CSU Master Plan Committee (MPC) Meeting

April 26, 2021
Agenda

- Mountain Campus – gravel quarry exploration
- METEC Facility on Foothills Campus - land use renewal
Mountain Campus
Gravel Quarry Exploration
SCHEDULE:
• Construction start: Fall 2020
• Functional: Spring 2022
SCHEDULE:
• Construction start: Spring 2021
• Functional: Spring/ Summer 2022
SCHEDULE:
• Construction start: Late Spring 2021
• Functional: Fall 2021
KEY NOTES:

- Ex. Quarry ~2 Ac.
- History on the existing quarry site development is unclear however it has been used for several decades. No records in either CSU or county databases.

- Gated Access from 64E to be kept locked when not in use.
- No removal of materials permitted from USFS Federal land without written permission.
- Currently used by CSU for debris drop off and holding yard.
• Gated Access from Larimer County Rd 64E to be kept locked when not in use.
POTENTIAL USE OF MATERIAL IF Viable:

Larimer County currently maintains 450 miles of gravel roads and is under long term contract with USFS to maintain another 120 miles of US forest service roads

- All aggregate currently is hauled 50-60 miles from FC to various sites including 64E.
- The hauling costs contribute 80% to the cost of any road work.
- This transportation impacts local air quality and adds to the overall carbon footprint.

If mineral assets are sufficient Larimer County may request to enter into a long term agreement with CSU and USFS for aggregate resources.
POTENTIAL BENEFITS TO CSU IF Viable:

- Educational opportunity for WCNR courses focusing on reclamation and mineral resources
- Fund for site reclamation/ restoration which is currently an unfunded CSU liability
- Long term road maintenance services for 63E and 44H
- Aggregate for our internal uses at lower cost and little carbon impact for hauling from Fort Collins
- Monetary compensation
POTENTIAL CHALLENGES FOR CSU IF Viable:

- Long term use of the site may limit CSU operations use
- Optics of “gravel quarry operation at the Mountain Campus”
- Dust mitigation measures
CURRENT PROPOSAL FROM LARIMER COUNTY:

“Requesting right of access from CSU and USFS to perform a sub-surface geotechnical survey”. 
Suggested Motion: Approve Larimer County’s Request for right of access from CSU to perform a sub-surface geotechnical survey.
METEC
(Land Use Renewal)
Suggested Motion:
Renew METEC site use for an additional 5 years.
CSU’s METEC Facility: Research & Testing Overview
Land Use Renewal Request

Daniel Zimmerle
Topics

• METEC Research Group – Research and Testing Overview
• METEC Facility Capabilities and Engagement
• Stakeholder Input on Renewal
• Proposed Site Modifications
• Motion to Renew Land Use
The \textbf{METEC}_{h4} Facility
How METEC began

• In 2016, CSU was awarded 4.5M$ to develop a test facility for methane detection technologies developed by the Department of Energy’s MONITOR technology development program, part of the Advanced Research Projects Administration-Energy (ARPA-E).

• The facility as approved in 2016 by Master Planning Committee has been completed except for the access road from Vine Drive, operational since February 2017

• Original DOE project completed, and facility has transitioned into a self-funded research program sponsored by industry, environmental groups, and ongoing research projects
Who we are

Daniel Zimmerle  
Director

Kristine Bennett  
Project Manager

Jerry Duggan  
Research Scientist

Tim Vaughn  
Research Scientist

Clay Bell  
Research Scientist

Stuart Riddick  
Research Scientist

Aidan Duggan  
METEC Site Engineer
What we do

1. **Test leak detection** solutions
   - METEC test facility
   - Develop basic performance data by testing common methods

2. **Make field measurements**
   - Measured across most sectors of NG industry

3. **Develop emissions simulation software:** *Pathway to Equivalence*
   - Methane Emissions Estimation Tool (MEET) – emissions simulator
   - Fugitive Emissions Abatement Simulation Tool (FEAST) – LDAR simulator
Research and Testing Facility: Buildout of plan approved in May 2016 by Master Planning Committee
Methane Emissions Technology Evaluation Center

