

**Well Capacity Determination Methods for Wells in Bedrock  
Bedrock formation is such that the water produced is yielded by secondary  
permeability features (e.g. fractures or cracks)**

NOTE: These testing procedures are based on the California Code of Regulations, Title 22, Section 64554(g). Before beginning any well yield pump test, the Well Completion Report must be reviewed to determine if this is an alluvial or bedrock aquifer. Due to Sonoma volcanics and other formations, the determination often is not clear. It is recommended that you submit the Well Completion Report to this Division to determine the type of pump test procedures to be used.

Methods to determine the sustained yield of a well drilled in a bedrock formation are described below.

Method 1: Report, §64554(g)(1).

The public water system must submit a report for Division review and approval, proposing a well capacity based on well tests and the evaluation and management of the aquifer from which the well draws water. The report must be prepared and signed by a California registered geologist with at least three years of experience with groundwater hydrology, a California licensed engineer with at least five years of experience with groundwater hydrology, or a California certified hydrogeologist. Acceptance of the proposed well capacity by the Division shall, at a minimum, be based on the Division's review and approval of the following information presented in the report in support of the proposed well capacity:

1. The rationale for the selected well test method and the results;
2. The geological environment of the well;
3. The historical use of the aquifer;
4. Data from monitoring of other local wells;
5. A description of the health risks of contaminants identified in a Source Water Assessment, as defined in Section 63000.84 of Title 22, and the likelihood of such contaminants being present in the well's discharge;
6. Impacts on the quantity and quality of the groundwater;
7. How adjustments were made to the estimated capacity based on drawdown, length of the well test, results of the wells test, discharge options, and seasonal variations and expected use of the well; and
8. The well test(s) results and capacity analysis.

Method 2: Pumping Test, §64554(g)(2).

Before the testing:

1. Submit the following to the Division prior to conducting the well capacity test:
  - a. The name and qualifications of the person who will be conducting the test;
  - b. The proposed pump discharge rate;
  - c. A copy of a United States Geological Survey 7 ½-minute topographic map of the site at a scale of 1:24,000 or larger (1 inch equals 2,000 feet or 1 inch equals less than 2,000 feet) or, if necessary, a site sketch at a scale providing more detail, that clearly indicates:
    - I. The well discharge location(s) during the test, and
    - II. The location of surface waters, water staff gauges, and other production wells within a radius of 1000 feet;
  - d. A well construction drawing, geologic log, and electric log, if available;
  - e. Dates of well completion and well development, if known;
  - f. Specifications for the pump that will be used for the test and the depth at which it will draw water from the well;
  - g. A description of the methods and equipment that will be used to measure and maintain a constant pumping rate;
  - h. A description of the water level measurement method and measurement schedule;
  - i. For wells located in or having an influence on the aquifer from which the new well will draw water, a description of the wells' operating schedules and the estimated amount of groundwater to be extracted, while the new well is tested and during normal operations prior to and after the new well is in operation;
  - j. A description of the surface waters, water staff gauges, and production wells—shown in (c)(ii);
  - k. A description of how the well discharge will be managed to ensure the discharge doesn't interfere with the test;
  - l. A description of how the initial volume of water in the well's casing, or bore hole if there is no casing at the time, will be addressed to ensure it has no impact on the test results; and
  - m. A written description of the aquifer's annual recharge.
2. Determine if the test will be conducted for 72 hours or 10 days. If the test is conducted for 72 hours, 25% of the pumping rate will be granted (An assigned well capacity may be revised by the Division if subsequent pumping data collected during normal operations shows that the assigned capacity is not representative of the actual well capacity.) If the test is conducted for 10 days, 50% of the pumping rate will be granted. (An assigned well capacity may be revised by the Division if subsequent pumping data collected during normal operations shows that the assigned capacity is not representative of the actual well capacity.)
3. Ensure discharge from the pump is piped far enough away to avoid recharge.

