

**DEPARTMENT OF ECOLOGY**  
**ENVIRONMENTAL ASSESSMENT PROGRAM**  
**Quarterly Report**

November 26, 2008

**TO:** Tonnie Cummings, Project Lead, Water Quality Program, SWRO

**FROM:** James Kardouni, Field Lead, Environmental Assessment Program

**THROUGH:** Stephanie Brock, Project Manager, Environmental Assessment Program  
George Onwumere, Unit Supervisor, Environmental Assessment Program

**SUBJECT:** Burnt Bridge Creek Total Maximum Daily Load (TMDL),  
Quarterly Progress Report #2 and #3

Project Code: 08-029-01-01

## Introduction

Burnt Bridge Creek and its tributaries lie within Water Resource Inventory Area (WRIA) 28 in southwestern Washington. Burnt Bridge Creek flows from east to west through the City of Vancouver draining approximately 27.6 square miles. From its headwaters near NE 162<sup>nd</sup> Avenue, Burnt Bridge Creek flows 12.7 river miles to its confluence with Vancouver Lake near Interstate-5 (Figure 1). The study area includes 16 waterbody segments impaired by *fecal coliform* bacteria, dissolved oxygen, and temperature, as listed in the 2004 Clean Water Act Section 303(d) list. The draft 2008 303(d) list potentially adds 12 segments impaired for *fecal coliform* bacteria, temperature, dissolved oxygen and pH. The impairments were identified based on sampling conducted by the City of Vancouver, Clark County, Ecology, and other entities. Field work for this study began in May 2008 to assess the current condition of the waterbodies and to identify and quantify factors contributing to the impairments.

This memorandum summarizes the progress for Quarter 2 (April-June) and Quarter 3 (July-September) related to data collection and project communications. Data presented are provisional. Data quality has not been checked.

## Progress to Date

## Dissolved Oxygen, Temperature, Bacteria and Hydrogeology Data Collection

Field data collection began during the week of May 19, 2008 and will continue through August 2009. Figure 2 shows fixed-network sites where routine sampling occurs. Table 1 lists the sampling sites. Table 2 lists the types of data collected at each site and the site status. Table 3 displays a brief summary of data relative to water quality criteria. Synoptic surveys, riparian assessments, channel surveys, time of travel, periphyton, and sediment oxygen demand studies were conducted over the summer and early fall. The types of data collected for this ongoing study are listed below. More information, including methods, on each survey/study are available in the quality assurance project plan (QAPP).

- **Thermistors and piezometers** were installed during the week of May 19. The thermistors will continue to log surfacewater and groundwater temperature data through August 2009 (see Table 2 for details at each site) at half-hour intervals. Instantaneous gradient comparisons between the piezometers and surfacewater were measured one to two times monthly. Figure 4 provides an example of groundwater movement relative to a stream.
- **Bacteria** sampling began during the week of June 2 and will continue until August 2009. Samples are collected every two weeks and analyzed for fecal coliform bacteria.
- **Streamflow** sampling began during the week of June 2. Instantaneous streamflow measurements will be taken every two weeks until August 2009 during bacteria sampling. In July 2008, three continuous streamflow stations were installed by Ecology's Environmental Assessment Program Freshwater Monitoring Unit.
- **Synoptic surveys** were conducted on July 29 and September 23. During the synoptic surveys, continuous data collection for temperature, dissolved oxygen, pH, and conductivity were logged using a multi-probe at four locations along Burnt Bridge Creek. Instantaneous flow and grab samples of nutrients, dissolved oxygen, and bacteria were taken at each site in the morning and evening during the survey.
- **Stream channel surveys** were conducted at each site on Burnt Bridge Creek except BBC0.0 (Burnt Bridge Creek at the mouth).
- **Riparian vegetation assessment** was conducted along the majority of Burnt Bridge Creek. As part of the assessment, riparian canopy photos were taken.
- **Periphyton** samples were collected at each site (except PET1.3) on July 29, to help assess benthic primary production.
- **Sediment oxygen demand (SOD)** studies were conducted during the weeks of July 28 and September 22, to help assess benthic primary production.
- **Time of travel** studies (dye studies) were conducted during the weeks of July 28 and September 22.
- **Winkler dissolved oxygen** samples were taken at most sites during bacteria sampling events.
- **Instantaneous data** such as temperature, dissolved oxygen, pH, and conductivity were measured using a multi-probe at each site during bacteria sampling events.

