

# Findings of Fact and Order

## White Bear Lake Protective Elevation

### White Bear Lake, Ramsey and Washington Counties

DATE: December 21, 2016

**Names of Reviewers:** Jason Moeckel and Julie Ekman, Section Managers, Division of Ecological and Water Resources, Minnesota Department of Natural Resources and staff.

**Decision:** The protective elevation for White Bear Lake (82-167) is hereby set at 922.0

### Factual Findings

Based on the information in the administrative record and the file with the Minnesota Department of Natural Resources (DNR) Division of Ecological and Water Resources and consideration of the applicable laws, the DNR finds that there is substantial evidence in the record supporting the protective elevation of 922.0 for White Bear Lake (Public Water No. 82-167).

### Background and Location

1. White Bear Lake is located at the intersection of Ramsey and Washington Counties Minnesota in the north east quadrant of the Twin Cities Metropolitan Area. The lake is 2410 acres<sup>1</sup>, covering numerous sections of Township 30N-Range 21 and 22W. *DNR Bulletin No. 25 – An Inventory of Minnesota Lakes* at 445 (1968) available at [http://www.dnr.state.mn.us/waters/watermgmt\\_section/pwi/bulletin25.html](http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/bulletin25.html) (*Bulletin 25*). White Bear Lake is a public water within the meaning of Minn. Stat. § 103G.005, subd. 15. Its public waters inventory identification number is 82-167.

2. At 923.0 feet 1912 MSL<sup>2</sup> White Bear Lake has a littoral area of approximately 1,314 acres, a mean depth of 20 feet, a relatively small watershed to lake area ratio of approximately 2:1, and a maximum depth of 83 feet. *White Bear Lake (82-167) Ramsey and Washington Counties* B-0469 (May 1978). These numbers vary depending on the elevation of the lake. White Bear Lake has no natural inlet and has a single constructed outlet.

3. White Bear Lake is primarily managed for walleye and muskellunge, but many other aquatic species thrive in the lake.

4. Riparian land owners and the citizens of Minnesota use White Bear Lake for swimming; angling; and boating, including sailing and ice boating. There are three public beaches on White Bear Lake.

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<sup>1</sup> No elevation data is listed for water basins included in Bulletin 25. The acreage provided in *Bulletin 25* is the acreage of White Bear Lake at the time the data was gathered. *Bulletin 25*, at 445.

<sup>2</sup> All elevations provided herein are in Ramsey County 1912 Datum.

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5. White Bear Lake overlays a shallow aquifer and the Prairie du Chien -Jordan aquifers. The interaction between White Bear Lake and the underlying aquifers is not fully understood. *See generally*, U. S. Geological Survey *Draft Statistical Analysis of Lake Levels and Field Study of Groundwater and Surface – Water Exchanges in the Northeast Twin Cities Metropolitan Area, Minnesota, 1001 through 1015*, Ch. A (2016).

6. A number of communities in the northeast metropolitan area obtain drinking water from the Prairie du Chien-Jordan aquifer.

7. Elevation data for White Bear Lake has been collected since 1924. White Bear Lake's elevation has fluctuated over that time within a 7.86 foot range. Its Ordinary High Water Elevation (OHW)<sup>3</sup> is 924.89 feet. White Bear Lake's highest recorded lake elevation was observed in June 1943, when the lake reached an elevation of 926.7 feet. Lake levels at or above 924.80 were measured in 1942 through 1947, 1950 through 1953, 1985 through 1987, 1995 through 1999, and 2003. Periods of water levels at the lower end of White Bear Lake's historic range (918.84 feet to 921.5 feet) were measured between 1924 to 1927, 1934 to 1935, 1989 to 1991 and 2009 to 2015. White Bear Lake's lowest recorded elevation of 918.84 was taken in January 2013.

8. White Bear Lake was intermittently augmented with water from the Prairie du Chien—Jordan aquifer from 1924 to 1978. Recorded water levels for White Bear Lake's did not exceed 923 feet until 1939. Between 1939 and 1978, White Bear Lake's elevation fluctuated between 923 and 926.7. Since 1978, White Bear Lake's elevation has twice dropped to the lower end of its historic range.

9. In 2012, two citizen's groups the White Bear Lake Restoration Association (WBL Restoration Association) and the White Bear Lake Homeowners Association (Homeowners Association) (hereinafter collectively referred to as "the Plaintiffs) sued the DNR under the Minnesota Environmental Rights Act (MERA). Minn. Stat. Ch. 116B. They allege that DNR-permitted groundwater appropriations to communities within the north and east Metropolitan Area have caused White Bear Lake water levels to decline, causing the impairment, pollution, and destruction of White Bear Lake and the aquifer beneath it. The DNR has denied and continues to deny these allegations in all respects.

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<sup>3</sup> The ordinary high water (OHW) level is a regulatory construct. The OHW level is the elevation where vegetation transitions from primarily aquatic to primarily upland. The OHW level is not an average water level or a "goal" water level. Water levels might occasionally rise above the OHW level, but are most often below the OHW level. Minn. Stat. §103G.005, subd. 14. The DNR may require a permit for activities that take place water-ward of the OHW level. Minn. Stat. §103G.245, subd. 1. In designated shoreland areas, local governments are required to assure that structures are setback a certain distance from the OHW. Minn. R.6120.3300.

