

**Use Attainability Analysis**  
**for**  
**Water Body Identification # 0833**  
**Linn Creek**

**Conducted by:**  
**Environmental Resources Coalition**

**To:**  
**Missouri Department of Natural Resources**  
**Water Protection Program**

**Submitted: November 21, 2005**



## Stream Description – WB ID: 0833 – Linn Creek

Linn Creek (WB# 0833) is located in the Osage/Gasconade Hills (Level VI Region 39e) of the Ozark Highlands eco-region. Chapman et al. (2002) characterized the region as the following:

*The Osage/Gasconade Hills eco-region is more densely forested and dissected than the lower relief Central Plateau (39d) to the south. Steep slopes and narrow ridges of carbonate and sandstone underlie soils which are rocky and thin. Outcrops of Gasconade dolomite with some sandstone are found throughout the region along with areas of Roubidoux sandstone, Jefferson City-Cotter dolomites and scattered Mississippian limestone outliers in the western portion. Numerous caves, springs, calcareous wet meadows, losing streams, and streams with entrenched valley meanders are common. Streams flow generally northward and drain into the Missouri River. The potential natural vegetation is predominantly mixed oak forest, with oak-pine forest and some pine forests in the southeast areas of the region and some small limestone and sandstone glades. The northeastern edges of this region are transitional and blend into the Interior River Valleys and Hills (72) eco-region.*

The Linn Creek classified stream segment (WB# 0833) is a seven mile long class C stream located in central Osage County. The stream upstream segment begins at Highway U just south of Linn and runs north to northwest to the confluence with Cedar Creek. Approximately one quarter of a mile of the seven-mile stretch lies upstream of the city of Linn wastewater treatment facility (WWTF) (MO0051551), and the remaining six and three quarters miles are located downstream of this facility. The area surrounding the stream is primarily wooded, or pastures with exception of a few residences which dot the landscape.

Chapman, S.S., Omernik, J.M., Griffith, G.E., Schroeder, W.A., Nigh, T.A., and Wilton, T.F., 2002, Ecoregions of Iowa and Missouri (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,800,000).

**Note: During the first visit to each site, ERC selected an assessment location (either upstream or downstream) based on which side appeared deepest or most likely for whole body recreation.**