## Provisional Results

Table 3 provides provisional data compared to water quality criteria for each site for bacteria, temperature, dissolved oxygen and pH. Samples collected from Burnt Bridge Creek and its tributaries indicate all sites but one had concentrations greater than 200 colony forming units

(cfu)/100 mL on at least one occasion during this sample period. Bacteria samples collected at the mouth of Burnt Bridge Creek (BBC0.0) did not exceed the criterion. Table 4 presents the fecal coliform data collected to date.

All sites exceeded the water quality standard for temperature (7-Day Average Daily Maximum of 17.5°C) except Cold Creek at the mouth (COL0.0). Peterson Ditch at SEH America (PET1.3) did not exceed the temperature criterion set for the facilities NPDES permit of a daily maximum of 21°C at any time during sampling period. The dissolved oxygen criterion (minimum of 8 mg/L) was exceeded at least once at all sites except at sites BBC1.6, COL0.0, BBC2.6, BBC3.4, and BBC4.3. The pH criterion was exceeded at least once at each site during the sampling season except at sites BBC5.2, BBC8.0, PET0.0, PET1.3, BBC8.8, BBC10.4, BBC10.8, and BBC11.4.

The bulk of the data collected from the piezometers suggests Burnt Bridge Creek is losing surface water to the groundwater. Figure 4 shows piezometer data indicating a surface water loss to groundwater. In contrast, Figure 5 shows piezometer data indicating groundwater upwelling to surface water.

### **Communication and Coordination**

- Toured SEH facility and waste stream treatment February 20, 2008.
- Met with the City of Vancouver to discuss our sampling plan and tour stormwater treatment facilities February 21, 2008.
- Presented overview of the TMDL study to the Advisory Group April 14, 2008.
- Presented overview of the TMDL study to the public May 20, 2008.
- QAPP finalized and distributed to the public July 2008.
- Met with SEH to discuss TMDL process, water pollutant trading and renewal of the facilities NPDES permit September 5, 2008.
- Media Event – September 24, 2008. Local media staff interviewed Ecology staff about the study and filmed/photographed a dye release (time of travel study).
- Requested and received assistance from PBS consulting for synoptic surveys and potential stormwater sampling.
- Gained access to Burnt Bridge Creek along NE 162<sup>nd</sup> Ave. on Aho construction company property.
- Informed Vancouver Police Department about sampling plans, including description of field equipment, use, and location.

### **Project Schedule and Upcoming Tasks**

Routine bacteria and streamflow sampling will continue until August 2009. During this time, piezometer/surfacewater gradients will be measured on occasion and instream thermistors will be redeployed as needed.

Stormwater sampling remains necessary to complete the study. The two stormwater sampling events remaining, include 1) bacteria and streamflow data collection twice during one storm

event and 2) a dry season storm sampled once for parameters such as nutrients, bacteria, total organic carbon, dissolved organic carbon, total suspended solids, and streamflow.

Attachment(s):

**Table 1.** Burnt Bridge Creek TMDL fixed network sampling locations.

**Table 2.** Sampling locations, routine data type collection and, status of continuous, temperature logging.

**Table 3.** Burnt Bridge Creek watershed preliminary data results based on water quality criteria.

**Table 4.** Burnt Bridge Creek watershed preliminary results for *fecal coliform* bacteria, colony forming units (cfu)/100mL.