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10. On December 9, 2014 the parties entered into a settlement agreement (Settlement) in which the DNR agreed to “set a protective elevation for White Bear Lake using the criteria set forth in Minn. Stat. § 103G.285 as they exist at the date of . . . [settlement].” The DNR further agreed to “consider this protective elevation and the cumulative impact of existing wells on White Bear Lake and the aquifers in (a) evaluating new groundwater appropriation permit applications and (b) in reviewing, modifying, suspending, and/or terminating existing groundwater appropriation permits, public water supply plans, and water demand reduction measures to the extent and in the manner required by Minnesota statutes and regulations and the terms of existing permits.” Settlement Agreement at ¶ 13. The Settlement Agreement also provides, however, that “[t]o ensure that communities have an adequate water supply, DNR is not obligated to enforce any protective elevation . . . by modification, reduction or termination of groundwater appropriations until or unless the Northeast Metro Project Phase I is operational” and capable of providing water to the communities of Vadnais Heights, White Bear Lake, White Bear Township, Mahtomedi, Shoreview, and North St Paul (hereinafter “Phase I Communities”). *Id.*

#### **Statutory Criteria**

11. Minnesota Statute §103G.285, subd. 3 (a) directs that “permits to appropriate water from water basins must be limited so that the collective annual withdrawals do not exceed a total volume of water amounting to one-half acre foot per acre of water basin.” Prior to issuing a permit to appropriate water directly from a surface water basin, the commissioner of DNR must set a protective elevation for the basin, below which an appropriation is not allowed, and incorporate that protective elevation as a condition in the water appropriation permit [Minn. Stat. § 103G.285, subd. 3(b)]. *See also*, Minn. R. 6115.0670, subp. 3(B)(4).

12. White Bear Lake is a designated water basin on Minnesota’s public water inventory with a designated basin number of 82-167. *Bulletin 25* at 445. It is a water basin within the meaning of Minn. Stat. § 103G.285, subd. 3 and Minn. R. 6115.0670, subp. 3(B)(4)(a)–(b).

13. DNR has no current water appropriation permit authorizing appropriations directly from White Bear Lake. DNR has no record of ever issuing a permit for a direct appropriation from White Bear Lake.

14. Minnesota Statute § 103G.287, subd. 2 provides that groundwater appropriations “that will have negative impacts to surface waters are subject to the applicable provisions section 103G.285” including the provisions of Minn. Stat. § 103G.285, subd. 3 to set and implement a protective elevation for the impacted surface water body.

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15. The DNR has issued a number of groundwater appropriation permits to communities in the north and east metropolitan area in the vicinity of White Bear Lake, including the Phase I Communities. The Plaintiff's contend that the DNR's decision to appropriate groundwater to the Phase I Communities as well as other surrounding communities has a negative impact on White Bear Lake. The DNR has denied these allegations in all respects but, without admitting or denying liability, agreed as part of the Settlement to exercise its jurisdiction pursuant to Minn. Stat. § 103G.285, subd. 3(b) and set a protective elevation for White Bear Lake, public water basin 82-167.

16. When the DNR sets a protective elevation for a water basin, the commissioner is required to consider the following factors set forth in Minn. Stat. § 103G.285, subd. 3(b):

- (1) the elevation of important aquatic vegetation characteristics related to fish and wildlife habitat;
- (2) existing uses of the water basin by the public and riparian landowners; and
- (3) the total volume within the water basin and the slope of the littoral zone.

The statute requires that the DNR consider each of these factors in setting a protective elevation, but does not establish a relative priority among these factors. Thus, in setting a protective elevation, the DNR must balance these factors in light of the facts of each case.

17. Minnesota Rule part 6115.0630, subp.13 further defines a protection elevation<sup>4</sup> as “the water level of the basin necessary to maintain fish and wildlife habitat, existing uses of the surface basin by the public and riparian owners, and other values which must be preserved in the public interest.”

18. Minnesota Rule part 6115.0670, subp. 3B(4)(6) further provides that protective elevations for a basin shall be based on the factors set forth in Minn. R. 6115.0670, subp. 2C including:

- a. The total volume of water within the basin;
- b. The slope of the littoral zone;
- c. Available facts on historic water levels for the basin and other relevant hydrologic factors;
- d. Cumulative long-range ecological effects of the proposes appropriation; and
- e. Natural and artificial controls which might affect the water levels of the basin.

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<sup>4</sup> Minn. Stat. § 103G.245, subd. 3 refers to the “protective elevation” while Minn. R. 6115.0670 refers to the “protection elevation”. The term “protective elevation” will be used throughout this document.

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The rule requires that each of these factors be considered by the DNR in setting a protective elevation but does not give priority to any single one of these factors. Thus, in setting a protective elevation, the DNR must balance these factors in light of the facts of each case.

19. The protective elevation is not a guaranteed water elevation for a water basin but is the point below which the DNR will not permit direct appropriations from the surface water. Minn. Stat. § 103G.285, subd. 3(a). In the case of groundwater appropriations, the DNR will consider groundwater - surface water interaction in determining how and when to restrict water use to support the protective elevation. If the specific circumstances warrant, groundwater appropriations could be restricted prior to the point at which the protective elevation is reached.

20. In assessing any adjustments that may be required for groundwater withdrawals when a protective elevation is reached, the DNR will first assess whether the groundwater withdrawal has a negative impact on the surface water body. Minn. Stat. § 103G.287, subd. 2.