## Field Data Sheets for Recreational Use Stream Surveys

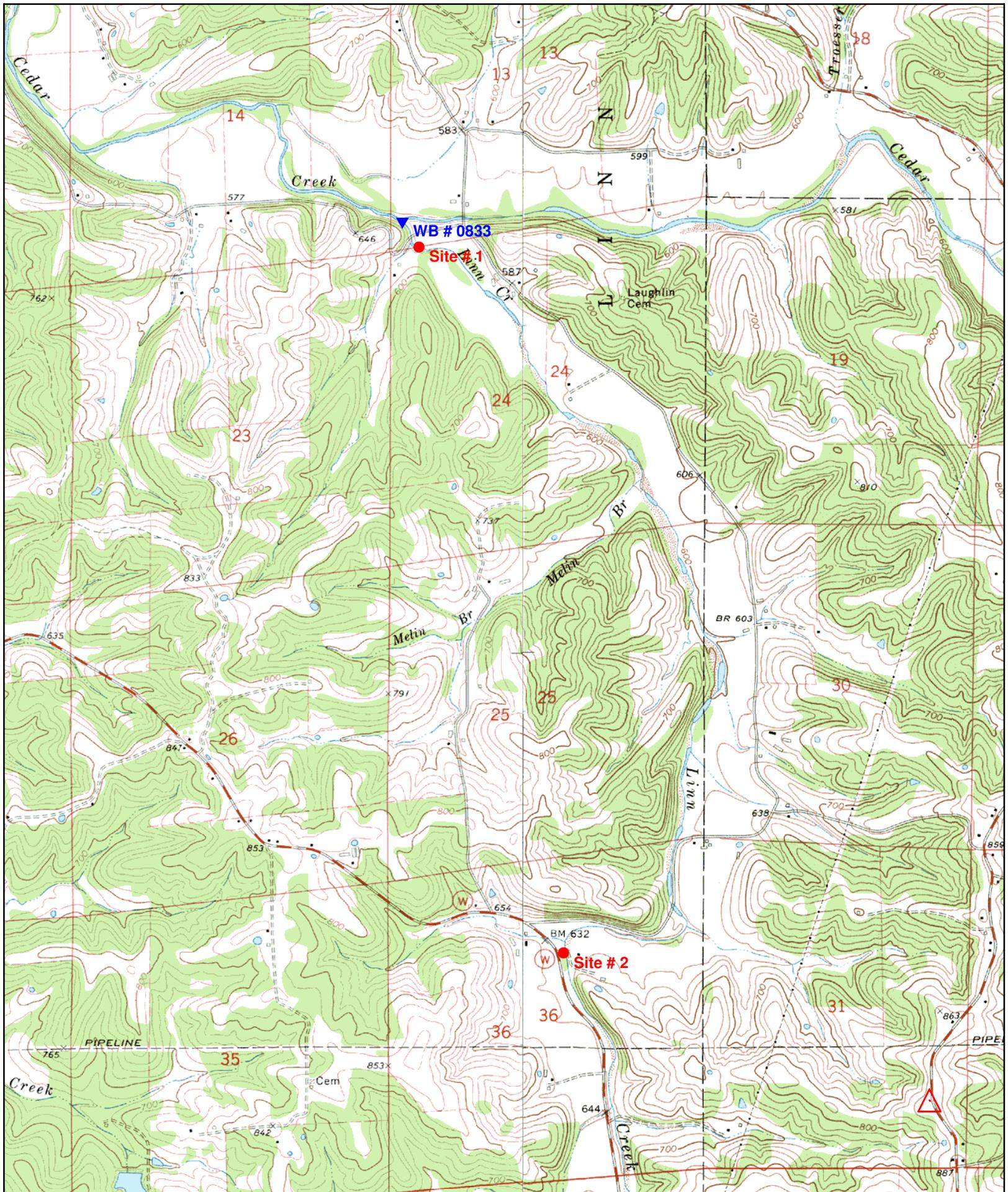
### Data Sheet A: Water Body Identification

<b>Water Body Name:</b> Linn Creek
<b>8 - digit HUC:</b> 10300102
<b>Missouri WBID #</b> 0833
<b>County:</b> Osage
<b>Upstream Legal Description:</b> Sec. 7, T43N, R8W, Osage County
<b>Downstream Legal Description:</b> Sec. 13, T44N, R9W (at confluence with Cedar Creek)
<b>Upstream Coordinates:</b> Latitude 38.485531 ° N , Longitude 91.856793 ° W
<b>Downstream Coordinates:</b> Latitude 38.5605 ° N , Longitude 91.881667 ° W
<b>Discharger Facility Name(s):</b> Linn WWTF
<b>Discharger Permit Number(s):</b> MO0051551
<b>Number of Sites Evaluated:</b> 4
<b>Name of Surveyor and Telephone Number:</b> Robert R. Bacon, (573) 634-7078
<b>Organization:</b> Environmental Resources Coalition (ERC)
<b>Position:</b> Director of Aquatic Services

I, the undersigned, hereby affirm to the best of my knowledge, that all information reported on this UAA sheet is true and accurate.

