which connects to the San Juan–Chama Project); thirty percent comes from the two small reservoirs; fifteen percent comes from the Buckman well field; and the remaining five to ten percent of the City's water comes from its well field.[85]

Santa Fe has also implemented extensive water resource planning and conservation incentives. For example, the City does not automatically provide new net water, that is, water that would increase the city's total water budget, to developers. New users of water (e.g., development) must buy water rights or water from a water conservation bank to provide offset water and they must submit water budgets.[86] The City's various conservation ordinances include water use restrictions and residential and commercial rebates for high-efficiency toilets, as well as other water-saving methods.[87] The City asserts that conservation ordinances and credits also apply to water pumped from domestic wells.[88]

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83. *Cf.* Minutes of the City of Santa Fe's Water Conservation Committee 11–12 (Aug. 13, 2013) (establishing the Water Conservation Committee's Domestic Wells Working Group), http://www.santafenm.gov/archive_center/document/9967 [https://perma.cc/4Z6B-BMYL].

84. *See* J.T. McGucklin et al. *Pricing and Conservation* at 189–92.

85. *See* CITY OF SANTA FE, WATER DIV., ANNUAL WATER REPORT 4 tbl.3 (2015), www.santafenm.gov/document_center/document/5224 [https://perma.cc/44VA-BKRE]; *see also Death by a Thousands Cuts: Will Santa Fe's Campaign to Buy Water Rights Kill the Rio Grande*, SANTA FE REPORTER (June 27, 2012, 12:00 am), http://www.sfreporter.com/santafe/article-6807-death-by-a-thousand-cuts.html [https://perma.cc/BFC7-6ZMX] (quoting Santa Fe's water resources and conservation manager, Rick Carpenter, characterizing the "no new net water" rule).

86. *See* SANTA FE, N.M., CITY CODE § 25-11 to -12.

87. *See* SANTA FE, N.M., CITY CODE § 25-3.1-3 (providing that city wastewater code applies to domestic wells) and § 25-11.3 (providing for Water Conservation Credits).

88. *See* Minutes of the City of Santa Fe's Water Conservation Committee, Ex. 8(B) at 3 (slide 12) (Sept. 10, 2013) (containing draft presentation by independent consulting hydrologist Amy Lewis entitled "Water Use and Conservation Potential for Domestic Wells in the Santa Fe Area") ("Rules apply to all water customers and all residents in the city limits, including domestic wells"), http://www.santafenm.gov/archive_center/document/8222[https://perma.cc/3EEM-DQYQ]

Owing to conservation efforts, long-range planning, and a diverse source portfolio, the City Water Conservation Committee characterizes Santa Fe's water supply as sufficient to meet projected demand. Indeed, average per-capita use of municipal water is 107 gallons per day per person, a low value among Southwestern cities,[89] and the current forty-five-year conservation plan calls for a 20 percent reduction in total demand by 2045.[90] The city's water utility thus appears to have two major planning goals: to provide water for its customers and to curtail use.

The implementation of Santa Fe's domestic well ordinance has also brought about equity concerns with respect to the right to water for different categories of water users. Most domestic wells are older than the ordinance and thus not metered, so their water is priced differently. The effective price of water in that case is the sum of the cost of installation,[91] pumping, and repairs, as opposed to water use-based prices charged to city users. City users are thus incentivized by such an increasing block rate structure and rewarded through tax incentives for conservation; well owners are not. Although domestic wells may provide for enhanced water access in a drought, some assert that these wells negatively impact water utility maximization. According to this argument, city water lines connected to more customers would provide water at a lower average cost than the sum of the drilled wells and the utility costs. Municipal water can also be considered more sustainable that domestic wells because water is consumed from multiple surface and groundwater sources in different locations, rather than from limited groundwater sources only.

B. Stipulations of the Ordinance

Santa Fe's domestic well ordinance applies within the city limits. The ordinance itself does not limit pumping;[92] rather, the city's *practice* is to allow new wells that use less than one-quarter AFY per household. Drilling a new well is permissible when farther than 300 feet from a city water distribution line or less than 300 feet if the cost to hook up to the city line is greater than the cost of drilling a well (known as the "300 foot Rule").[93] The ordinance also requires monthly metering and annual reporting of use to the city. The city may add additional permitting conditions.[94] For example, the ordinance specifies that certain wells in an area delineated by the city water authority must be drilled fifty feet into the Tesuque formation, and sealed to avoid contamination into or from the Ancha

89. CITY OF SANTA FE WATER CONSERVATION OFFICE, CITY OF SANTA FE WATER CONSERVATION AND DROUGHT MANAGEMENT PLAN 2015, at 2, 17 (2015), http://drought.unl.edu/archive/plans/drought/city/SantaFeNM_2014.pdf [https://perma.cc/6H9F-KS2C].

90. CITY OF SANTA FE, LONG-RANGE WATER SUPPLY PLAN 4-2 (2008), www.santafenm.gov/document_center/document/772 [https://perma.cc/338T-8LYG].

91. The cost of installing a well includes the costs both of drilling and equipping the well.

92. SANTA FE, N.M., CITY CODE § 25-1.10(F)(5).

93. *See* N.M. STAT. ANN. § 3-53-1.1 (allowing cities to restrict domestic well drilling and providing the 300 foot Rule); *see also* SANTA FE, N.M., CITY CODE Section 25-1.10(D)−(E) (2017) (reflecting the statutory requirement).

94. SANTA FE, N.M., CITY CODE § 25-1.10(F)(7).

formation.[95] Wells must also be constructed according to City standards by a licensed well driller. [96] In turn, the ordinance demands well owners demonstrate offsets[97] or buy into a conservation program for their water use.[98] These rules provide limitations and guidelines to limit the effects of wells drilled after 1999. Old wells—which the City assumes to total at least 700—are unaffected.[99] As owners of these pre-1999 wells apply for replacement well permits, however, they fall under the ordinance and must be approved by the city.[100] Finally, the ordinance allows the City to put further limitations on new wells "to prevent waste, conserve water, preserve health and safety and general welfare."[101]

C. The Ordinance in Relation to Other Policies

Statutory regulations for domestic wells are less stringent than the Domestic Well Ordinance in Santa Fe.[102] The Domestic Well Statute (DWS) limits uptake to one AFY, and while the city ordinance does not contain a stricter limit, in practice new permits are approved with a limit of one-quarter that rate. Other aspects of the Santa Fe Domestic Well Ordinance are identical to state rules. The

95. *Id.* § 25-1.10(F)(1). *See* R. ALLAN FREEZE & JOHN A. CHERRY, GROUNDWATER 385–462 (1979) (reviewing groundwater contamination); *see also* U.S. GEOLOGICAL SURVEY, GEOLOGIC AND HYDROGEOLOGIC FRAMEWORK OF THE ESPANOLA BASIN—PROCEEDINGS OF THE 4TH ANNUAL ESPANOLA BASIN WORKSHOP, SANTA FE, NEW MEXICO, MARCH 1–3, 2005, at 22 (Kevin C. McKinney ed., 2005), https://pubs.usgs.gov/of/2005/1130/pdf/508OF05-1130.pdf [https://perma.cc/37TE-RL82] (providing a hydrogeological overview of the Ancha formations); D.J. Koning et. al, *Redefinition of the Ancha Formation and Pliocene-Pleistoncene Deposition in the Santa Fe embayment, North-central New Mexico*, 24 N.M. GEOLOGY 3 (2002), https://geoinfo.nmt.edu/publications/periodicals/nmg/24/n3/nmg_v24_n3_p75.pdf [https://perma.cc/84A9-BVCP] (providing an overview of hydrogeological formations in the Santa Fe region, including both the Tesque and Ancha).

96. SANTA FE, N.M., CITY CODE § 25-1.10(F)(3).

97. SANTA FE, N.M., CITY CODE § 25-12. Offsets can be made by buying into the Water Conservation Credit Program, which aims to increase system-wide water conservation, facilitate offsetting impacts on the City's water supply system from new development, and supply water for other municipal uses. Water conservation credits are placed in the City's water bank, to offset the impact of the city's water system.

98. *Id*. (referencing SANTA FE, N.M., CITY CODE § 14-8.13(F)).

99. SANTA FE, N.M., CITY CODE § 21-1.10 3 (Oct. 7, 2014); THE CITY OF SANTA FE WATER CONSERV. COMM. WORKING GRP. #5 (PRIVATE WELLS IN THE CITY), *Regulation of Private Wells in the City of Santa Fe*, *New Mexico: An Assessment of the Need, Benefit and Powers of the City to Regulate the Use of Private Wells* 3 [hereinafter *Working Grp. Rpt.*] (included as attachment to Minutes of the City of Santa Fe's Water Conservation Committee (Oct. 7, 2014) ("Cautioning that the database may not be complete because there are wells that were in place before 1956 when the Office of the State Engineer (OSE) began requiring permits for private wells for household or domestic use in the Santa Fe area, Erdmann states that there are 753 domestic wells located within the City of Santa Fe's current boundaries based on the most current (2011) records in the OSE database."), http://www.santafenm.gov/archive_center/document/10748 [https://perma.cc/SUC9-VWFJ].

