Weston & Sampson

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# MEMORANDUM

| | |
|---|---|
| **TO:** | Seth Prescott, New Hampshire Department of Natural and Cultural Resources |
| **FROM:** | Lindsay Guertin, Engineer II, Weston & Sampson Engineers<br>Erik Carlson, Project Manager, Weston & Sampson Engineers |
| **DATE:** | October 6, 2026 |
| **SUBJECT:** | Mount Sunapee Ski Area – Sewage Lagoon Feasibility Study: Flows and Loads Analysis |

## Background

The Mount Sunapee Resort is owned by the New Hampshire (NH) Department of Natural and Cultural Resources (DNCR) who leases the site to Vail Resorts. Vail Resorts operates the ski resort and wastewater system. Wastewater flows from the resort's two base lodges, learning center, rental shop, Alpine Racing Competition Center, ski patrol building, snowmaking building, and two maintenance facilities. Besides the two base lodges which have food service, every other building collects only restroom flows. Each building has an individual septic tank to collect flows and allow solids to settle before flows are combined into a common gravity pipe and discharged to the unlined wastewater lagoons. Flows are first discharged to lagoon 2 which is interconnected with lagoon 3 for flow equalization. As the level rises in lagoon 2, the operator opens a gate to allow the wastewater to flow into lagoon 1. From lagoon 1, another gate is operated to allow wastewater to flow from lagoon 1 into the pump house which is then pumped to the spray irrigation fields. Wastewater flows into the lagoons year-round but is only discharged via spray irrigation onto three upgradient irrigation fields from May 1 through October 31.

This memorandum will serve to evaluate the existing and anticipated future wastewater flows and loads of the Mount Sunapee Resort wastewater lagoons.

### Federal, State, and Local Regulations for the Site

The New Hampshire Department of Environmental Services (NHDES) Wastewater Engineering Bureau regulates new and existing wastewater treatment facilities. Groundwater discharge of treated wastewater is reviewed by the Groundwater Discharge Permitting Program of NHDES. This flows and

loads analysis of the lagoons complies with standards set forth in Env-Wq 707.04(b), (c)(2), (c)(4) and (c)(5).

The site is currently regulated under groundwater discharge permit (GWDP) number GWP-198801026-N-007 which was issued on February 1, 2024 and expires on February 1, 2029. The permit requires that the effluent shall not cause violations of Ambient Groundwater Quality Standards (AGQS) adopted by the NHDES or cause groundwater degradation that would result in a violation of the surface water quality standards at the boundary of the groundwater discharge zone. To determine this, six (6) monitoring wells are sampled twice a year in May and October for E.coli, nitrate-nitrogen, total kjeldahl nitrogen (TKN), and chloride. Monitoring wells #3 and #4 are also sampled annually in January for the same parameters excluding E.coli. The locations of all monitoring wells can be seen in Attachment 1.

Additional spray irrigation permit conditions include:

- Spray irrigation discharge volumes shall not exceed 2 inches per week including precipitation.
- Spray effluent shall meet secondary treatment levels ($BOD_5 \leq 30$mg/l and TSS $\leq$ 30mg/l) prior to discharge.
- No spray application shall be allowed during rainfall or after leaf fall. Spray shall be allowed only from May 1 through October 31 unless otherwise approved by the NHDES in writing.
- The permittee shall maintain a one-foot minimum of unsaturated soil depth at all times in the spray field areas and shall maintain observation wells in the spray area(s) to record the unsaturated thickness during the spray season.
- The activities shall not cause runoff, surface erosion or result in a direct discharge to any surface water body, wetland or storm water drainage way. Spray activities shall be conducted so as to minimize any overland flow on site.
- Complete records shall be kept of spray application rates (gallons/day/spray area), lagoon levels, and water levels in the observation wells. Records shall be tabulated and submitted with the monthly operations reports (MORs) to the NHDES.

# Basis of Design Parameters

## Current Influent Flows

Influent flows to the lagoons are measured via a V-notch weir located in the influent distribution structure. Daily average flow rates provided by Vail Resorts from 2018 through 2025 were reviewed to determine current flow conditions. Due to the seasonal nature of ski resorts, flows during the ski season are much greater than the summertime flows. Average daily flows during the winter season range from 2,770 gallons per day (GPD) to 6,650 GPD while the range for the summer season was 370 GPD to 1,110 GPD. Overall annual average daily flows range from 2,160 GPD to 3,610 GPD. A max daily flow of 32,980 GPD was recorded in 2025. A breakdown of the influent flows can be seen in Table 1.