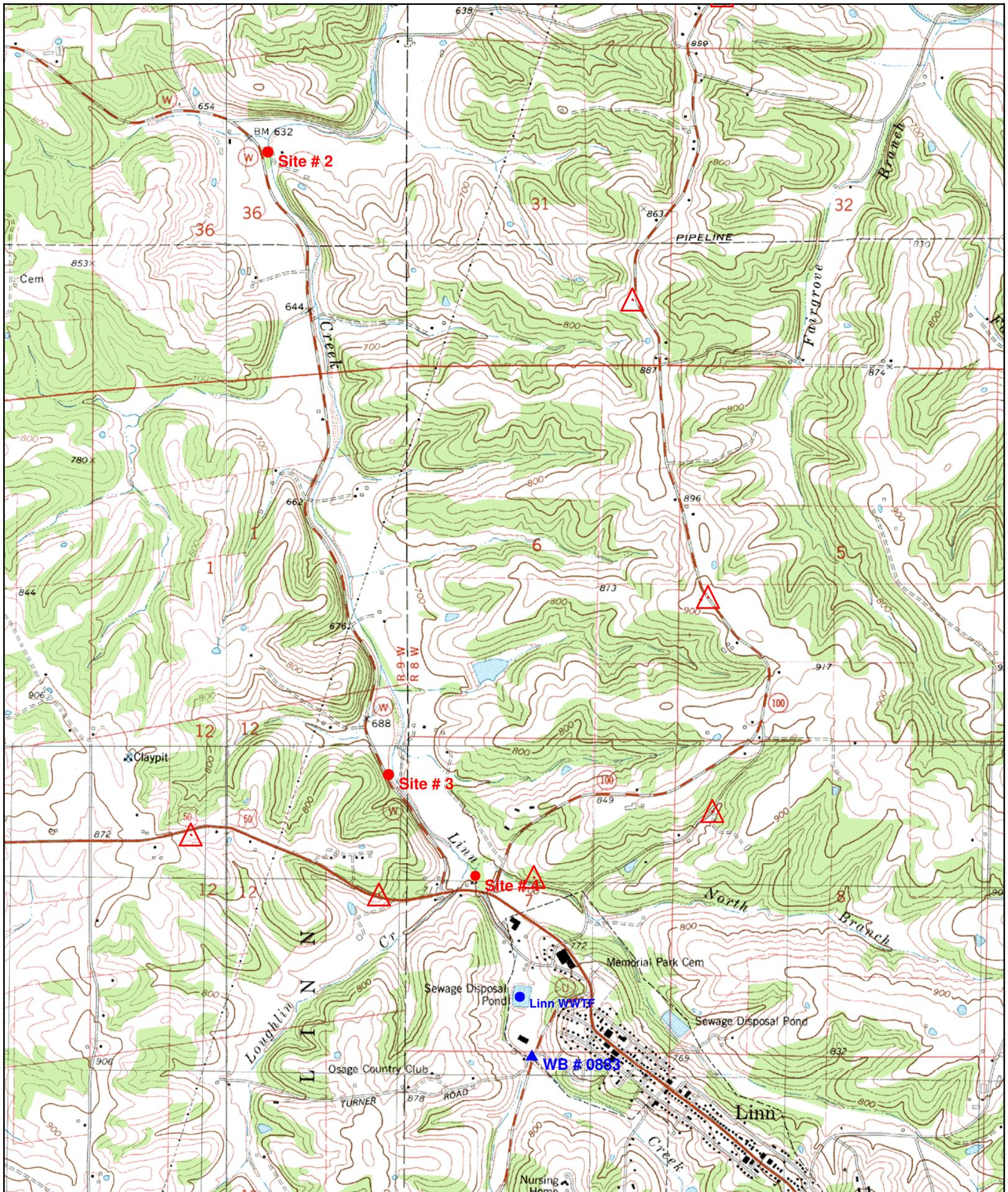
Signed: Robert R. Bacon

Date: 11-21-2005



Name: LUYSTOWN  
Date: 11/17/2005  
Scale: 1 inch equals 2000 feet

Location: 038.5441732° N 091.8760954° W



Name: LINN  
 Date: 11/17/2005  
 Scale: 1 inch equals 2000 feet

Location: 038.5067971° N 091.8585785° W

## Weather Conditions

Weather conditions for the field surveys and the previous ten days are listed in the tables below.