#### **Protocol Used to Set the Protective Elevation**

21. In setting the protective elevation for White Bear Lake, the DNR considered factors identified in statute and rule [Minn. Stat. § 103G.285, subd. 3(b) and Minnesota Rule part 6115.0670, subp. 3B(4)(6)] and followed the process set out in the DNR's *Report to the Minnesota State Legislature: Definitions and Thresholds for Negative Impacts to Surface Water* at 20-21 (January 2016) (*Thresholds Report*). The process laid out in the *Thresholds Report* was the outcome of a 2015 legislative requirement directing the DNR to develop recommendations for the calculation of thresholds for negative impacts to surface waters. The protocol was then tested by applying it to a range of lake types and hydrologic conditions. *Id.* at 1. This process for setting protective elevations for water basins was reviewed by aquatic resource experts both internal to and external to the DNR, including aquatic resource professionals from the U.S. Geological Survey (USGS), and Mankato State University.

22. The protocol for setting the White Bear Lake protective elevation involved the following steps:

- Determine Characteristic Elevations: Examine historic water level records for White Bear Lake and evaluate the lake's characteristic elevations to determine the variability and range of elevations that are necessary for maintaining the lake's hydrology, ecology (including aquatic vegetation and habitat) and in-stream uses<sup>5</sup> (including lake access).

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<sup>5</sup> An in-stream use is a use made of any water body in its natural condition by natural systems, the public at large, and riparian land owners that is dependent upon maintaining sufficient water in the water body to support such uses, including recreational uses such as swimming, boating, sport

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- Assess Deviation from Characteristic Elevations over Time: Determine how often water levels drop below the characteristic elevations.
- Set Protective Elevation: Establish a protective elevation that will protect the key resource values of the lake including hydrology, ecology, and in stream uses of the lake most of the time.

*See generally Thresholds Report at 21.*

23. Applying the protective elevation to an individual permit is a process separate and apart from the setting of a protective elevation and any application of the protective elevation to any individual permit will be addressed separately from the setting of the protective elevation and in accordance with the requirements of Minn. Stat. §§ 103G.285, subd. 3 and 103G.287, subd. 2.

24. The *Thresholds Report* sets out protocol for how the protective elevation should inform permitting decisions. In applying this protocol the DNR will:

- Develop a Lake Water Budget: Develop a water budget for White Bear Lake that accounts for all water inflows into and water losses from the lake basin.
- Assess Appropriation Impact: Assess how much water existing and/or proposed appropriations are diverting from the system, and how those might affect the lake's hydrology, ecology, and in-stream uses of the water body.
- Establish Diversion Limits: Based on the water budget and the protective elevation, establish a sustainable diversion limit (a volume of water) that can be diverted from the lake throughout the year. The intent is to set diversion limits at a level that will remain effective across multiple "wet" or "dry" years. In extreme drought conditions that span one or more years, appropriations would likely need to be reduced (as with streams and other resources).

*Thresholds Report at 21*

25. If a groundwater withdrawal is found to negatively impact the surface water, the DNR will consider the degree of impacts groundwater withdrawals have on the surface water and the water use priorities set forth in Minn. Stat. § 103G.261 in making any adjustments to water

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fishery habitat, and skating as well as water quality, aesthetics, and electrical power generation. *See eg Mathew Levinson, California Water: An Economic Consideration*, 12 UCLA J. of Envl. Law & Policy 183, 185 (1993), Lawrence J. MacDonnell, *Federal Interests in Western Water Resources: Conflict and Accommodation*, 29 Nat. Resources J. 389 (1989), *National Audubon Society v. Superior Court*, 658 P.2d 709, 725-26 (defining in-stream uses to include navigation, fishing, recreation, ecology, and aesthetics).

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appropriation permits. Recreational use alone will not be protected at the expense of the other priority uses set forth in Minn. Stat. § 103G.261.

26. The process set forth in ¶ 21 - 22 provided the framework for setting the protective elevation for White Bear Lake. Professionals with expertise in water permitting, surface and groundwater monitoring, fisheries, wildlife, wetlands, aquatic invasive species, shoreland communities, engineering, limnology, boating access, and aquatic plant management all contributed their expertise in setting the protective elevation.

27. On November 3, 2015, the DNR received a letter from the White Bear Lake Conservation District (WBL Conservation District) requesting that the protective elevation for White Bear Lake be set at 924.0 feet – 924.5 feet, close to White Bear Lake’s OHW level of 924.89 feet. The WBL Conservation District’s arguments stressed the regional recreational significance of the lake, including swimming at the County beach and boat racing. The DNR considered the recreational impacts identified by the WBL Conservation District in setting the protective elevation for White Bear Lake.

#### **Application of the Statutory Criteria**

28. As illustrated by White Bear Lake’s historical data lakes and other natural water basins are dynamic systems and the dynamic nature of those systems is important to aquatic ecosystem health, including fisheries and wildlife habitat. In setting the protective elevation for any given water body, the DNR must balance the public interest in the ecological health of the water basin with the public’s use of the water body and the desire of the public and riparian landowners to maintain the water body within an elevation range the best supports desired recreational activities. Because water basins are dynamic and their health and natural character depend on water level variation, a protective elevation cannot be viewed as a steady state elevation or an artificially high minimum elevation to be maintained over time. Lakes exist in natural settings and should be expected to fluctuate in accordance with their position in the watershed and the hydrologic inputs and outputs to and from that system.

