PUBLIC HEALTH DIVISION
Environmental Public Health Office, Drinking Water Program
John A. Kitzhaber, MD, Governor

Oregon Health Authority

800 NE Oregon Street, Suite #640
Portland, OR 97232-2162
(971) 673-0405
(971) 673-0694 – FAX
(971) 673-0372 – TTY

May 26, 2011

Jim Kuhns
Midland Water Association
P.O. Box 922
Clatskanie, OR 97016

Re: Tracer Study, Plan Review # 91-2011, Midland Water Association, PWS ID # 4101139
Conditional Approval

Dear Mr. Kuhns:

I have received and reviewed a copy of the Disinfection Contact Time Tracer Study for the Midland Water Association, prepared by the Oregon Association of Water Utilities. The study was performed on May 10, 2011. The results for both the reservoir and length of pipeline between chlorine injection and first user, are summarized below:

41,330 gallon reservoir:
Demand Flow Leaving Reservoir = 91 gallons per minute (gpm)
Volume in Reservoir at Beginning of Test = 29,958 gallons – determined as outlined in the Addendum to this letter
Volume in Reservoir at End of Test = 36,342 gallons (calculated from the difference in flow into (175 gpm) and leaving the reservoir (91gpm) during the test)
Contact Time = 43 minutes
Baffling Efficiency Factor of the Reservoir = 10.9 %

4,500 feet of 4-inch pipeline:
Demand Flow = 91 gpm
Pipe Volume = 2,937 gallons
Contact Time = 32 minutes

Total Contact Time at Midland = Approx. 75 minutes

I have the following comments regarding the test:

1. The tracer study needs to accurately reflect conditions during the peak hourly demand flow leaving the reservoir. Given that the Association does not have a good assessment of the peak hourly demand flow leaving the reservoir, and currently only records daily total flows (average daily demand flow), additional steps are required to ensure that the peak flow during the tracer study of 91 gpm is indeed reflective of peak hourly demand flow scenarios that the reservoir experiences, and that the contact time determined from the tracer study may be used for disinfection verification. See the addendum for an outline of how 91 gpm was determined. The contact time determined from the tracer study of 75 minutes may not be used until the Association completes the following:
   A. Determine current Peak Hourly Demand (PHD) flow: Measure the total hourly flows at the flow meter during a weekday morning (from 6-7, 7-8 am, etc.) and evening (from 5-6, 6-7 pm, etc.), or other peak time for this residential system. This should be done in June, every other day for one week, or less frequently for a longer period of time, to establish a representative data set.
   B. Determine highest PHD of recorded values from measurements during busy periods. Select the highest value of the newly created PHD data set.
   C. Compare newly determined current PHD, to the flow used during the tracer study (91 gpm):
      i. If current PHD is less than or equal to 100 gpm (110 % of 91), then the tracer study was done at a high enough peak flow for now, and the contact time of 75 minutes may be used for disinfection verification.
      ii. If the current PHD is greater than 100 gpm, then the Association will need to re-run the tracer study at the PHD flow, determined in D below. In the interim, for daily disinfection verification, use the contact time value calculated from the baffling efficiency of the reservoir determined from this study (10.9 %), the minimum reservoir volume (29,958 gallons), and the highest PHD flow determined in B above.
   D. The above steps will still need to be repeated during the month of peak usage (likely in August), so that a PHD during the peak may be determined, and compared to the peak flow used in the tracer study.

Pursuant to Oregon Administrative Rules (OAR) 333-061-0036 (5)(b)(B)(iii), "The disinfectant contact time ("T") in minutes must be determined for each day during peak hourly flow . . ." Additionally, OAR 333-061-0050(6)(a)(S), states, "Reservoirs and clearwells that are to be used for disinfection contact time to treat surface water shall have a means to adequately determine the flow rate on the effluent line." With a totalizing meter, you can tell it is difficult to determine the peak hourly demand leaving the reservoir. If the procedures outlined above are not adequate to determine

peak hourly flow over time, we may require a flow meter that measures gallons per minute.

2. The determined contact time of 75 minutes may be used as long as the minimum operating level in the reservoir does not drop below 10 % of the volume used during the study, or 26,960 gallons. See the addendum for a description of how the minimum operating volume of the reservoir was determined.

3. During the March 24, 2011 treatment plant inspection, I was told that free chlorine residual, temperature and pH are recorded daily at the treatment plant after the 41,330 gallon reservoir, but before the 4,700 feet of 4-inch pipe to the 'first user'. During the tracer study first user measurements of chlorine were taken at the true 'first user' after the pipeline. **Measurements of chlorine residual, temperature, and pH must be taken at the first user, at the end of the contact volume for disinfection, after both the reservoir and pipeline.** If you wish to continue to use measurements immediately after the reservoir, but prior to the pipeline, you may monitor parameters at both locations daily for two weeks, or at a lesser frequency for a longer period of time to demonstrate that the values are more conservative. Ensure that the same sample measurement technique is used at the two points to minimize instrumentation variability. To be more conservative, values for free chlorine residual and temperature would be no greater, and pH no less at the current monitoring point prior to the pipeline. See the addendum for a comparison of the free chlorine residual measured at the plant on the on-line chart recorder, and the residual measured at the first user by taking grab samples, both taken during the May 10 study.