Data from the Midwestern Regional Climate Center  
Rich Fountain, Missouri - (Station ID: 237105)

<b>Date</b>	<b>Precipitation (Inches)</b>	<b>Min. Temp (°F)</b>	<b>Max. Temp (°F)</b>	<b>Average Temp (°F)</b>
05/07/2005	0	51	80	66
05/08/2005	0	58	79	69
05/09/2005	0	60	81	71
05/10/2005	0	57	86	72
05/11/2005	0	61	87	74
05/12/2005	0.02	58	86	72
05/13/2005	0.04	59	78	69
05/14/2005	0.59	53	72	63
05/15/2005	0	41	64	53
05/16/2005	0	40	71	56
05/17/2005	0	43	76	60

<b>Date</b>	<b>Precipitation (Inches)</b>	<b>Min. Temp (°F)</b>	<b>Max. Temp (°F)</b>	<b>Average Temp (°F)</b>
05/29/2005	0	53	82	68
05/30/2005	0	57	80	69
05/31/2005	0	60	81	71
06/01/2005	0	56	81	69
06/02/2005	0	57	82	70
06/03/2005	0	59	85	72
06/04/2005	0	64	91	78
06/05/2005	0	67	88	78
06/06/2005	0	64	86	75
06/07/2005	0.08	64	87	76
06/08/2005	0.17	64	90	77

## Weather Conditions (continued)

Weather conditions for the field surveys and the previous ten days are listed in the tables below.

Data from the Midwestern Regional Climate Center  
Rich Fountain, Missouri - (Station ID: 237105)

<b>Date</b>	<b>Precipitation (Inches)</b>	<b>Min. Temp (°F)</b>	<b>Max. Temp (°F)</b>	<b>Average Temp (°F)</b>
08/22/2005	0	69	84	77
08/23/2005	0.2	66	76	71
08/24/2005	0.88	64	81	73
08/25/2005	0.35	66	82	74
08/26/2005	0.35	70	86	78
08/27/2005	0.63	68	88	78
08/28/2005	0	64	89	77
08/29/2005	0	63	87	75
08/30/2005	0	64	83	74
08/31/2005	0	63	87	75
09/01/2005	0	64	84	74



## Physical Dimensions – Site # 1

	05/17/05	06/08/05
<b>Assessment Location</b>	Downstream	Downstream
<b>Time</b>	8:20 AM	9:45 AM
<b>Stream Type</b>	Run	Run
<b>Width (m)</b>	8.53	5.94
<b>Length (m)</b>	30.48	30.48
<b>Ave Depth (cm)</b>	19.47	17.95
<b>Maximum Depth (cm)*</b>	42.0	27.0
<b>Flow Present</b>	Yes - very low flow	Yes - very low flow
<b>Flow (cfs)</b>	-	-

### **SUBSTRATE**

<b>Cobble</b>	0%	10%
<b>Gravel</b>	80%	90%
<b>Sand</b>	20%	0%
<b>Silt</b>	0%	0%
<b>Mud / Clay</b>	0%	0%
<b>Bedrock</b>	0%	0%
	100%	100%

### **OTHER**

<b>Uses Observed</b>	None	None
<b>Evidence of Human Use (WBCR)</b>	None	None
<b>Aquatic Vegetation</b>	Periphyton	Periphyton
<i>Water Characteristics</i>		
<b>Odor</b>	None	None
<b>Color</b>	Clear	Clear
<b>Bottom Deposits</b>	None	None
<b>Surface Deposits</b>	Small amounts of foam	Small amount of scum

\* Maximum depth is the maximum measured depth within the stream cross-section.