**Table 1: Historical Influent Wastewater Flows**

| Year | Influent Flow, GPD | | | | | | |
|---|---|---|---|---|---|---|---|
| | Avg. Daily | Avg. May - Oct | Avg. Nov - Apr | Max. Month | Max. Day | Min. Month | Min. Day |
| 2018 | 2,680 | 950 | - | 7,820 | 16,360 | 389 | 7.4 |
| 2019 | 2,470 | 790 | 4,180 | 7,960 | 14,860 | 369 | 8.7 |
| 2020 | 2,400 | 470 | 4,030 | 9,420 | 17,730 | 224 | 36 |
| 2021 | 2,160 | 370 | 4,670 | 9,180 | 12,320 | 62 | 0 |
| 2022 | 2,260 | 1,010 | 2,770 | 6,100 | 18,010 | 70 | 2.8 |
| 2023 | 3,610 | 1,110 | 6,650 | 12,380 | 21,820 | 272 | 42 |
| 2024 | 3,370 | 880 | 5,490 | 10,580 | 20,250 | 376 | 32 |
| 2025 | 3,590 | 1,030 | 6,290 | 12,210 | 32,980 | 328 | 26 |

Annual total visitors for each year were not available for this analysis so information from the previous GWDP application submitted by Hoyle, Tanner & Associates, Inc. in July 2023 was utilized to determine typical visitor numbers. Based on their application, Mount Sunapee Resort sees, on average, an estimated 250,000 annual skiers and 60,000 summer visitors, for an average total of 310,000 annual visitors, and the expected maximum number of visitors per year is 340,000. Due to the ski lift capacity, the resort has a winter daily Design Day capacity of 4,820 visitors. Vail Resorts defines the Design Day as a typical non-holiday midwinter weekend day. Occasionally the number of visitors may exceed the Design Day capacity during the ski season as not every visitor will be utilizing the ski lifts.

Table 2 shows the total yearly flow to the lagoons. The average number of annual visitors (310,000) was used to calculate a per capita flow for the past 8 years. Flows from the past three years (2023 – 2025) were the greatest for the dataset with a maximum per capita value of 4.25 gal/visitor. From the 2018 GWDP renewal application, Hoyle, Tanner & Associates, Inc. calculated a maximum per capita usage of 5.62 gal/visitor based on actual visitor numbers which was not available for the 2018 – 2025 dataset.

As this value is greater than the calculated value of 4.25 gal/visitor it will be utilized for determining future flows as a conservative per capita usage.

**Table 2: Total Yearly Influent Wastewater Flows**

| Year | Total (GPY) | Per Capita (gal/visitor) |
|---|---|---|
| 2018 | 978,103 | 3.16 |
| 2019 | 900,487 | 2.90 |
| 2020 | 876,694 | 2.83 |
| 2021 | 789,499 | 2.55 |
| 2022 | 822,913 | 2.65 |
| 2023 | 1,317,070 | 4.25 |
| 2024 | 1,233,667 | 3.98 |
| 2025 | 1,310,679 | 4.23 |

From a review of the historical influent flows, the current conditions were classified as shown in Table 3. The maximum annual average flows for the entire year, summertime, and ski season were used as the current average daily flows for each time period. A similar process for the average maximum/minimum month and day was utilized. In future design stages, a peak hourly flow may be required, however there was insufficient data available at this time to determine this parameter.

**Table 3: Current Influent Wastewater Flow Conditions**

| Current Conditions - Influent Flow, GPD | | | | | | |
|---|---|---|---|---|---|---|
| Avg. Daily | Avg. May - Oct | Avg. Nov - Apr | Max. Avg. Monthly | Max. Day | Min. Avg. Monthly | Min. Day |
| 3,610 | 1,110 | 6,650 | 12,380 | 32,980 | 60 | 0 |

## Future Influent Flows

Vail Resorts releases a Five-Year Master Development Plan (MDP) for Mount Sunapee Resort every five years. The most recent plan details planned improvements and developments expected to be completed from 2026 through 2030. During this time, Vail Resorts plans to improve the ski infrastructure which would increase the daily Design Day visitors from 4,820 to 6,850 visitors. This is an increase of 2,030 visitors per day during the ski season. There is little information available for planned improvements beyond 2030, however, the resort will be adding new infrastructure to the west side of the mountain which will have its own wastewater system as a part of the proposed West Bowl expansion. It is assumed that there will be minor improvements to the existing developed side of the mountain that contributes flows to the lagoons. Without any publicly available information regarding Mount Sunapee's future development beyond the current MDP and planned West Bowl expansion, a 10% increase in the Design Day visitors was conservatively assumed from 2030 through 2046 for use in estimating the flows to the wastewater lagoons.

