INTERGOVERNMENTAL COOPERATIVE AGREEMENT FOR THE HINKSON CREEK CONTINUOUS WATER QUALITY MONITORING PROJECT

The parties hereto are the City of Columbia, Missouri, a Constitutional charter city of the State of Missouri (the "City"), the County of Boone, a first class non-charter county and political subdivision of the State of Missouri by and through its County Commission (the "County"), and The Curators of the University of Missouri (the "University") and those parties enter this Intergovernmental Cooperative Agreement ("Agreement") effective on the date of signing by the third party executing this Agreement ("Effective Date").

Whereas, the parties entered an Intergovernmental Cooperation Agreement, attached hereto as Exhibit A, on April 2, 2013; and,

Whereas, in that Agreement the parties acknowledged their mutual obligations in certain projects initiated under a Collaborative Adaptive Management (CAM) process emanating from a Municipal Separate Storm Sewer System (MS4) permit issued by the Missouri Department of Natural Resources; and,

Whereas, the parties now wish to agree to the scope and details and costs of a study project known as the "Hinkson Creek Continuous Water Quality Monitoring Project".

Whereas, the County will enter into the contract with Geosyntec Consultants to perform work for the project.

Whereas, the County will provide the City and the University access to all data and deliverables received from the consultant.

NOW, THEREFORE, in consideration of the mutual covenants in this Acknowledgement, the parties agree as follows:

1. The parties agree to the scope and details of the project known as the "Hinkson Creek Continuous Water Quality Monitoring Project" as described in the attached Exhibit B. This project has a total not to exceed amount of $124,500.00, with each of the parties' total proportionate one-third costs not to exceed $41,500.00. The proportionate payments shall be subject to the appropriations of each of the parties. Subject to appropriation, the City Finance Director will have the authority to make payment on behalf of the City to the County, after receiving an invoice for the proper amounts as set forth herein. Subject to appropriations, the University and County shall take whatever individual actions they deem appropriate to make payment for the proper amounts as set forth herein.

2. No party may assign or transfer any of its rights or obligations under this Agreement to any other person or entity without the prior, written consent of the other parties.

3. This Agreement is for the sole benefit of the parties, and nothing in this Agreement is intended to confer any rights or remedies on any third party.

4. Nothing in this Agreement will be deemed or construed by the parties, nor by any other entity or person, as creating any principal and agent relationship, or partnership, or joint venture, between the parties.

5. This Agreement will be governed by the laws of the State of Missouri, and any action relating to this Agreement will be brought in the Circuit Court of Boone County, Missouri.

6. The covenants, agreements, and obligations in this Agreement will extend to, bind, and inure to the benefit of the parties and their respective successors and approved assigns.

7. Each person signing this Agreement on behalf of any of the parties represents that he or she has been duly authorized and empowered, by order, ordinance, or otherwise, to execute this Agreement and that all necessary action on behalf of that party to effectuate that authorization has been taken and done.

8. The parties state that this Agreement, together with its attached Addenda A through B, contains the entire agreement between the parties, and there are no other oral, written, express, or implied promises, agreements, representations, or inducements not specified herein.

9. No Waiver of Sovereign Immunity. In no event shall the language of this Agreement constitute or be construed as a waiver or limitation for any Party's rights or defenses with regard to each Party's applicable sovereign, governmental, or official immunities and protections as provided by federal and state constitution or law.

IN WITNESS WHEREOF the parties hereto have caused this Acknowledgement to be executed by their duly-authorized officers on day and year indicated by their signature below.

BOONE COUNTY, MISSOURI

By: _____
Kip Kendrick, Presiding Commissioner

_____
Date

ATTEST:

_____
Brianna L. Lennon, County Clerk

APPROVED AS TO LEGAL FORM:

_____
C.J. Dykhouse, County Counselor

Boone County Auditor Certification:
I hereby certify that a sufficient, unencumbered appropriation balance exists and is available to satisfy the obligation arising from this contract. (Note: Certification of this contract is not required if the terms of this contract do not create a measurable county obligation at this time.)