#### **Lake Hydrology and Water Level**

29. The DNR review of White Bear Lake’s hydrology included, but was not limited to, a review of all historic lake gage information for White Bear Lake, modifications to the elevation of the lake’s outlet, the history of intermittent groundwater pumping for lake level augmentation, and other historical lake data.

30. Data has been collected on White Bear Lake’s water levels since 1924. An analysis of this data indicates that White Bear Lake has experienced large swings in lake levels (> 5 foot change) on four separate occasions, each extending over multiple years. Two of these instances involved large, multi-year, declines in water elevation and two involved large, multi-year,

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increases in water elevation. The recorded variation in White Bear Lake water elevations is 7.86 feet, ranging from elevation 918.84 feet to 926.7 feet.

31. Large swings in lake levels are not unique to White Bear Lake. Such swings have been recorded by the DNR for other lakes in Minnesota, particularly for those lakes that have small watershed or land area providing water input to the lake in comparison to the size of the lake. This is consistent with other available data that indicates lakes with a low watershed to lake size ratio may have larger swings in elevation over time. *U.S. Geological Survey Scientific Investigations Report 2013—5044: Groundwater and Surface – Water Interactions near White Bear Lake, Minnesota, through 2011*, at 7.

32. The outlet of White Bear Lake has been lowered twice between 1924 and the present. The outlet was first lowered in 1943 (from 926.3 feet to 925.4 feet) in response to lawn and basement flooding on riparian properties around the lake. The lake outlet was lowered a second time in 1982 to an outlet elevation of 924.3 feet.

33. During the period of record described above, water has flowed out of White Bear Lake infrequently. This pattern of infrequent discharge is consistent with that observed in other Minnesota lakes with a low watershed to lake size ratio.

34. Between 1924 and 1977, groundwater pumping was used intermittently in an attempt to augment White Bear Lake. The degree to which historic augmentation was successful in raising the water level of White Bear Lake is unknown. Records indicate that lake augmentation was a common practice from the late 1920s through the early 1940s and occurred less frequently in the 1950s and 1960s. The DNR permit authorizing the practice was terminated in 1977.

35. Using water level records from White Bear Lake, the DNR developed water level exceedance graphs—i.e., graphs that show the percentage of time the lake was at or above a specific elevation. The DNR created and analyzed lake-level exceedance graphs for the following time periods: the total period of available records (1924 to 2016), the period from 1924 to 1980, and the period from 1980<sup>6</sup> to 2016.

36. The White Bear Lake water level exceedance graph for the full period of historic record reflects the wide range of water levels that lake has experienced over time. The 50% exceedance elevation (i.e., the lake elevation that is exceeded by 50% of the recorded elevations, with the remaining 50% of the recorded elevations falling below that level) is 923.3 feet. However, the lake level exceedance graphs for the period prior to 1980 and the period since 1980 depart at the high end and the low end of the water level record. For the highest 15% of the lake level readings (0 – 15% exceedances), the period prior to 1980 had higher water levels as compared to

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<sup>6</sup> 1980 was selected as a dividing line because it was midway between 1977 (the year augmentation ceased) and 1982 (the year the outlet was lowered to 924.3 feet).



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the period after 1980. This difference likely reflects the impact of lowering the lake's outlet to 924.3 feet in 1982. After 1980, the lowest 45% of the readings (55 – 100% exceedances) are lower than the lows in the period prior to 1980. The cause of the differences in low water elevation between these two time frames is one of the focuses of an ongoing USGS groundwater modeling study. See generally, *U.S. Geological Survey Scientific Investigations Report 2013—5044: Groundwater and Surface – Water Interactions near White Bear Lake, Minnesota, through 2011* (2013) and *Draft U.S. Geological Survey Scientific Investigations Report 2016—5139—A: Statistical Analysis of Lake Levels and Field Study of Groundwater and Surface Water Exchanges in the Northeast Twin Cities Metropolitan Area, Minnesota 2002 through 2015* Chapter A (2016).

37. Based on the full historical lake gage record (i.e., 1924 to present), water levels in White Bear Lake have been above elevation 924.0 feet only about 28% of the time, above 923.0 feet about 58% of the time, above 922.0 feet 73% of the time, and above 921.0 feet 90% of the time.

38. Based on its analysis of the water level exceedance graphs, the DNR concluded that large swings in lake elevation are a natural part of White Bear Lake's hydrology and likely occurred prior to the available lake gage history. As a result, it would not be reasonable to set a protective elevation for the lake at a high water level that has occurred infrequently in the lake's history, particularly when the lake has regularly dropped below this level even prior to extensive development and groundwater appropriation. It would also not be reasonable to attempt to maintain lake elevations at a fixed level or within a narrow, elevated range, given the lake's extensive history of fluctuating water levels.

39. The DNR also estimated the volume of water that flowed out of White Bear Lake between 1995 and 2004, the last time that lake levels were above the outlet elevation of 924.3 feet. This is the elevation at which water begins to flow through the outlet culvert. A relationship between lake level and outflow developed by the DNR in its 1998 White Bear Lake study was used to estimate daily flow rates during the period between 1995 and 2004 and those daily values were summed to generate a total outflow volume. Based on this analysis<sup>7</sup>, the DNR concluded that approximately 2.867 billion gallons of surface water flowed out of the lake's outlet between 1995 and 2004.

#### Littoral Zone

40. DNR also considered the slope of the littoral zone in relationship to water volume, as required by Minn. Stat. § 103G.285, subd. 3(b):(3). As a first step in this analysis, DNR directly measured the slope of the littoral zone at selected locations in the lake basin (see ¶42) and reviewed historical photographs and other relevant historic documents to assess the littoral zone and that portion of the lake's volume associated with the littoral zone.