Currently summer activities include mountain biking trails, the Adventure Park, disc golf, hiking, miniature golf, the NH League of Craftsmen's Fair, as well as several other special events throughout the summer. The 2026-2030 MDP proposes modest improvements to the resort's Adventure Park that operates during the summer, including an alpine slide and summer tubing lanes, and continued development of mountain bike trails, but no major improvements are planned at this time that would drastically increase summer visitors. Many ski resorts are improving their summertime offerings to increase summertime visitors, so a modest summer visitor increase of 2% per year was assumed. It was assumed that these improvements and associated visitor increase would begin in 2028, coinciding with when the new ski season Design Day was assumed to go into effect. The projected ski season and summertime visitors are presented in Table 4.

**Table 4: Current and Projected Annual Visitors**

| Year | Avg. Winter Visitors | Avg. Summer Visitors | Total Annual Visitors |
|---|---|---|---|
| 2026 | 250,000 | 60,000 | 310,000 |
| 2027 | 250,000 | 60,000 | 310,000 |
| 2028[1] | 331,200 | 61,200 | 392,400 |
| 2029 | 331,200 | 62,424 | 393,624 |
| 2030 | 331,200 | 63,672 | 394,872 |
| 2031 | 331,200 | 64,946 | 396,146 |
| 2032 | 331,200 | 66,245 | 397,445 |
| 2033[2] | 358,600 | 67,570 | 426,170 |
| 2034 | 358,600 | 68,921 | 427,521 |
| 2035 | 358,600 | 70,300 | 428,900 |
| 2036 | 358,600 | 71,706 | 430,306 |
| 2037 | 358,600 | 73,140 | 431,740 |
| 2038 | 358,600 | 74,602 | 433,202 |
| 2039 | 358,600 | 76,095 | 434,695 |
| 2040 | 358,600 | 77,616 | 436,216 |
| 2041 | 358,600 | 79,169 | 437,769 |
| 2042 | 358,600 | 80,752 | 439,352 |
| 2043 | 358,600 | 82,367 | 440,967 |
| 2044 | 358,600 | 84,014 | 442,614 |
| 2045 | 358,600 | 85,695 | 444,295 |
| 2046 | 358,600 | 87,409 | 446,009 |

[1]*The planned improvements described in the 2026 – 2030 MDP are not included in Vail Resorts 2026 – 2027 Annual Operating Plan (AOP) so it was assumed that they would not go into effect until 2028.*

[2]*It was assumed that any future improvements that would increase winter ski season capacity would not go into effect until 2033 which would be two years after the approval of the next MDP (2031 – 2035).*

To calculate the projected flows to the lagoons through 2046, the increased Design Day was applied to the number of weekends/holidays in a typical ski season of 129 days. This equated to 40 weekend/holiday days per ski season. It was assumed that there would be a negligible increase in

weekday ski visitors. Then the per capita flows of 5.62 gal/visitor was applied to projected annual visitors to determine projected influent flows to the lagoons. The results are presented in Table 5.

**Table 5: Projected Average Daily Flows and Annual Influent Flows**

| Year | 5.62 gal/visitor | |
|---|---|---|
| | Avg. Daily Flow (GPD) | Annual Flow (GPY) |
| 2026 | 3,610 | 1,317,650 |
| 2027 | 3,610 | 1,317,650 |
| 2028[1] | 6,040 | 2,204,600 |
| 2029 | 6,060 | 2,211,900 |
| 2030 | 6,080 | 2,219,183 |
| 2031 | 6,100 | 2,226,340 |
| 2032 | 6,120 | 2,233,640 |
| 2033[2] | 6,560 | 2,394,400 |
| 2034 | 6,580 | 2,401,700 |
| 2035 | 6,600 | 2,409,000 |
| 2036 | 6,630 | 2,419,950 |
| 2037 | 6,650 | 2,427,250 |
| 2038 | 6,670 | 2,434,598 |
| 2039 | 6,690 | 2,441,850 |
| 2040 | 6,720 | 2,452,800 |
| 2041 | 6,740 | 2,460,260 |
| 2042 | 6,770 | 2,471,050 |
| 2043 | 6,790 | 2,478,235 |
| 2044 | 6,820 | 2,489,300 |
| 2045 | 6,840 | 2,496,600 |
| 2046 | 6,870 | 2,507,550 |