100. *See Working Grp. Rpt*., *supra* note 99, at 10.

101. SANTA FE, N.M., CITY CODE § 21.1-10.

102. *See* SANTA FE, N.M., CITY CODE § 25-1.10; N.M. STAT. ANN. § 3.53.3, 72-12-1.1, 72-12-3 (2016); N.M. CODE R. § 19.27.5.14 (2016). Within the city limits, there are a few categories of wells requiring OSE oversight in addition to the that provided by the municipal ordinance. Metered wells in the Española region, including Santa Fe, report their pumping to OSE if they serve more than one house, service incidental commercial uses, or are in the Aamodt settlement area.

language of the 300 foot Rule, for example, is also found in the statute allowing municipalities to regulate the drilling of domestic wells.[103] The City ordinance requires that new well drillers be issued a permit by the Office of the State Engineer prior to applying for their well to the city, a stipulation also found in the statute that allows cities to regulate domestic wells.[104] Overall, the ordinance furthers Santa Fe's conservation efforts owing to this added obligation to apply to the City for a permit, which can be rejected.[105]

The goal of Santa Fe's domestic well ordinance can be inferred from language in its last stipulation, which allows the city to put further limitations on wells in order to promote conservation and protect public health. In the context of the City's water planning, the ordinance appears to address aquifer protection by requiring additional stipulations for approval in comparison to state-wide limits on domestic well pumping. The city has a vested interest in protecting the aquifer domestic wells pump because it is one of the same sources the city uses for municipal water.[106] Furthermore, the City reviewed the ordinance and the applicability of other regulations to domestic wells through the Water Conservation Committee's Domestic Well Working Group from 2012 to 2014.[107] It therefore appears that Santa Fe is attempting to achieve their perceived conservation goals, to protect their water source from other unquantified uses, and to limit the proliferation of domestic wells within the municipality.

IV. INTERFERENCE

A. Wells and Rivers

Proliferation of domestic wells can be a concern to other water uses because of well interference effects. "Interference" refers to the ability of any well tapping into groundwater to affect other groundwater uses and surface-water rights through cones of depression in unconfined aquifers. Cones of depression are the result of groundwater pumping at such rates that conical depletions occur in response, lowering the local water table.[108] These depletions may intersect, affecting an added decrease of the water level in each well.[109] This enhanced water

103. *See* N.M. STAT. ANN. § 3.53.3 (1965).

104. SANTA FE, N.M., CITY CODE § 25-1.10; N.M. STAT. ANN. § 3.53.3 (2016).

105. *See Working Grp. Rpt.*, *supra* note 99, at 7 ("Since the enactment of the [ordinance], the city has denied most applications for the installation of new wells.")

106. Justin Horwath & Joey Peters, *Well, Well,* SANTA FE REPORTER, July 30, 2013, http://www.sfreporter.com/santafe/article-7604-well-well.html [https://perma.cc/ZV9H-G2XU] (The ordinance was created to some extent as the city felt the need to protect the water source for the city utility wells. According to Marcos Martinez, Santa Fe was interested in the matter "because it sort of viewed the proliferation of these [domestic] wells as a potential impact on the city's own well system—the city's ability to provide a safe and available water supply to the city of Santa Fe").

107. *See* Agenda, City Council of Santa Fe Water Conservation Committee Meeting (Aug. 8, 2013) (on file with the Santa Fe City Clerk).

108. *See* Drennan Jocelyn, Comment, *Lassoing the Loophole: The Need to Rope in the Use of the Domestic Well Loophole by Subdividers in New Mexico,* 37 NAT. RESOURCES J. 923, 940 (1997).

109. *See, e.g.*, J.G. FERRIS ET AL., U.S. GEOLOGICAL SURVEY, PUB. NO. 1536(E), THEORY OF AQUIFER TESTS 148 fig.37(b) (providing a conceptual diagram of the enhanced water level drawdown, or resultant "cone of depression").

level drawdown can eventually result in both wells running dry.[110] When cones of depression exist in specific locations, or high well density results in overlapping cones of depression in a small land area, domestic wells may thus interfere with other ground or surface-water rights and uses.[111]

Domestic well interference with surface flows in rivers or streams can occur due to the dynamics of groundwater flow in the local aquifer and the interconnected nature of surface and groundwater. Stream-flow reduction—the rate and timing of the effect on rivers by groundwater pumping—depends on the distance from the pumping location to the river as well as aquifer storage properties. Wells will either intercept groundwater base-flow that would otherwise flow into rivers or pull water from the rivers through enhanced riverbed infiltration.[112] Stream-flow reduction can ensue to varying degrees based on a well's pumping rate and the periodicity of that discharge, in addition to the well's location and depth.[113] Minor tributaries, rather than interstate streams, are most likely to be in danger from domestic well pumping as domestic wells pump at relatively low rates.[114]

Even at relatively low pumping rates, domestic wells that draw from riparian aquifers could adversely affect groundwater-dependent ecosystems if they disrupt the underground water exchange balance.[115] Wetland health and riparian ecosystem viability rely on both surface and groundwater fluxes; riparian vegetation can die out when the water table is lowered below the root depth of riparian flora for extended periods of time.[116] The use of domestic wells—unquantified and potentially in excess of the groundwater exchange balance—could increase the rate of depletion of surface-water sources or lower the water table in shallow riparian aquifers that support riparian and hyporheic flora and fauna. In the Santa Fe area, pumping-related long term reduction in aquifer storage in the shallow Ancha Formation threatens the existence and viability of wetlands on the lower Santa Fe River.[117]

Depletions from streams are dependent on specific hydrogeologic conditions that vary from area to area. However, domestic wells are likely to be

110. *Id.*

111. *See* Jocelyn, *supra* note 108, at 940.

112. Maddock III & Barroll, *supra* note 3, at 211.

113. JOHN METESH, MON. BUREAU OF MINES AND GEOLOGY OPEN FILE REPORT NO. 612, HYDROLOGY RELATED TO EXEMPT WELLS IN MONTANA 16, http://www.mbmg.mtech.edu/pdf-open-files/mbmg612.pdf [https://perma.cc/3AB3-NU58].

114. Balleau & Silver, *supra* note 19, at 828.

115. Robert H. Webb & Stanley A. Leake*, Ground-Water Surface-Water Interactions and Long Term Change to Riverine Riparian Vegetation in the Southwestern United States*, 320 J. OF HYDROLOGY 302, 308 (2006) "A substantial withdrawal draws down the aquifer sufficiently to create a water-level gradient away from the stream and floodplain . . ." *Id.* at 308. "[A]fter a substantial period of pumping in excess of the rate of ground-water flow from up-gradient areas, surface-water and groundwater systems may become disconnected if streamflow cannot provide enough recharge to maintain water levels in the alluvial aquifer . . . [In this case], riparian vegetation can be strongly affected." *Id.*

116. *Id.*

117. *See* Peggy S. Johnson, *Water, Watersheds, and Land Use in New Mexico Impacts of Population Growth on Natural Resources Santa Fe Region 2001,* 1 N.M. DECISION-MAKERS FIELD GUIDE 1, 145, 147 (2001).

located near a stream, affecting a river's hydrologic balance. One quarter of domestic wells in New Mexico pump from within a mile of a stream and, as of 2005, half of all known domestic wells are in a river-connected aquifer. [118] Wells in floodplains can create drawdowns from rivers that are used by senior water rights holders who rely on specific surface-flow quantities (although some of these effects may be negated over time by return flows).[119] Balleau and Silver estimated that in the year 2000, 11,780 acre-feet were depleted from interstate streams because of domestic wells, an estimate that nearly doubles by 2040.[120]

B. Interference in Santa Fe

In Santa Fe, surface-water is limited to small streams, acequias, storm-water runoff, and the Santa Fe River. Even though flows in the lower reach of the Santa Fe River have generally been low over the past decade,[121] the city code attempts to protect the river.[122] While significantly urbanized, the watershed of the Santa Fe River—which runs directly through the city with its headwaters in the Sangre de Cristo Mountains—includes a number of wetlands. Located downstream of the city, these ecosystems are in need of protection.[123] To this end, Santa Fe has codified a goal for a flowing river—a target of 1,000 AFY in "average years." This target flow represents approximately one-fifth of the annual watershed yield. [124]

Despite this "living river" goal, a number of wells within one-quarter mile of the river may remain entirely unregulated until they are in need of re-drilling or repair, and the Domestic Well Ordinance only applies to wells drilled after 1999 and the state WATERS database[125] does not include wells drilled before 1956. Although the Ancha formation that intersects the hyporheic zone[126] of the Santa Fe River is hydrologically disconnected from the deeper Tesuque Aquifer in many

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118. Balleau & Silver, *supra* note 19, at 817.

119. *See* Maddock III & Barroll, *supra* note 3, at 203; Titus, *supra* note 10, at 857.