**NOTES: Site # 1 is the lowermost site on Linn Creek.**

**06/08/05 – Possible site of whole body contact recreation located near downstream view. Assessment team went back for assessment of this pool on 09/01/05. At this assessment site many minnows were present.**

# Site of potential WBCR

## Downstream of Site # 1

(This pool is located approximately 6.25 miles downstream from WWTF outfall)

**GPS Location**

**38.5605006 North**

**91.8816667 West**

### Upstream View of the Pool

**09/01/05**



### Downstream View of the Pool

**09/01/05**



## Physical Dimensions – WBCR site

**09/01/05**

<b>Assessment Location</b>	Upstream and Downstream
<b>Time</b>	9:30 a.m.
<b>Stream Type</b>	Pool
<b>Width (m)</b>	7.62 estimate
<b>Length (m)</b>	15.24
<b>Ave Depth (cm)</b>	-
<b>Maximum Depth (cm)</b>	>140
<b>Flow Present</b>	Yes – very low flow
<b>Flow (cfs)</b>	-

### **SUBSTRATE**

<b>Cobble</b>	0%
<b>Gravel</b>	90%
<b>Sand</b>	10%
<b>Silt</b>	0%
<b>Mud / Clay</b>	0%
<b>Bedrock</b>	0%
	100%

### **OTHER**

<b>Uses Observed</b>	None
<b>Evidence of Human Use (WBCR)</b>	None current
<b>Aquatic Vegetation</b>	Small mats of algae and periphyton
<i>Water Characteristics</i>	
<b>Odor</b>	None
<b>Color</b>	Turbid
<b>Bottom Deposits</b>	None
<b>Surface Deposits</b>	Foam

### **NOTES:**

**09/01/05 - Assessors could not cross the stream at this location. Depths greater than 140 cm were measured with actual maximum pool depth likely to exceed 200 cm. Footprints and several alcohol bottles were noticed on the gravel bar adjacent to the pool.**

# WB # 0833 – Linn Creek

## Site # 2 - Located just off Hwy W

GPS Location

38.5277046 North  
91.8726428 West

### Upstream Views

05/17/05



06/08/05



### Downstream Views

05/17/05



06/08/05



## Physical Dimensions – Site # 2

	<b>05/17/05</b>	<b>06/08/05</b>
<b>Assessment Location</b>	Downstream	Downstream
<b>Time</b>	8:53 AM	10:12 AM
<b>Stream Type</b>	Run	Run
<b>Width (m)</b>	18.90	17.37
<b>Length (m)</b>	91.44	91.44
<b>Ave Depth (cm)</b>	13.08	8.30
<b>Maximum Depth (cm)*</b>	24.0	23.0
<b>Flow Present</b>	Yes – very low flow	Yes – very low flow
<b>Flow (cfs)</b>	-	-

### **SUBSTRATE**

<b>Cobble</b>	40%	40%
<b>Gravel</b>	60%	60%
<b>Sand</b>	0%	0%
<b>Silt</b>	0%	0%
<b>Mud / Clay</b>	0%	0%
<b>Bedrock</b>	0%	0%
	100%	100%

### **OTHER**

<b>Uses Observed</b>	None	None
<b>Evidence of Human Use (WBCR)</b>	None	None
<b>Aquatic Vegetation</b>	None	periphyton
<i>Water Characteristics</i>		
<b>Odor</b>	None	None
<b>Color</b>	Clear	Clear
<b>Bottom Deposits</b>	None	None
<b>Surface Deposits</b>	Foam	Foam

\* Maximum depth is the maximum measured depth within the stream cross-section.

### **NOTES:**

**This site is located approximately 3.0 miles downstream of WWTF outfall.**

# WB # 0833 – Linn Creek

## Site # 3 - Hwy W – at roadside pull off

GPS Location

38.4986366 North

91.8654972 West

### Upstream Views

05/18/05

06/08/05



### Downstream Views

05/18/05

06/08/05



## Physical Dimensions – Site # 3

	05/18/05	06/08/05
<b>Assessment Location</b>	Downstream	Downstream
<b>Time</b>	9:17 AM	10:17 AM
<b>Stream Type</b>	Run	Run
<b>Width (m)</b>	9.30	5.79
<b>Length (m)</b>	91.44	91.44
<b>Ave Depth (cm)</b>	12.18	9.25
<b>Maximum Depth (cm)*</b>	22.0	16.0
<b>Flow Present</b>	Yes - very low flow	Yes - very low flow
<b>Flow (cfs)</b>	-	-

