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New Opportunities for Small-Scale Hydropower in Colorado

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NEW OPPORTUNITIES FOR SMALL-SCALE HYDROPOWER IN COLORADO

CHRISTOPHER AINSCOUGH*

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I. INTRODUCTION

Colorado has substantial untapped hydropower resources.¹ Most of the state's hydropower potential exists at sites smaller than five megawatts ("MW").² The combination of friendly federal legislation³ and the recent Colorado Supreme Court decision in *Frees v. Tidd*⁴ will enable more small-scale⁵ hydropower development within the state. This Article analyzes the possible impact of that legislation and the *Frees* decision on the development of that hydropower potential in Colorado. It also attempts, in a novel analysis,⁶ to estimate, post *Frees*, the number and size of decreed water rights whose junior appropriators could potentially use their water as a source for hydropower development.

Electricity from renewable resources represents a growing portion of the energy consumption in the United States.⁷ The United States Department of Energy ("DOE") places renewable energy resources into eight different categories: hydroelectric, geothermal, solar, wind, wood biomass, ethanol, biodiesel, and waste biomass.⁸ The DOE predicts that total electricity production from renewable energy resources will increase over thirty-seven percent between 2013 and 2040.⁹ This growth, however, does not have an even distribution among the categories; for example, the DOE predicts that hydroelectric consumption will increase only twelve percent as compared to 2013 levels.¹⁰ A 2006 DOE report analyzed the feasibility for hydropower development of over

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1. See JAMES E. FRANCFORT, U.S. HYDROPOWER RESOURCE ASSESSMENT FOR COLORADO 2 (1994) [hereinafter *COLORADO ASSESSMENT*] (finding that Colorado has an unadjusted hydropower potential of 2,346 megawatts ("MW") at 251 sites). After adjusting for land-use issues and the presence or absence of existing development at the particular sites, the authors estimated the Colorado's hydropower potential at 665 MW. See *id.*

2. *Id.* (showing that 188 sites of the 251 sites the report identified have hydropower potential less than ten MW).

3. See *infra* Part 0 (discussing Hydropower Regulatory Efficiency Act, and Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act).

4. *Frees v. Tidd*, 349 P.3d 259, 268 (Colo. 2015) (holding that junior water right holder may appropriate water for non-consumptive, small-scale hydropower use).

5. There is no generally accepted definition of small-scale hydropower. COLO. ENERGY OFFICE, THE SMALL HYDROPOWER HANDBOOK 7 (2013); compare *id.* (defining "small-scale hydropower" as "development on existing infrastructure or hydropower with generating capacity of 2-megawatts or less."), with Hydropower Regulatory Efficiency Act of 2013, Pub. L. No. 113-23, § 3, 127 Stat. 493 (2013) (defining "small-scale hydropower" as below ten MW of electricity). In this Article, I define "small-scale hydropower" as sites with the potential to generate ten MW of electricity or less.

6. The author is unaware of any similar attempt to correlate small-scale hydropower potential with effects on decreed water rights throughout the entire state of Colorado.

7. U.S. Dep't of Energy, U.S. Energy Information Administration, Renewable & Alternative Fuels, <http://www.eia.gov/renewable/> (last visited Feb. 12, 2016).

8. *Id.*

9. U.S. DEP'T OF ENERGY, U.S. ENERGY INFORMATION ADMINISTRATION, ANNUAL ENERGY OUTLOOK 2015: WITH PROJECTIONS TO 2040 A-1 (2015) (Total Energy Supply, Disposition, and Price Summary).

10. *Id.*

500,000 potential small hydropower sites in the country, and concluded that the approximately 130,000 sites that meet feasibility criteria could increase hydroelectric generation by over 50 percent after development.¹¹ However, an antiquated hydropower permitting process, developed for large-scale projects like the Hoover Dam, also applies to small-scale hydropower sites and impedes the development of these resources.¹²

The Colorado Supreme Court's recent ruling in *Frees* may enable more hydropower plants to come online.¹³ The Court held that water courts may decree junior, conditional non-consumptive water rights that divert appropriation by senior rights holders, and apply that water to the beneficial use of producing electric power.¹⁴ This decision correctly applied Colorado water law and is consistent with the public policy of maximizing beneficial use of the state's waters.¹⁵ That is, the Court's authorization for junior rights holders to apply water to non-consumptive use provides for the maximization of water's beneficial use without harming senior appropriators' rights.

In Part I, this Article will examine the backdrop of Colorado water law in which the dispute in *Frees* took place. Part II will thoroughly summarize the *Frees* decision discussing the relevant facts, the procedural history, the majority's reasoning, and the dissent's warning of unintended consequences. Part III will review the relaxed statutory landscape for new small-scale hydropower development, and how the *Frees* decision may affect this development. Part IV assesses potential small-scale hydropower sites in the state and how the *Frees* decision may affect water rights with diversion points near those sites. Part V offers a brief conclusion concerning future small-scale hydropower development in Colorado.

II. THREE KEY ASPECTS OF COLORADO WATER LAW LED TO THE FREES DECISION: PRIOR APPROPRIATION, CONSTITUTIONAL PROTECTION OF DITCH EASEMENTS, AND THE PUBLIC POLICY TO MAXIMIZE BENEFICIAL USE OF APPROPRIATED WATER

To provide a grounding for the legal landscape in which the *Frees* controversy and eventual Colorado Supreme Court holding developed, the reader first must understand: (i) the prior appropriation doctrine, (ii) the purpose and constitutional protection of ditch easements, and (iii) the maximization of the beneficial use of appropriated water. Experienced practitioners may wish to skip to the analysis of *Frees* in Part II.

A. THE PRIOR APPROPRIATION DOCTRINE

Colorado long ago abandoned the riparian doctrine in favor of the doctrine

11. U.S. DEP'T OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, WIND AND HYDROPOWER TECHNOLOGIES, FEASIBILITY ASSESSMENT OF THE WATER ENERGY RESOURCES OF THE UNITED STATES FOR NEW LOW POWER AND SMALL HYDRO CLASSES OF HYDROELECTRIC PLANTS, at v (2006) [hereinafter *ASSESSMENT*].

12. Gina S. Warren, *Hydropower: Time for a Small Makeover*, 24 *IND. INT'L & COMP. L. REV.* 249, 250 (2014) [hereinafter *Hydropower*].

13. See *Frees v. Tidd*, 349 P.3d 259, 262 (Colo. 2015).

14. *Id.*

15. See *COLO. REV. STAT.* § 37-92-102(1)(a).

of prior appropriation.¹⁶ The prior appropriation doctrine, established in the Colorado Constitution, codified a first-in-time, first-in-right system—so long as the user puts the water to beneficial use.¹⁷ In fact, the right forms only once the user puts the water to a beneficial use.¹⁸ The constitution applies a rank preference for domestic use over agricultural use, and agricultural use over manufacturing.¹⁹ Ownership of a water right in Colorado does not equate to ownership of the water itself: water rights are usufructuary.²⁰ However, in order for the owner of a water right to use water for agriculture, the owner must convey the water to her lands, which would otherwise remain barren.²¹

B. DITCH EASEMENTS

Even prior to statehood, the Colorado Territorial Legislature recognized the right to appropriate water and convey it to develop lands not adjacent to the source.²² The state's constitution enshrined this doctrine: the constitution allows, upon just compensation, for a right-of-way across all lands for ditches and canals to convey water for domestic, agricultural, and manufacturing uses.²³ The owner of land burdened with such an easement may not alter that easement without first obtaining the owner's permission or obtaining a declaratory judgment that the alterations will not damage the owner's rights.²⁴ State statute clarifies and further defines the doctrine by allowing any owner of a water right or conditional water right²⁵ to obtain a right-of-way across another's land between the point of diversion and the point of beneficial use.²⁶ Moreover, state statute provides that "[n]o tract or parcel of . . . land . . . shall be subjected to the burden of two or more ditches . . . when the same object can . . . be attained by uniting and conveying all the water necessary . . . through one ditch."²⁷ Consistent with this policy goal, the statute authorizes multiple water rights owners to make their diversions at the same point of a water source.²⁸

C. MAXIMIZATION OF BENEFICIAL USE

Maximizing the beneficial use of water is a basic tenet of Colorado water law. In *Fellhauer v. People*, the Colorado Supreme Court held that this policy goal was "implicit" in the state constitution.²⁹ The Colorado Legislature made

16. *Id.* at 264. (citing *Coffin v. Left Hand Ditch Co.*, 6 Colo. 443, 447 (1882)).