120. Balleau & Silver, *supra* note 19, at 827.

121. *See* Claudia Borchert & Brian Drypolcher, *Sustaining the Santa Fe River*, 9 URB. WATERSHED MGMT. 28, 29 (2010), http://www.swhydro.arizona.edu/archive/V9_N1/feature6.pdf [https://perma.cc/SMV8-8RUY]; *see also* AMY LEWIS & CLAUDIA BORCHERT, SANTA RIVER STUDIES: STREAM FLOW 2–4 figs.2–4 (2009), http://www.santafenm.gov/document_center/document/758 [https://perma.cc/27BJ-YNZL].

122. SANTA FE, N.M., CITY CODE § 25-13.3 (2016) (attempting to "formalize the city's commitment to provide for a target flow within the Santa Fe River in order to enhance and further the objective of restoring the Santa Fe river as a living river by committing to use up to one thousand (1,000) acre-feet per year (AFY) of the city's water supply, depending upon hydrologic conditions in the Santa Fe River watershed") (and providing that Section 25-13 "shall be interpreted to further this objective").

123. JANSENS JAN-WILLEM, KEEPING SANTA FE COUNTY WETLANDS VIABLE AND FUNCTIONING 15 (Ecotone ed., 2012), https://www.env.nm.gov/swqb/Wetlands/WAP/SFC/SantaFeCountyWAP12-31-12.pdf [https://perma.cc/7B9P-EXZU] (the Santa Fe County Wetlands Action Plan is a summary review of the need to keep the wetlands viable and how to accomplish that objective).

124. SANTA FE, N.M., CITY CODE § 25-13.3.

125. *New Mexico Water Rights Reporting System*, OFFICE OF STATE ENG'R, http://nmwrrs.ose.state.nm.us/index.html. Also known as WATERS ("Water Administration Technical Engineering Resource System"), the database was published online in 2000. Its purpose is to "provide on-line access to Office of the State Engineer well reports and well permits in New Mexico." *Id*.

126. The zone in the earth both below and along a riverbed where surface-water and shallow groundwater mix.

areas, many known domestic, municipal, and commercial wells lie close to the Santa Fe River on the east side of the City.[127] To make matters worse, meter reporting is not enforced by the City and unmetered, older and unaccounted wells are likely located closer to the river, where they can more easily pump (i.e., intercept) the groundwater recharge the river can provide. Indeed, there is no method to guarantee that domestic wells near the Santa Fe River will not adversely affect both the flow and the riparian ecosystem downstream.

The ordinance does mitigate inter-formation interference, mandating that wells be drilled at least fifty feet into the Tesuque formation underlying the Ancha and completed with a proper seal. But it is not clear where this applies because the locations to which these stipulations apply are not codified.[128] Without any restrictions of domestic well proximity to the river, the ordinance fails to directly address the conflict between a flowing river and domestic wells that could draw groundwater from nearby,[129] a conflict that has been noted by Santa Fe's Water Conservation Committee.[130]

The City ordinance does not directly address well interference with other wells either as it contains no rule regulating well spacing, except for a ten to twenty foot infrastructure easement provision.[131] Although the ordinance states that wells must be completed in and pump only from the Tesuque formation, this specification impedes the mitigation of interference between users because the Tesuque is the same water-bearing formation that the city well field, for example, draws from. Realistically, there is no better formation to pump because the Ancha formation, on the other hand, is connected to the Santa Fe River and pumping there could affect river flows through induced groundwater recharge.

The 300 foot Rule may only marginally help avoid interference between wells. The rule requires users to hook up to the city water utility when that costs less than drilling a well, and in the absence of the 300 foot Rule, wells could be drilled in those locations instead. However, Santa Fe's domestic well ordinance does not regulate wells farther away from the city's water lines or outside the city's boundaries. These wells may still have an effect on the Tesuque aquifer, from which the City pumps.[132] Additionally, the Ordinance's 300 foot rule is required by state statute and thus duplicative.[133]

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127. *See* LEWIS, WATER RESOURCE INVENTORY OF THE ESPAÑOLA BASIN, *supra* note 22, at 21 (see Office of the State Engineer WATERS Database, Figure 7).

128. SANTA FE, N.M., CITY CODE, § 25-1.10(F)(2); Thomas C. Winter, *Relation of Streams, Lakes, and Wetlands to Groundwater Flow Systems*, 7 HYDROGEOLOGY J. 28–45 (1999).

129. It is axiomatic that different sources in the hydrologic cycle should not be treated in isolation because groundwater and surface-water are interconnected.

130. *See* Minutes of the City of Santa Fe's Water Conservation Committee, *supra* note 88, 12.

131. SANTA FE, N.M., CITY CODE, § 25-1.10(F)(4).

132. In contrast, domestic wells near the city's Northwest Well are regulated by the ordinance. *Cf.* ZANE SPIEGEL & BREWSTER BALDWIN, U.S. GEOLOGICAL SURVEY, WATER-SUPPLY PAPER NO. 1525, GEOLOGY AND WATER RESOURCES OF THE SANTA FE AREA, NEW MEXICO 216–20 (1962), https://pubs.usgs.gov/wsp/1525/report.pdf [https://perma.cc/HDN6-KMSX] (characterizing the hydrogeology of the Tesuque Formation). Domestic wells may impact the pumping ability of the city's Northwest Well, and that well may be causing a water level decline for domestic well users. In a dispute between the City of Santa Fe and the Office of the State Engineer, a number of well owners claimed that water table drawdowns they suffered were caused by the city's North Well. OSE monitoring wells have shown up

Other statutes and rules also do not protect against interference between domestic wells and other water rights; in fact, some may even exacerbate the problem. The Aamodt Settlement allows for some non-Pueblo domestic wells to use more water (based on their historic beneficial use) than their neighbors (regulated under the ordinance).[134] At least in the short term, this compromises the City's ability mitigate domestic well interference.[135] The City might benefit from taking the Settlement into account in their water planning, perhaps even restricting domestic wells in that area to allow the aquifer to recover, if necessary. Balleau and Silver argue that as long as domestic wells are spaced more than 300 to 500 feet. from each other, they should not cause significant interference.[136] DWMAs and CMAs may provide alternative pathways to restrict uptake and wells in certain locations—if they are ever implemented; but ultimately interference between domestic wells and other ground and surface-water uses remains largely unregulated in the City of Santa Fe.

V. AQUIFER SUSTAINABILITY

A. Defining Sustainability

Apart from interference effects, domestic well pumping on a large scale is also feared to disrupt the balance between recharge and outflow from aquifers by consuming more water than is sustainable. However, without measurable parameters, "sustainability" is an empty term. In order to more properly account for sustainability, water managers must define a concrete time horizon as the benchmark for how long the resource can be sustained with specific pumping parameters.

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to 3.2 feet of drawdown in the area affected by the City's well. However, it is unclear what is causing the drawdown since water table declines do not occur uniformly in relationship to the North Well. The complex geology of the area may have confounding effects. In either scenario, water level declines will affect both the city and the domestic well users, providing an example of the need for well-to-well interactions to be examined and limited.

133. N.M. STAT. ANN. §§ 72-12-1.1, 72-12-3 (2016); *see also* N.M. ADMIN. CODE § 19.27.5.14 (LexisNexis 2006).

134. *See Aamodt Water Rights Settlement*, N.M. OFFICE OF THE STATE ENG'R, http://www.ose.state.nm.us/Legal/settlements/Aamodt/index_aamodt.php [https://perma.cc/MD9A-M4LF]. The Aamodt settlement of water rights was a multi-party deal begun in 2000 and signed in 2013 between the State of New Mexico; the United States; the City of Santa Fe; Santa Fe County; the Pueblos of Nambé, Pojoaque, Tesuque, and San Ildefonso; as well as non-pueblo water right users. Santa Fe County is responsible for 1,500 AFY of water for non-pueblo users.

135. Under the settlement affecting the area north of Santa Fe (Tesuque, Nambe and Pojoaque), Domestic wells were put into four categories: (1) pre-basin wells are allowed more than domestic use (their adjudicated use is based on "historic" use), (2) wells permitted prior to 1983 moratorium, (3) wells signed as part of the 1982 well agreement (enacted in 1999), or (4) wells that were not a party to the agreement. All wells can be protected from priority calls if they connect to the CWU eventually or to keep their well in perpetuity and reduce usage to varying degrees dependent on their categorization. *See* LARRY WHITE, SUMMARY OF AAMODT SETTLEMENT RE: DOMESTIC WELLS—SECTION 3.1.7 1 (2013) http://www.santafecountynm.gov/userfiles/Aamodt_2013/Aamodt-SummaryofAamodtSettlement-DomesticWells2013.pdf [https://perma.cc/ZL7N-GBRJ].