[1]*The planned improvements described in the 2026 – 2030 MDP are not included in Vail Resorts 2026 – 2027 Annual Operating Plan (AOP) so it was assumed that they would not go into effect until 2028.*

[2]*It was assumed that any future improvements that would increase winter ski season capacity would not go into effect until 2033 which would be two years after the approval of the next MDP (2031 – 2035).*

By 2046, it is estimated that average daily flows to the lagoons will be 6,870 GPD which equates to a total annual flow of 2.51 MG. A discussion of the increased flows in relation to the lagoon capacity will be presented in a future memorandum. Future influent flows were also broken down by season to determine average daily flows for the ski season and summer season. An average maximum month and maximum day were also calculated using the average peaking factors (value compared to the annual average) for each metric. The corresponding peaking factors were 3.4 and 6.8 respectively. As flows are being projected to 2046, the projections were split into two time periods. The first is to 2032, the last year before the assumed 10% additional Design Day increase that would be further detailed in the 2031 – 2035 MDP. The second period is the end of the 20-year period, 2046. It was assumed that there would be no change in the minimum recorded flows through 2046. The future wastewater flow conditions are shown in Table 6.

**Table 6: Future Influent Wastewater Flow Conditions**

| Time Period | Future Influent Flow, GPD | | | | | | |
|---|---|---|---|---|---|---|---|
| | Avg. Daily | Avg. May - Oct | Avg. Nov - Apr | Max. Avg. Monthly | Max. Day | Min. Avg. Monthly | Min. Day |
| Current (2026) | 3,610 | 1,110 | 6,650 | 12,380 | 32,980 | 60 | 0 |
| Intermediate (2032) | 6,120 | 2,020 | 10,280 | 20,810 | 41,620 | 60 | 0 |
| Future (2046) | 6,870 | 2,670 | 11,130 | 23,360 | 46,720 | 60 | 0 |

## Influent Wastewater Characteristics

Flows from each building are first conveyed to septic tanks which remove some TSS and $BOD_5$ prior to the wastewater reaching the lagoons. Solids from the septic tanks are pumped and hauled offsite twice a year per discussions with Vail Resorts' onsite operator. The septic tank effluent is classified as the lagoon influent in this memorandum. From the Environmental Protection Agency's (EPA) Onsite Wastewater Treatment Systems Manual (2002) typical septic tank $BOD_5$ concentrations from a commercial site with restaurants range from 100 – 330 mg/L. Typical effluent TSS concentrations range from 50 – 120 mg/L.

Influent TSS and $BOD_5$ grab samples are collected once a month from the influent distribution structure prior to flow entering the lagoons. Data from 2018 – 2025 was analyzed to determine current loads to the lagoons. On average, the TSS and $BOD_5$ concentrations are consistent with septic tank effluent from commercial sites. Due to the infrequency of sampling, once per month, it is difficult to draw meaningful correlations between influent concentrations and flow fluctuations, which would explain the higher concentrations shown in the data of Table 7 and Table 8. Historical TSS and $BOD_5$ concentrations are shown in Table 7 and loads are shown in Table 8.

**Table 7: Historical TSS and $BOD_5$ Concentrations**

| Year | TSS, mg/L | | $BOD_5$, mg/L | |
|---|---|---|---|---|
| | Avg. | Max. | Avg. | Max. |
| 2018 | 66 | 140 | 198 | 460 |
| 2019 | 56 | 124 | 208 | 450 |
| 2020 | 51 | 112 | 116 | 300 |
| 2021 | 173 | 690 | 122 | 320 |
| 2022 | 131 | 490 | 140 | 350 |
| 2023 | 111 | 370 | 165 | 500 |
| 2024 | 235 | 680 | 135 | 280 |
| 2025 | 114 | 210 | 158 | 590 |

### Table 8: Historical TSS and $BOD_5$ Loadings

| Year | TSS, lbd | | $BOD_5$, lbd | |
|---|---|---|---|---|
| | Avg. | Max. | Avg. | Max. |
| 2018 | 1.1 | 3.6 | 4.1 | 14.4 |
| 2019 | 0.6 | 1.8 | 3.4 | 14.7 |
| 2020 | 1.1 | 7.3 | 3.6 | 19.4 |
| 2021 | 1.5 | 9.6 | 3.8 | 19.9 |
| 2022 | 1.2 | 6.5 | 1.3 | 5.1 |
| 2023 | 1.8 | 8.0 | 5.2 | 36.3 |
| 2024 | 1.9 | 4.5 | 3.4 | 16.9 |
| 2025 | 2.6 | 9.4 | 7.5 | 40.3 |