17. COLO. CONST. art. XVI, § 6.

18. *Santa Fe Trail Ranches Prop. Owners Ass'n v. Simpson*, 990 P.2d 46, 53 (Colo. 1999).

19. COLO. CONST. art. XVI, § 6.

20. *Kobobel v. Colo. Dep't of Natural Res.*, 249 P.3d 1127, 1134 (Colo. 2011).

21. *Yunker v. Nichols*, 1 Colo. 551, 555 (1872).

22. 1861 Colo. Terr. Laws § 2.

23. COLO. CONST. art. XVI, § 7.

24. *Roaring Fork Club, L.P. v. St. Jude's Co.*, 36 P.3d 1229, 1239 (Colo. 2001).

25. A conditional water right holds a priority date in the appropriation system while the court adjudicates the application and the appropriator puts the water to beneficial use. See *Empire Lodge Homeowners Ass'n v. Moyer*, 39 P.3d 1139, 1147–48 (Colo. 2001).

26. COLO. REV. STAT. § 37-86-102 (2015).

27. § 37-86-105.

28. § 37-92-305(2).

29. *Fellhauer v. People*, 447 P.2d 986, 994 (Colo. 1968).

this goal explicit via statute, “it is the policy of this state to integrate the appropriation, use, and administration of. . . water in such a way as to maximize the beneficial use of all of the waters of this state.”³⁰ In 2001, the Court added three more factors to this policy consideration, namely, that the purpose of the water law is to “guarantee security, assure reliability, and cultivate flexibility. . . of this scarce and valuable resource.”³¹ In a subsequent case, the Court held that promotion of entrepreneurial development, so long as it respects senior water rights, is an acceptable use for water.³² The Court has limited this holding by requiring that an applicant must show that the source contains sufficient water to meet the needs of his proposed appropriation.³³ The applicant’s proposed appropriation may not affect the “quantity, quality, and timing” of the water delivered according to existing water and easement rights on the ditch.³⁴

III. FREES V. TIDD: AN ISSUE OF FIRST IMPRESSION BEFORE THE COLORADO SUPREME COURT OPENED THE DOOR TO MORE DEVELOPMENT OF SMALL-SCALE HYDROPOWER

One feature for easing the federal regulatory burden for a small-scale hydropower project is that the developer has all the necessary water rights.³⁵ Prior to the Frees decision,³⁶ obtaining junior water rights in a fully-appropriated stream could be costly or impossible.³⁷ The Frees decision allows a junior appropriator, under certain conditions, to claim a right to available water in a stream, even if the senior right holder has completely appropriated the water.³⁸ This decision opens the door to the development of small-scale hydropower by enabling power project developers a clear path to claiming a junior right that maximizes the beneficial use of water for hydropower purposes. Because the Frees majority finds water available even in over-appropriated streams,³⁹ the potential exists for an unlimited number of junior appropriators on a stream to install hydropower facilities.

While in her dissent, Justice Márquez sees this decision as a topic best left to the legislature and warns of unintended repercussions,⁴⁰ the majority’s opinion is predictable in light of Colorado policy to maximize beneficial use of the state’s waters discussed in Part III *supra*.

This Article attempts in Part IV *infra* to assess the impact of Frees by cross-referencing potential hydropower sites, or places where the DOE found it could

30. COLO. REV. STAT. § 37-92-102(1)(a) (2015).

31. *Empire Lodge Homeowners’ Ass’n v. Moyer*, 39 P.3d 1139, 1147 (Colo. 2001).

32. *Mount Emmons Mining Co., v. Town of Crested Butte*, 40 P.3d 1255, 1257 (Colo. 2002).

33. *In re Bd. Of Cty. Comm’rs of Cty. of Arapahoe*, 891 P.2d 952, 962 (Colo. 1995).

34. *Roaring Fork Club, L.P. v. St. Jude’s Co.*, 36 P.3d 1229, 1238 (Colo. 2001).

35. See *infra* pp. 10–11.

36. *Frees v. Tidd*, 349 P.3d 259, 265 (Colo. 2015).

37. See Julia S. Walters, *Safeguarding Colorado’s Water Supply: The New Confluence of Title Insurance and Water Rights Conveyances*, 77 U. COLO. L. REV. 496 (2006) (footnotes omitted) (“Because almost every river and stream in Colorado has been over-appropriated for years, it has become increasingly difficult to obtain substantial and reliable new water supplies under junior rights.”).

38. *Frees v. Tidd*, 349 P.3d 259, 262, 268 (Colo. 2015).

39. *Id.* at 266.

40. *Id.* at 270-72 (Márquez, J., dissenting).

be economical to install hydropower, with existing decreed water rights whose physical water such installations could appropriate under junior priority.

A. FACTS OF THE FREES CONTROVERSY

The parties in *Frees* owned adjacent properties in Sagauche County, Colorado.⁴¹ The *Frees* possessed a water right with an 1890 priority date to use 6.4 cubic feet per second (“cfs”) of water diverted through the Garner Creek Ditch No. 1 for irrigation.⁴² This ditch, for which the *Frees* owned an easement, diverted the whole flow of Garner Creek, and traveled across the *Tidds*’ land to deliver water to the *Frees*.⁴³

B. PROCEDURAL HISTORY

The *Frees v. Tidd* controversy stands as an example of the untapped, small-scale hydropower within Colorado, and the way in which hydropower is inextricably linked to water law and water rights within the state. In 2010, the water court issued to the *Tidds* a non-consumptive conditional water right to divert 0.41 cfs from the Garner Creek Ditch No. 1 for small-scale hydropower purposes.⁴⁴ The *Tidds* planned to pipe water 1,222 feet downhill to a turbine that would generate 4.38 kilowatts (“kW”) of electricity.⁴⁵ The *Tidds*’ proposed pipeline would return all of the water to the ditch prior to the point where it crosses into the *Frees*’ property.⁴⁶

The *Tidds*’ application initially indicated the diversion point as being on the ditch.⁴⁷ Early in 2011, the *Frees* submitted a Statement of Opposition to the *Tidds*’ proposed water right.⁴⁸ The *Frees* argued that the *Tidds* were seeking to circumvent the *Frees*’ senior water right.⁴⁹ In June of 2011, the *Tidds* amended their application to show the source as the headgate of Garner Creek, and thus they would be using the same point of diversion as the *Frees*.⁵⁰

While awaiting a decree on their conditional water right application, the *Tidds* moved for a declaratory judgment on whether applicants have a right to use water in a ditch that runs across their property for purpose of hydropower.⁵¹ In ruling on the *Tidds*’ motion, the water court cited Colorado’s public policy of maximizing the beneficial use of limited water supplies to the extent that the user can do so without injuring senior water rights.⁵² The water court found that the ditch contained sufficient water for the *Tidds*’ proposed non-consumptive use.⁵³

41. *Id.* at 261.

42. *Id.*

43. *Id.* at 262.

44. *Id.* at 261.

45. *Id.* at 263.

46. *Id.*

47. *Id.*

48. *Id.*

49. *Id.* at 265.

50. *Id.* at 263.

51. *Id.*

52. *Id.* at 263–64.

53. *Id.* at 263.