_____
Kyle Rieman, County Auditor Date

THE CURATORS OF THE UNIVERSITY OF MISSOURI

By: _____

Name Ed Kroll Meyer

6/9/2023

Date

CITY OF COLUMBIA, MISSOURI

By: _____
De'Carlon Seewood, City Manager

_____
Date

ATTEST:

_____
Sheela Amin, City Clerk

APPROVED AS TO FORM:

_____
Nancy Thompson, City Counselor

I hereby certify that this contract is within the purpose of the appropriation to which it is to be charged, that is, account 55806610-504990 and that there is an unencumbered balance to the credit of such account sufficient to pay therefore.

_____
Matthew Lue, Director of Finance

INTERGOVERNMENTAL COOPERATION AGREEMENT

This intergovernmental cooperation agreement (the "Agreement") is entered into on this 2ND day of APRIL, 2013, by and between the City of Columbia, Missouri, a Constitutional charter city of the State of Missouri (hereinafter referred to as the "City"), and the County of Boone in the State of Missouri (hereinafter referred to as "County"), and The Curators of the University of Missouri (hereinafter referred to as "University"); and may collectively be referred to as the "Parties."

WHEREAS, a Total Maximum Daily Load (TMDL) for Hinkson Creek was issued by the Federal Environmental Protection Agency (EPA) in 2011; and

WHEREAS, the City, County, and University are partners in a Municipal Separate Storm Sewer System (MS4) permit issued by the Missouri Department of Natural Resources, which is affected by the TMDL; and

WHEREAS, the City, County, and University entered into an agreement with the EPA and the Missouri Department of Natural Resources (DNR) to address the TMDL with a Collaborative Adaptive Management (CAM) process; and

WHEREAS, the City, County, and University wish to enter into an agreement with regard to how the Parties will contribute to projects that are initiated in the CAM process to address the TMDL.

NOW, THEREFORE, the parties agree as follows:

1 **TYPES OF PROJECTS.** The Parties will contribute to projects which are initiated in the CAM process to address the TMDL for research, study, or monitoring-type projects and for construction projects.

For research, study, or monitoring-type projects, the three entities will each be responsible for one-third of the project cost. The University shall coordinate research, study, or monitoring-type projects on behalf of the parties. Before any research, study, or monitoring-type project is started, the Parties shall agree in writing regarding the scope and details of the project, including a not-to-exceed amount for each project.

For construction projects, each entity will exercise discretion and control over projects and be responsible for the costs of projects conducted on its own property unless otherwise agreed between the parties in writing.

2. **APPROPRIATIONS.** All types of projects shall be subject to the appropriations of the Parties who shall pay for the projects. Subject to these appropriations, the Parties shall each delegate in writing a person who shall be responsible for implementing this agreement and any associated documents or contracts to give this agreement effect.

3. **TERM.** The effective date of this Agreement is the date the last party executes the Agreement and provides original executed documents to the other Parties. Any of the Parties may terminate this Agreement at any time by providing the other Parties written notice of their intent to terminate at least thirty (30) days in advance of the intended termination date

4. **ASSIGNMENT.** None of the Parties may assign or transfer any of its rights or obligations under this Agreement to any other person or entity without the prior, written consent of the other Parties.

5. **SOLE BENEFIT OF PARTIES.** This Agreement is for the sole benefit of the City, County and University. Nothing in this Agreement is intended to confer any rights or remedies on any third party.

6. **ENTIRE AGREEMENT.** The Parties state that this Agreement contains the entire agreement between the Parties, and there are no other oral, written, express or implied promises, agreements, representations or inducements not specified herein.

7. **AUTHORITY.** The signatories to this Agreement warrant and certify that they have obtained the necessary authority, by resolution or otherwise, to execute this Agreement on behalf of the named party for whom they are signing.