As the users of Mount Sunapee Resort are not expected to change in the next 20 years, it is assumed that TSS and $BOD_5$ concentrations will not change significantly during that time period. The increased flows will lead to an increase in the typical loads, however. To determine the future loadings, the largest average concentration for each parameter as well as the projected annual average daily flow and seasonal average daily flows were used to calculate new average loadings for the intermediate year of 2032 and future year of 2046. The results are shown in Table 9.

### Table 9: Future TSS and $BOD_5$ Loadings

| Time Period | TSS, lbd | | | $BOD_5$, lbd | | |
|---|---|---|---|---|---|---|
| | Annual Avg. | Avg. May - Oct | Avg. Nov - Apr | Annual Avg. | Avg. May - Oct | Avg. Nov - Apr |
| Current (2026) | 7.1 | 2.2 | 13.0 | 6.3 | 1.9 | 11.5 |
| Intermediate (2032) | 12.0 | 4.0 | 20.1 | 10.6 | 3.5 | 17.8 |
| Future (2046) | 13.5 | 5.2 | 21.8 | 11.9 | 4.6 | 19.3 |

Currently the lagoon system does not have any nitrogen or phosphorus influent data. A future design or permit may require nitrogen or phosphorus limits so total kjeldahl nitrogen (TKN) and total phosphorus (TP) loadings were estimated. This was completed using the average TKN to $BOD_5$ and TP to $BOD_5$ ratios, calculated from the typical septic tank effluent presented in the EPA's Onsite Wastewater Treatment Systems Manual (2002). It is recommended that supplemental sampling be completed prior to final design of any treatment system. The estimated loadings are shown in Table 10.

### Table 10: Future Estimated TKN and TP Loadings

| Time Period | TKN, lbd | | | TP, lbd | | |
|---|---|---|---|---|---|---|
| | Annual Avg. | Avg. May - Oct | Avg. Nov - Apr | Annual Avg. | Avg. May - Oct | Avg. Nov - Apr |
| Current (2026) | 1.5 | 0.5 | 2.8 | 0.5 | 0.1 | 0.8 |
| Intermediate (2032) | 2.6 | 0.9 | 4.3 | 0.8 | 0.3 | 1.3 |
| Future (2046) | 2.9 | 1.1 | 4.7 | 0.9 | 0.3 | 1.4 |

It should be noted that all flow and loading calculations in this memorandum assume that the Mount Sunapee Resort will continue to use all septic tanks as an upstream treatment step and that they will remain is good condition for the next 20 years. It is possible that an alternative treatment system may not require the septic systems, in which case, flows and loads from the system prior to the septic tank would need to be determined. This will be evaluated further in a future technical memorandum.

## Summary

The purpose of this memorandum was to provide the New Hampshire DNCR with an evaluation of the current and future wastewater flows and loads to the Mount Sunapee Resort wastewater lagoons. The values presented in Tables 6, 9, and 10 will be utilized in determining if the lagoons have adequate capacity and capability of handling the increased flows and loads. These parameters will also be used in a forthcoming technical memorandum which will evaluate wastewater disposal and treatment alternatives for the Mount Sunapee Resort.