If you have any questions or concerns, or would like this in an alternate format, please contact me at (971) 673-0459, or james.b.nusrala@state.or.us. Your cooperation is appreciated.

Sincerely,

James Nusrala

James Nusrala, P.E.
Regional Engineer
http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater
cc:
Heath Cokeley, Circuit Rider; Oregon Association of Water Utilities, 935 N. Main Street; Independence, OR 97351

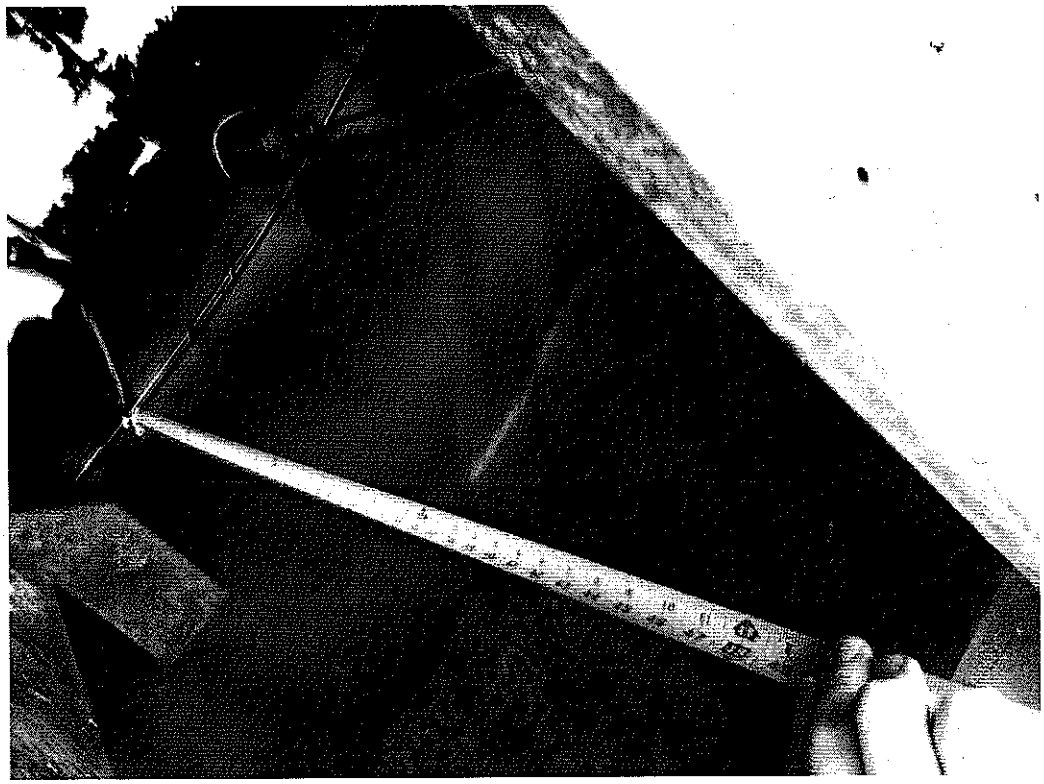
Addendum to Letter – Midland Tracer Study (Plan Review # 91-2011)

1. Comment #1:

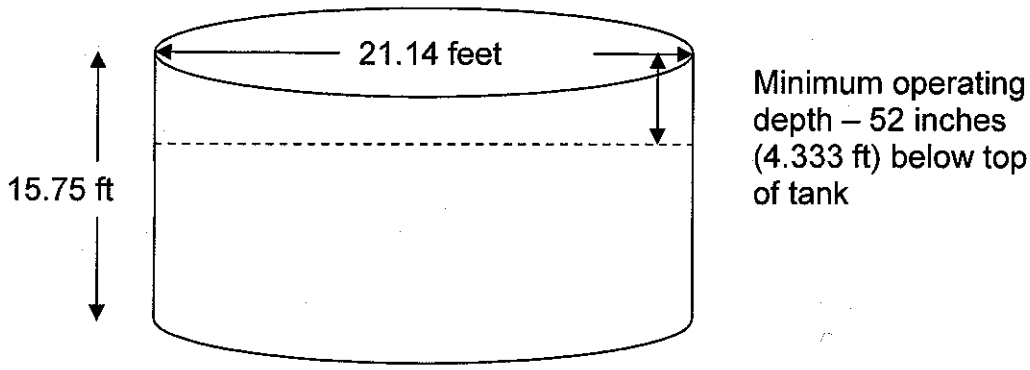
   The peak hourly flow used in the tracer study of 91 gpm was based on a flat peaking amount of 22,400 gallons per day, added to the highest average day demand on record from August 2010 (109,000 gallons), then dividing by 1,440 minutes per day. The flat peaking amount was determined by applying a factor (0.8) to the estimated average daily use determined from a literature search (400 gallons per day per connection) multiplied by the number of connections at Midland (70 connections).