136. Balleau & Silver, *supra* note 19, at 823.

There may not be an easy method to evaluate domestic well pumping effects on aquifer levels. "Safe yield" was a commonly used concept signifying sustainable rate of pumping from an aquifer. It was defined in 1959 as "the amount of water which can be with withdrawn from a groundwater basin annually without producing an undesirable result"—in other words, average annual recharge.[137] Yet the use of this concept, which dictates that pumping should not exceed aquifer recharge rates, has been criticized on the basis that sustainability should be established based on hydrologic mass-balance concepts.[138] Safe yield may not accurately account for sustained water levels and aquifer storage, or for long term outflows to seeps and streams.[139] Surface recharge is often not the only inflow and pumping may not be the only outflow, as most aquifers are hydrologically connected to other pathways for water movement, above and below ground. Balleau argues that hydrologists should consider, instead, analyzing transient (rather than steady state) responses of hydrologic boundaries when under stress, i.e., over-pumping or drought. Balleau makes clear that natural recharge 'should not be the determining factor in policy decisions on how wells affect aquifer sustainability."[140]

Some suggest that, in place of "safe yield," water managers should employ the concept of "sustainable yield,"[141] that is, aquifer use consistent with sustainable development goals. In this case, cities must consider their baseline, i.e., what groundwater levels they would deem acceptable or "unimpaired." The definition of "unimpaired supply" should in turn be paired with an understanding of long-term balances in aquifers. One such dynamic, for example, is the offset to aquifer recharge by discharge through evapotranspiration and through exfiltration[142] to groundwater-dependent surface flows such as streams, springs, and seeps. Therefore, even where groundwater pumping equals aquifer recharge, "eventually streams, marshes, and springs may dry up."[143]

Even so, total domestic well pumping may not have a significant effect on the overall water budget for a large region because these wells draw very small quantities of water at low rates.[144] Balleau, for example, argues that domestic wells are the least impactful human water use in the Albuquerque Basin.[145] According to the best available information, domestic wells currently do not appear to be a threat

137. DAVID KEITH TODD, GROUND WATER HYDROLOGY 200 (1st ed. 1959); DAVID KEITH TODD, GROUND WATER HYDROLOGY 469 (3rd ed. 2005) (noting safe yield is "basically limited to average annual recharge").

138. M. Sophocleaous, *From Safe Yield to Sustainable Development of Water Resources—The Kansas Experience*, 235 J. OF HYDROLOGY 27, 27 (2000).

139. W. Peter Balleau, *The Policy of "Pumping the Recharge" is Out of Control*, 94 EOS 4, 4 (2013).

140. *Id.*

141. *Cf.* Sophocleaous, *supra* note 138, at 29.

142. Water moving from one focus body to another—in this case, groundwater to surface-water (i.e., a river gaining water from the ground).

143. Sophocleaous, *supra* note 138, at 29

144. Balleau, *supra* note 139, at 4.

145. *See generally* Balleau & Silver, *supra* note 19, at 833 ("Among the major categories of water use, domestic well use is the smallest category and the most sustainable of water uses with the least impact on the water resource and the interrelated streams").

to the sustainability of the aquifer used for drinking water beneath Santa Fe due to their low pumping rates and the thickness of the aquifer. Estimates of groundwater in the Tesuque Formation show values from 500 to 4000 feet in saturated thickness.[146] The State Engineer limited domestic well use to one AFY in 2005, and Santa Fe's one-quarter AFY limit[147] is a step closer approximation to average household use in Santa Fe, at 107 gallons per day (or 0.12 AFY).[148] Indoor uses in a household with efficient water installations can amount to as little as forty-five gallons per day.[149] Outdoor water use varies from eight to thirty-two gallons per square foot per day.[150] Independent hydrologist Amy Lewis has estimated that in Santa Fe residential per capita demand, the sum of indoor and outdoor use, varies from 77 to 167 gallons per day depending on conservation appliances and garden types.[151] Clearly, Santa Fe households can and do conserve, and this ethic may help—either normatively or quantitatively—to define sustainable groundwater use.

It is also clear, however, that a dramatic increase in the number of domestic wells could affect the water table. One hydrologic model predicts a rate of three feet of water level drawdown in forty years, due to the current pattern of domestic wells pumping rates according to available data.[152] Although a very small portion of water pumped by domestic wells may be returned to the ground as return flow from outdoor watering,[153] this flow will not make up for removed (i.e., consumed) water on the same time scale as the withdrawals due to evapotranspiration and the slow movement of groundwater. Accordingly, where cities have quantified goals for maintaining groundwater levels, domestic well pumping should be included in their estimates.

Maintaining groundwater levels is critical for Western cities because water resources are relatively scarce. In Santa Fe, when reservoir levels decline or surface-water is unavailable due to quality concerns related to wildfire events, the city relies more heavily on groundwater sources.[154] Furthermore, the Española

146. Amy Lewis & Francis West, *Conceptual Hydrologic Systems for Santa Fe County, in* N.M. GEOLOGICAL SOCIETY GUIDEBOOK NO. 46, GEOLOGY OF THE SANTA FE REGION 299, 304–05 (1995), https://nmgs.nmt.edu/publications/guidebooks/downloads/46/46_p0299_p0306.pdf [https://perma.cc/58T3-EUUS].

147. Stacy Matlock, *City Ban on New Private Wells Upheld*, SANTA FE NEW MEXICAN, Sept. 29, 2007, http://www.santafenewmexican.com/news/local_news/city-ban-on-new-private-wells-upheld/article_a21d04e6-5ad4-50c3-b634-e5ed6144873b.html [https://perma.cc/8UUY-C8L7].

148. CITY OF SANTA FE, WATER DIV., *supra* note 85, at 7.

149. LEWIS, WATER RESOURCE INVENTORY OF THE ESPANOLA BASIN, *supra* note 22, at 48.

150. *Id.*

151. *Id.*

152. Balleau & Silver, *supra* note 19, at 846 fig.14–847 fig.15

153. Washington Water Trust, estimates this at less than ten percent (90 percent consumptive use outdoors). *See Dungeness Water Exchange FAQ*, WASH. WATER TRUST, http://www.washingtonwatertrust.org/dungeness-water-exchange-faqs [https://perma.cc/5FXH-BW3D].

154. Santa Fe uses San Juan–Chama water through the Buckman diversion and wellfield, as well as the Nichols reservoir in the Santa Fe National Forest. The watersheds contributing to those two sources of water sources can be and have been impacted by forest fires. The immediate aftermath of large fires is that surface-water use can and has been cut off from these sources. Runoff waters, full of ash and sediment, are both undrinkable and untreatable and often dangerous during flooding. Long-term water quality can also be impacted by runoff from fire events. For more information on wildfires effect on

basin—which contains the Santa Fe River Basins—gets very little aquifer recharge. The existing recharge occurs mostly in the higher elevations of the region due to the high evapotranspiration and temperatures, as well as the low precipitation rates in the valleys. Additionally, drought can cause a significant lowering of the water table, up to thirty feet in mountainous regions, which are more sensitive to this drought-induced effect as steeper water-table gradients drain water faster.[155] In contrast, recharge rates are consistently low; McAda and Wasiolek estimated that precipitation contributes 0.05 to 0.5 inches to the water table per year.[156] Sub-surface recharge is occurring in the Santa Fe River Basin at slightly higher rate of approximately 2.7 inches per year.[157] The Tesuque aquifer has also shown indications of being a leaky aquifer, in which some groundwater flows to other basins.[158] Establishing an accurate model of the water table, as well as creating a water budget with that baseline in mind, are important and unrealized steps towards establishing the extent to which domestic wells can draw from the aquifer without long-term consequences.

Unfortunately, total domestic well uptake from the Tesuque aquifer below Santa Fe is unknown. Known domestic wells, numbering 8,200 in the Española basin, pump approximately 5,600 AFY, for a per well average of 0.68 AFY,[159] but 98 percent of domestic wells within the state's WATERS database have no reported meter readings.[160] Within the City of Santa Fe, the database returns a total of 753 wells known to have been drilled after 1956. One report estimates these domestic wells account for 260 AFY,[161] a small quantity in comparison to Santa Fe's municipal water demand (roughly 10,000 AFY in 2011).[162] Still, multiple water uses are sourced from the Tesuque Formation, including city wells. This lack of information contributes to unfinished water budget accounting, which can be exacerbated by the proliferation of unmetered domestic wells.

B. Aquifer Use in Santa Fe's Ordinance

In the case of Santa Fe, the city's goal is to use the aquifer "sustainably"[163] in order to avoid over-use of the aquifer in the long run. The City's domestic well

water quality. *See Wildfire Impacts on Surface Water Quality*, N.M. ENV'T DEP'T., https://www.env.nm.gov/swqb/Wildfire/ [https://perma.cc/MTS6-F5ZR].

155. Balleau & Silver, *supra* note 19, at 813.

156. *See* DOUGLAS P. MCADA & MARYANN WASIOLEK, U.S. GEOLOGICAL SURVEY, SIMULATION OF THE REGIONAL GEOHYDROLOGY OF THE TESUQUE AQUIFER SYSTEM NEAR SANTA FE, NEW G 33 fig.13 (1988) (Water-Resources Investigations Report: 87-4056).

157. MARYANN WASIOLEK, U.S. GEOLOGICAL SURVEY, SUBSURFACE RECHARGE TO THE TESUQUE AQUIFER SYSTEM FROM SELECTED DRAINAGE BASINS ALONG THE WESTERN SIDE OF THE SANGRE DE CRISTO MOUNTAINS NEAR SANTA FE, NEW MEXICO 36 (1995).