**Figure 1.** Burnt Bridge Creek study area with 303(d) listed waterbody segments.

**Figure 2.** Burnt Bridge Creek TMDL fixed network sampling locations.

**Figure 3.** Instream piezometer with thermograph and conceptual hyporheic groundwater movement.

**Figure 4.** Piezometer thermograph and water gradients for Burnt Bridge Creek at 18<sup>th</sup> St. (BBC5.9).

**Figure 5.** Piezometer thermograph and water gradients for Burnt Bridge Creek at NE 121<sup>st</sup> Ave. (BBC10.8).

cc: Kim McKee, Unit Supervisor, Water Quality Program, SWRO  
Garin Schrieve, Section Manager, Water Quality Program, SWRO  
Kirk Sinclair, Hydrogeologist, Environmental Assessment Program

## Tables

Table 1. Burnt Bridge Creek TMDL fixed network sampling locations.

Site ID	Description	NAD 83	
		Latitude	Longitude
BBC0	Burnt Bridge Ck downstream of Fruit Valley Rd	45.67520	-122.69253
BBC1.6	Burnt Bridge Ck at 2nd Ave near Alki Rd	45.66137	-122.66934
COL0	Cold Creek at Hazel Dell Ave BBC RM 1.6	45.66174	-122.66827
BBC2.6	Burnt Bridge Ck at Leverich Park	45.65339	-122.66180
BBC3.4	Burnt Bridge Ck near SR 500 at 41st Cr	45.65250	-122.65034
BBC4.3	Burnt Bridge Ck upstream of Saint Johns Blvd	45.64745	-122.63946
BBC5.2	Burnt Bridge Ck at Rossiter Ln	45.64112	-122.63094
BBC5.9	Burnt Bridge Ck at NE 18th St	45.63469	-122.62405
BBC7	Burnt Bridge Ck at NE 65th Ave	45.63456	-122.60497
BBC8	Burnt Bridge Ck NE 86th Ave, dwn/strm of Burton Ch.	45.63523	-122.58489
BUR0	Burton Channel at BBC RM 8.3 19th Cr & 92nd Ave	45.63672	-122.58121
BBC8.4	Burnt Bridge Ck at NE Burton Rd, blw Peterson Ditch	45.63802	-122.58246
PET0	Peterson Ditch confluence at 93rd Ave, BBC RM 8.8	45.64501	-122.57767
PET1.3	Peterson Ditch at 102nd Ave (SEH outfall 001)	45.65207	-122.55736
BBC8.8	Burnt Bridge Ck above Peterson Ditch at NE 93rd Ave	45.64468	-122.57837
BBC9.5	Burnt Bridge Ck at 98th, up/strm of Royal Oaks Dr	45.65148	-122.57191
BBC10.4	Burnt Bridge Ck at NE 110th Ave	45.65809	-122.55974
BBC10.8	Burnt Bridge Ck at NE 121st Ave	45.66031	-122.54881
BBC11.4	Burnt Bridge Ck at 131st Ave	45.66308	-122.53808

Table 2. Sampling locations, routine data type collection and, status of continuous temperature logging.

Site ID	Bact.	Stream Temp.	Air Temp.	RH	Piezo.	Streamflow		Temp. Data Logging Status
						Inst.	Cont.	
BBC0.0	x	x	x	x		x		ending <sup>1</sup>
BBC1.6	x	x	x		x	x	x	on going
COL0.0	x	x	x			x		ending <sup>1</sup>
BBC2.6	x	x	x		x	x		on going
BBC3.4	x	x	x	x	x	x		on going
BBC4.3	x	x	x		x	x		on going
BBC5.2	x	x	x		x	x		on going
BBC5.9	x	x	x		x	x		on going
BBC7.0	x	x	x		x	x		on going
BBC8.0	x	x	x			x		ending <sup>1</sup>
BUR0.0	x	x	x	x		x		ending <sup>1</sup>
BBC8.4	x	x	x	x	x	x	x	on going
PET0.0	x	x	x			x		on going
PET1.3	x	x				x	x	on going
BBC8.8	x	x	x		x	x		on going
BBC9.5	x	x	x		x	x		on going
BBC10.4	x	x	x		x	x	x	on going
BBC10.8	x	x	x		x	x		on going
BBC11.4	x	x	x	x	x	x		on going

Bact.= *fecal coliform* bacteria, Temp.= temperature, RH= relative humidity, Piezo.= piezometer, Inst.= instantaneous, Cont.=continuous.