Following the water court's finding, the Tidids and Frees collaborated on a decree to assure that the Tidids' non-consumptive use would not harm the Frees' senior priority appropriation.⁵⁴ In June 2014, the water court entered a decree granting the Tidids an appropriation in accordance with their application.⁵⁵ The Frees appealed, leading to the instant case.⁵⁶

C. MAJORITY OPINION: MAXIMIZING BENEFICIAL USE OF SCARCE WATER RESOURCES

The Frees contended that the Tidids were trying to change the Frees' senior water right.⁵⁷ The Frees argued that the Tenth Circuit opinion in *Public Service Co. of Colorado v. Federal Energy Regulatory Commission* supported their position.⁵⁸ That case focused on the Federal Energy Regulation Commission's ("FERC") assessment of a headwater benefits fee on Public Service for its release of additional water from a reservoir upstream of its run-of-the-river Shoshone hydropower plant.⁵⁹ The Tenth Circuit, in dicta, stated that once water entered the reservoir it is no longer public property because it has a "label" on it.⁶⁰ The Frees asserted that once they diverted water it also had a label upon it and so the Tidids may not use it.⁶¹ In rejecting this argument, the Court cited the Tenth Circuit's self-contradiction later in the case, namely, that "a water right is a usufructuary right, and is in no sense a right of ownership in the corpus of the water itself."⁶² The Court then interpreted the Tenth Circuit's dicta to mean that the FERC had a sufficient basis to assert the headwater benefits fee pursuant to the Federal Power Act, not that a user could no longer use the water for any purpose as the Frees asserted.⁶³

In the Frees decision, Justice Hobbs held that the water court properly granted the Tidids' conditional water right and that the water right was sound.⁶⁴ Justice Gregory Hobbs served on the Colorado Supreme Court as an associate justice and the body's pre-eminent water law expert from 1996 until 2015. Writing for the majority, Justice Hobbs found that the Tidids appropriately sought and obtained a decree for a conditional water right before seeking to use water in the ditch that runs across their land.⁶⁵ In strong language, Justice Hobbs reinforced the policy of maximizing beneficial use of scarce water resources: "Although the Tidids intend to use. . . the same physical water as the Frees, this is not merely permissible, Colorado water law favors such multiple uses if injury to senior water rights will not occur."⁶⁶

54. *Id.*

55. *Id.*

56. *Id.*

57. *Id.* at 265.

58. *Id.*

59. *Pub. Serv. Co. of Colo. v. Fed. Energy Regulatory Comm'n.*, 754 F.2d 1555 (10th Cir. 1985).

60. *Frees*, 349 P.3d at 266 (quoting *Pub. Serv. Co. of Colo.*, 91 F.3d at 1565).

61. *Id.* at 266.

62. *Id.* (quoting *Pub. Serv. Co. of Colo.*, 754 F.2d at 1566) (further citation omitted).

63. *Id.* at 266.

64. *Id.* at 265–66.

65. *Id.* at 265.

66. *Id.* (citing *Nichols v. McIntosh*, 34 P. 278, 279 (Colo. 1893)).

The Court discussed the two statutory circumstances under which a water resource is “available” for an adjudicated water right: (i) “there is un-appropriated water available in a stream that is not over-appropriated;” and (ii) “when the affected stream is over-appropriated, the decree for junior water right contains sufficient conditions to prevent injury to other adjudicated water.”⁶⁷ These two circumstances are consistent with the prior appropriation doctrine and the policy of maximizing beneficial use.⁶⁸ Further, Colorado law adds the so-called “can and will” requirement that applicants will complete such projects “with diligence and within a reasonable time.”⁶⁹ The parties agreed that the Tidds’ junior appropriation would not harm the Frees’ senior appropriation.⁷⁰ The Court also noted that its ruling does not require the Frees to divert water from Garner Creek for the benefit of the Tidds’ junior right, even if the Frees do not need water.⁷¹

Finally, the Court rejected the Frees’ argument that the Tidds were unable to appropriate pursuant to the Colorado Constitution.⁷² The state legislature made it a matter of state policy to maximize beneficial use of the state’s waters.⁷³ The Court noted that the Tidds applied for a conditional right of available water from a natural stream in order to put the water to the beneficial use of hydropower.⁷⁴

In total, the Court completely upheld the ruling of the water court and affirmed the decree of the Tidds’ conditional right for hydropower.⁷⁵

D. DISSENT: UNINTENDED CONSEQUENCES

Justice Márquez, joined by Justice Coats, dissented noting that because the Tidds used water that the Frees have already appropriated and diverted, the Tidds essentially appropriated the water out of priority.⁷⁶ Justice Márquez disagreed with the majority’s statement that the Tidds cannot force the Frees to divert water when they do not need it.⁷⁷ She argued that the Tidds necessarily relied on the Frees’ larger flow because they admitted that their appropriation of 0.41 cfs may not be enough by itself to reach their intake pipe.⁷⁸ Thus the Tidds could only appropriate by “piggybacking” on the Frees’ diversion.⁷⁹ Further, Justice Márquez argued that the majority misapplied the “can and will” requirement because case law interpreting the statute only refers to the out-of-priority diversion explicitly adopted by the legislature like augmentation plans,

67. *Id.* at 266.

68. See COLO. REV. STAT. § 37-92-102(1)(a).

69. Frees, 349 P.3d at 267–68 (quoting COLO. REV. STAT. 37-92-305(9)(b) (2014)) (further citation omitted).

70. *Id.* at 267.

71. *Id.*

72. *Id.* at 268.

73. COLO. REV. STAT. § 37-92-102(1)(a) (2015).

74. Frees, 349 P.3d at 268.

75. *Id.*

76. *Id.* at 269 (Márquez, J., dissenting).

77. *Id.* at 269 (Márquez, J., dissenting).

78. *Id.* at 269-70 (Márquez, J., dissenting).

79. *Id.* at 270 (Márquez, J., dissenting).

not new appropriations.⁸⁰ Justice Márquez succinctly summarized her opposition to the majority ruling thusly:

The syllogism evident in [the majority opinion's] statement is that, if unappropriated water is available, then the applicant's proposed new diversion will not harm senior appropriators. Yet the majority turns this logic on its head and effectively holds that, if a new diversion will not harm senior appropriators, then water is available for the new appropriation.⁸¹

Justice Márquez concluded by warning of the ruling's unintended policy repercussions because of the potential duty the Frees may now owe the Tidids.⁸² She pondered about "[w]hat happens, for example, if the Frees wish to change the point of diversion for their Garner Creek Ditch No. 1 water right at some point in the future?"⁸³ Do the Frees now owe a duty to the Tidids not to injure their junior water right?⁸⁴

Justice Márquez' warning might not have important societal implications for users like the Tidids seeking to divert water for small-scale hydropower facilities. But, if the Court applied the same rule to a large hydropower facility relying on non-consumptive use of the same water as a senior appropriator who decided to change a diversion point, the societal impact could be extensive.⁸⁵

IV. DISCUSSION: THE STATUTORY LANDSCAPE FOR SMALL-SCALE HYDROPOWER

A. EASING REGULATIONS FOR SMALL-SCALE HYDROPOWER

While the potential for small-scale hydropower in the United States is vast,⁸⁶ the permitting and regulatory scheme in place, developed by the federal government decades ago for large-scale public works projects, frustrates small-scale hydropower development.⁸⁷ Two recently passed pieces of legislation, however, may help alleviate this situation.⁸⁸

First, with the Hydropower Regulatory Efficiency Act of 2013 ("Efficiency Act"), Congress aimed to promote small-scale hydropower in three significant ways.⁸⁹ First, Congress amended 16 U.S.C. § 2705 to increase the small hydro-power exemption from five MW to ten MW under the Public Utility Regulatory Policies Act.⁹⁰ This amendment allows larger small-scale hydropower projects

80. *Id.* at 271 (Márquez, J., dissenting) (citing *Buffalo Park Dev. Co. v. Mountain Mut. Reservoir Co.*, 195 P.3d 674, 685 (Colo. 2008)).

81. *Id.* (Márquez, J., dissenting) (citation omitted).

82. *Id.* at 272 (Márquez, J., dissenting).

83. *Id.* (Márquez, J., dissenting).

84. *Id.* (Márquez, J., dissenting).

85. See Section IV.C *infra*.

86. ASSESSMENT, *supra* note 11, at 23.

87. Gina S. Warren, *Hydropower: It's a Small World After All*, 91 NEB. L. REV. 925, 926 (2013).

88. Hydropower Regulatory Efficiency Act of 2013, Pub. L. No. 113-23, 127 Stat. 493 (2013) (codified in scattered sections of title 16); Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act, Pub. L. No. 113-24, 127 Stat. 498 (2013).