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<sup>7</sup> This analysis assumes that the lake area is 2,400 acres.

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41. A lake's littoral zone is defined as that area of the lake where water depths are equal to or less than 15 feet deep and represents the near-shore area where aquatic plant growth is typically most abundant. This area of a lake provides critical "shallow-water" habitat for many fish and wildlife species.

42. The DNR calculated the size of White Bear Lake across a range of lake levels from 926.0 to 914.0 feet. LiDAR data was used to define contour lines for elevations on exposed lake bed. DNR's White Bear Lake depth map B-0469, May 1978 was used to define contour lines for elevations below the lake's water surface. As one would expect, as water levels fall, the size (surface area) of the lake gets smaller. However, the decline in the surface area of White Bear Lake as water levels fall does not occur in constant, even steps. For the first four feet of lake elevation loss, from 926.0 to 922.0 feet, the lake shows a small decrease in surface area (3.3 %). In contrast, over the next four foot drop, from 922.0 to 918.0 feet, a much larger decline in surface area is observed (18.5%).

43. Because of White Bear Lake's contours, the acreage of littoral zone remains fairly consistent at varying lake levels within the historic range. Indeed, as water levels decline from 926.0 to 922.0 feet, the area of littoral zone in White Bear Lake actually increases slightly from 1158 acres to approximately 1338 acres. Moreover, the littoral zone acreage at 926.0 feet (1158 acres) is nearly the same as the littoral zone acreage at 918.0 feet (approximately 1111 acres). This analysis indicates that the size of the littoral zone, which is critical in supporting associated fish, wildlife, and plant resources, is not significantly affected over the range of observed lake levels on White Bear Lake.

44. The DNR has conducted aquatic plant assessments in White Bear Lake periodically since 1978 and has records from as far back as 1930. The data from these assessments were examined to identify potential impacts of fluctuating lake levels.

45. The DNR also reviewed the scientific literature on aquatic habitat in littoral zones to assess the scientific knowledge regarding the impact of lake elevation changes on aquatic plants that provide important fish and wildlife habitat in lakes similar to White Bear Lake. This literature was also examined to determine whether specific water elevation change patterns play an important role in a plant's life cycle.

46. No large-scale changes in White Bear Lake's native submerged plant community were identified in the historic data. Eurasian watermilfoil, a non-native plant was detected in the lake in 1988. Emergent and floating-leaf aquatic plant communities are abundant, diverse, and broadly distributed around the shallow-water areas of White Bear Lake. These community types have high fish and wildlife habitat value and are given the highest level of protection under DNR's aquatic plant management rules and permit program.

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47. DNR's aquatic plant data show that three-square bulrush (*Scirpus americanus*) is a particularly abundant emergent species in White Bear Lake. The scientific literature identifies this species as one that is well adapted to lakes with large, periodic, fluctuations in water levels. This species provides important aquatic habitat for fish and wildlife. The fact that three-square bulrush is abundant in White Bear Lake today demonstrates that large, periodic changes in water level are normal for this lake and are ecologically important in maintaining the aquatic plant communities that are critical to the lake's health. As water levels fall to 922 or below, the increased extent of exposed lakebed provides conditions necessary for the germination of seeds that replenish three-square bulrush stands. This in turn improves aquatic habitat as water levels rise.

48. Since 1954 the DNR has conducted regular fish population assessments in White Bear Lake. *White Bear Lake – Lake Management Plan*. In addition, the DNR has conducted a series of seven special fisheries assessments on White Bear Lake since 1999.<sup>8</sup> *Id.* These seven assessments correspond to the most recent period of declining water levels in White Bear Lake. *Id.* The data from these assessments were examined to identify potential impacts of fluctuating lake elevations and a range of environmental conditions on native and stocked fish populations.

49. The following fish species are found in White Bear Lake in average or above average abundance: Walleye, Northern Pike, Muskellunge, Largemouth Bass, Bluegill, and Crappie. Bullhead species and Yellow Perch are found in White Bear Lake at lower abundance. White Bear Lake is one of the only inland lakes in the St. Paul Minneapolis area with a naturally reproducing population of Smallmouth Bass. *Id.* The DNR stocks White Bear Lake with fingerling Walleye and Muskellunge. *White Bear Lake – Lake Management Plan*. Walleye have been stocked annually in White Bear Lake since 1976. *Id.* Muskellunge have been stocked in White Bear Lake intermittently since 1975. *Id.* Stocking of these two species occurs in a number of lakes throughout the state.

50. For recreational fish species that reproduce naturally in White Bear Lake such as those species identified in ¶ 49, the DNR reviewed the scientific literature to determine whether those species are known to be impacted by changing lake elevations.

51. An analysis of White Bear Lake fish population assessments showed no evidence of fish population decline over the historic period in which DNR has gathered fish population data. DNR Fisheries Section staff did not find any evidence that the recreational fish species that naturally reproduce in White Bear Lake are being impacted by changes in the lake's water level. Likewise, there is no evidence of impacts to recreational fish species that are stocked. The DNR concluded that the pattern of water change observed in White Bear Lake is not adversely impacting

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<sup>8</sup> These special assessments were conducted in 1999, 2004, 2006, 2009, 2010 (2 assessments), and 2012. *White Bear Lake – Lake Management Plan*.