158. *See* Elizabeth H. Keating et al., *Coupling Basin- and Site-Scale Inverse Models of the Espanola Aquifer*, 41 GROUNDWATER 201, 203 (2003).

159. LEWIS, WATER RESOURCE INVENTORY OF THE ESPAÑOLA BASIN, *supra* note 22, at 6, 20.

160. *Id.* at 7–8.

161. *See Working Grp. Rpt.*, *supra* note 99, at 4.

162. *See* CITY OF SANTA FE, LONG RANGE WATER SUPPLY PLAN 5 (2011).

163. *See id*. at 1–5.

ordinance attempts to generally reduce groundwater use include the following five ways:

- the necessity of an application to the city limits the proliferation of wells;
- the offset requirement replenishes some of the consumed water;
- well construction regulations help avoid waste by leaks;
- metering requirement for new domestic wells should help estimate total pumping rates; and
- finally, the city's reserved right to impose further conditions necessary to conserve water and protect the public welfare.[164]

While these steps are necessary to regulate aquifer depletion, the City does not address declines in the water table directly, nor does it state a measured limit to depletions. Rather, the ordinance limits proliferation of new domestic wells within areas of the city that are supplied by city water lines. Some hydrologic models have shown that curtailment of domestic well growth can reduce depletion across the state by up to 13.4 feet in forty years.[165] A drawdown limit that applies to all users would be a way for the city to mitigate any affect that domestic wells may have, however such a limit may not be currently defined.

In addition, the sections of the ordinance that appear to address limiting aquifer use do not necessarily play out as they are written. Total depletion is not proportionally addressed through the ordinance's "offsets" provision, which requires domestic well applicants to purchase offsets from the water bank to fund a conservation program.[166] This conservation fund provides rebates (e.g., for installation of low water use toilets or appliances) as incentives for city water users to conserve. However, potable city water comes from multiple surface-water and groundwater sources, namely:

- the San Juan–Chama project;
- the Buckman well field at the Buckman diversion;
- city wells south of Santa Fe; and
- two reservoirs fed by the Santa Fe River.

Ultimately, domestic well users are offsetting their use through water from a combination of surface and groundwater flows, which do not recharge the aquifer on a 1:1 basis. Unfortunately, the implementation of this aspect of the ordinance is lacking as well: well users face no punishment if they do not purchase these required offsets. While domestic well water use could be offset by the conservation

164. SANTA FE, N.M., CITY CODE § 25-1.10 (2016).

165. BALLEAU & SILVER, *supra* note 19, at 826.

166. SANTA FE, N.M., CITY CODE § 25-1.10(F)(6) (requiring compliance with offset provisions of Section 14-8.13(F)(3) (1987), amended and revised in 2011 by SANTA FE, N.M. CITY ORDINANCE No. 2011-37); *see also* Bates, *supra* note 78, at 25. Santa Fe's Water Budget Program is an attempt to have no net increase in total demand of water in the city. While these offsets don't address sources—and do not necessarily contribute to stability of the water table, businesses must offset their new uses, which is in line with what new domestic well users must do according to the ordinance.

fund, use from the Tesuque formation by domestic wells is not decreased proportionately.

The most limiting aspect of domestic well management in the context of aquifer protection—and interference—is the lack of data in the state WATERS database. Metering requirements, which would allow the City to have some sense of domestic wells' actual groundwater use, carry with them no enforcement stipulations. The WATERS database returns only seventy-one metered wells connected to specific houses, serving 161 homes in the entire county of Santa Fe. Just considering this small portion of wells with reported metering, approximately 1,870 AFY worth of potential water savings exists, taking into account conservation technology and current landscaping. This prospective savings from a limited number of wells compares favorably to the estimate total domestic well use of 5,637 AFY in the City of Santa Fe.[167] Domestic wells can conserve even more than they currently do and owners appear to use more water per capita than those hooked up to municipal water.

Beyond its lack of coverage, the WATERS database, used by the City of Santa Fe, the county, and state, is insufficient in other ways. The database is statistically weak because most metering is reported voluntarily, which causes selection bias. Average use therefore may be larger than one-quarter AFY.[168] As mentioned previously, there are examples where owners using domestic wells irrigate more than the acceptable acre of land.[169] The database also does not include wells drilled before 1956 and so the number of wells that are currently being used in Santa Fe may be underestimated. According to the WATERS database, there are 753 known domestic wells within the city boundary, including the recently annexed area of Santa Fe as of 2011.[170]

Domestic wells cannot be fully accounted for by the City even when cross-referencing is employed. A query into homes that have waste pick up but are not hooked up to the city water utility would not solve the problem either because it would not account for those homes which do not avail themselves of city waste management service.[171] The actual yield of these domestic wells is therefore unknown due to the lack of both metering and an accurate well count. Anecdotally, this problem has not been curtailed by the ordinance because unknown wells are still being found: a developer in Santa Fe found six domestic wells on a small parcel that were not included in the city database. The life-time of a well, however, is approximately forty years,[172] so when old domestic wells cycle through and need re-drilling, they will fall under the ordinance.

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167. LEWIS, WATER RESOURCE INVENTORY OF THE ESPANOLA BASIN, *supra* note 22.

168. *Id.*

169. BALLEAU & SILVER, *supra* note 19, at 813; LEWIS, WATER RESOURCE INVENTORY OF THE ESPANOLA BASIN, *supra* note 22.

170. LEWIS, WATER RESOURCE INVENTORY OF THE ESPANOLA BASIN, *supra* note 22.

171. *See* CITY OF SANTA FE, WATER DIV., 2012 ANNUAL WATER REPORT 7 (2013) (noting "estimated use"), http://www.santafenm.gov/media/files/Public_Utilities_WATER/2012_City_of_Santa_Fe_Annual_Water_Report.pdf. The last two City of Santa Fe Water Utility division water coordinators have seen between five and ten new well applications annually. On file with City of Santa Fe Water Utility Division, 2012–2014.

172. BALLEAU & SILVER, *supra* note 19, at 823.

There are some alternative policy options to minimize drawdown in aquifers from domestic wells. One such option is to limit the well density beyond the 300 foot Rule, which consequentially limits their total numbers. San Diego County, California, the Front Range counties of Colorado, and Santa Fe have implemented such low-density requirements in some areas with a minimum of ten acres per lot.[173] Aquifers, however, are complex geologic bodies that may be affected differently in different localities depending on various properties such as the presence or absence of confining layers or the hydraulic conductivity of the material. While Santa Fe's domestic well ordinance does not include *enforceable* metering and an aquifer-wide physical limit on pumping (i.e., a specified allowable water table decline), it does limit proliferation of domestic wells that could cause significant water-level declines. The ordinance, nevertheless, does not define what it means to protect the aquifer.

VI. THE DEVELOPMENT LOOPHOLE

Groundwater has historically been a large source of urban water in New Mexico cities.[174] But while the City of Santa Fe has correlated its growth management strategies with water availability, domestic wells allow for suburban development away from city water lines. Domestic wells also provide cheaper water.[175]

However, low-priced water does not serve conservation goals in the west. Many have argued that pricing drinking water to incentivize conservation should be a goal of Western cities.[176] For domestic well users, the price of obtaining water is not directly correlated to use, but to the cost of construction, energy,[177] and permitting. For multi-lot developers, domestic wells are also a way to avoid having to obtain a community well water right, and various fees.

Limited water availability in Santa Fe limits options for these developers. There is pressure for development: Santa Fe County added 1,000 people to its current total of 147,400 in 2013 alone,[178] and the county is expected add another 16 percent of its current population in the next five years.[179] As mentioned above, the City of Santa Fe does not provide "new net water" to new developments or businesses, but requires these entities to purchase water offsets or provide their

173. BELL & TAYLOR, *supra* note 17, at 64.

174. *See* Bruce M. Thomson, *Water Resources in New Mexico, in* WATER POLICY IN NEW MEXICO 26 (Brookshire et al. eds., 2012); J.T. McGucklin et al., *The Pricing and Conservation of Water in Urban Areas, in* WATER POLICY IN NEW MEXICO, *supra* note 174, at 190. Over the last decade, the cities of Albuquerque and Santa Fe have enacted policies to decrease aquifer drawdown by acquiring surface flows as a larger portion of their municipal budgets through the San Juan Chama and Buckman Direct Diversion projects.

175. BALLEAU & SILVER, *supra* note 19.

176. *See* McGucklin et. al., *supra* note 174, at 196; BELL & TAYLOR, *supra* note 17, at 75.

177. Here, energy refers to the energy required to lift the water to the surface.

178. *Santa Fe County, New Mexico*, U.S. CENSUS BUREAU, https://www.census.gov/quickfacts/table/PST045216/35049 [https://perma.cc/D5UX-HYR8].

179. *Projected Annual Population Growth Rates New Mexico Counties July 1, 2010 to July 1. 2040*, GEOSPATIAL AND POPULATION STUDIES GRP., BUREAU OF BUS. & ECON. RESEARCH, UNIV. OF N.M., http://bber-old.unm.edu/demo/PopProjTable2.htm [https://perma.cc/498V-S49M].

own water.[180] But the City's goal of reducing total water use by 20 percent by 2045 may be hampered by "double-dipping," which can be employed using "the loophole."