89. See 127 Stat. 493.

90. § 3, 127 Stat. 493.

to skip the FERC regulatory process thereby reducing the cost and lead time for qualifying projects.⁹¹

Second, Congress amended 16 U.S.C. § 823a to remove the licensing requirement for certain qualifying hydropower facilities; remove conduit projects (without an impoundment such as a dam) under five MW from FERC jurisdiction; and increase the conduit project exemption up to forty MW.⁹² Third, Congress amended 16 U.S.C. § 798 to allow the FERC to extend preliminary permits, and implement a streamlined two-year application process for certain projects.⁹³ This legislation is important for run-of-the-river projects such as the Tidd's that do not have an impoundment.⁹⁴ Again, these changes will ease the permitting burden for small scale projects.

Moreover, the Efficiency Act requires that a person or entity, such as the Tidds, file a notice of intent with the FERC in order to license a conduit project.⁹⁵ The FERC then has fifteen days to make an initial determination whether the proposed facility meets the qualifying criteria, and, if the facility qualifies, the FERC must publish the notice of intent.⁹⁶ Within forty-five days of publication of the notice of intent, the person or entity may contest whether the proposed project meets the qualifying criteria.⁹⁷ The Efficiency Act define qualifying criteria as projects that (i) are on a conduit presently operated for purposes other than hydropower; (ii) do not contain an impoundment such as a dam; (iii) are on a conduit not federally owned; (iv) have a capacity of five MW or less; and (v) do not have prior licenses or exemptions.⁹⁸ Note that the default action under this Act is for the FERC to let the project through the process once it determines that the project meets the qualifying criteria.⁹⁹ This process, again, should streamline permitting.

Second, in the Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act of 2013 ("Jobs Act"), Congress implemented similar improvements for licensing federal conduit projects.¹⁰⁰ The Jobs Act requires that the Bureau of Reclamation ("Reclamation") determine whether the proposed facility is compatible with the conduit's current use, and if the proposed facility will avoid "any unmitigated financial or physical impacts."¹⁰¹ The Jobs Act further requires Reclamation to first offer the lease of the power privilege to the conduit's users.¹⁰² If they decline the offer, Reclamation must offer the

91. See § 4, 127 Stat. 493; cf. *Hydropower*, supra note 12, at 260 (footnote omitted) ("Regardless of the size of the facility, the licensing process can take up to five-and-a-half years to complete and can cost thousands of dollars.").

92. *Id.*

93. § 5, 127 Stat. 493

94. See *Frees v. Tidd*, 349 P.3d 259, 261–62 (Colo. 2015); see infra note 197.

95. § 4, 127 Stat. 493.

96. *Id.*

97. *Id.*

98. *Id.* (defining a "conduit" as a "tunnel, canal, pipeline, aqueduct, flume, ditch, or similar manmade water conveyance").

99. *Id.*

100. Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act of 2013, Pub. L. No. 113-24, 127 Stat. 498 (2013).

101. § 2, 127 Stat. 498

102. *Id.*

privilege to others.¹⁰³

As a backdrop to this loosening of restrictions, the FERC has encouraged states to establish memoranda of understanding with the FERC to develop small-scale hydropower projects.¹⁰⁴ In 2010, the State of Colorado signed such an agreement with the FERC (“MOU”)¹⁰⁵ in order to help meet the state’s Renewable Portfolio Standard.¹⁰⁶ The MOU articulates the FERC’s and Colorado’s “mutual interest in streamlining and simplifying regulations for authorizing small hydropower projects.”¹⁰⁷ The FERC retained the responsibility under the Federal Power Act for issuing licenses and exemptions, and for regulatory authority over dam safety.¹⁰⁸ The State of Colorado has the responsibility to regulate water quality; ensure *ex ante* that projects qualify for an exemption from FERC regulations; and consult with appropriate federal and state agencies, tribes, and the public.¹⁰⁹ The MOU’s pilot program consists of twenty installations whose purpose is to “identify and test opportunities to simplify and streamline procedures and regulations for authorizing small scale hydropower projects.”¹¹⁰ The State of Colorado and the FERC may continue the pilot program if it is successful.¹¹¹ Colorado’s pre-screening criteria are:

1. The project will be located within an existing water delivery system;
2. The project will use existing infrastructure, including points of diversion and discharge;
3. There will be no increased stream diversions;
4. The project will be entirely contained by existing waterway structures;
5. The primary purpose of the infrastructure will remain, e.g., most commonly municipal water supply and irrigation;
6. There will be no significant change in operation of the infrastructure;
7. The water delivery system has all necessary water rights, permits, licenses or other approvals required by any local, state, or federal authority;
8. The project will not adversely affect water quality;
9. The project will not adversely affect fish passage;
10. The project will not adversely affect a threatened or endangered species;

103. *Id.*

104. Hydropower, *supra* note 12, at 264.

105. State of Colorado & Fed. Energy Regulatory Comm’n, Memorandum of Understanding Between the Federal Energy Regulatory Commission and The State of Colorado through the Governor’s Energy Office to Streamline and Simplify the Authorization of Small Scale Hydropower Projects (2010) [hereinafter MOU].

106. Colo. Rev. Stat. § 40-2-124 (2015) (mandating certain percentages of renewable electrical power generation within Colorado for different power generator types, by 2020).

107. MOU *supra* note 105, at 2.

108. *Id.* at 2.

109. *Id.* at 2–4.

110. *Id.* at 2.

111. *Id.* at 4–5.

11. The project will not adversely affect a cultural resource;
12. The project will not adversely affect a recreational resource; and
13. The project will meet all of the other requirements for either a conduit or a 5 MW exemption.¹¹²

The Court's decision in *Frees* has the potential to directly affect the seventh of these criteria— that is, the requirement that the project obtain the necessary water rights—because it may make it easier for hydropower project developers to obtain junior appropriations for non-consumptive use of the same physical water along the same conduit used by senior appropriators.¹¹³ Provided, as the Court held, that the junior appropriations will not injure the senior water right.¹¹⁴

B. POTENTIAL RESOURCES IN COLORADO

Between existing but under-utilized hydropower facilities, non-powered dams, unimproved conduits, federally and non-federally owned conduits, the untapped hydropower potential in the state is wide-ranging and complex.¹¹⁵ Many of these resources, however, will fit into one of the regulatory schemes recently put in place to accelerate the development of small-scale hydropower.¹¹⁶

In 2013, the State of Colorado published *The Small Hydropower Handbook* (“Colorado Handbook”), a set of guidelines for small-scale hydropower development.¹¹⁷ While the Colorado Handbook acknowledged that there is no established definition of “small-scale hydropower,” it nonetheless defines “small-scale hydropower” as projects producing fewer than two MW.¹¹⁸ The Colorado Handbook noted that since 2005, Colorado has had sixty-two operating hydropower facilities with a combined capacity of 1,162 MW, and that these facilities generate over one trillion watt-hours annually.¹¹⁹ The state's largest plant is 300 MW in capacity.¹²⁰

Prior to the DOE's 2006 nationwide assessment of hydropower resources,¹²¹ the agency commissioned a detailed state-level assessment, *United States Hydropower Resource Assessment for Colorado* (“Colorado Assessment”), that identified and assessed the hydropower potential of 251 sites in Colorado.¹²² That report assigned a project environmental suitability factor (“PESF”) for each project's hydropower potential.¹²³ The PESF assessed the

112. *Id.* at 3. (numbering added for clarity). Note that the State of Colorado and the FERC published the MOU three years prior to the passage of *The Hydropower Regulatory Efficiency Act*, and so the MOU reflects the older exemption limits. Compare *id.*, with *Hydropower Regulatory Efficiency Act of 2013*, Pub. L. No. 113-23, 127 Stat. 493 (2013).

113. See *id.*; *Frees v. Tidd*, 349 P.3d 259, 265 (Colo. 2015).

114. *Frees*, 349 P.3d at 265.

115. See COLORADO ASSESSMENT, *supra* note 1, at 2.

116. See *id.*; see also *Hydropower Regulatory Efficiency Act of 2013*, Pub. L. No. 113-23, 127 Stat. 493 (2013); *Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act of 2013*, Pub. L. No. 113-24, 127 Stat. 498 (2013); MOU, *supra* note 105, at 3; *infra* Figure 4.

117. Colo. Energy Office, *Colorado Small Hydropower Handbook* (2013).

118. *Id.* at 7.