[SIGNATURES ON THE FOLLOWING PAGES]

IN WITNESS WHEREOF, the Parties hereto have been duly authorized to execute this Agreement as of the day and year first above written.

CITY OF COLUMBIA, MISSOURI

By: _____
Mike Matthes, City Manager

ATTEST:

_____
Sheela Amin, City Clerk

APPROVED AS TO FORM:

_____
~~Fred Boeckmann~~, City Counselor
Cavanaugh Nace

BOONE COUNTY, MISSOURI

By: _____
Dan Atwill, Presiding Commissioner

ATTEST:

_____
Wendy Noren, County Clerk

APPROVED AS TO FORM:

_____
C.J. Dykhouse, County Attorney

THE CURATORS OF THE
UNIVERSITY OF MISSOURI

By: _____
Lisa J. Wimmenauer
Assoc. Director, Business Services

ATTEST:

Approved By

MAR 0 5 2013
RJH
General Counsel via EMAIL

163 -2013

CERTIFIED COPY OF ORDER

STATE OF MISSOURI } ea.
County of Boone

April Session of the April Adjourned Term. 20 13

In the County Commission of said county, on the 2nd day of April 20 13

the following, among other proceedings, were had, viz:

Now on this day the County Commission of the County of Boone does hereby approve the Intergovernmental Cooperation Agreement between the County of Boone, the City of Columbia and The Curators of the University of Missouri as it relates to the collaborative adaptive management implementation process for Hinson Creek.

The terms of this Cooperative Contract are stipulated in the attached Intergovernmental Cooperation Agreement. It is further ordered the Presiding Commissioner is hereby authorized to sign said Intergovernmental Cooperation Agreement.

Done this 2nd day of April, 2013.

Daniel K. Atwill
Presiding Commissioner

Karen M. Miller
District I Commissioner

Janet M. Thompson
District II Commissioner

ATTEST:
Wendy S. Noren
Wendy S. Noren
Clerk of the County Commission

Geosyntec consultants

2009 East McCarty St., Suite 1
Jefferson City, MO 65101
PH 573.443.4100
FAX 573.443.4140
www.geosyntec.com

VIA EMAIL

April 1, 2022
Revised, September 28, 2022

Lynne Hooper
Urban Hydrologist, Boone County Resource Management (BCRM)
801 E. Walnut
Columbia, MO 65201-7732
lhooper@boonecountymo.org

Subject: Proposal for Hinkson Creek Continuous Water Quality Monitoring

Dear Ms. Hooper:

This revised proposal addresses the clarifications and decisions made regarding the April 1, 2022 proposal submitted by Geosyntec Consultants, Inc. (Geosyntec) to conduct continuous water quality monitoring on Hinkson Creek. The clarifications include selection of the number of stations, duration of monitoring, and coordination with Dr. Zeiger's ongoing water quality monitoring of Hinkson Creek.

INTRODUCTION AND PURPOSE

In 2019, Geosyntec assisted the Hinkson Creek Collaborative Adaptive Management (CAM) process by performing an *Environmental Analysis Study: Hinkson Creek Macroinvertebrate Data Mining Project.* Through this project, Geosyntec identified chloride as an aquatic life stressor in Hinkson Creek. Publicly available water quality data indicate attainment of in-stream chloride water quality standard protective of Missouri's aquatic life. However, based on when historic chloride data were collected and other scientific research, chloride data were not believed indicative of potential elevated concentrations during critical periods (winter season). In addition, chloride concentrations in Hinkson Creek were noted to correlate with instream specific conductance. Therefore, continuous specific conductance is a candidate surrogate for continuous chloride monitoring to characterize frequency, magnitude, duration, and travel time of chloride stressors in Hinkson Creek and its tributaries.

Geosyntec provides this proposal to perform continuous water level, water temperature and specific conductance monitoring at six (6) to be determined Hinkson Creek or tributary stations.