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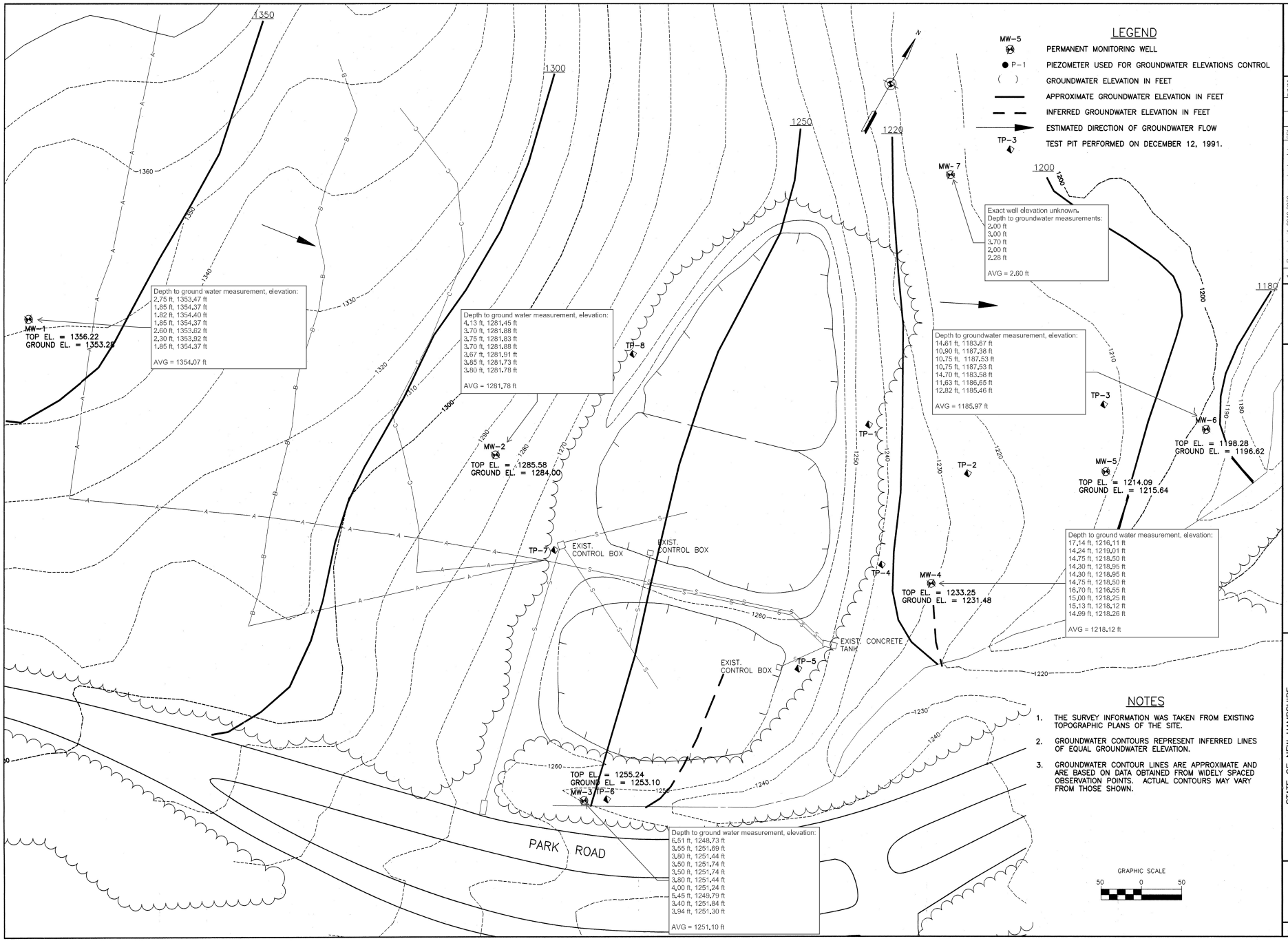
# ATTACHMENT 1

GROUNDWATER MONITORING WELLS SITE MAP




## NOTES

1. THE SURVEY INFORMATION WAS TAKEN FROM EXISTING TOPOGRAPHIC PLANS OF THE SITE.
2. GROUNDWATER CONTOURS REPRESENT INFERRED LINES OF EQUAL GROUNDWATER ELEVATION.
3. GROUNDWATER CONTOUR LINES ARE APPROXIMATE AND ARE BASED ON DATA OBTAINED FROM WIDELY SPACED OBSERVATION POINTS. ACTUAL CONTOURS MAY VARY FROM THOSE SHOWN.

ENGINEER/ARCHITECT

| NO. | DESCRIPTION | DR. BY | CHKD. APPD. BY | DATE |
|---|---|---|---|---|
| 1 | Revised with 2018-2022 groundwater data | SDL | | 7/6/23 |

PROJECT NO. 23007
FILE NAME HYDROPLN
DO NOT SCALE DRAWING

Hoyle, Tanner & Associates, Inc. HTA engineers planners surveyors Companies
Five Commerce Park North, Bedford, New Hampshire 03102

SCALE: 1"=50' | DATE: JANUARY, 1992 | DES. BY P.O.B. | DR. BY K.A.R. | CHKD. BY P.O.B.

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
MOUNT SUNAPEE STATE PARK
SPOKY IRRIGATION SYSTEM

# HYDROGEOLOGICAL PLAN

DRAWING NO.
H-1

SHEET 2 OF 4