2. Comment #2:

   During the study, the reservoir low level float that turns on the plant was verified at roughly 52 inches below the top level of the reservoir (equivalent to a minimum operating level of 29,958 gallons). Please see the photo below documenting the minimum operating level of the reservoir (the black float in the upper left of the photo turns the plant on to fill the reservoir), and the tape measure reads roughly 52 inches of drop between the top of the tank and the float.



Additionally, measurements subsequent to the test, verified that the diameter (21.14 feet) and water height (15.75) of the reservoir. Based on the schematic below:



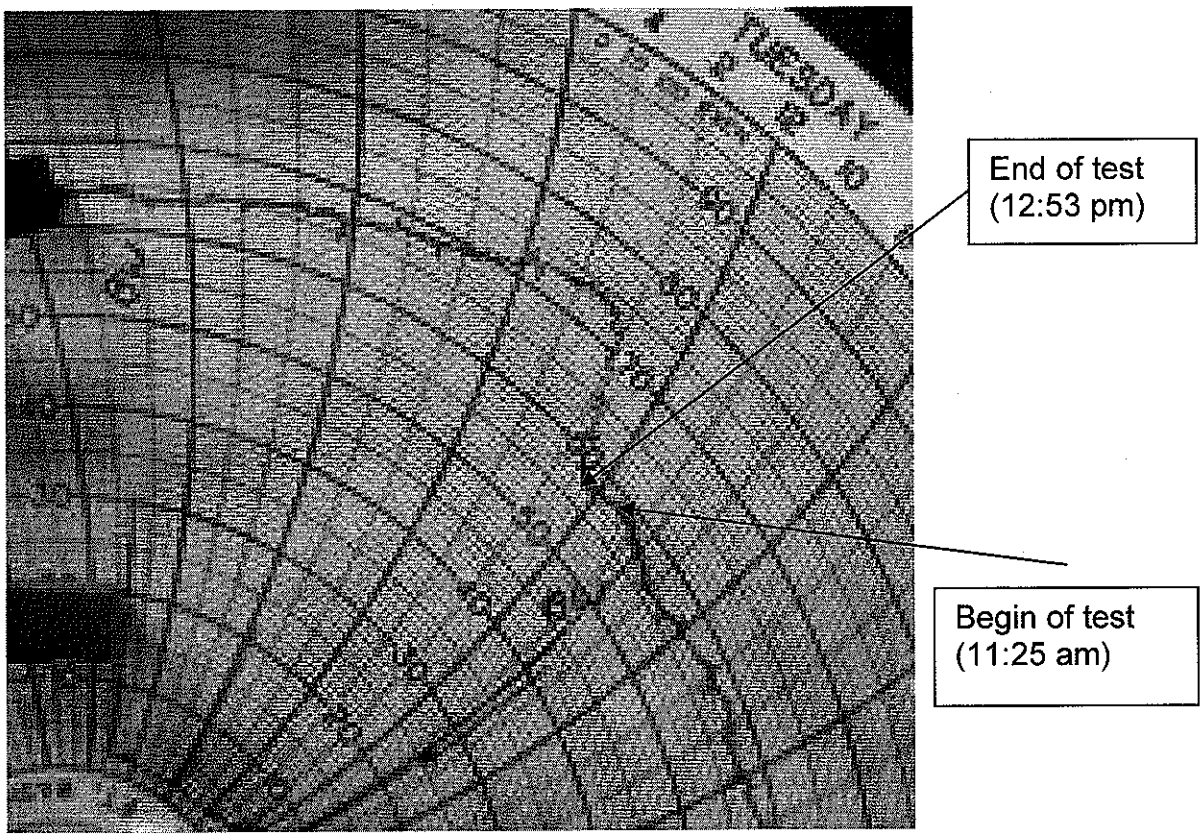
The minimum operating volume is calculated as:

Vol = π x (dia/2)^2 x (total depth – drop from top of tank to min. depth) x conv. factor

[3.14 x (21.14/2)^2] x (15.75 ft – 4.333 ft) x (7.48 gal/ ft^3)= Approx. 29, 958 gallons

3. Comment #3:

Please see below a display of the free chlorine residual recorded at the plant chart recorder prior to the pipeline for the day of the test (test was performed between 11:25 a.m. and 12:53 p.m on Tuesday May 10th). Note that the red outer pen draws the chlorine residual, and 10 increments on the chart equals 0.2 milligrams per liter-mg/L (50 increments = 1.0 mg/L). The recorded levels are roughly 1.17-1.18 mg/L at the plant:



The graph below depicts the free chlorine residual recorded at the first user after the pipeline during the test. Note, that free chlorine residual values recorded at the first user below (marked by diamonds) range from 1.15 to over 1.2 mg/L during the same period. Results should be verified by further analysis.