New Solinst Levelogger 5 level, temperature and conductivity (LTC) instrumentation are proposed for continuous monitoring and will become property of the project's funding entity for subsequent use. **Attachment A** includes the specifications of the Solinst Levelogger 5 LTC instrumentation.

SCOPE OF WORK

The following tasks of field reconnaissance, station deployment, monthly station maintenance and data acquisition, instrumentation removal, and project reporting are proposed for monitoring water quality of Hinkson Creek and its tributaries.

Task 1. Reconnaissance

Objective: Geosyntec will visit proposed monitoring station locations to evaluate suitability for instrumentation and the resources (e.g., hardware) for developing semi-fixed continuous water quality monitoring station network in Hinkson Creek or its tributaries.

Activities:

- Document suitability, specific location, and necessary hardware to establish a semi-fixed water quality monitoring station network.
- Evaluate specific conductance variability of the stream cross-sections (distance and depth).
- One (1) meeting with the Hinkson CAM to finalize selected monitoring stations.
- Procure and prepare necessary instrumentation and installation hardware for Task 2.

Deliverables:

- Provide field data and site images for each station evaluated for the Hinkson CAM site selection meeting.

Assumptions

- Prior to reconnaissance, BCRS or Hinkson CAM will select six (6) Hinkson Creek or tributary monitoring stations.
- Budget includes three (3) extra, for a total of nine (9) Solinst Levelogger 5 LTC instruments.
- Recon up to 6 stations in one 8-hour day.
- Two (2) Geosyntec staff per day for station recon.
- New Solinst Levelogger 5 LTC instrumentation will become property of the project's funding entity.

Task 2. Station Installation and Instrumentation Deployment

Objective: In accordance with field reconnaissance data, Geosyntec will deploy six (6) water quality monitoring stations in Hinkson Creek or tributaries with Solinst Levelogger 5 LTC instruments to continuously (every 15-minutes) monitor water temperature, water level and specific conductance. This data collection frequency is consistent with Dr. Zeiger's five (5) monitoring stations in Hinkson Creek.

Activities:

- Calibration of Solinst Levelogger 5 LTC instruments.
- After calibration, compare one (1) Solinst Levelogger 5 LTC instrument to one (1) of Dr. Zeiger's HOBO onset conductivity sensors for confirmation of conductivity values.
- Water quality station installation and instrumentation deployment.

Deliverables:

- If requested, provide field notes and images of each station deployed.

Assumptions:

- Final monitoring station selection will be agreed upon and finalized by BCRM or the Hinkson CAM.
- Data are not transmitted real-time and require manual download (monthly interval).
- Water levels are relative and not established for development of flow rating curve.
- For health and safety purposes, two (2) Geosyntec staff per day of deployment.
- Instrumentation deployment will occur during base flow conditions approximately at the start of the water year (October 1st, 2023).
- Dr. Zeiger or representative will be available for Solinst Levelogger 5 LTC and HOBO onset conductivity sensor comparison.
- Monitoring duration will be three (3) years from deployment.

Task 3. Station Maintenance and Data Acquisition

Objective: Station maintenance (instrumentation cleaning and calibration) and data retrieval from each station will occur monthly. Downloaded data will be compiled in a continuous database for each station.

Activities:

- Monthly station maintenance (cleaning, calibration/checks) and download data.
- Monthly data compilation and review.

- Monthly drift corrections, as applicable; quality assurance and quality control reviews; and data validation.

Deliverables:

- Monthly maintenance (calibration) data sheets will be provided.
- Quarterly summary report will be provided per station.

Assumptions:

- Maintain up to six (6) stations in an 8-hour day.
- Replacement of instruments stolen or damaged from vandalism or flooding will be the responsibility of the funding entity.

Task 4. Station Removal

Objective: Removal of water quality monitoring instrumentation and installation hardware.

Activities:

- Equipment removal and restoration of site to pre-existing conditions.