<sup>1</sup>Continuous temperature data logging will resume May 2009 and end August 2009.

Table 3. Burnt Bridge Creek watershed provisional data results based on water quality criteria. Data have not been quality assured.

Site ID	Total number of days above water quality criteria			
	Bacteria > 200 cfu/100mL	Temperature <sup>1</sup> > 17.5°C	Dissolved Oxygen < 8 mg/L	pH 6.5 - 8.5
BBC0.0	0	66	1	3
BBC1.6	4	83	0	1
COL0.0	8	0	0	1
BBC2.6	6	92	0	1
BBC3.4	3	93	0	1
BBC4.3	3	86	0	1
BBC5.2	5	92	1	0
BBC5.9	2	103	4	1
BBC7.0	1	109	4	3
BBC8.0	1	95	3	0
BUR0.0	5	94	4	1
BBC8.4	1	85	2	1
PET0.0	6	87	1	0
PET1.3	1	0 (> 21°C)	2	0
BBC8.8	1	85	1	0
BBC9.5	1	26	11	1
BBC10.4	2	7	10	0
BBC10.8	1	9	9	0
BBC11.4	1	11	10	0

<sup>1</sup> The highest annual running 7-day average of maximum temperatures.

Table 4. Burnt Bridge Creek watershed preliminary results for *fecal coliform* bacteria, colony forming units (cfu)/100mL.

Site ID	6/2/08	6/16/08	6/30/08	7/14/08	7/28/08	8/11/08	8/25/08	9/8/08	9/22/08
BBC0.0	NC	NC	9	65	17	14	86	37	29
BBC1.6	835	130	140	430	147 J	140	160	260	260
COL0.0	380	81	220	435	470	420	300	260	260
BBC2.6	1000	280	100	230	330	170	220	280	180
BBC3.4	830	75	110	120	100 J	88	215 J	260	147
BBC4.3	1100	180 J	145	120	87	100	190 J	270	200
BBC5.2	785	300	92 J	210 J	65	92 J	200 J	140 J	250
BBC5.9	1800 J	825	92 J	96 J	62 J	79 J	180	100 J	66
BBC7.0	2300	25 U	120	63	120	160 J	49	7	17
BBC8.0	2600 J	110	74	67	61	77	98	160	23
BUR0.0	3950 J	230	140	130	170	200	990	160	200
BBC8.4	3000 J	25	96	140	85	100	100	120	180
PET0.0	4200 J	130	75	220	220	320	171	250	550
PET1.3	880 J	8 U	5	18	24	1 U	11	15	4
BBC8.8	3100 J	32	70	34	44	75	110	40	37
BBC9.5	1900 J	46	83	81	37	100	71	43	54
BBC10.4	1450 J	101	160	100	42	215	150 J	40	69
BBC10.8	1300 J	85	110	96	93	47	63 J	31	28
BBC11.4	3200 J	120	190	73 J	46	22	105 J	26 J	57

NC = Not Collected

J = The organism was positively identified. The associated numerical result is an estimate.

U = The organism was not detected at or above the reported result.