Major Facilities

- **Simulated Pipeline ROWs**
- **Pipeline Test Bed**
  - Simulated Pipes & Leaks
  - Natural and sand fill
- **10m x 10m well pads**
- **45m x 60m well pad**
  - Dry gas setup
  - Wet/Dry Gas Setup
  - Wet/Dry setup
- **Small Compressor Station**
  - Share tanks with adjacent pad
- **Dehydrator**
- **Flare**
- **Office, Control, Meeting**
- **Mobile/Large Release System**

**Test Bed**

- 45m x 60m well pad
- Wet/Dry setup

**Well Pads**

- 10m x 60m well pad
- Wet/Dry setup
General Capabilities

- Controlled gas releases from ≈200 above-ground points from 6 pads / 4 facility types
- Variable release rates
- Mobile / large volume gas release rig
- Tunable wet gas releases
- Forced-air flare (possible for lofted plumes)
- Underground pipeline test bed
- Analytic equipment
- 6 networked OGI Cameras
Using **METEC**

- Ad-hoc Testing
  - Uniform charge schedule for all users
  - $2380 Setup charge for test planning
  - $2480/day for site usage
  - $ for unusual gas amounts, fabrication, unusual requests

- Protocol testing
  - Per-protocol charge (MONITOR R2 was $5000/test)
  - Fee schedule will be developed with new protocols
  - Typically multiple solutions testing simultaneously

- Have developed a membership advisory board
  - $15K/year ... includes 3 days of ad-hoc time (worth over $9K)
  - $50K/year membership for associations

**Process for use:**
1. Contact METEC
2. Scoping call
3. Quote, if necessary for additional services
4. Schedule time
5. Test
6. Data report to tester or authorized recipients
Testing Portfolio

>30 solutions tested to date – *MONITOR and non-MONITOR*

Range of testing performed from “kicking tires” to serious single-blind evaluations
METEC Research Impact

- Current funded activity: $6.56M (IAB, testing services, funded research)
- METEC is funded through three diverse sources ensuring business continuity:
  - Industry membership in the ‘industry advisory board’
  - Providing services to companies and other organizations:
    - Testing leak detection solutions.
    - Developing new technologies.
    - Training company personnel.
  - Providing an experimental facility for CSU projects from across campus, and involving students from Mechanical, Electrical and Systems Engineering, Computer Science, and other programs.
- Unique opportunity to increase CSU’s visibility around methane emissions research. Given the high profile of the MONITOR Program, almost every major gas producer, regulatory agency and environmental group has visited CSU during the past five years.
- In non-pandemic era, hosts two tours per month of visitors from high profile organizations
IAB Membership Current Year

Basic Members ($8,000)
- Williams
- Utah Lands
- Environment and Climate Change Canada/ Government of Canada
- Antero Resources
- Canadian Energy Partnership
- Occidental

Full Members ($15,000) Contd.
- Chevron
- Project Canary
- Cimarex Energy Company
- Schlumberger
- BPX Energy
- Kuva Systems

Full Members ($15,000)
- Total American Services
- Shell
- ABB

Consortium Members ($50,000)
- API The Environmental Partnership
METEC Research Collaborations

Long-standing academic collaborations
• University of Texas – Austin
• University of Texas – Arlington
• Harrisburg University of Science and Technology

Regulatory Engagement
• State of Colorado (CDPHE, COGA)
• California Air Resource Board

• Academics site users
  • Stanford – OGI testing and Machine Learning development
  • Stanford/EDF – Mobile monitoring challenge
  • University of Calgary – Mobile method validation
  • University of Wyoming – Validation of OTM33a measurement technique
  • Utah State University – Validation of high-volume sampling system
Stakeholder Input
Stakeholders

Following people were contacted, we received either no response or a response indicating they support the METEC land use renewal.