119. *Id.*

120. *Id.*

121. ASSESSMENT, *supra* note 11.

122. COLORADO ASSESSMENT *supra* note 1, at 2.

123. *Id.* at 1.

project's wild and scenic resource protection; the presence of fish and threatened/endangered species; and the cultural, geologic, historic, recreational, scenic, and wildlife value of the site.¹²⁴ The PESF is always a number between 0.1 and 0.9, "where 0.9 indicates the highest likelihood of development, and 0.1 indicates the lowest likelihood of development."¹²⁵ I used the PESF in the United States Hydropower Resource Assessment for Colorado ("Colorado Assessment") to adjust the raw potential of a particular site with the likelihood that someone might actually develop the site.¹²⁶

The Colorado Assessment classified sites in three ways: (i) sites with existing hydropower but untapped capacity; (ii) sites with no generation, but some sort of developed impoundment; or (iii) undeveloped sites without a diversion structure.¹²⁷ Most of the sites identified the DOE had power ratings below five MW,¹²⁸ and so would fit under the MOU's exemptions.¹²⁹ The adjusted capacity of the sites identified and assessed was approximately 665 MW.¹³⁰ Ninety-one of these sites had existing impoundments, undeveloped hydropower resources, and a combined adjusted annual capacity of approximately 377 MW.¹³¹ Because these sites have existing impoundments, they qualify under the MOU exceptions but not the Efficiency Act.¹³² 155 of the 251 sites the DOE identified are undeveloped and with a combined adjusted annual capacity of 209 MW, and so may qualify under the Efficiency Act.¹³³ The total number of sites in these two categories, that is, without hydropower development, is 246.¹³⁴

Reclamation estimated that Colorado has twenty-eight potential hydropower generation sites with a total potential annual energy capacity of over 100 MWh on Reclamation-owned conduits.¹³⁵ These sites may qualify for licensing

124. *Id.* at app. D at 1.

125. *Id.* at 1.

126. See *id.* For each site, I calculated a nameplate power rating in kW. Then, I multiplied the name plate rating by the PESF to arrive at an adjusted power rating that reflects not only the site's raw power potential, but the likelihood someone will develop that potential into an actual power plant. For instance, appendix B of the Colorado Assessment shows the Azure site on the Colorado River has a nameplate rating of 21,000 kW. *Id.* at app B at 1. The site's PESF, however, is only 0.1. *Id.* The adjusted capacity (PESF multiplied by name plate rating) is thus 2,100 kW. See *id.* This calculation reflects that although the raw potential of the site is strong, environmental and land-use factors make its development unlikely. See *id.* at 1. This Article relies on the adjusted power calculation.

127. *Id.* at 2. Note that sites that fall under the first classifications have previously obtained licenses to generate hydropower and so they would not qualify under FPA exemptions. See Hydropower Regulatory Efficiency Act of 2013, Pub. L. No. 113-23, 127 Stat. 493, § 4 (2013).

128. COLORADO ASSESSMENT *supra* note 1, at 2.

129. MOU, *supra* note 105, at 2.

130. COLORADO ASSESSMENT *supra* note 1, at 2.

131. *Id.* at app. A at 1.

132. See § 4, 127 Stat. 493; MOU, *supra* note 105, at 3.

133. See § 4, 127 Stat. 493; COLORADO ASSESSMENT *supra* note 1, at 2, 3 (Figure 2 and Figure 3); see also *infra* Figure 4.

134. COLORADO ASSESSMENT *supra* note 1, at app. A at 1.

135. U.S. DEP'T OF THE INTERIOR, BUREAU OF RECLAMATION, POWER RESOURCES OFFICE, SITE INVENTORY AND HYDROPOWER ENERGY ASSESSMENT OF RECLAMATION OWNED CONDUITS: SUPPLEMENT TO THE "HYDROPOWER RESOURCE ASSESSMENT AT EXISTING RECLAMATION FACILITIES REPORT 7 (2012).

under the Jobs Act.¹³⁶ The Colorado Handbook also notes that the DOE identified in Colorado an additional eleven sites at non-powered dams with the potential to produce an additional 632,000 MWh annually.¹³⁷

V. POTENTIAL EFFECTS OF THE FREES DECISION

A. METHODOLOGY

In order to estimate the potential impact of the Frees decision,¹³⁸ I researched existing decreed appropriations for uses other than hydropower that exist on the 246 conduits and non-powered dams identified by the DOE in the Colorado Assessment.¹³⁹ That report identified sites by FERC number, latitude and longitude coordinates, and a name.¹⁴⁰ Where possible, I matched these data to the state's database of decreed water rights.¹⁴¹

I cross-referenced the latitude and longitude of the possible hydropower sites with the land grid sections in the United States Bureau of Land Management's Statewide Geographic Coordinate Database.¹⁴² This database contains the locations and the extent of the township, range, and sections from the Public Land Survey System ("PLSS") for each state.¹⁴³ I determined the location of each of the 246 sites within a section of the database.¹⁴⁴

I accomplished this matching via a custom-developed computer program I wrote in MATLAB¹⁴⁵ that compared the extent of each PLSS section to check if it contained each of the 246 sites.¹⁴⁶ The program created a composite table of water rights and nearby potential hydropower sites. In order to generate the figures *infra*, I first filtered the composite table of water rights using different variables such as water division,¹⁴⁷ county,¹⁴⁸ and structure type.¹⁴⁹ I then added the total flows in the water rights.¹⁵⁰ Two sites the DOE identified in the Colo-

136. See Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act of 2013, Pub. L. No. 113-24, 127 Stat. 498, § 2 (2013).

137. Colo. Energy Office, Colorado Small Hydropower Handbook 8 (2013).

138. See discussion *supra* Part II.

139. See COLORADO ASSESSMENT *supra* note 1, at 3 (Figure 3), app. A at 1.

140. *Id.* at app. D-1 to D-251.

141. See Colorado's Decision Support Systems: Water Rights, COLO. WATER CONSERVATION BD., <http://cdss.state.co.us/onlineTools/Pages/WaterRights.aspx> (last visited Feb. 19, 2016) [hereinafter Support Sys.].

142. Dep't of the Interior, Bureau of Land Mgmt., GEOCOMMUNICATOR, http://www.geo-communicator.gov/GeoComm/Isis_home/home (last visited Feb. 19, 2016).

143. *Id.*

144. See COLORADO ASSESSMENT *supra* note 1, at app. A at 1; Dep't of the Interior, *supra* note 142.

145. See MATLAB, <http://www.mathworks.com/products/matlab/?requestedDomain=www.mathworks.com> (last visited June 5, 2016) ("The MATLAB platform is optimized for solving engineering and scientific problems. The matrix-based MATLAB language is the world's most natural way to express computational mathematics.").

146. See COLORADO ASSESSMENT *supra* note 1, at app. A at 1.

147. See *infra* Figure 3.

148. See *infra* Table 1.

149. See *infra* Figure 2.

150. See *infra* Figures 2-4; Tables 1-2.

rado Assessment contained incorrect coordinate information, and so I corrected the coordinates in order to include them in the analysis.¹⁵¹

Using the PLSS data shown in Figure 1 *infra*, I searched the Colorado Decision Support System for decreed water rights within each section containing a potential hydropower site.¹⁵² I filtered the results to include only water rights whose diversion structures Colorado described as “other,” “ditch,” “reservoir,” “pipe,” “power plant,” and “minimum flow.”¹⁵³ I excluded unlikely sources for hydropower development, such as ground water, wells, and pumps,¹⁵⁴ as well as seeps and springs.¹⁵⁵

To assess the potential impact of the Frees decision,¹⁵⁶ I totaled for reservoirs the flows and storage volumes in groups by water court division, county, and structure type. I am aware of no publicly available assessment of Colorado’s hydropower potential that is more thorough than the Colorado Assessment.¹⁵⁷ This assessment combined with an exhaustive search of the state’s decreed water rights within proximity of a single PLSS section should indicate the water rights with hydropower potential.¹⁵⁸

Nonetheless, potential shortcoming of the analysis is the relatively old age of the Colorado Assessment.¹⁵⁹ Certainly, some pertinent details in the state’s water distribution architecture have occurred since its publication in 1994.¹⁶⁰ It

151. See *infra* Figure 1 (incorporating corrected latitude and longitude coordinates for Glacier Creek and Homestake Tunnel); compare COLORADO ASSESSMENT *supra* note 1, at app. D at 40 (listing Glacier Creek’s latitude and longitude coordinates as 3935.00 and 11544.00), at 98 (listing Homestake Tunnel’s latitude and longitude coordinates as 7916.00 and 10623.00), with LAT-LONG.COM, http://www.lat-long.com/Latitude-Longitude-179818-Colorado-Glacier_Creek.html (last visited Mar. 19, 2016) (listing Glacier Creek’s latitude and longitude coordinates as 39.283044 and -106.4380834), and LAT-LONG.COM, http://www.lat-long.com/Latitude-Longitude-179823-Colorado-Homestake_Tunnel.html (listing Homestake Tunnel’s latitude and longitude coordinates as 39.3119324 and -106.4514172).