# Figures

## Burnt Bridge Creek TMDL Study Area

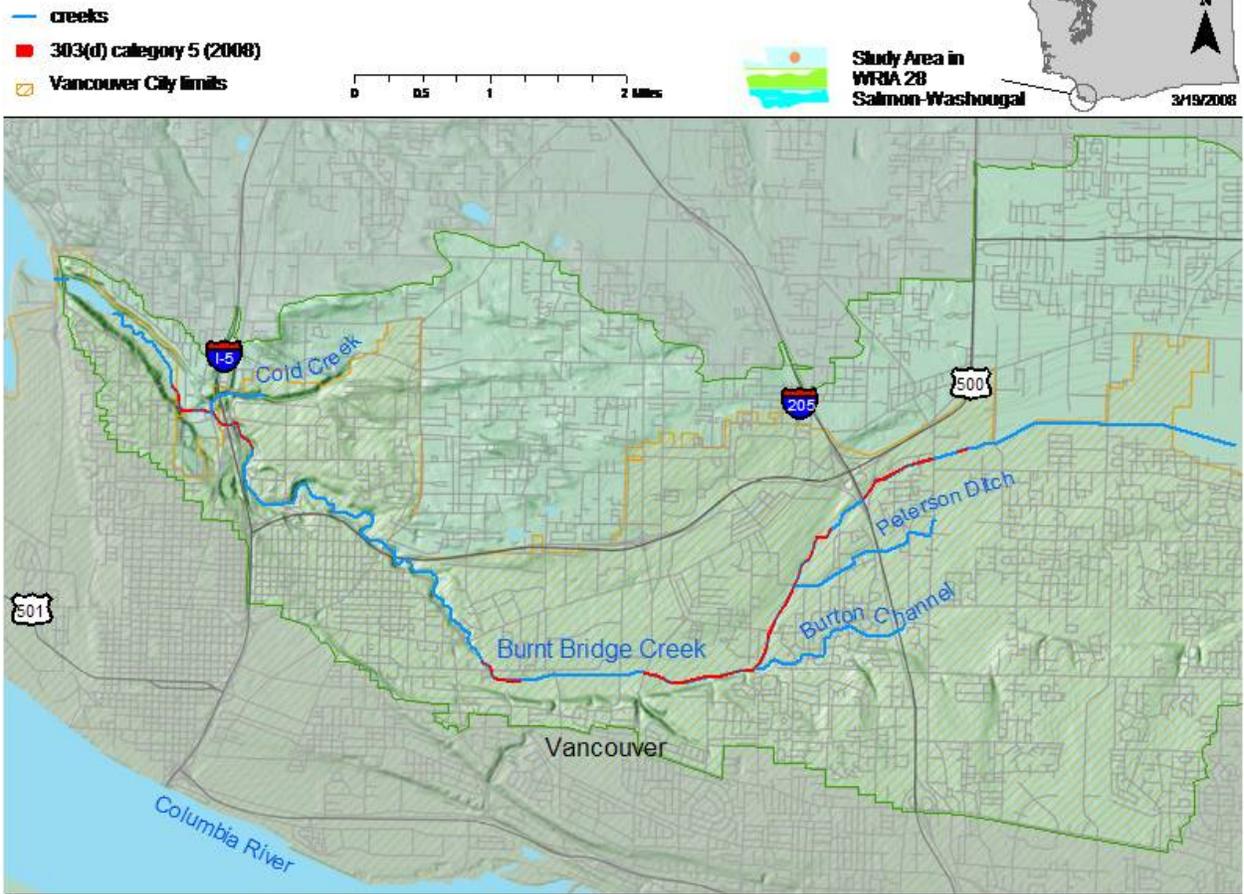


Figure 1. Burnt Bridge Creek study area with 303(d) listed waterbody segments.