### Conducting the testing:

During the months of August, September, or October, conduct either a 72-hour well capacity test or a 10-day well capacity test, and determine the well capacity using the following procedures:

1. Procedures for a 72-hour well capacity test:
  - a. For the purpose of obtaining an accurate static water level value, at least twelve hours before initiating the next step, pump the well at the pump discharge rate proposed in step 1(b), Before the Testing, for no more than two hours, then discontinue pumping;
  - b. Measure and record the static water level and then pump the well continuously for a minimum of 72 hours starting at the pump discharge rate proposed in step 1(b), Before the Testing;
  - c. Measure and record water drawdown levels and pump discharge rate:
    - I. Every thirty minutes during the first four hours of pumping,
    - II. Every hour for the next four hours, and
    - III. Every four hours thereafter until the water drawdown level is constant for at least the last four remaining measurements, and;
  - d. Enter the measurements on the attached spreadsheet using the tab corresponding to the test performed. A plot will automatically be generated on the Graph tab corresponding to the test performed. If you choose not use the attached spreadsheet, plot the drawdown and pump discharge rate data versus time data on semi-logarithmic graph paper, with the time intervals on the horizontal logarithmic axis and the drawdown and pump discharge rate data on the vertical axis.
  
2. Procedures for a 10-day well capacity test:
  - a. For the purpose of obtaining an accurate static water level value, at least twelve hours before initiating the next step, pump the well at the pump discharge rate proposed in step 1(b), Before the Testing, for no more than two hours, then discontinue pumping;
  - b. Measure and record the static water level and then pump the well continuously for a minimum of 10 days starting at the pump discharge rate proposed in step 1(b), Before the Testing;
  - c. Measure and record water drawdown levels and pumping rate:
    - I. Every thirty minutes during the first four hours of pumping,
    - II. Every hour for the next four hours,
    - III. Every eight hours for the remainder of the first four days,
    - IV. Every 24 hours for the next five days, and
    - V. Every four hours thereafter until the water drawdown level is constant for at least the last four remaining measurements, and;
  - d. Enter the measurements on the attached spreadsheet using the tab corresponding to the test performed. A plot will automatically be generated on the Graph tab corresponding to the test performed. If you choose not use the attached spreadsheet, plot the drawdown and pump discharge rate data versus time data on semi-logarithmic graph paper, with the time intervals on the horizontal logarithmic axis and the drawdown and pump discharge rate data on the vertical axis.

### Recovery Data:

The well must demonstrate that, within a length of time not exceeding the duration of the pumping time of the pumping test (72 hours or 10 days), the water level has recovered to within two feet of the static water level measured at the beginning of the well capacity test or to a minimum of ninety-five percent of the total drawdown measured during the test, whichever is more stringent. If the well recovery does not meet these criteria, the well capacity cannot be determined using the proposed pump discharge rate.

1. To demonstrate meeting the recovery criteria, the following water level data in the well shall be measured, recorded, and compared with the criteria:
  - a. Every 30 minutes during the first four hours after pumping stops,
  - b. Hourly for the next eight hours, and
  - c. Every 12 hours until either the water level in the well recovers to within two feet of the static water level measured at the beginning of the well capacity test or to at least ninety-five percent of the total drawdown measured during the test, whichever occurs first.

### Well Capacity:

Following completion of a 72-hour or 10-day well capacity test, the well shall be assigned a capacity no more than:

- For a 72-hour test, 25 percent of the pumping rate at the end of a completed test's pumping. (An assigned well capacity may be revised by the Division if subsequent pumping data collected during normal operations shows that the assigned capacity is not representative of the actual well capacity.)
- For a 10-day test, 50 percent of the pumping rate at the end a completed test's pumping. (An assigned well capacity may be revised by the Division if subsequent pumping data collected during normal operations shows that the assigned capacity is not representative of the actual well capacity.)

### Submittal to the Division:

A report must be submitted to the Division that includes, but is not limited to:

1. Pumping test methods and calculations.
2. Static water level, pump discharge rate, all recorded drawdown and recovery data from the attached spreadsheet. If a transducer is used, provide an electronic file of the transducer data.
3. Other pertinent observations associated with the well capacity test.
4. Plot of the drawdown, pump discharge rate, and time data.