152. See Support Sys., *supra* note 141.

153. See *id.*

154. Ground water, wells, and pumps all typically require energy input to produce water. Extracting energy from these sources would be a net loss of energy due to the Second Law of Thermodynamics, which states that an irreversible process is one that includes dissipative effects, or the presence of non-quasistatic processes. Because pumping water includes dissipative effects (e.g. friction in pump or turbine bearings) it is an irreversible process and cannot extract 100 percent of the energy available. In other words, a hydropower turbine (or any other means) cannot completely extract the energy imparted to the water by a pump. Therefore, I excluded these sources. For a description of the second law and irreversibility, see, e.g., YUNUS A. ÇENGEL & MICHAEL A. BOLES, THERMODYNAMICS, AN ENGINEERING APPROACH 257–62 (2d. ed. 1994).

155. I excluded seeps and springs because they are unlikely to flow with sufficient velocity for hydropower production, and if one were to impound the water produced in order to attain sufficient potential energy or hydraulic head, the Decision Support System would include the water in a reservoir.

156. See discussion *supra* in Part II.

157. Other sources are available to estimate the hydropower potential in Colorado. For instance, the Colorado Department of Agriculture published an extensive report in 2013 showing possible locations for small-scale hydropower on pressurized irrigation systems, ditch drops, and dams. However, the detailed site-specific information contained in the COLORADO ASSESSMENT was not available in these other sources. See, e.g., COLO. DEP’T OF AGRIC., RECOMMENDATIONS FOR DEVELOPING AGRICULTURAL HYDROPOWER IN COLORADO 3 (2013).

158. See *id.*; Figure 1 *infra*.

159. See COLORADO ASSESSMENT, *supra* note 1 (published in 1994).

160. See, e.g., Water Project Loan Program, COLORADO WATER CONSERVATION BOARD (Mar. 22, 2016), <http://cwcb.state.co.us/LoansGrants/water-project-loan-program/Documents/Ex>

is also possible that some water rights, though in the same PLSS section, are in a different drainage than the potential hydropower site. The Colorado Assessment only reported on two sites with raw power capacity less than five kW order of magnitude of the Tidd's project.¹⁶¹ Also, the list of potential hydropower sites identified by DOE is not exhaustive. For instance, the list did not include Garner Creek, the Tidds' proposed project source.¹⁶²

B. RESULTS: THE FREES DECISION COULD SUBJECT THE WATER USED UNDER SEVERAL HUNDRED SENIOR WATER RIGHTS WITHIN THE STATE TO JUNIOR APPROPRIATIONS FOR HYDROPOWER USE

By cross-referencing the potential hydropower sites from the Colorado Assessment with the state's list of decreed water rights within the same land section, the Frees decision has the potential to affect up to 315 individual water rights.¹⁶³ These rights draw from seventy-three sources in thirty-two different Colorado counties and seven Water Court Divisions.¹⁶⁴ The total of all affected water rights flows is over 7,600 cfs.¹⁶⁵ Additionally, reservoirs hold nearly 1.3 million acre-feet of water in proximity to the potential power plant sites.¹⁶⁶ This is a substantial amount of water; for reference, the state's reservoirs currently hold over 2.5 million acre feet of water appropriated for power generation in general.¹⁶⁷ The largest potential source of flows (nearly 4,000 cfs) to support hydropower projects could come from ditches, as in the Frees case.¹⁶⁸ The second largest source (nearly 3,000 cfs) exists in power plant diversions.¹⁶⁹ The Water Court Divisions most affected are Divisions 4 and 5.¹⁷⁰ These divisions encompass the drainage of the Gunnison River and Colorado River.¹⁷¹ Two counties in these divisions, Montrose and Mesa Counties, individually are among the largest possible sources for hydropower flows.¹⁷² Specifically, Montrose County

ampleProjectsFunded.pdf

161. *Frees v. Tidd*, 349 P.3d 259, 263 (Colo. 2015); see COLORADO ASSESSMENT, *supra* note 1, at app. D at 6-7 (the assessment lists McDonough 2 with a raw power potential of 3 kW, and Blue Valley Ranch 3(2) with 5 kW).

162. See *Frees v. Tidd*, 349 P.3d 259, 261 (Colo. 2015); COLORADO ASSESSMENT, *supra* note 1, at app. D at 1-251; Support Sys., *supra* note 141 (after inputting "Garner Creek," showing Tidd's conditional water right at township 45 north, range 10 east, section 1).

163. See *Frees*, 349 P.3d at 268; COLORADO ASSESSMENT, *supra* note 1, at app. D at 1-251; Support Sys., *supra* note 141 (input land section).

164. See *infra* Figures 1-3, Tables 1-2.

165. See *infra* Figure 2.

166. See *id.*

167. See Support Sys., *supra* note 141 (input "power generation" for use and "reservoir: for structure type").

168. See *Frees*, 349 P.3d at 265; *infra* Figure 2.

169. See *infra* Figure 2.

170. See *infra* Figure 3.

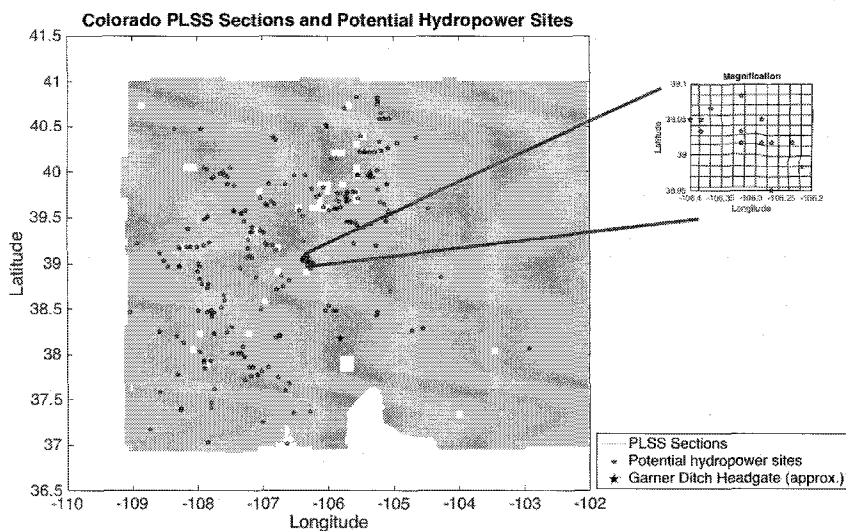
171. Water Division Four – Gunnison River Basin, COLO. JUDICIAL BRANCH, https://www.courts.state.co.us/Courts/Water/Division.cfm?Water_Division_ID=4 (last visited Feb. 20, 2016); Water Division Five – Colorado River Basin, COLO. JUDICIAL BRANCH, https://www.courts.state.co.us/Courts/Water/Division.cfm?Water_Division_ID=5 (last visited Feb. 20, 2016).