# Burnt Bridge Creek TMDL Proposed Fixed-Network Monitoring Sites

- Monitoring Sites
- Creeks
- ▭ Vancouver City limits

0 0.5 1 2 Miles

Study Area in  
WRIA 28  
Salmon-Washougal

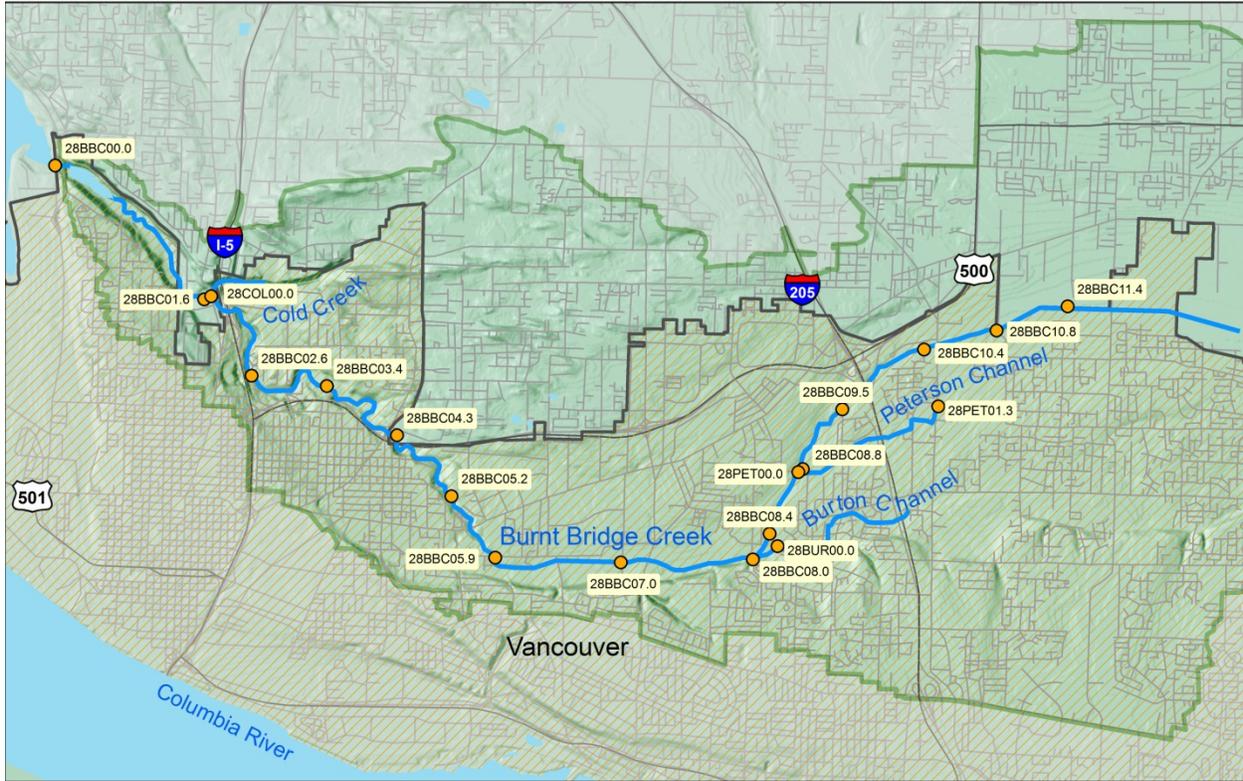


Figure 2. Burnt Bridge Creek TMDL fixed network sampling locations.