Deliverables:

- No deliverable associated with station removal.

Assumptions:

- Remove up to six (6) monitoring stations in an 8-hour day.

Task 5. Project Reporting and Management

Objective: Database and PowerPoint presentation to the Hinkson Creek CAM summarizing continuous water quality (temperature, level, and specific conductance) data collected.

Activities:

- Final raw and validated database.
- Summary of water quality parameters data statistics for the period of monitoring.
- Quarterly and annual timeseries figures of water quality parameters.
- PowerPoint presentation to the Hinkson CAM.
- Monthly project management.

Deliverables:

- PowerPoint presentation to Hinkson CAM.
- Raw and validated (formulas/code removed) database.

Assumptions:

- One (1) Hinkson CAM PowerPoint presentation.
- Electronic water quality database transmittal.

SCHEDULE

The project will be performed starting approximately October 1, 2023, for a duration of three (3) years.

PROJECT SUMMARY ESTIMATE

The estimated cost to complete the proposed scope of work is **$124,500** This estimate was developed using projected labor rates and direct costs. Geosyntec has attempted to provide this as a not-to-exceed estimate; however, it may be modified at the time of contracting due to unforeseen circumstances. The project work will be conducted on a time-and-materials basis.

Should you have any questions, please contact Cody Luebbering.

Sincerely,
Geosyntec Consultants

Cody Luebbering

Cody Luebbering
Senior Scientist

ATTACHMENTS

A: Solinst Levelogger 5 LTC Specifications
B: Example Water Quality Calibration Sheet and Instrumentation Servicing Sheet

Levelogger 5 LTC

Level, Temperature, Conductivity

The Levelogger® 5 LTC logs water level, temperature, and conductivity. It combines a datalogger, 8-year battery, Hastelloy® pressure sensor, temperature detector, and conductivity sensor within a small waterproof housing, 22 mm x 208 mm (7/8" x 8.2"). A baked-on coating using polymerization technology protects the body against corrosion, abrasion and high temperatures. The conductivity sensor is a 4-electrode platinum sensor, with autoranging capabilities. The minimal-maintenance, sealed Levelogger 5 LTC is simple to clean and calibrate, even in the field.

Level Sensor:	Piezoresistive Silicon with Hastelloy Sensor
Ranges:	5, 10, 20, 30, 100, and 200 m
Accuracy:	±0.05% FS
Resolution:	0.001% FS to 0.0006% FS
Units of Measure:	cm, m, ft, psi, kPa, bar (°C, °F)
Normalization:	Automatic Temperature Compensation
Temp Comp. Range:	0°C to 50°C
Temperature Sensor:	Platinum Resistance Temperature Detector (RTD)
Accuracy:	±0.05°C
Resolution:	0.003°C
Conductivity Sensor:	4-Electrode Platinum
Full Range:	0 – 100,000 µS/cm
Calibrated Range:	50 – 80,000 µS/cm
Accuracy:	±1%: 5,000 µS/cm – 80,000 µS/cm; greater of ±2% or 15 µS/cm: 50 µS/cm –5,000 µS/cm
Resolution:	±0.1 µS/cm
Temp Comp. Range:	0°C – 50°C
Normalization:	Specific Conductance @ 25°C
Battery Life:	8 Years (1 reading every 5 minutes)
Clock Accuracy (typical):	±1 minute/year (-20°C to 80°C)
Operating Temperature:	-20°C to 80°C
Maximum Readings:	100,000 sets of readings
Memory:	Slate or Continuous
Communication:	Optical high-speed: 57,600 bps with USB
Size:	22 mm x 208 mm (7/8" x 8.2")
Weight:	197 grams (6.95 oz)
Corrosion Resistance:	Baked-on coating using polymerization
Wetted Materials:	Platinum, Delrin®, Viton®, 316L Stainless Steel, Hastelloy, Regulator approved PFAS-free PTFE (inside and out)
Sampling Mode:	Linear, Event & User-Selectable with Repeat Mode, Future Start, Future Stop, Real-Time View
Measurement Rates:	2 seconds to 99 hours
Barometric Compensation:	Software Wizard and Barologger 5