172. See *ibid.*; COLORADO DIVISION OF WATER RESOURCES, http://www.water.state.co.us/Home/PublishingImages/Map_CountiesAndDivs.gif (last visited Mar. 17, 2016) (showing that Mesa County straddles Gunnison River and Colorado River Basins); see also *infra* Table 1.

has the potential to produce 3,011 cfs and Mesa County 2,338 cfs.¹⁷³

Of the 251 potential hydropower sites the DOE identified, 110 are in a PLSS section containing at least one decreed water right with a diversion in the same section, which may indicate the availability of water that a junior appropriator could use for hydropower purposes.¹⁷⁴ The bulk of the decreed flows (approximately 6,000 cfs) coincide with existing impoundments that may qualify for development under the MOU.¹⁷⁵ The remaining flows (approximately 1,000 cfs) are associated with unimproved sites that may qualify for development under the Efficiency Act.¹⁷⁶ Note that most flows are associated with existing impoundments, which number the fewest sites.¹⁷⁷ Specifically, forty existing structures account for over 6,400 cfs, and the remaining seventy-three unimproved sites account for 1,240 cfs.¹⁷⁸ That most of the high flow water resources are at existing sites¹⁷⁹ may imply that the quality of the remaining sites is less favorable for hydropower development.

Figure 1. Colorado PLSS Sections and Potential Hydropower Sites¹⁸⁰



173. See *infra* Table 1.

174. See COLORADO ASSESSMENT, *supra* note 1, at D 1-251; Support Sys., *supra* note 141.

175. See COLORADO ASSESSMENT, *supra* note 1, at D 1-251; MOU, *supra* note 105, at 3; *infra* Figure 4.

176. See Hydropower Regulatory Efficiency Act of 2013, Pub. L. No. 113-23, 127 Stat. 493, § 4 (2013); COLORADO ASSESSMENT, *supra* note 1, at D 1-251; Support Sys., *supra* note 141; *infra* Figure 4.

177. See COLORADO ASSESSMENT, *supra* note 1, at D 1-251; Support Sys., *supra* note 141; *infra* Figure 4.

178. *Ibid.*

179. *Ibid.*

180. See COLORADO ASSESSMENT *supra* note 1; SUPPORT SYS., *supra* note 141; see also *supra* Part IV(A).

Figure 2. Possibly Affected Flows by Structure Type¹⁸¹

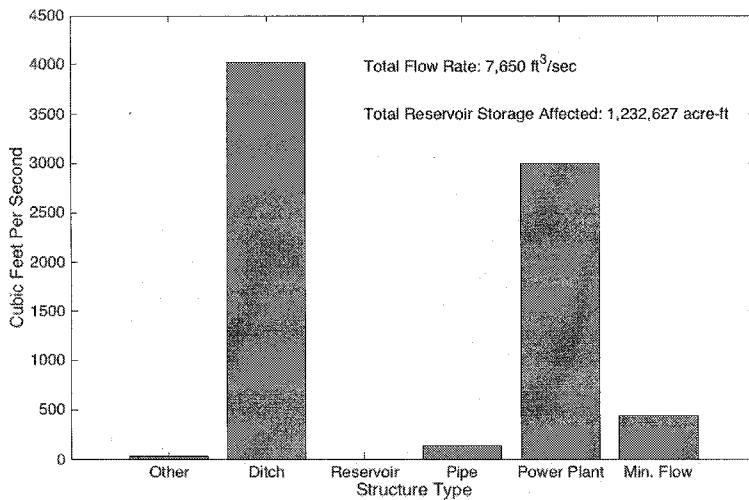
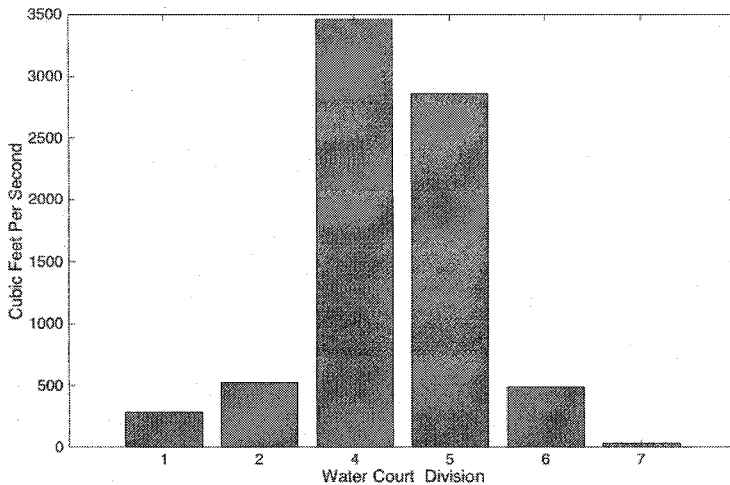


Figure 3. Possibly Affected Flows by Water Court Division¹⁸²



181. See COLORADO ASSESSMENT *supra* note 1; SUPPORT SYS., *supra* note 141.

182. See COLORADO ASSESSMENT *supra* note 1; SUPPORT SYS., *supra* note 141.

Figure 4. Possibly Affected Flows by Site Type, and Site Count¹⁸³

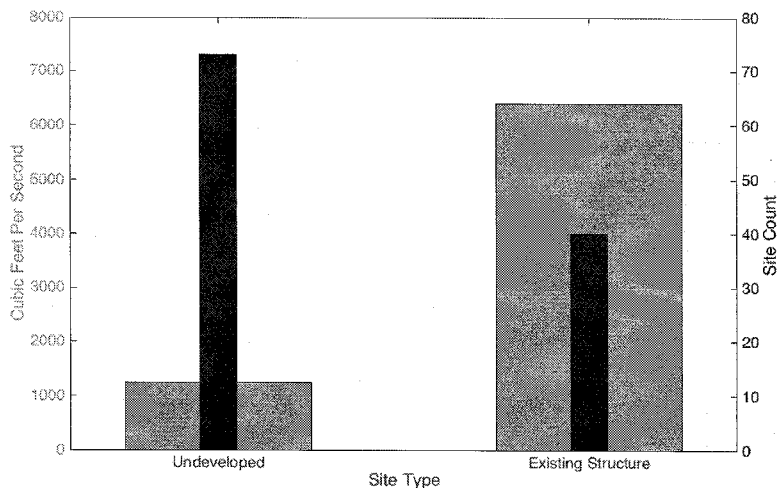


Table 1. Total Flows Possibly Affected by County¹⁸⁴

| County Name | Total Flow (CFS) | County Name | Total Flow (CFS) |
|-------------|------------------|-------------|------------------|
| ARCH | 9.4 | LARIMER | 95.8 |
| BOULDER | 34.9 | MESA | 2337.6 |
| CHAFFEE | 22.9 | MONTRORSE | 3011.5 |
| CLEAR CREEK | 135.4 | MONTEZUMA | 0.5 |
| DELTA | 97.1 | OURAY | 9.6 |
| EAGLE | 60.79 | PARK | 11.3 |
| FREMONT | 60.0 | PITKIN | 25.0 |
| GARFIELD | 152.3 | PUEBLO | 38.0 |
| GRAND | 223.0 | RIO BLANCO | 234.5 |
| GUNNISON | 318.9 | ROUTT | 6.4 |
| HINSDALE | 21.8 | SAGUACHE | 19.3 |
| JACKSON | 249.3 | SAN MIGUEL | 29.5 |
| JEFFERSON | 5.0 | SUMMIT | 10.2 |
| LAKE | 405.1 | WELD | 3.0 |
| LA PLATA | 21.9 | | |

183. See COLORADO ASSESSMENT supra note 1; SUPPORT SYS., supra note 141. Note that undeveloped sites may qualify under the Efficiency Act, Hydropower Regulatory Efficiency Act of 2013, Pub. L. No. 113-23, 127 Stat. 493, § 4 (2013), and existing sites may qualify for further hydropower resource development under the MOU, MOU, supra note 105, at 3.