"Double dipping" can be defined as applying two water use rights on one property. In the case of the development loophole, one is a conventional water right, and the other is a domestic well. Usually, this loophole is employed on a property that was originally farmland. Developers can sell their traditional, or underlying, water right and still have the ability to draw water from the same source as the original right through a domestic well (in most cases, a number of domestic wells).[181] By using domestic wells in this way, subdivision developers outside of the reach of municipal water systems can avoid the water right acquisition process, which is regulated comprehensively by the OSE.[182] These sub-dividers can then avoid: well construction guidelines; a more involved and vetted water rights acquisition process; purchasing offsets in adjudicated closed basins; costs associated with drilling (that fall on the purchaser of the lot); and compliance with water quality standards for community wells.[183]

This development loophole has been a controversial issue across New Mexico for decades. Recent amendments to county, state and municipal rules, however, have eliminated the majority of land that can be subject to the loophole. Passed in 2013, these amendments, provide for more extensive OSE oversight and a decrease in the number of parcels, from twenty to ten that are subject to OSE review for water adequacy.[184] Currently, subdivisions comprising over ten parcels of two acres or less must have other water rights instead of domestic wells, so only some subdivisions can employ the loophole.[185] These changes are a significant limitation to prospective developers who may have otherwise employed the loophole. Still, these recent amendments only apply to land from which appurtenant irrigation water rights are severed after the effective date of the bills, and two opportunities remain to employ the loophole: farmlands where water rights have been severed before 2013, and subdivisions with fewer than ten parcels. The issue of irrigation water impairment surfaced in *Bounds* citing the legislative amendment that requires the Office of the State Engineer to be shown proof of a different type of water right than domestic wells, if water rights have been severed from the parcel, for approval of a subdivision plat.[186]

Other policies within the City, county, and state set guidelines for the use and sourcing of water for housing developments. These policies include Santa Fe's economic development plan and Santa Fe County's low density requirements in certain areas. The County prepared a Sustainable Land Development Code in 2010

180. *See* SANTA FE, N.M., CITY CODE § 25-11 to -12 (2016). That is to say, purchase and transfer water from another basin.

181. *See* Drennan, *supra* note 24, at 923; Titus, *supra* note 10, at 859.

182. *See* Drennan, *supra* note 24, at 923.

183. *Id.* at 939.

184. N.M. STAT. ANN. § 47-6-11.4 (amended 2013).

185. *Id.*

186. N.M. STAT. ANN. § 3-20-9.1 (1978); Bounds v. State *ex rel.* D'Antonio, 2013-NMSC-037, ¶ 42, 306 P.3d 457.

and updated the code in 2016.[187] The County has created a zoning map associated with this code that limits lot sizes in certain areas. The OSE provides further oversight by examining proposed subdivisions in unincorporated areas to make sure that county plans fulfill the anticipated maximum water requirements. The OSE's analysis includes predicted water demand and availability for a forty-year planning period.[188]

In general, the use of the development loophole represents an example of ineffective polycentric governance and is detrimental to growth management efforts (i.e., with respect to the City of Santa Fe's water conservation goals).[189] Unfortunately, a majority of wells that are drilled under the loophole are not metered, and it is impossible to accurately ascertain well pumping data. This lack of comprehensive metering results in broad-scale groundwater budget inaccuracies. As a consequence, the loophole makes it more difficult to address concerns of interference and aquifer protection as it allows the proliferation of unaccounted wells. The loophole also complicates inter-governmental water management coordination. Areas outside of city boundaries are hydrologically connected to the city's groundwater sources, yet pose a threat to both the city water utility and the suburban users who pump groundwater from the same source. City ordinances cannot directly address the management of water resources outside of their boundaries associated with these suburban or subdivided housing developments.

Although Santa Fe's domestic well ordinance narrows the qualifications for a domestic well permit to be passed, it contains no specific provisions addressing municipal growth.[190] Similarly, the Ordinance does not limit suburban growth in the context of domestic wells on land parcels whose other appurtenant water rights have been severed from the land and sold off. However, it remains unclear the extent to which the development loophole has promoted domestic proliferation within the City of Santa Fe, or even if landowners and developers have taken advantage of it, as there are few farms left within the city limits. But considering that the remaining, albeit small ways to take advantage of loophole, can play out across the state and that the City of Santa Fe is not facing dire consequences due to the loophole, the domestic well ordinance is not likely to be an effective political pathway for closing the loophole.

VII. OTHER STATES

Other states across the West face many of the same domestic well-related management challenges as New Mexico. Programs and initiatives in Montana, Washington, and Oregon supply examples of local regulations that represent alternative approaches to managing domestic wells in the face of a domestic well statute. These approaches have addressed some of the concerns aquifers protection

187. SANTA FE COUNTY SUSTAINABLE LAND DEVELOPMENT CODE (2013), http://www.santafecountynm.gov/userfiles/SLDC/ClickableSLDCwithOrdinance.pdf [https://perma.cc/TNA3-7PAK]; S.B. 479, 51st Leg., 1st Sess. (N.M. 2013); S.B. 480, 51st Leg., 1st Sess. (N.M. 2013).

188. Bates, *supra* note 78, at 21.

189. BELL & TAYLOR, *supra* note 17, at 36.

190. SANTA FE, N.M., CITY CODE § 25-1.10 (2016).

and domestic well interference have caused, especially in relation to stream flow reductions and well data.

A. Requiring Mitigation of Pumping Impacts

The problem of domestic wells depleting surface flows has been addressed more thoroughly in Washington State's Dungeness Water Exchange Program (DWE) than it has by the Santa Fe ordinance**.** Using the DWE, managers have attempted to mitigate the groundwater depletions on small tributaries to the Dungeness River, a complex concern due to the combined effect of over-appropriation of the basin's water and the presence of four species protected by the federal Endangered Species Act. [191]

The DWE allows for more accurate water budgeting as compared to the offsets rule in Santa Fe's domestic well ordinance. Under the DWE, new users are required to report their pumping rates and this provides a dataset that allows those users' impacts on the river to be quantified. Exempt well users are also required to offset all consumptive use (i.e., that portion of water use that is not returned to groundwater in the form of return flows from effluent tanks or the small amount that seeps into the aquifer over time through irrigation of their garden). The mitigation requirement for domestic wells is quantified based on reported meter readings and considers both indoor and outdoor usage, thus offering a more accurate account of water consumed.[192] This requirement may also allow the DWE to provide critical information used to reach sustainability goals, although the enforcement of the DWE is limited.

Additionally, the DWE appears to allow for more flexible implementation than the ordinance in Santa Fe. In the DWE, well owners have options: they can make their own mitigation plan, purchase credits as required by the DWE, or work directly with the Washington State Department of Ecology[193] to mitigate their consumed water.[194] Such options that give flexibility to domestic well users are not available in Santa Fe.

B. Limited Zones

Limiting domestic wells by zone or area of concern may be one of the most effective ways to avoid domestic well interference with surface-water. Indeed, most issues related to domestic wells are confined to specific areas of concern, whether near a stream, in an area with significant groundwater depletions, or high density development. Washington State's DWE is an example of a limited zone. Oregon also addresses local domestic well limitations through groundwater "limited" and "restricted" areas, much like New Mexico's DWMAs or CMAs. In Oregon, flow meters and reporting are required along with compliance with state well drilling standards. Like New Mexico, exempt uses outside of these zones

191. *Dungeness Water Exchange*, WASH. WATER TR., http://www.washingtonwatertrust.org/water-exchange [https://perma.cc/RG4V-VLRD].

192. *Id.*

193. The Department of Ecology is Washington's functional equivalent of both New Mexico's Office of the State Engineer and Environment Department.

194. *Dungeness Water Exchange FAQ*, *supra* note 154.

avoid the Oregon Water Resources Department[195] process for reviewing interference with competing uses, over-appropriated surface-waters, and protected waters.[196]

Limited zones allow for more efficiency in the regulation of domestic wells. The state of Montana, where there are 148,000 domestic wells on record and the growth of domestic wells is correlated with population growth,[197] provides an illustrative example. Montana domestic well uses comprise roughly only one percent of all water uses, and their estimated consumptive use amounts to two-tenths of one percent of total consumptive water use in the state.[198] However, the consumptive use of groundwater by domestic wells in the southwestern portion of Montana ranges from 15 to over 50 percent of total water use.[199] This provides an example of how the importance of domestic well management may be of a greater magnitude in a small subsection of a state than throughout.