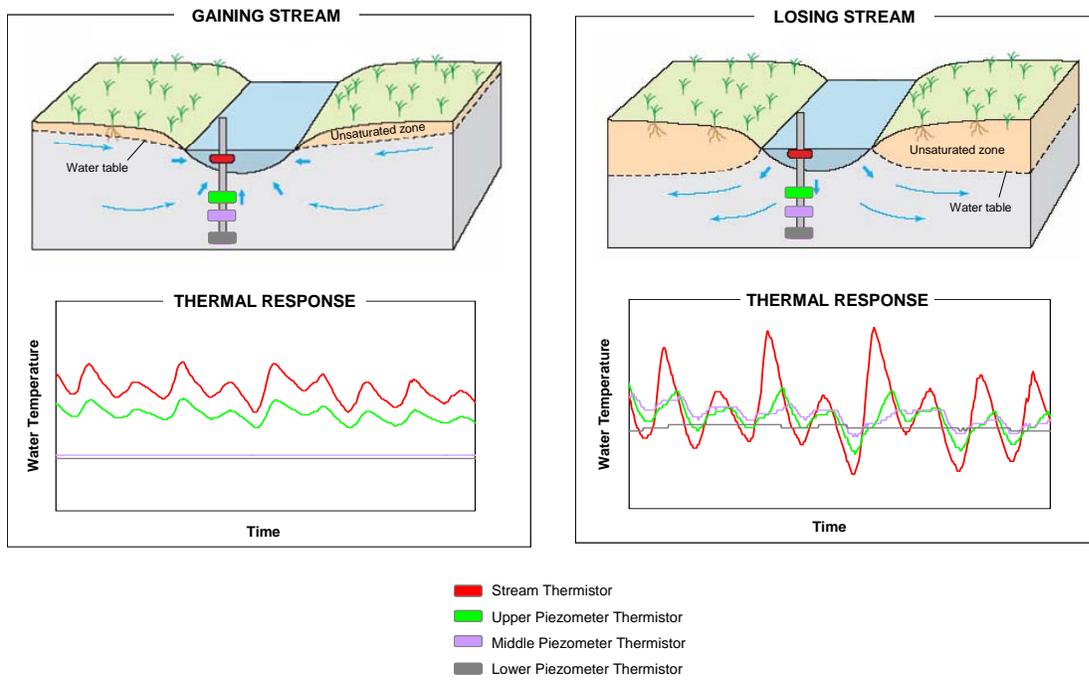


Figure 3. Instream piezometer with thermograph and conceptual hyporheic groundwater movement.

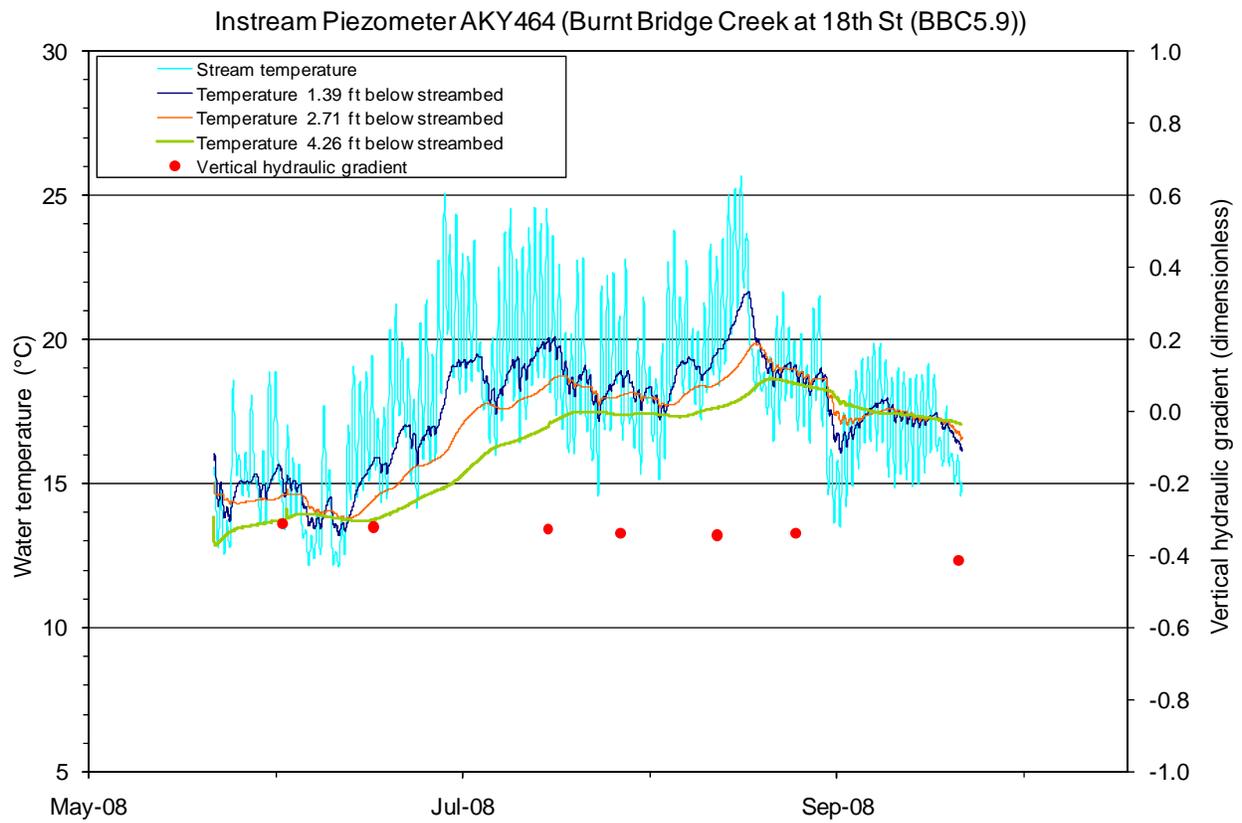


Figure 4. Piezometer thermograph and water gradients for Burnt Bridge Creek at 18<sup>th</sup> St. (BBC5.9).