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the habitats or the food resources that the lake's recreational fish populations need. The scientific literature reviewed by the DNR supported this conclusion.

#### Water Quality

52. Since 1988, Ramsey County has annually collected water water quality data for White Bear Lake: water clarity and total phosphorus. Secchi disk depth, a standard method employed by the Minnesota Pollution Control Agency, was used to assess water clarity in White Bear Lake. Total phosphorus concentration was also used to represent the lake's water quality because phosphorus is typically the nutrient limiting algae growth in Minnesota lakes and is the primary focus of water quality management efforts. Bi-monthly sampling results for White Bear Lake were available for the months of May through September (summer period) each year. Data was gathered from multiple locations in the lake and the available samples were averaged to generate a lake-wide summer average value each year. The lake is in the upper 25% in terms of water clarity in the North Central Hardwood Forest Ecoregion of the state. *White Bear Lake – Lake Management Plan.*

53. The DNR obtained and reviewed water quality data for White Bear Lake collected by Ramsey County between 1988 and 2015 to look for patterns demonstrating a potential relationship between White Bear Lake's water level and the measured water clarity and/or water quality values. No significant patterns were found between the lake's water elevation, and water clarity or water quality over the period of record examined. White Bear Lake's water clarity and water quality did not change with observed fluctuations in the lake's water level.

#### *Ecological Conclusion*

54. DNR analyzed the hydrologic data throughout White Bear Lake's historic period of record; the size of White Bear Lake's littoral zone habitat; its aquatic vegetation communities including emergent, floating-leaf, and submerged types; the health of its recreational fish populations including those that reproduce naturally in the lake and those that are stocked; and the lake's water clarity and water quality. Based on that analysis and the application of the criteria set forth in Minn. Stat. § 103G.285, subd. 3(b)(1) and (3) and Minn. R. 6115.0670, subps. 2C and 3B(6), DNR concluded that the water level fluctuations that White Bear Lake has experienced since 1980, including the lows experienced between 2009 to 2014, are not harmful to the lake's ecology. DNR's analysis further identified the presence of three-square bulrush, a high-value emergent plant species whose life cycle is well adapted to the relatively large fluctuations in water level characteristic of White Bear Lake. This species positively impacts aquatic vegetation habitat and fish populations. The fact that three-square bulrush is abundant in White Bear Lake today is consistent with DNR's view that large, periodic changes in water level are a normal and ecologically important part of White Bear Lake's hydrologic history and ecology.

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55. Based on its analysis, DNR determined that, were recreation not a factor, there is no evidence that the fluctuating lake levels White Bear Lake has experienced over its recorded history have adversely impacted either aquatic vegetation, lake ecology or fish and wildlife habitat. Thus, based on these ecological factors alone any protective elevation DNR would set for White Bear Lake would be below its historic range. Indeed, DNR's evaluation of both the limnology and hydrology indicate that fluctuating lake levels within the range observed over the period of record are important to the health of White Bear Lake.

#### Recreational Use

56. Minnesota Statute section 103G.285, subd. 3(b)(2) requires that, in addition to considering environmental factors discussed in ¶¶ 29 – 53, the DNR also consider the use of a water basin by both the public and riparian owners when setting a protective elevation for a water basin. In the case of White Bear Lake there are no permitted direct surface water appropriations and the water body is not used to generate electric power. The public and riparian uses of White Bear Lake are primarily recreational.

57. Many recreational activities take place at or near the shoreline, including public swimming, boat launching, and boat docking (both public and commercial). For these activities, changes in the location of the lake shore and water depth were assessed to evaluate how lake level changes impacted recreational use. Lake level changes also have the potential to impact off-shore boating activity if certain areas of the lake become too shallow to navigate safely. Thus changes in lake elevations may adversely impact recreational activities within the littoral zone even where there are no adverse impacts to aquatic vegetation and lake ecology.

58. The DNR used the White Bear Lake water level exceedance graphs discussed in ¶ 35 to help assess the recreational impacts of changing lake elevations. These graphs were important to identifying the impacts to recreational activities and facilities, such as boat accesses and swimming beaches, at given lake levels. If the use of boat accesses and swimming beaches was limited when the lake levels receded below a certain elevation, it was also important to know with some certainty what percentage of the time the lake level had historically been at or below that elevation.

59. To help assess the impact of fluctuating lake elevations on recreational activities in White Bear Lake, a DNR survey crew collected detailed, current shoreline elevation profile data at points of interest (e.g., public beaches, public access points, areas of important aquatic plant habitat). The survey crew visited White Bear Lake on two separate occasions, May 20 and June 9, 2016. The survey crew measured lakebottom profiles, extending perpendicular from the shoreline to assess the slope of the lake bottom as one moves from shore towards deeper water. The DNR found that the shoreline elevation profiles differed from location to location. The difference in lake profiles, as outlined in ¶¶ 60 – 71 below had the potential to impact recreational activities in the littoral zone as water elevations fluctuated. Thus the lake bottom profile data was

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important data for interpreting patterns of changing recreation activities in response to changing water levels in White Bear Lake.

60. To assess the range of recreational uses of White Bear Lake, the DNR contacted local governments that operate or have operated public swimming beaches on White Bear Lake and asked them to provide details on the impact of changing lake elevation on public beaches. The DNR's review found that the water level changes in White Bear Lake have had different impacts on the lake's different public swimming beaches, depending on the beach location.