### **SUBSTRATE**

<b>Cobble</b>	10%	0%
<b>Gravel</b>	0%	0%
<b>Sand</b>	0%	0%
<b>Silt</b>	0%	0%
<b>Mud / Clay</b>	0%	0%
<b>Bedrock</b>	90%	100%
	100%	100%

### **OTHER**

<b>Uses Observed</b>	None	None
<b>Evidence of Human Use (WBCR)</b>	Trail from roadside area to stream	Trail from roadside area to stream
<b>Aquatic Vegetation</b>	Filamentous algae growth	Filamentous algae growth
<i>Water Characteristics</i>		
<b>Odor</b>	None	None
<b>Color</b>	Clear	Clear
<b>Bottom Deposits</b>	None	None
<b>Surface Deposits</b>	Foam	Foam

\* Maximum depth is the maximum measured depth within the stream cross-section.

### **NOTES:**

**This site is located approximately 0.9 of a mile downstream of WWTF outfall.**

# WB # 0833 – Linn Creek

## Site # 4 - Off Hwy 50

**GPS Location**

**38.4939249 North  
91.8604058 West**

### Upstream Views

**05/17/05**



**06/08/05**



### Downstream Views

**05/17/05**



**06/08/05**



## Physical Dimensions – Site # 4

	<b>05/17/05</b>	<b>06/08/05</b>
<b>Assessment Location</b>	Downstream	Downstream
<b>Time</b>	9:35 AM	10:27 AM
<b>Stream Type</b>	Run	Run
<b>Width (m)</b>	3.35	3.05
<b>Length (m)</b>	10	10
<b>Ave Depth (cm)</b>	5.17	6.91
<b>Maximum Depth (cm)*</b>	13.0	12.0
<b>Flow Present</b>	Yes - very low flow	Yes - very low flow
<b>Flow (cfs)</b>	-	-
 <b><u>SUBSTRATE</u></b>		
<b>Cobble</b>	60%	60%
<b>Gravel</b>	40%	40%
<b>Sand</b>	0%	0%
<b>Silt</b>	0%	0%
<b>Mud / Clay</b>	0%	0%
<b>Bedrock</b>	0%	0%
	100%	100%
 <b><u>OTHER</u></b>		
<b>Uses Observed</b>	None	None
<b>Evidence of Human Use (WBCR)</b>	None	None
<b>Aquatic Vegetation</b>	Filamentous algae, periphyton	Algae/periphyton
<b><i>Water Characteristics</i></b>		
<b>Odor</b>	None	None
<b>Color</b>	Clear	Clear
<b>Bottom Deposits</b>	None	None
<b>Surface Deposits</b>	Foam	Oily film, small amount of foam

\* Maximum depth is the maximum measured depth within the stream cross-section.

## Site Descriptions

**Site #1:** Site #1 is located just south of County Road 427 and is the lowermost assessment site on Linn Creek. The site is surrounded by woods. The assessment site can be accessed relatively easily from the lower water crossing of County Road 427.

**Site #2:** Site #2 of Linn Creek is located just off Highway W before the stream and highway curve away from each other. The surroundings at this site include wooded area, pasture land, and a low water crossing. The stream is very wide and shallow at this location.

**Site #3:** Site #3 of Linn Creek is located just off Highway W by the roadside pull off on the east side of the highway. The assessment site is surrounded by wooded areas and Highway W. Access to stream is easily accomplished by a small footpath from the highway pull off to the edge of the stream. At this location, trash lines the banks of the stream. It is the opinion of the assessment team that the path is likely used for dumping trash rather than whole body contact recreation. This site is located approximately 0.9 of a mile below the WWTF.