Instream Piezometer AKY463 (Burnt Bridge Creek at 65th Ave (BBC7))

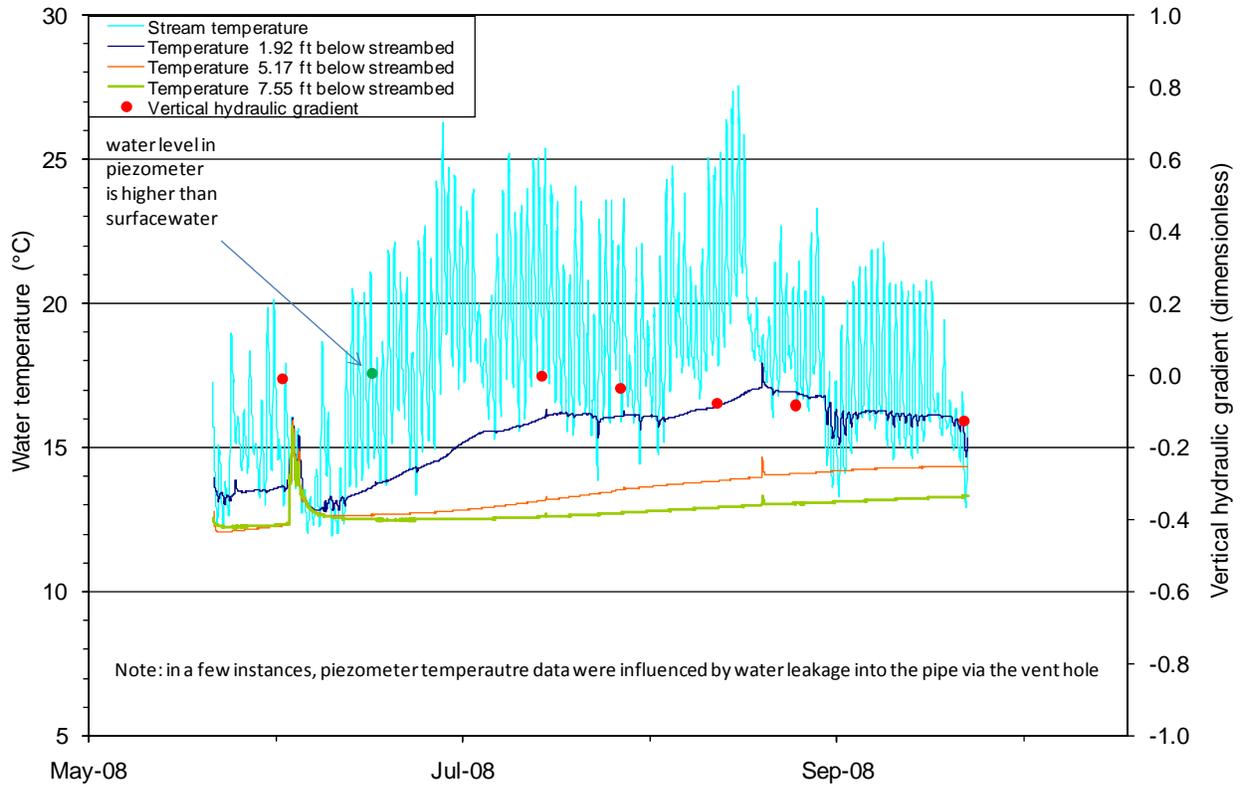


Figure 5. Piezometer thermograph and water gradients for Burnt Bridge Creek at NE 121<sup>st</sup> Ave. (BBC10.8).