184. See COLORADO ASSESSMENT supra note 1; SUPPORT SYS., supra note 141.

Table 2. Possibly Affected by Water Source¹⁸⁵

| Source | Total Flow (CFS) | Source | Total Flow (CFS) | Source | Total Flow (CFS) |
|-----------------------|------------------|-------------------------|------------------|--------------------------|------------------|
| ALDER CREEK | 12.8 | DIRTY GEORGE CREEK | 4.2 | ROARING FORK RIVER | 10.2 |
| ALFALFA RUN | 0.1 | DRY CEDAR CREEK | 0.3 | ROCK CREEK | 2.0 |
| ANIMAS RIVER | 21.9 | EAGLE RIVER | 30.0 | SAN JUAN RIVER | 1.3 |
| ARKANSAS RIVER | 100.0 | ELK CREEK | 4.0 | SAN MIGUEL RIVER | 12.3 |
| BEAR CREEK | 1.0 | GOOSE CREEK | 26.0 | SHUTTOWN CREEK | 2.0 |
| BEAVER CREEK | 4.8 | GUNNISON RIVER | 3054.9 | SLAUGHTER HOUSE GULCH | 1.0 |
| BIG TITOMPSON RIVER | 3.0 | GYPSUM CREEK | 6.0 | SOUTH ARKANSAS RIVER | 7.3 |
| BLUE RIVER | 155.5 | HARRISON CREEK | 4.9 | SOUTH FORK MICHIGAN RIVE | 249.3 |
| BRANDY CREEK | 1.0 | HENSON CREEK | 6.0 | SOUTH FORK WHITE RIVER | 45.4 |
| BRUSH CREEK | 19.0 | IRON CREEK | 8.0 | SOUTH SAINT VRAIN CREEK | 8.9 |
| CACHE LA POUFRE RIVER | 95.8 | KANNAH CREEK | 1.5 | SPRING CREEK | 4.0 |
| CANYON CREEK | 13.3 | KENNEDY GULCH | 0.5 | SURFACE CREEK | 36.7 |
| CHERRY CREEK | 0.5 | KISER CREEK | 1.0 | SWEETWATER CREEK | 19.0 |
| CHICKEN CREEK | 0.5 | LAKE FORK | 427.6 | TAYLOR RIVER | 240.4 |
| CIMARRON RIVER | 25.0 | LEAVENWORTH CREEK | 88.5 | THOMAS CREEK | 6.0 |
| CLEAR CREEK | 44.3 | LONGS GULCH | 3.6 | TUMBLE CREEK | 3.0 |
| COAL CREEK | 1.5 | MAD CREEK | 6.0 | TURKEY CREEK | 14.0 |
| COCHETOPA CREEK | 19.3 | MILL CREEK | 8.2 | WARD CREEK | 0.3 |
| COLORADO RIVER | 2483.0 | MILLER CREEK | 9.4 | WEST CHICAGO CREEK | 1.5 |
| COW CREEK | 9.1 | NORTH FORK SOUTH PLATTE | 6.8 | WHITE RIVER | 175.5 |
| CRYSTAL RIVER | 47.5 | NORTH FORK WHITE RIVER | 3.6 | WILLOW CREEK | 7.5 |
| DANVERS CREEK | 1.5 | PERU CREEK | 10.2 | YULE CREEK | 4.0 |
| DERBY CREEK | 7.8 | PLATEAU CREEK | 19.1 | | |

185. See COLORADO ASSESSMENT *supra* note 1; SUPPORT Sys., *supra* note 141.

C. ESTIMATING THE SCOPE OF THE DISSENT'S UNINTENDED CONSEQUENCES

In her dissent in *Frees*, Justice Márquez warned about unintended consequences of the *Frees* decision:

What happens, for example, if the *Frees* wish to change the point of diversion for their Garner Creek Ditch No. 1 water right at some point in the future? If doing so would impact the availability of water for the *Tidds*' hydroelectric water right, is this 'injury' sufficient to preclude such a change to the *Frees*' water right? In other words, what obligations do the *Frees* now have to avoid injury to the *Tidds* (or to a future holder of the *Tidds*' hydroelectric power right)?¹⁸⁶

Should this question arise for adjudication in a Colorado court, I believe the Colorado Supreme Court's *St. Jude I* decision is sufficient to resolve the situation.¹⁸⁷ In *St. Jude's I*, the Court re-affirmed a balancing test developed in prior cases: "[T]he direction of the law in Colorado has also been toward the accommodation doctrine, in requiring that, whenever possible, the uses must be exercised consonantly with one another."¹⁸⁸ The Court cited its earlier case, *Lazy Dog Ranch*, to state that "both the holder of the easement and the owner of the land burdened by the easement have rights to use the property. Consequently, the interests of both parties must be balanced in order to achieve due and reasonable enjoyment of both the easement and the servient estate."¹⁸⁹ This holding suggests that Justice Márquez is correct: should the *Frees* wish to move their diversion point they will have to take the *Tidds*' new water right into consideration and will be unable to unilaterally move the diversion point.¹⁹⁰

Given the relatively small size of most of the potential hydropower sites in Colorado (under five MW),¹⁹¹ her predictions of wider socio-economic impacts seem at first unlikely from a practical point of view.¹⁹² However, given the number of water rights that a junior appropriator may wish to use for hydropower development (over three hundred),¹⁹³ the scope of potential conflicts expands greatly. Consider also the seventy-three water sources supplying those water rights,^{194,138C} and the situation becomes potentially more complex than in the *Frees* case, in which there were only two rights holders and a single ditch.¹⁹⁵

In support of Justice Márquez's position, for instance, consider this extreme

186. *Frees v. Tidd*, 349 P.3d 259, 272 (Colo. 2015) (Márquez, J., dissenting).

187. *Roaring Fork Club, L.P. v. St. Jude's Co.*, 36 P.3d 1229, 1235 (Colo. 2001).

188. *Id.* at 1235 (citing *Gerrity Oil v. Magness*, 946 P.2d 913, 927 (Colo. 1997)).

189. *Id.* at 1235 (citing *Lazy Dog Ranch v. Telluray Ranch Corp.*, 965 P.2d 1229, 1238 (Colo. 1998)) (further citation omitted).

190. *Frees*, 349 P.3d at 272 (Márquez, J., dissenting).

191. MOU, *supra* note 105, at 3.

192. See *Frees*, 349 P.3d at 272 (Márquez, J., dissenting).

193. See COLORADO ASSESSMENT, *supra* note 1, at app. D at 1–251; Support Sys., *supra* note 141. See *ibid.*; *supra* Figures 1-3, Tables 1–2. See *ibid.*; *supra* Figures 1-3, Tables 1–2.

194. *Frees*, 349 P.3d at 261.

hypothetical on the Colorado River. Relying on the Frees decision,¹⁹⁶ a hydro-power developer using run-of-the-river generators¹⁹⁷ installs small five MW plants every half mile from the headwaters of the Colorado all the way to the state line. To paraphrase the Frees decision, so long as the developer puts the water back where he found it and does not affect senior water rights, he is maximizing the beneficial use of the water.¹⁹⁸ Thus, the developer can obtain a whole series of junior appropriations using water also appropriated by the multitude of users of the Colorado River.

VI. CONCLUSION

The Colorado Supreme Court's decision in Frees,¹⁹⁹ coupled with an easing of federal regulations,²⁰⁰ paved the way for more small-scale hydropower projects in Colorado. Such projects can tap into the under- or undeveloped water power resources in the state.²⁰¹ The decision strikes an appropriate balance between Colorado's public policy of maximizing beneficial use of scarce water resources, while protecting the integrity of the state's prior appropriation doctrine.²⁰² However, given the number of water rights and the associated flows or water storage that future hydropower projects could affect,²⁰³ the decision may lead to more conflicts over the beneficial use of the state's limited waters.

196. *Id.* at 268.

197. Unlike a traditional dam-based generator that relies on stored water, a run-of-the-river generator requires no impoundment or little hydraulic head. Run-of-River Power, ENERGY BC, <http://www.energybc.ca/profiles/runofriver.html> (last visited Mar. 19, 2016). Instead, a run-of-the-river generator relies on the kinetic energy of the river water flowing past it. *Id.*

198. Frees, 349 P.3d at 265.

199. *Id.* at 265.

200. See Hydropower Regulatory Efficiency Act of 2013, Pub. L. No. 113-23, 127 Stat. 493 (2013); Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act, Pub. L. No. 113-24, 127 Stat. 498 (2013); MOU, *supra* note 105, at 2.

201. See COLORADO ASSESSMENT, *supra* note 1, at 1; Figure 1 *supra*.

202. See Frees, 349 P.3d at 272 (Márquez, J., dissenting).

203. *Id.* (Márquez, J., dissenting).