Get Quote

LTC Models	Full Scale (FS)	Accuracy	Resolution
M5, C80	5 m (16.4 ft.)	± 0.3 cm (0.010 ft.)	0.001% FS
M10, C80	10 m (32.8 ft.)	± 0.5 cm (0.016 ft.)	0.0006% FS
M20, C80	20 m (65.6 ft.)	± 1 cm (0.032 ft.)	0.0006% FS
M30, C80	30 m (98.4 ft.)	± 1.5 cm (0.064 ft.)	0.0006% FS
M100, C80	100 m (328.1 ft.)	± 5 cm (0.164 ft.)	0.0006% FS
M200, C80	200 m (656.2 ft.)	± 10 cm (0.328 ft.)	0.0006% FS

Upgraded Features

- Increased memory: 100,000 sets of data
- More stable communication: single-eye optical, easy to clean, more scratch resistant
- Stronger, robust design: double o-ring seals for two times over pressurization rating
- Better thermistor and conductivity sensitivity: upgraded platinum RTD and conductivity sensor
- Superior protection in harsh conditions: baked-on coating using polymerization—inside and out

User-Friendly Operation

Software Calibration and Data Wizards guide you through conductivity calibration and barometric compensation, ensuring accurate data sets. The Data Wizard also converts conductivity readings to Specific Conductance (@ 25°C).

Levelogger Software allows you to easily program your preferences, download data, and display data in a graph or table format or export to other programs. Real Time View allows immediate viewing of live water level, conductivity, and temperature readings.

Leveloggers are easy to deploy; install with direct read cables or wireline/cord suspension. The Levelogger 5 LTC is SDI-12 compatible using the Solinst SDI-12 Interface Cable.

Download data in the field using the new Field Reader 5, DataGrabber 5 USB data transfer device, or through *Bluetooth*® using the Levelogger 5 App Interface and your smart device. Integrate the Levelogger 5 LTC with Solinst Telemetry Systems, which use the latest wireless technologies.

Levelogger 5 LTC Applications

- Salt water intrusion and soil salination monitoring
- Plume remediation monitoring and studies
- Leachate monitoring at landfills, mine tailings, waste disposal storage sites, and more
- Agricultural and stormwater runoff monitoring
- Create a historical database for potable water supply monitoring
- Tracer tests

Biofoul Screen

When a Levelogger 5 LTC is deployed for an extended period, there is the risk of biofouling on the pressure sensor and/or conductivity cell, which can compromise their readings.

The Biofoul Screen is designed to reduce the unwanted buildup of microorganisms, plants, algae, or organisms such as barnacles and mussels, on the sensors. The Biofoul Screen consists of a Delrin sleeve wrapped with copper wire. Slip onto the sensor end of a Levelogger 5 LTC, where it is held in place by compression fit.

Using the natural anti-fouling characteristics of copper, the Biofoul Screen is an affordable option to lengthen the time a Levelogger 5 LTC can be deployed. It reduces site visits and time spent cleaning Leveloggers, and improves long-term performance by ensuring accurate sensor measurements.

An optional Biofoul Screen provides extra protection for the Levelogger 5 LTC pressure and conductivity sensors in harsh environments.