Domestic regulations tailored to specific geographical areas—as delineated by the relevant hydrologic issues—can also allow for improved model accuracy. Hydrogeological parameters vary by location and increased accuracy can be achieved by limiting the extensiveness of data required overall. To this end, John Metesh's concept of "stream depletion zones" is promising.[200] According to this idea, wells can be set back enough from riparian areas in outlined zones so that, for example, their peak depletion rates do not overlap with the peak of the growing season or critical timing for environmental flows. Zone size and location are based on measured stream depletion from groundwater pumping, which depends on aquifer properties, pumping rate, and distance to the stream. Additionally, septic draining systems can be placed closer to a stream so that recharge can offset consumption to some degree—in some cases up to 75 percent.[201] Similar proposals have been recommended by other authors.[202]

C. Acquiring Data on Well Use

In New Mexico, a major drawback for any program attempting to limit domestic well uptake is the lack of data quantifying how much domestic wells actually pump. Metering requirements vary from area to area. A lack of regulation and missing information about the magnitude and locations of groundwater extraction by domestic wells may create conflicts with senior water rights holders and inefficiencies such as forcing homeowners to deepen their wells.[203] In Santa Fe, although new wells are required to install meters, this is unenforced and most old wells go without any enforced pumping limit.

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195. Oregon's Water Resources Department is the equivalent of New Mexico's Office of the State Engineer.

196. *See* OR. REV. STAT. § 537.545 (2015).

197. METESH, *supra* note 113, at 1, 4.

198. *Id*. at 6.

199. *Id*. at 7.

200. METESH, *supra* note 113, at 14–17.

201. *Id*. at 16.

202. Titus, *supra* note 10, at 859; Bracken, *supra* note 33, at 27.

203. Bates, *supra* note 78, at 13.

The State of Montana attempted to explore all recorded challenges facing domestic well management in a legislative committee study in 2011–2013.[204] Montana's record of domestic wells appears more complete than New Mexico's (the first well in the database dates from 1850, whereas New Mexico's database includes only wells drilled since 1956).[205] Montana is an example where both an extensive state-sponsored review and fewer data gaps do not lead to an absence of uncertainty or congruence around domestic well issues, especially issues of local concern.[206] For New Mexico, a broad-brush approach, like a statewide database or state-wide comprehensive study, may not address the state's domestic well management issues, especially if they do not include comprehensive data for threatened areas.

Oregon provides citizens and decision makers with more up-to-date and easily accessible water-use data on domestic wells than does New Mexico. Water levels and well drilling logs[207] must be submitted to and are supplied publicly by the state of Oregon Water Resources Department. Observation wells contained in this database are measured quarterly.[208] New Mexico utilizes the WATERS database, but local water table levels and metered pumping rates are not readily available to the general public, since commercial geographical information systems software—ArcGIS—is required to access them. New Mexico administrators and the public would be better positioned to answer questions of aquifer sustainability and interference if they had access to more complete well data as Oregon does. However, broad databases are unlikely to be the penultimate solution to addressing domestic well management conflicts because decision makers have more success by collecting information and doing analysis at the small scales at which these conflicts often occur.

VIII. LESSONS FROM SANTA FE

As the cases of Oregon, Washington, and Montana have shown, Western states begun to address domestic wells' effects on streams through various zone-based methods, targeted enforcement, and descriptive and accurate well databases. In New Mexico, while there are a number of specific changes that could be made to

204. The goals of the study include determining the number of existing wells and estimating how many wells may be drilled over the next decade, and may contribute to an argument that domestic wells are under-studied whether or not their impacts are large in terms of groundwater sustainability. The study attempts to address unknowns of: the legal quantity, accurate measurements of use, ways to ensure a limit on effects on other users from domestic wells including surface-water appropriations, and what legal options exist to put a call on domestic wells in times of scarcity under prior appropriation. They consider other programs and mitigation, offset purchasing, as well as the relationship between land use decisions and alternatives to domestics, and their own rulemaking authority. JOE KOLMAN, WATER POLICY INTERIM COMM., THE EXEMPTION: TO CHANGE OR NOT TO CHANGE? (2012) http://leg.mt.gov/content/Publications/Environmental/2013-exempt-wells.pdf [https://perma.cc/U6AD-H6X8].

205. METESH, *supra* note 113, at 1.

206. *See* KOLMAN, *supra* note 204, at 14 (noting that conflicts between surface-water users and domestic users in specific creeks are not addressed in the study).

207. *See* OR. REV. STAT. § 537.765(1), (3)(h) (2015). These logs indicate the geological strata penetrated by the well, if not some indication of hydrogeological conditions.

208. *Water Level Data and Hydrographs*, OR. WATER RESOURCES DEP'T, http://www.oregon.gov/owrd/pages/gw/well_data.aspx#View_Water_Level_Data [https://perma.cc/8KDT-UY5S].

Santa Fe's Domestic Well Ordinance to limit the potential conflicts associated with domestic wells, other aspects of domestic well management may be better addressed at the county or state governance levels. Furthermore, other towns and cities with more dire water demand scenarios than that of Santa Fe may benefit from implementing some of the same measures that New Mexico's capital has benefitted from.

A. Santa Fe's Ordinance

Santa Fe's ordinance does not directly address or account for interference effects of domestic wells.[209] While the City of Santa Fe has codified conservation goals that include a reduction in total water use and the protection of the Santa Fe River, there remains a disconnect between the domestic well ordinance and other city-wide regulation. The ordinance does not specifically limit domestic wells based on the location of other wells or their proximity to streams. Fortunately, however, most wells tapping into the Tesuque aquifer are not a direct threat to the Santa Fe River as the Tesuque and Ancha formations are disconnected within most of the municipality.[210]

The ordinance also does not directly protect water table levels, although limiting new domestic well applications disincentives well proliferation to some degree. But the lack of a quantitative limit on aquifer depletion means the city's groundwater conservation strategy is ineffective. Hydrogeologic models show a large depth of saturation in the Tesuque formation aquifer, suggesting that aquifer depletion is a long-term concern and not a current crisis.[211]

The domestic well loophole is not addressed by the Ordinance, but need not be addressed. In this respect, state and county rules should suffice as the loophole applies to subdivisions, which, when not regulated under the 300 foot Rule, mostly lie outside the city limits. Currently, the only regulatory framework for limiting developments of such subdivisions within Santa Fe County is the county's new Sustainable Land Development Code.[212] This code, however, does not fill regulatory gap because it only applies in Santa Fe County—outside of the municipal boundary—and the state does not otherwise close the loophole.

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209. *See supra* Part IV.A and IV.B.

210. *See* LEWIS, WATER RESOURCE INVENTORY OF THE ESPAÑOLA BASIN, *supra* note 22, at 21 fig.7; GLENN A. HEARNE, U.S. GEOLOGICAL SURVEY, WATER SUPPLY PAPER 2205, MATHEMATICAL MODEL OF THE TESUQUE AQUIFER SYSTEM NEAR POJOAQUE, NEW MEXICO 7 fig.4 (1985).

211. HEARNE, *supra* note 210, at 7 fig.4.

212. SANTA FE COUNTY, SUSTAINABLE LAND DEVELOPMENT CODE (adopted by Ordinance 2016-9, December 13, 2016). The Sustainable Land Development Code provides some additional limitations to the propagation of domestic wells outside of the municipal boundary. The Santa Fe board of county commissioners unanimously approved the ordinance to adopt the SLDC on December 10, 2013. The County Zoning Map adoption process will include legal notice and a public process. Various sections of the code address water availability and reporting, including a "water service availability report" for any development of potable water, allowing more oversight of new water use. *See* SANTA FE COUNTY, N.M. SUSTAINABLE LAND DEVELOPMENT CODE § 6.5.5.6. (2016), https://www.santafecountynm.gov/media/files/SLDC%201.20.17.pdf [https://perma.cc/K2BJ-8ZHH]. Unlike the domestic well ordinance, this code states a sustainability goal including planning for the use of a well for at least 99 years, extending the OSE's definition from a 40 year planning horizon. *See Id.* § 7.13.6.1.

B. Specific Recommendations

1. Stream Depletion Zones and Well Protection Zones

As Santa Fe's Ordinance currently does not directly address interference, it should be updated to include zone-based protections that limit well uptake and well density in areas of concern for interference between wells. Such areas could encompass the vicinity of the City's North Well (located along the Santa Fe Relief Route (state Route 99) just west of Highway 84)[213], and would both protect well users and the city's wells from interference-elated drawdown. A stream-depletion zone, administered by the City with more specific parameters[214] than a Critical Management Area,[215] could also be established in the Santa Fe River Watershed to protect the more vulnerable tributaries from depletions due to domestic well pumping. The City, however, should determine if current wells pose a threat in any specific area (a generalized threat is unlikely due to the disconnected state of the Ancha and Tesuque formations). To be sure, data on pumping quantity, depth, and location within the stream depletion zone are needed for effective implementation of these zone-based protections. Still, data requirements for local, zone-based protections are comparatively less burdensome than under a state-wide or region-wide regulatory regime.

Any domestic well ordinance should address localized interference effects, for example, to cones of depression. Interference-induced stream depletion, however, must also be holistically managed since most streams cross political boundaries. Municipal ordinances, therefore, will not suffice as stand-alone regulations. Accordingly, a stream depletion zone within a municipality should be coordinated with the county and the state to ensure that a stream zone that runs the length of the stream. Similarly, a well zone should be designed to fully encapsulate the combined radii of the relevant cones of depression. In general, cities with surface-water and groundwater conservation ordinances should consider whether or not domestic well policy adversely affects the goals of such ordinances.