61. The Ramsey County Beach, which is located on the western side of the lake's Northwest Bay, was closed in 2009 when the water level dropped to 922.0 feet. Ramsey County has not reopened the beach since, even though current lake levels are above 922.5 feet. When the lake was at 922.0 feet or lower, the exposed beach area expanded considerably, and there was a smaller area of gradual slope under water before the lake bottom suddenly "dropped off." Rapid changes in water depth pose an increased safety risk for swimmers and Ramsey County had concerns for swimmer safety. Citing swimmer safety concerns, the White Bear Conservation District, in a letter addressed to the DNR in November 2015, indicated that the Ramsey County Beach was unlikely to open until White Bear Lake's lake elevation was at or near 924.0 feet.

62. In contrast, the Mahtomedi swimming beach located on White Bear Lake's eastern shore and the Bellaire beach on the western shore have remained open despite fluctuating lake levels. The lake bottom topography in these locations may have contributed to the decision not to close either the Mahtomedi or Bellaire Beaches. These beaches do not have the sudden drop in lake-bottom slope that is found at the Ramsey County Beach. Based on this evaluation, the DNR concluded that shore-based swimming can occur across the range of water levels the lake has experienced. The lake's bottom topography at each beach location, however, determines whether it is safe for a particular beach to remain open as water levels fluctuate.

63. The DNR reviewed aerial photos of public water access points to examine how lake levels affected access use patterns. The DNR also reviewed construction plans for the Ramsey County Park and the City of White Bear Lake Matoska Park access ramps.<sup>9</sup> The DNR considers a lake's water level history when it designs water accesses and strives to use access designs that will accommodate boat use across the range of expected water levels for the water basin. This was true when, in 2007, the DNR redesigned the Ramsey County Beach boat access, which is designed to be useable down to an elevation of 920.0 feet. The City of White Bear Lake's Matoska Park boat access was similarly designed. Although these access points are designed to be useable down to 920.0 feet, low water levels may reduce the rate at which boats can be launched and retrieved. This is because at lower lake elevations the size and depth of the channel leading from the boat ramp to the open water narrows and becomes shallower making departing from or returning to the ramp a slower process.

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<sup>9</sup> The DNR did not evaluate the Bellaire Beach boat access site or private access sites.

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64. There are a number of commercial and public docks located in the Southwest Bay of White Bear Lake. The DNR reviewed aerial photos of the Southwest Bay taken periodically from 1991 to 2016 to assess how the length and configuration of those docks changed as water elevations fluctuated over time.<sup>10</sup> The DNR also used the aerial photos to determine which dock slips may have become unusable at lower elevations.

65. The DNR found that water level changes impacted the length and configuration of four dock facilities located in the Southwest Bay. In general, the length of the docks in the complex increased as water levels fell. As water levels approached 920.0 feet changes to dock length or configuration were more apparent. For example, the southern-most mooring facility examined added an “L” to the deep end of its existing dock as elevations dropped in an apparent attempt to accommodate its customers. These changes were apparently undertaken to insure that there was sufficient water depth to moor boats. It also appears in the aerial photos that, when the lake elevation was low, near-shore boat slips went unused.

66. An examination of lake-bottom contours suggests that dock location is an important factor in the usability of docks on White Bear Lake during lower elevations. The bottom contour of White Bear Lake in the Southwest Bay is not uniform. Some of the docks are located next to steeply sloping lake bottom and little change in dock length or configuration appeared necessary to adjust to changing water levels. Other docks are located in areas where the slope of the lake bottom is more gradual and changes in water level required larger accommodations. Additionally, when water levels were low for multiple years, the beds of aquatic plants become more abundant in shallow water. The presence of this aquatic vegetation is consistent with reduced use of the adjacent boat slips.

67. The DNR also reviewed aerial photos for areas of the lake where private docks are located to assess how fluctuating lake elevations affected the use of riparian land owners. For this analysis, the DNR examined how the length, configuration, and number of docks changed with fluctuating water levels.

68. The DNR found that water level changes impacted both the location and length of private docks. As water levels dropped, riparian property owners either extended the length of their docks or moved the shoreward end of the dock out onto newly exposed lakebed. As water levels continued to drop and the water’s edge moved further away, some riparian property owners stopped installing docks. Again, as was the case with public beaches and commercial and public

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<sup>10</sup> There were limitations associated with using aerial photographs to assess recreational boating impacts because the available aerial photos were taken in different months. Additionally, the number of boats moored at these facilities varies throughout the open water season. In every photo except that from April 2012, mooring facility docks were present and many boats were moored at these facilities, especially in northern portion of the bay.

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docks, the impact to riparian landowners varied depending upon the lake bottom topography adjacent to the riparian owner's property. In areas with steeper slopes where water depth increases rapidly as one moves out from shore, less change in dock length or position was needed in response to changing water levels. Conversely, in areas with shallower slopes where water depth increases slowly with distance from shore, extensive changes in dock length and or position were observed. In general, dock impacts were limited when the lake's elevation was at 923.0 feet or higher. Dock extensions became more pronounced at an elevation of 922.0 feet or below.

69. Eurasian watermilfoil is a non-native submerged aquatic plant (i.e., grows predominantly beneath the water's surface) that grows in denser stands and in deeper water than many of Minnesota's native submerged plant species. When the top of the plant reaches or nears the water's surface, recreational boat use can be impacted, as the plant becomes entangled in outboard motors or on the center boards of sailboats. DNR does not have annual data on the abundance or distribution of Eurasian watermilfoil in White Bear Lake that could be used to evaluate how recreational boating impacts associated with this invasive plant varied with changing water levels.