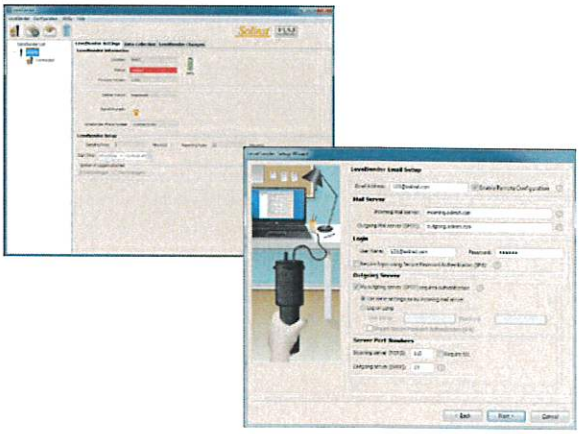
Levelogger 5 App Interface

The Solinst Levelogger App is designed to communicate to Solinst dataloggers via your smart device. Programming options include start/stop, data downloading, linear and real-time sampling, future start/stop, and GPS coordinates.

The Levelogger 5 App Interface uses Bluetooth wireless technology to connect with your smart device running the Solinst Levelogger App. Use our Levelogger 5 App Interface and a Solinst direct read cable to communicate to a downhole Levelogger and email data files right from the field (see Model 3001 Solinst Levelogger 5 App Interface data sheets).

Download on the App Store

GET IT ON Google play



LevelSender 5 Telemetry System

Instantly add cellular telemetry to your Levelogger 5 LTC by connecting to a Model 9500 LevelSender 5. Send data by email or SMS from your remote stations to your desired location. The LevelSender 5 simplifies your telemetry setup, by working with Solinst direct read cables and is compatible with the full Levelogger Series product line (see Model 9500 LevelSender 5 data sheet).

Solinst Canada Ltd. 35 Todd Road, Georgetown, Ontario Canada L7G 4R8 www.solinst.com
E-mail: instruments@solinst.com Tel: +1 (905) 873-2255; (800) 661-2023 Fax: +1 (905) 873-1992
Printed in Canada September 1, 2020

Water Quality Servicing Data Sheet

Sampling Site: _____

Date: _____

General Information	
Arrival Time: **Departure Time:**	**Barometric Pressure (mmHg):** **Last Site Visit:**
Weather:	**Field Crew Members (name):**
Temp (F) (approx.): **Water Depth (ft) (approx.):**	

Site Information

Sonde Readings	Time	Spec. Cond. (uS/cm)	Water Temp. (°C)	DO (mg/L)	DO %	pH
Field Sonde Reading at Time of Arrival						
QA Sonde Readings						
Field Sonde Reading After Cleaning						
Field Sonde Last Three Logged Readings						
Field Sonde Calibration Reading				Initial DO %	Cal DO %	
Field Sonde Post Calibration Reading						
QA Sonde Readings						

Batteries Replaced: Y N	Voltage:
Sonde Logging Active: Y N NA	
Sonde & Probe Condition:	
Run Mode Exited before Sonde Was Disconnected? Y N NA	Field Crew Initials:
Was Unit Running? Y N NA	
Comments:	

Water Quality Instrumentation Calibration Log

Project Name:

Calibration Prior to Field Activities Handset Model _____ Handset ID # _____

Date: Time: Sonde Model _____ Sonde ID # _____

Person performing calibration:

	Equipment	Standard Solution	Temperature (°C)	Initial Reading	Final Reading	Units
Dissolved Oxygen	YSI	100.0				% saturation
SP Conductivity	Solinst	1.413				mS/cm
pH (1st point - 7.0)*	YSI	7.0 / 0.0 (±50)				pH/mV (0 ±50)
pH (2nd point - 10.0)*	YSI	10 / -180 (±50)				pH / mV = Δ 155 - 180 of pH 7.0

DO Gain:

YSI barometric pressure reading at time of calibration:

End of Day Testing After Completion of Field Activities

Date: Time: YSI barometric pressure reading at time of check:

Personnel performing testing:

	Equipment	Standard Solution	Temperature (°C)	Reading	Difference between standard and reading	Acceptable Range	Units	Out of Range (Y or N)
Dissolved Oxygen	YSI	100.0				90.0-110.0	% saturation	
SP Conductivity	Solinst	1.413				1.342-1.484	mS/cm	
pH (1st point - 7.0)	YSI	7.00				6.8-7.2 / 0.0 ±50	SU	
pH (2nd point - 10.0)	YSI	10.00				9.8-10.2 / Δ 155 - 180 of pH 7.0	SU	