**Site #4:** Site #4 is located just off Hwy 50 near the concrete plant and is the uppermost assessment site on Linn Creek. This site located approximately 0.4 of a mile downstream of the WWTF. Surrounding conditions include; a concrete plant, a car dealership, Highway 50, and some wooded areas. During the assessment on 05/17/05 approximately 2.5 miles of the stream was assessed between Site #2 and Site #4.

I, the undersigned, hereby affirm to the best of my knowledge, that all information reported on the UAA datasheets, are true and accurate.

Signed: Robert D. Brown

Date: 11-21-2005

Organization: ERC

Position: Dir. of Aquatic Services

## Summaries of Interviews

The following interviews were conducted by Abby Welschmeyer with landowners and creek users during the month of June 2005. Questions were asked of the interviewee either in person or over the phone, and survey sheets were completed based on the information acquired by the interviewer. The questions asked are as follows:

- How long have you lived near this body of water?
- Do you or your family utilize this body of water for recreational activities?
- If not used, why?
- If used, what types of activities, how many times per period, and what flow conditions?
- Have you witnessed other people utilizing the water body?

**Date:** 06/08/05

**Time:** 11:50 AM

**Name:** Anna Storing

**Reason for Interview:** lives near site #1

Anna Storing has lived near Linn Creek for one year. She and her family use the stream for swimming, fishing, and wading many times during the summer months. After losing something in a deep swimming hole, Ms. Storing had a scuba diver come to recover the item, at which at that time she learned the swimming hole is approximately 9 ½ feet deep. She stated that she has seen people fishing and swimming at the hole and that it is, "A great place to swim."

**Date:** 06/29/05

**Time:** 3:13 PM

**Name:** Dave Dudenhoeffer

**Reason for Interview:** owns land between sites #1 and #2 – phone interview

Dave Dudenhoeffer has lived near Linn Creek for 25 years, and owns approximately ½ to ¾ of a mile along the stream. He stated that he and his family use the stream 25 to 30 times a year for swimming and fishing. He commented that he has seen his neighbors using the stream for fishing and swimming during the summer months.

**Date:** 06/08/05

**Time:** 11:15 AM

**Name:** Pat Oidtman

**Reason for Interview:** lives between sites #2 and #3

Pat Oidtman has lived near Linn Creek for 30 years. She stated that her grandchildren use the stream for wading five or six times during the late spring and summer months. Ms. Oidtman commented that she has seen her neighbors fishing and wading in the stream several times during the summer months.

## Summaries of Interviews (cont'd)

**Date:** 06/08/05

**Time:** 11:40 AM

**Name:** Kathy Loethen

**Reason for Interview:** lives between sites #2 and #3

Kathy Loethen has lived near Linn Creek for 52 years, and her family owns approximately  $\frac{3}{4}$  of a mile along the west side of the creek. She uses the stream for wading a few times during the summer months, and commented that the stream is mostly ankle deep and is not used for swimming because one cannot put their head under water. She said she has seen teenagers riding their ATVs through the stream, and she has also seen people wading in the stream a few times during the summer months.

**Date:** 06/08/05

**Time:** 11:00 AM

**Name:** Linda Roberts

**Reason for Interview:** lives between sites #4 and #5

Linda Roberts has lived near Linn Creek for 20 years, and does not use the stream for recreational activities. She stated that the WWTF discharges to the stream near her home, causing the water to be green. Ms. Roberts commented that in the last ten years, neighbor children have used the stream for swimming, but there is little to no usage now. She also said a bridge that crossed the stream nearby closed approximately ten years ago, which more than likely contributed to the decreased usage.

**Date:** 06/08/05

**Time:** 10:50 AM

**Name:** Lou Jean Boss

**Reason for Interview:** lives between sites #4 and #5

Lou Jean Boss has lived near Linn Creek for 30 years. She does not use the stream for recreational activities because she has no need to do so. Ms. Boss stated that she has seen people fishing from the stream for minnows during the summer months.