70. The DNR maintains annual data on of the number of acres for which Eurasian watermilfoil control permits are requested. The DNR compiled and reviewed records of aquatic invasive species permits issued for White Bear Lake to control Eurasian watermilfoil. This analysis included an evaluation of changes in the total acreage of permitted control as the water level in White Bear Lake fluctuated. The DNR assumed that the acreage of Eurasian watermilfoil control permits requested would vary in proportion to the degree that recreational boating was impacted by Eurasian watermilfoil. Thus the acreage of permitted aquatic plant control work could be used as a proxy for impacts on recreational boating attributable to lake level fluctuations. The DNR found that the acres of Eurasian watermilfoil control requests for White Bear Lake varied from year to year and that there was a clear relationship between acres of control requested and the lake's elevation. When, during the summer months, the elevation of White Bear Lake was 921.5 feet or higher, 20 acres or less of aquatic plant control work was typically requested. When the lake's elevation dropped below 921.5 feet, Eurasian watermilfoil control requests were substantially higher (ranging from 33 – 174 acres). There were, however, years when the lake's elevation was below 922.0 feet and few acres of control requests was received. The reason for this is unknown. Nevertheless, using the amount of Eurasian watermilfoil control as a proxy for recreational boating impacts, indicates the impacts increase when the lake level drops below 921.5 feet.

71. The White Bear Lake Conservation District addressed the relationship between Eurasian watermilfoil and boating in its November 2015 letter to the DNR. The White Bear Lake Conservation District's letter indicated that Eurasian watermilfoil was adversely impacting recreational boating, and sailboat use in particular, on White Bear Lake. In its letter, the White Bear Lake Conservation District recommended that the protective elevation be set at 924.0 to 924.5 feet (close to White Bear Lake's OHW level of 924.89 feet).



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#### Conclusions

1. Based on the evaluation of the lake's history, hydrology, biology, water quality, topography and littoral area as set forth in ¶¶ 29 – 51 and the criteria set forth in Minn. Stat. § 103G. 285, subd. 3(b)(1) and Minn. R. 6115.0670, subp. 2 C, there is no evidence to support a conclusion that setting a protective elevation at or above White Bear Lake's historic low is necessary to protect the lake's ecological health generally or more specifically the important aquatic vegetation characteristics related to fish and wildlife habitat. There is, however, substantial evidence in the record supporting the conclusion that periodic fluctuations in lake elevation are important to the ecological health of White Bear Lake.

2. Based on the evaluation of lake's history, hydrology, topography and littoral area as set forth in ¶¶ 40 – 51 and the requirements of Minn. Stat. § 103G.285 subd. 3(b)(3), the DNR concludes that the recorded range of fluctuation of water volume within the basin has not significantly reduced the acreage of the littoral zone.

3. Based on the evaluation of the lake's history, hydrology, biology, water quality, topography and littoral area as set forth in ¶¶ 40 – 71 and the criteria set forth in Minn. Stat. § 103G. 285, subd. 3(b) and Minn. R. 6115.0670, subp. 2 C, there is substantial evidence to support a conclusion that the existing recreational uses of White Bear Lake by the public and riparian landowners provide the only justification for establishing a protective elevation for White Bear Lake that is within the historic range of water level elevations recorded for White Bear Lake

4. Based on the evaluation of the lake's history, hydrology, biology, water quality, topography, littoral area and uses of White Bear Lake by the public and riparian landowners as set forth in ¶¶ 56—71 and the criteria set forth in Minn. Stat. § 103G. 285, subd. 3(b)(2) and Minn. R. 6115.0670, subp. 2 C, there is substantial evidence in the record on the recreational values and uses of White Bear Lake to support a protective elevation of 922.0.

5. Based on the evaluation of the lake's history, hydrology, biology, water quality, topography, littoral area and uses of White Bear Lake by the public and riparian landowners set forth in ¶¶ 56 – 71 there is substantial evidence in the record for the DNR to conclude that setting a protective elevation above 922.0 feet would not significantly increase the recreational attributes of the lake.

6. This protective elevation for White Bear Lake is not intended as a guaranteed water elevation for White Bear Lake, nor does it indicate that there are adverse ecological impacts to falling below the protective elevation. Rather, the protective elevation is the point below which the DNR will not permit direct appropriations from the surface water and the point at which groundwater withdrawals that will have negative impacts to surface water may be adjusted to mitigate negative impacts. Minn. Stat. § 103G.285, subd. 3(a).

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7. In the case of groundwater appropriations, the DNR will consider groundwater - surface water interaction, the cumulative impact on White Bear Lake from all groundwater uses, the duration of any lake elevation change, critical resources to be protected, the legislative water use priority scheme, and such other factors as may be deemed relevant under the circumstances. If the specific circumstances warrant, groundwater appropriations could be restricted prior to the point at which the protective elevation is reached. In making and implementing any such adjustments the DNR will seek input from the affected groundwater users.

### ORDER

**Based on the factual findings set forth in this findings of fact and the record on file with the Minnesota Department of Natural Resources,** the protective elevation of White Bear Lake (Public Water No. 82-167) is hereby set at 922.0 feet.

Dated: December 21, 2016

By:   
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Barb Naramore  
Assistant Commissioner  
Minnesota Department of Natural Resources