	Standards Lot #	Exp. Date
pH 7.0		
pH 10.0		
SP Conductivity		

Hinkson Creek CAM Science Team Recommendation for Specific Conductance Data Logger Deployment

Executive Summary

Chloride is a known stressor of aquatic life and concentrations exceeding water quality standards have been documented in Hinkson Creek. Although chloride is an apparent cause of impairment in Hinkson Creek, there are likely other physical, chemical, and/or hydrological issues that contribute to aquatic life impairment. Studies on Hinkson Creek have shown that chloride concentrations are about four-times higher than those in reference/control streams. Chloride concentrations in Hinkson Creek tend to increase from upstream to downstream as land use in the watershed transitions from rural to urban. Some of the chloride values that have been measured exceeded water quality criteria levels, indicating toxic chloride events have occurred in Hinkson Creek.

Specific conductance can be defined as the indirect measurement of all dissolved ions in water, measured through electrical conductance. Chloride is one of the dissolved ions measured. Chloride is difficult to measure continuously, complicating the ability to detect peak concentrations as well as long term continuous concentrations. Specific conductance can be measured continuously and cost effectively. Specific conductance can fluctuate greatly in Hinkson Creek during the winter months, indicating water quality is dynamic. Studies show that while elevated chloride levels are most likely to occur during winter months, high concentrations can occur during non-winter periods.

The Science Team recommends deploying six (6) specific conductance sensors, in complement with those deployed by Lincoln University (Dr. Sean Zeiger), for a minimum of three (3) years. The Geosyntec proposal (attached) is for three years. The Science Team believes that three years would be likely to include a range of hydrological events. This will document seasonal variation, track the moving baseline resulting from continued development in the watershed, and assist with identifying tributaries that have the greatest relative contribution of chloride and other dissolved ions.

Lincoln University Specific Conductance Monitoring (Dr. Sean Zeiger)

Utilizing funding not connected to the Hinkson CAM, Dr. Sean Zeiger has installed discharge gages at five (5) sites on Hinkson Creek and plans to deploy specific conductance data loggers at each of the sites.

1. Hinkson Creek near Rogers Road
2. Hinkson Creek near Mexico Gravel Road

3. Hinkson Creek near Walnut
4. Hinkson Creek near Providence
5. Hinkson Creek near Forum

Geosyntec Specific Conductance Monitoring

Geosyntec has provided a proposal and budget for the deployment, operation, and maintenance of specific conductance data loggers (attached). The Science Team recommends funding the deployment of data loggers for a minimum of three (3) years at the following sites:

1. Hinkson Creek below I-70
2. Hominy Branch near Moon Valley Road
3. Grindstone Creek near Rock Quarry Road
4. Flat Branch near Stadium or MKT Trail
5. County House Branch below Chapel Hill Road
6. Mill Creek near Scott Boulevard

Data Management and Analysis

The data acquisition by Geosyntec and Lincoln University are funded by different sources and each come with their own requirements for data management.
In order to assure that data collected by Geosyntec and by Lincoln University are comparable, both parties will calibrate and validate instruments to the same standards and perform maintenance on comparable schedules. It would be beneficial – but not essential – that they both use the same models of specific conductance instruments.

The parties will jointly develop and employ identical data editing and processing procedures, including criteria to identify and delete erroneous data. Both parties will also agree to use an identical data format. Data and metadata (including spatial and temporal ranges, methods, and formatting information) will be delivered to the Science Team at the end of each water year (October 1 through September 30 of the following year) and will be posted on the Help the Hinkson website after an embargo period of 1 year after the end of data collection. The embargo will enable Geosyntec and Lincoln University the opportunity to analyze, interpret, and publish the data.

Map of Sampling Stations