- David McLean Dean, WSCOE
- Sonia Kreidenweis Research Associate Dean, WSCOE
- Jeff Collett Atmospheric Science & CIRA
- Christian Puttlitz Mechanical Engineering
- All ME faculty The Factory (more specifically areas occupied by Kaka Ma, Chris Weinberger, Mostafa Yourdkhani, and Don Radford)
- Jorge Rocca Advanced Beam Laboratory
- Mazdak Arabi Air, Water and Research Building
- Chris Thornton Engineering Research Center
- Chris Robertson Drone Center
- Carol Dollard Facilities – PV field management
- Melissa Reynolds Physics has space in the SimLab
Sample Stakeholder Comments

• *I am very supportive of this request.*  **METEC is a major asset to CSU.** Anthony Marchese, Associate Dean for Academic and Student Affairs, WSCOE

• *I have no concerns from the Drone Center side and I am excited to see this awesome program continuing on.*  **Thank you for reaching out!** Chris Robertson, Director CSU Drone Center

• *No issues from my side.*  **METEC has been a good partner, we've had several senior design teams in and around that space over the last few years and have had several projects that were mutually beneficial to education and research. They run a tight ship and keep the place clean and operational. If there's anything I can help with from my side on the renewal please let me know.** Steve Johnson, Manager of Undergraduate Teaching Laboratories for Mechanical Engineering
Site Modification: projected to be completed June 2021
Proposed Site Modification: Access Road

• Create an access road on the north side of the Factory buildings
• Was intended to be constructed during initial development phase
• Will provide a more direct route and avoid traveling between buildings
• Stakeholder input: Don Radford at The Factory approves of this option--only concern is that the straightaway needs to be designed to discourage high rates of speed as people enter the parking lot outbound to Vine to lessen risk of accidents with vehicles backing out of the parking spaces along the north side of the building. A speed berm is a feasible option.
• Stakeholder input: CSU Logging Sports Club approves of this route as it is less intrusive on their practice field, provides access for firewood sales
• Will lock gate to discourage use of the current access route
METEC Entrance off W. Vine Drive
Motion: Renew METEC land use agreement for an additional 5 years.
Thank You

Contact

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Selected Research Projects
Marginal Wells Methane Emissions

71% of the 1.1 million wells in the USA are marginal
- < 15 BOE/d
- < 90 Mscf/d (2500 m³/d)

Few emissions studies focus on marginal wells

Methods:
- OGI leak detection (OPGAL EyeCGas 2.0)
- Measurement: Bacharach Hi-Flow Sampler with gas composition canisters
- Tracer flux or other downwind methods for large emitters
ADED - Advancing Development of Emissions Detection
DOE + Partner funding

Define LDAQ Solutions
Survey Methods
Continuous Monitoring

Controlled Testing (METEC)
Protocol
Testing
Performance Metrics

Field Testing (Pilot Sites)
Protocol
Testing
Performance Metrics

LDAQ Simulation Tool
Method Comparisons
Field ↔ Controlled
**M&M: Underground Gas Migration**

**Goal:** Identify what conditions are at most risk for long-distance underground gas migration.

**Science & Modeling**
- Buoyancy effects
- Pressure-driven flow
- Advection
- Diffusion

**METEC Measurements**
- Above-ground meas.
- Subsurface meas.
- Surface meas.

**Field Work**
- Working with 5 major distribution companies
  - Collect data from 70-100 leak responses
  - Detailed field work for in-depth measurements at a few leaks
  - Test releases at METEC to calibrate / enrich models
  - Develop tools for simple surface measurements → estimated leak size & risk.
OGI Efficacy Study

What is detection performance of OGI surveys in controlled, pseudo-realistic conditions?

• Experienced camera operators / their camera / their protocol
• 29 days / 39 operators / 488 tests / 24 organizations / 4 seasons

Conclusions:
• Experience matters ... a lot ... experienced surveyors are 1.7x as likely to find leaks overall
• Detection rates are 1/10th that of prior camera-focused studies

Optical Gas Imaging Practical Course

Gain experience using an OGI camera in controlled conditions with immediate feedback

- Unique 2-day hands-on practical course
- Complements thermography certification with hands-on practice.

Objectives:

- Experience impact of different backgrounds on visibility of emissions.
- Understand effective detection limit of OGI cameras in different environmental conditions.
- Evaluate your OGI performance in simulated LDAR scenarios at METEC.
Open Architecture High Flow Design

Critical Instrument for Measuring Emissions *In Situ*

Assessment at METEC & elsewhere ...
... many problems found

Current instrument is obsolete & falling out of support

**Objective:** Develop and test a new design for a High Flow Sampler ...

- **Open source architecture**
- Could be constructed by multiple parties
- Identify and design or source critical components
- Develop updated software
- Better sensors