2. Aquifer Drawdown Limits

In Santa Fe, protecting the Tesuque—which is tapped by both municipal and domestic wells—should be addressed as part of data-driven, empirical sustainability planning. Even with the Española basin's complex hydrogeology, groundwater in the Santa Fe portion of the basin should be regulated. This underground source comprises a critical supply: 30 percent of the City's potable water is sourced from this area's groundwater, also tapped by so many individuals there who rely on domestic wells for their drinking water.[216] This is especially the

213. CITY OF SANTA FE, WATER DIV., 2013 ANNUAL WATER REPORT (2015), www.santafenm.gov/document_center/document/5154 [https://perma.cc/9EFG-8R2T].

214. Parameters, such as shape, could be determined by the riparian zones, through pumping restrictions based on wells' depth and distance from the streambed, or with the temporal distinction of a seasonal (rather than yearly) pumping limits. These parameters could be further refined based on current and predicted flows, ecosystem health, and drought conditions, rather than a planned "economic life" of 40 years.

215. *See supra* notes 16 and 63.

216. Water Conservation Committee, *supra* note 83.

case in the context of a changing climate, with fewer available surface-water sources.[217] In particular, Santa Fe's offset program should be amended to not offset one source using another, so that the use of surface-water is not considered a valid replacement for groundwater depletions. [218]

Furthermore, permissible water table declines should be quantified as a physical, direct limitation (such as amount of decline allowed per time) and as accurately as groundwater modeling allows. Not only would domestic wells then be subject to a pumping limit based on the best available science—which could potentially allow them to pump more[219]—but the City would be able to include their use when evaluating aquifer sustainability. In Santa Fe, this is a long-term concern as the Tesuque aquifer is estimated to be relatively thick (between 500 to 4,000 feet of saturation).[220]

Transboundary aquifers that should be regulated at a higher level of governance, but city ordinances can, by setting limits and coordinating with other authorities in the region, restrict aquifer use by requiring all well owners to conserve as much as municipal water users do.[221] Similarly, aquifer budgeting should be according to polycentric governance principles.[222] Planning conservatively about any use of an aquifer, no matter how *de minimis*, is a valid response that anticipates a more chaotic water future due to climate change. In areas with critically low groundwater levels, offset programs should offset groundwater withdrawals at a 1:1 ratio, and wells should be metered, with pumping limitations relative to the sustainability goals for the aquifer.

3. Close the Loophole

In Santa Fe, the most pressing problems related to domestic wells are not their effect on the Tesuque aquifer and the Santa Fe River's future flows, and the ordinance significantly limits any depletions by limiting proliferation. Other parts of New Mexico, however, face on-going problems stemming from the original subdivision loophole. Under the original loophole in 2007, a housing developer in the Zuni area was granted permission by McKinley County to develop hundreds of homes, each on a domestic well, near endangered Zuni Bluehead Sucker habitat.[223] The Zuni tribe appealed the county's approval of the development citing concern for the endangered fish.[224] However, the effect of the wells on streamflows is not

217. *See* Garfin et al., *supra* note 8, at 465–66.

218. *See supra* note 168 and accompanying text.

219. *See* Titus, *supra* note 10, at 855 ("Finally, it probably is true that water-table drawdown due solely to domestic wells is nowhere great enough to preclude adding even more domestic wells.").

220. HEARNE, *supra* note 210, at 7 fig. 4.

221. In Santa Fe, average municipal water use averages 107 gallons per person per day.

222. *See generally* Elinor Ostrom, *Beyond Markets and States: Polycentric Governance of Complex Economic Systems*, 2 TRANSNAT'L CORP. REV., no. 2, at 1 (2010) (Prof. Ostrom's Nobel Prize Lecture, given Dec. 8, 2009 in Stockholm, for the Nobel Prize in Economic Science, narrating her "intellectual journey" in understanding polycentric systems and concomitant governance).

223. *See* Donald Jaramillo, *Improving Zuni Bluehead Sucker Habitat*, CIBOLA BEACON (May 7, 2013), http://www.cibolabeacon.com/news/improving-zuni-bluehead-sucker-habitat/article_ba88e15a-b6cc-11e2-83e7-001a4bcf887a.html [https://perma.cc/R5HN-H39C]; STEPHANIE M. CARMAN, N.M. DEP'T OF GAME AND FISH, ZUNI BLUEHEAD SUCKER RECOVERY PLAN 21 (2004).

224. Zuni Indian Tribe v. McKinley County Bd. Of County Commissioners, 2013-NMCA-041, 300 P. 3d 133.

settled, and the housing development's future status still unclear. The 2012 act to decrease the number of parcels allowed in a subdivision without a water right would help avoid repeating the less-than-efficient legal process at Zuni. But the remaining loophole, allowing subdivisions of less than ten parcels to use domestic wells instead of a community well or water right[225] should to be closed throughout the state, as clusters of these small subdivisions with different developers would have the same pumping effect as one large subdivision.

Although recent amendments to state law in New Mexico have decreased the likelihood of large detrimental effects through the use of the domestic well loophole, there remain small subdivisions and non-irrigation lands that can still employ it.[226] The best way to close the development loophole is through amendments to both county and state-wide regulation. As the loophole is not as a function of hydrology, as with other issues, this solution can be generalized. Closing the loophole would have the effect of requiring a subdivision to hold water rights, no matter its size. Cities where the loophole could be employed should work in tandem with counties and the state to ensure that the effect of domestic wells in new developments is integrated into groundwater budgets.

4. Statistically Accurate and Efficient Well Databases

Ultimately, better local databases—including well locations, wells depths, and flowmeters—are needed for most domestic well management methods to effectively monitor both effectively well uptake and groundwater level drawdown. For example, the first step in creating a stream depletion zone in Santa Fe might require 10 percent of wells within one mile of a Santa Fe River Tributary to be metered to estimate the rate of induced recharge. To be statistically accurate, however, this random sample would have to apply to old wells, in order to represent all domestics excluded from statutory authority and the ordinance.

In contrast to such an approach, blanket metering and monitoring has been rejected as expensive and ineffective.[227] While some have suggested the Office of the State Engineer employ more staff at the New Mexico OSE to track water use,[228] hydrogeologic databases should instead be improved. Current domestic well pumping data is statistically biased, so one such database improvement would be the inclusion of randomly distributed metering sample, i.e., within the radius of the combined cone of depression for the city wells and along defined stream depletion zones, as current uptake data is statistically biased.

In New Mexico, many citizens want water monitoring and metering to inform management in specific cases.[229] To better understand the effect of domestic wells, sample metering should be imposed in specific areas of concern. As these critical groundwater areas multiply throughout the West due to population growth, groundwater overdraft, and climate change, databases should be location and

225. N.M. STAT. ANN. § 47-6-11.2 (2016).

226. S.B. 479, 51st Leg., 1st Sess. (N.M. 2013); BELL & TAYLOR, *supra* note 17, at 65.

227. *See* Bracken, *supra* note 6, at 241; Titus *supra* note 10, at 861.

228. LEWIS, WATER RESOURCE INVENTORY OF THE ESPAÑOLA BASIN, *supra* note 22, at 7.

229. N.M. FIRST, ADVANCING NEW MEXICO'S FUTURE: A TOWN HALL ON WATER PLANNING, DEVELOPMENT AND USE 9 (2014).

problem-specific, rather than state-wide, in order to address problems of the same scale.

CONCLUSION

In the case of New Mexico, the domestic well statute creates a governance gap where courts have recommended local regulations limiting the adverse effects of domestic wells, but where few municipalities have taken up this responsibility. Cities and regions would benefit by bridging this regulatory gap with both domestic well ordinances and stronger regional regulations, in either case based on hydrologic data tailored to the needs of specific issues such as diminishing flows in important tributaries or ecologically degraded riparian zones. The City of Santa Fe's Domestic Well Ordinance can be seen as a tightening of state-wide regulations on domestic wells that begins to address domestic well issues on a local scale by limiting the proliferation of domestic wells in the City, even though groundwater levels are not yet critically low in Santa Fe. The challenge of domestic well regulation is exacerbated most significantly by the lack of reliable data on domestic wells in New Mexico. As part of a geographically-specific water management approach, domestic well metering and limits on their pumping should be stipulations that should be included in any policy initiative to protect aquifers, streams, or other groundwater uses as part of a geographically-specific water management approach. And because groundwater hydrology is not bound by geopolitical boundaries, any ordinance or restricted zone should be coordinated with regional authorities to ensure that problems are holistically addressed.

In most states in the American West, irrigators, industry, cities, and individuals rely upon the groundwater in aquifers to supplement scarce surface-water supplies that are diminishing due to climate change.[230] Domestic well management within areas of concern is essential to protect aquifers, as well as rivers, surface-water rights, and city water resources. The western domestic well exemption has undermined water management planning and policy.[231] The exemption, however, need not undercut water management going forward, as localized rules—combined with improved metering and monitoring—can better protect streams, aquifers, and other groundwater uses.

230. *See generally* Alan F. Hamlet et al., *Effects of Temperature and Precipitation Variability on Snowpack Trends in the Western United States*. 18 J. CLIMATE 4545 (2005).

231. Drennan, *supra* note 24, at 939.